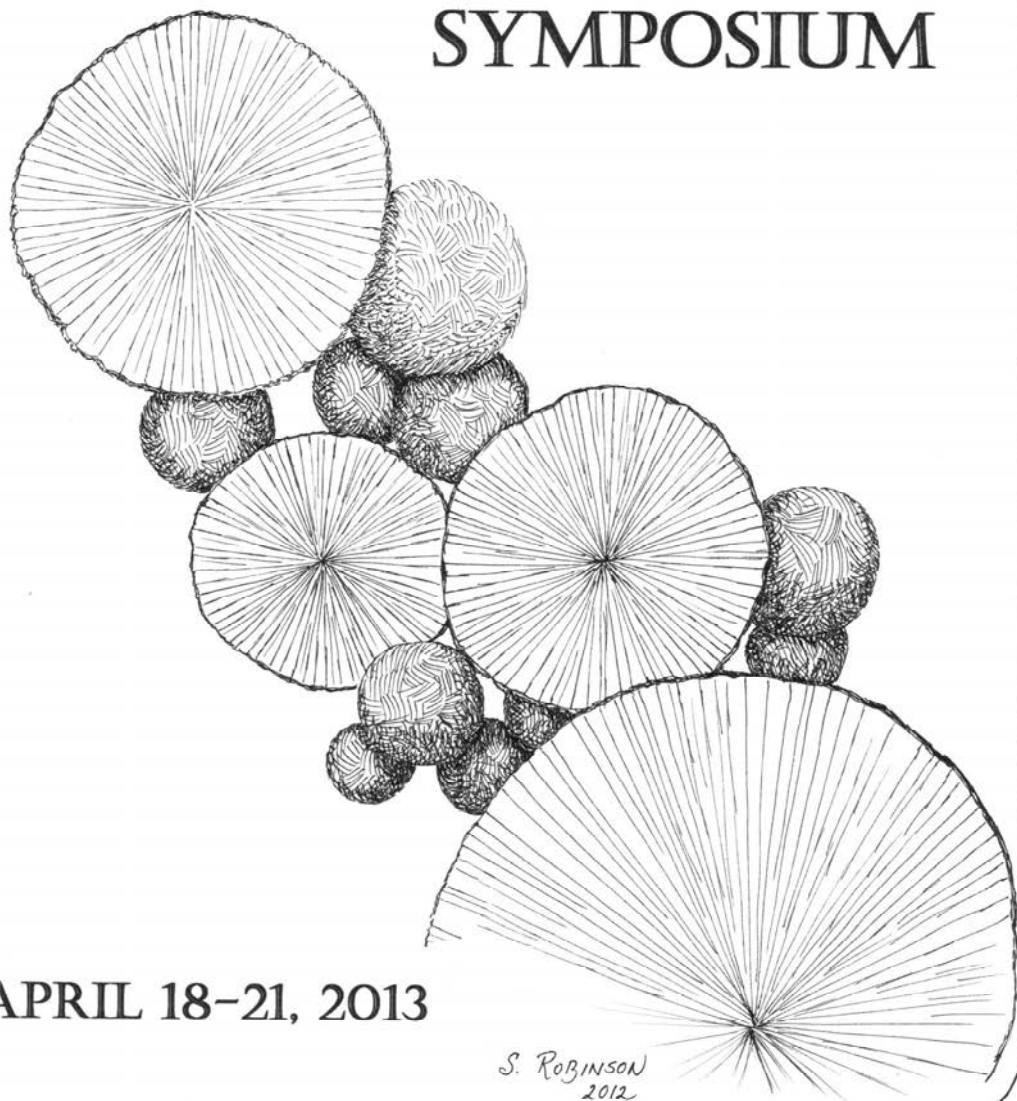


THE ROCHESTER
MINERALOGICAL
SYMPOSIUM



APRIL 18-21, 2013

S. ROBINSON
2012

40th Rochester Mineralogical Symposium

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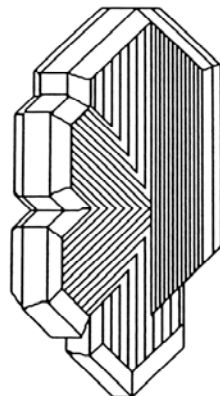
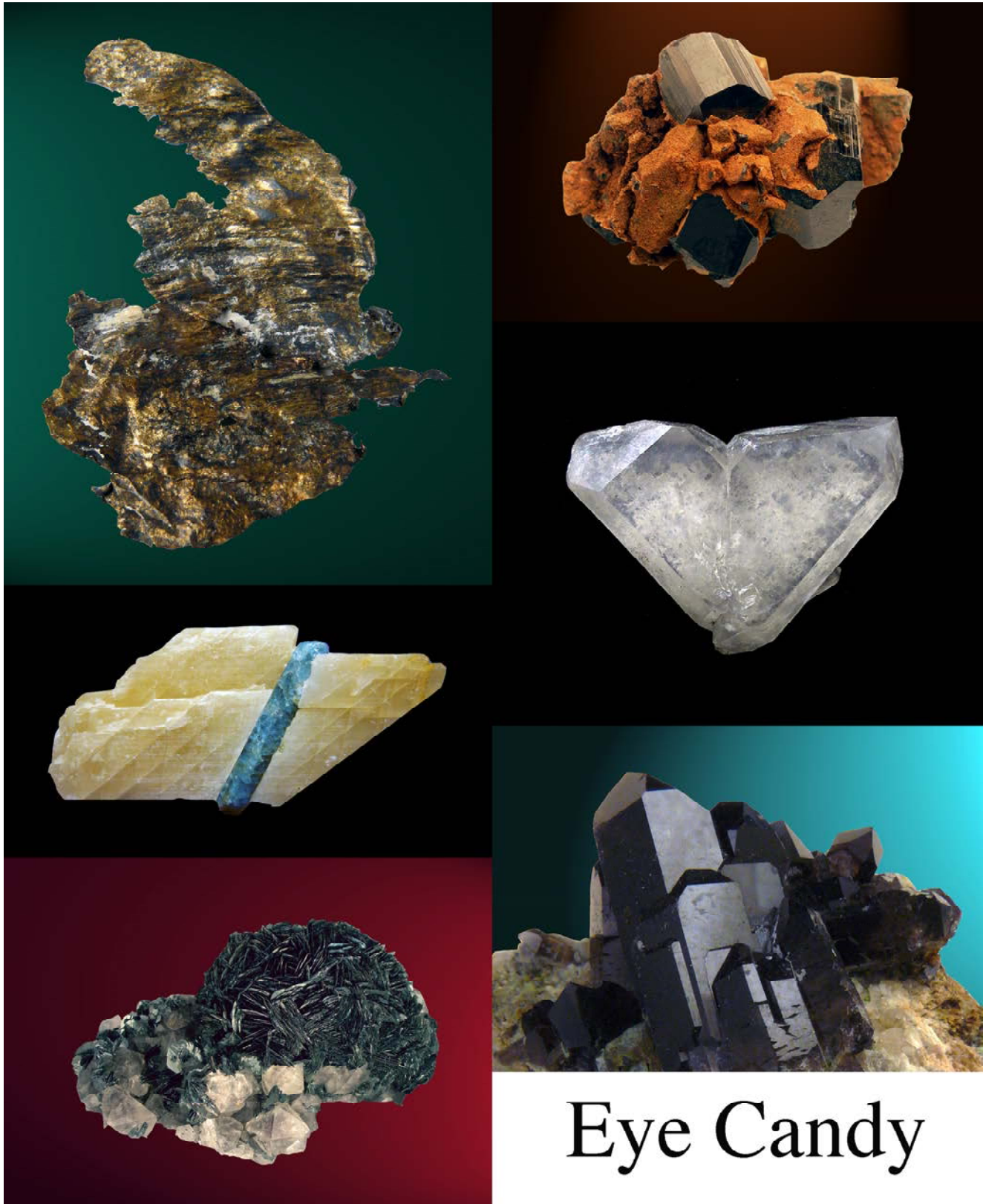


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Our warmest welcome to the 40th Rochester Mineralogical Symposium. We continue this year with our program designed to provide excellent speakers, new information, camaraderie, displays of extraordinary specimens, opportunities to acquire desired objects—all in a familiar and comfortable environment. Our speakers for this year include several who have never lectured here before and others who are familiar faces. Most of their topics will be quite new to our collective experience. This year's Technical Session is again robust! We welcome numerous new attendees and hope you enjoy our meeting. We appreciate the continuing support of returning attendees. We are trying printing these Program Notes electronically for the first time, permitting us to have color where needed at a reasonable price. As usual, everything is different, yet everything is the same.



Eye Candy

Clockwise from top left: Silver, ZCA #3 mine, Balmat, NY; Fluor-dravite, road cut near Gouverneur, NY; Quartz (Japan-Law twin), Ellenville Lead mine, Ellenville, NY; Quartz, Bower Powers farm, Pierrepont, NY; Hematite, Quartz, Chub Lake Prospect, Hailesboro, NY; Fluor-apatite, Calcite; Rose Road Occurrence; Pitcairn, NY. Steve Chamberlain photos.

PROGRAM

Thursday Evening, April 18, 2013

- PM 4:00-6:00 Cocktails and Snacks – Hospitality Suite 400 (4th Floor)
- 6:00-7:45 Dinner – Baxter’s
- 8:00-9:15 **Mineralization in Caves, Part I – Kevin Downey**
Kevin Downey has the ideal background for tonight’s opening lecture. He earned a BS in geology from the University of Massachusetts in 1978; a BA in cinematography and photographic sciences from the same institution in 1981; and a Certificate of Mastery from the Ecole Francaise de Speleologie in Vercours, France in 1984. During the past 33 years, he has made more than 2000 trips underground to take photographs. His work has appeared in 12 books and more than 300 magazine articles. Study of cave minerals and the genesis of secondary speleothems is a personal priority. And yes, he is involved in the study of the gigantic selenite crystals in Naica, Mexico. Tonight he will introduce caves, cave science, and some current exploration. His talk will include many of the best caves yet found on the planet. We are delighted to have Kevin Downey open the 40th RMS!
- 9:15 Cocktails and snacks in the Hospitality Suite on the 4th floor will be available throughout the rest of the evening. Dealers’ rooms will be open at this time. All of the dealers are located on the 4th floor.

Friday Morning, April 19, 2013

- AM 9:00 Announcements
- 9:15-10:15 **Apatite and Other Phosphates from Llallagua, Bolivia: An Interesting Story of Hydrothermal Mineralization and Pseudomorphism – Dr. John Rakovan**
Dr. John Rakovan is a frontline academic. Currently a full professor at the University of Miami (Ohio), he has a CV overflowing with professional publications, funded research grants, successful doctoral and masters students, extensive work with undergraduate research, and professional service to the mineralogical community. In particular, John is an outstanding specimen mineralogist well known to all of you in the audience. He is an executive editor of *Rocks & Minerals* and a prolific author. The current apatite volume published by Lithographie is an excellent example of his efforts. Underpinning this activity is a BS in geology from the University of Illinois at Urbana-Champaign in 1988; an MS in clay mineralogy/crystallography from the University of Illinois at Chicago in 1990; and a PhD in geochemistry/mineralogy from SUNY Stony Brook in 1996. As many of you know, two of John’s favorite minerals are fluorite and apatite. Today, he is going to talk about interesting phosphate mineralogy involving apatite from Llallagua, Bolivia. Please welcome Dr. John Rakovan back to the RMS speakers podium!
- 10:15 Coffee Break

10:30-11:30

Dr. Allen Bassett and the Ruby Mines of Nepal – *Elise A. Skalwold*

Elise Skalwold, BSc, FGA, GG, is a gemologist and author involved in curating and independent research at her alma mater, Cornell University (BsC 1982). She completed her gemological training in-residence at the Gem and Jewelry Institute of Thailand in Bangkok, qualifying with Merit and subsequently elected a Fellow of the Gemmological Association of Great Britain (FGA). She is also a Graduate Gemologist (GG). As the winner of the James R. Lucy scholarship, she trained in-residence at the GIA at its campus in Carlsbad, CA. This morning, Elise will tell the story of how Dr. Allen Bassett went to Nepal to test the plate tectonics hypothesis in the 1970s and fell in love with the country's ruby deposits. He worked to establish a fully integrated gem industry in Nepal and was instrumental in developing the mines of Chumar and Ruyil, which produced the finest ruby cabinet specimens from Nepal.

11:30-1:00

Lunch and Shopping Break

Friday Afternoon, April 19, 2013

PM 1:30

Contributed Papers in Specimen Mineralogy - *Dr. Carl A. Francis* - Moderator

1:30

Beryl, eosphorite and secondary beryllium phosphates from the Collins Quarry, Georgetown, Maine – *J. W. Nizamoff, A. U. Falster, D. Leavitt, & W. B. Simmons.*

1:45

The world's largest reddingite crystal from the Bennett Quarry, Oxford Co., Maine? – *M. Felch, A. U. Falster, & W. B. Simmons.*

2:00

Nizamoffite, $Mn^{2+}Zn_2(PO_4)_2(H_2O)_4$, the Mn analogue of hopeite from the Palermo #1 Pegmatite, North Groton, Grafton Co., New Hampshire – *A. R. Kampf, A. U. Falster, W. B. Simmons & R. W. Whitmore.*

2:15

Collecting samarskite at the historic Spinelli Prospect, Glastonbury, Hartford County, Connecticut – *A. J. Albin & H. Moritz.*

2:30

Chernikovite, Fe-free warwickite, and dissakisite-(Ce) from New York State, USA – *M. V. Lupulescu, R. Rowe, D. G. Bailey, & M. Hawkins.*

2:45

Analysis of a 1970s find of exceptional dolomite crystals in the Lockport Dolostone, Cicero, Onondaga County, NY – *S. C. Chamberlain, D. G. Bailey, & R. Lyons.*

3:00

The Lowville quartz occurrence, Lewis County, NY – *M. Walter & S. C. Chamberlain.*

3:15

Rhodonite-axinite-(Mn) vein assemblages, Franklin, New Jersey, USA. – *V. King & J. Nemetz.*

3:30 Coffee Break

3:45

Three potentially new minerals from an oil shale fire in north-central Ohio – *R. P. Richards & A. R. Kampf.*

- 4:00 **Accessory mineralogy of the Black River Pegmatite and Humboldt Granite, Marquette County, MI** – T. W. Buchholz, A. U. Falster, & W. B. Simmons.
- 4:15 **New data on planerite from Mauldin Mountain, Montgomery County, Arkansas** – T. A. Brown, S. L. Hanson, & A. U. Falster.
- 4:30 **Mineralogy ofmiarolitic pegmatites in the Stove Mountain area, Colorado** – S. L. Hanson & G. Zito.
- 4:45 **Investigation of the chrysotile deposit on the Baie Verte Peninsula, Baie Verte, Newfoundland** – C. C. Reynard.
- 5:00 **Problems with Gladstone-Dale and Lorentz-Lorenz relationships** – C. Spencer.
- 5:15 **Benedikt Franz Johann Hermann** – E. Grundel.
- 5:30 **A unique Reichenstein-Grieserental law quartz twin from Galilea, Minas Gerais, Brazil** – R. Morgan.
- 5:45-6:30 Shopping Break

Friday Evening, April 19, 2013

- 6:30-8:00 Dinner – Baxter’s
- 8:15-9:15 **The Pleasures of Micromounting** – *Quintin Wight*
 Canadian Quintin Wight was born in Scotland. He earned a BA in chemistry and physics from Queens University and a BA in English from Carleton University, and then an MA from Sir George Williams University (now part of Concordia University). He spent his career in the Royal Canadian Air Force in a variety of roles, retiring as a full colonel. Quintin’s interest in mineralogy began when he was posted to Ottawa in 1961. In 1969, Quintin was posted to St-Hubert, right next to Mt. St-Hilaire and the rest is history. Quintin has written more than 150 articles and reviews in various publications, including *Rocks & Minerals* and *Mineralogical Record*. He also wrote *The Complete Book of Micromounting*, published in 1993. Quintin has been one of the leading expert amateurs who exhaustively collected and studied the minerals of Mt. St-Hilaire, bringing many new species to the attention of professionals. His personal passion is for microminerals and tonight he will share his enthusiasm with all of us. Please join me in welcoming Quintin Wight back to the speakers’ podium.
- 9:15-???
- Continuation of “Shop’til You Drop”, spirits, and fellowship – 4th Floor

Saturday Morning, April 20, 2013

- AM 9:00-10:00 **What’s New in Minerals and Localities, Part I** – *Jeffrey A. Scovil*
 Each year Jeff Scovil shares his excellent photographs of minerals that have appeared on the market since the previous Symposium. Again this year, we welcome Jeff to the speakers’ podium for What’s New in Minerals and Localities.
- 10:00-11:00 **What’s New in Minerals and Localities, Part II** – *Contributions from the audience*.

11:15-12:15 **Big Fish River and Rapid Creek - Ian Nicklin**
Ian Nicklin began collecting minerals at the age of 6, and it has become a life-long obsession. He started work at the Royal Ontario Museum in the Jack Satterly Geochronology lab over 31 years ago. Since then, he has worked in a number of areas of the museum, but over the past 15 years he has been focusing exclusively on the mineral and meteorite collections. Ian has had the great privilege of going to the Big Fish/Rapid Creek areas a number of times over the past 20 years and has survived each trip relatively unscathed. Today he is going to talk about the latest ROM fieldwork there. Please join me in welcoming Ian to his debut at the speakers' podium. (Note: Ian is a very last-minute and willing substitute for Kim Tait, who found out that she is pregnant with twins and is not permitted to travel.)

12:15-1:30 Lunch and Shopping Break

Saturday Afternoon, April 20, 2013

PM 1:30-2:30 **Reminiscences of an Old Former Curator – John White**
John White earned a BS in geology from Franklin and Marshall College and an MS in mineralogy from the University of Arizona. He joined the Division of Mineralogy at the Smithsonian Institution in 1963 and retired in 1991 as Curator-in-charge. Of his many articles, lectures, and other contributions to specimen mineralogy, one of the most important is the founding of *Mineralogical Record*. Today's talk chronicles a life-long career that has been influenced, even dictated, by an amazing series of serendipitous events, without which John thinks he might have ended up selling life insurance! Not the least of these events was his becoming acquainted with Paul Desautels while still a teenager. Please join me in welcoming John White back to the speakers' podium!

2:30 Coffee Break

2:45-3:45 **Silver Mining in the Cobalt District, Ontario - David Joyce**
David Joyce has been a mineral collector since he was 12 years old, growing up in rock and mineral bereft Scarborough, where he was a member of the Rockkids, the junior arm of the Scarborough Gem and Mineral Club. At 19 years of age, he left to attend the Haileybury School of Mines, only about a 10-minute drive from Cobalt. Upon graduation, he worked across Canada in the explosives and mining industries. Later, he worked designing and building mining complexes. David was an adjunct Professor at the University of Toronto for 8 years, was past vice-president of the Canadian Institute of Mining and Metallurgy (CIM), past Chair of the Toronto Branch of CIM, and past President of the Walker Mineralogical Club. His own collecting interests reflect his Canadian mining background since he collects Canadian minerals, plus sulfides, sulphosalts, and native elements, either from Canada or anywhere! David Joyce has had a mineral business either full or part-time for 30 years and is currently a full-time mineral dealer and also a director on the boards of several companies and organizations which keeps him extra busy. Please join me in welcoming David Joyce back to the speakers' podium!

Saturday Evening, April 20, 2013

5:15-6:30 SILENT AUCTION

7:00-8:30 Thirty-Seventh Annual Symposium Auction Dinner – Main Ballroom

8:30 THIRTY-SEVENTH ANNUAL SYMPOSIUM AUCTION

Sunday Morning, April 20, 2013

- AM 9:00-10:00 **U.S. Mica Industry Pioneers: The Ruggles and Bowers Families – *Fred E. Davis***
Fred E. Davis is a retired electronics engineer who rediscovered his childhood love of mineral collecting about 14 years ago. He volunteers in the Mineralogy Division (where else?) of the Yale Peabody Museum of Natural History in New Haven, Connecticut—home to a most remarkable and historic collection. While researching the history for his last field investigation of the Spinelli prospect in Glastonbury, Connecticut, he realized that finding a long-lost nugget of forgotten history releases the same endorphins as finding a rare, radioactive mineral, but with the notable difference that fingernails usually remain clean and undamaged during historical research. Please join me in welcoming Fred to the speaker's podium!
- 10:00-11:00 **Mineralization in Caves, Part II – *Kevin Downey***
In this second talk on mineralization in caves, Kevin will look specifically at some cave minerals and what we have been learning about their formation. Often common minerals like calcite are found in remarkably diverse forms and habits in caves. The degassing hypothesis for formation of calcite structures will be evaluated. The use of speleothems in paleoclimate measurements has provided interesting information and even more questions, which will be discussed. Join me in welcoming Kevin Downey back to the speakers' podium!
- 11:00 End of the Symposium

**See you next year for the
41st RMS:**

April 24-27, 2014

Contributed Papers in Specimen Mineralogy

This year submitted abstracts were reviewed by a committee consisting of Dr. Carl Francis, Dr. Marian Lupulescu, Dr. George Robinson, Dr. Sarah Hanson, and Dr. Steve Chamberlain. Eighteen abstracts were submitted, accepted, and scheduled for platform presentations on Friday afternoon. The accepted abstracts follow.

COLLECTING SAMARSKITE AT THE HISTORIC SPINELLI PROSPECT, GLASTONBURY, HARTFORD COUNTY, CONNECTICUT. *A. J. Albin*¹ and *H. Moritz*². ¹86 Hillcrest Avenue, Waterbury, CT 06705; ²15 Geoffrey Road, East Haddam, CT 06423.

The small Spinelli pegmatite in Glastonbury, Hartford Co., Connecticut is famous for crystals of a samarskite group mineral collected in the 1930s, some of which were used for early radiometric dating studies. Many classic specimens from that era can be found in museums and old collections. The quarry lies on residential property and is closed to collecting. After sitting idle for over 80 years, the samarskite-rich portion was mined again for specimens beginning in April 2008 when Anthony J. Albin received permission from the owner. Due to the radioactivity, prospecting for samarskite was commenced with the aid of gamma-ray scintillometers to locate subsurface crystals and diamond blade power saws to more carefully remove them.

The 1-meter thick, simple pegmatite is largely composed of pink microcline, albite, smoky quartz and muscovite with scattered samarskite group, columbite-(Fe) and rare monazite-(Ce) crystals. The surface of samarskite group and columbite-(Fe) crystals and the nearby matrix are typically coated and stained with a dark red, earthy mineral most likely hematite. The very brittle, metamict crystals are subhedral to euhedral, range from micros to cabinet specimens, and are recovered loose or less commonly in matrix. There are no significant miarolitic cavities in the pegmatite, all minerals are frozen in the matrix. Their habit is typically subparallel, slightly radiating, elongated prisms with simple chisel-tip terminations and as skeletal crystals up to 15 centimeters long.

Other intact crystals were found loose in previously unrecognized shallow dumps flanking the 1930s trench. Many are in parallel growth with difficult to distinguish columbite-(Fe), a mineral rarely mentioned in the older Spinelli literature, creating doubt about its early recognition. Some old Spinelli specimens labeled simply samarskite were found to have associated columbite-(Fe). Monazite-(Ce) has been reported from the Spinelli pegmatite, but it took 4 years of work before several crystals were found within a short period of time. A 15-cm specimen may be the largest from Connecticut.

NEW DATA ON PLANERITE FROM MAULDIN MOUNTAIN, MONTGOMERY COUNTY, ARKANSAS. *T.A. Brown*¹, *S.L. Hanson*¹, and *A. U. Falster*². ¹Geology Department, 110 S. Madison St., Adrian College, Adrian, MI 49221; ²University of New Orleans, Department of Earth and Environmental Sciences, 2000 Lakeshore Drive, New Orleans, Louisiana, 70148.

A quarry for fill on the south face of Mauldin Mountain in Montgomery County, central Arkansas is best known for the beautiful green wavellite specimens that form as fracture fills in the Bigfork Chert. Less commonly turquoise, variscite, and planerite have been recovered from this mine. Outstanding specimens of planerite ($\text{Al}_6(\text{PO}_4)_2(\text{PO}_3\text{OH})_2(\text{OH})_8 \cdot 4\text{H}_2\text{O}$), a turquoise group mineral, were recovered from recently quarried material during an Adrian College class field trip. These specimens occur as individual round flat plates or clusters of radiating crystals up to 4 mm in diameter. In vuggy areas, planerite occurs as small spheres up to 3 mm in diameter. The crystals are zoned with light aqua-blue cores and colorless rims. Compositional X-ray maps were collected using a Scanning Electron Microscope (SEM) and show that the aqua-blue color of the core is due to the presence of copper whereas the rims, which are nearly end member planerite, are colorless (Figure 1).

X-ray diffraction (XRD) analysis of a complete sphere was compared to both the white planerite and pale blue planerite-turquoise from Foord & Taggart (1998). Although the diffraction patterns are similar for both minerals, the pale blue planerite-turquoise has a single 100 intensity peak at $d = 3.691$ whereas the white planerite peak is split into two peaks at $d = 3.744$ ($I = 100$) and $d = 3.692$ ($I = 60$).

The Mauldin Mountain planerite exhibits peaks at both $d = 3.693$ ($I = 100$) and $d = 3.744$ ($I = 90$). The presence of the 3.744 peak suggests the presence of white planerite. Additionally, the higher intensity of the 3.744 peak as well as the presence of the $d = 3.304$ peak, which is unique to pale blue planerite-turquoise, suggests that phase is also present. The 100 intensity of the 3.963 peak for Mauldin Mountain samples suggests that white planerite is dominant. This is consistent with the appearance of the X-ray map as the core, which exhibits significant copper substitution, is volumetrically less abundant to the Cu-poor rims.

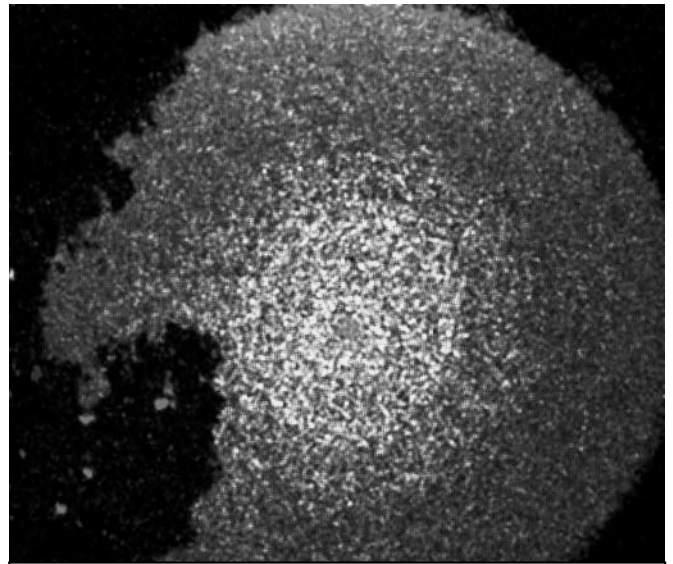


Fig. 1. SEM X-ray map of Mauldin Mountain planerite. The brighter regions of the core exhibit greater Cu substitution than the near-end member rims.

Literature Cited

Foord, E.E. and Taggart Jr., J.E. (1998) A reexamination of the turquoise group: the mineral aheylite, planerite (redefined), turquoise and coeruleolactite. *Mineralogical Magazine*. v. 62, 93-111.

ACCESSORY MINERALOGY OF THE BLACK RIVER PEGMATITE AND HUMBOLDT GRANITE, MARQUETTE COUNTY, MI. Buchholz, T. W.¹, A. U. Falster², and W. B. Simmons²,
¹1140 12th Street North, Wisconsin Rapids, Wisconsin 54494; ²Department of Earth and Environmental Sciences, University of New Orleans, New Orleans, Louisiana 70148.

Materials from the Black River pegmatite and the Humboldt granite, exposed in Marquette County, Michigan, were recently examined in order to characterize their mineralogy and chemical development. They are spatially associated with a post-Penokean gneiss dome structure (Tinkham and Marshak, 2004), are relatively undeformed, and are post-Penokean in age. Note: The Penokean Orogeny is dated at approximately 1880-1830 Ma (Schultz and Cannon, 2007).

The Black River pegmatite is exposed along an old railroad grade approximately 350-400 meters west of M-95, north of the village of Republic, where it cuts Precambrian gneisses. Robinson (2004) reported britholite-(Y), xenotime-(Y) and fluorite, as well as possible synchysite-(Y) (or possibly kamphaugite-(Y)) from this pegmatite, and Carlson and Mircea (2010) reported topaz, columbite-(Fe), monazite-(Ce) and calcite. Tanteuxenite-(Y) and grayite have also been reported recently (Mineralogy of Michigan Update, Robinson and Carlson, in prep).

From heavy mineral separates the following species have been identified: columbite-(Fe), monazite-(Ce), HREE-rich (particularly Yb) xenotime-(Y), fluorite, probable HREE-rich synchysite-(Y), probable synchysite-(Ce), pyrite, chalcopryrite, a Th-rich phase intergrown with monazite (probably grayite), REE-rich thorite or thorigummite, allanite-(Ce), probable betafite, microlite, pyrochlore, malachite and zircon. Calcite, probable synchysite-(Y), probable synchysite-(Ce), chalcopryrite, malachite (alteration product of chalcopryrite) and pyrite occur in small miaroles scattered more or less abundantly throughout the intermediate zones; the probable synchysites form aggregates of tiny pale pinkish to pale yellow crystals perched on miarole walls and embedded in calcite.

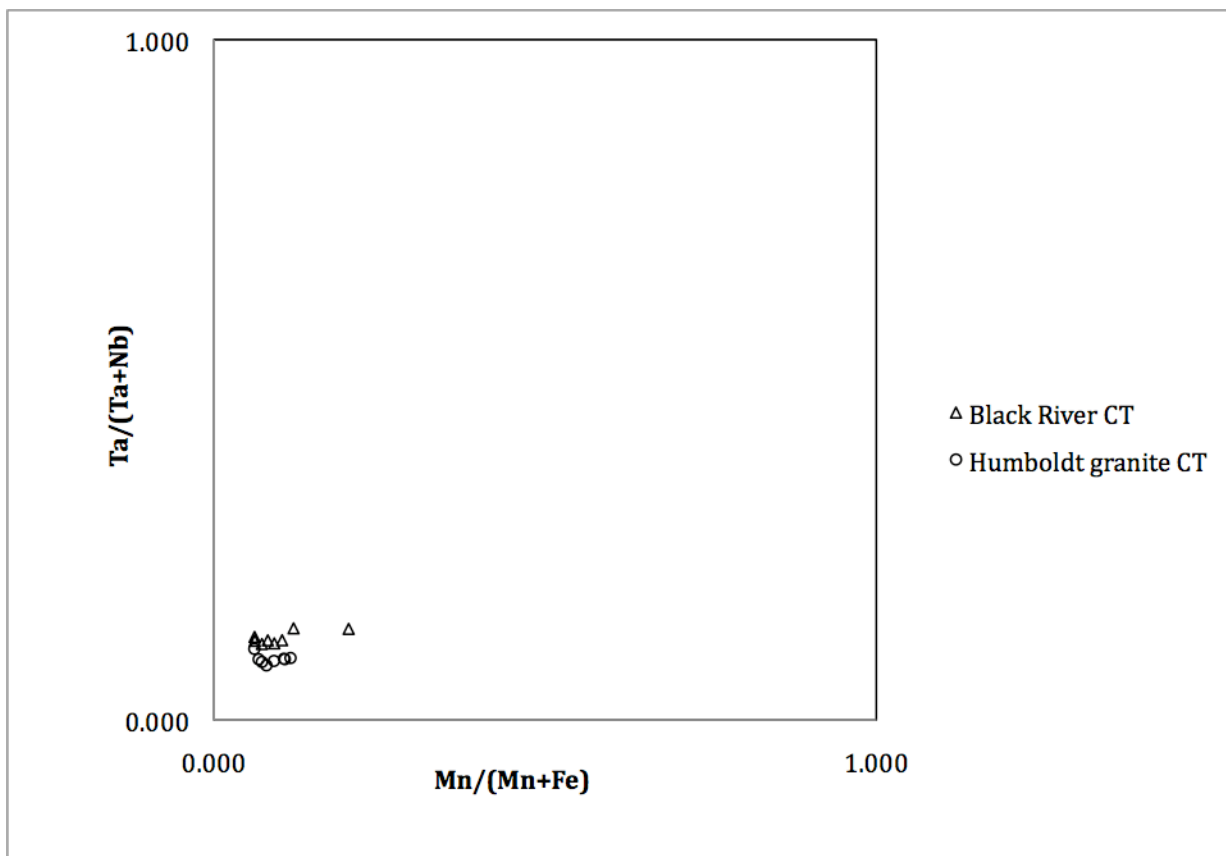
This pegmatite is marked by strong enrichment in LREE and HREE, minor late enrichment in Ta, and high F. We concur with Carlson and Mircea (2010) that it can probably be classified as an "NYF" type pegmatite.

Carlson and Mircea (2010) suggested that the parent granite for the Black River pegmatite might be the nearby 1805 ±4 Ma Humboldt granite (Holm et al., 2005). The Humboldt granite is an evolved columbite, cassiterite and topaz bearing granite (Hoffman, 1987; Schulz, et al., 1988). Samples were taken from two sites within the Humboldt granite, and heavy mineral separates prepared. While no cassiterite and topaz were found (likely due to limited sampling), columbite-(Fe), monazite-(Ce), HREE-rich xenotime-(Y), bastnäsite-group minerals and Hf-enriched zircons with (in part) strong Th and HREE enrichment were found.

Thus, the accessory minerals of both the pegmatite and the Humboldt granite are broadly comparable, with both bearing chemically relatively primitive columbite-(Fe) and both strongly LREE and HREE enriched. Columbite-(Fe) compositions are clustered closely, with Black River examples showing slightly higher Ta/Nb and Mn/Fe ratios vs the Humboldt granite, suggesting that the pegmatite may be a slightly more fractionated derivative of the granite. This, however, does not exclude the possibility that both may be descended from a parental granitic melt that might not be currently exposed. Attoh and Klasner (1989) suggest low-pressure and high temperature metamorphic conditions in the Republic area could have caused partial melting at depth, and their gravity modeling revealed shallow negative gravity anomalies in the Republic area that they interpret as products of partial melting, suggesting the presence of shallow granitic plutons in the area.

Literature Cited

- Attoh, K., J.S. Klasner. 1989: Tectonic implications of metamorphism and gravity field in the Penokean orogeny of northern Michigan. *Tectonics*, V. 8, no. 4, p. 911-933.
- Carlson, S.M., C. Mircea. 2010: Do Michigan Pegmatites Contain Topaz Crystals? Yes, They Do! *Mineral News*, V. 26, no. 2, p. 13-14.
- Hoffman, M.A. 1987: The southern complex: geology, geochemistry, mineralogy and mineral chemistry of selected uranium- and thorium-rich granites. Unpublished PhD dissertation, Michigan Technological University, 382 pages.
- Holm, D.K., W.R. Van Schmus, L.C. MacNeill, T.J. Boerboom, D. Schweitzer, D. Schneider. 2005: U-Pb zircon geochronology of Paleoproterozoic plutons from the northern midcontinent, USA: evidence for subduction flip and continued convergence after 18 Penokean orogenesis. *Geological Society of America Bulletin*, V. 117, no. 3-4, p. 259-275.
- Robinson, G. W. 2004: *Mineralogy of Michigan* by E.W. Heinrich, Houghton, MI: A. E. Seaman Mineral Museum, Michigan Technological University
- Schulz, K.J., P.K. Sims, Z.E. Peterman. 1988: A post-tectonic rare-metal-rich granite in the southern complex, Upper Peninsula, Michigan (abstract). *Institute on Lake Superior Geology, 34th Annual Meeting, Proceedings and Abstracts*, 34
- Schultz, K.J., Cannon, W.F. 2007: The Penokean Orogeny in the Lake Superior region. *Precambrian Research*, V. 157, No. 1-4, p. 4-25.
- Tinkham, D.K., S. Marshak. 2004: Precambrian dome-and-keel structure in the Penokean orogenic belt of northern Michigan, USA. *In* Whitney, D.L., Teyssier, C., and Siddoway, C.S., eds., Gneiss domes in orogeny: Geological Society of America Special Paper 380, p. 321-338.



ANALYSIS OF A 1970s FIND OF EXCEPTIONAL DOLOMITE CRYSTALS IN THE LOCKPORT DOLOSTONE, CICERO, ONONDAGA COUNTY, NY. S. C. Chamberlain¹, D. G. Bailey², and R. Lyons³. ¹Center for Mineralogy, 3140 CEC, New York State Museum, Albany, NY 12230; ²Geosciences Department, Hamilton College, Clinton, NY 13323; ³R. Lyons, 48 Elm St., Camillus, NY 13031.

In the 1970s, an excavation was made for a new water main north from Gillette Road in Cicero. Local collector, Marian DeNardo, preserved a large number of specimens of mineralized cavities from the top of the Lockport Dolostone encountered in the excavation. Late in 2012, this suite of specimens was donated to the Gem and Mineral Society of Syracuse. Here we give a preliminary report of our study of this material.

In this part of Central New York, the top of the Lockport Formation is buried under several meters of soil and mineralization is only exposed during the occasional surface excavation. The dolostone is dark grey, almost black and contains roughly spherical mineralized cavities from several cm to 20 cm or more formed by the dissolution of original diagenetic anhydrite.

Dolomite occurs in exceptional colorless to white, uncurved rhombohedral crystals to 6 or 7 cm. We examined all the specimens with a light microscope and analyzed selected samples with an EDS system on a scanning electron microscope (SEM). A full list of minerals follows.

Barite occurs as gray, tan, and white spheres and hemispheres of microscopic blocky crystals. These spheres lack any obvious radiating structure from the center when broken and sometimes have a central zone of orange-brown barite. The largest aggregates are about 5 cm, but most are much smaller. Barite also occurs as sharply formed tabular crystals epitaxially oriented on blades of

celestine. Most samples contain significant strontium. A typical composition for the barite is close to $(\text{Ba}_{0.70}\text{Sr}_{0.30})\text{SO}_4$.

Celestine forms gray to off-white sprays of lamellar crystals to several cm, minute wafer-like crystals on the surfaces of barite spheres, or individual bladed white crystals directly on the dolostone. All samples seem to contain significant barium. A typical composition for the celestine is close to $(\text{Sr}_{0.85}\text{Ba}_{0.15})\text{SO}_4$.

Chalcopyrite is found as complex bisphenoidal copper-brown crystals to 8 mm, but most are microscopic. Typically chalcopyrite crystals occur directly on dolomite crystals.

Dolomite is found as unusually large simple rhombohedral crystals to 8 cm. Most of the dolomite crystals are white, but some are colorless and transparent at least in part. Dolomite makes up most of the volume of crystals in each cavity. We analyzed 9 samples of colorless dolomite from different crystals and determined that all contain about 10 wt. % FeO (range 6.8 to 12.9). A typical composition for this dolomite is close to $\text{Ca}(\text{Mg}_{0.86}\text{Fe}_{0.14})(\text{CO}_3)_2$. Obviously iron is not always a significant chromophore in dolomite. Some specimens showed traces of manganese to 2.2 wt. % MnO.

Gypsum occurs as translucent white masses of parallel prismatic crystals. Only two such specimens were noted.

Hematite rarely occurs as a thin, transparent pink coating on dolomite crystals and very rarely as minute deep red prismatic crystals on dolomite.

Malachite occasionally occurs as tufts of tiny green crystals on chalcopyrite crystals.

Pyrite forms fine-grained black coatings between dolomite crystals.

Quartz occurs sparingly as colorless prismatic crystals to several mm long.

Strontianite appears occasionally in SEM images as tufts of acicular crystals on lamellar celestine crystals.

Of these, the larger dolomite crystals make spectacular specimens. The accessory minerals are interesting, but not nearly as showy as the large colorless to white dolomite rhombohedra.

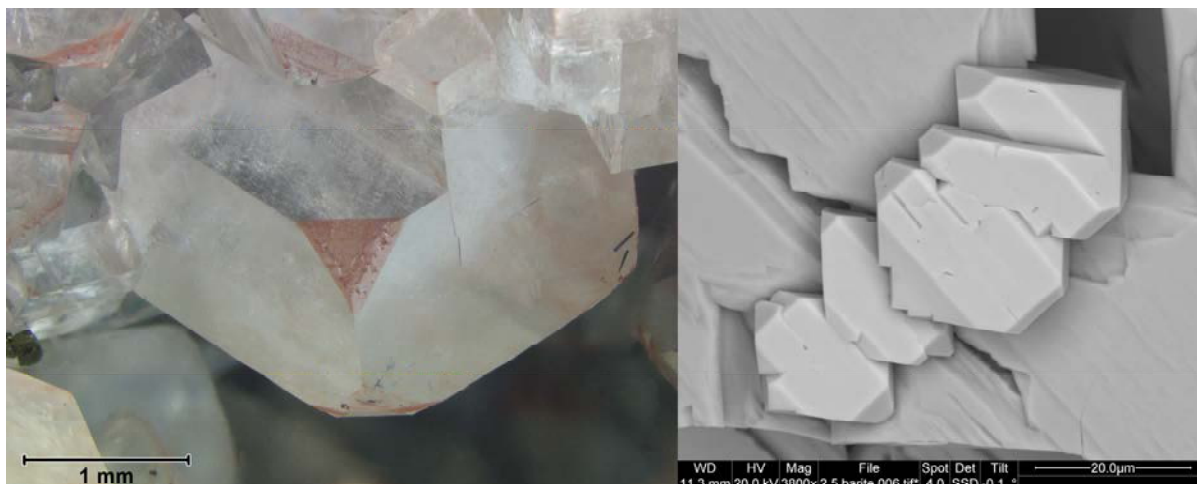


Fig. 1. Hematite selectively coating secondary faces on iron-rich dolomite from Cicero, NY

Fig. 2. SEM backscatter image of strontium-rich barite on barium-rich celestine from Cicero, NY

THE WORLD'S LARGEST REDDINGITE CRYSTAL FROM THE BENNETT QUARRY, OXFORD CO., MAINE? M. Felch, A. U. Falster, and Wm. B. Simmons. Department of Earth and Environmental Sciences, University of New Orleans, New Orleans, Louisiana 70148.

Reddingite, $\text{Mn}^{2+}_3(\text{PO}_4)_2 \bullet 3(\text{H}_2\text{O})$, is a rare late-stage pegmatite mineral species. It is orthorhombic and may have pseudo-octahedral morphology with dominant {111}. The "world's largest" crystals of this species are reported to have come from the Bennett Mine, Buckfield, Oxford Co., Maine. Wallace Dickerson Nevel of Andover, Maine obtained the specimen from the Bennett Mine in Buckfield, ME. The mineral later became part of a collection owned by Dr. James Leaseman, which has subsequently become part of the collection of the Maine Mineral and Gem Museum.

The identification of the acclaimed "world's largest reddingite" came into question when Dr. Carl Francis examined the sample and discovered that the density was too high for it to be reddingite. For this reason, he sent the sample to the University of New Orleans for analysis. As suspected by Dr. Francis, the measured density for the specimen is 5.7 g/cm^3 , significantly higher than the 3.1 g/cm^3 density of reddingite. Scanning electron microscope (SEM) energy dispersive spectral (EDS) analyses and backscatter imaging revealed that the sample is composed of 3 distinct phases. The bulk of the specimen is composed of the Ca tungstate, scheelite (CaWO_4), which is veined with secondary Pb and Fe tungstates, stolzite (PbWO_4) and ferberite (FeWO_4). The ferberite is essentially devoid of the huebnerite (MnWO_4) component. The presence of these species was confirmed by X-ray diffraction analysis. It should be noted that the monoclinic polymorph of stolzite, raspite, has not been found in this specimen.

The distribution of both stolzite and ferberite is fracture-controlled. Late stage replacement along fracture fills first formed stolzite and then ferberite.

In contrast with reddingite, scheelite typically occurs in skarn and greisen assemblages and rarely in granitic rocks. Scheelite is tetragonal with pseudo-octahedral morphology ({011} or {112}), thus it is evident that the original identification of this specimen was done solely on morphological properties. Had the initial examination determined even the most basic properties such as density and UV-fluorescence, it would have been clear that the material could not have been reddingite.

BISMUTHINITE AND MONAZITE-(CE) FROM RATTLESNAKE MOUNTAIN, STONEHAM, OXFORD CO., MAINE. C.A. Francis and J.A. Mann. Maine Mineral and Gem Museum, P.O. Box 500, Bethel, Maine 04217.

The Rattlesnake Mountain quarry comprises two pits at an elevation of 1170 feet, 1.1 miles north of the village of East Stoneham near the Albany-Stoneham town line. It was mined for feldspar by Stuart Cross between 1956 and 1958. King and Foord (1994) list the locality as being in Stoneham, but it is plotted by Thompson et al. (2000, p.382 #5) as being in Albany Township. The locality was worked for specimens by J.A. Mann in 1978 and 1983. Cross' specimen production was acquired by Mt. Mann Jewelers in 1993. This report is based on examination of those two collections.

The Rattlesnake Mountain prospect is a rare element pegmatite of the beryl subtype that intrudes the Songo granodiorite. It is part of the Sebago granite-pegmatite system (age 283 ma). The observed minerals are: albite, beryl, bismuthinite, fluorapatite, microcline, monazite-(Ce), muscovite, quartz and zircon. This simple mineralogy, except for bismuthinite and monazite-(Ce), is typical of the approximately 40 feldspar and mica quarries and prospects in the western part of the Sebago pegmatite population. In contrast, many pegmatites in the northeastern and eastern parts of that population have lithium mineralization and are famous for gem tourmaline.

Beryl is the principal specimen mineral at Rattlesnake Mountain. It occurs as subhedral to euhedral green or blue hexagonal prisms, usually in microcline. Subhedral zircon is also notable. Both bismuthinite and monazite-(Ce) were verified by X-ray powder diffraction by the late L.C. Pitmann at Harvard University and the monazite was also chemically analyzed by electron microprobe. Bismuthinite occurs as patches to 10 cm of small grains intergrown with white microcline. Monazite-

(Ce) occurs as small brown tabular inclusions in beryl. The host crystal is green but the monazite-(Ce) centers a patch of yellow color, presumably caused by ionizing radiation emitted by the monazite-(Ce). Rattlesnake Mountain is one of only five local pegmatites that host bismuthinite and two that host monazite-(Ce) (King and Foord, 1994). Voucher specimens are preserved at Harvard University and the Maine Mineral and Gem Museum.

Literature Cited

King, V.T., and E.E. Foord. 1994. *Mineralogy of Maine*. Vol. 1. Maine Geological Survey.
Thompson, W. B., N.A. Winteringham, and V.T. King. 2000. Maine mineral locality index. In *Mineralogy of Maine*. Vol. 2, 355-426. Maine Geological Survey.

BENEDIKT FRANZ JOHANN HERMANN. E. Grundel, 2000 S. 2nd Street, Apt. #8, Arlington, Virginia 22204.

Benedikt Franz Johann Hermann (1755-1815) was born in what is today Austria. He had an interest in minerals. There appears to be little known about his mineralogical activities (Wilson, 1994). Recent biographical sketches (Flügel, 2006; Kernbauer, 2005) shed light on his career but, again, not much on his mineralogical activities.

B.F.J. Hermann was a prolific author. However, his writings are hard to find and this scarcity is probably the reason he is, at least in the United States, so obscure. He spent most of the last 35 years of his life in Russia where he was first appointed by the Empress Catherine II, also known as Catherine the Great, to oversee iron mines in the Ural Mountains. Over the years he held positions in other Russian mines and institutions and traveled extensively in the country, including Siberia. His writings on Russia, as well as an earlier work on Central Europe and Italy, contain hundreds of passages of mineralogical subjects. Topics include: a famous mineralogical book and its author, collectors, dealers, mineral specimens; including descriptions of some specimens and their prices, mineral localities, mineralogist and the sale of a large collection. He was himself a dealer in Russian minerals.

A look at a few examples of his writing will illustrate that the information he recorded gives us some insights about mineralogy in the late 18th century and that he deserves to be remembered for this.

Literature Cited

Flügel, H. W. (2006) *Abenteuerlich Leben des Benedikt Hermann (1755-1815): vom steirischem Bauersohn zum Chevallier und Interdanten der russischen Bergwerke*.

Kernbauer, A. (2005) *Das Russlands des Geologen und Mineralogen Benedikt Franz Johann Hermann (1755-1815)*, pp. 75-93. In: Kästner, Ingrid and Prepper, Regine, *Deutsche im Zarenreich und Russen in Deutschland: Naturforscher, Gelehrte, Ärzte, und Wissenschaftler im 18. Und 19. Jahrhundert: Vorträge des Symposiums vom 26. Und 27. August 2004 am Karl-Sudhoff Institute für Geschichte der medizin und der Naturwissenschaften Medizinische Fakultät der Universität Leipzig*. ISBN: 3832243437.

Wilson, W. E. (1994) *The History of Mineral Collecting 1530-1799*. p. 102, p. 175. *The Mineralogical Record* v. 25, no. 6.

MINERALOGY OF MIAROLITIC PEGMATITES IN THE STOVE MOUNTAIN AREA, COLORADO. S.L Hanson¹ and G. Zito², ¹Adrian College, Geology Department, 110 S. Madison St., Adrian, MI 49221; ²Colorado School of Mines, Metallurgical and Materials Engineering Department, 1500 Illinois St., Golden, CO 80401.

The Stove Mountain area, located ~5 miles southwest of Colorado Springs, is famous for a diverse suite of accessory minerals from miarolitic cavities in pegmatites. Geologically, the area is complex as exposures of the 1.08 Ga Pikes Peak Granite (PPG) are intruded by the late-stage Mount Rosa Granite (MRG) and fayalite granite. Compositionally, the PPG is potassic, with $\text{Na}_2\text{O}/\text{K}_2\text{O} < 1.0$ whereas the late-stage intrusives are more sodic, with $\text{Na}_2\text{O}/\text{K}_2\text{O} > 1.0$.

Pegmatites hosting miarolitic cavities are genetically related to PPG and MRG although they occur in all three units. Both the PPG and MRG pegmatites are composed of the same major minerals and have some accessory minerals in common; the MRG pegmatites sometimes contain sodic amphibole whereas it is absent in PPG pegmatites.

Major minerals in the miarolitic cavities include late-stage secondary albite that coats earlier formed minerals and gray or pink (½ - 2 cm) microcline crystals that are often highly etched with albite exsolution lamellae preferentially removed. Rare amazonite occurs as deep blue to light blue-green crystals in PPG pegmatites. Astrophyllite occurs in MRG pegmatites as bronze blades or masses that occasionally reach 15 cm in length. X-ray diffraction analyses confirm that the long, black Na-amphiboles from granite and pegmatite are predominantly riebeckite. Mica minerals are rare as late-stage hydrothermal activity either replaced the mica minerals or completely removed them leaving holes in mineral clusters.

Fluorite, the most common accessory mineral, ranges from early green, to purple to colorless late-stage crystals. Small amounts of Y (1-10 wt. %) may substitute for Ca forming yttrifluorite.

Rare-Earth-Element bearing minerals include bastnäsite-(Ce), which most commonly occurs as root-beer colored, 1-5 mm hexagonal prisms and yellow fluocerite-(Ce) crystals. In some cases, fluocerite has an epitaxial overgrowth of bastnäsite-(Ce) on (0001). This may be the result of concomitant fluorite growth, which depleted the fluid in F, producing a relative enrichment in carbonate, thus promoting bastnäsite-(Ce) crystallization over fluocerite-(Ce). Xenotime-(Y) occurs as late-stage, 1-10 mm yellow, often etched, dipyramids on quartz.

Columbite-(Fe) occurs as 0.1 - 0.5 cm black blades that rarely reach 2 cm in size. Pyrochlore group minerals are uncommon and form 0.1 to 2 cm black octahedrons that are often partly altered to a reddish-brown color on the surface. Ilmenite, the most common Ti-bearing mineral, occurs as small (0.5 – 2 mm) golden brown to black crystals. Low temperature leaching and oxidation of iron converted some of the ilmenite to golden brown pseudorutile. Hematite occurs as rosettes and rarely as black plates up to several mm across. Rutile, resulting from partial or complete epitaxial alteration of ilmenite, exhibits reticulated contact twins on {101}. In the some MRG pegmatites, niobian rutile is present. Brookite and anatase are rare. “Limonite” commonly replaces earlier crystallizing carbonates minerals.

Abundant, early forming wine red to brown zircon occurs as anhedral aggregates or euhedral to subhedral dipyramids (<2 cm), sometimes with narrow prism forms. Bertrandite from lower Helen Hunt Falls occurs as small (1-5 mm), colorless to white tabular crystals. Genthelvite rarely occurs as distorted yellow-brown to rose colored octahedrons and dodecahedrons that form as overgrowths on red to brown Fe-rich danalite.

When present, rare fayalite forms in black to dark brown 1-25 cm Fe-silicate pods and, in one pod, was altered to protoferro-anthophyllite. Other rare minerals include kainosite-(Y) which form white (50-200 m) crystal sprays, cassiterite, phenakite, gadolinite-(Y), hollandite, pyrolusite, wulfenite, and pyrite.

This large diversity of minerals is attributed to the presence of pegmatites from two late-stage plutons, each with a distinct origin, coupled with alteration and secondary growth from late-stage hydrothermal fluids.

NIZAMOFFITE, $Mn^{2+}Zn_2(PO_4)_2(H_2O)_4$, THE MN ANALOGUE OF HOPEITE FROM THE PALERMO #1 PEGMATITE, NORTH GROTON, GRAFTON CO., NEW HAMPSHIRE

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The new mineral nizamoffite occurs at the Palermo No.1 pegmatite in North Groton, Grafton County, New Hampshire, USA in a Zn- and Pb-rich phosphate-carbonate assemblage (Nizamoff *et al.*, 2007; Kampf *et al.*, 2012) along the margin of a 1.5 m triphylite crystal in the core-margin of the pegmatite. The triphylite crystal is rimmed on one side by a 10-30 cm thick rind of siderite, fluorapatite and quartz. This carbonate-rich zone also contains minor amounts of sulfide minerals including pyrite, sphalerite, galena and chalcopyrite. A significant portion of the sulfides have been altered by aqueous phosphate- and carbonate-bearing solutions, thereby resulting in the formation of numerous secondary Zn- and Pb-bearing phosphate and carbonate species. Minerals observed in direct association with nizamoffite include childrenite-eosphorite, falsterite, fairfieldite-messelite, frondelite-rockbridgeite, mitridatite, phosphophyllite, pyrite, quartz, siderite, smithsonite, sphalerite and vivianite. Other secondary species observed in this assemblage include cerussite, keckite, parascholzite, pyromorphite and schoonerite.

Nizamoffite forms prisms elongated on [001] and lightly striated parallel to [001] (Figure 1)

Forms observed are {100}, {010}, {230}, {011}, {031} and {111}

The empirical formula (based on 2 P and 12 O apfu) is



The simplified formula is $MnZn_2(PO_4)_2(H_2O)_4$, which requires MnO 15.84, ZnO 36.35, P_2O_5 31.71, H_2O 16.10, total 100.00 wt%.

Nizamoffite is isostructural with hopeite. The octahedral site contains Zn in hopeite and Mn in nizamoffite. The dominance of Mn in the octahedral site in nizamoffite is confirmed by site occupancy calculations using the program OccQP, which uses quadratic equations in a constrained least-squares formulation to optimize occupancy assignments based upon site scattering, chemical composition, charge balance, bond valence and cation-anion bond lengths.

The name is in honor of James W. Nizamoff (b. 1971) in recognition of his research on pegmatite mineralogy, in general, and especially on the phosphate mineralogy of the Palermo pegmatites in North Groton, New Hampshire.

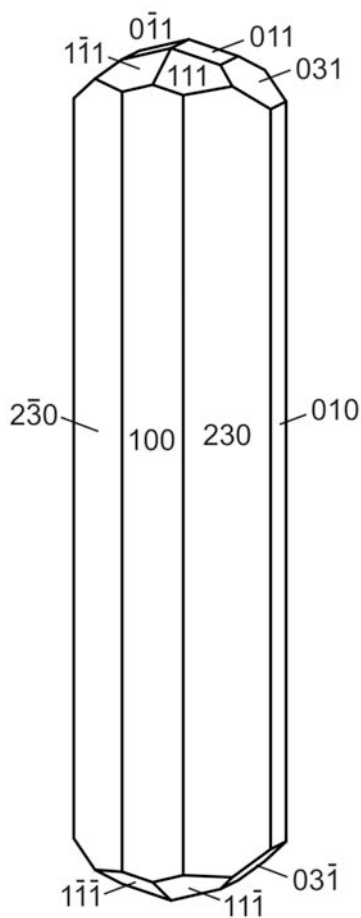


Fig. 1. Crystal drawing of nizamoffite; clinographic projection in standard orientation.

EUMANITE – FURTHER SUGGESTION OF A SILLIMAN-DANA-SHEPARD FAMILY FEUD.
V. King¹, and J. Nemetz². ¹PO 90888, Rochester, NY 14609; ²104 Ashley Dr., Rochester, NY 14620.

Evidence suggesting a mineralogical family feud was presented by the senior author (King, 2012). The son and two sons-in-law of Benjamin Silliman, Sr. were mineralogists and had variously been on the faculty of the mineralogy and chemistry departments at Yale University. Benjamin Silliman, Jr. (BSJ) was an editor of the (AJS) as early as 1838 and started the public invective against his brother-in-law, Charles Upham Shepard (CUS), in 1844, when BSJ reviewed the “Treatise of Mineralogy, second edition” of CUS. James D. Dana (JDD), also a brother-in-law to CUS was enlisted by BSJ to publicly substantiate “errors” made by CUS in his Treatise. The “feud” was ostensibly a professional one, although very interesting energy was invested by BSJ and JDD. The replies by CUS were generally politely defensive. The brothers-in-law were authors of mineralogical, geological, and chemical books. CUS wrote three systematic mineralogies. JDD wrote five systematic mineralogies. BSJ wrote chemistry and physics textbooks, but was better known as a consultant in mining. White (1968) has reviewed the petroleum consulting and scandals relating to BSJ, which began in 1864-5, and how they affected his career. CUS was a proponent of Friedrich Mohs' (and by extension that of Abraham Werner's) natural arrangement philosophy that minerals should be classified according to their physical characteristics, a practice commonly used in botany, zoology, and related natural history studies. BSJ and JDD favored the chemical classification of Jns Jakob Berzelius. The use of physical properties were particularly apropos for CUS as his personal mineralogical reference collection was

one of the most complete in the USA. In March 1850, he named a blackish brown mineral with “garnet” red internal reflections, with a crystallography similar to “topaz”, from Clarks Ledge Pegmatite, Chesterfield, Massachusetts, eumanite, from the Greek, ἐύ μάηος, meaning “good” and “rare” referring to only one good crystal found, initially. After the announcement was abstracted in the *AJS*, JDD discredited eumanite in the next issue of *AJS*, based on 3 common interfacial angles between eumanite and brookite. JDD stated that he just received two crystals from James Teschemacher, presumably by JDD's request. JDD did not cite the description of eumanite, but did provide two crystallographic drawings that seemed to suggest one was drawn by CUS and one by JDD, although CUS had published a different drawing than illustrated by JDD. The fact that JDD located a specimen of eumanite from another person rather than requesting the original specimen from CUS is interesting, but it is certainly extraordinary that JDD was able to find any other crystal of eumanite and that there must have been a concerted effort regarding it. Eumanite appears to be a member of the manganocolumbite-manganotantalite series. Many of Shepard's supposed new species were discredited by JDD or other members of the Yale University mineralogy department. The coining of new mineral names without much supporting data was not uncommon in the time period, but Shepard's output of new names must have greatly diverted the energies of the Yale faculty (1852, v. 12, p. 397-398. 2012, p. 37-8. 1850, p. 317-318. 1968, Huntington Library, San Marino, CA, pp. 272).

RHODONITE-AXINITE-(MN) VEIN ASSEMBLAGES, FRANKLIN, NEW JERSEY, USA
V. King¹, and J. Nemetz². ¹PO 90888, Rochester, NY 14609; ²104 Ashley Dr., Rochester, NY 14620.

One of the very interesting assemblages in the Franklin ore body includes discrete veinlets rich in Mn- and B-bearing minerals that cut franklinite-willemite-calcite-bearing ore. The veinlets vary in width from millimeters to about 10 cm in thickness. Within this assemblage, the following species are among those so far observed: andradite, axinite-(Mn), bakerite, baryte, cahnite, datolite, ganophyllite, hancockite (epidote-(Pb), hedyphane, hendricksite, hetaerolite, johannsenite, marsturite, rhodonite, and willemite. Similar mineral assemblages with different parageneses occur at Franklin, but they do not have discrete vein deposition, but include a degree of metasomatism of the vein walls. The rhodonite-axinite-(Mn) vein assemblages are highly prized for the bright and contrasting colors of the mineral assemblage and the frequent euhedral nature of the crystallization. The sequence of crystallization may begin with yellow axinite-(Mn) more or less with bright pink rhodonite and/or hendricksite, but rhodonite formation persists after axinite-(Mn). Andradite may be early as might hendricksite, but these species are more frequently present during metasomatism of the vein walls. With the exception of johannsenite and marsturite, which form epitaxially on or from rhodonite, all of the later species occur interstitial to the early well-formed species. Boron crystallizes in several species with axinite-(Mn) first and subsequent datolite and very late cahnite formation. Datolite may be present as either colorless crystals or a late milky white coating of the variety botryolite, so-named because this late datolite occurs in botryoids or in continuous crusts, unlike much other datolite, worldwide. Botryolite may coat cahnite crystals. Hetaerolite and bakerite are among the last of the species in this assemblage.

IMAGE STACKING IN MACRO PHOTOGRAPHY - INEXPENSIVELY ACHIEVABLE

RESULTS. V. King¹, and J. Nemetz². ¹PO 90888, Rochester, NY 14609; ²104 Ashley Dr., Rochester, NY 14620.

Systematic mineralogy publications usually require illustrations of tiny crystals or small bits of massive minerals. The current *Mineralogy of Franklin and Ogdensburg, New Jersey, Sussex County, New Jersey. A Photographic Celebration* being sponsored by the Franklin Mineral Museum has the daunting task of illustrating 353 species in white light and 85 species which fluoresce in either short wave, mid wave, or long wave ultraviolet light. Because there is an excellent text version of the mineralogy of these locations in print (Dunn, 1995), the Museum wishes to fulfill the dream that many have had over the past half-century in photographing all of the known species from the deposits and publishing an illustrated systematic mineralogy. Because a vast majority of the species to be illustrated occur in small size, the problem of high quality image collection had to be solved. The solution was to use image stacking to collect as many quality images as possible. This technique is much in the public eye at the moment and many people have expressed a desire to use this technique in their own work. Most of the currently available how-to videos or texts emphasize the results over the equipment or techniques. As a result of the information gap, many people are left without the knowledge of where to begin and are stymied by the projected cost that additional equipment and software seem to entail. Simple studio mineral photography requires a camera that can accept interchangeable lenses, a tripod, and lights. Macro photography ordinarily requires suitable extension rings to permit a camera lens to focus at close distances, e.g. 5-20 cm. Studio photography requires suitable lights that simulate daylight (near 5000°K). The primary expense is the interchangeable lens camera. Because close-up photography utilizes manual focusing, the lowest cost extension rings (which do not permit auto-focusing) are ideal. Stands that support daylight light bulbs can be homemade. The major concern for macro photography is limited depth of field. The innovation of image stacking has relieved much of that concern. The lens can be focused on a front edge, median positions, and back edge of a specimen and the set of progressively focused images can be combined in a free computer program such as CombineZP or in editing programs such as Photoshop 5, or GIMP 2.8.2. With an additional investment, extremely good results may be obtained photographing subjects less than 1 mm. Instead of changing focus, the entire camera or the specimen may be moved using a manual focusing rail. This equipment consists of a device that uses gears to advance the subject by small increments. Movements of 0.5 mm may be feasible. Exceptional results may be had by using enlarging lenses intended for darkroom work. These lenses have very sharp focus, far sharper than “normal” lenses, but very shallow depths of field. Stacking may result in very sharp images that are in focus from front to back. Many of these lenses have Leica M25 or M39 threads and an adapter from that thread to your extension tubes is necessary. The ultimate focusing rail is programmable and the camera or specimen moves with maximum precision. Additional magnification is obtained by using an adapter ring that fits the threads of the lens's filter with a connection to your extension rings or camera. The lens is then reversed from its normal orientation. The back of the lens, therefore, points toward the object.



Fig. 1. Axinite-Mn, Franklin, NJ. Richard Hauck Collection. FOV 4 mm.

Fig. 2. Rhodonite, Franklin, NJ. Richard Hauck Collection. FOV 4 mm.

CHERNIKOVITE, Fe-FREE WARWICKITE, AND DISSAKISITE-(Ce) FROM NEW YORK STATE, USA. M. V. Lupulescu¹, R. Rowe², D. Bailey³, and M. Hawkins¹. ¹New York State Museum, Albany NY, 12230; ²Canadian Museum of Nature, Gatineau, Quebec, J9J 3N7, Canada; ³Department of Geosciences, Clinton, NY 13323.

During our ongoing study of the minerals of New York we have identified three mineral species / varieties not previously described in the State: chernikovite, dissakisite-(Ce), and Fe-free warwickite. These minerals were characterized by SEM-EDS, Raman spectroscopy, electron microprobe, and X-ray powder-diffraction.

Chernikovite, $(\text{H}_3\text{O})_2(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 6\text{H}_2\text{O}$, was found in a pegmatite body from the Werner # 4 pit, Mayfield, Fulton County. It occurs as millimeter-size, square yellow crystals along the cleavages and fractures in microcline. Until now, the compositional and structural data for chernikovite were reported only on synthetic material. We report here the first chemical data on natural chernikovite that were determined on the crystals from Mayfield; the electron microprobe analyses yielded UO_2 70.58, P_2O_5 16.43, Al_2O_3 0.42, CaO 0.24, and H_2O (by difference) 12.33, all in weight %. According to Mindat.org this appears to be the fourth occurrence of this mineral in the USA, and the first one in New York State. We suggest that the mineral replaced autunite, probably during a late low-temperature hydrothermal phase.

Fe-free warwickite, $\text{Mg}_{1.5}\text{Ti}_{0.5}\text{BO}_4$. We report here the second occurrence of warwickite in New York (the type locality is Warwick, Orange County), the first occurrence of a boron-bearing mineral (excluding tourmaline) in the Adirondack Lowlands, and the closest composition to theoretical end-member warwickite ever reported. During the mineralogical survey of the mineral specimens from the New York State Museum Collections we found that one specimen from the Edwards Mine, St. Lawrence County, (NYSM 13164) contained millimeter-size warwickite, spinel (pink, containing up to 2% Cr_2O_3), anhydrite, dolomite, calcite, and pyrite. Warwickite, analyzed by electron microprobe, yielded the following composition: Cr_2O_3 0.88, TiO_2 21.85, MnO 0.09, Al_2O_3 6.99, ZrO_2 0.81, MgO 43.77, B_2O_3 26.04, all oxides in wt. % with sum 100.43 (B_2O_3 calculated for 3 B *apfu*). This corresponds to the empirical formula $(\text{Cr}_{0.02}\text{Ti}_{0.37}\text{Al}_{0.18}\text{Zr}_{0.01}\text{Mg}_{1.45})\text{B}_{1.00}\text{O}_4$ or ideally $\text{Mg}_{1.5}\text{Ti}_{0.5}\text{BO}_4$. The mineral is the product of upper-amphibolite facies metamorphism ($T = 650 \pm 30^\circ\text{C}$ and $P = 6.5 \pm 1$ kbar), with boron probably derived from meta-evaporitic lenses in the Upper Marble Formation.

Dissakisite-(Ce) – $\text{CaCeAl}_2\text{Mg}^{2+}[\text{Si}_2\text{O}_7][\text{SiO}_4]\text{O,OH}$ - the magnesium analogue of the more common allanite-(Ce), was found in a specimen (NYSM 21533) from the Henry Rudy Farm, in

Orange County. It occurs as millimeter-size pink crystals associated with chondrodite, spinel, and phlogopite in marble (Franklin Marble). The electron microprobe work is ongoing and the results will be presented during the technical session. To our knowledge, and according to Mindat.org, this is the first reported occurrence of this mineral in North America. The mineral association formed in Franklin Marble during regional metamorphism at the amphibolite_facies P and T conditions.

A UNIQUE REICHENSTEIN-GRIESERTAL LAW QUARTZ TWIN FROM GALILEA, BRAZIL. R. Morgan, 2711 Mechanics Avenue, Savannah, GA 31404.

In 2007, the author purchased a specimen of quartz mined years earlier around Galilea, Brazil. It has three larger crystals and several smaller ones. The largest of the three is in twin relations with the other two. In one direction there is a Japan Law twin, and ninety degrees around its c-axis is a very rare Reichenstein- Griesertal (R-G) Law twin. The central crystal is 8.7 cm long. The other crystal of the Japan Law twin is broken off at about 4 cm. The other crystal of the R-G Law twin terminates 6.7 cm from its lowest visible contact with the central crystal. Near that base, but probably unrelated to the twinning, is a siderite crystal.

The R-G Law twin developed farther up the central crystal than the Japan Law twin at its base, and, therefore, is later in origin. This makes it a deposition twin where the twin develops on the surface of an already established crystal.

The habit of all crystals in the specimen is noteworthy. The terminations are pseudocubic – 3 large rhombohedral faces with very small or no negative rhombohedral faces. These faces have striations parallel to their boundary with prisms, which are stepped edges of growth layers that nucleated near the termination and spread toward the prisms.

The prism faces are mostly covered with very fine striations that refract light and reflect it diffusely even on flat areas that appear to be faces. Only few striations reflect the sharp flash of a crystallographic plane. The three larger crystals thicken between their bases and terminations, resulting from growth centers on prism faces and interference effects of contact with other crystals. These all are indicative of rapid later stage growth.

The R-G Law is generally described as a reflection across the {101} twin plane resulting in a 76° 26' angle between the c-axes of the two crystals. This particular specimen even looks much like a reflection being relatively symmetrical beyond lower areas, where contact with other crystals has affected growth.

As with many other twins, particularly Japan Law twins, there is exaggerated growth in the twin notch. The inner notch of R-G Law twins is centered on the junction of two prism faces. Because more rapid growth happened there, those prism faces have become narrower, and the two prism faces on either side of each are widened. The inner notch faces are curved due to new layer creation at the twin boundary having been faster than the spread of those layers away from the notch. This is another indication of later stage rapid growth.

How this specimen compares to other R-G Law twins is an ongoing study. Preliminary results of a 4 sample survey so far indicates:

- 1) R-G Law twins are much more rare than Japan Law twins.
- 2) Most R-G Law twins are found in proximity to Japan Law twins, indicating similar origins. (One from the PC Mine in Montana is perched on a Japan Law twin.)
- 3) Exaggerated reentrant notch growth is a feature of R-G Law twins, though generally not as great as that of Japan Law twins.
- 4) Unlike most Japan Law twins, R-G law twins generally do not grow much bigger than nearby single crystals.
- 5) Unlike this specimen, R-G Law twins are generally not pseudocubic. They have six face terminations, have few striations, and have flat prism faces meeting in their inner notch.

6) Usually R-G twins are less symmetrical across the twin boundary.



Left: Japan-Law twin on lower right; R-G twin on left. *Right:* R-G twin. Siderite crystal on bottom right.

BERYL, EOSPHORITE AND SECONDARY BERYLLIUM PHOSPHATES FROM THE CONSOLIDATED QUARRY, GEORGETOWN, MAINE. J. W. Nizamoff¹, A. U. Falster², D. Leavitt³ and Wm. B. Simmons². ¹ Omya Inc. 39 Main Street, Proctor, VT 05765; ² Department of Earth & Environmental Sciences, University of New Orleans, New Orleans, LA 70149; ³ 225 Bryant Road, Buckfield, ME 04220.

The Consolidated Quarry in Georgetown, Maine is a large, mineralogically simple granitic pegmatite that contains sporadic seams or zones of lithium mineralization. The lithium-rich zones contain cavities that may produce gem quality polychrome tourmaline and spodumene in association with lepidolite, beryl, fluorapatite, montebrasite, cassiterite and columbite-tantalite group minerals.

In 2012, an area of the quarry containing a mineralized zone rich in albite, muscovite and beryl was encountered. One large (~50 cm) and a number of smaller cavities were opened that mainly contained quartz crystals, white to colorless beryl crystals to 10 cm, blocky to bladed albite, tan microcline and muscovite. Many of the minerals found in the cavities were partially to completely overgrown by brown eosphorite crystals up to 3 mm in length. Eosphorite was confirmed by electron microprobe, the empirical formula (based on 5 O atoms) is: $(\text{Mn}^{2+}_{0.71}\text{Fe}^{2+}_{0.29}\text{Ca}_{0.02})_{\Sigma=1.02}\text{Al}_{1.01}(\text{P}_{0.98}\text{Si}_{0.02})_{\Sigma=1.00}(\text{OH})_2(\text{H}_2\text{O})$, with OH and H₂O calculated by stoichiometry. In addition, the interior portions of several of the beryl crystals exhibit alteration to a number of secondary beryllium phosphates not previously reported for the locality. Beryllonite is present in contact with altered beryl and forms thin platy white masses to 2 cm. Lozenge-shaped hydroxylherderite crystals to 2 cm are locally abundant and are typically coated by eosphorite crystals. Greifensteinite is present as brown hemispheres to 1 mm on beryllonite and altered beryl. White spheres of moraesite to 1 mm occur on beryllonite. The observed paragenesis for the beryl alteration

assemblage is: beryl → beryllonite → moraesite → hydroxylherderite → fluorapatite → greifensteinite.

Late-stage low temperature aqueous fluids likely caused partial dissolution of primary beryl resulting in the formation of hydroxylherderite and other secondary beryllium phosphates. The origin of the eosphorite is problematic as no remnants of primary phosphate minerals (triphylite-lithiophilite, montebrasite-amblygonite, fluorapatite) were observed, although montebrasite can be abundant in the lithium rich zones in the quarry.

INVESTIGATION OF THE CHRYSOTILE DEPOSIT ON THE BAIE VERTE PENINSULA, BAIE VERTE, NEWFOUNDLAND. C. C. Reynard, 110 College Avenue, Poughkeepsie, NY 12603

The mineral occurrence of chrysotile in the Dunnage Zone of Newfoundland is the result of progressive low-grade metamorphism along a slice of upper mantle and oceanic crustal rocks that was obducted during the Ordovician with the closing of the Iapetus Ocean. In the Humber and Dunnage Zones, there are two areas of ophiolite emplacement separated by a tectonic boundary that runs the length of the Baie Verte Peninsula. This suture is known as the *Baie Verte – Brompton Line, (BVBL)*. In the western Humber Zone, the upper mantle and ophiolite rocks at Corner Brook and Tablelands in Gros Morne Park are not metamorphosed. In the Dunnage Zone, to the east, evidence of low-grade metamorphism is present.

The Dunnage Zone is bordered by the major south-north tectonic suture (BVBL) and represents a much deeper portion of the ophiolite suite that was metamorphosed, deformed and altered by fluids rich in water at greater pressure and depth. At this low metamorphic grade, the upper mantle peridotite is composed of olivine and enstatite, thus is a harzburgite that has been partially altered to serpentinite. This alteration process is visually recognized by a mesh-like pattern that forms. Under a microscope using plane-polarized light, it is evident that the webbed mesh-like granular pattern is the result of alteration along fractures and cracks that formed serpentine group minerals. Of those minerals in the serpentine group, lizardite, antigorite and chrysotile; the fibrous member chrysotile is the subject of this investigation.

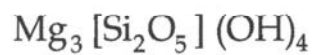
Chrysotile is a sheet silicate (phyllosilicate) with an idealized chemical formula of $Mg_3(Si_2O_5)(OH)_4$. This elastic, fibrous mineral has a hardness of < 2.5. The electrostatic bonding between atoms in chrysotile's atomic structure is of a weak type known as van der Waal's. This explains the reason why the fibers can separate easily and become friable. The formation of the tubular/rod form for each chrysotile fibril is a very thin rolled sheet composed of layers of magnesium and silica. Each sheet is about 0.8 nanometers thick; these fibrous soft "crystal" sheets, form silky yellow-white veins in serpentine matrix.

Chrysotile displays important properties such as being chemically inert, incombustible, non-rotting, excellent sound insulator, and insulator for thermal and electric products. The flexibility and high tensile strength of chrysotile makes it a mineral that can be woven. There is a cautionary aspect of chrysotile. Long term exposure and inhalation of mass amounts of fibers can create medical problems and even death. Other minerals are much more dangerous. For instance, the fibrous habits of amphibole group minerals, tremolite, amosite and crocidolite are far more dangerous because their fibers are stiff and sharp.

The open-pit chrysotile mine, north of the village of Baie Verte, was opened in 1963 by the Advocate Mines, a division of the larger Johns-Manville Company. Health/Safety regulations finally closed mine in 1981; it appears Advocate found it was too expensive to install all of the safety equipment required to continue production. Currently chrysotile is the only known "asbestos" being used; scientists have found ways to encapsulate it for many industrial products.

For the mineral collector, the golden chrysotile offers an interesting unique beauty in the mineral world. Chrysotile offers the collector a wide range of study, including the emplacement of the upper mantle protolith peridotite, alteration to serpentinite and the formation of serpentine, and then the unique formation of the very tiny tubes of each fibril.

Serpentine



Trigonal, Monoclinic or Orthorhombic (-)

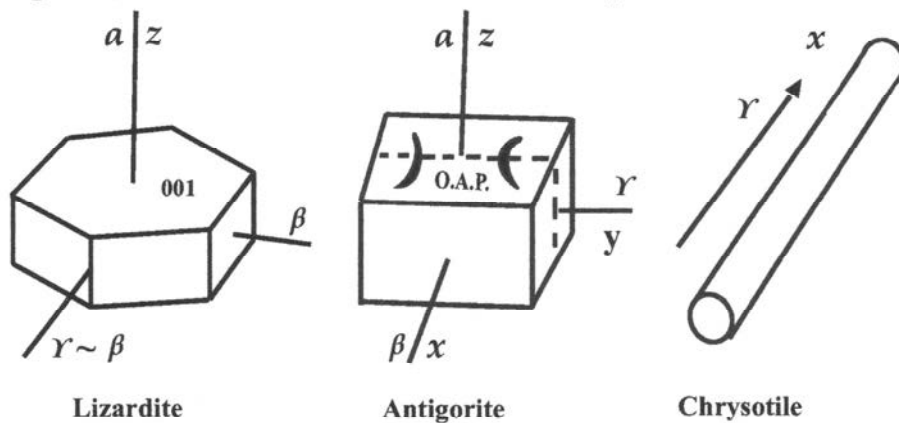
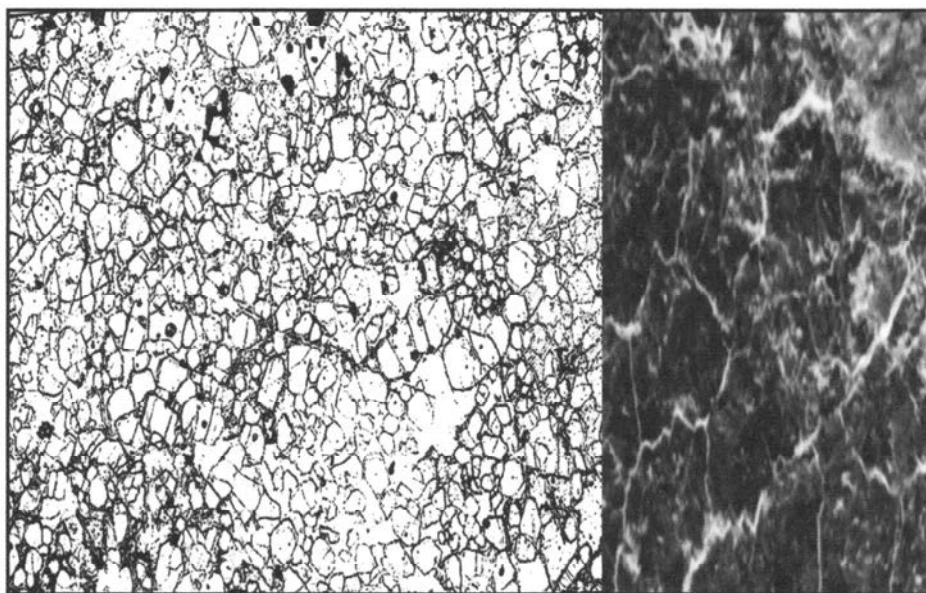


FIGURE 1.-Serpentine Group....diagram by C. Reynard - after Deer, Howie & Zussman, *The Rock Forming Minerals*, page 344.



2.a. Igneous Peridotite thin-section crystal pattern in plane-polarized light
Shiant Isles, Scotland

2.b. Digital photograph of serpentine pattern
Baie Verte, Newfoundland

Figure 2. a. Black and white thin-section example adapted with mode change by C.Reynard, W. S. MacKenzie & A. E. Adams, *A Color Atlas of Rocks and Minerals in Thin Section*, p.70

Figure 2.b. Photograph by C. Reynard - Newfoundland 2012

THREE POTENTIALLY NEW MINERALS FROM AN OIL SHALE FIRE IN NORTH-CENTRAL OHIO. R. P. Richards¹ and A. R. Kampf². ¹Morphogenesis Inc., 154 Morgan Street, Oberlin, OH 44074; ²Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007.

A natural fire in an oil-bearing shale exposed at the interface between a stream cliff and its talus pile along the Huron River in north-central Ohio in 2011 produced nearly a dozen minerals new to Ohio; preliminary descriptions of most of these were presented at last year's symposium. At least three phases in the assemblage are new to science and represent potentially new minerals. These are the focus of this presentation.

Phase 1 is a light green angular mineral, visually resembling prehnite, which is associated mostly with anhydrite that formed by the dehydration of gypsum. Its ideal formula is $[(\text{NH}_4)_6(\text{H}_3\text{O})_2(\text{SO}_4)_2(\text{H}_2\text{O})][(\text{Al},\text{Fe}^{3+})_3(\text{SO}_4)_6(\text{OH})_2(\text{H}_2\text{O})_4]$. The phase is triclinic, $P\bar{1}$, with cell parameters: $a = 9.6406$, $b = 10.3526$, $c = 10.6006 \text{ \AA}$, $\alpha = 77.543$, $\beta = 74.663$, $\gamma = 66.229^\circ$, and $Z = 1$. The structural unit is a cluster consisting of three corner-linked Al, Fe octahedra, cross-linked by four sulfate tetrahedra, and decorated by two additional sulfate tetrahedra (Fig. 1). The interstitial portion of the structure includes ammonium, hydronium, sulfate and water groups.

Phase 2 is an orange-brown pseudo-hexagonal platy mineral, which occurs in loose crystalline aggregates without other species. Its ideal formula is $[(\text{H}_3\text{O})_5(\text{H}_2\text{O})_4][\text{Fe}^{3+}_3\text{O}(\text{H}_2\text{O})_3(\text{SO}_4)_6]$. The phase is triclinic, $P\bar{1}$, with cell parameters: $a = 9.5466$, $b = 9.6894$, $c = 18.288 \text{ \AA}$, $\alpha = 93.377$, $\beta = 94.197$, $\gamma = 117.716^\circ$ and $Z = 2$. The structural unit is a cluster consisting of three Fe octahedra sharing a common corner and cross-linked by six sulfate tetrahedra (Fig. 2). The interstitial portion of the structure includes hydronium and water groups.

Phase 3 is a colorless to light tan hexagonal platy mineral, which occurs in loose crystalline aggregates associated with other phases (e.g. pyracmonite and alunogen). Its formula is $[\text{NH}_4][\text{Fe}^{3+}(\text{SO}_4)_2]$ (although the presence of NH_4 as opposed to H_3O has not been confirmed). The phase is hexagonal, $P6_3$, with cell parameters: $a = 4.8338$, $c = 16.4362 \text{ \AA}$ and $Z = 2$. The structure contains Fe octahedra to which sulfate tetrahedra link at each vertex forming a polyhedral grouping referred to as a *pinwheel*. The pinwheels are condensed into glaserite(aphthitalite)-like sheets parallel to $\{001\}$. Ammonium groups occupy the interlayer region. Successive sheets are flipped relative to one another; however, ubiquitous fine-scale polysynthetic twinning on $\{001\}$ indicates that occasionally successive layers are not flipped.

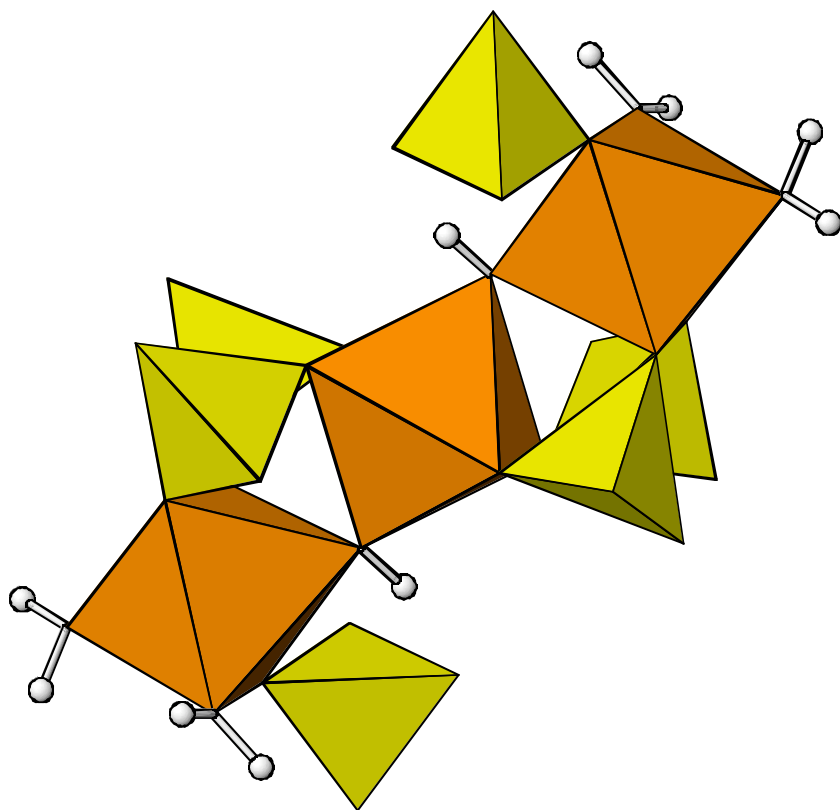


Fig. 1. The structural unit in phase 1.

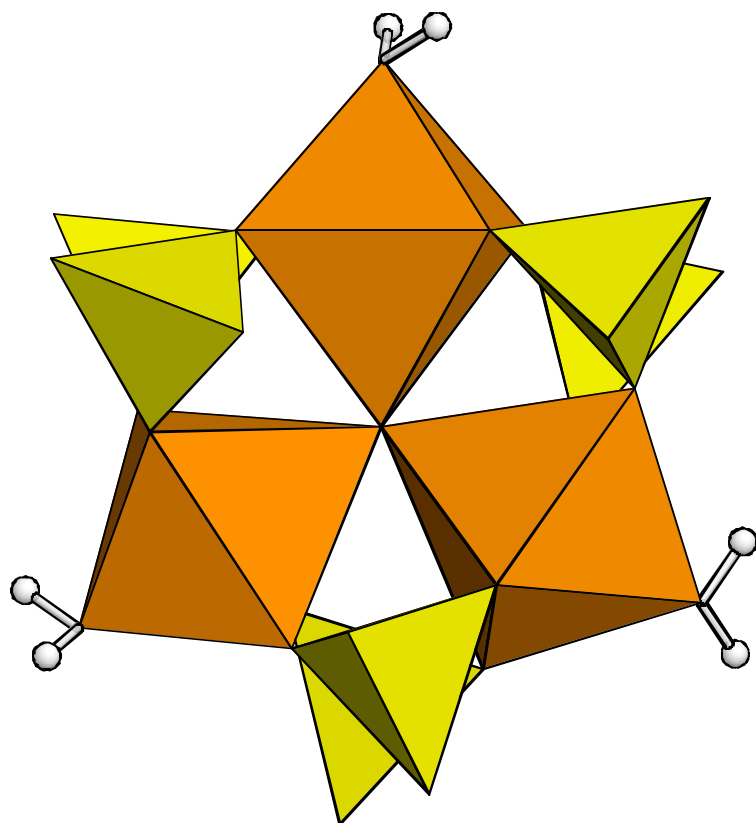


Fig. 2. The structural unit in phase 2.

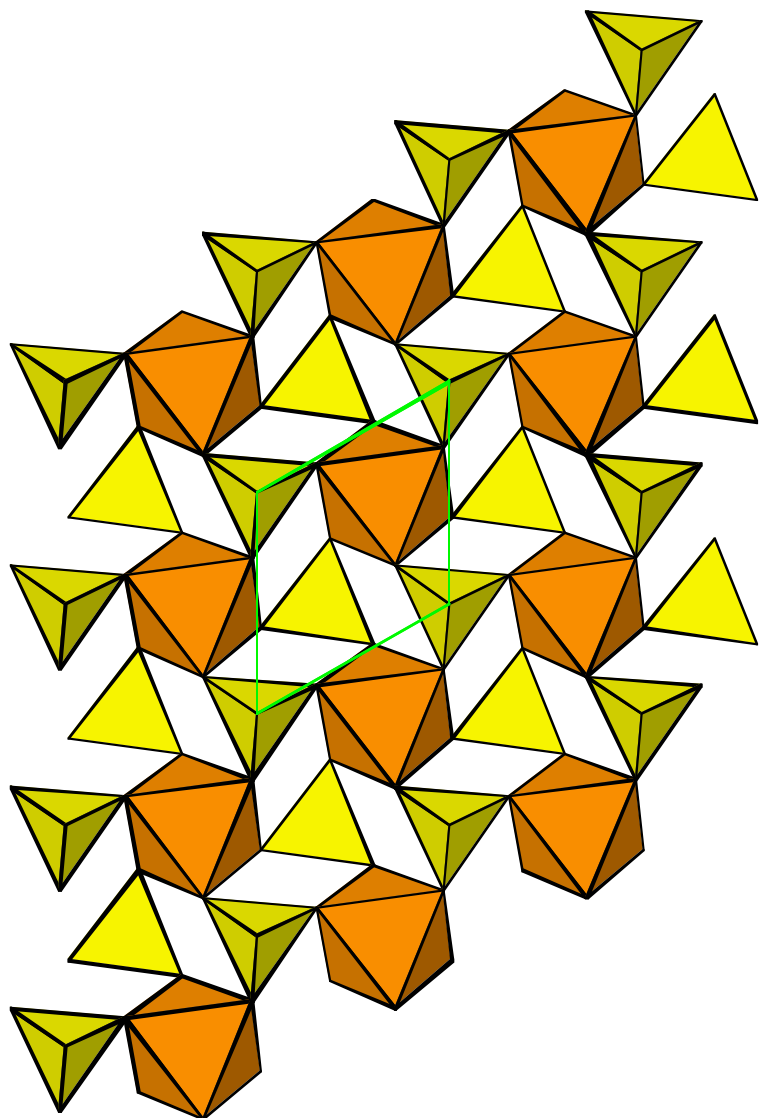


Fig. 3. Glaserite-like sheet in phase 3.

PROBLEMS WITH GLADSTONE-DALE AND LORENTZ-LORENZ RELATIONSHIPS. Clyde Spencer, 1858 Robin Hood Drive, Fairborn, OH 45324.

The classic relationships for predicting the real-part (n) of the complex refractive index from density (d) — Gladstone and Dale (1863), and Lorentz and Lorenz (1880) — have demonstrated utility for transparent minerals. However, there are problems that have been overlooked during the last 150 years!

For this analysis, the primary data are from the Physical Constants of Minerals section in the *CRC Handbook of Chemistry and Physics* (1995); the minerals have an $n < 2$ and are non-opaque.

The Gladstone-Dale relationship (GDR) is expressed as $(n - 1) / d = K$, where n is the mean refractive index, d is the density, and K is a constant that is different for every mineral; the only way to use GDR as a general predictor of n for an unknown mineral is to use a mean or median value for K . For this data set, the mean and median values are the same: 0.210.

GDR doesn't provide any information over a plot of the original data. Data-cloud shapes, trend-line slopes, and R^2 values are identical whether plotted against n or $n - 1$. The two plots only have different n -axis intercepts for the trendlines; however, this effects the values of the $(n - 1) / d$ ratio. Thus, the mean value of K is nearly twice the slope of the regression line. When solved for n , GDR has the following form: $n = Kd + 1$, which explicitly assumes an n -axis intercept of 1. The implication of this expression is that as density approaches zero, n approaches one, which is reasonable behavior for gases; however, as can be seen in figure 1, it does not represent the behavior of minerals, where the least-squares regression (LSR) intercept is 1.2494.

The Lorentz-Lorenz relationship (LLR) is expressed as: $(n^2 - 1) / (n^2 + 2)d = K$, where K is a constant, which again is different for every mineral. Linear regression on the numerator $(n^2 - 1)$ plotted against the denominator $(n^2 + 2)d$ gives a high R^2 (0.81). Unfortunately, it is the presence of the same variable in the numerator and denominator that is responsible for the high R^2 value! Density behaves similar to multiplicative noise modifying the denominator, otherwise there would be a perfect correlation with the n^2 factors.

When LLR is solved for n it has the form $n = ((2Kd + 1) / (1 - Kd))^{0.5}$. Unfortunately, using the average ratio ($K = 0.120$) from the empirical data, at approximately $d = 8.3$, the denominator becomes negative and the square root is undefined. However, as the denominator approaches zero, the predicted n approaches infinity. Thus, the function ceases to be reliable even before the singularity is reached; the line becomes significantly curved for a density above about 4 g/cm^3 . Thus, the difference between the predicted and actual refractive index (Δn) becomes increasingly positive for large density values. While LLR is mentioned by Dana (1958) as applicable to minerals, it is supposedly strictly applicable only to dielectrics. Therefore, it would not be useful for most opaque minerals.

The R^2 values for both regression- and GDR-predicted n are the same (0.688) when regressed on the actual n values; the LLR-predicted n has an R^2 value of 0.60. The error in GDR-predicted n becomes progressively larger with increasing density; the Δn regression lines for both GDR and LLR become positive at about 2.7 g/cm^3 . GDR tends to slightly overestimate n and LLR tends to significantly overestimate for high densities. Simple linear regression provides better prediction of n than either GDR or LLR.

Literature Cited

- Dana, E. S. and Ford, W. E. (1958) *A Textbook of Mineralogy*, 4th edition, John Wiley & Sons, Inc., NY. P. 233.
- Gladstone, J. H. and Dale, T. P. (1863) Researches on the refraction, dispersion and sensitiveness of liquids. *Philosophical Transactions of the Royal Society London* **153**:317-343.
- Lorentz and Lorenz (1880) *Wied. Ann.* **11**:70.

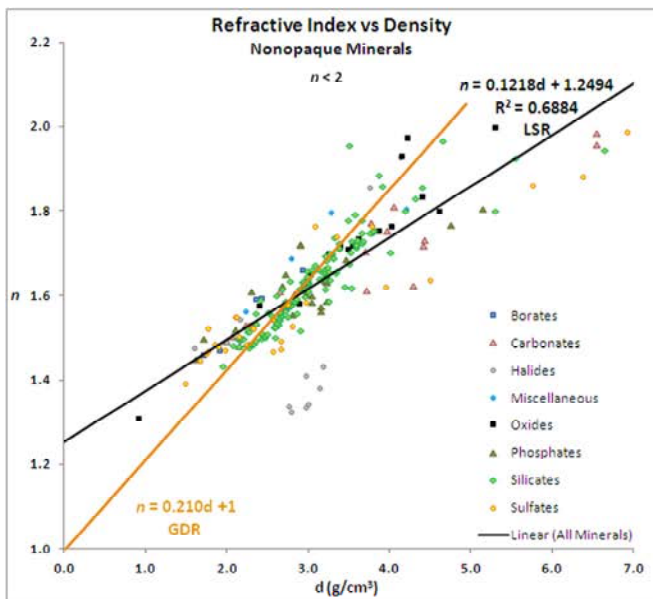


Fig. 1. Scatterplot of n versus density for 245 Common, nonopaque minerals.

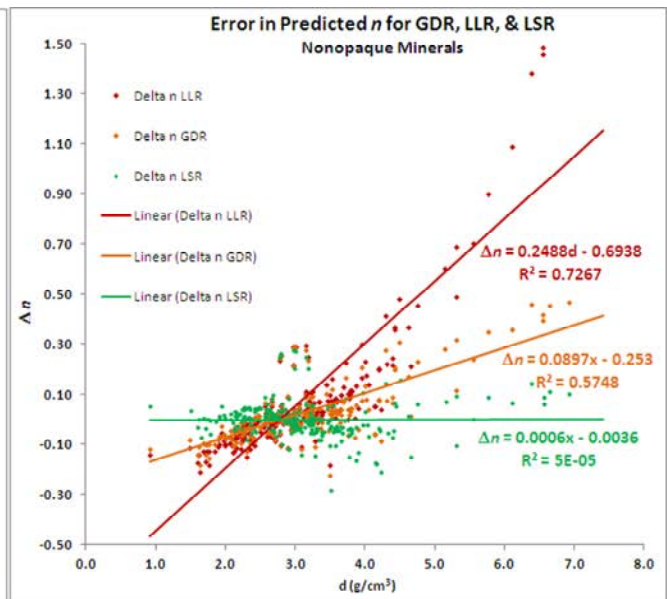


Fig. 2. Error in predicted n for GDR, LLR, and Least Squares Regression on original data.

THE LOWVILLE QUARTZ OCCURRENCE, LEWIS COUNTY, NY. M. Walter¹ and S. C. Chamberlain². ¹P.O. Box 137, 2982 State Rt. 11B, Nicholville, NY 12965; ²Center for Mineralogy, 3140 CEC, New York State Museum, Albany, NY 12230.

Unusual, Herkimer diamond-like quartz from a new locality began appearing on the market in the spring of 2011. These specimens were found during exploration for deposits of pyritized trilobites near Lowville in Lewis County, NY. Several pockets to a half meter across in the Beekmantown Dolostone have been recovered to date. Both the quartz crystals and the accessory minerals are noteworthy, resembling specimens recovered from the Grant quarry near Ottawa, Ontario, Canada (Robinson et al., 2011). This occurrence probably formed by the same mechanisms as other Herkimer diamonds from the slow thermolytic cracking of organic acids during burial.

The following suite of associated minerals has been identified:

Calcite, CaCO_3 , crystals to 10 cm occur as black, red, yellow and colorless transparent crystals. Crystals commonly show scalenohedral hydrocarbon phantoms overgrown by rhombohedra. Some crystals are twinned on $\{01\bar{1}2\}$. Occasionally rhombohedral overgrowths form scepters on scalenohedral crystals. Specimens with multiple generations and habits of calcite are common. Their association with quartz makes very attractive specimens that are atypical of New York State Herkimer diamond and diamond-like localities.

Dickite, $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$, occurs as late-stage white coatings of microscopic pseudo-hexagonal crystals arranged as expanded books in parallel growth and well developed rosettes. Identification was made with a combination of EDS and XRD analyses.

Dolomite, $\text{CaMg}(\text{CO}_3)_2$, series minerals form gray saddle-shaped rhombohedra to more than 1 cm on edge, usually in attractive groups and occasionally in parallel growth. Commonly these crystals are partially coated with copper-colored coatings of iron oxides and probably hydrocarbon since the coatings fluoresce yellow.

Fluorite, CaF_2 , occurs as microscopic, simple cubes.

Quartz, SiO_2 , occurs in a variety of forms in crystals to 8 cm. Crystals exceeding several cm are usually skeletal in form and smoky brown in color. Smaller crystals are colorless and virtually indistinguishable from typical Herkimer diamonds from other localities. Inclusions of sulfides, hydrocarbons, and two- and three-phase inclusions are relatively common. At least two generations of quartz crystallization occurred.

Pyrite, FeS_2 , is far more common in well formed crystals as an accessory mineral than at most Herkimer diamond or diamond-like localities in New York or southern Ontario. It forms interesting stepped crystals to 1 cm, sometimes in aggregates covering a 100 square cm of surface. Both the pyrite and calcite formed contemporaneously with quartz and continued to crystallize after quartz formation was finished, including broken matrix contact surfaces of quartz crystals.

We thank Dr. Jeff Chiarenzelli of St. Lawrence University and Dr. Dave Bailey of Hamilton College for technical assistance.

Literature Cited

Robinson, G. W., Dix, G. R., Richards, R. P., and Picard, M. (2011) Minerals of the Beekmantown group, southeastern Ontario, southern Quebec, and northwestern New York. *Rocks & Minerals* **86**:546-560.



Fig. 1. Calcite scepters, field of view 6 cm, Lowville, NY.



Fig. 2. Quartz and calcite, 4.5 cm. Lowville, NY

Caves and Cave Minerals

Kevin Downey

The past several decades have been a sort of golden age of cave exploration. New world records and amazing discoveries have exploded the number, size, and complexity of caves around the world. Along with this new exploration, there has been a rapid expansion of scientific understanding and interest in spelean studies, especially focused on cave genesis. Studies of morphology, geochemistry, and mineralogy have been expanding knowledge and raising many more questions. In 1980, there were just 19 listed cave minerals; today there are 319, many of which occur in incredibly diverse forms. Much of this work is clearly in its infancy. Unanswered questions of *how* and *why* abound.

Since many of the “frontiers” of cave exploration are remote and difficult to access, these studies have become a unique collaboration of dedicated amateurs and traditional professional scientists. Most fieldwork, maps, observations, and discoveries have been produced by a small group of intensely passionate cavers. These field observations have also yielded many exciting hypotheses and found evidence that has ruined many others. It can take billions of dollars and vast resources to attempt to study another planet or the deep ocean, but cave science is very different. It is quite possible for a curious person to be the first human ever to enter new passages or find incredible new minerals.

These talks will attempt to share some of this excitement, some of the new discoveries, and many of the unanswered questions.

Friday’s presentation introduces caves, cave science, and some current exploration. This will include several examples of new discoveries and projects from diverse types of environments. There are significant caves in deserts, rainforests, high alpine regions, and more “normal” places. These environments provide context and influences for the caves, and these caves provide the context for different cave minerals. Caves often act as time capsules in which it is possible to see many geochemical processes at work, and often the most obvious results are various mineral deposits. Trying to understand these contexts and to read the geomorphic signs are critical to making the type of observations that have value. A photographic tour of several major cave projects will include normal and “exotic” speleothems with some of the most spectacular known examples of cave minerals. This is a personal tour since it includes some of my favorite discoveries, and it will include many of the best caves yet found on the planet.

Sunday’s presentation looks specifically at some cave minerals, and what we have been trying to learn about their formation. Often common minerals like calcite are found in remarkably diverse forms and habits. In some cases, there are enough clues in the cave that may explain them, but as we find more exotic examples, the explanations get much harder. A hypothesis related to atmospheric pressure and carbon dioxide levels while supersaturated waters are degassing is presented with some experimental support as a partial explanation. The use of speleothems in related studies including paleoclimate measurements is yielding more data and even more questions. Further examples of puzzling formations from great caves like Lechuguilla and others lead to many more questions. These may not be answered soon, but trying will be interesting.

The Cobalt Silver Mining Area

David K. Joyce and Dr. Kimberly Tait

The Cobalt silver mining area (Cobalt) incorporates the silver deposits mined, primarily, around Cobalt but also includes Gowganda, Casey Township, South Lorrain Township and Elk Lake. The mines at Cobalt produced over 600 million troy ounces of gold over the years from 1905 to the mid 1980's and, thus, have been one of the world's most prolific sources of silver. Before Cobalt, the Canadian population was indifferent to the great wilderness north of the relatively tiny and/or sparsely populated areas in the south of Canada. The success of the silver mining and exploration boom at Cobalt spurred exploration and development of Canada's natural resources throughout the north, vaulting Canada to be the centre of mining/exploration finance and technical expertise, a mantle that it continues to wear today.

From a mineral collector's standpoint, Cobalt has been an intriguing place over the years. The prolific numbers of specimens of native silver (wire, leaf, plate and crystals) that have been recovered are amongst the best in the world and certainly amongst the biggest! They can still, relatively easily, be found today! Minerals like proustite, stephanite, acanthite ps argentite and safflorite that were recovered from active mining are world class. Nine minerals new to science have been discovered at Cobalt. The Royal Ontario Museum was the repository for many early noteworthy specimens and collections and was the centre of research for most of the new minerals. Excellent specimens of silver, bismuth, breithauptite, safflorite, nickeline, bismuthinite, rammelsbergite, arsenopyrite, skutterudite, maucherite, allargentum, etc., are still being found, today, by mineral collectors.

The presentation will cover the history of the Cobalt Camp, collecting techniques, currently productive areas and an overview of specimens from the ROM and private collections.

U.S. Mica Industry Pioneers: The Ruggles and Bowers Families

Fred E. Davis

Most people associate Sam Ruggles' name and the year 1803 with early U.S. mica mining. Many myths abound, but very little has been written about the documented history of his mica business, or anything about his family and descendants. Also missing from the history is any mention of the Ruggles' only competitor, the Bowers family and their descendants. In other words, almost a century of U.S. mica industry history has been incomplete and, in some instances, in error.

The origin of the U.S. mica industry is the story of two families: the Ruggles and the Bowers. Most accounts mention only Sam Ruggles and omit his sons George H. and Charles Ruggles, Sam's grandsons in the Randall family (by Sam's daughter Sarah Ann), and Sam's great-grandson Charles Ruggles Tainter (by Charles Ruggles daughter Julia E. Ruggles Tainter). Three generations of the Bowers family – James Bowers, his son Joseph S. Bowers and grandsons Charles D. and Elbran S. Bowers – are now virtually unknown. Both Ruggles and Bowers began in New Hampshire in the early 1800s, and by the 1850s their award-winning mica was well known around the world. Prior to about 1870, these two families *were* the mica industry. While the Ruggles' mining remained in New Hampshire, the Bowers expanded their operations to Western North Carolina in 1873.

This presentation is based on extensive original research that draws upon many primary documents. Rare, original letters were found, written by members of the Ruggles, Randall and Bowers families. Also discovered is an old business ledger documenting the competition between the Ruggles and Bowers, and extraordinarily rare business cards printed on mica. Over a century of property deeds, trusts and agreements in New Hampshire and North Carolina, U.S. and State Census records, books, newspapers, journals and document archives were searched to piece together the actual people, places, dates and events that provide a foundation for the history of the U.S. mica industry. Because the early mica industry was very much a family business across generations, the immediate and extended families of these mica industry pioneers are explored. Mining properties and activities are detailed, including some surprising new information never before published. It is richly illustrated with images of original publications, documents, letters, photographs, period newspaper and magazine clippings and illustrations. Additionally, many new photographs of gravesites and headstones, mines, quarries and homes help bring the history to life.



More Eye Candy

Clockwise from top left: Malachite, Chalcopyrite, West Pierrepont, NY; Molybdenite, Finlay farm, Pierrepont, NY; Goethite, Calcite, Cicero Clay Pits, NY; Dolomite, Gillette Road, Cicero, NY; Zircon, McLear Pegmatite, Dekalb Junction, NY; Millerite, Sterling Mine, Antwerp, NY; Steve Chamberlain photos.

40th RMS Exhibits

Bob Morgan – Fluorite: Not Just Boring Cubes

Bruce Gaber – Mineralscapes

Chris Stefano – Selected Rare and Unusual Specimens from the Thumbnail
Collection of Christopher J. Stefano

Darryl Powell - Odd Mineralogical Treasures from eBay

David Joyce – Minerals from Cobalt

Donald Dallaire - Apatites of the US

Don Lapham – Minerals of the LaFarge Quarry, Niagara Falls, NY

Erich Grundel - Benedickt Franz Johan Hermann

Erich Grundel - Mineralogy in 18th Century Russia

Erich Grundel - Cobalt, Ontario in Pictures and Words

George Konig - Recent Acquisitions

George Loud - Ed Swoboda Pseudomorph Collection

George Thompson - TBA

Harvard Mineral Museum - TBA

John Betts - TBA

John Medici - Single Crystals

John Rakovan - Apatites of Lithographie

Jonathan Levinger - Gaspé Copper Mine, Murdochville, Québec and Niobec
Mine, St-Honore, Québec

Maine Mineral & Gem Museum - Ray Woodman Collection

Michael Walter - Lowville, NY

Michael Walter - Pseudomorphs from St. Lawrence County, NY

New York State Museum - Apatites of NY

Technical Session - Minerals from the Technical Session

Terry Huizing – Colorful Copper-bearing Minerals

William Severance – Selected Fluorites from the William Severance Collection

William Severance – ELVIS' and Friends

Cover Art by Susan Robinson

