Voice of the Dinosaur

Newsletter of the
Kawartha Rock and Fossil Club

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CLUB ADDRESS:
1211 Kenneth Ave.
Peterborough, ON
K9J 5P8

PRESIDENT
Mark Stanley
705-639-2406
mark.stanley@bellnet.ca

VICE-PRESIDENT
Steve Wesley
705-743-9175
swesley@i-zoom.net

TREASURER (to Jan. 2013)
Ken Fox
705-742-6440
kfox71@cogeco.ca

SECRETARY
Open

FIELD TRIP CO-ORDINATORS
Ulrik Kullik
705-778-3787
ulrik.kullik@gmail.com
Bill Rawson
wrawson62@live.com

SHOW CO-ORDINATOR
Bob Beckett
705-748-0178
rbeckett@cogeco.ca

NEWSLETTER EDITOR
Bev Fox
705-742-6440
kfox71@cogeco.ca

PAST PRESIDENT
Bob Beckett

WEB SITE:
www.rockandfossil.com
WEBMASTER: Bob Moore
bobmoore@hotmail.com

Member of the CCFMS

LAST MEETING
September 11, 2012

Regular September Meeting. The lock on the Orientation Centre door would not open so, as the weather was fine, the meeting was held outdoors.

Business:

1. **It was agreed to keep the membership charges the same for the following year, singles - $20.00, family - $25.00.**
2. **Ken Fox agreed to become Treasurer until the Elections at the AGM in January 2013.**
3. **Stanley Nowicki agreed to be Recording Secretary until the AGM in January 2013.**

NEXT MEETING
October 9, 2012

Place - Orientation Centre, Peterborough Zoo
Time - 7:00 pm.
Agenda - Regular October Meeting

The Article VI of the Constitution states that:
"This Constitution, and the By-Laws of the Club, shall be reviewed at the October meeting."
If you believe there should be changes to the Constitution or Bylaws, bring your proposed changes to this meeting to be discussed.

Feature Presentation: To Be Announced

We will have another of Tom's popular silent auctions.

Bring a mineral or fossil of interest to you.

NOTE: Tom Jenkins appreciates the clear, clean milk bags that you have given him. Please keep on collecting, and cleaning them and give them to Tom when you can. They are much tougher than regular sandwich bags and are great for wrapping samples for the Kids Auctions, etc. With group participation, Tom should have a good supply by the 2013 Show.

THE FOSSIL CORNER
2012 Fossil Collecting - Trip 5
By Kevin Kidd

Between getting kids ready for back-to-school and squeezing in some final camping trips for the season, I haven't done as much collecting as I'd like, but I still made it out on a couple of trips

<u>Sunday, September 16</u>

Before I headed down to the Scarborough show, I spent the morning at my usual quarry. It had been several weeks since I'd been here, but nothing much had changed, with the exception of a new blast pile on the bottom level. I saw a couple of pieces of what would have been huge trilobites, 10" at least, but not much else. As I was limited on time, rather than walking around the perimeter of the quarry again, I focused on searching the crush pile. I went very slowly up and down some of the deeper gullies and while it wasn't the best day of hunting, it wasn't the worst either. I was finding common specimens (brachiopods, bivalves, snails etc.) when KRFC member Beth K. showed up. She was desperate to find a trilobite. After a brief chat, I continued up the gulley I was standing in and right away found an enrolled *Isotelus* trilobite still in some

Figure 1.
***Isotelus* trilobite in matrix.**

Figure 2.
***Glyptocystites* cystoid theca**

matrix (Figure 1). There's a bit of a ding on his lip, but it has both eyes, so it's a keeper. My next find was a rare *Glyptocystites* cystoid theca (body) (Figure 2). Unfortunately, it was broken, but since it's the first I've ever found, I'll give it a quick clean-up and add it to my ever-growing collection. I bought a complete example from another collector earlier in the year, which he also found on the pile (Figure 3). Prior to that piece, I didn't know that they were even found here.

Figure 3.
***Glyptocystites* cystoid**

My last find was another oddball association piece. I usually pick up snail fossils if they're large and complete, and this particular one obviously wasn't but I still picked it up anyway. I was surprised to see a *Flexicalymene* trilobite head inside the cast of the snail (Figure 4). The "Flexi" likely hid in the empty shell for protection but met his end inside. I'm not sure if the trilobite is complete, and finding out would destroy the snail, so it'll stay as I found it. And yes, before I left, I heard a cheer off in the distance –Beth had found herself a trilobite -FINALLY!

Figure 4.
Snail with trilobite inside.

<u>Saturday, September 22</u>

Wanting to get back to a Devonian fauna, I was weather watching all week trying to decide between Arkona and NY. Saturday morning came, and the better forecast had me heading back to southwestern Ontario. As usual, I started off in the south pit and stayed there for my full seven hour visit. This late in the season, the site is pretty picked over, but with persistence, there are still goodies to be found. Things started off slow, but then I noticed a piece of matrix that had a nice negative impression of a *Phacops* trilobite. It wasn't until I picked it up that I noticed that flanking that negative were two enrolled specimens (Figure 5). I'm almost certain that one is incomplete, but my fingers are crossed on the second. That was a nice rush, but that was about it for a while. I was still picking up pieces here and there, but mostly just brachiopods and a couple of nice snails.

Figure 5.
Matrix with Phacops impression and two enrolled specimens.

I did manage to find some new species for my personal collection (Figures 6 & 7), and that's always a nice bonus.

Figure 6.
A pair of inarticulate brachiopods, *Petrocrania hamiltonae* (?) attached to a horn coral, *Heliophyllum halli.*

Figure 7.
Another brachiopod compressed in the shale, possibly *Eumetabolotoechia multicostum* (say that five times quickly).

By mid-afternoon, I noticed I was no longer alone in the pit. A second collector had arrived but was about as far away from me as you can get. After a while, he gave up on the area he was scouring and came over to me. It turns out that this was one of the guys I'd met on my last trip down. We talked for a bit and he gave me some great stratigraphic info on this particular site. He said he comes here nearly every weekend and has picked the brains of the Topor brothers –a pair from Michigan that have been collecting here since the late 60's/early 70's. Realizing it was getting late and I wanted to be home in good time (it's a three hour drive), we resumed our collecting. Within a few minutes, I found another trilobite just sitting on the ground (Figure 8). It was another *Phacops* roller, and very similar to the one I had found on my last trip. That was good enough for me, so I gathered my gear and made my way home, already thinking of my next trip - Bowmanville.

Figure 8.
Enrolled *Phacops* trilobite

Until next month – Happy Hunting!

THE MINERAL CORNER
Mica
Compiled by Sue Kehoe

<u>Nomenclature</u>:
The word mica is from the Latin word *mica* referring to "a crumb" and *micare* meaning "to glitter".

<u>Chemical Composition</u>:
Mica belongs to a group of minerals called *phyllosilicates*, all of which have the same basic formula. It is a large group of over 30 minerals. This became a bit complicated as each reference source I used had the formulas set up differently, so for simplicity I am going to use the formulas as set out in Mindat.

The atomic structure (Figure 1) is of six tetrahedrons joined in a circle with a point turned inward to the centre of the circle. Each tetrahedron shares its oxygen with another tetrahedron. Two such layers sandwich a layer containing a metallic ion such as aluminum. This sandwich forms one sheet of mica. The six tetrahedron base is the reason sheets of mica form the hexagonal shape. Sheets of mica are stacked on top of each other and are joined by bonds of large cations such as potassium or calcium. This cation layer is called the interlayer. The final product such as a book of mica

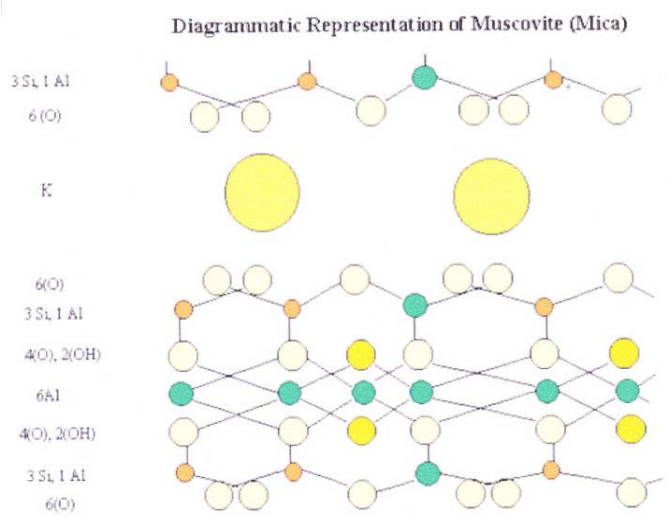

Figure 1. Mica atomic structure diagram.
(Note the large potassium ions joining two layers.)

has a flat, shiny surface with rough edges, and typically will flake off along the interlayer.

Using the formula for muscovite as an example of a typical phyllosilicate, this will indicate where substitutions of other elements can occur for this large and complex group of minerals.

Interlayer	Octohedral Layer*	Tetrahedral layer	Hydroxide
K	Al_2	$(AlSi_3O_{10})$	$(OH)_2$
Rubidium - RB	Chromium - Cr	Boron - B	
Sodium - Na	Lithium - Li	Berillium - Be	
Barium - Ba	Iron - Fe	Iron - Fe^{3+}	
Cesium - Cs	Zinc - Zn	Titanium - Ti	
Ammonium	Vanadium - V	(Can substitute up to 50% of the silicon.)	
Titanium - Ti			
Manganese - Mn			
Magnesium - Mg			

All micas are either *dioctahedral* (less than 2.5 ions) or *trioctahedral* (if greater than 2.5 ions) in the Octahedral layer* as indicated by Aluminum above.

<u>The Mica Group</u>:
The mica group can also be classified as:
(1) True or Common Micas generally containing single charged ions such as sodium or potassium as the cation, and exhibit elasticity/flexibility of the layers i.e. biotite, lepidolite, muscovite, phlogopite;
(2) Brittle Micas containing a double charged ion such as calcium and are not flexible such as Clintonite; and
(3) Interlayer-deficient Micas or Hydro-micas due to their very clay-like qualities, i.e.hydro-muscovite, Illite, and Phengite. These are very fine grained and have greater variation in both ion and water content.

<u>General Characteristics of the Group</u>:

Colour:

Colourless, silvery white, gray, brown, green, rarely violet or red in muscovite.
Pink, lilac, yellow, gray, white and colourless in lepidolite.
White, greenish in paragonite.
(These do not contain iron or magnesium.)

Dark brown, black, greenish brown, bronze, yellow white in biotite.

Colourless, yellow to reddish brown, gray green in phlogopite.
(These contain iron or magnesium.)

Lustre: **Pearly, vitreous for most species: glauconite - earthy, dull**

Streak:	**Colourless, white for most species.**
Fracture:	**Uneven, micaceous.**
Hardness:	**2.0 - 3.0 for most species; 4-4.5 for paragonite.**
Cleavage:	**Perfect, basal in one direction.**
Specific Gravity:	**2.7 - 3.0 for most species; 2.7 - 3.4 for biotite, 2.6 - 3.3 for chlorite.**
Diaphaneity:	**Translucent to opaque.**
Crystals:	**Monoclinic, tabular six-sided pseudohexagonal parallel to cleavage, may also be foliated, scaly, granular and compact, by stacking form "books".**
Refractive Index:	**1.565-1.625**
Birefringence:	**0.03-0.07**
Pleochroism:	**Varies according to species.**
Fluorescence:	**None.**
Occurrence:	**Generally found in granite pegmatites, regional metamorphic rocks and schists. Very common around the world.**

<u>Some species specific information</u>:

Biotite: $K(Mg,Fe)_3(AlSi_3O_{10})(F,OH)_2$

No longer considered a species. Represents a dark coloured iron rich solid-solution series that includes annite, fluoroannite, tetra-ferri-annite, siderophylite, phlogopite, eastonite, fluorophlogopite, fluorotetraferriphlogopite. It was named after Jean-Baptiste Biot born in 1774 , a French physicist, astronomer and mathematician who researched mica for its optical properties.

It is also known as black mica or iron mica. Can form tabular crystals with twinning common on the {310} face, less commonly on the {001 face. In the field it is any darkcoloured mica.

Figure 2.
Biotite

Occurs in plutonic volcanic rocks, metamorphic schists and gneiss. Associated with quartz and orthoclase in granite pegmatites; in granite diorite, monzonite; in rhyolite, andesite and dacite; and with albite and horneblende in greenstone.

Chlorite: (Magnesium,iron aluminum silicate)

A brittle mica occurring as a secondary mineral with calcite and zeolites in cavities in basaltic volcanic rocks and with albite and epidote in contact metamorphic rocks; with actinolite, almandine, glaucophane in amphibole schists, gneisses in regional metamorphic rocks and with quartz and siderite in hydrothermal replacement deposits.

Glauconite:

From the Greek *glaukos* for "blue green". Occurs in rounded aggregates, pellets of fine grained scaly particles. Forms in shallow marine environments. Is part of greensand sedimentary rock - giving it its colour.

Lepidolite: $K(Li,Al_3)(Si_3AlO_{10})(F,OH)_2$ (lithium mica)

Named by Martin Klaproth in 1792 from the Greek *Lepidos* for "scale" and *lithos* for "stone". Belongs to the Polylithionite-Trilithionite series. Fluoresces cream white to yellow. Found in granite pegmatites in fine grained masses and in cavities as short tabular crystals. Associated with microcline, quartz, beryl, topaz, spodumene and tourmaline. Used as a source of lithium. May also contain rubidium which is used to date rocks greater than 10 million years old.

Figure 3.
Lepidolite

Muscovite: $KAl_2(AlSi_3O_{10})(OH)_2$ (potassium aluminum silicate)

Named for "Muscovy glass" used as a glass substitute in Russia by Johann Gottfried Schmeisser in 1794 in his System of Mineralogy. Forms a continuous series with celandite, phengite, illite to aluminocelandite. Twinning does occur on {310}, forming 6-pointed stars; occurs less commonly on {001}. Occurs with albite, quartz and tourmaline in granite pegmatites; with quartz and almandine in contact metamorphic rocks, in schists, gneisses and with quartz and calcite in mesothermal veins.

Phengite: Mariposite

A variation between muscovite and celadonite with iron substituting for magnesium and aluminum. Also contains chromium. Is associated with gold-bearing quartz and serpentinite. Mostly massive with waxy lustre and no visible crystals.

Phlogopite: (potassium, magnesium aluminum silicate)

From Greek word *phlogopos* meaning "fiery-looking" referring to red-brown colour. Shows a 6-12 ray star when a light source is shone through it (termed asteriated). This is due to the inclusion of rutiles. Forms in marbles, metamorphosed limestones and dolomite which distinguishes it from other micas. Also found in contact and regional metamorphic rocks with calcite and spinel. Largest single crystal (11 metres x 4.5 metres) was found at Lacey Mine in Kingston, Ontario.

Zinnwaldite: $KLiFe^{2+}Al(F,OH)_2AlSi_2O_{10}$ (lithium iron mica)

No longer considered a species. Has a hardness of 2.5 - 4.0. Has been found in the Leduc Mine, Outaouais, Quebec.

<u>Uses</u>:

Historically, mica powder was used in pottery in India, Pakistan, and by the Pueblo Indians of New Mexico to give it sparkle. It has been found in cave paintings from 40,000 to 10,000 B.C. It was also a major component of the outer stonework of the Pyramid of the Sun near Mexico City at Teotihuacan.

Muscovite, phlogopite and lepidolite are the only micas that are used commercially. Lepidolite is used as a source of lithium and is used in glass, enamels, and ceramics. It is also used in switches and modulators as well as for demodulators for high speed optical communications systems. As lithium hydride, it produces the hydrogen used in weather balloons.

Mica is a stable compound and can be subjected to moisture, light, high temperatures and electricity without change or puncturing. It has the ability to hold an electrostatic charge momentarily then release it with very little loss in the form of heat. This is called *being dielectrically stable* and makes mica very useful in the electrical industry for capacitors. It is also stable at high temperatures (muscovite up to 700 degrees C and phlogopite up to 900 degrees C) giving it good insulating qualities for high heat environments such as rockets or jet engine ignition systems.

It is used in both sheet and ground forms. Sheet of mica is split by hand from books into specific sizes -" blocks" being 1/8 inch thick and 2 x ½ inches; "blocks" are then further split into "films" 0.004 - 0.0012 inches thick; and "splittings" are less than 0.0012 inches thick. It is graded depending on quality, amount of staining and size and priced accordingly. Any scrap is sorted and can be used as in the fabrication of a composite material called *micanite* where layers of mica are glued together with a shellac or resin and baked. Built up mica products are used in wiring circuits and fire-resistant power cables, as in kilns, alarm systems, heaters and boilers and smelters.

The remaining scrap is ground by dry or wet methods and used in a number of compounds such as joint filler for dry wall, providing smooth surfaces and resistance to cracking. This accounts for approximately 54% of dry ground mica consumption. It is also used as a pigment extender in the paint industry where it prevents shrinkage, allows particle suspension, prevents water penetration, highlights the pigments and promotes paint adherence to surfaces. Paint uses approximately 22% of dry ground mica consumption.

Another application is in the well drilling industry where it seals porous sections of the drill hole. (15%) It is used in the plastics industry for insulating purposes and for providing light weight yet strength/stiffness (2%). It is used as a rubber mold lubricant as an antisticking agent for such items as tires and roofing (1.5%). It is not affected by the acidity of the asphalt, or weather. It is used in wallpaper, concrete, stucco and tiles; as a flux coating on welding rods. Phlogopite is also used in car brake linings and clutch plates; as sound-proofing insulation; in heat shields. It is used as insulation , soil conditioner, and grease extender.

Wet-ground mica retains its glitter and is used in automotive paints, plastic containers, inks and cosmetics such as body glitter, and eye shadow; as an abrasive in tooth paste and in latex balloons.

Sheet mica is used in electrical components and electronics and a diversity of other applications. Some of these are dials on compasses, optical filters, stove and kerosene heater windows, laser devices, radar systems, missile systems. It has the ability to be cut, stamped or machined to specific shapes, and thicknesses.

Mica is also used as a substrate for atomic force microscopy providing a flat film for imaging such things as DNA molecules.

References:

"Mica", "Biotite", "Paragonite": www.en.wikipedia.org
Figure 1: Courtesy of Sabine Grunwald, University of Wisconsin - Madison
www.delminsociety.net/motm/motm_dec2007
Figures 2 and 3: own collection
"Mica" : www.mineralszone.com
"Mica": www.mindat.org
"Biotite" - Pp. 533-534; Muscovite - Pp. 531-532; Phlogopite - Pp. 532-533; Lepidolite - Pp. 534-535; Chlorite - Pp. 535-536, *National Audubon Society Field Guide to North American Rocks and Minerals*, Charles W. Chesterman, Alfred A. Knopf, New York, 1979.
"Zinnwaldite" - Pp. 48-49; "Margarite - Pp. 92-93, *Handbook of Rocks, Minerals & Gemstones*, Walter Schumann, Houghton-Miflin, New York, 1993.
"Muscovite" - p. 261; Phlogopite - p. 261; Glauconite - p. 261; Biotite - p. 262; Lepidolite - p. 262; Fuchsite - p. 262; Vermiculite - p. 263; Zinnwaldite - p. 263, *Smithsonian Rock & Gem*, Ronald Louis Bonewitz, DK Books, New York, 2005.
"Muscovite mica"," phengite", "phlogopite": www.geology.about.com/minerals
"The Mica Group": www.galleries.com/MicaGroup

THE EDITOR'S CORNER

My thanks to Sue Kehoe for her excellent article on Mica and to Kevin Kidd for his continuing articles on his field trips. I must apologize to Kevin and to the readers. In the September issue of the Newsletter I mislabeled Kevin's trip as number 3, and of course, it should have been number 4. The bane of any editor is to discover mistakes after printing and distributing copies.

The Thanksgiving Holiday is coming up, so drive carefully and have a great weekend.

FIELD TRIPS

List for Fall 2012
Prepared by Ulrik Kullik

Except for the Lacy Mine Trip you must contact Ullie if you are interested in a trip.
Contact info: ulrike.kullik@gmail.com or phone 705-778-3787.
NOTE: If you do sign up for a trip and then have to cancel, please inform Ullie or the trip leader at least a day ahead of time.

Oct 8 - Thanksgiving Monday (This was changed from Sept 28.)
Lacey Mine near Kingston, ON
Meeting Time: 8:00 am
Meeting Place: 4637 Stirling Marmora Road (George Thompson's residence)
Travel Time: @ 1 hr, 20 minutes (120 kilometers) from George's place.

Car pooling, etc. can be arranged at George's place.
The trip will involve a short hike into the mine as part of the road is in poor condition.
Minerals Found: philogopite mica, apatites in a range of colours, pyroxene, calcite crystals, quartz crystals
This was the largest mica mine in North America during its operation. The mica was used for stove windows and later as electrical insulators by General Electric. There was also an unsuccessful attempt to mine the apatite as a source of phosphate.
If you wish to go and/or have any questions, contact trip leader George Thompson: Email: Truenorthminer@aol.com, or phone 613-827-0368

Oct 13, Saturday
Malone Pinchon Quarry
Meet at 9.30 am at the Tim Horton's in Marmora on Highway 7

Oct 21, Sunday
Kevin Kidd will lead a fossil trip to James Dick quarry in Gamebridge, ON
Please contact Ullie if you would like to go. There is still room for more people.
Meeting place and time will be announced later.

COMING EVENTS - FALL 2012

Oct 13-14 **43rd Annual Gem Show and Sale sponsored by the Kingston Lapidary and Mineral Club.**
Sat. 10-6, Sun. 10-5
Portsmouth Olympic Harbour, 53 Yonge St., Kingston, ON.
Features: Over 30 dealers; Children's mine, Jewellery Workshop
Information: Contact Les Moss, Show Chairman at emoss@cogeco.net
Website: http://www.mineralclub.ca

Oct 20 **Walker Club Annual Auction**
Saturday 1:00 pm to whenever
Knox United Church Christian Education Centre Auditorium in Scarborough. North East corner of Sheppard and Midland avenues.
Information: Contact Bill Lechner
Website: www.walkermineralogicalclub.com/

Nov 1-8 **Robert Hall Originals - Annual Fall Open House**
Canadian made pewter gifts & jewellery for Christmas gift giving
Thursday, November 1 to Thursday, November 8
10 am-5pm each day
138 Sugar Maple Road, St. George Ontario
Contact: inquiry@roberthalloriginals.com (519) 448-1236 or 1-800-360-2813
Website: http://www.roberthalloriginals.com

Nov 10 **CMMA Fall Mini-Conference**
Burlington Arts & Cultural Center, 1333 Lakeshore Road, Burlington, ON
Contact: Bill Lechner at 416-438-8908 or bill.lechner@rogers.com
Website: http://canadianmicrominerals.ca/

Nov 21 **Mineral Identification Night at the ROM**
4:00 pm to 5:30 pm
Use President's Choice Entrance on Queen's Park, doors nearest Museum subway stop.
Website at www.rom.on.ca/programs/id_clinics.php