

# THE MINERAL VEIN

Official Newsletter of

## THE MINERAL SOCIETY OF MANITOBA

NOVEMBER 2014



### RARE EARTHS IN MANITOBA REPORT

- TANIA MARTINS -

*By Marjorie Turton*

On Nov. 5 our Mineral Society of Manitoba had the pleasure of listening to a presentation by Tânia Martins, on her exploration of our province, of the influence of politics on mining and the vagaries of the free market when monopolies are created.

So began her presentation on rare earth metals. The interesting thing is that these metals are not that rare and the category is elastic. Rare earth metals was first named in 1794 – “rare” because they were originally thought to be present in the earth’s crust only in small amounts – “earth” because as oxides, when first discovered they had an earthy appearance.

Rare earth elements are considered as a set of seventeen chemical elements in the periodic table, specifically the fifteen lanthanides plus scandium and yttrium. Scandium and yttrium are considered rare earth elements since they tend to occur in the same ore deposits as the lanthanides and exhibit similar chemical properties. While named rare earths, they are in fact not that rare and are relatively abundant in the Earth's crust. What is unusual is to find them in quantities significant enough to support economic mineral development

Here is where they are on the periodic table. Sometimes rare earth elements are also called rare earths, thus they are sometimes all grouped together.

These are also sometimes known as speciality metals.



*Tânia Martins*

## THE MINERAL SOCIETY OF MANITOBA

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***The Mineral Vein*** is published monthly from September to June.

**Meetings** are held on the first Wednesday of each month from September to May inclusive at the Manitoba Museum in room P47 on the Planetarium level. They begin at 7:30 PM and feature announcements, an invited speaker and a raffle. Members are encouraged to bring along any new, interesting specimens, or specimens appropriate to the speaker's topic.

**Field Trips** take place from May to September to interesting sites in Manitoba plus neighbouring provinces and states.

**Membership:** A single membership is \$15 while a family membership is \$20. Memberships run from October to October and the annual dues are payable each October.

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### -----UPCOMING EVENTS-----

**1). December 03<sup>rd</sup> is our next meeting.**

**- If you have not already submitted your monies for Annual dues please do so ASAP.**

**2). 2014 MB Mining & Minerals Convention Report**

Hi Matt, Marion & Marjorie, Tim and Nancy, Marjorie Reynolds, Nikolay, Kelly McB.,(Mining Matters), and Yukon Dan...

I've never had so many 'high fives' from school students and so much warm appreciation from school teachers in 3 short days as I experienced last week during the **Manitoba Rocks!** school tours at Convention 2014. Yes...it was a totally new 'set up' this year, with the separate 'stations' or activity areas for schools to visit perhaps providing somewhat of a challenge, and yes, we also had 30 new university and high school volunteers helping out with activities.

I'm sure you all agree, it was a **whole lot of fun...**and that's because the students all enjoyed every minute of it... thanks to **all of YOU** and **all of your volunteers** who pitched in, worked hard, and helped make it happen. Please share my appreciation with your volunteers for joining us. My very special thanks also...to Kelly Dunn of Manitoba Mineral Resources for her positive and always excellent school tour coordination support and volunteer planning support.

I have to say it... **'You ALL Rock!'**. Thank you...thank you...**THANK YOU!**

**Please note:** Our Convention Coordinator will be forwarding a survey your way in a few days, which gives you an opportunity to provide feedback as an exhibitor in the **Manitoba Rocks!** program at the 2014 Manitoba Mining and Minerals Convention. I appreciate your taking time to respond to the survey. Your feedback is important and can help make next year even better.

Wishing you all the very best of the holiday season ahead, and a most happy and successful 2015!

## Susan Michaels

### Susan Michaels

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Learn more at [Mineral Resources Division](#)  
 and [ManitobaRocks!](#)

### Rare Earth's Report Cont'd:

rare earth elements	PERIODIC TABLE																		He	rare elements																	
Lanthanum (La)	3	4																	5	6	7	8	9	10	Beryllium (Be)												
Cerium (Ce)	Li	Be																	B	C	N	O	F	Ne	Cesium (Cs)												
Praseodymium (Pr)	11	12																	13	14	15	16	17	18	Gallium (Ga)												
Neodymium (Nd)	Na	Mg																	Al	Si	P	S	Cl	Ar	Germanium (Ge)												
Samarium (Sm)	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	Zn	Ga	Ge	As	Se	Br	Kr	Hafnium (Hf)											
Europium (Eu)	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr								Indium (In)											
Gadolinium (Gd)	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	Lithium (Li)
Terbium (Tb)	55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	Niobium (Nb)
Dysprosium (Dy)	87	88	89	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Uuq	Uup	Uuh	Uus	Uuo	Rubidium (Rb)
Holmium (Ho)																																					Tin (Sn)
Erbium (Er)																																					Tantalum (Ta)
Thulium (Th)																																					Zirconium (Zr)
Ytterbium (Yb)																																					
Lutetium (Lu)																																					
Yttrium (Y)																																					

What is so important about these? Well they are employed in a multitude of modern day things: cell phones, green technology, pharmacological industry, hybrid cars, permanent magnets, compact fluorescent lamps, liquid crystal displays, plasma, jet engine thermo barriers, etc.

With rare earths, a little goes a long way. The amount of rare earths used in high tech equipment is nominal but almost always critical to the unit's performance. For example, an iPhone uses eight rare earths – for everything from its colored screen, to its speakers, to the miniaturization of the phone's circuitry. While the amount of rare earths in each

phone is very small, the quantity of phones sold each year is impressive.

Another usage of rare earths is due to their stability or instability. Rare earth elements change through time in small quantities (ppm, parts per million), so their proportion can be used for geochronology and dating fossils.

Until 1948, most of the world's rare earths were sourced from placer sand deposits in India and Brazil. Through the 1950s, South Africa took the status as the world's rare earth source, after large veins of rare earth bearing monazite were discovered there. Through the 1960s until the 1980s, the Mountain Pass rare earth mine in California was the leading producer. Today, the Indian and South African deposits still produce some rare earth concentrates, but they are dwarfed by the scale of Chinese production. In 2010, China produced over 95% of the world's rare earth supply, mostly in Inner Mongolia while it had only 37% of proven reserves. All of the world's heavy rare earths (such as dysprosium) come from Chinese rare earth sources.

China also controls the market on these. China became the world's dominant producer of rare earths in the 1990s. Because China sold rare earths at very low prices, mines like Molycorp's Mountain Pass in California, our own here in Manitoba and others throughout the world were unable to compete. By 2000, China accounted for more than 95% of world rare earth production.

Yet the demand for rare earths metals for our modern day technology has increased to the point that countries are scrambling for them. Japan has an entire industry in recycling rare earths.

In Manitoba all rare earths occur in pegmatite.

A pegmatite is a holocrystalline, intrusive igneous rock composed of interlocking phaneritic crystals usually larger than 2.5 cm in size; such rocks are referred to as pegmatite. Most pegmatites also contain quartz, feldspar and mica, and have a similar basic composition as granite.

The single feature that is diagnostic to all Pegmatites is their large size crystal components. Pegmatite bodies are usually of minor size compared to typical intrusive rock bodies. Compared to typical igneous rocks they are rather inhomogeneous and may show zones with

different mineral assemblages. Crystal size and mineral assemblages are usually oriented parallel to the wall rock or even concentric for pegmatite lenses. The world's largest crystals are typically found in pegmatites.

Pegmatites are important because they often contain rare earth minerals and gemstones, such as aquamarine, tourmaline, topaz, fluorite, apatite and corundum, often along with tin and tungsten minerals, among others.

Mining, refining, and recycling of rare earths have serious environmental consequences if not properly managed. A particular hazard is mildly radioactive slurry tailings resulting from the common occurrence of thorium and uranium in rare earth element ores. Additionally, toxic acids are required during the refining process. Improper handling of these substances can result in extensive environmental damage not to mention humans.

The cost and scarcity of rare earth metals have resulted in people re investigating mine tailings. Another recently developed source of rare earths is electronic waste and other wastes that have significant rare earth components. New advances in recycling technology have made extraction of rare earths from these materials more feasible, and recycling plants are currently operating in Japan, where there is an estimated 300,000 tons of rare earths stored in unused electronics.

The strategic plan in Manitoba is 3 fold

- Revisiting and reassess known occurrences with rare earth potential
- Acquiring and re-interpreting data
- Identifying

Tânia Martins' exploration of Manitoba produced interesting pegmatite rare earth composition in the following areas

- Red Sucker Lake has the possibility of Lithium
- Burntwood Lake has a geology to Eden Lake
  - Red syenite and pink syenite
  - Fluorite bearing quartz
  - The rocks are weird
  - Apatite in Cpx-rich red syenite

Have to take rocks back to lab, crush, and then get another lab to analyze composition.

Brezden Lake - The area is banana shaped

Eden Lake - Beautiful rocks

- Black minerals stick out
- Easier to distinguish the mineral

Oxford Lake

Mineralogy similar in profile

- Calcite & dolomite
- Pyroxene
- Magnetite
- Biotite
- Clinopyroxene
- Amphibole
- Apatite
- Epidote

Trans Hudson

- Has quartz, muscovite, biotite
- Margins are straight, thickness 30 cm to 4 m
- Metasomatic alterations, aplitic texture
- Garnets surround by apatite

Southern Indian Lake

- Tourmaline, beryl, and columbite grp minerals

Partridge Breast Lake

- Structures are bigger
- Also boron and tourmaline

South Bay

- New causeway blew up some red
- Quartz, feldspar, garnets
- Beryl bearing pegmatite

Tanco mine

The pegmatite ore body now mined by the Tanco Mine was discovered in the late 1920s and the first mining started in 1929. Several times the mine was closed, reopened and closed, until in 1969 when it was reopened as a tantalum mine. Cabot Corporation bought the mine in 1993, and began the production of caesium brine from pollucite in 1996. The pegmatite found at the north west shore and below the lake floor of Bernice Lake is a granitic igneous rock enriched in the incompatible elements, for example caesium, lithium, tantalum and beryllium. Examples of minerals found in the mine are the lithium-containing spodumene and



amblygonite, caesium-containing pollucite, beryllium-containing beryl and tantalum- and niobium-containing simpsonite and tantalite.

The pollucite  $((Cs,Na)_2Al_2Si_4O_{12} \cdot 2H_2O)$  deposit associated with the pegmatite is the largest known deposit of this mineral. The mined pollucite contains approximately 24%  $Cs_2O$ . For several decades the pegmatites at Bernice Lake have supplied the world with the needed caesium.

There are political and environmental reasons to look for rare earth minerals outside of China. Canada has over 1,000 rare earth occurrences nationwide and Manitoba has more than 40, and still finding more. All the rocks occur in different environments, thus need to understand how formed.

One could list many more sites and their findings that Tânia Martins explored in Manitoba. In spite of the rich and not so rich deposits she found, no one has taken advantage of her findings. Funding available or rather not available to mining companies can be one obstacle. However Manitoba does have deposits of pegmatite in which rare earth minerals are found.

*- Thank you Tânia for your wonderful talk -*

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### 3). ANNUAL CHRISTMAS PARTY & AUCTION



Please inform Wendy or Ron Anthony that you are planning to attend our annual Christmas party on:

Date: Sunday December 07<sup>th</sup>

Time: 4 pm - 8 pm.

Where: Canad Inns Garden City (2100 McPhillips St)

Ham & roast beef buffet followed by Tony Smith's Auction House Benefit!! All proceeds from auction go towards annual Geology Student Prize Award. Fellowship meal...**BE THERE OR BE SQUARE!!!**

