GRAND RIVER HERITAGE MINES SOCIETY NEWSLETTER

July-August-September, 1998

Editor's Notes, by Jean Farquharson

What an ideal springtime we have had! And summer solstice is a few days in the past. Mike O'Byrne and I had a pleasant drive to the **York Grand River Historical Society** meeting last week, where we met with many familiar faces, and saw some interesting old tourism videos of this part of Ontario. We confirmed that we would be sharing the booth with York Grand River Historical Society at the **Golden Horseshoe Steam Show on August 1, 2 and 3.** We hope to get volunteers to help set up the building and take turns at the booth. Please let us know if you can help. Don't wait to be asked.

Unfortunately, we had to decline invitations to set up a booth at the **Paris Historical Show** and a special event at **Cayuga** last week-end because we couldn't get enough help. Everyone was too busy.

We always like to find out what gypsum was used for, but didn't know it was connected with **sports**! Of its many uses, this is one of the strangest. A *Flashback* in the **Brantford Expositor** tells us that on Feb.2, 1898, at a Brantford-Woodstock hockey match, it was reported that a hockey player threw the puck which "rose only a few feet and skimmed along the edge of the boards. A lad named George Whelan happened to be leaning over the boards, and in its flight ***the hard gypsum*** just caught the boy on the bridge of the nose as it flew past. The boy's nose was badly broken and Dr. Palmer, president of the hockey club, set the fracture on the spot, and the boy went home with a very sore face".

This a first! For this issue we have had **four** articles submitted by our members! **Joe Clark**, an eminently qualified geology/geography teacher who writes a column for the Brantford Expositor, has written us a background article on the geology of Southern Ontario, including gypsum. **IlseKraemer**, still recuperating from surgery, has outlined basic facts about gypsum, related minerals and crystals; **Mike(Grizzly) O'Byrne** has contributed to this issue an interesting history of mine shafts and hoisting; and **Mary Martindale**, from the Martindale Mine family, and a retired teacher, has recalled from her past memories of gypsum.
Keep up the good work, folks! Submissions are always welcome.

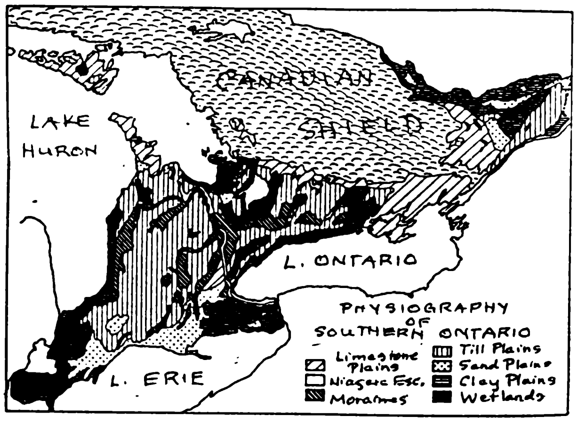
NOTE: There are a few people who have not yet paid their dues (due every January). Please look after this if you wish to receive the newsletter. We will print the names and addresses of **paid-up** members in our next newsletter unless we hear that you want your name excluded.

We have received an invitation to set up a display and be available at the **Haldimand Norfolk Regional Museum and Archives** (note the name change) in Cayuga on August 30th from 1 to 4 p.m. We ask that as many members as possible attend to support this **Open House. Please let us know whether you are able to come.**

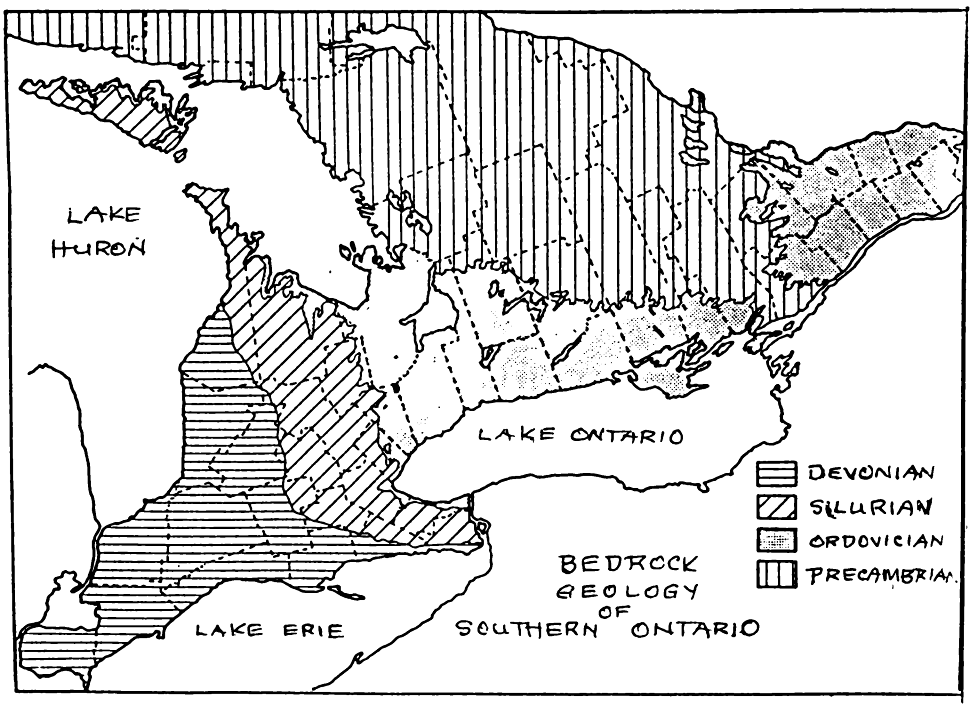
GEOLOGY AND GYPSUM, by Joe Clark

What is under our feet? To most of us, the surface is topsoil in which we grow things; to the contractor, under the topsoil can be construction material; to the geologist, it's glacial geology deposits.

Geological time is measured from the present backwards as we go deeper into the ground; e.g., the Canadian Shield is measured backwards from 600 million to about 4 billion years. A geological map of Southern Ontario shows the following:



In the southern part (around Delhi), the **Norfolk Sand Plains** were formed from the meltwater deposits of the retreating glacier. Glaciers left **horseshoe moraines** further north, with the Guelph, Galt, Paris and Tillsonburg moraines in the southern part. These moraines are very high, long ridges of any combination of deposits from clay to boulders, which contain granites, gneiss, marble, conglomerate, etc., carried by the ice from the Shield.



In Southern Ontario, **sedimentary rock**, under the glacial debris, is called **Paleozoic** because it was thought to contain the first forms of life. The first advanced sea life appeared 600 million years ago in the **Cambrian** seas, the oldest of the Paleozoic seas, where the sediments that became sedimentary rock contained brachiopods, trilobites and corals.
A line from Orillia to Kingston is the boundary of the metamorphic and igneous rocks of the **Pre-Cambrian Canadian Shield** to the north and the Paleozoic sedimentary rocks to the south. The sedimentary rocks are or have inclusions in , the limestone, shale, and sandstone. Some of these inclusions are gypsum- used by farmers as a fertilizer, and used in the building industry to make drywall; chert - used to make arrowheads; oil; natural gas; fossils; and salt.

The Shield is made up of metamorphic rocks, produced by extreme heat and pressure many miles below the surface, and igneous rocks, which were once molten magma(formed deep in the earth), or lava. The over 600 million year old Canadian Shield underlies most of the rocks in North America, and are found at the bottom of the Grand Canyon in Arizona.

The Paleozoic seas once covered all of the southern part of Ontario, lapping against the Shield in the north; the first being Cambrian - overlying the Pre-Cambrian (from which it was named) Shield.

The Cambrian was followed by the more recent **Ordovician, Silurian and Devonian**; the latter formed about 380 million years ago is fossilized limestone. All of these Paleozoic rocks are sloping down to the southwest from the exposed Shield. The oldest and thinnest are at the surface next to the Shield, and the thickest, from the youngest to the oldest are at the surface south of Sarnia.

Now visualize a period at the end of the Devonian 360 million years ago, in which no rock was deposited, until 1.8 million years ago, when glaciation began. In this 358 million years, the sedimentary rocks were exposed to constant erosion from the Shield to lake Huron. One result of this is the hard, very resistant to erosion, **Lockport dolostone** which overlies the easily eroded **Queenston shale**, resulting in the formation of the **Niagara Escarpment**, most dramatically seen in Niagara Falls. There is a much less dramatic escarpment running from Dunnville to west of Brantford and then north, of which the Hagersville quarries are a part. Many valuable deposits of **gypsum** were and still are mined north and east of this escarpment and along the Grand River, in the **Salina Formation**.
Oil was first found, several years before the find in Titusville, Pennsylvania, near Petrolia, and **natural gas** is in many places. **Salt** occurs near Windsor.
Limestone is made up of inorganic material, calcium carbonate and organic material which became fossils. Natural acid rain erodes limestone quickly, by geological standards, thus leaving the harder fossils exposed.
The **dolostone cap rock** at Niagara is also very resistant to erosion because, in addition to calcium carbonate, it contains magnesium.

Don't be afraid to "discover" geology or be a "rock hound". It's a lot of fun; it just requires a different mindset - time is backwards and a million years means little, except in glaciation. The field is limitless; I have been studying geology for 40 years, and haven't even scratched the surface.

GYPSUM, ANHYDRITE, AND CRYSTALS

by Ilse Kraemer

Although we have previously discussed some of the physical and chemical properties of gypsum and anhydrite, its crystal structure is one aspect we have not looked at. In order to understand the crystal structure, we need to define some terms or we will be intimidated by the language. Much of the information in this article was obtained from a book entitled *Minerals and How to Study Them*, by Edward Salisbury Dana, 1932. If you wish to have more information, you may consult with Ilse Kraemer. She has the book and is willing to explain or answer any questions.

Crystallography is the science of crystals including their physical , chemical and geometric structure.
A **crystal** is the solid form assumed by many minerals.
Crystal Systems: crystals are classified into crystal systems by fundamental patterns which are determined by the number of imaginary axes they have drawn from each face or edge through the centre of the crystal. Orthorhombic and Monoclinic crystals are two of the six crystal systems, and each has three axes.
An **axis** is one of the lines of reference meeting at the centre of a crystal, and determining to which system it belongs.
Orthorhombic: all angles are 90 degrees in all faces, like a cross.
Monoclinic: has two oblique (less than 90 degrees) axes, and a third axis perpendicular to both.
Pinacoid: resembling a cube.

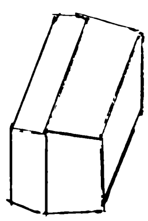
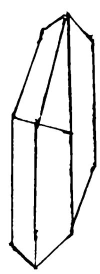


FIG. 1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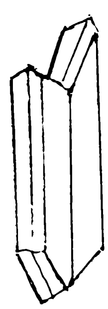
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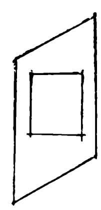


FIG. 4

Anhydrite ($CaSO_4$) receives its name because, although consisting of calcium sulphate, it does not, like gypsum, contain water. It is less common than gypsum and has little industrial value.
Habit: Anhydrite is orthorhombic, but crystals are rare, and it is usually in cleavable masses (the way it breaks off). It could also be massive, fibrous or granular.
Physical Properties: Anhydrite has distinct cleavage parallel to the three pinacoids. The fragments may appear cubic, but careful examination shows that the three cleavages are unlike as they must be since anhydrite is in the orthorhombic system. Colour is usually white or grey but may have a blue or red tinge.
Occurrence: Anhydrite is much less common than gypsum but occurs in the same manner and with the same mineral association, with bedded salt and limestone deposits.

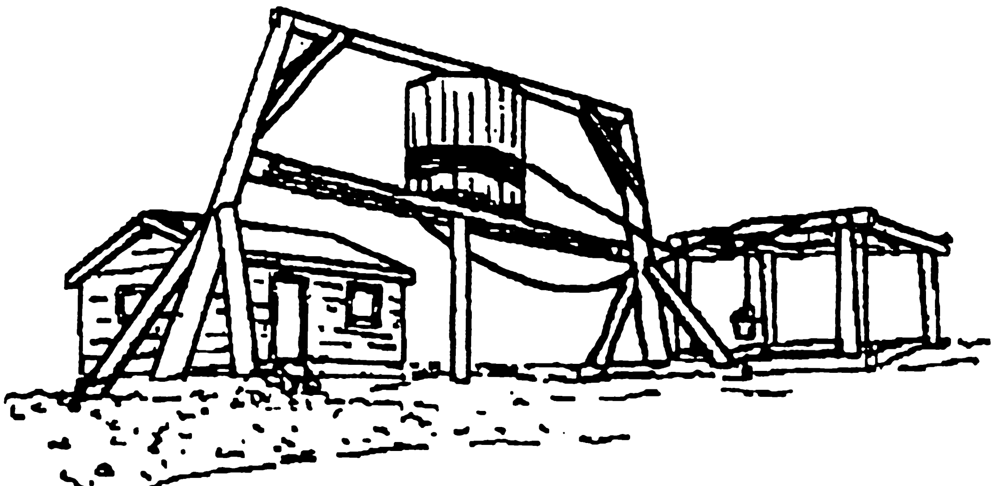
Gypsum ($CaSO_4.2H_2O$) is a very common mineral and of considerable commercial importance as plaster of Paris.
Habit: gypsum is monoclinic (having one oblique intersection of the crystallographic axes). Crystals often look like figures 1, 2 or 3. Twin crystals are common, especially the swallow-tail type (fig.3). It can also be found in cleavable and fine granular masses. A fibrous variety with a silky lustre is known as satin spar. The fine-grained massive variety is called alabaster, and is used for ornamental purposes.
Physical Properties: The crystals have a perfect cleavage (fig. 4) parallel to the side pinacoid (resembles a cube). Sometimes very large, thin and perfectly transparent plates may be obtained. These plates look a little like mica but are much softer and inelastic. This variety is called selenite. Gypsum has a hardness of 2 (very soft) and can be scratched with a fingernail.
Composition: Hydrous calcium sulphate. When held in a flame, it becomes opaque, white and exfoliated, fusing to a globe. Abundant water is given off in the closed tube.
Occurrence: Gypsum is mostly found as a sedimentary rock interstratified with limestone or shales and is usually underlying beds of rock salts. Such beds are resulting from the evaporation of salt water bringing about the crystallization and precipitation of gypsum and other dissolved salts. Many commercial deposits of gypsum are found in Canada and the U.S.A. One of the most unusual occurrences of gypsum is in New Mexico at the White Sands National Monument. The gypsum which has been deposited as the result of evaporation of water in a closed basin, has been blown into great dunes. For many miles, only the snow white dunes can be seen.

MINE SHAFTS AND HOISTING, by Old Grizzly (Mike O'Byrne)

One could argue that vertical shaft mining operations are the epitome of the mining industry. Complicated, expensive and dangerous deep mining operations developed in North America in a big way in the mid 1800's, particularly as a result of the opening up of the rich silver deposits on the Comstock lode, Virginia City, Nevada.

In 1860, Nevada had 37 mines with shafts at least 1,000 feet deep and five below 3,000 feet. Outside of the American west, no other mine shafts exceeded 1,000 feet.
When mineral deposits were shallow, a hand-powered windlass was often used to raise ore.

Frequently, a basket or pail would be affixed to the hoist rope for the hoisting of ore, materials and/or miners. Miners entered the workings via the basket or via vertical wood ladders affixed to the side of the shaft. In some cases, miners would be raised or lowered by sitting or standing in loops of rope woven into the hoisting rope. More progressive mines might employ a horse-powered whim to raise and lower items.



A WHIM

As shafts became deeper these hoisting arrangements became increasingly inefficient and dangerous. The windlass and whim were restricted in their capacity and speed by which materials could be hoisted or lowered. The use of vertical ladders was dangerous in that they were subject to damage from falling rock unless they were enclosed in a separate timbered manway. Ladders failed and a misstep resulted in the miner falling to his death. It is also a time-consuming and physically demanding chore ascending or descending several hundred feet via vertical ladders. This was more of the miner's problem than the owner's problem as travelling time to the working face was usually unpaid.

During the 1860's steam-powered hoisting engines were developed. Riding up and down a shaft certainly became faster but not necessarily safer. Frequently miners were raised or lowered on six to eight inch wide planks which were lashed to the hoisting rope. Miners stood on the planks and held onto the hoist rope for support. A typical example would see eight miners descending a 4.5 ft. by 3.5 ft. shaft standing on various crossheads. This practice was perilous: miners became dizzy, the crossheads bumped against the sides of the shaft causing the miners to lose their balance and fall. Buckets attached to the hoist rope may have been marginally safer but were easy to fall out of and buckets could also hit rock projections, causing them to tip, etc.
The cage was the next invention. Cages initially consisted of a wooden platform, without sides, attached to the end of the hoist rope. The cage was prevented from swinging from side to side by u-shaped metal flanges fitted on opposite sides of the platform. The flanges fitted around vertical timbers fastened to the sides of the shaft. These shaft timbers or guides were heavy square timbers 8" by 8"and larger running the whole depth of the shaft.

The introduction of the cage introduced a number of new hazardous variables. High-speed hoisting became a reality especially after the introduction of gear-driven hoisting engines. In 1875 the Consolidated Virginia Mine was hoisting at the speed of 2700 ft. per minute. Slow speeds were used when hoisting or lowering miners, but 1,000 ft. per minute was common. As mining depths increased, the sudden change in the atmosphere experienced by miners being hoisted frequently caused them to lose their balance, collapse and lose consciousness. This was a major problem in mines where the workings were hot and foul due to non-existent or inadequate ventilation. The gap between the sides of the cage and shaft timbering was less than 8 inches so it was easy to become snagged, or for tools or clothing to get caught in the timbers, usually resulting in the death of the victim.

The dangers of hoisting are compounded when it was necessary to use the cage to hoist cars full of rock, or to move items such as ore cars, lengths of rail track, ventilation pipe, etc. Hoisting signals, quality standards for hoist cables, and qualifications for hoist operators and cage tenders were non-existent. Safety devices for stopping the cage in the event that the cable parted, and the devices to prevent the cage from being run up into the shaft house sheavewheel were not necessarily foolproof.

As mining became more sophisticated, cages were equipped with sides and a roof. Shafts invited disasters, cables parted, material being moved in the shaft broke loose and fell. Mine locomotives used to move cars of ore sometimes fell down the shaft with devastating results. Depending upon a mines ventilation system, the shaft is frequently used as an airway and shaft fires have resulted in the loss of many miners' lives.

'Tis little wonder that as an occupational group they tended to live hard and play even harder.

MEMORIES OF GYPSUM, by Mary E. Martindale

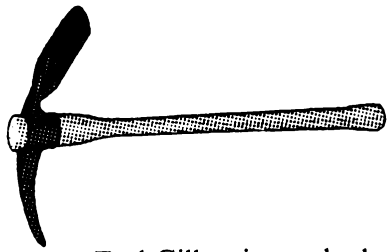
My Aunt Olive Martindale, my father's sister, who grew up at Plaster Hill Stock Farm, told me of the huge piles of gypsum in the barnyard. She received her education at Mt. Healy Public School, at Caledonia Model School, and Hamilton Normal School. She accepted a teaching position near Wardsville, Ontario, married there and lived many years of her life there. She always kept with her in her home a rock containing gypsum from the farm where she was born.

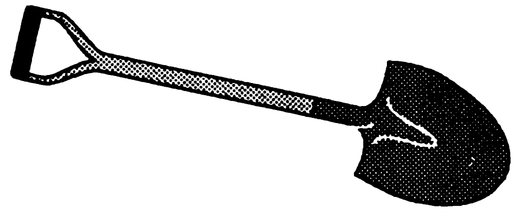
Uncle Ben Martindale was the youngest member of the family. He told me about following the drift back into the mine behind the house. He said it was spooky, but he continued on until he came out at a shaft back in the field.

Early on, the gypsum was brought out of the drift by means of pony carts, to be loaded on lighters, a sort of glorified raft, which took it to a gypsum crushing plant run by two Martindale brothers in York, or one owned by John Donaldson at Mt. Healy. I can remember large timbers imbedded in the river bank with huge staples in them at which the lighters could tie up.

As children, Herb and I were taken by our mother to visit out on the 4th line, Oneida. They put a board across the car on the Dinky Train and we rode back through the fields and bush. This was after the river traffic stopped.

The Dinky cars were noted for going off the track and all progress halted while things were righted, One night, when Bill Donaldson was watchman, the whistle blew and blew. All the neighbours were alerted. When someone went to investigate, Bill was asleep and a rain storm had shrunk the rope which had kept the whistle blowing. All was well!





Earl Gillespie worked at the Gypsum, Lime and Alabastine Co. in Caledonia. He showed slides and gave a talk at the York Grand River Historical Society. These are things I jotted down while he spoke:

Gypsum is a natural white or greyish rock found all over the world. Gypsum is used all around us and is used in our lives: casts, walls, chalk, lipstick, and fertilizer. It is $CaSO_4.2H_2O$ -- a good fire resistor. It was found in the pyramids of Egypt and also the Romans used it before Christ was born for fire protection.

In the Grand River Valley, there were 15 mines [at least]. Sometimes gypsum is mined in a quarry, but more often as at Caledonia, where the underground areas have big rooms and pillars eight feet high. There has been much improvement throughout the years. Buckets and donkeys were used to carry the gypsum in early years. The long ears of the donkey kept them from hitting their heads on the roof. Horses were used, too, but were trained for months before they were put to work.

Now at Caledonia, there is a modern control panel where they just push buttons to direct machines to break up the rock. A diesel electric tram takes it to a large scoop and then into a crusher. It goes up an incline into the plant where they calcine (cook) it. The water comes out and it is known as plaster of Paris. Three types of calcined gypsum are used locally. Keene's cement is heated to be red hot and then it is ground up. Plaster of Paris is put through rollers and makes drywall or it is made into plaster of Paris.

There are many beneficial uses of gypsum. It is the best and cheapest fertilizer for peanuts and mushrooms. Lythmore was noted for its white gypsum, which is the purest form, and can be used for chalk, clarifying water for fish, medicines, beer, wine, lipstick, canned vegetables, and mixed into cattle feed. Also gypsum was used as a filler in linoleum, paint and tires, and toothpaste. Telescopes were floated on gypsum when they were grinding the lenses. There was a bug finish with gypsum in it to kill bugs.

Gypsum blocks used to be made for building, 2" x 30" and 2" or 4" solid. They were freeze-dried in a cold climate. They were fireproof and sturdy, but have disappeared from the market.

Gypsum was used for walls and ceilings and acoustical purposes. Elevator shafts and air ducts were made out of gypsum because of their fireproof qualities. In the EatonCentre in Toronto, there are 3 miles of fireproof gypsum ducts. There were several widths of wallboard which would withstand high fire exposure, and were used in ships to give fire protection.

I wish I had been more speedy and more attentive to this excellent lecture.

This newsletter is edited by Jean Farquharson. We are not responsible for errors. We are looking for more information about the mining industry in Southern Ontario. Submissions are welcome. Please send **correspondence** to Jean Farquharson, R.R.3, Paris ON N3L 3E3. Phone 519/442-2156. Fax 519/442-2373. For **membership inquiries**, contact Ilse Kraemer, 23 KingsHill Lane, Brantford ON N3T 6A3. Phone 519-756-6634.