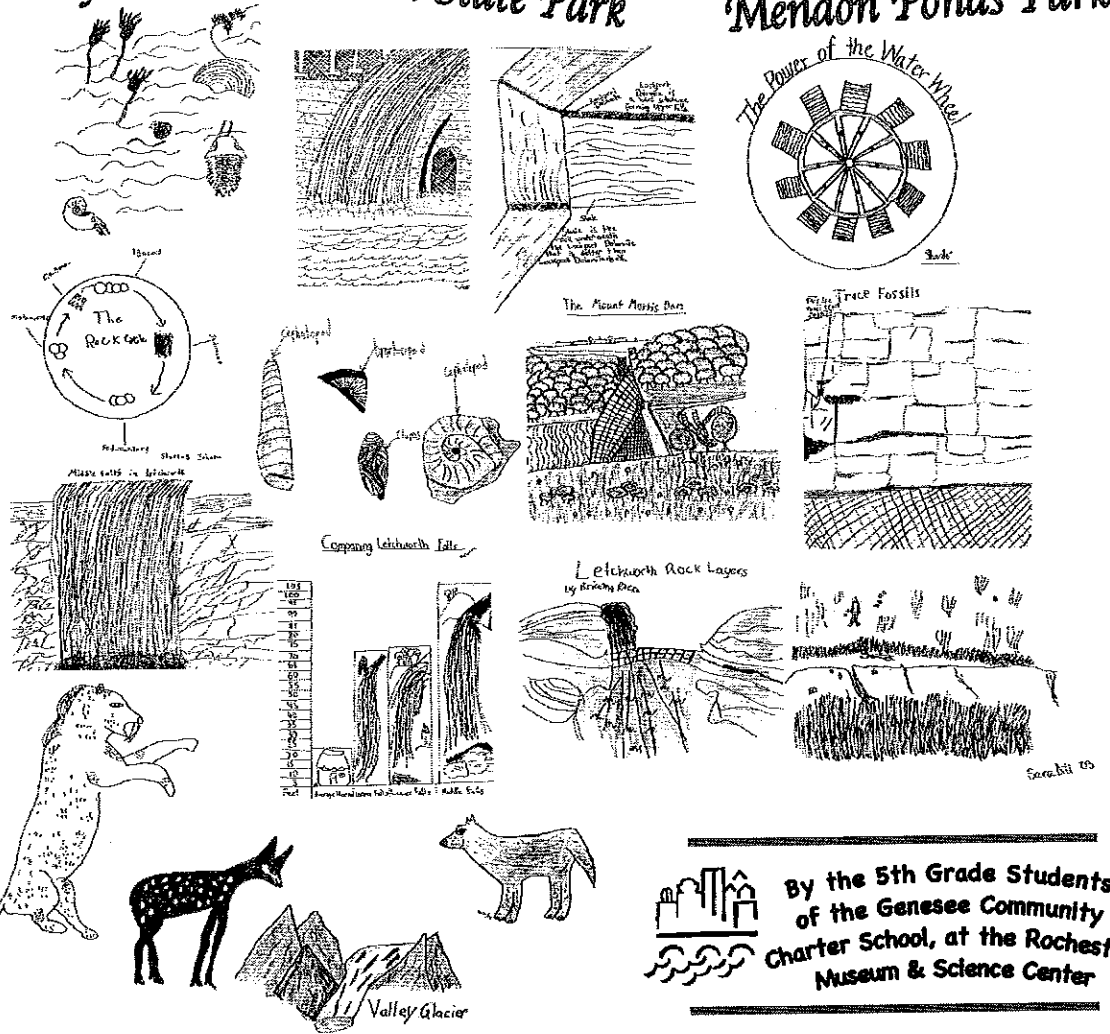


Rock-On "Rock"chester

The Field Guide

to Local Geologic Destinations

High Falls Lower Falls The Rochester Museum & Science Center
 Retsof, NY Letchworth State Park Mendon Ponds Park



By the 5th Grade Students
 of the Genesee Community
 Charter School, at the Rochester
 Museum & Science Center

Rock-On "Rock"chester

The Field Guide
To Local Geologic Destinations



By the Fifth Graders of the
Genesee Community Charter School at
The Rochester Museum & Science Center
Co-edited by students, teachers, and parents

Dedication

Done, we are done!
With what you may ask?
With our field guide book oh, it was such fun!
We've written, we've typed,
We could barely sleep at night!
We've sketched and painted,
I swear we almost fainted!
But who may I ask helped us along the way?
Who? Who? Who? Who?
We dedicate this book and thank you
For all of your help,
We give this book to you!

For our friends and family, Dr. Rory Cottrell, Mr. Gill Petri, and last but not least Dr. George McIntosh and of course Rochester's residents.

"There is strength in great numbers"

Poem by Sydney

Thank You To:

Our Teachers

- | | |
|-------------------|----------------|
| -Mrs. Aspenleiter | -Mrs. Henry |
| -Miss Looby | -Mrs. Milke |
| -Mr. Michailidis | -Mrs. O'Malley |
| -Mrs. Nesselbush | -Mrs. Valle |
| -Mrs. Overacker | -Dr. Wing |

Guest Speakers / Experts

- Dr. Rory Cottrell
- Dr. George McIntosh
- Mr. Gill Petri

Parents & Friends

- | | |
|--------------------|------------------|
| -Marcy Berger | -Dean Rutland |
| -Larry Denk | -Karen Schneider |
| -Marty Larch | -Tom Slothower |
| -Mary Lavin | -Teresa Snell |
| -Patrick Michelson | -Ray Teng |
| -Kit & Dave Miller | -Mary Terziani |
| -Jesus Rivera | -Heidi Zinkand |

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By Wesley



By Anija



Expedition Explanation

By Sara' and Nahoma

We are the 5th graders at the Genesee Community Charter School. Our school is an Expeditionary Learning Outward Bound School, located in Rochester, NY. We have grades kindergarten- 5th grade. The first year we had kindergarten- 3rd grade. This is our third year open, and next year we will add a 6th grade. If you would like to learn more check out our website at www.gccschool.org

Our curriculum is divided into six historical time periods. We study three periods each year. It takes two years to cover all six parts of the curriculum ("Pre-History" through "Today and Tomorrow"). We study each time period for three months; we call these studies "expeditions."

An expedition is a journey through time. It is when our school journeys out and discovers the great unknown. We gain information with our guiding questions. A guiding question is a question that helps us get information to start off on an expedition. The teachers choose 2-4 guiding questions to help us learn about the topic of our expedition. With our guiding questions we learn from our research, guest speakers, and field studies. We collect information and make a final product (usually a service to the community). This is a time of learning and a lot of hard work. Our guiding questions for this expedition were:

- What gave Rochester its geologic features?
- How has the Earth changed over time?
- How does life respond to geologic change?

The answers to these questions are throughout the field guide.

We go on field studies at our school. They are called field studies, not field trips, because we go somewhere to learn about what we are studying in an expedition. For example: We went on a trip to Lower Falls to help us learn more about rock layers and the different types of sedimentary rocks. On a field study we take notes, sketch, and record information. The locations in our field guide are the field studies we took.

A Design Principle is a guideline that helps us form the culture of our school. They help us act the way we should. There are ten Design Principles:

- The Primacy of Self-Discovery
- The Having of Wonderful Ideas
- The Responsibility for Learning
- Empathy and Caring

-Success and Failure
-Diversity and Inclusion
-Solitude and Reflection

-Collaboration and Competition
-The Natural World
-Service and Compassion

The Primacy of Self-Discovery- Using the Primacy of Self-Discovery, we discover what is inside ourselves and what we can do. We discover our talents, our craftsmanship, and our imagination.

The Having of Wonderful Ideas- We have our own wonderful and unique ideas, with sketches, paintings, models, and everything we do.

The Responsibility for Learning- We have to be responsible for our own learning. It is our choice if we learn. We have to work hard and ignore distractions to get a final product done on time.

Empathy and Caring- We care for everyone and meet his or her needs. We help one another to finish on time and get up if they fall. Different classes work together to learn.

Success and Failure- Success is sweet but failure is good food. This means success is good for you so you don't give up; but failure is good so you can learn from your mistakes.

Collaboration and Competition- Work together and compete with yourself to see the values in yourself, the values of friendship, trust and group work. We are crew, not passengers. This means everyone needs to work together to keep the boat afloat. If one person does not help something will go wrong and the boat will sink.

Diversity and Inclusion- We include everyone and take everyone as an equal. We take many ideas and put them together to come up with something really great. One person cannot do as much, or come up with as good an idea, as a group can.

The Natural World- We respect the world and keep it whole. We do not pull grass or flowers and restrain ourselves from swinging on trees. We also help the earth by helping plants to grow and stay alive.

Solitude and Reflection- We take time to be with ourselves. We reflect after field studies and exhibition night. We reflect on what we did and how we could do better. We also reflect on what we learned.

Service and Compassion- Our final product is often a service to the community. We help the community by making a source to learn from and to be entertained by.

Geologic Time

By: Olivia.

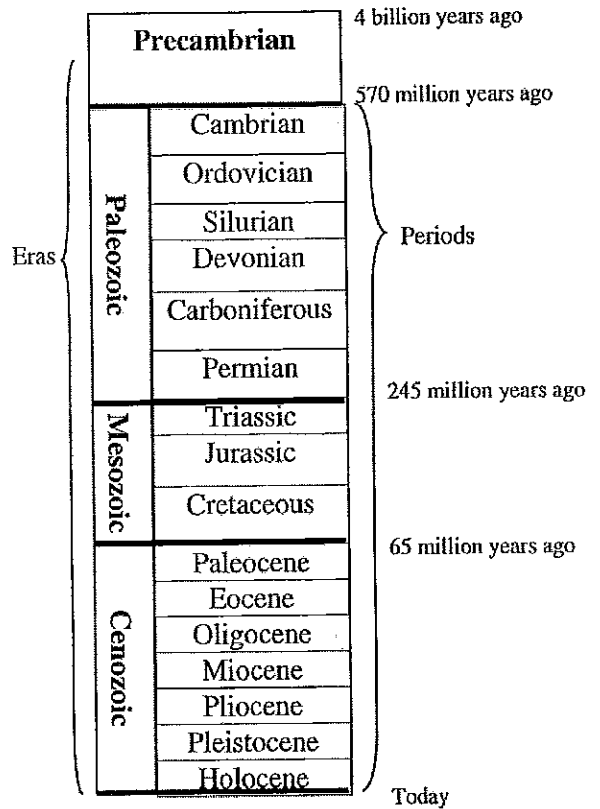
A geologic timeline is our way of keeping track of the Earth's ancient history before people existed. The four eras of the geologic timeline are the **Cenozoic Era** (recent life), the **Mesozoic Era** (middle life), the **Paleozoic Era** (ancient life), and the **Precambrian Era** (very ancient life). It is very tough to imagine millions of years ago because we weren't there to see any of it.

The animals that formed fossils at Retsof, NY were alive during the Silurian and Devonian Periods (about 300 to 400 million years ago).

The rock layers you see in Letchworth State Park were all deposited in shallow oceans that advanced and retreated several times during this time period.

The glacier that helped shape what is called Mendon Ponds Park was here during the last ice age (about 12,000 years ago).

Geologic Timeline



Layers of the Earth

By Dan

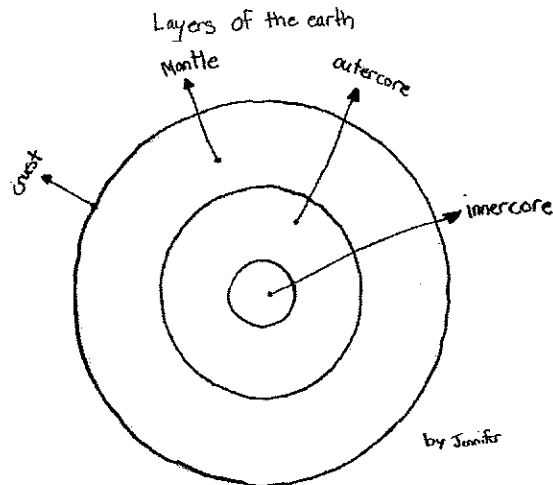
The Earth has four layers, and the first layer is the **crust**. The crust is the layer that we inhabit or live on. It is the thinnest layer, only 4.8 kilometers thick under ocean level. It can get as thick as 100 kilometers under some mountain ranges. The crust is mostly made up of cooled **magma**. The crust is brittle and breaks easily under great pressure.

The second layer is the **mantle**. The mantle is made up of semi-solid rock. The mantle is quite a bit hotter than the crust. The pressure is more intense than the crust because the deeper you go, the stronger the pressure. The mantle is the thickest layer, being 2,800 kilometers thick.

The third layer inside the earth is called the **outer core**. The outer core is almost entirely made up of liquid nickel and iron. The spinning of the Earth makes the liquid outer core spin, creating the earth's magnetic field. The outer core is about 2,080 kilometers thick.

Finally, the last layer is the **inner core**. The inner core is the hottest and the densest layer. The inner core is almost twice as dense as the mantle. Unlike the outer core, the inner core is made up of solid metal.

The four layers of the Earth are the crust, mantle, outer core, and inner core. We live on the crust. Someday, we may inhabit the other layers if we can find a way to overcome the heat and pressure.



Tectonic Plates

By Molly

There are about eleven tectonic plates covering the Earth. They make up our Earth's crust. These plates float on top of the Earth's mantle. There are two different kinds of plates. Oceanic plates are under the ocean. The plates above the water are called continental plates.

The plates can do amazing things. Sometimes when oceanic plates move, they shake and make an earthquake under the ocean. This causes a tsunami (soo-NAH-mee), or a giant wave. A tsunami can reach 100 feet high.

Two continental plates can press together, and the pressure is so great, it folds and crumbles the rock and forms mountains.

These plates have shifted around the planet since the Earth's beginning. They were all part of one big continent called Pangea (pan-GEE-uh), which was about 250 million years ago. They split apart to form two continents called Laurasia and Gondwanaland. Since then the plates have slowly drifted apart to form our earth as we know it today.

Because of these plates Rochester wasn't always where it is today. A long time ago Rochester was a tropical sea. This was around the time of the Silurian and Devonian periods. This was when most of the sedimentary rocks in Rochester were made. Over time, these rock layers have been exposed, showing the earth's amazing history!

Earth's Tectonic Plates



By Molly

A Walk Through Lower Falls

By Nicoya

Lower Falls is located in Rochester, New York. The Seth Green Trail leads to the falls. They are located on the Genesee River.

Two of the main types of rock that exist at Lower Falls are **sandstone** and **shale**. Sandstone and shale are types of **sedimentary** rock. The Kodak Sandstone is the reason why we have the waterfall at Lower Falls. As the water hits the rock the Kodak Sandstone didn't erode away as the shale and the other rocks in the riverbed did.

Fossils are in the sedimentary rock. **Trace Fossils** are imprints of an animal's path. Traveling down the Seth Green trail visitors will see fascinating rocks. Have a nice day at Lower Falls!



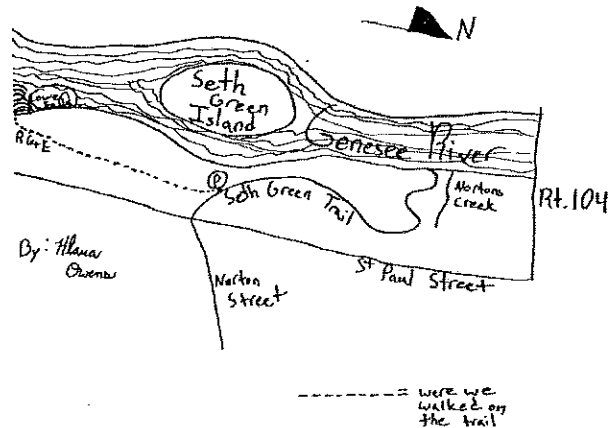
Seth Green Trail

By: Klara

The Seth Green Trail is the trail leading to Lower Falls. Along the trail there are a lot of different types of sedimentary rocks. You can see many different examples as you walk down this trail leading to the falls.

The trail was named after a man named Seth Green. He spent a lot of his time down at the Genesee River trapping, fishing, and hunting. He observed the habits of fish, and he ran a successful fish and chowder business. After that he started the Caledonia Fish Hatchery. Seth Green received a huge amount of fame from being a fish grower and a conservationist. A conservationist is a person who is in favor of saving the environment. Today the salmon stocked in the Genesee River comes from the Caledonia Fish Hatchery.

Seth Green is a fitting name for the trail because he spent a lot of his time at the river. Now every time someone walks on the trail he will be remembered.



Directions to Lower Falls

By: Tim

There is a traffic light at the intersection of St. Paul Street and Seth Green Drive. This is about one mile south of Rt. 104. As you travel south on St. Paul Street turn right onto Seth Green Drive. You can park immediately on the left. Go through the fence and follow the road down to the power plant and Lower Falls.

Rockin' Rock Layers at Lower Falls

By: Phoebe

As you step out of your car and walk down the Seth Green Trail you will notice several unique rock layers. The most noticeable rocks are the Queenston Shale, Grimsby Sandstone, Kodak Sandstone, Maplewood Shale, and Reynales Limestone. These rocks are all distinctively different in their own special way.

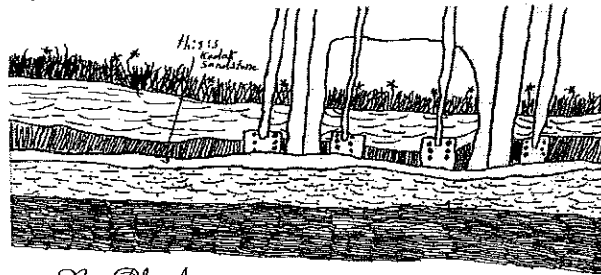
The Queenston Shale is the bottom layer. The bottom layer is the oldest layer, therefore the Queenston Shale is the oldest of the many layers of rock visible at Lower Falls. Queenston Shale is a red - brown color. If you have a chance to feel it, it will feel very fine grained (many small grains of mud and clay). This layer was formed during the upper Ordovician time period. You can find mudstone, limestone, sandstone, and siltstone in the Queenston Shale group.

The Grimsby Sandstone is the next oldest layer of rock at Lower Falls. The Grimsby Sandstone is a red-brown color. The texture is fine grained. This Grimsby Sandstone was deposited in the lower Silurian time period. The Grimsby Sandstone is a lot like the Queenston Shale in color.

The Kodak Sandstone is the most important layer at Lower Falls. This is because Kodak Sandstone holds up the falls. The sandstone is a light to regular gray to green. Years ago people used to call Kodak Sandstone, Thorold Sandstone. They actually built the bridge on this layer because it's so hard.

The Maplewood Shale is the second youngest rock layer at Lower Falls. The Maplewood Shale layer is light green-gray color. This layer was formed during the lower Silurian period.

Reynales Limestone is the youngest rock layer at Lower Falls. Even though this is the youngest rock layer it was formed about 400 million years ago! Reynales Limestone is a light to medium gray color. The texture is fine grained just like many of the other layers. A cool thing about the Reynales limestone is that you can find fossils in it. I hope you enjoy your hike at Lower Falls!!



By Phoebe

What Are Trace Fossils?

By Timothy

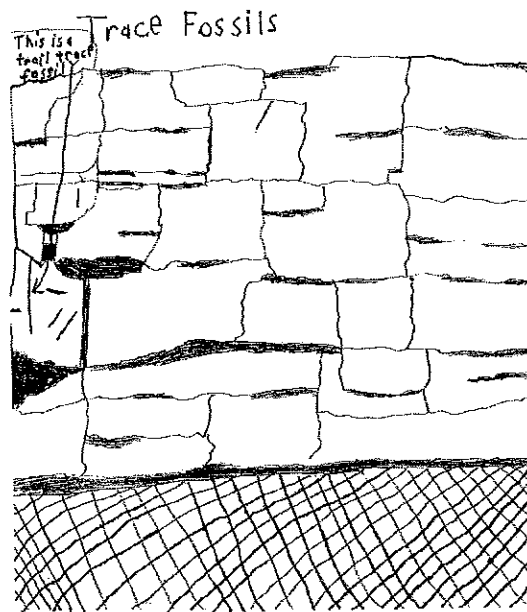
There are two main types of fossils, **body fossils** and **trace fossils**. Body fossils are the bones of animals that have been fossilized. Trace fossils are the imprints of animals. Trace fossils can be footprints, trails, or burrows.

Burrow trace fossils represent the activity of an animal that has burrowed into the sedimentary bedding after it has been there for a long time. In some areas the burrowed hole can be so big that it changes the sedimentary layer in the ground. When an animal burrows into the ground and mixes up the entire sedimentary layer, it is called **bioturbation**.

Trace fossils can be found at the bottom of the Seth Green Trail at Lower Falls. Two animals that were commonly known for making trace fossils were called *Styolistes* and *Daedalus*. They were types of worms.

Trace fossils can also be found on your sidewalk. When somebody steps in wet cement they leave a footprint. Later the next day it will dry. It is the same for an animal. An animal will make thousands of trace fossils but only one body fossil in its entire life.

The study of trace fossils is called **ichnology**.



By Timothy

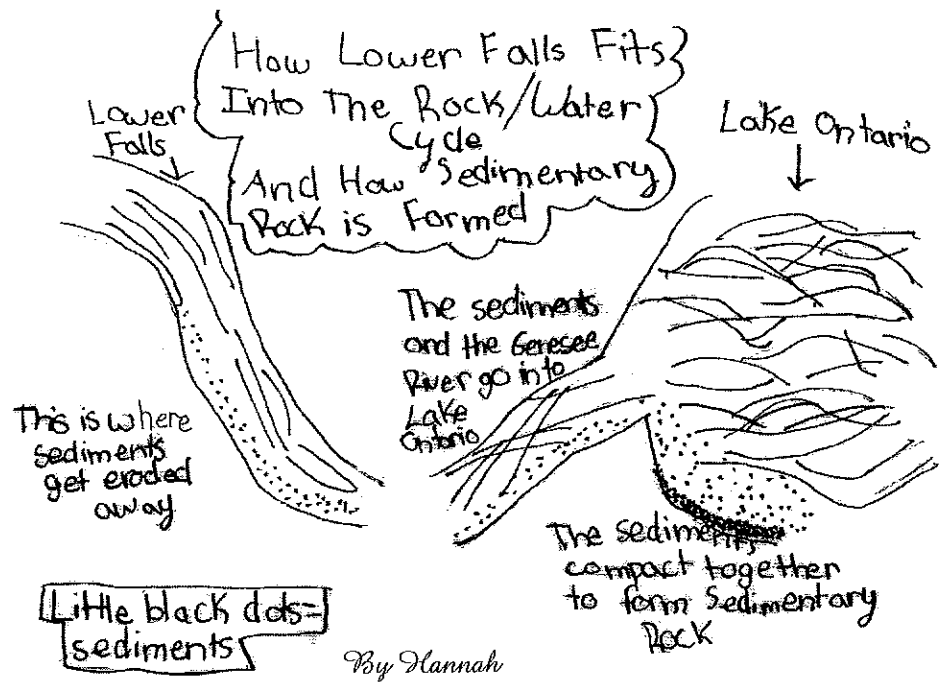
The Fantastic Fabulous Formation of Sedimentary Rock

By: Hannah

Did you ever wonder how sedimentary rocks are formed? If you don't know, this article will give you a lot of new and interesting information. First, you need to know where **sediments** come from. When water or wind makes contact with a rock, it **erodes** sediments from the rock. Eventually, the sediments make their way to a stream, river, lake, or ocean. The sediments can't settle in a stream or river because the water is running too fast. The river or stream would eventually make its way to a lake or ocean. The current in a lake or ocean would be slower and not as rough so the sediments could settle down at the bottom. The floor of their landing place could be made of mud, sand, rocks or fossils.

Over thousands of years sediments build up, and all the pressure compacts the sediments together to form sedimentary rock. Different types of sediments build up to form different types of sedimentary rock. The diagram below shows the types of sedimentary rocks that are found at Lower Falls and what makes up these rocks.

Types of Sedimentary Rock	Made of
Kodak Sandstone	sand
Maple Wood Shale	mud and clay
Reynales Limestone	shells and fossils
Queenston Shale	mud and clay
Grimsby Sandstone	sand



The Marveling Migration at Lower Falls

By: Hannah

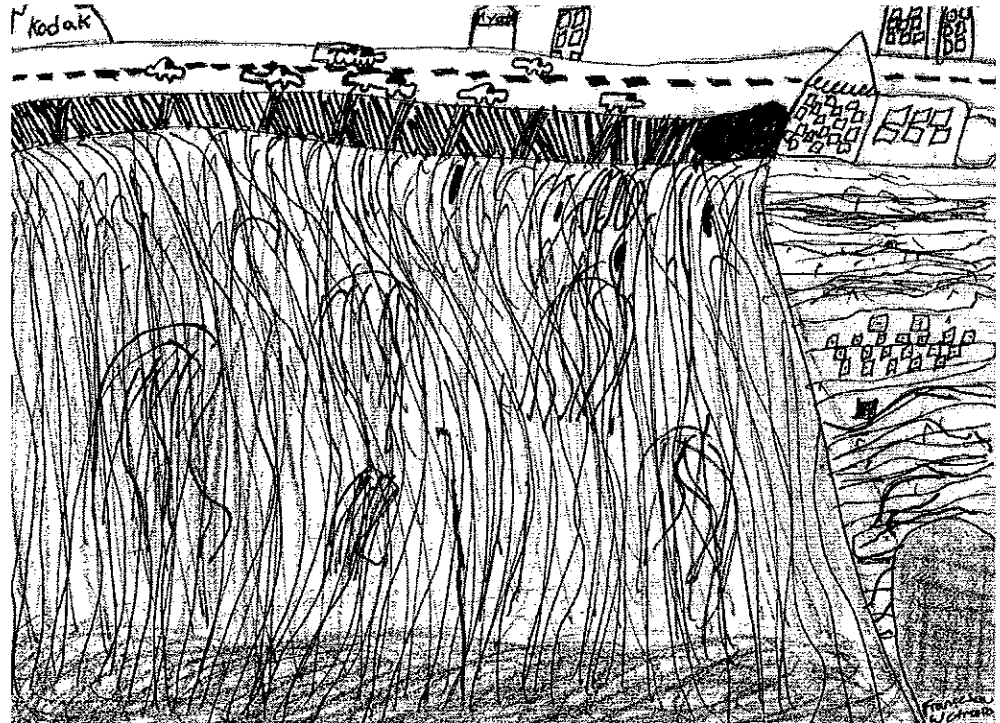
Did you know that the location of Rochester's Lower Falls is migrating? To understand how it migrates, you first have to know how Lower Falls has formed. At Lower Falls, the layers of rock are slanted a bit (they are not parallel to the ground). When water flows over the Kodak Sandstone, it hits the shale below. The water erodes the shale more quickly than the Kodak Sandstone and that is how the Lower Falls was formed. Kodak Sandstone still erodes, but more slowly than the shale. When the Kodak Sandstone erodes away, the location of the waterfall migrates upstream. Most people think waterfalls can't move, but High Falls used to be where Lower Falls is today!

Welcome to High Falls

By Francesca

High Falls is a waterfall located in Monroe County (Rochester, NY), on the Genesee River. This is a 96-foot high waterfall. The settlers came and built the mill and created Rochester's power plant. The falls and the mill worked together to create power in Rochester.

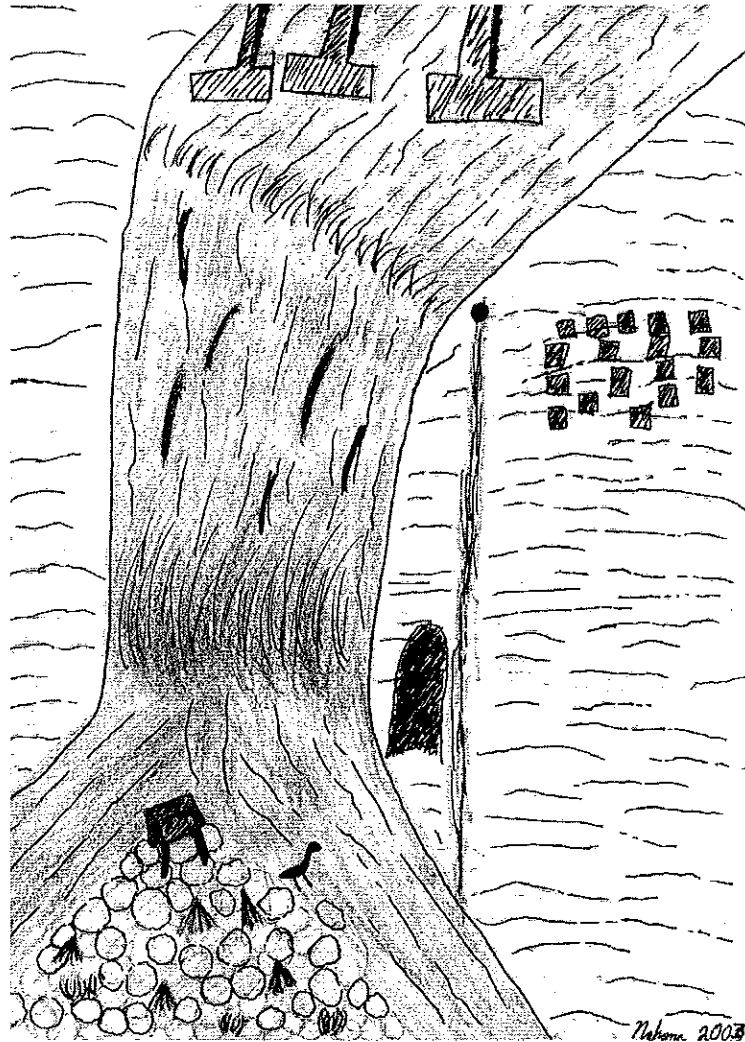
Lockport Dolomite (a sedimentary rock) is the rock that makes Upper Falls occur where it is today. Rochester Shale is the rock you will find underneath the Lockport Dolomite. There are many other rock layers under the Rochester Shale but you can't see them because they are underground. The rocks found at High Falls are all sedimentary rocks (they are formed from sediments). That is how High Falls fits into the rock cycle.



How to Get to High Falls

By Francesca

From East Avenue turn left on Main Street and turn right on State Street. Go through 2 stoplights then turn right on Commercial Street. Turn left on Brown's Race and find a parking spot. The High Falls Museum is next to the bridge overlooking the falls. Enjoy your visit.

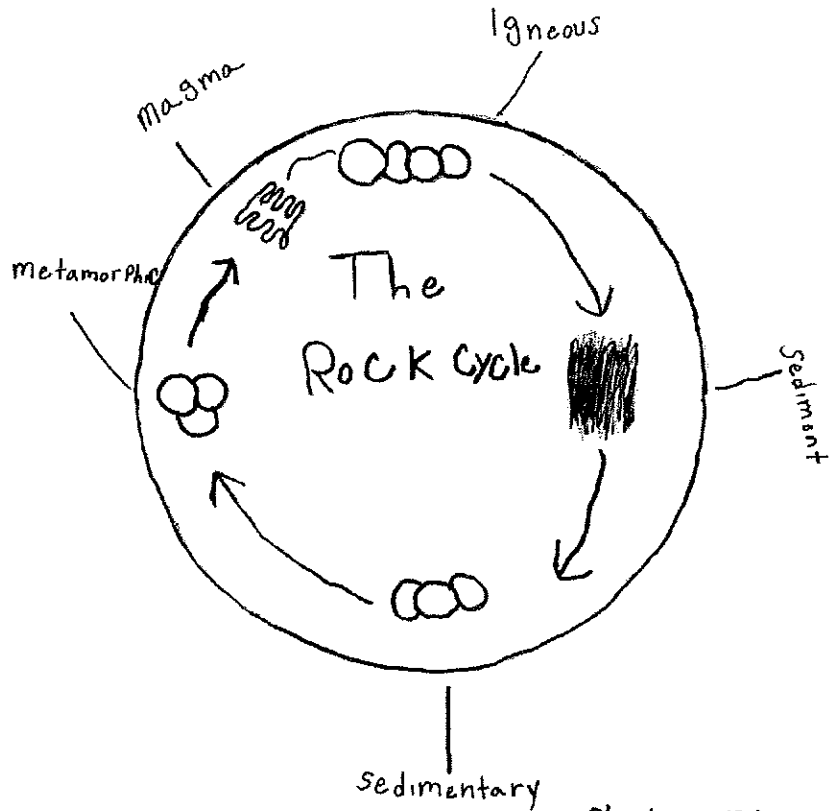


The Rock Cycle

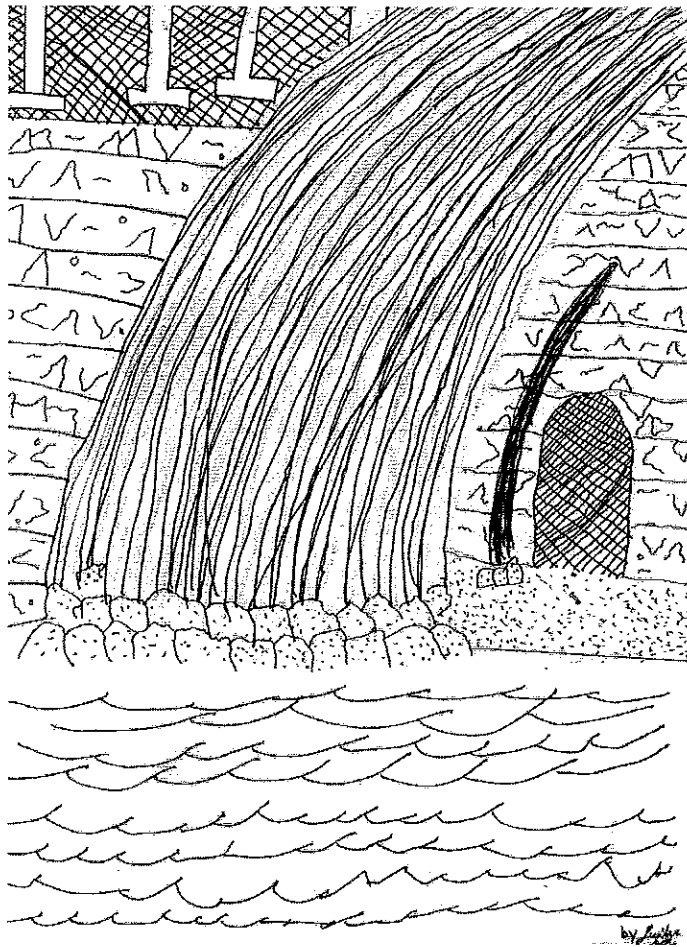
By Sterling

There are three main rocks in the rock cycle. They are **igneous**, **sedimentary**, and **metamorphic**. Shifting tectonic plates pull igneous, sedimentary, and metamorphic rocks into the mantle where the rock melts and becomes magma. Eventually, some of the magma spills on land and cools to form igneous rock- this is a volcano.

The rock cycle can start with igneous rock, and change it to sedimentary and metamorphic rock. To have metamorphic rock you need heat and pressure. To have sedimentary rock you need erosion and build up of sediment. If you ever go to High Falls and watch the waterfall it's like your watching the rock cycle. Little pieces of sediments are traveling downstream, and will settle and form layers in Lake Ontario.



Sterling Johnson



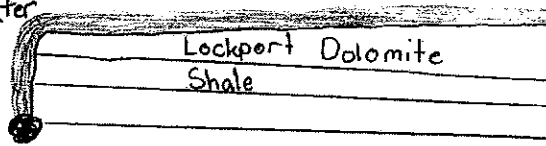
Migration of High Falls

By Jennifer

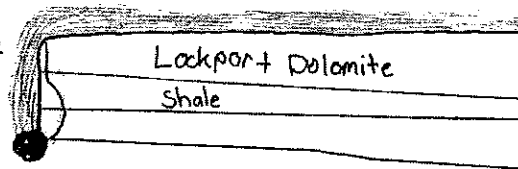
There are many waterfalls in the world. One of the waterfalls is called Upper Falls, or High Falls, in Rochester, New York. High Falls used to be where Lower Falls is today but it migrated back (it moved upstream). Migration is an interesting process. As the waterfall flow moves down, the water erodes away the rock.

The rocks at High Falls are called Rochester Shale and Lockport Dolomite. The Rochester Shale is much softer than the dolomite and is found under the Lockport Dolomite layer. As the waterfall erodes the rock it will erode the shale faster than the dolomite. The falls will keep moving up stream as it erodes the dolomite.

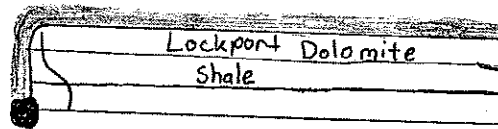
This is where the water fall is first.



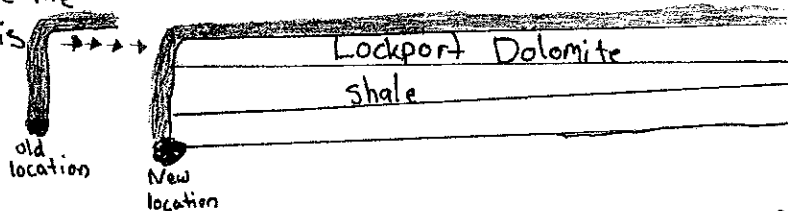
The water flow moves down and erodes away the rocks (shale and Lockport Dolomite).



The shale is much softer than the Dolomite so the shale will get eroded faster and the Dolomite will get eroded slower.



Where the fall is now.



by Jennifer

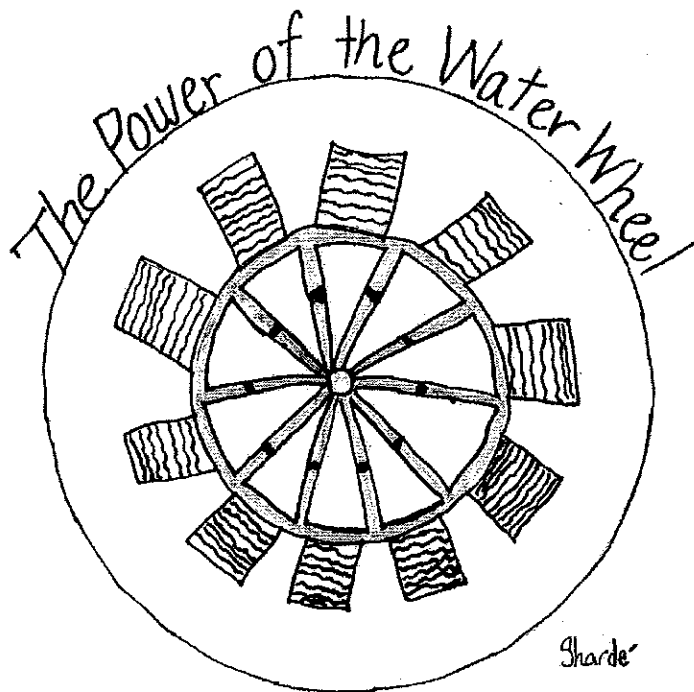
The Power of the Water Wheel

By: Sharde'

Over ten thousand years ago a glacier caused the Genesee River and High Falls to be here. In the 1800's, Rochester became the Flour City of the world. The water wheel on the Genesee River supplied power to the local mills. The High Falls area became Rochester's earliest industrial area during the "flour city" era. Rochester would not be a large city if it were not for the Genesee River, the water wheel, and the flourmills. The area around the water wheel is a National Historic District.

The water wheel used the force of the Genesee River for power. The buckets on the water wheel were filled with a total of 400 pounds of water from the river. The Genesee River kept the water wheel going round and round creating power.

The water wheel is a landmark at High Falls but is not used for power today. This was the service of the water wheel for the city.

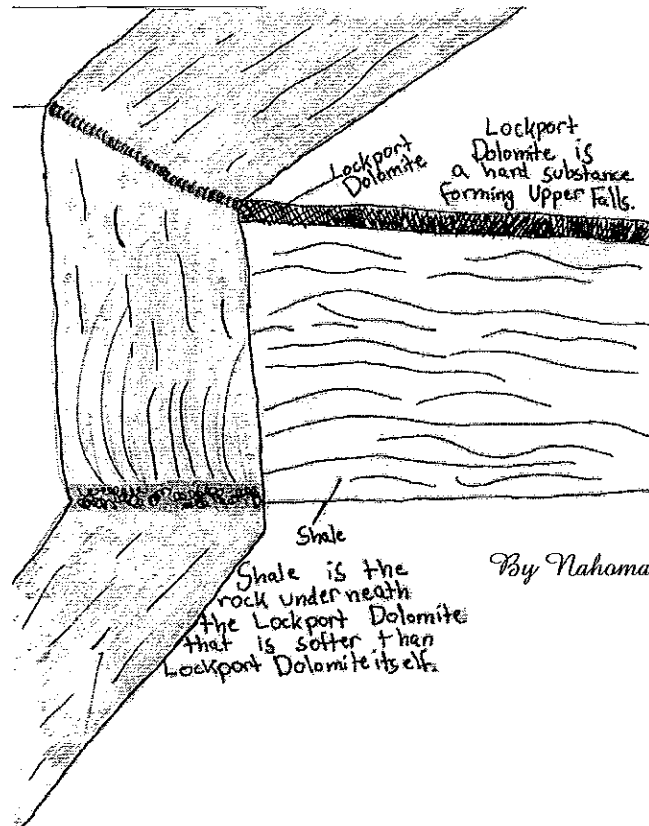


The Rock Layers at High Falls

By Francesca

At High Falls the two main rock layers that you can see are Lockport Dolomite and Rochester Shale. There are many other rock layers underneath the Rochester Shale, but you can't see them because they are underground. All of the rocks at High Falls are sedimentary rocks. Over hundreds of years sediments settled to the bottom of a lake or ocean and formed layers. Sedimentary rocks are formed by lots and lots of tiny sediments building up and being pressed together tightly.

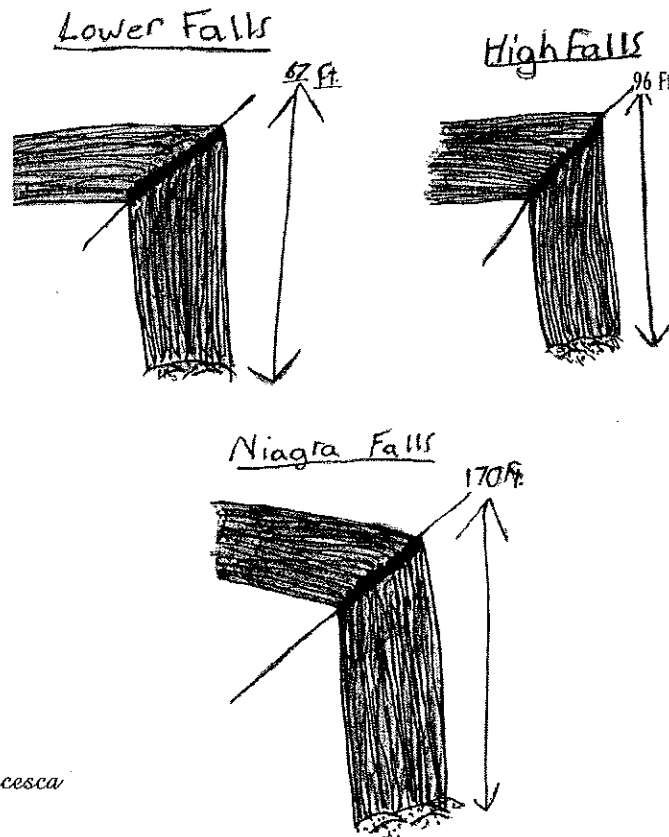
The Genesee River carved or eroded away the rock and sediments forming a gorge. When this happened, the rock layers that are usually hidden underground became visible. These sedimentary rocks are about 350 million years old. This is the only reason why we can see those beautiful rock layers at High Falls today.



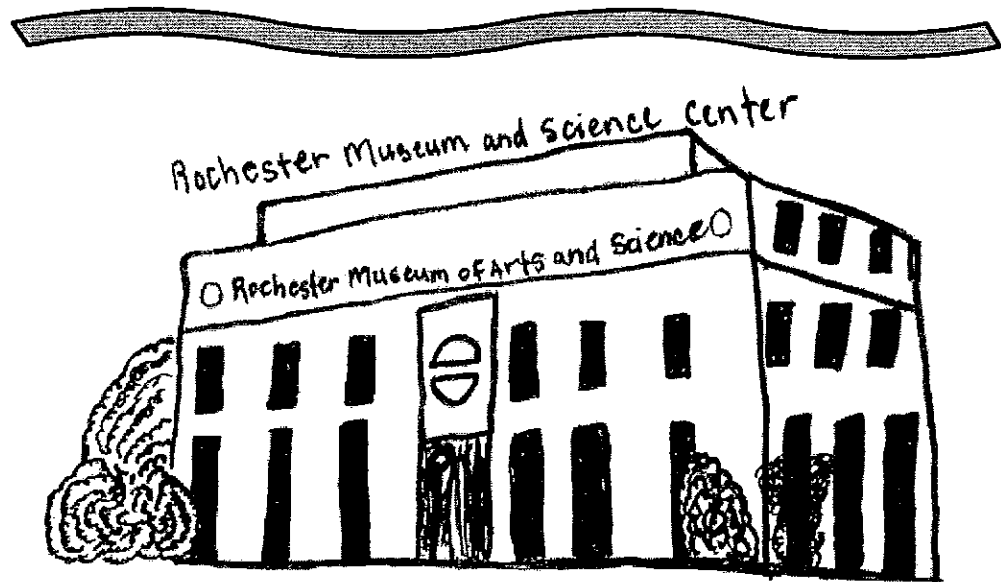
Did You Know?

By Nahoma

- Lockport Dolomite is a **magnesium**-rich sedimentary rock!
- Lockport Dolomite can also be called Lockport Dolostone!
- Lockport Dolomite resembles limestone!
- Lockport Dolomite is the rock that formed Niagara Falls!
- The Lockport Dolomite layer formed 420 million years ago!
- Rocks can change from heat and pressure!
- Niagara Falls is 170 feet! Think about the difference between Niagara Falls and High Falls.
- Nine of Rochester's 24 mills were located in Brown's Race!



By Francesca



Olivia

Introduction to the Rochester Museum and Science Center

By: Sterling

The RMSC stands for The Rochester Museum & Science Center. Visitors of the RMSC can learn about **mastodons**, marine life, and the archaeology exhibits of Western New York's geologic history.

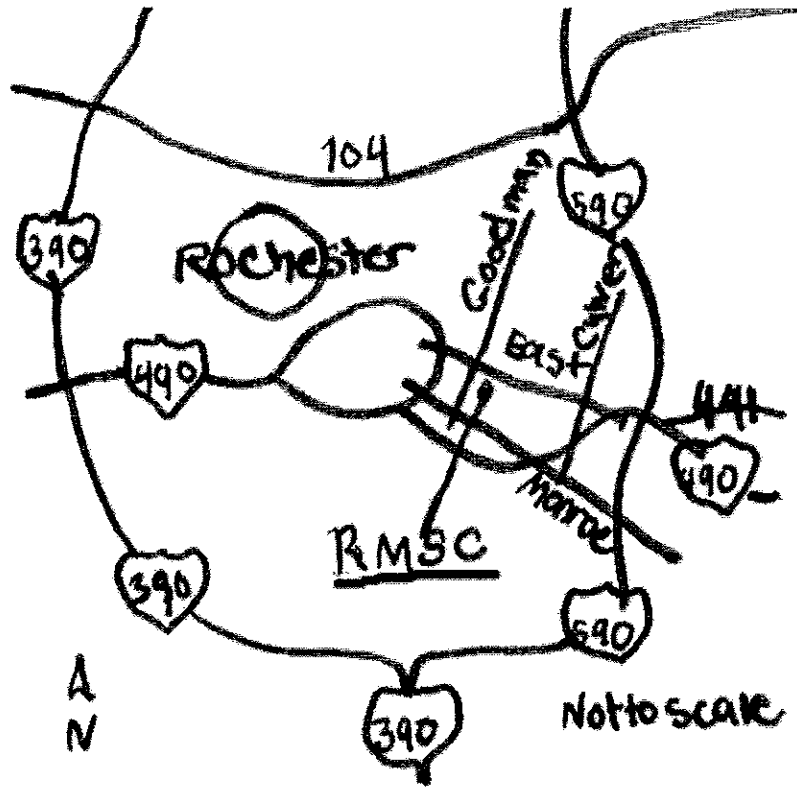
If you go to the RMSC you can learn about **prehistory**, **geology**, and kids can explore the Adventure Zone and the current exhibits of the Explorazone. The Farview mastodon exhibit shows a model of what this huge prehistoric creature looked like when it was alive. There are actual bones of the mastodon found in New York State. The marine life exhibit can help you learn about prehistoric and marine life. The archaeologist tools and mastodon exhibit will help teach about using fossils to reconstruct the mastodon.

The RMSC hours are Monday-Saturday: 9:00am-5:00pm and Sunday 12:00noon-5:00pm. The gift shop at the RMSC is open Monday-

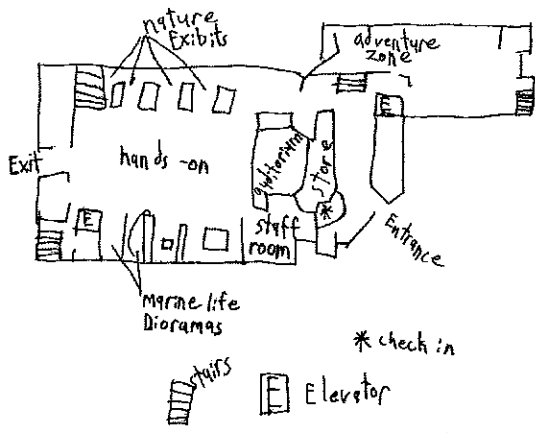
Saturday 9:00 AM - 5:00 PM and Sunday 12:00 PM - 5:00 PM. They have really neat products that you can buy, like crack-open geodes, telescopes, or astronaut ice cream.

They also have a library located on the second floor and is open 9:30am-12noon and 1:00-4:30pm Tuesday through Friday. You can have birthday parties at the RMSC too! Enjoy your visit!

Located at: 657 East Avenue
Rochester, NY 14607
(585) 271-4320



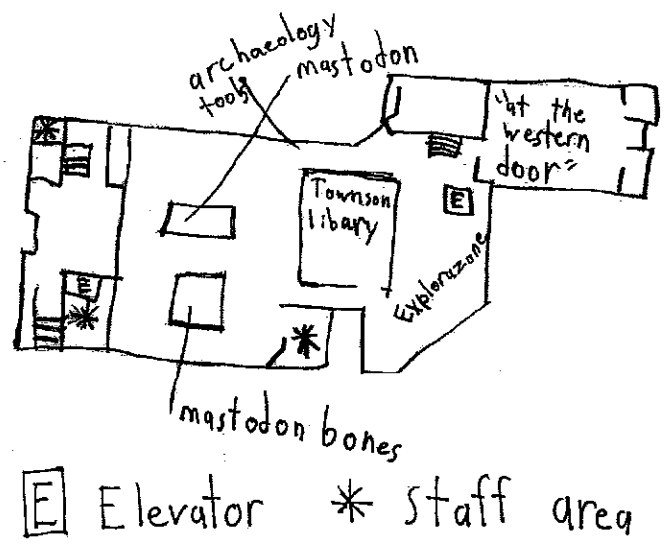
By Olivia



1st floor of the
RMSC

By Zachary

2nd floor of the RMSC



E Elevator * staff area

Paleozoic Marine Life Dioramas

By Zach and Sage

425 million years ago

Imagine this, a long time ago Rochester was a tropical marine environment. During the middle Silurian period, Rochester was completely covered with warm seawater. The climate back then was somewhat like the environment in the Bahamas today. The Rochester Museum and Science Center has a diorama of fossils and what the creatures would look like from this time period. These fossils include brachiopods, trilobites, a cystoid, a crinoid, a cephalopod, and a bryzoan. The fossils were found in Rochester Shale and Irondequoit Limestone.



412 million years ago

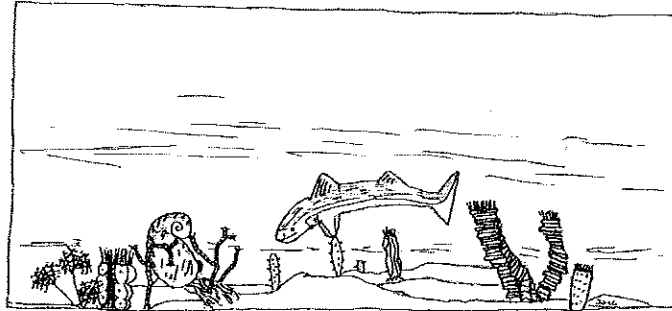
At the end of the Silurian period the environment had changed, the water was shallow near shore. The water was full of mostly eurypterids. They are close relatives to the common horseshoe crab.

The fossils in this diorama include three eurypterids and a plant. These fossils were found in Bertie Dolomite near Buffalo, New York. The eurypterid is New York's state fossil.



370 million years ago

The diorama of the late Devonian period shows fossils that were found in Nunda Sandstone in Cohocton, New York. When viewing the diorama, you can find fossils of sea creatures and plants, such as *Grammysiodea Alveata*, *Devonster Eucharis*, *Bothriolep Canadensis*, and *Macheracthus*. All of them are from the late Devonian period, which was about 370 million years ago. A drawing with the names of the local marine life shows visitors what they are looking at in a scene from the middle Devonian period, and includes facts like how the murky water conditions reduced the number and variety of the sea creatures.



By Sage

387 million years ago

The middle Devonian diorama shows fossils of corals, crinoids and trilobites that were found near Leroy, New York. The diorama scene was based on large reefs that were found in Onondaga Limestone. There were many different species of corals and crinoids. Some were new that evolved from older Silurian forms, but others stayed the same.



by Alliyah

Tools

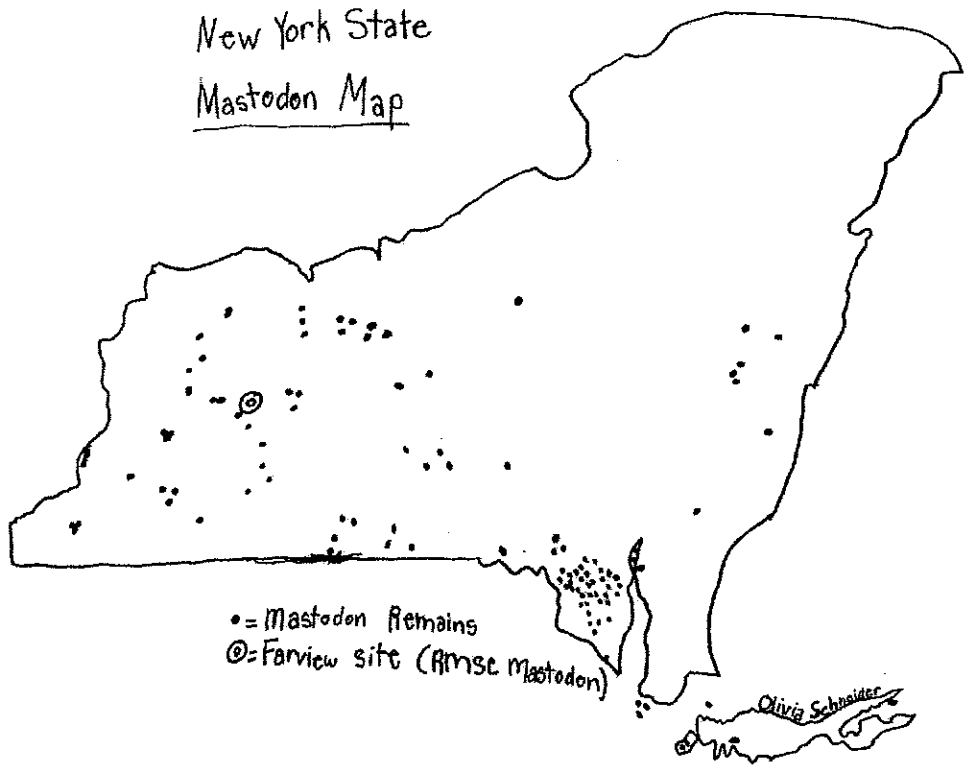
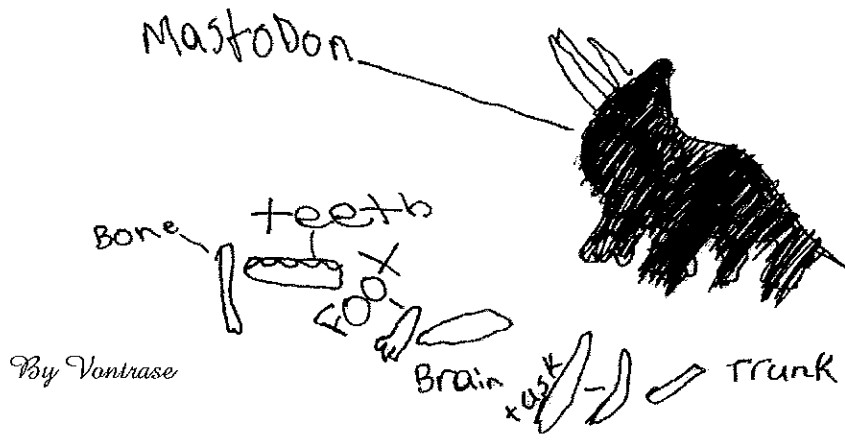
By Vontrase

Paleontologists and geologists search for fossils, rocks, and minerals. They need to use brushes, shovels, picks, hammers, flashlights, and magnifying glasses to uncover fragile fossils and rocks. Brushes are used to brush off bacteria from the bones so they will not decay. A sifter is something to shake out tiny sediments from the fossils. Scientists use magnifying glasses to see up close and study the impressions and details of a fossil or rock. After they examine the rocks and fossils they are stored or displayed in special cases to preserve them.

Paleontologists use tools to dig up mastodon bones in New York State. Mastodons existed until 10,000 years ago. The tools used today are much different than the tools of the 1800's. Modern day tools are much better than the old ones; they don't chip and break the specimens. The specimens can be any number of things like rocks and fossils. If glaciers froze mastodon remains until the 2000's, paleontologists and geologists could hammer at them and they could probably have a complete mastodon skeleton.



The mastodon exhibit

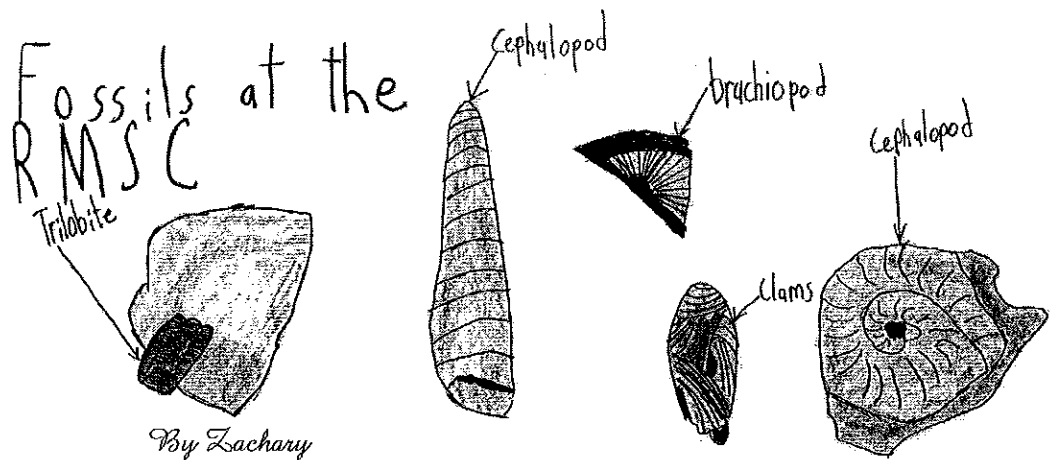


Scavenger Hunt For the Rochester Museum and Science Center

By: Olivia

Directions: As you view the Marine Life and Mastodon exhibits try to investigate these fun facts. You will need some paper and a pencil for sketching and writing.

- 1) ___ Sketch and label one of the tools used by a Paleontologist to dig up fossils.
- 2) ___ Name all the bones or parts of the bones that are still missing from the Mastodon skeleton.
- 3) ___ What is the name of the New York State fossil?
- 4) ___ How many years ago was the Jurassic Period?
- 5) ___ Sketch and label the fossil of the cephalopod that was found in New York.
- 6) ___ Find the colonial coral, sketch and write a description of it.



Rochester Museum & Science Center

"DID YOU KNOW?"

By Sterling

Did you know that the RMSC has a display of mastodon bones that were found in North America?

Did you know that they have a model of a Mastodon with tusks that was made by the RMSC? And that they have a real picture of a mastodon, with its skin, fur, and real mastodon tusks?

Did you know that they have a marine life tank with fossils, and models of what trilobites, colonial coral, and starfish looked like about 300 to 400 million years ago?

Did you know the Farview mastodon at the RMSC was discovered in 1991?

Did you know dating the rib of a mastodon bone indicates the mastodon died about 11,600 years ago?

Did you know that 425 million years ago Rochester was covered by a warm, marine sea?

Did you know that a eurypterid is New York's state fossil?

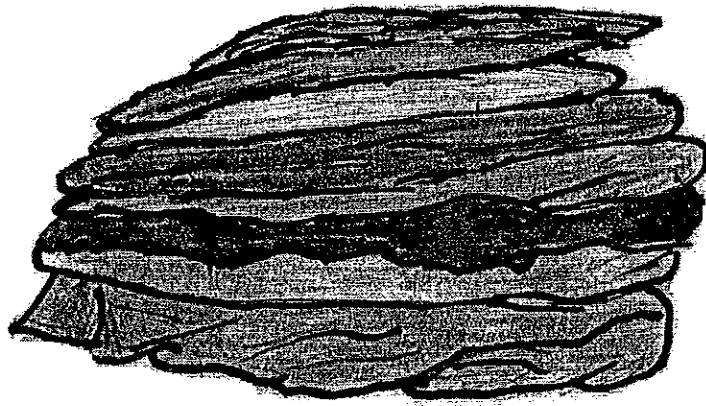
Welcome to Retsof!

By the Retsof Crew

Retsof is an open field where fossils, trace fossils, body fossils, and pieces of fossils can be found. The fossils are evidence of past life in Western New York. The fossils show what types of animals lived in the marine habitat that was here millions of years ago. The ground is made of shale and is very soft so...

WATCH YOUR STEP AND BE PREPARED FOR MUD!!!!!!!

The strata or layers can only be seen on the hill where the rock is exposed and vertical. Most of the fossils can be found at the surface so there is no need too dig to deep. Have a great, fun time exploring the Retsof field!

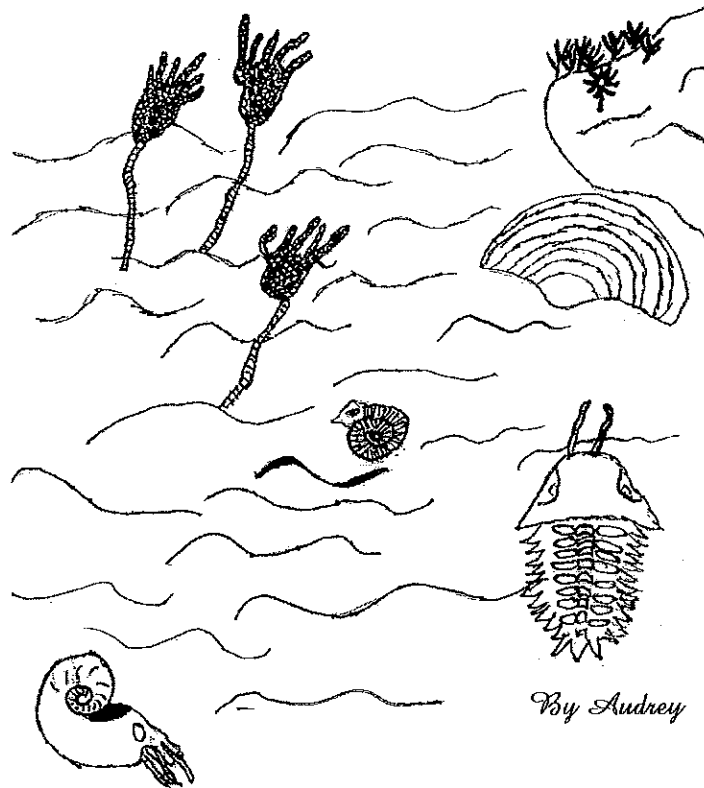


Sara

Retsof / Then

By Audrey

380 million years ago during the Devonian time period, the Retsof area was a warm, salt-water ocean filled with marine animals. Some of the sea creatures were crinoids, brachiopods, trilobites, and cephalopods. All these animals lived in warm salt water. Each of these animals was unique and different.



The crinoids had a long **stem** that reached up to the head. The head had arms coming out of the top that captured food for it to eat.

The brachiopod looked a lot like a clam. The two shells opened and closed like a clam too. The only difference between them is that the clam's shells are symmetrical (identical) and a brachiopod's were not.

Trilobites have three parts, the **cephalon**, **thorax**, and the **pygidium**. They were named for having three parts, because tri- means three.

Cephalopods were alive a long time ago and are still alive today. Cephalopods back then had a shell, and as the cephalopod grew the shell grew a new chamber (section). Some of the shells were tightly coiled and some were long and straight. Either way they were still cephalopods.

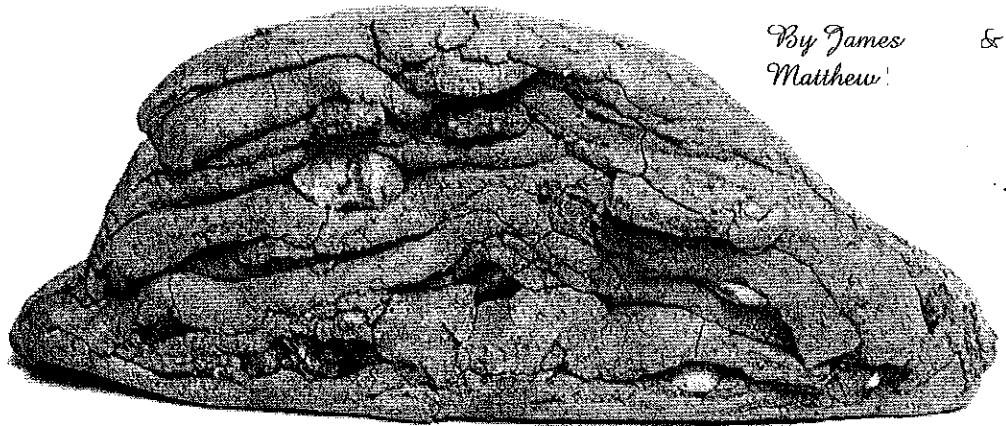
These were some of the marine animals that lived a long time ago. There were a lot of other marine animals that lived in the warm waters but these were the animals that lived in a little place called Retsof.

How Sedimentary Rocks are Formed

By James

Sedimentary rocks are the only kinds of rocks at Retsof. Every year rivers dump sand, mud, and pebbles into oceans. When microscopic sea creatures die their skeletons and shells (if they have shells) sink to the ocean floor. The waves sort the sediments into horizontal layers. The weight of the sediments and water squeeze the sediments together to form sedimentary rock.

Sedimentary rock tells a story of how it was formed and what weather conditions existed. Sedimentary rock usually forms in shallow seas. Salt is a sedimentary rock so every time you eat french-fries think of sedimentary rocks.



*By James &
Matthew!*

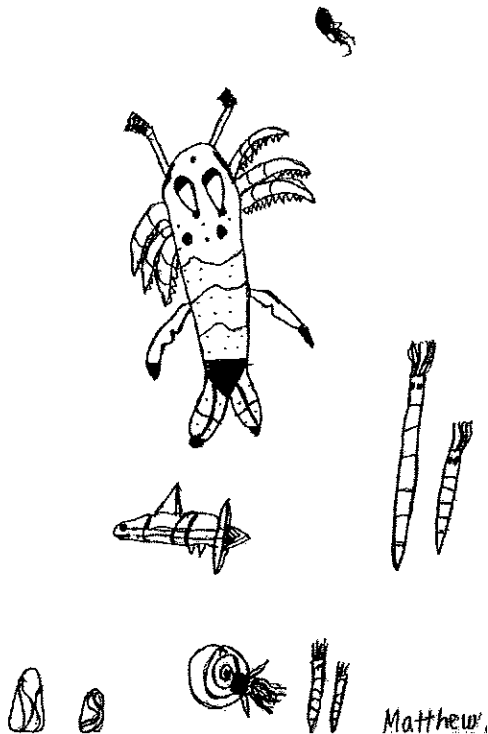
How Fossils Are Made

By Matthew

A fossil can be an imprint of an animal on mud or rock. They often become fossil when bones of a dead animal are buried in mud or water. Fossils can be found when water or wind wears away the dirt, leaving the bones that have fossilized.

Retsof was once an ocean. When an animal died it sank to the bottom of the ocean. During the journey other animals and bacteria ate the flesh. Sediments built up on the bones. As they rested at the bottom dissolved minerals seeped into the rock and the animal's bones. The water dried up and the animal became part of the hardened rock. This is called **fossilization**.

At Retsof, millions of years later the rocks were lifted up and became dry land. Water and wind wore away the rocks exposing the fossils. The fossils we find tell the story of Western New York. When fossil hunting in Retsof you can learn about the earth's ancient **climate**, and that there was an ocean in Rochester.



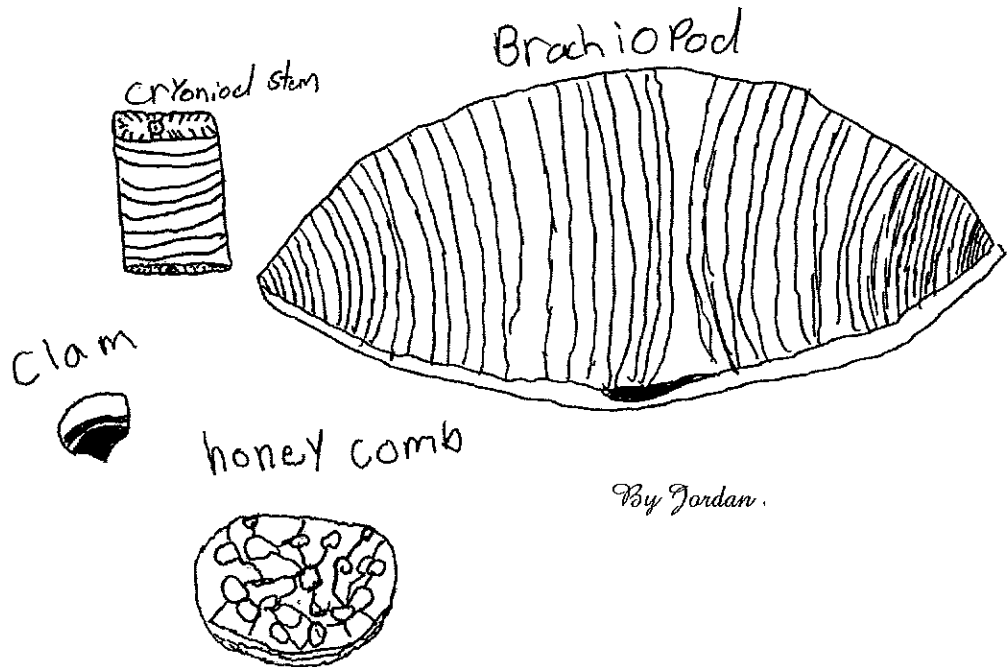
Fossil Hunting

By Jordan.

Fossil hunting in Western New York can teach you what lived almost 400 million years ago. There were brachiopods, crinoids, clams, and some other sea creatures

Fossil hunters need equipment. The first thing a fossil hunter need is a bag to collect in. Serious fossil hunters need a geologic hammer to break rocks. It also will be a good idea to bring goggles to protect your eyes. Fossil hunters need a tooth brush to brush the dirt off the rock or fossil to make it visible, or a little scrub brush with water will work well.

On a cold and rainy day you will want to bring boots. You need to bring a shovel. You should bring a coat or dress warmly.



By Jordan.

The Retsof Field Today

By Sara

When going to the Retsof field, you will see a lot of shale. The ground might look plain with nothing in it, but bend down close and look really carefully and fossils will be discovered. You may see crinoids, brachiopods, bivalves, or bryozoans. Many fossils can be found at Retsof.

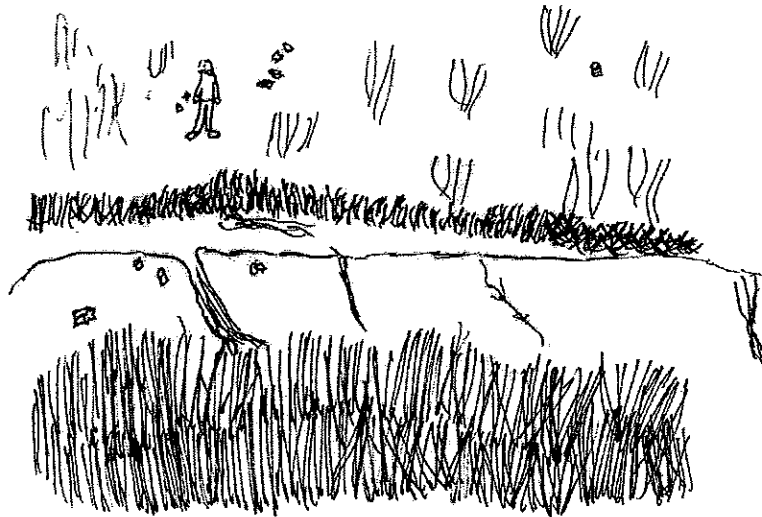
Find a fossil and hold it in your hand; Do you realize that you are holding a part of history?! An animal that was alive around 360 to 545 million years ago!

When you look on the side of the hill, the many rock layers look like little drawers. The rocks seen at the Retsof field are sedimentary rocks. They are made of tiny built up sediments.

At the Retsof field there is a train track. Near the train track there are many rocks. These rocks are not like the other rocks at the Retsof field. These rocks were imported for the railroad bedding. The rocks are made of limestone and they have fossils in them just as the Retsof field rocks do. The organisms that these fossils represent lived in a different environment than the fossils that originated in the Retsof field.

You may want to wear hiking boots that will help you stay steady on the hill and uneven ground. Consider bringing a shovel (it will help to dig up fossils).

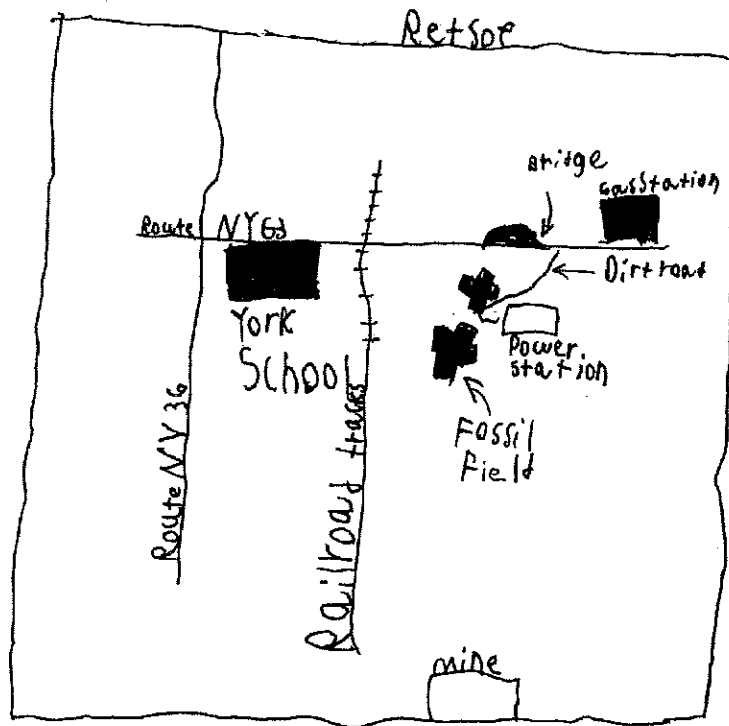
The Retsof field is an interesting place to look at local geologic history. When you go, keep track of time, you may get lost in a trip to the past!



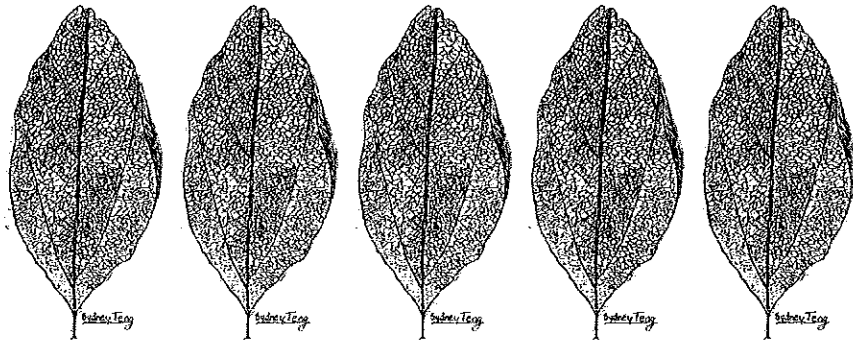
Directions to Retsof

By Sara

Get yourself onto Route 36 going south. From Route 36 turn left onto Route 63, immediately you will see York School on your right. Then you will go over a Railroad track, and after the Railroad track there is a bridge. Immediately after the bridge is a dirt road. Turn right onto this dirt road and there you are. If you see a gas station you have gone TOO FAR! Have a nice time!



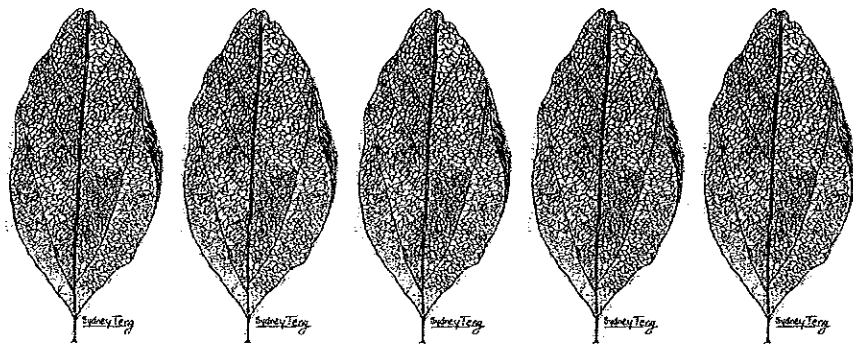
BY JAMES



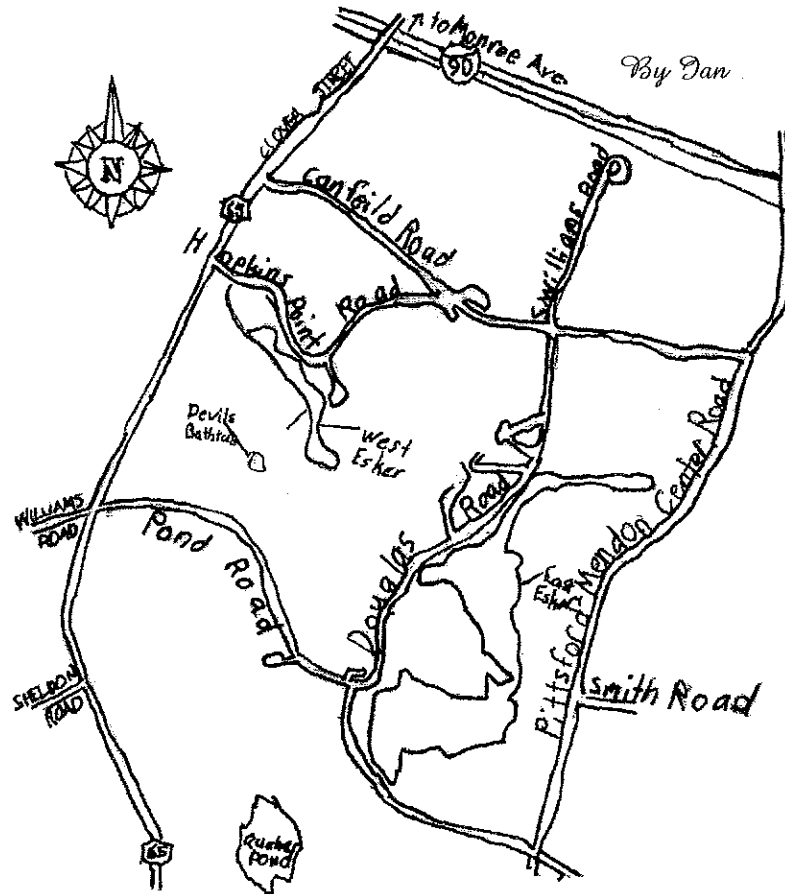
Discovering Mendon Ponds Park

By Sydney and Dan

Glaciers. Glaciers made a huge impact on Rochester's geologic features. Mendon Ponds Park is a local example of what these frigid bulldozers did. Ten thousand years ago massive **continental glaciers** smothered Rochester and most of Canada. The time in history that this big freeze took place is called the **Cenozoic** Era (the last 65 million years). Cen means "new life" and ozoic means "time of" in Greek. These colossal sheets of ice could be a mile thick! These same ice sheets carved out Mendon Ponds Park. The park is full of very good examples of **kettles** and **eskers**. Can you believe that this happened right here in Rochester!?!



MENDON PONDS PARK

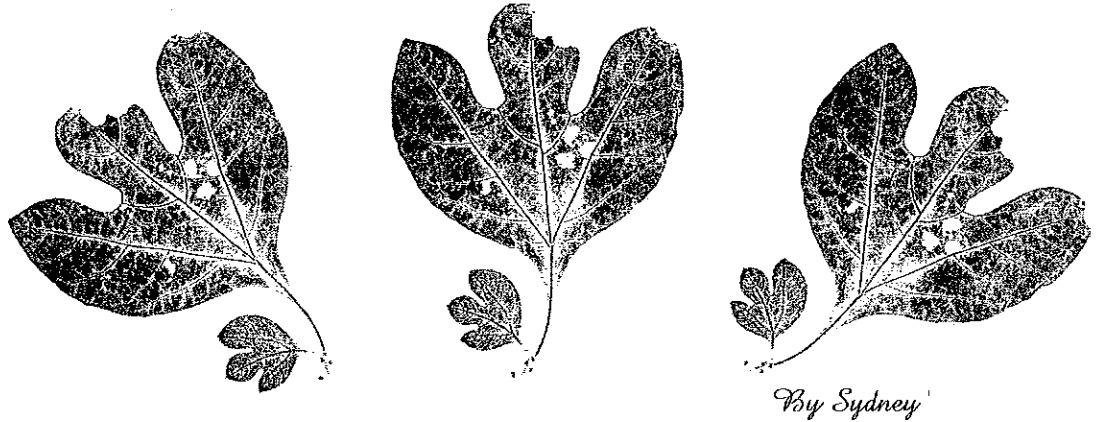


How Do You Get To Mendon Ponds Park?

By Sydney

From Monroe Avenue get onto Clover Street (65) traveling south. After you cross over the thruway the next three left turns will take you into the park. If you want to see Hundred Acre Pond and Deep Pond then you should take the second left onto Hopkins Point. Follow that road and take your first

right. You can park at the end of this road. For your convenience there are restrooms. From here you can start your hike on the West Esker trail (a 1.5 mile hike). There are horses allowed on most of the main trails so be very mindful of where you step!! Enjoy the fresh air and your visit at Mendon Ponds Park!!



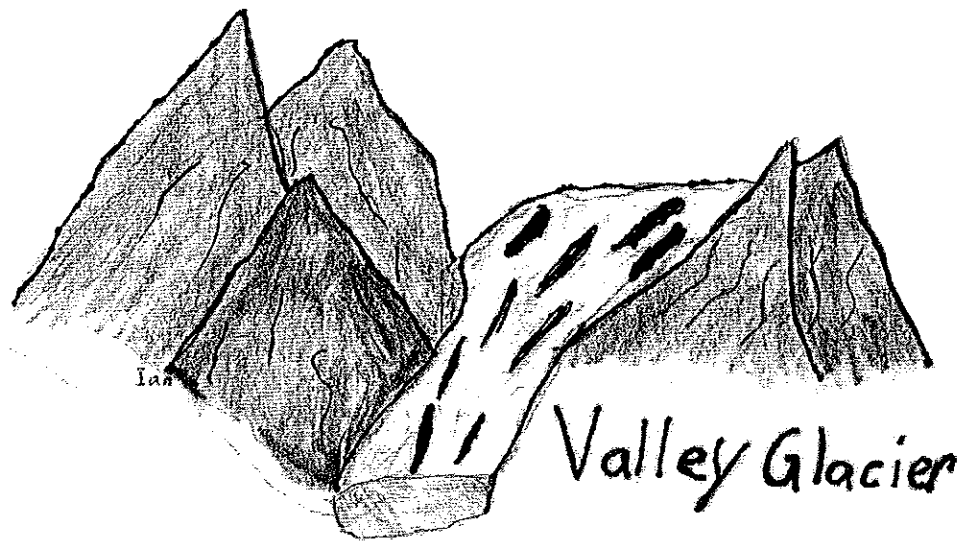
Continental Glaciers

By Stephanie

Continental glaciers covered enormous areas of land. These glaciers helped create some of the interesting geologic features of Mendon Ponds Park.

Continental glaciers are sometimes referred to as ice sheets. These glaciers are made when more snow falls than is melting. Snow falls on the ice and melts. The water freezes building another layer of ice. This occurs over and over for a long time. It may take hundreds of years for a glacier to form.

Continental glaciers flow downhill, outward, and in all directions. As the glacier moves, it knocks down everything in its way and this becomes part of the glacier. Glaciers were not only in Mendon Ponds Park, they are all over the world. They helped shape this unique planet we live on.



Amazing Valley Glaciers

By Dan

The glaciers that formed Rochester's landscape are different than those that formed western North America. If you have visited the Rockies, you probably marveled at the scenery. You might be wondering what created the deep gorges and valleys. **Valley glaciers** are a major part of what caused the beautiful scenery. The valley glacier slowly moves down hill, finding the lowest path to travel on. The glaciers carve out large amounts of rock and sediment, turning a V-shaped valley into a U-shaped valley. These glaciers have entirely changed some landscapes.

The rocks and sediment that are pushed along by glaciers is called **till**. Glaciers, after a while, begin to stop going down hill and retreat, or melt, leaving the till in a different place from where it came from. A rock that has been transported from one place to another by a glacier is called an **alien rock**. Many mountain ranges have been altered by glaciers to create breath-taking scenery.

How You Know When A Glacier Has Been Around?

By: Kendall

When you see a kettle, you know a glacier has been around. We also know there has been a glacier if an esker and **drumlins** are found. All three of these things are made by glaciers. Glacier weight, combined with gradual movement, can drastically reshape the land. The ice erodes the land and it carries rocks from their original place to a different place. A glacier picks up or pushes its material as it moves. Till is material that is deposited as the glaciers retreat. Till is the stuff that gets pushed by the glaciers. It gets rolled together and gets pushed into a different place. There are many natural signs that tell you a glacier has visited that place. So the next time you see a kettle, an esker, or a drumlin then you know a glacier has been there.

What in the World is a Kettle?

By Sydney

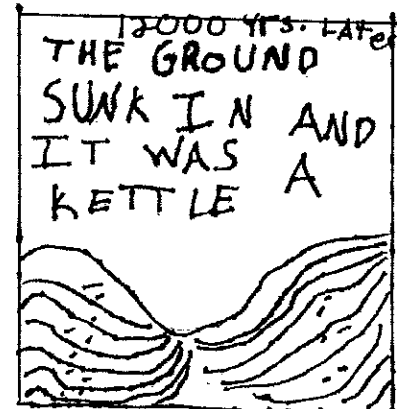
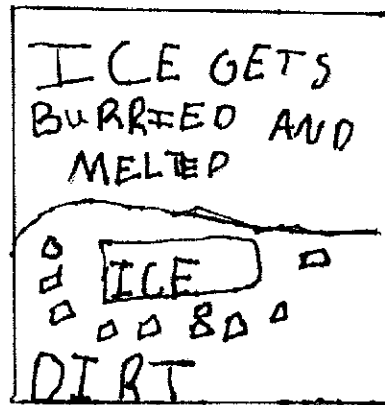
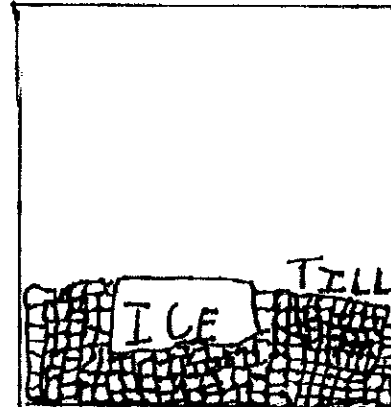
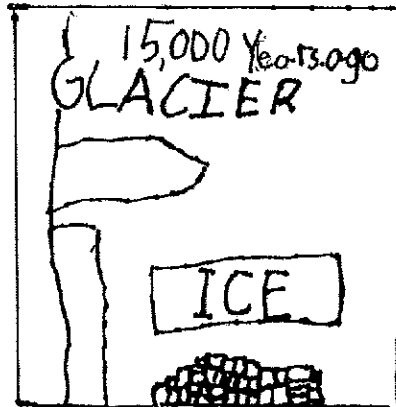
Do you ever wonder how a kettle was formed? Do you know what a kettle is? If you answered no to any of these questions, then this paragraph is for you!

A kettle is an impression that takes the shape of a circle on land. Think of it like this; A huge bulldozer is plowing along, slowly but surely devouring everything in its path. The bulldozer comes to a halt. What is in front of the bulldozer? A monstrous pile of till! Now imagine this bulldozer is really a glacier that covers states and even whole continents!! This glacier is called a continental glacier.

The last glaciers were here about 10,000 years ago. The glaciers eventually disappeared, as they started to inch back toward Canada (a glacier moves a few centimeters per day). Receding is the process of melting away. As the glaciers melted away chunks of ice called **icebergs** fell off into this colossal pile of till (icebergs DO NOT have to float in water!!!) When the iceberg made contact with the pile of till, it created a small circular impression. The majority of the iceberg must then be covered with till to form a kettle. As the ice melts, the land on top of the iceberg would cave in like a sinkhole. The water from the melted ice would eventually erode away the edge of the circle like an

indentation. The water from the melted ice either escaped the kettle or it became a pond.

Some of the best examples of kettles are at Mendon Ponds Park. These include: Devil's Bathtub, Deep Pond, Hundred Acre Pond, Round Pond, Lost Pond, and Quaker Pond. Notice that not all of the ponds are perfectly circular. This is because not all the icebergs were perfectly round. Kettle holes are just one of the examples of what the gigantic glaciers did to Rochester's landscape about 10,000 years ago.



KETTLE FORMATION

By Anija

What Exactly is an Esker?

By Sydney

What is an esker? How is an esker formed? Who's even heard of an esker? If you answered no to any of these questions then this is an article you should read. An esker is an up-raised snake shaped area on land that is formed by glaciers.

When a glacier melted, small streams or rivers of till mixed with water from the melted ice run off of the glacier. The stream (or river) then deposited the till it was carrying. All of this till eventually built up and created an Esker. You can't see any sign of an esker forming until the glacier has retreated completely.

Some of the main trails at Mendon Ponds Park are eskers! There are the East Esker and the West Esker trails. There are probably more through out the park that aren't well marked or marked at all. You can find a lot of eskers in and around Rochester. The farther you go out of Rochester and toward Pennsylvania the fewer eskers you will see. Glaciers have greatly impacted Rochester's landscape causing our beautiful parks and scenery. Eskers are just one of the many examples of what glaciers did.

A Walk Through: Mendon Ponds Park

By Hannah

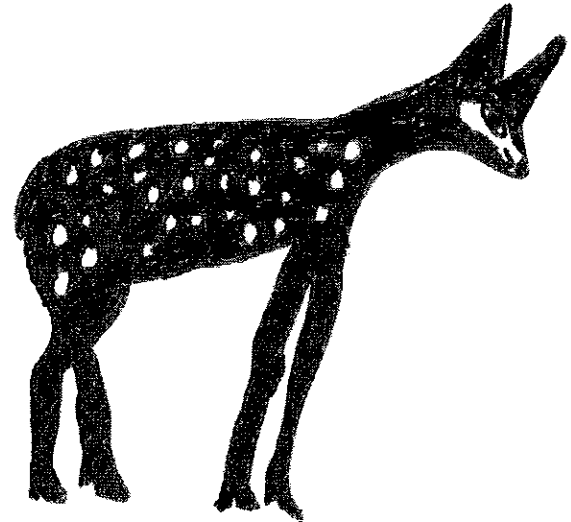
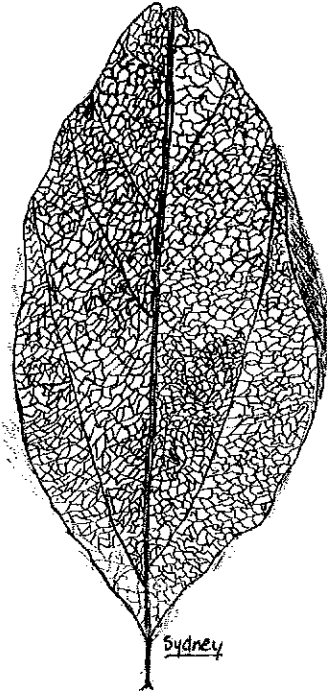
There are many different types of berries in Mendon Ponds Park, some you can eat and others you cannot. One kind of berry you can eat are the wild grapes that grow on a vine. One berry you cannot eat are the choke-cherries, they will make you choke.

There are lots of trees in Mendon Ponds Park. There are also a few poisonous plants such as Poison Ivy and Stinging Nettle. There are plants and trees that are not poisonous. Some of the trees and plants you probably will see include Maple, Oak, Sassafras and Milkweed. Milkweed is food for Monarch Butterflies.

As you walk the trails you can see the many rows of neatly planted trees. They were planted in straight rows because during the Great Depression there were no jobs. A man created jobs to plant trees, and called it, "The

Nursery for Trees." The men planted trees in rows and helped them grow by taking care of them. Today the trees are still there in rows.

There are a lot of animals like deer, hawks, Turkey Vultures, squirrels, chipmunks, birds, and Monarch Butterflies. The animals help the environment and all the trees and plants you will see. There is a lot to learn about the nature of Mendon Ponds Park.



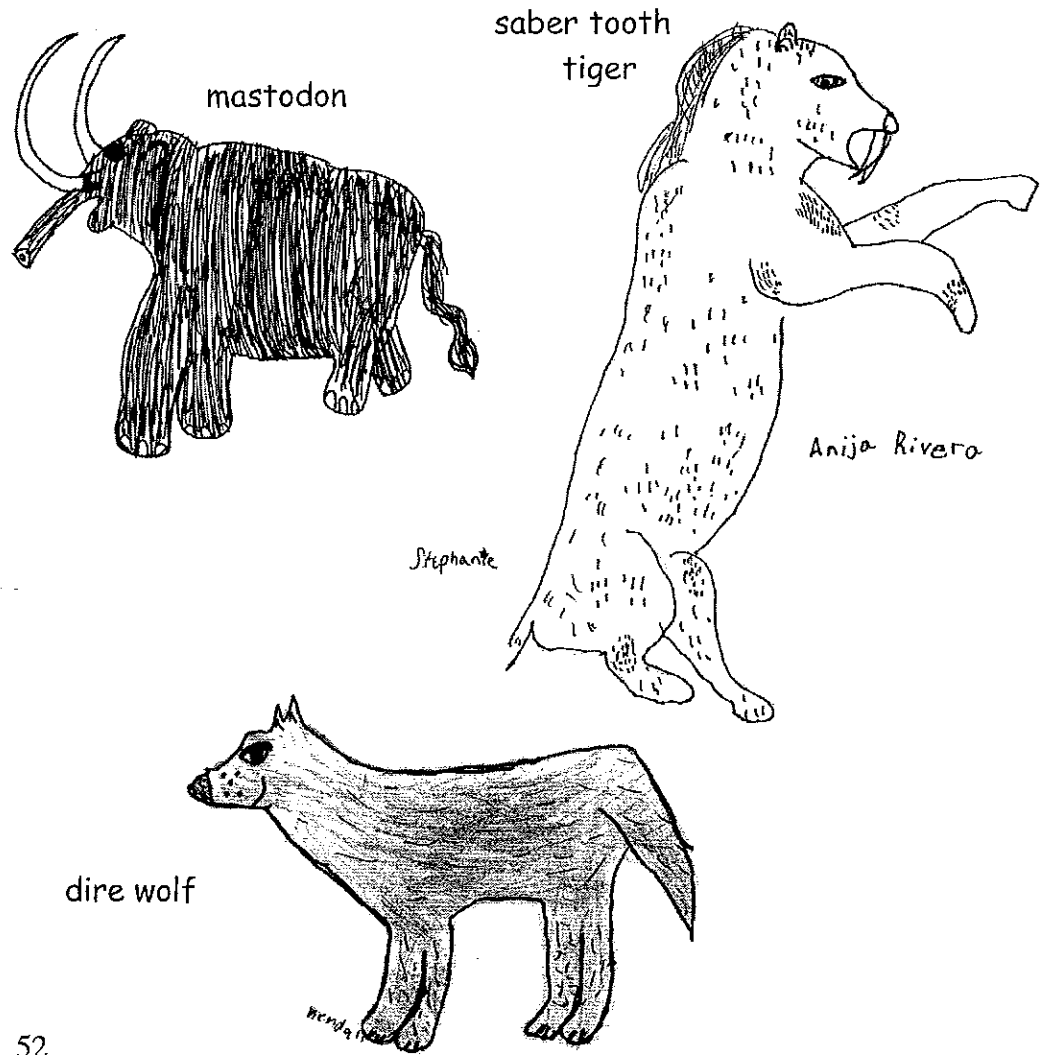
What Lived in Mendon Ponds Park?

By: Anija

Many of the animals that lived in the time of the glaciers were similar to the animals of today. The animals that may have lived here in Mendon Ponds Park were the saber tooth tiger, American lion, mastodon, woolly mammoth, dire wolf, giant sloths, giant armadillo, short-faced bears, and North American horses. They were very interesting, vicious, smart, and slick animals.

The elephant is a relative of the mastodon and the woolly mammoth. The elephant looks like the mammoth and the mastodon. The smilodon, known as the saber tooth tiger, is the ancestor of the big cats of today. Saber tooth tigers are a prehistoric version of an African lion. They became extinct 11,000 years ago.

The earliest wolves were the dire wolves. Animals today look a little like their ancestors. The tiger looks like a saber tooth but a tiger has stripes and does not have as big teeth. Some of the animals today are endangered or extinct just like the animals back then.



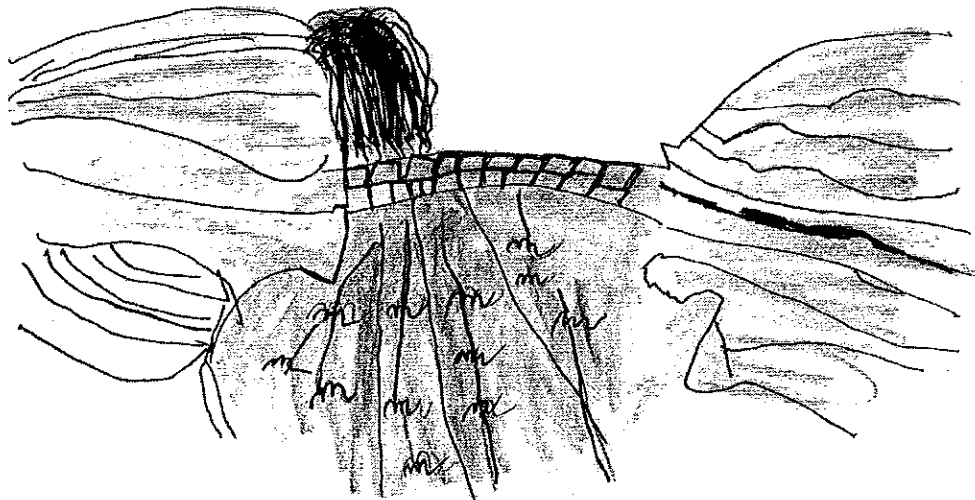
Letchworth State Park

By Brianna

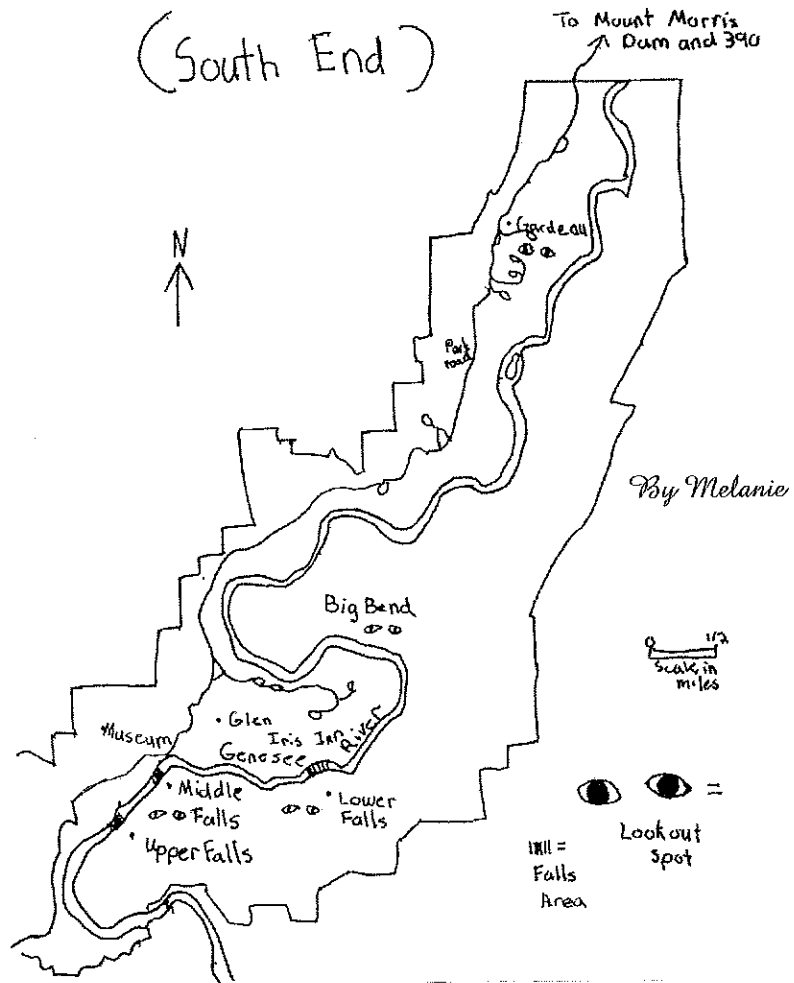
Letchworth is a very scenic state park. The park is 14,350 acres in width and length. Letchworth is best known for its gorge and water falls. The Genesee River roars over three waterfalls giving Letchworth its nickname "The Grand Canyon of the East." Its highest falls is 107 feet tall. Letchworth is 35 miles south of Rochester and 55 miles from Buffalo. Shale and sandstone have formed beautiful rock layers in Letchworth. There are a lot of fun things to do like camping, swimming, hiking, and lots more! If you visit Letchworth you can learn a lot about sedimentary rock layers and get information about Lower, Middle and Upper falls. You can also learn about the Mount Morris Dam. We recommend you go to Letchworth and see the wonderful views!

Letchworth Rock Layers

by Brianna



Letchworth State Park (South End)



Directions to Letchworth

By Melanie

Take Route 390 South out of Rochester and get off at Exit 7 (Mt. Morris). Turn left onto Route 408 South, and then right onto Route 36 North. The entrance to the park and Mt. Morris Dam will be on your left. Enjoy!

FAQs (cool questions, awesome answers)

By Melanie

You probably learned some new things from reading this chapter, but here are some things you might not know.

Q. What are the heights of the three waterfalls at Letchworth?

A. Lower: 70 feet, Upper: 71 feet, Middle: 107 feet

Q. How high is the top of the Mount Morris dam?

A. 760 feet above sea level

Q. Who owns Letchworth State Park?

A. The State

Q. How many acres make up Letchworth?

A. 14,350 acres

Q. How did Letchworth get named?

A. William Pryor Letchworth founded it

Q. How old is Mount Morris Dam?

A. 51 years old, it was built in 1952

Q. What is the water source of the three waterfalls?

A. The Genesee River

The Waterfalls of Letchworth

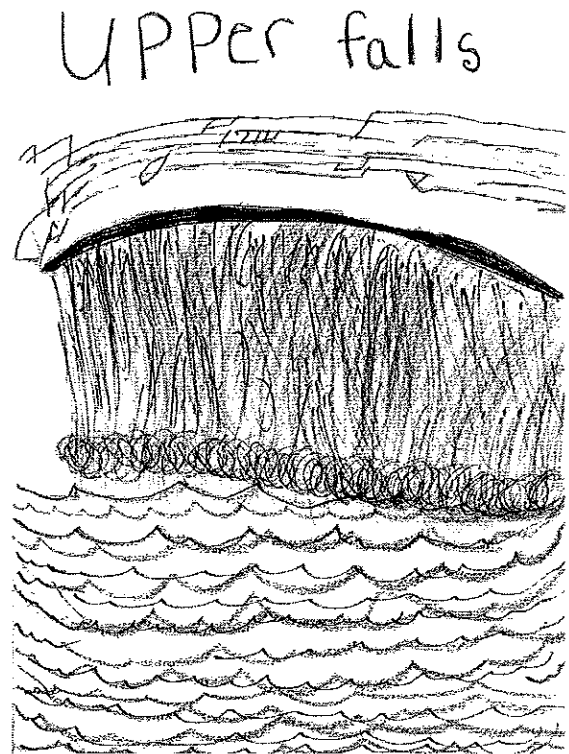
By: Molly

Rushing, powerful, elegant. Those are just a few descriptive words for **waterfalls**. Along with the waterfalls at Letchworth State Park, there are gigantic gorges. In one place, the Great Bend Gorge, the canyon is 550 feet deep! Another section of the gorge, the Portage Canyon holds Letchworth's three major waterfalls, lower, upper, and middle falls. These falls are named because of where they are located on the river. Lower falls is the lowest **downstream** and upper falls is the farthest **upstream**.

Now more about the falls. Upper falls is usually considered the least appealing to look at. It's 71 feet tall. Its supporting layer of rock is underlying sandstone of the **Gardeau formation**, starting about 28 feet below the rim. The other two falls have a thick layer of siltstone. It is these layers that make the waterfalls where they are. This is because the layers underneath have eroded away, leaving the water to just fall over the edge.

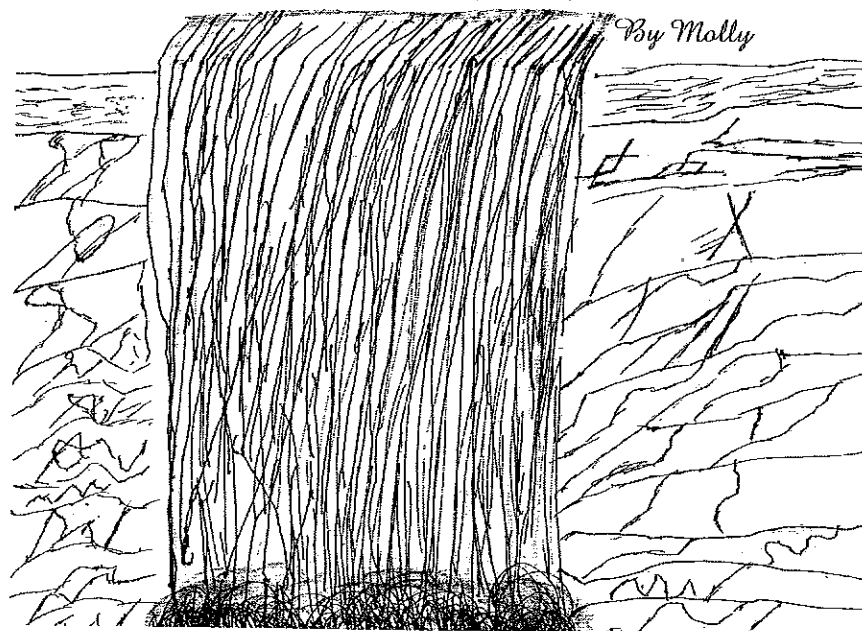
Middle falls is normally considered the most scenic of the three falls. Water is raging down the falls at 107 feet; it takes your breath away. At night, lights shine on it. William Pryor Letchworth built an estate overlooking middle falls called **Glen Iris**, which is now an inn and restaurant.

56



By Alexandria

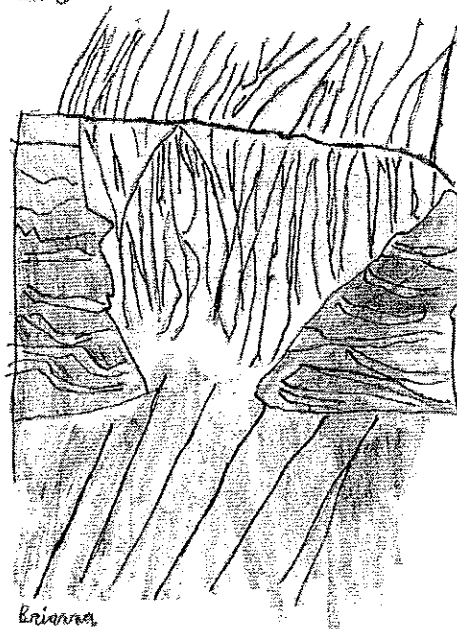
Middle falls in Letchworth



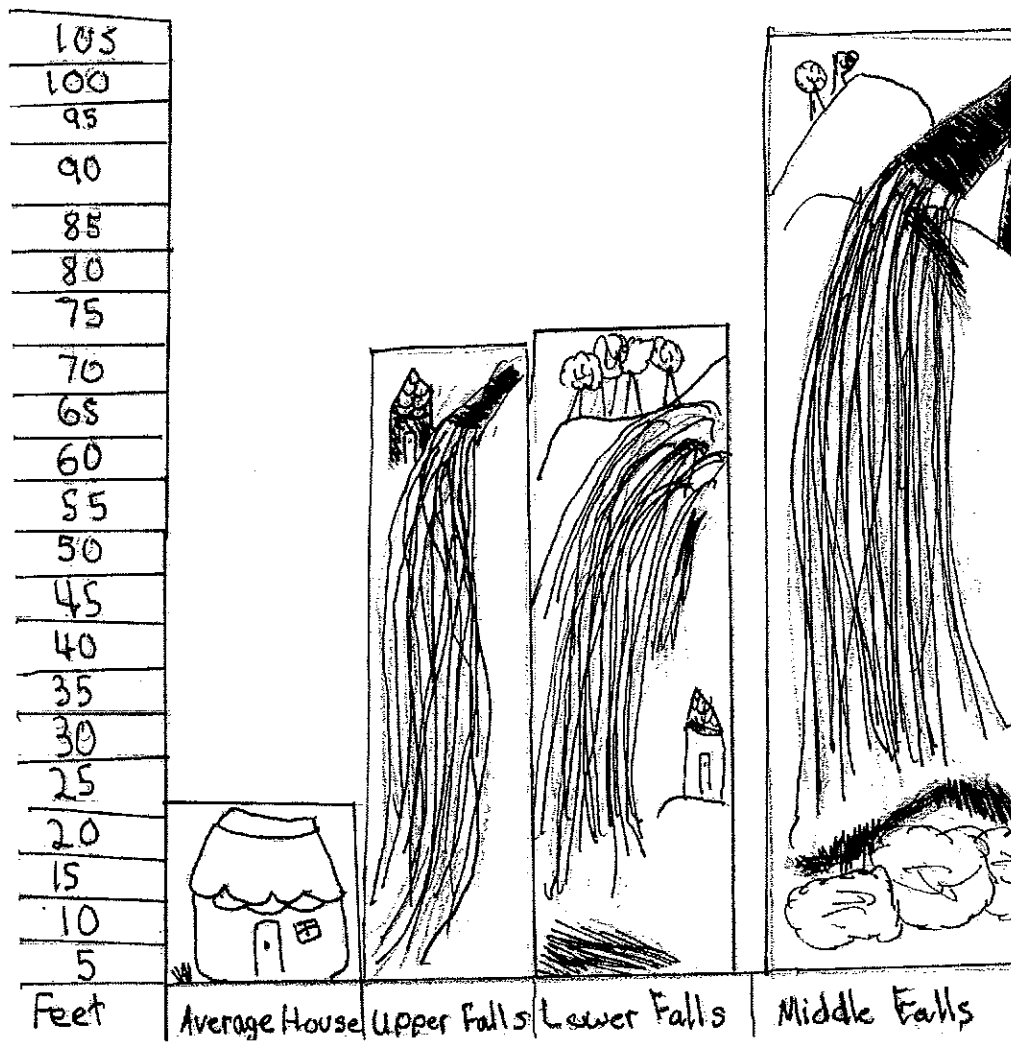
Lower falls is the lowest of the three waterfalls at 70 feet. Lowest yet not the least inspiring. It is very beautiful, with five rocks jutting out from the rock wall that the water flows over.

These are only the major waterfalls in the park. There are many small waterfalls you may come upon. I hope you have learned a lot. Have a great time exploring!

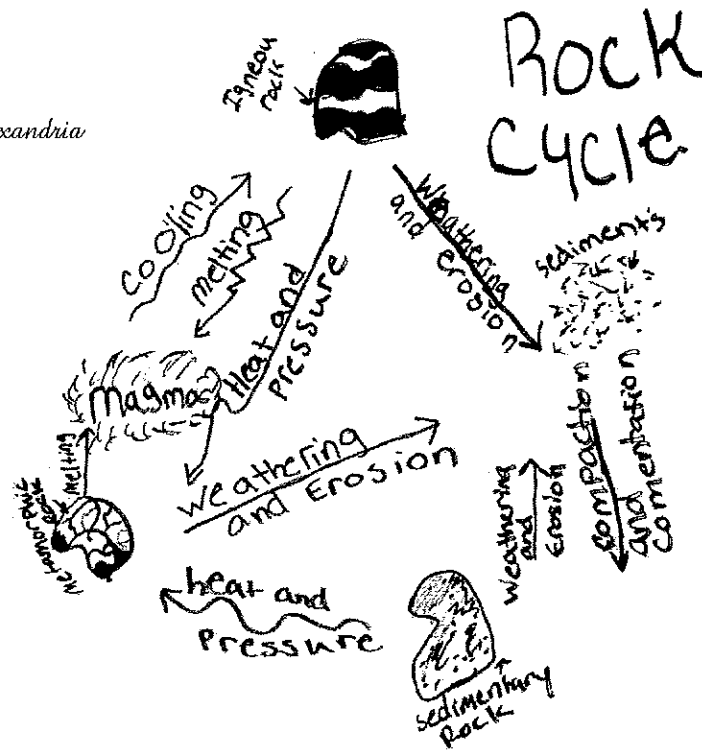
Lower Falls at Letchworth



Comparing Letchworth Falls



By Alexandria



Types of Rocks

By Alexandria

Letchworth is a great place to go because you can see how sedimentary rocks are formed in layers. There are three types of rock formed during the rock cycle. Each type of rock is created differently.

An igneous rock is formed by magma that is from the earth's mantle. The magma is really hot and when it cools it becomes an igneous rock. Some examples are basalt and granite.

Metamorphic rock is formed when extreme heat and pressure are applied to igneous or sedimentary rock. Magma bakes the surrounding rock turning it into metamorphic rock. The slate that is used on house rooftops is made from metamorphic rock.

Sedimentary rock is made up of different layers of sediment, which can be sandstone, limestone, shale, mud, and clay. Sedimentary rock usually forms in horizontal layers. If two of the tectonics plates collide sedimentary rock can

take a different angle. If you look closely you can see the difference in the layers from the collision of the plates. Fossils can be found in sedimentary rock.

Beautiful sedimentary rock layers can be seen at Letchworth State Park. The Genesee River flows through the gorge. The sedimentary rocks shape the beautiful waterfalls.

The Geology of Letchworth State Park

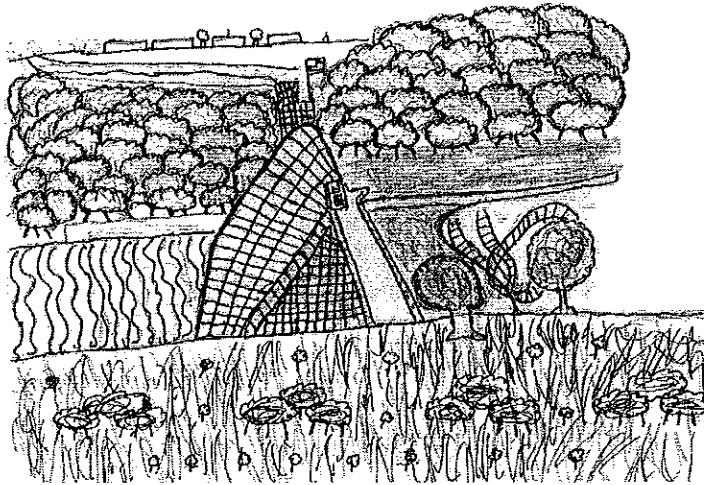
By Wesley

People call Letchworth the Grand Canyon of the east. The cliffs of the Genesee River Gorge are 550 feet high in some places. The Genesee River flows through the gorge. There are three major waterfalls between the cliffs. The three most popular falls are lower falls, middle falls, and upper falls. Many people come there every year to see the beautiful scenery. The height of lower falls is 70 feet. The middle falls are 107 feet in height. Middle falls is the biggest of the three falls, and it is the easiest to get to. Upper falls is 71 feet in height. Wolf Creek Falls is another waterfall in the park.

The Mount Morris Dam is located in Letchworth State Park. It is situated deep in the gorge of the Genesee River about 67 miles upstream of the city of Rochester. The dam cost was about \$25 million. The dam provides flood protection.

The Mount Morris Dam

By Wesley





Glossary

alien rock: rock that has been dropped from a glacier

bioturbation: when an animal burrows into the ground and mixes up all of the sedimentary layers

body fossil: bones of an animal that has been fossilized

Cenozoic: approximately the last 63 million years

cephalon: the head

cephalopod: any of various mollusks, such as squids, cuttlefishes, and octopuses, having a group of muscular sucker-bearing arms, highly developed eyes and usually a bag of inky fluid which can be released for defense

climate: a region with specified weather conditions

continental glacier: a broad ice sheet resting on a plain or plateau and spreading outward from a central mass, or region of accumulation

crust: a hard outer layer or covering to Earth's three inner layers

downstream: the direction a stream is flowing

drumlin: a spoon-shaped hill of glacial sediment

environment: the surrounding conditions of forces that influence or modify the whole complex of factors, such as soil, climate, and living things

erode: wear away

esker: A long, narrow ridge of material (till) deposited by a stream flowing in or under a decaying glacial ice sheet

formation: a group of rocks, or sedimentary beds of the same age or period

fossil: evidence of past life

fossilization: to change or become changed into a fossil

geologist: one versed in the scientific study of the origin, history, and structure of the Earth

geology: the study of the structure of the Earth or another planet, in particular its rocks, soil, and minerals, and its history and origins

glacier: a large body of ice moving slowly down a slope or valley or spreading outward on a land surface

iceberg: a large mass of ice that was detached from a glacier

ichnology: the study of trace fossils

igneous: used to describe rock formed under conditions of intense heat or produced by the solidification of volcanic magma on or below the Earth's surface

inner core: the dense core of the Earth that lies below the mantle and outer core, thought to be composed of iron and nickel

kettle: a depression left in a mass of glacial drift, formed by the melting of an isolated block of glacial ice

limestone: a rock formed chiefly from an animal's remains

magma: the molten rock material under the Earth's crust, from which igneous rock is formed by cooling

magnesium: a silver white metallic element that is lighter than aluminum, is easily worked, it burns with a dazzling light, and is used in making light weight alloys

mantle: the layer of the Earth between the crust and the core, consisting of magma; the Earth's tectonic plates float on the mantle

mastodon: any of several very large, extinct proboscidian mammals of the genus *Mammut* (sometimes *Mastodon*), resembling the elephant but having molar teeth of a different structure

Mesozoic: belonging to or dating from an era of geologic time 250 to 65 million years ago, between the Paleozoic and Cenozoic Eras, when dinosaurs, birds, and flowering plants first appeared

metamorphic: a rock that is formed by heat and pressure

outer core: a liquid state of the Earth's core that is about 1,400 miles (2,260 km) thick. The Earth has an iron-nickel core that is about 2,100 miles in total radius. The inner core (which has a radius of about 750 miles (1,228 km) is solid.

paleontologist: the study of the forms of life existing in prehistoric or geologic times, as represented by the fossils of plants, animals, and other organisms

Paleozoic: of, belonging to, or designating the era of geologic time that includes the Cambrian, Ordovician, Silurian, Devonian, Mississippian, Pennsylvanian, and Permian periods and is characterized by the appearance of marine invertebrates, primitive fishes, land plants, and primitive reptiles

Precambrian: the period of geologic time when the Earth's crust consolidated and primitive life first appeared, 4,650 to 700 million years ago

prehistory: the time before written history

pygidium: a protective covering of the rear portion of the abdomen of some invertebrates

sandstone: a type of sedimentary rock made up of particles of sand, mostly quartz, bound together with a mineral cement, along with some feldspar, mica, and rock debris.

sedimentary: a rock formed from sediments

sediment: material (as stone and sand) carried onto land or onto water, wind or a glacier

shale: a rock with a fine grain formed from clay, mud or silt

stem: the main axis of a plant that bears buds and shoots; any long slim part of an object,

thorax: the middle division of the body of an insect, crustacean, or arachnid

till: a mixture of clay, sand, gravel, and boulders deposited by a glacier

trace fossil: the imprint of an animal's footprint, trail, or burrow

upstream: at or toward the beginning of a stream

valley glacier: one of four types of chief glaciers. valley, or mountain glaciers, are tongues of moving ice sent out by mountain snowfields following valleys originally formed by streams

waterfall: a fall of water from a height



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<http://www.allwny.com/letchworth.html>

High Falls Heritage Area

<http://www.Centerathighfalls.org>

High Falls of Genesee River

<http://www.centerathighfalls.org>

Livingston County, New York

<http://www.fingerlakeswest.com/letchworth.html>

Rochester Museum and Science Center

<http://www.rmsc.org>

Western New York Parks and Nature Centers

<http://www.westernny.com/letch.html>

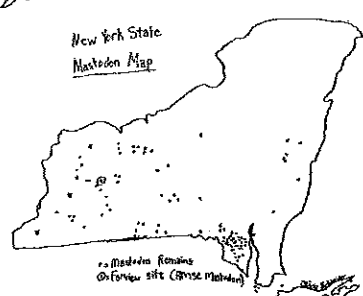
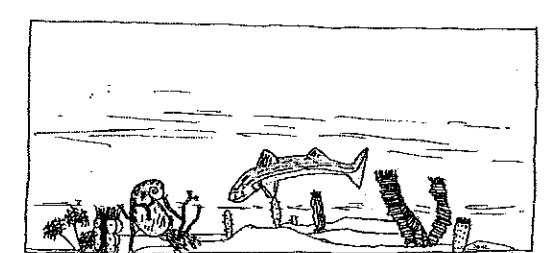
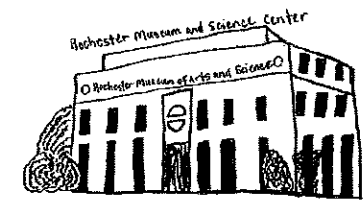
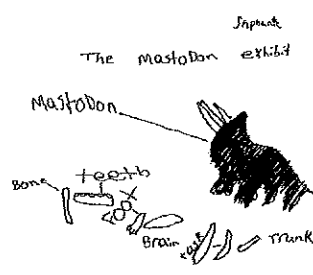
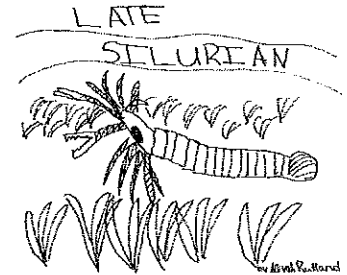
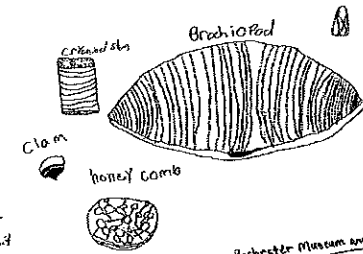
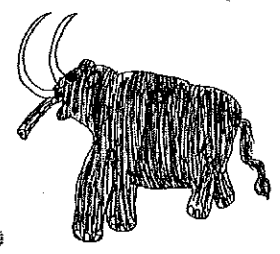
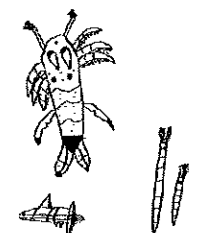
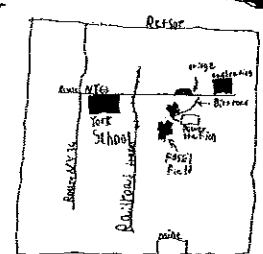
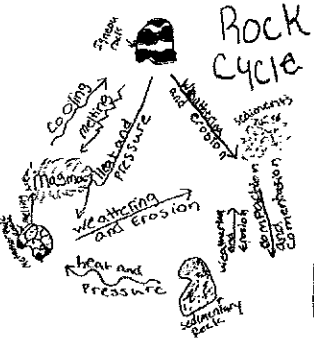
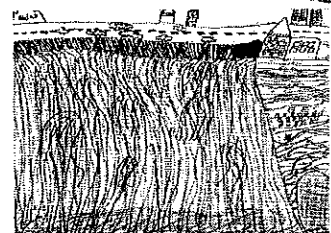
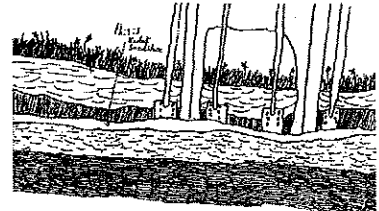
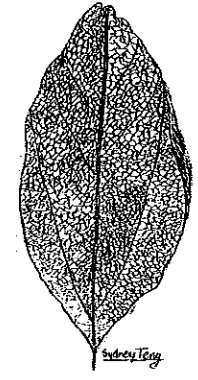
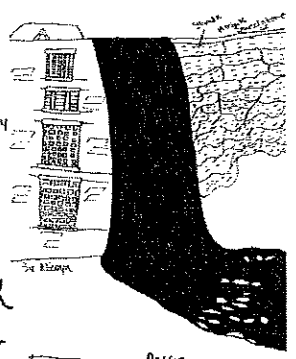
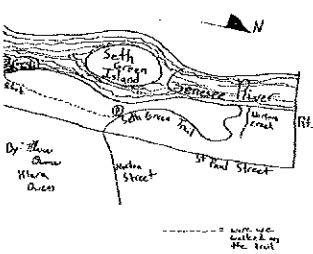
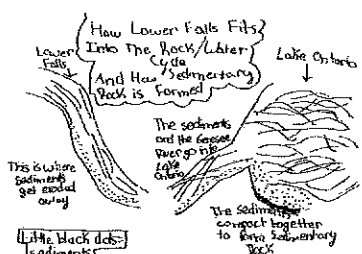
SPEAKERS AND EXHIBITS

Cottrell, Dr. Rory. University of Rochester

McIntosh, Dr. George. Rochester Museum and Science Center, Director of Collections

Petri, Gill. Retired Biology teacher, nature enthusiast

Rochester Museum and Science Center exhibits: Mastodon exhibit; Middle Silurian, Late Silurian, Middle Devonian and Late Devonian exhibits



"The Changing Earth" Expedition 2003