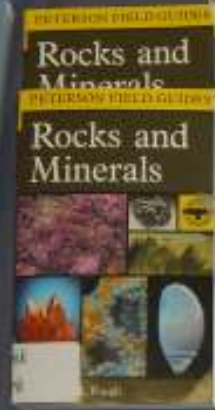


Geology



<u>Item</u>	<u>Number of</u>
<u>Peterson Field Guides: Rocks and Minerals</u>	2
<u>Roadside Geology of Indiana</u>	1
Rock and Mineral Test Kit	10



08.18.2009

Station 7- Geology

Introduction to Indiana Geology

Paleozoic/ Ocean Era

During Paleozoic times, as crustal plates moved, a large part of the continent was submerged under a great inland sea that extended east to the Appalachian Mountains west to the Rocky Mountains. The seas that covered Montgomery County was a bit shallower due to the geologic structure called the Cincinnati Arch (or Dome) that remained above water as a large island.



Diagram of the Cincinnati Arch and relative depths during the shallow ocean era
<http://allencountygeology.indiana.edu/bedrock-geology.html>

Indiana itself lay near the equator. Average temperatures were high and Montgomery County was submerged below a shallow tropical ocean. The seawaters were warm and relatively deep because the animals that form limestone are not found in shallow water. The waters teemed with life such as shellfish, trilobites, brachiopods, corals cephalopods, and sharks. Limestone, shale, and siltstone, all began to form from the decomposing creatures' calcium shells.

One creature in particular has brought fame and fortune to Montgomery County. The crinoids were sea animals related to starfish.. These sea echinoderms flourished during the Mississippian Era, which is the third period of the Paleozoic Era. The Mississippian began about 35 million years ago and lasted about 20 million years. After the Mississippian, crinoids rapidly declined from 63 species to 6. The crinoids were buried under thousands of layers of rock that Sugar Creek has eroded away over the years.



Crinoid found in Montgomery County

Called a sea lily, it consisted of a head to which food gathering arms were attached, a stem, and a plant-like root. The only purpose of the root was to anchor the creatures to the sea floor. It ate microscopic organisms gathered from the water by the arms and worked down to the mouths. Some stems attained great lengths- 30 feet or more.

Crinoid species from Montgomery County are housed at Harvard University, Carnegie-Melon, Yale University, University of Chicago, United States National Museum, Cambridge University in England, Smithsonian Institute, Indiana State Museum, Copenhagen, Stockholm, and our local Crawfordsville District Library.

Glaciers/ Ice Age

The Great Ice Age featured enormous ice sheets that came south like huge bulldozers moving tons and tons of rock, gravel, and clay in front of them that reached parts of Indiana. The last one, called the Wisconsin Glacier, came south about 20,000 years ago. The Wisconsin Glacier's leading edge reached below Montgomery County about ½ way into Putnam County. There, it dropped its load of rocks, boulders, sand and seeds.



Map of the area covered by the Wisconsin Glacier

<http://astuteblogger.blogspot.com/2007/04/long-island-was-formed-by-glaciation.html>

The Ice Age ended in Indiana about 10,000 years ago. Average climates warmed and the weather turned warm and dry causing desert like conditions south of the moraine, which is material at the edge of the ice, and melting of the glacier began. Melting ice ran through the uneven area left by the glacier cutting channels wherever possible.

As more ice melted, a lake was formed covering the northern third of the county. Harney's Lake, a prehistoric lake, probably fed Sugar Creek at one time. The waters of this lake began to cut waterways through the moraine and this runoff formed Sugar Creek. Waters of the lake gradually receded and the marshy lake bottom was exposed. Here, swamp grasses grew and over the years their annual deposit of humus accumulated to form new soil called black muck. Several hundred years later, the weather changed again, becoming warm and moist, which allowed trees to grow and prairies to flourish. Their decomposing leaves and grasses allowed more soils to develop. That soil now nurtures crops of corn, soybeans, alfalfa, clover, and some of the finest hardwoods in the world. Montgomery County is part of the Corn Belt that stretches from Nebraska to Ohio, Minnesota to Missouri. Corn Belt crops are used internationally to feed people and locally to feed livestock such as cattle and swine.

It took thousands of years for Sugar Creek and its tributaries to cut their paths that still change every year. Other creeks, tributaries, and swamps created Potato Creek, Big and Little Raccoon Creek,

Lye Creek, and Black Creek Swamps. Wearing evenly through bedrock, Sugar Creek built Turkey Run, Pine Hills and Shades State Park.

Rocks form the hard solid crust of the earth. Geologists attempt to trace the history of rock formations. They are divided up into three main classifications; igneous, metamorphic, and sedimentary. Geologists classify rocks and minerals by using physical properties such as shape, hardness, color, luster, magnetism, and density to identify and classify rocks.

The rock in Indiana and the Midwest are mostly sedimentary ranging in size from pebbles to boulders and including sand and gravel which have been reduced in size by water, wind, and glaciers. Sedimentary rock is made from parts of older rocks combined with organic materials from the remains of plants and animals who long ago lived in tropical seas that covered southern Indiana. The sedimentary rocks- limestone, sandstone, shale and dolomite, rest on ancient igneous and metamorphic rocks. Each layer represents a different period of geologic time. Igneous rocks were brought to Indiana by glaciers. Metamorphic rocks were changed through time and pressure to other rock forms. Slate and marble are good examples of this. Rocks are essential to our lives for such things as soil formation and construction materials.

Activity suggestions before visiting the Nature Park

- Practice using the rock and mineral test kits
- Study the rock cycle
- Invite a rock collector or geologist to the classroom to discuss rocks and minerals

Activity suggestions during your visit to the Nature Park

- Find rocks, minerals, and fossils and identify them using the rocks and minerals tests and field guides
- Study the landforms in the area
- Determine if Sugar Creek is an old, mature or new stream based on its characteristics
- Find and catalogue crinoids in the Nature Park. Photograph and leave them in their approximate place for others to find

Activity suggestions after visiting the Nature Park

- Create a presentation on crinoids
 - Description
 - How the rock was formed/Age of fossil
 - Two interesting facts
- Choose a specific rock or mineral and create a presentation that must include:
 - Name
 - Type of rock—metamorphic, sedimentary, or igneous
 - Description
 - Picture
 - How the rock was formed/Age of fossil
 - Two interesting facts
 - Sources where the public can find more information
- Create a final, large project presentation outlining the entire Sugar Creek Nature Park with these characteristics
 - Structure and stratigraphy
 - Geologic timeline
 - Incorporate data to complete a rock and fossil inventory
 - Use the rock cycle to explain the geology of the Sugar Creek area
 - Research how erosion and sedimentation have effected the creek bed

Resources in the travelling trunk

- Geology in Indiana
- 2 Peterson Guide to Rocks and Minerals
- 10 Rock and Mineral Testing Kits

On-line References

Historical Area at the Public Library

Common Rock, Minerals and Fossils found in Indiana,
<https://scholarworks.iu.edu/dspace/bitstream/2022/234/1/C03.pdf>

Indiana State Museum, <http://igs.indiana.edu/Geology/structure/bedrockgeology/index.cfm>

Geology, <http://igs.indiana.edu/Geology/index.cfm>

Tectonic Features of Indiana, <http://igs.indiana.edu/Geology/structure/tectonicfeatures/index.cfm>

Landscapes of Indiana, <http://igs.indiana.edu/Geology/topo/landscapes/index.cfm>

Igneous, Sedimentary, and Metamorphic Rocks,
http://www.classzone.com/books/earth_science/terc/content/investigations/es0602/es0602page01.cfm

Indiana Geography and Geology Facts,
http://www.geology.iupui.edu/Resources/Students/Geology_Resources/indiana_geology_facts.htm

Indiana Geology - Map of Indiana, <http://geology.com/states/indiana.shtml>