Geological Walk Through Time: A New Exhibit for 21st Century State Science Standards

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Project Background

- Began 2007 w/ Friends of Ohio Governor's Residence & Heritage Gardens, Hope Taft
- Tell story of Ohio landscape & how it formed
- Key ideas from focus groups & students

Project Background
(cont'd)

- Over 5 years planning by:
  - Educators
  - Natural resource agencies
  - Mineral industries
  - Geotechnical firms
  - Architects
  - Citizens
- Financed through private donations of money & materials

Original architect's concept drawings

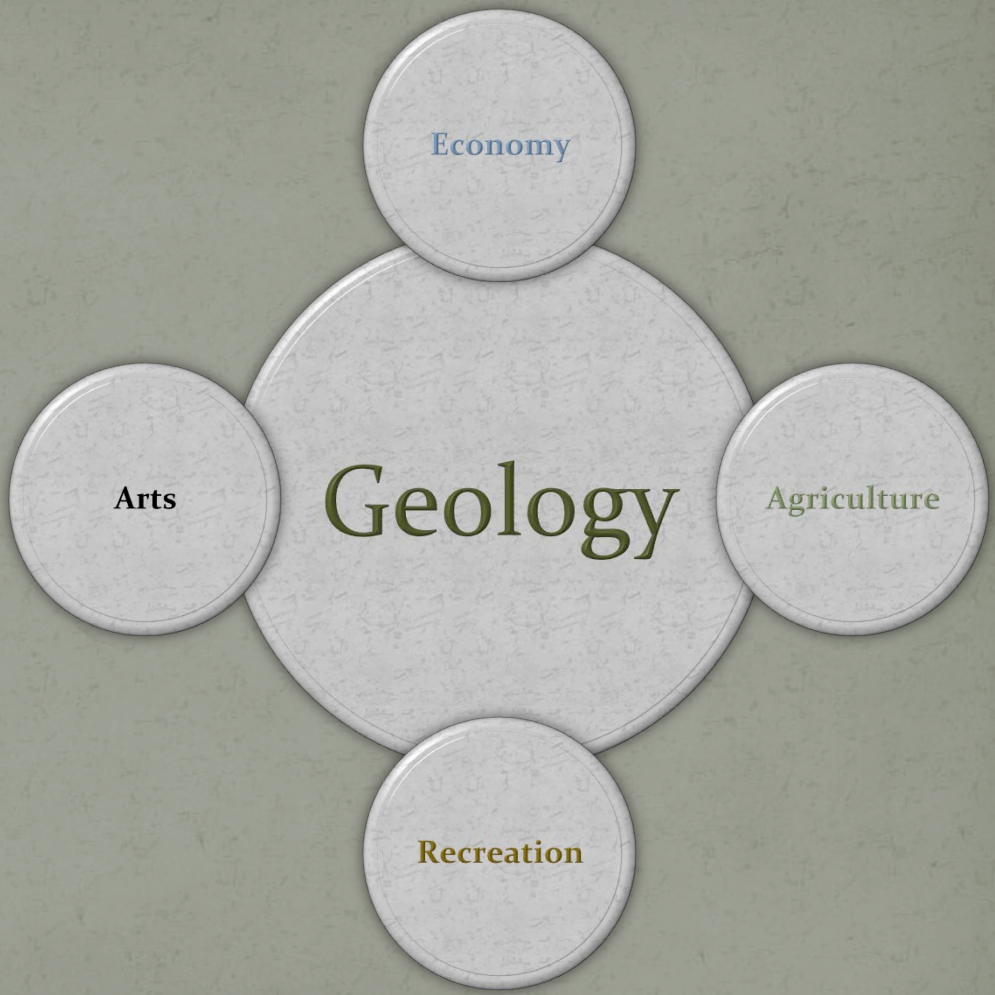
Project Background
(cont'd)

- 2010 – Governor John Kasich elected; all planned work at mansion suspended
- 2011 – Decision to install at Natural Resources Park at Ohio State Fairgrounds:
  - Open in time for Survey's 175th Anniversary
- 2012 – GeoWalk dedicated & opens during Ohio State Fair

Opening day & dedication of Geo Walk

Project Goals

- Environmental education about Ohio geology:
  - Geologic history
  - Earth science concepts
  - Connect to economy, agriculture, recreation, & arts
- Hands-on learning & critical-thinking opportunities
- Demonstrate "what's beneath your feet"

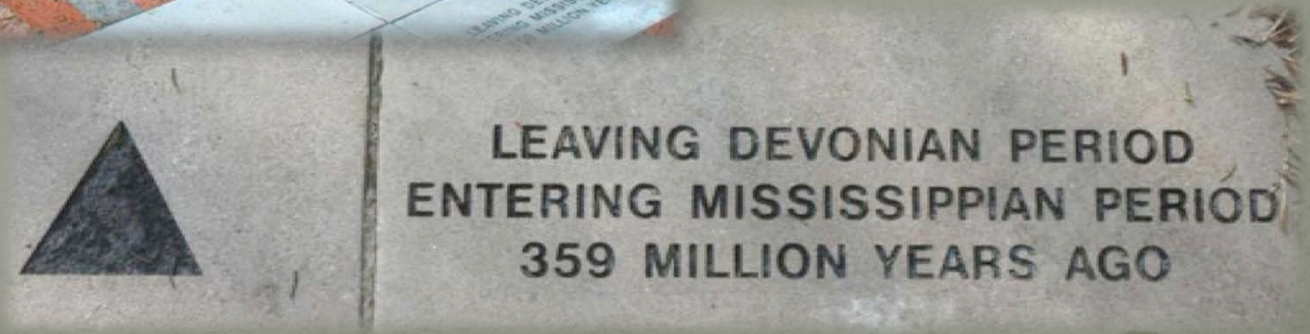


Project Features

- Nearly 300-ft long walkway:
  - Interactive timeline
  - Large specimens from each period
  - Signage for each geologic period
- Geologic map of Ohio
- Folded brochure
- ADA accessible

Project Features: Interactive Timeline

- 1 ft = 1 million yrs of Earth time
- Marker stones show periods beginning & ending
- Printed brochure



Project Features: Specimen Stones

- Large specimen stones & signage for each geologic period
- Visitors can get up close to touch & examine

Various rock types:

- Sedimentary, metamorphic
- Sandstones, limestones, flint
- Industrial minerals
- Erratics

Project Features:
Geologic Map of Ohio

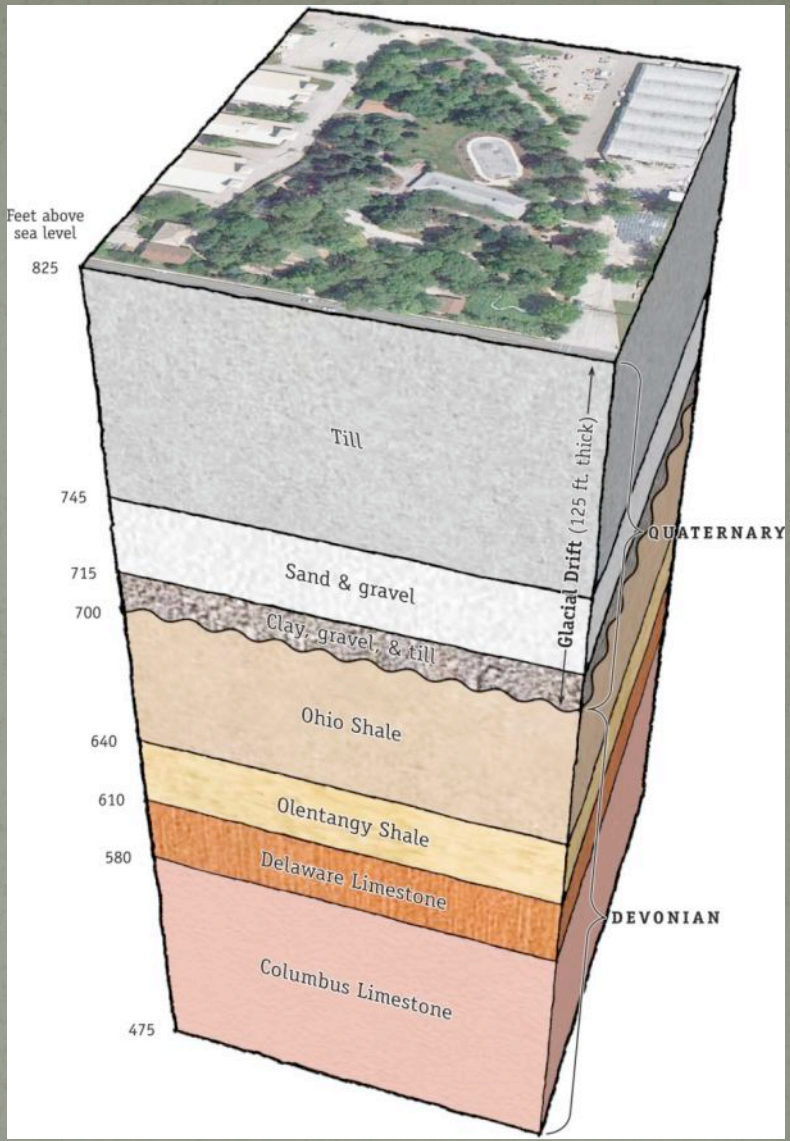
- World's largest bedrock geologic map (24.5 x 27 ft)
- Glacial boundary shown

Project Features: Geologic Map of Ohio (cont'd)

- All 88 Ohio counties represented
- Posted URLs for smart phone users

Project Features: Interpretation

- Signage explains “what’s beneath your feet”
- Guided tours led by experienced geologists



Geology beneath the Ohio State Fairgrounds Natural Resources Park

Ohio's New State Science Standards

..."a basis for what all students should know and be able to do in order to become scientifically literate citizens equipped with knowledge and skills for the 21st century workforce and higher education."

Ohio Dept. of Education, 2011

Highlights:

- More rigorous & demanding of young learners
- Earth science standards expanded
- Greater emphasis on climate change, evolution
- Standards & model curriculum entirely Web-based
- Extensive resources (links) provided
- Fully in use by 2014–2015

Ohio's New State Science Standards (cont'd)

Standards & model curriculum provide a framework; curriculum is a local responsibility

- Goals – Emphasis on engagement:
  - Excitement, interest & motivation to learn
  - Use scientific method
  - Science as a way of knowing
  - Use scientific language & tools
  - Develop a science "identity"
- Emphasis on 21st century skills:
  - Creativity & innovation
  - Critical thinking, problem solving & communication
  - Information, media & technological literacy
  - Personal productivity, accountability, & leadership
  - Interdisciplinary, project-based, real-world learning opportunities

Ohio's New State Science Standards (cont'd)

Earth Science Topics, Pre-K–8

- Pre-K: Observations of Nature
- K: Daily & Seasonal Changes
- 1: Sun, Energy, & Weather
- 2: The Atmosphere
- 3: Earth's Resources
- 4: Earth's Surface
- 5: Cycles & Patterns in the Solar System
- 6: Rocks, Minerals, & Soil
- 7: Cycles & Patterns of Earth & the Moon
- 8: Physical Earth

Earth Science Topics, 9–12

- Physical Geology:
  - Minerals
  - Igneous, Metamorphic & Sedimentary Rocks
  - Earth's History
  - Plate Tectonics
  - Earth's Resources
  - Glacial Geology

Helping Meet Ohio's New State Science Standards

Using Ohio Geological Survey educational materials:

- *E.g.*: Rocks & Minerals
  - Grades: Pre-K*, 3, 6
- *E.g.*: Landforms & Physical Change
  - Grades: 4, 8
- *E.g.*: Geologic (Rock & Fossil) Records
  - Grades: 4, 6, 8–12

Division Of Geological Survey
HANDS ON EARTH SCIENCE No. 11

IS IT A ROCK OR A MINERAL?
by Sherry L. Weisgarber

Kids love rocks and minerals. However, many kids (and adults!) do not know the difference between a rock and a mineral. This activity is designed to train K-5 young scientists to observe and classify while learning how to tell the difference between a rock and a mineral.

What is a mineral? A material must fit the following four general criteria to be called a mineral:

1. Minerals are inorganic, meaning they typically do not form from the remains of plants or animals.
2. Minerals are naturally occurring. True minerals are not manmade.
3. Minerals have the same chemical makeup wherever they are found. For example, the mineral quartz always consists of one part silicon (an element) to two parts oxygen (another element). Some minerals, like gold, copper, and sulfur, are made up of only one element. However, most minerals are combinations of several different elements.
4. Minerals have specific repeating patterns of atoms. This orderly arrangement of atoms forms the mineral's characteristic crystal shape. For example, a crystal of quartz is always hexagonal because of the way the atoms of silicon and oxygen join together. However, if a quartz crystal does not have much ... to grow, it may not look hexagonal on the outside, even though the atoms on the inside are ar- ... orderly pattern.

... are the building blocks of rocks. A rock is made up of one or more minerals.
... categories depending on how they form:
... either deep within the Earth (for example, granite),
... example, pumice).
... accumulation and compaction
... water, wind, or ice)
... (for example,
... morphic—are
... and pressure
... marbles and
... rocks and miner-
... homogeneous (the
... interior and exterior
... because of this homo-
... rocks are made up of
... observe and classify some
... choose bags of the following
... the "mineral" list. The more
..., Nestle's Buncha Crunch™,
... includes: Hershey Kisses™,
... activity assumes that none of

... ESOURCES

* Not present in 2002 standards.

Helping Meet Ohio's New State Science Standards (cont'd)

Tailoring activities to the grade level and standards:

- Social Studies
  - Role of natural resources in prehistory & history
- Environmental Science
  - Geohazards
- Biology
  - Ancient animal & plant life
- Physics

OHIO GEOLOGY

GEOFACTS No. 6

OHIO DEPARTMENT OF NATURAL RESOURCES • DIVISION OF GEOLOGICAL SURVEY

ISOTELUS: OHIO'S STATE FOSSIL

On June 20, 1985, Ohio House Bill 145 designated the trilobite genus *Isotelus* as the official state invertebrate fossil of Ohio. With the signing of this bill, *Isotelus* joined Ohio's other official state symbols, which include the ladybug (insect), red carnation (flower), flint (gemstone), cardinal (bird), white-tail deer (animal), tomato juice (beverage), and of course, the state tree, the buckeye.

HOW *ISOTELUS* WAS CHOSEN AS THE STATE FOSSIL OF OHIO

Ohio has long been known worldwide for the abundant and well-preserved fossils collected throughout the state. Individuals involved in geologically related activities in Ohio, either as professionals or hobbyists, had long thought that Ohio should have an official state fossil. This idea finally became a reality largely through the efforts of two Dayton, Ohio, area elementary school classes, Doris Swabb's third graders at Beavertown School in Kettering and Virginia Evers' fourth graders at St. Anthony School in Dayton.

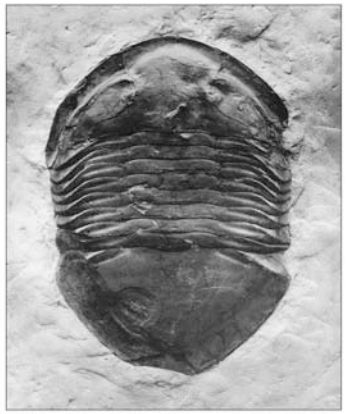
After visiting the Dayton Museum of Natural History (now known as the Boonschoft Museum of Discovery) and viewing a cast of the famous Huffman Dam specimen of *Isotelus*, the students and teachers came up with the idea of trying to have the Huffman Dam trilobite designated as the official state fossil of Ohio. The students wrote letters to Representatives Robert L. Corbin and Robert E. Hickey of Dayton, who agreed to sponsor legislation in the Ohio House of Representatives to make the Huffman Dam *Isotelus* the official state fossil. Senator Charles Horn of Dayton agreed to do the same in the Ohio Senate.

The proposal for a state fossil received widespread publicity in newspapers and on television. Support for the idea came from various geologic interest groups throughout the state. Rather than naming only one specimen as the state fossil, the bill, which was drafted with technical assistance from the Division of Geological Survey, actually designated the trilobite genus *Isotelus* as the

the pill bug or armadillo of today, thereby enclosing their legs and softer underside within their hard outer exoskeleton.

ISOTELUS AND ITS HISTORY IN OHIO

Isotelus has had a long and illustrious history in Ohio, in terms of both geologic time and scientific study. *Isotelus* is known from rocks of Ordovician age, about 488 to 443 million years ago. In southwestern Ohio, only rocks of Late Ordovician age (455 to 443 million years ago) are exposed. These rocks consist of about 820 feet of comparatively thin, alternating layers of limestones and shales. These beds were deposited as limy mud and clay on the floor of a warm, shallow, tropical sea that covered Ohio during the Ordovician.



Specimen of Isotelus *collected from Huffman Dam, near Dayton, in 1919.*

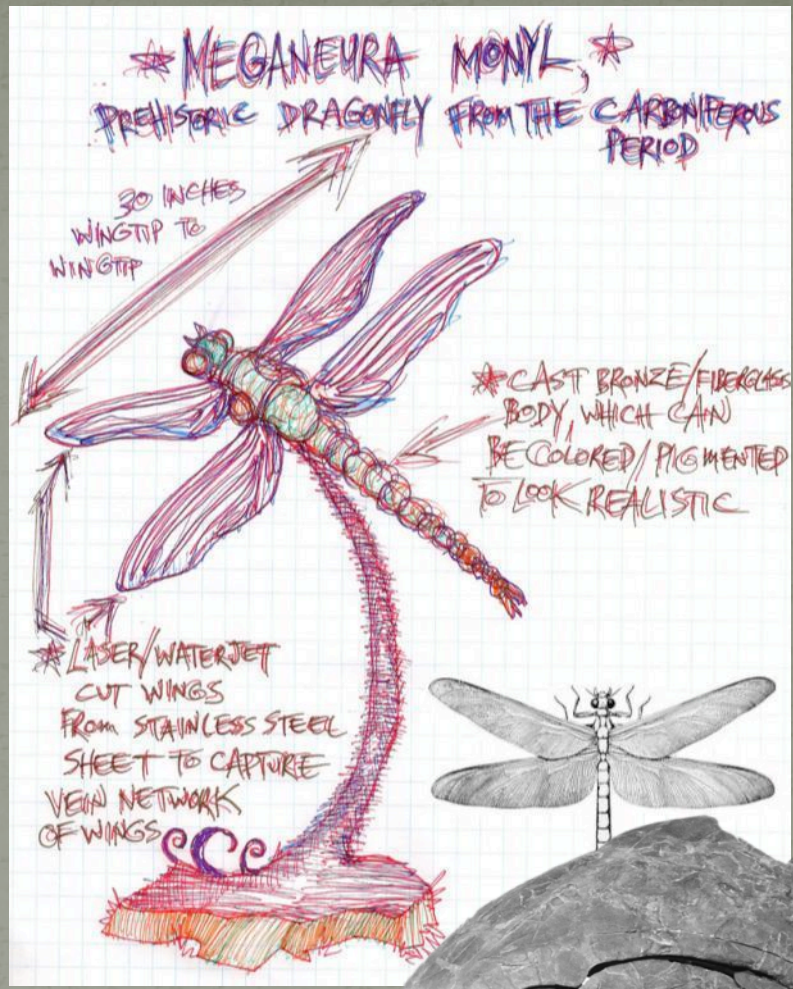
The first serious study of Ohio's Ordovician rocks was undertaken by the first Geological Survey of Ohio in 1837-1838. At this time John Locke mapped portions of the southwestern corner of the state. Among Locke's many discoveries were partial remains of a large specimen of *Isotelus*. Because of its size, Locke named the trilobite *Isotelus maximus*. He later changed the name to *Isotelus megistos*, but today *I. maximus* is the accepted species name. Locke collected only the pygidium (tail) of the trilobite but, by proportional comparison, he estimated that the complete trilobite would have been about 21 inches in length.

Challenges & Limitations

- Untested (new for 2013)
- Seasonal restrictions:
  - Weather
  - Academic calendar
  - State fair
  - Other EXPO events
- Volunteer dependent—geologists wanted!
- Missing elements?
- Funding

Future Additions & Improvements

- Plants reflecting Ohio's ancient landscape
- Improved Web presence
- Activity sheets for students
- Additional rock specimens:
  - Concretions
  - Fossil plants & animals
  - Core & minerals
- Expanded signage
- Sculptures of Ohio's ancient creatures



Further Information

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References

Ohio Dept. of Education, 2011, Ohio Revised Science Standards and Model Curriculum—Overview: State of Ohio, Department of Education, 10 p., accessed at <http://www.education.ohio.gov/GD/Templates/Pages/ODE/ODEDetail.aspx?Page=3&TopicRelationID=1696&Content=139190>.

OHIO Rocks!™