

# Geologic Timeline Guide Book



GEOLOGIC PERIOD	ERA
<b>Quaternary</b> Recent Pleistocene 1.8 mya	CENOZOIC
<b>Tertiary</b> Pliocene Miocene Oligocene Eocene Paleocene 65 mya	
<b>Cretaceous</b> 145 mya	
<b>Jurassic</b> 200 mya	MESOZOIC
<b>Triassic</b> 250 mya	
<b>Permian</b> 300 mya	
<b>Carboniferous</b> 360 mya	PALEOZOIC
<b>Devonian</b> 415 mya	
<b>Silurian</b> 440 mya	
<b>Ordovician</b> 490 mya	
<b>Cambrian</b> 540 mya	
<b>Precambrian</b>	PRECAMBRIAN

# Imagine a world...

...where change is marked, not by days or weeks, but by centuries and millennia. This is **Geologic Time**, the vast boundaries by which the growth and maturity of the earth is measured. Geologic time is made up of very large units of time, most lasting for many millions of years. Each division in the time scale relates geologic events to one another creating a series of events in the proper sequence. For instance, you will see that dinosaurs came long after trilobites, but long before humans.

Our geologic timeline begins 540 million years ago (MYA). You would need to travel all the way to Brigham County Park – over a mile away on our scale – to reach 4.6 billion years ago (BYA), the estimated time that earth began!

A walk down our geologic timeline will take you on a journey to understand how the earth developed – both above and below ground. Along the way, there are rocks, fossils, plants and other activities which will bring the wonders of geology to you. If you look closely, you'll even see some speleothems from our Cave! So, put on your walking shoes and follow the footprints to discover the wonder of evolution – from trilobites to tyrannosaurs.



## Take a trip through time and walk our line!



### EXAMINE THIS!

The rocks you see on this part of the Geologic Timeline are very old. Those sitting near this first sign are **Precambrian** – that means they formed billions of years ago. Look closely at them and see if you can see individual “grains” in the rock. Rocks are made up of minerals. You can often see the different types of minerals as small grains of various colors.



# PALEOZOIC ERA

## Early Paleozoic Era

The Paleozoic Era is a very important time for Cave of the Mounds because this is when the limestone rock you see in the Cave, and all over the Blue Mounds, formed. You can see the fossilized remains of many of the ancient sea creatures that lived during this time period in the limestone. In fact, the fossilized shell of a squid like creature, the Giant Cephalopod, can be seen on the South Cave ceiling when you are on the tour!

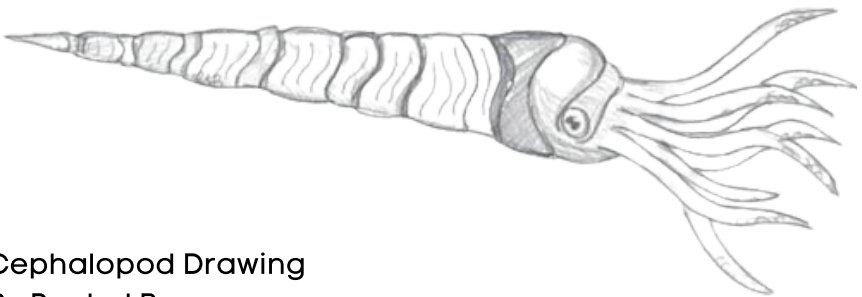
## Late Paleozoic Era

Imagine, you've walked all this way and still haven't left the Paleozoic Era! You can see that the Paleozoic Era covers much of geologic time. In fact, it covers over 250 million years of time during which many "firsts" took place – like the first trees, the first fish, the first coral reefs, the first amphibians and the first insects. Keep going and you'll soon be in the Age of the Dinosaurs!

### WISCONSIN CONNECTION – Paleozoic Bugs



During the Paleozoic Era, giant insects roamed the earth, both in and out of the water. One of these aquatic bugs (arthropods) was the trilobite, a large creature with a hard outer shell made up of many segments. They went extinct before dinosaurs even came into existence, about 250 million years ago. A certain type of trilobite, **Calymene celebra**, is Wisconsin's State Fossil.



Cephalopod Drawing  
By Rachel B

# Geologic Time

## 1.8 MILLION YEARS AGO

During this period of time, giant ice sheets covered all of Wisconsin except for the area you are now in. We call this area the Driftless Area and this is where you find many of the caves in Wisconsin including Cave of the Mounds.

## 145 - 65 MYA

At the end of the Mesozoic era, dinosaurs became extinct. There have been many periods of extinction throughout geologic time. Extinctions are caused by many different factors including volcanic eruptions and meteorite impacts.

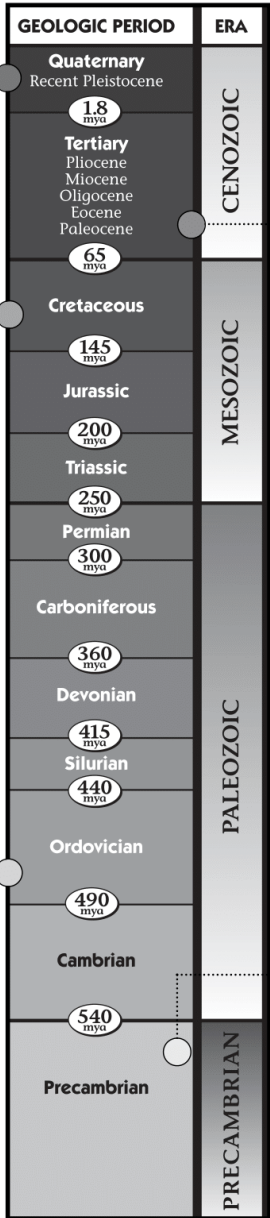
## 540 - 440 MYA

During the Ordovician Period, the rock in Cave of the Mounds began to form at the bottom of the large seas that covered much of the earth at that time. This rock is limestone and forms from the shells of all the creatures that lived in those shallow seas. You can still see the remains of those creatures in the fossils which are evident throughout the Cave.

## EXAMINE THIS!

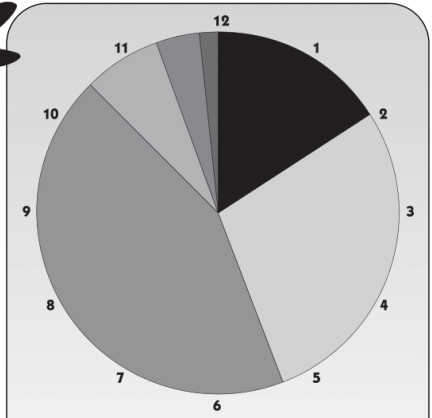
Both plants and animals reached giant proportions during the Mesozoic. Massive ferns and Gymnosperms grew as large as a tree. In our garden near the Mesozoic sign, we have the modern versions of some of these plants. You can see that these plants are much smaller in size than their ancient relatives. If you look closely at the ferns, you may be able to see how they reproduce – by tiny spores on the back of the leaves. Always be careful when handling a plant – they are delicate forms of life!

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<b>Precambrian</b>		



### 65-1.8 MYA

We are living in the Cenozoic Era. It is during this era that humans first appear in the geologic record. It is also the first time flowering plants begin to appear. It is during this era that Cave of the Mounds began to form. Water, from receding glaciers, carved out part of our Cave as it flowed through large underground streams. You can see this erosion on the walls of our Cave.



### CLOCK OF ERAS

1 hour = 375,000,000 years

	Era	Years	Clock Time
■	Hadean	700,000,000	1 hour 52 min.
■	Archaean	1,300,000,000	3 hours 28 min.
■	Proterozoic	1,957,000,000	5 hours 12 min.
■	Paleozoic	295,000,000	47 minutes
■	Mesozoic	183,000,000	29 minutes
■	Cenozoic	65,000,000	10 minutes

### BEFORE 540 MYA

The Precambrian is the largest segment of time on our Geologic Timeline. It lasted for billions of years. During this time, the earth was still forming, and conditions were hostile to life as we know it. However, simple life forms, such as algae began to appear during this time. It would be hard to represent this much time on our time line. In fact, you would have to walk all the way to Brigham County Park – over a mile away on our scale, to walk this far back in time!

**“Take nothing but pictures, leave nothing but footprints, kill nothing but time.”**

— Caver's motto

# Mesozoic Era

## Early Mesozoic Era

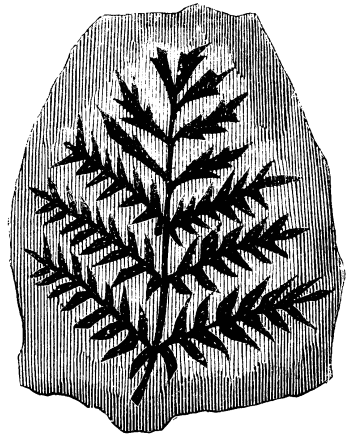
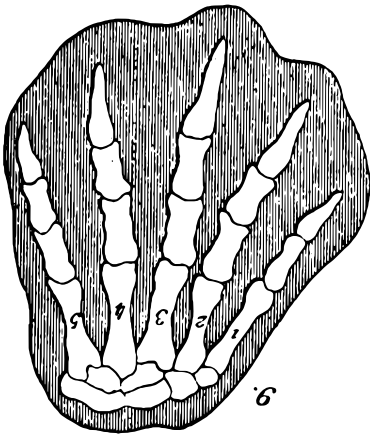
During much of the Mesozoic Era reptiles dominated the land, sea and air. Dinosaurs are the most well-known group from this era and this interval is known as the “Age of Dinosaurs.” Alas, there are no Mesozoic rocks preserved in Wisconsin, so we have little hope of finding dinosaur fossils here.

## Late Mesozoic Era

Another mass extinction occurred at the end of the Cretaceous Period, bringing an end to the dinosaurs and the tropical forests. This extinction, while not as broad and devastating as that at the end of the Permian Period, had the effect of eliminating a way of life that has not been replicated.

### DINOSAUR FOOTPRINTS

Do you see the different types of dinosaur footprints stenciled on the ground? Imagine you are tracking a dinosaur through an ancient forest by following its footprints. Dinosaurs, and other ancient life, can leave very specific prints in rock in the form of **trace fossils**. Trace fossils are evidence of ancient life left in rocks. They are among the most interesting fossils because they reveal the life habits of ancient and often extinct animals and give us clues to ancient environments.



# Cenozoic Era

## Tertiary Period and Pliocene Epoch

During the Cenozoic Era, humans finally appear on the timeline. Fossils of early humans indicate an origin in Africa or Asia. Humans reached North America by a land bridge between Asia and Alaska (the Bering Straits) which formed from lowered sea levels during ice age glaciation.

## Pleistocene Epoch

Sheets of ice up to a mile thick pushed over much of North America during this most recent glaciation, carving out the Great Lakes and dumping vast quantities of sand and gravel to shape the modern landscape of the upper Midwest. As these glaciers melted, glacial water flowed over and under the surface of the earth.

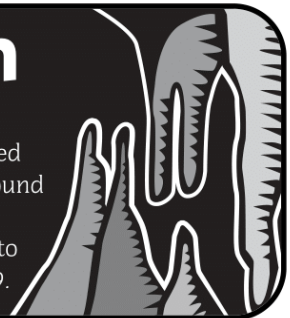
Evidence of water dripping into or flowing through the Cave can be seen throughout the tour. A lower meandering portion of the Cave was formed by the rushing water of an underground stream. A large room filled with formations and pools of water shows signs of chemical erosion. The history of the Cave is truly one of water and stone.

## CAVE DISCOVERY – August 4th, 1939

On August 4th, 1939, the Cave was discovered during a routine quarry blast on the site where you are now standing. Imagine seeing the large hole in the rock that appeared once the dust and smoke settled. Once the workmen decided it was safe, they lowered themselves into the newly blasted out hole and discovered an amazing underground cavern! The formations you see before you came from the blast area in Cave of the Mounds. Take a minute to closely look at and touch the formations. In the Cave, formations such as this are still growing. Touching formations that are still growing can damage them and that is why visitors to the Cave are not allowed to touch any of the formations while on the tour. It is our duty to protect and preserve this Cave for those that will come in future generations.

## Cave Connection

It is difficult to imagine the time it took for the large caverns to be dissolved within rock that is itself believed to be over 500 million years old. This unique underground world lay hidden from view until modern humans appeared and began to excavate the surface. This led to the accidental discovery of the Cave on August 4, 1939.



# Extend Your Learning

Now that you've taken a trip through Geologic Time...

- Take a walk through our perennial, prairie and savanna gardens or hike our woodland and karst trails and witness the beauty of Southwest Wisconsin's Driftless Area.
- Sluice for your own collection of rocks, fossils, minerals and crystals at the Quarry's Edge Gem Mine.
- Check out our Rock Shop! We have a wide variety of rocks, minerals, crystals fossils and souvenirs. You will find a unique item to help you remember your experience at Cave of the Mounds.

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## Travel Green Wisconsin



Wisconsin's conservation history and leadership has a long tradition. Cave of the Mounds National Natural Landmark is proud to continue this tradition of environmental stewardship as a charter member of Travel Green Wisconsin. Through this certification program, we work to continuously improve our environmental footprint by reducing energy, water and waste consumption, encouraging recycling, providing environmental education opportunities and restoring native ecosystems. Among these projects are our Prairie and Oak Savannah Restoration projects, our large Rain Gardens near the upper parking lot, and our Butterfly Gardens throughout the grounds. In addition, we have taken steps to reduce our consumption of energy and water. We have installed a high efficiency wood burner to heat our visitor center with wood from the property. We also avoid watering by planting drought tolerant plants, and we do not water or use any weed killers on our lawn, so please understand if it looks a bit brown in the heat of the summer.

While visiting us today, please help us to care for this special place so that future generations may also appreciate it as we do today.

If you would like more information about Travel Green Wisconsin, please visit [www.travelgreenwisconsin.com](http://www.travelgreenwisconsin.com).

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**“Nature’s peace will flow into you as sunshine flows into trees. The winds will blow their own freshness into you... while cares will drop off like autumn leaves.”** — John Muir

*For more information about Cave of the Mounds & Wisconsin's Driftless Area please contact us at:*



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