LESSON PLAN

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Uncovering Wisconsin's Geologic Past

M. Carol McCartney, Wisconsin Geological and Natural History Survey | 2019

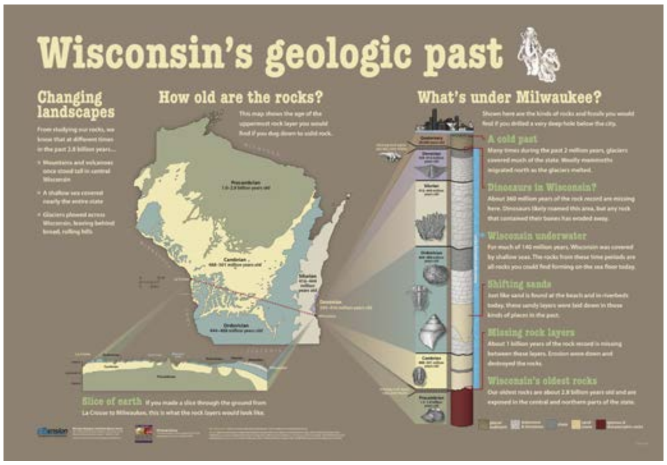

Figure 1. *Wisconsin's Geologic Past* poster. This poster illustrates the distribution of the ages of the rocks of Wisconsin.

Background

At different times in the past 3 billion years, mountains and volcanoes stood tall in Wisconsin, shallow seas covered much of the state, and glaciers plowed across the landscape. Wisconsin's geology includes some of the oldest rocks on the continent (from the Precambrian) and some of its youngest geologic formations (from the Ice Age). *Wisconsin's Geologic Past* poster (fig. 1) provides a simplified map of Wisconsin's rocks and their ages. It also illustrates how the rocks relate to each other in the subsurface in both a slice of earth (geologists call this a cross section) and a core (also called a geologic or stratigraphic column).

Concepts to learn

- Geologists study rocks and rock layers (strata) and they illustrate those layers in columns. Geologic columns are a simple model of the geology in an area. This is also called a stratigraphic column.
- Rock layers are laid down horizontally, so the oldest rocks are on the bottom for undisturbed rock columns.
- It takes time—geologic time—to deposit materials that turn into rocks. Sometimes rocks are eroded instead of being deposited, leaving a space or time-gap in the column.

What you will need

- *Wisconsin's Geologic Past* poster.
- Rock hand samples: four pieces of dolomite, three pieces of sandstone, three pieces of shale and one piece of granite. If you do not have all of these rocks, substitute Wisconsin rock cards.
- Student geologic time sheet (p. 4).
- Roll of 100 squares of toilet paper (or a rope with 100 tape marks or adding machine tape with 100 tick marks)—anything with 100 divisions that you can spread out in your classroom or outdoors.

Activity 1
Build a geologic rock column

Have students divide the rocks and rock cards into four groups using the rock types shown at the bottom right on the poster: (1) dolomite (dolostone) and limestone, (2) shale, (3) sandstone, and (4) granite (igneous) and quartzite (metamorphic).

Match the patterns for each rock type to organize rocks as they are pictured in the geologic column on the poster (fig. 2). Granite and quartzite, the Precambrian igneous and metamorphic rocks, go at the bottom. Build up using sandstone, dolomite, limestone, and shale. Rock cards can substitute for rocks.

Figure 2. The geologic or stratigraphic column from the poster illustrates the rocks beneath Milwaukee.

Questions to consider

We have created a three-dimensional model of the geologic column in the Milwaukee area. Questions to consider are:

- What can you learn from the three-dimensional model that you cannot learn from the poster?
- The column shows where rocks are missing. Does it do a good job of illustrating the gaps?
- Have you ever seen any of these rocks in cliffs or outcrops or roadsides in Wisconsin? Anywhere else?

Explanation

We now have a model of the stratigraphic column—like the one on the poster, but with real Wisconsin rock samples. This shows us the order we might expect to see the rocks if we found them in an outcrop on the side of the road—or if we drilled into the rock near Milwaukee.

Activity 2
Build a rock timeline

The poster tells us that there are missing rock layers and they represent missing time—time when rocks were either not deposited or they were eroded away. These are known as unconformities.

Now we will build a model that includes the time it took to form and erode the layers—to get a sense of the rock timeline. The geologic timeline is so long that it is called "deep time"—like deep space. For a more detailed discussion of deep time lessons go to http://serc.carleton.edu/quantskills/methods/quantlit/DeepTime.html.

What to do

Have students fill in the times on the geologic time sheet. Most of the times are on the *Wisconsin's Geologic Past* poster; some dates may need to be looked up (Wisconsin's statehood, Aztalan civilization).

1. Students should calculate the "Units on a 100 scale" by setting the largest number on our scale as equal to the oldest time. Then, divide all the other times by that oldest time and multiply by the end of our scale (in this case, 100).
2. Have students check their work. (Answer key provided.)
3. To build a scale model, roll out your rope or your 100 squares of toilet paper from a new roll. (This should go to the back of your classroom or, better yet, take it and your students outside for this activity.)
4. Using the numbers calculated from the "Units on a 100 scale" column of the Results sheet, have students count out the appropriate number of squares, spreading rocks between appropriate places along the roll. Granite and quartzite, the Precambrian rock samples, should be placed between 61 and 33 squares of paper (oldest and youngest). All of the sandstone, dolomite, and shale rocks will need to be squeezed between squares 11 and 8.

Note: tell students they're counting backwards in time, from today (0) to Earth's beginning (100). Every square (or mark) represents the same amount of time. How much? Nearly 5 million years.

Questions to consider

We have created a deep-time scale model of the geologic column in the Milwaukee area. Questions to consider are:

- Why do you think we usually DON'T use a scale model for geologic time?
- The time periods are named on the *Wisconsin's Geologic Past* poster. Which is the longest on the poster? Which is the longest in our deep-time scale model?

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3817 Mineral Point Road • Madison, Wisconsin 53705 • wgnhs.org
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Explanation

These activities demonstrate using different kinds of models (three-dimensional and deep time) to represent and understand the relationships among rock layers. Wisconsin has some very old rocks—Precambrian rock that is billions of years old—and Ice Age deposits that are less than 30,000 years old. The timeline lets us see why 30,000 years old is young in geologic time.

For more information contact:

M. Carol McCartney
Wisconsin Geological and Natural History Survey
3817 Mineral Point Road
Madison, WI 53705
608.263.7393
carol.mccartney@uwex.edu

ANSWER SHEET

Geologic time sheet

Event	Years ago	Units (on a scale of 100)*
"Current" events	**0**	**0**
Wisconsin statehood	Today – 1848	0.000
Aztalan culture going strong	1,000	0.000
Ice Age	—	—
Oldest Ice Age deposit in Milwaukee	30,000	0.001
Beginning of Ice Age	2,000,000	0.057
Tropical seas—*Wisconsin underwater*	—	—
Devonian (youngest)	350,000,000	8
Devonian (oldest) / Silurian (youngest)	416,000,000	9
Silurian (oldest) / Ordovician (youngest)	444,000,000	10
Ordovician (oldest) / Cambrian (youngest)	488,000,000	11
Cambrian (oldest)	501,000,000	11
Missing rock layers—*a billion years, gone!*	—	—
Oldest rocks	—	—
Precambrian rock, youngest in Milwaukee	1,500,000,000	33
Precambrian rock, oldest in Wisconsin	2,800,000,000	61
Age of Earth	**4,600,000,000**	**100**

*To calculate units, divide the age of an event by the age of Earth, then multiply by 100.

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Ordovician (oldest) / Cambrian (youngest)		
Cambrian (oldest)		
Missing rock layers—*a billion years, gone!*	—	—
Oldest rocks	—	—
Precambrian rock, youngest in Milwaukee		
Precambrian rock, oldest in Wisconsin		
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