



DISCOVERING *Alabama*

Teacher's Guide

Suggested Curriculum Areas

Science
Geography
Social Studies

Suggested Grade Levels

4–12

Key Concepts

Scientific Hypothesis
& Verification
Catastrophic Events

Key Skills

Map Reading

Wetumpka Impact Crater

Synopsis

Alabama bears the scar of an ancient terrible event, the fall of a giant meteorite near Wetumpka. Because this happened so long ago — near the end of the Age of Dinosaurs — scientists were slow to recognize the eroded four-mile wide crater, or astrobleme, in Elmore County, northeast of Montgomery. *Discovering Alabama* visits this interesting spot, talks to the geologists who discovered it, and interviews scientists who have been studying it.

Update: At the time of this video production, featured scientists were studying geologic samples from the astrobleme, searching for microscopic evidence of “shocked quartz,” uniquely fractured quartz grains that would confirm the meteoric origins of the crater. No other known earthly process, not even volcanos, can shatter the hard grains of quartz present in most rocks. After this video was produced, the scientists found shocked quartz collected in the drill cores from the bottom of the astrobleme — proof positive that the Wetumpka Crater was the result of the impact of a large meteorite.



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#31 Wetumpka Impact Crater © Doug Phillips, 2000

Before Viewing

1. Find Wetumpka on an Alabama highway map. Can you see any trace of the crater? A more detailed map, perhaps the recently published *Alabama Atlas & Gazetteer* or an Elmore County map, may show the crater area better. The astrobleme is immediately east of downtown Wetumpka, but it is hard to see. Point out to the students a large oval of woods east of Wetumpka that most of the main roads go around. Its eroded, indistinct nature is why it went unrecognized as an astrobleme until recently.

2. Find a picture of Meteor Crater, southeast of Flagstaff, Arizona — also called the Barringer Crater or Canyon Diablo Crater. This is a fairly recent crater, only about 40,000 years old. Now that looks like a crater! The reason why the Wetumpka crater doesn't look like the Barringer Crater is because it is about 1650 times older!

While Viewing

Make sure each student has a pencil and paper at hand so they can note key information, questions, and comments that come to mind when viewing the video. For example: Who are the people interviewed in the video? What are their names and where do they work? How does each contribute to this story? Why should we believe them?

After Viewing

1. What would be the effect of a Wetumpka-sized meteorite strike today? Cut a four-inch circular hole in the middle of a piece of paper. Look at the graphic scale at the bottom of an official Alabama highway map: four inches is about 50 miles. This is roughly the diameter of the heat and blast-effect area of the Wetumpka meteorite strike. Move this circle around the map and check out your community!

2. Are you in danger of being struck by a meteorite? Mrs. Anne Hodges of Sylacauga remains the only human being in history known to have been hit. What is truly dangerous? Compare the known and measurable dangers of lightning, tornadoes, earthquakes, and floods. (Note: About 150 people a year are killed by lightning in the U.S.)

Extensions

1. Alabama has three good meteorite stories: the asteroid impact at Wetumpka about 66 million years ago, the 8.5 pound meteorite that hit Mrs. Hodges in 1954, and the great Leonid meteor storm of 1833 — the year “the stars fell on Alabama.” Read about these interesting stories in the *Alabama Heritage Magazine*, see **Additional References and Resources**.

2. Go on a crater hunt. Get a good world atlas or the *National Geographic Atlas of North America*. Eastern Canada is a good place to begin looking because the Ice Age glaciers scraped off most of its soil only a few thousand years ago, and so you can see a number of old craters blasted into the bedrock. The rest of the world is equally cratered, but like Wetumpka, many of them are hard to see.

3. Use a telescope to check out the obvious craters on the moon.

Philosophical Reflections

The Earth seems so permanent and solid beneath our feet. The notion that, with no warning, an awful calamity can come out of the clear blue sky and destroy everything we know is a frightening idea. But we Alabamians live with more frequent and destructive natural disasters such as tornadoes and hurricanes. It is a tribute to the spirit of mankind that, even when faced with uncontrollable disasters, we manage to live and progress as a human society. What systems of belief and reasoning are related to human survival in the face of catastrophic events?

Nature in Art

1. Have the students draw or paint their impressions of the fall of the Wetumpka meteorite and the micro-meteor storm in the dark Alabama countryside in November 1833.

2. The song “Stars Fell on Alabama” was inspired by a book of the same name written in 1934, and it has been recorded over a thousand times. One notable major recording is on Jimmy Buffet’s 1980 album, *Coconut Telegraph*. Try to find other recordings, such as by the great jazz trombonist, Jack Teagarden.

Community Connections

1. This would be a good time to check out your community’s emergency preparedness. Invite the county or city disaster preparedness manager and discover how he or she prepares for disasters. Find out if meteorites are on their list!

2. Many astronomy clubs across our nation are finding it increasingly difficult to locate dark places to view the night sky. “Light pollution” prevents most people from being aware of the glorious night sky. What are some of the main sources of light pollution? Invite a local astronomer to talk to the class about asteroids, comets, and meteorites, and try to arrange an evening field trip to a dark place to watch for micrometeorites. You do not need a fancy telescope. Patience and a dark sky will reveal “shooting stars” almost every evening. Every year, there are a number of meteor shower events, such as the

Perseid around August 12th and the Leonid in mid-November.

Additional References & Resources

• *Stars Fell on Alabama* by Carl Carmer, 1934. The book was reprinted by University of Alabama Press in 1985. The song “Stars Fell on Alabama” by Mitchell Parish and Frank Perkins, was published by the Mills Music Company in 1934, and the sheet music is still in print. “Stars Fell on Alabama” was recorded by Jimmy Buffet and is on his album, *Coconut Telegraph*, recorded in 1980. The song is also on several of his song collection CDs.

• Several articles by John Hall on meteorites are: “The Night the Stars Fell,” *Alabama Heritage Magazine* no. 55 (Winter 2000); “The Wetumpka Astrobleme,” *Alabama Heritage Magazine* no. 42 (Fall 1996); and “Anne Hodges and the Hand of Fate,” *Alabama Heritage Magazine* no. 37 (Summer 1995).

• *The Cryptoexplosive Structure at Wetumpka* by Tony Neathery, Geological Survey of Alabama Reprint Series #44. Order from GSA, Box O, Tuscaloosa AL 35486, or call 205-349-2852. This is the scientific report on the astrobleme by one of its discoverers.

• *Sky Calendar* (good for evening sky watching) is available from Abrams Planetarium, Michigan State University, East Lansing MI 48824. They offer an inexpensive 12-month subscription that every school should receive. The calendar and sky maps are also available each month in *Sky & Telescope* magazine.

• *Alabama Atlas & Gazetteer* by DeLorme Publishing, 1998.

Parting Thoughts

Discovering Alabama is committed to presenting educational programs about the natural wonders of the state. Therefore, some might ask why this video is about such a catastrophic event as an asteroid collision. Our intent is not to breed anxiety about an impending disaster, but to elicit scientific curiosity. This video was produced in conjunction with the first scientific exploration of the subsurface geology of the floor of the Wetumpka structure. Even though this strange place was discovered over a century ago, it wasn’t until the 1970s that discoveries in space allowed a theory as to its formation. Recent geological studies of the crater lend local relevance to space age scientific inquiry.

Oh yeah, I almost forgot. Space age inquiry has also prompted increasing collaboration among theologians and scientists, many of whom are working together to examine questions of order and meaning in the universe. Meanwhile, let us Alabamians celebrate the remarkable natural wonders that help make our state so uniquely blessed in contrast to the stark and lifeless extremes found elsewhere in the universe.

Happy outings,

Dr. Doug





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Activity/Information Sheet

Wetumpka Impact Crater

More Facts

While asteroids, meteoroids, and comets are all debris resulting from the formation of the Solar System, there are differences between them. Asteroids are large rocky bodies, some several hundred miles in diameter, which inhabit the asteroid belt that lies between the orbits of Mars and Jupiter. Meteoroids are smaller chunks of rocks ranging in size from tiny dust particles to several miles wide. If a meteoroid enters the Earth's atmosphere, it is heated to a glowing streak of light—a falling or shooting star—by friction, and it becomes a meteor. While most meteors never reach the Earth's surface, ones that do are called meteorites. Meteor showers occur when the Earth passes through the trail of particles left by a comet. Comets are made up of frozen gases and dust. As they come closer to the Sun, their surfaces begin to vaporize, producing the visible tail.

Until recently, few people believed that large meteorites ever struck the Earth. However, with the rise of space

exploration in the 1960s, it became obvious that every hard surface in the solar system was heavily cratered. So why not us? Well, the atmosphere does protect us from the small stuff, but not the Wetumpka-sized chunks. The sea that covers 70% of the Earth hides a lot of craters, and the active weather and mobile crust of the Earth covers and destroys many older craters. Still, the closer scientists look, the more craters they find.

Some craters, like the Barringer Crater in Arizona are geologically recent (ca. 40,000 years ago) and look like craters, but others, like Wetumpka, are so worn and eroded that they were harder to identify and verify. In the Arctic regions of Canada and Russia, glaciers have scraped the bedrock clean revealing many craters blasted into the rocks in days gone by. Some, like the one in eastern Hudson's Bay and the Gulf of St. Lawrence are huge!

Making Craters

A rule of thumb is that a meteorite crater is 20 times larger than the meteorite that made it. For example, the Barringer Crater is 4,000 feet across. By dividing that by twenty, you get a 200-foot wide meteorite. The size of the Wetumpka meteorite can be determined by knowing that its crater is about 20,000 feet—about 4 miles—across.

Space objects commonly travel at enormous speeds, about 25 miles per second; this is called "hypervelocity." The fastest bullet fails to travel even one mile per second. A meteorite traveling at hypervelocity penetrates the atmosphere and surface rocks before slowing down, whereupon its energy instantly converts to heat and light, causing a great explosion. This explosion has almost every character-

istic of an enormous hydrogen bomb—blast, heat, bright light, and destructive effects—miles from the impact. In fact, it worries some in the military and in science that an event like the impact of a large meteorite might be mistaken for an act of aggression, thereby touching off an atomic war before anyone could note that no radiation was released from the explosion.

The "Dinosaur Killer"

On a geologic time scale, some really large meteorites occasionally fall. So powerful are these explosive events that they fill the atmosphere with dust, preventing the sun from reaching the plants on the earth's surface. As a result, plants and the animals that feed on them die in what is called an "extinction event." It now appears that the occasional periods of extinction, so clearly indicated in the fossil record, may be due to such meteorite impacts.

The most famous of these events was the sudden extinction of the dinosaurs and most of the other species of plants and animals on Earth at the end of the Mesozoic Era, about 66 million years ago. The dinosaurs, the dominant vertebrates on Earth for more than 100 million years, vanished abruptly, leaving behind their resilient relatives, the smaller birds and mammals.

This "Dinosaur Killer" created an enormous crater in Mexico where Yucatan is now. The crater is not visible because it is completely filled with limestone and forms the Yucatan Peninsula. Drilling and careful chemical analyses have confirmed that this is the spot. If the diameter of the crater is 150 miles, how large was the Dinosaur Killer?