



Kentucky Geological Survey  
University of Kentucky, Lexington

# Meteorites

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Fact Sheet No. 06

**General Information:** Our planet has many neighbors in space. In addition to other planets and moons, there are many smaller objects, from minute dust particles to asteroids many miles in diameter, and occasional visitors such as comets. When these interplanetary particles (meteoroids) enter our atmosphere they are called “shooting stars” or meteors.

Meteors are heated by friction to the point of evaporation, usually at heights between 60 and 120 kilometers above the earth’s surface. As the meteor melts, high-speed collisions between atoms from the meteor and atoms in our atmosphere generate light and radio signals. If the meteor is very small, it is detected only by its radio signal. If it is large enough and occurs at night, it is made visible by the glowing trail it leaves. Meteors can be very bright (brighter than Venus) and may leave a persistent glowing trail or “train.” These fireballs or bolides may explode into smaller fragments.

Sometimes a meteor is large enough to completely pass through the atmosphere and hit the earth; then it is called a meteorite. Fireballs are rare, and by carefully observing their paths, you may be able to recover the resulting meteorites. Some scholars suggest that a very large meteorite impact can cause global climate change. Some scientists believe the extinction of dinosaurs was caused by a huge meteorite impact.

Typical visible meteors are about the size of a small pea and hit the atmosphere at 18 kilometers per second (about 11 miles per second). The average angle of entry into the earth’s atmosphere is 45°.

A meteorite impact usually forms a roughly circular crater, called an astrobleme, and can crack the earth’s crust in a characteristic circular pattern. Astroblemes may show a “rebound structure” where a central core of rock has been brought up from deeper underground by the impact.

## Meteorites in Kentucky:

Numerous Kentucky meteorites are on display at the Kentucky Geological Survey. The collection was donated by William Ehmann, a retired chemistry professor at the University of Kentucky.

*Bath County, 1902:* On the night of November 15, 1902, a meteor was observed from the Gulf of Mexico to Ohio. Its path suggested that the Knobs region of Bath County, in eastern Kentucky, was the impact site. A meteorite was recovered that weighed 6 kilograms (13 pounds). In 1903, the main mass of this meteorite was found, an 82 kilogram (181 pound) mass of iron.

*McCreary and Pulaski Counties, 1919:* A meteor was observed over Tennessee and Kentucky on the night of April 9, 1919. The meteor produced a sound heard from Tennessee to Lexington, Ky. One fragment was discovered at Sawyer, near Cumberland Falls in southeastern Kentucky. It weighed 24.5 kilograms (54 pounds).

**Astroblemes:** Three sites in Kentucky bear the scars of ancient impacts by meteorites: the Jephtha Knob in Shelby County, a site near Versailles in Woodford County, and a site near Middlesboro in Bell County (Fig. 1). These Kentucky astroblemes represent the highly eroded cores that were situated under the original cra-

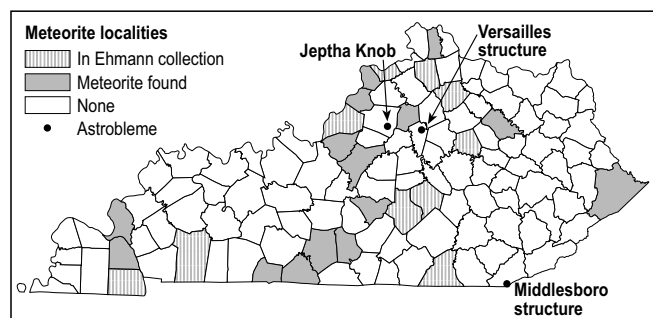


Figure 1. Astroblemes and meteorite localities in Kentucky.



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ters; the crater walls eroded long ago. Each of these structures is characterized by a circular belt of arc-shaped faults cross cut by faults radiating outward from the central core of intensely broken rock. In the past, these structures were referred to as “cryptoexplosive” because their origin was uncertain.

These features provide clues to help us understand the history of Earth and our solar system. In addition, they may contain oil or natural gas; the fractured and broken rocks of the structure form excellent traps. Oil companies have estimated that the Middlesboro structure may contain as much as 16 million barrels of oil.

*Jeptha Knob:* Jeptha Knob (Fig. 2) is located in Shelby County in north-central Kentucky and can be observed on the Shelbyville and Waddy geologic quadrangle maps (1:24,000 scale). This nearly 3-mile-diameter group of hills is visible just north of Interstate Highway 64. It contrasts sharply with the surrounding rolling farm land and is the geologic remnant of the uplifted rebound structure in the center of the crater. Geologists think the structure was formed around 425 million years ago.

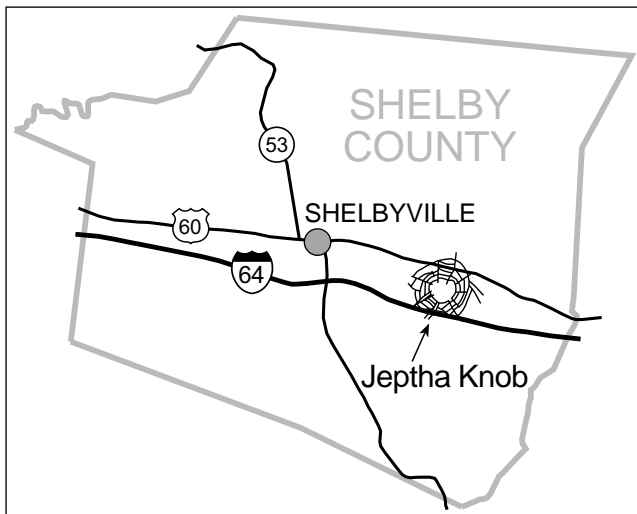


Figure 2. Jeptha Knob, Shelby County, Kentucky.

*Versailles structure:* The Versailles structure (Fig. 3), approximately 1 mile in diameter, is located along Big Sink Road in Woodford County, central Kentucky (see the Versailles geologic quadrangle map). This circular depression was for years thought to be a large sinkhole, but detailed mapping revealed a telltale belt of circular and radial faults. The Versailles structure was formed sometime after the close of the Ordovician Period, 440 million years ago.

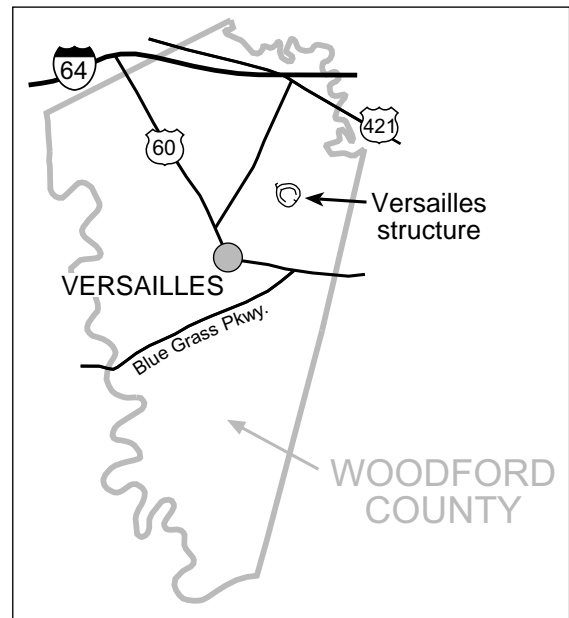


Figure 3. The Versailles structure, Woodford County.

*Middlesboro structure:* The Middlesboro structure (Fig. 4) is a circular depression nearly 4 miles in diameter. Middlesboro is probably the only town in North America that lies in an astrobleme. The structure was probably caused by the impact of an object about 500 meters (1,640 feet) in diameter. Located in Bell County, southeastern Kentucky (see the Kayjay, Fork Ridge, Middlesboro North, and Middlesboro South geologic quadrangle maps), the structure is thought to be 300 million years old.

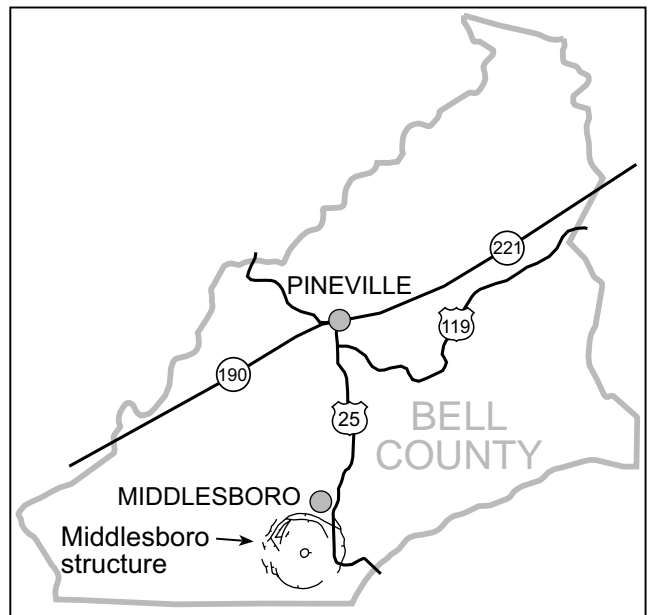


Figure 4. The Middlesboro structure, Bell County. The city of Middlesboro is actually in the center of the structure, but is shown offset on this map for clarity.