Meteorites

Kentucky Geological Survey

FACT SHEET

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 inter-planetary 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 23 and 46 miles 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 11 miles per second.

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 KGS. 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 Bath County in eastern Kentucky was the impact site. A 13-pound meteorite was recovered. In 1903, the main mass of this meteorite was found, a 181-pound mass of iron.

McCreary and Pulaski Counties, 1919: A meteor observed over Tennessee and Kentucky on the night of April 9, 1919, produced a sound heard from Tennessee to Lexington, Ky. One fragment discovered near Cumberland Falls in southeastern Kentucky weighed 54 pounds.

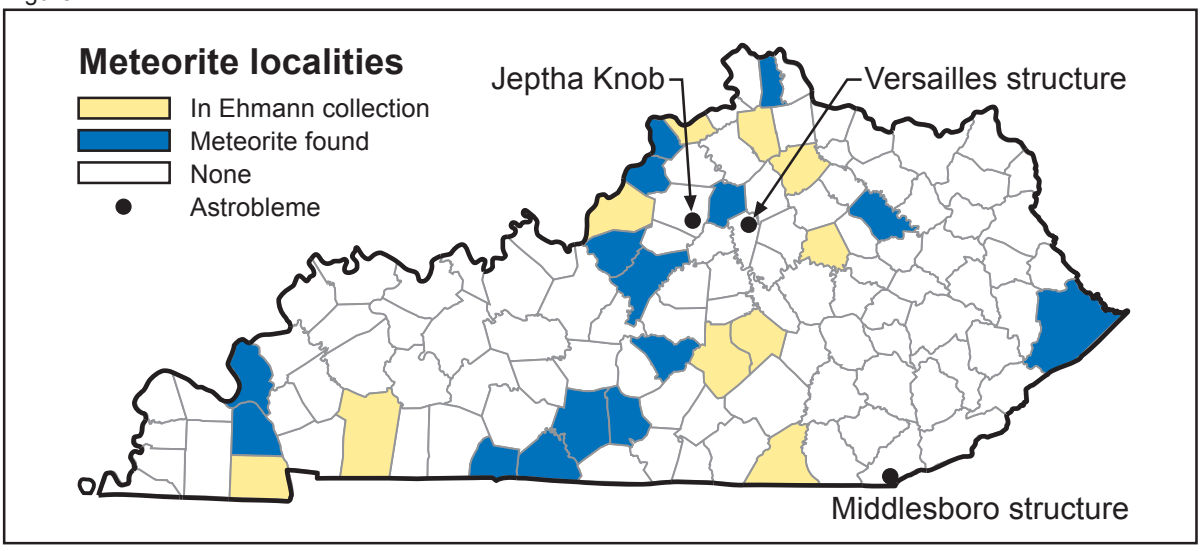
Murray, Calloway County, 1950: This meteorite fell on the night of September 20, 1953, and about 28 pounds of stones was recovered 9 miles east of Murray. This unusual specimen was a very organic- and gas-rich carbonaceous chondrite (a stony meteorite with small, rounded embedded particles).

Astroblemes

Three sites in Kentucky bear the scars of ancient impacts by meteorites (Fig. 1). These Kentucky astroblemes represent the highly eroded cores that were situated under the original craters; the crater walls eroded long ago. Each of these structures is characterized by a circular belt of arc-shaped faults crosscut by faults radiating outward from the central core of intensely broken rock.

These features provide clues to help us understand the history of Earth and our solar system. In addition,

Figure 1



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 This nearly 3-mile-diameter group of hills is visible just north of Interstate 64. It contrasts sharply with the surrounding rolling farmland. It is believed to be the geologic remnant of the uplifted rebound structure in the center of a 425-million-year-old meteorite crater, though this has not been confirmed. It can be observed on the Shelbyville geologic quadrangle map (Cressman, E.R., 1975, Geologic map of the Waddy quadrangle, central Kentucky: U.S. Geological Survey Geologic Quadrangle Map GQ-1255, scale 1:24,000).

Versailles structure: The Versailles structure (Fig. 3), approximately 1 mile in diameter, is located along Big Sink Road in Woodford County, central Kentucky. This circular depression was for years thought to be a large sinkhole, but detailed mapping revealed a telltale belt of circular and radial faults, making it a possible remnant of a meteorite crater. The Versailles structure was formed sometime after the close of the Ordovician Period, 440 million years ago. (See the Versailles geologic quadrangle map Black, D.F.B., 1964, Geologic map of the Versailles quadrangle, central Kentucky: U.S. Geological Survey Geologic Quadrangle Map GQ-0325, scale 1:24,000.)

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 1,640 feet in diameter. Located in Bell County, southeastern Kentucky, the structure is thought to be 300 million years old.

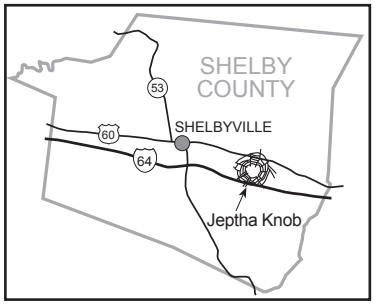


Figure 2 Jeptha Knob, Shelby County, Kentucky.

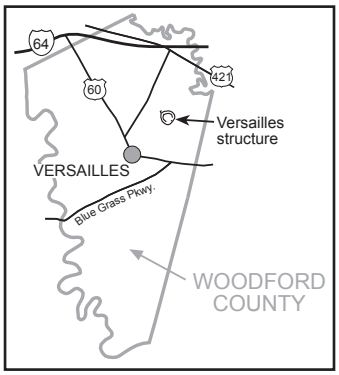


Figure 3 The Versailles structure, Woodford County.

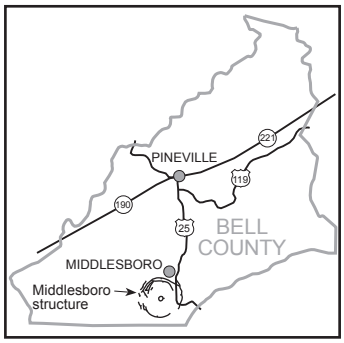


Figure 4 The Middlesboro structure, Bell County. The city of Middlesboro is actually in the center of the structure, but is shown offset on this map for clarity.

Figure 5 Comparison of the appearance and texture of a 1.8-inch piece of the stony meteorite that fell near Cumberland Falls in 1919 (left) and a 4.5-inch specimen from the iron meteorite found in Clark County.