

METEORS



THAT STRUCK
IOWA

FRONT COVER
This rock fragment is from an exploding meteor that showered an eight-square-mile area of Winnebago County near Forest City on May 2, 1890.

Meteorite fragment is property of Cornell College.

Iowa Department of Natural Resources
Geological Survey
109 Trowbridge Hall
Iowa City, Iowa 52242-1319
www.igsb.uiowa.edu

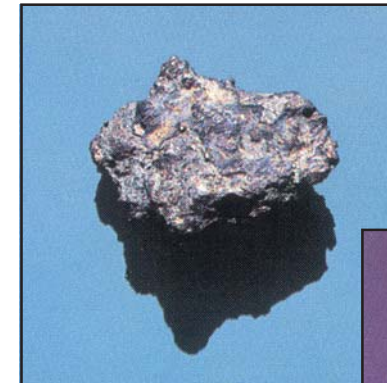
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ON MOST CLEAR MOONLESS NIGHTS,

patient skywatchers can see a meteor, a streak of light produced by interstellar material entering the Earth's atmosphere at high speed. If large enough to survive the intense heat, a chunk may strike the ground – becoming a meteorite. Some of Iowa's historic meteorites are shown here. Others have been found near Lone Tree (Johnson Co.) and Alvord (Lyon Co.). Iowa's largest meteorite impact occurred in southern Pocahontas County, just north of Manson, 74 million years ago.

Estherville

Residents of Estherville in Emmet County received an extra-terrestrial visitor at 5:00 p.m. on May 10, 1879. An exploding meteor roared to Earth along a seven-mile path in Dickinson County. Three large fragments (weighing 431, 152, and 101 pounds) and hundreds of smaller pieces were recovered. A monument near Estherville commemorates the event.



Property of Cornell College



Property of Cornell College

Forest City

On the afternoon of May 2, 1890, a meteor sounding like heavy cannon fire, throwing off sparks, and trailing black smoke exploded about 11 miles northwest of Forest City in Winnebago County. Rock fragments showered an eight-square-mile area, and local residents reported the smell of sulfur. The

fall was observed from as far away as Chamberlain, South Dakota, 300 miles from the impact site. As with Iowa's other meteorites, fragments are now widely distributed in museums and private collections.

Amana

Just before 10:30 p.m. on the wintry evening of February 12, 1875, a brilliant fireball dazzled people from Omaha to Chicago and from St. Paul to St. Louis. Accounts by C.W. Irish, an Iowa City civil engineer, described the blinding light and loud explosions from what he called the "Detonating Meteor." Over 800 pounds of fragments were recovered south of the Iowa River and southwest of Homestead in Iowa County.



Property of Amana Heritage Museum

Mapleton

The fall of the Mapleton Meteorite was not observed. A 108-pound chunk was discovered northeast of Mapleton in Monona County on June 17, 1939, by a farmer cultivating corn. An article about meteorites in National Geographic magazine helped him determine its identity. The meteorite (sawed thin-section, left) eventually was purchased by the Field Museum of Natural History in Chicago.



Property of Field Museum of Natural History

Marion

The first historic Iowa meteorite fell south of Marion in Linn County just before 3:00 p.m. on February 25, 1847, the day that legislation establishing the University of Iowa was signed into law in Iowa City, then the State Capitol. Residents were alarmed by a series of loud explosions to the north. The largest fragment is on display in the Old Capitol Building.



Property of University of Iowa

IOWA'S LARGEST METEORITE

THE MANSON IMPACT STRUCTURE



A remarkable array of dinosaurs as well as other animals and plants inhabited the north-central United States 74 million years ago. This is what Iowa may have looked like just prior to the meteor's impact at Manson.

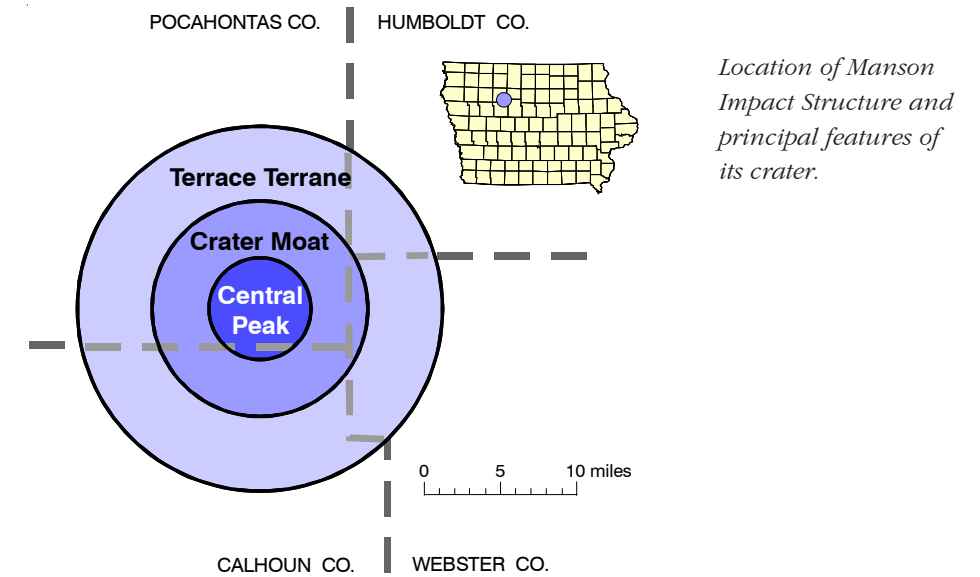
SEVENTY-FOUR MILLION YEARS AGO, near the end of the Cretaceous Period, central Iowa lay near the shoreline of an inland seaway that separated eastern North America from rapidly rising mountains to the west. The low-lying Iowa landscape was home to a rich population of plants and animals, including dinosaurs and small mammals. These creatures lived in a fern-rich, mixed conifer and deciduous forest with a warm moist climate much like today's Gulf Coast. This environment changed dramatically when a stony meteor, over one mile in diameter, weighing about 10 billion tons and traveling about 45,000 miles-

per-hour, blasted through the atmosphere and crashed to earth.

In a fraction of a second, the meteorite penetrated about one mile into the ground. The shock wave instantly ignited everything within about 130 miles of the impact (most of Iowa), and the blast left a crater over 24 miles in diameter. Today there is no land surface expression of the crater that lies 100 to 300 feet below the Calhoun County town of Manson, situated near the center of the crater that bears its name.

The Manson Crater has been a geologic puzzle since the early 1900s. At that time, drilling for a new town well at Manson encountered an unusual sequence of rocks that yielded the only naturally soft groundwater known in Iowa. In 1955 the first research drilling cores, plus other rock samples collected from water well drilling in the area, were studied. Since meteor impact craters were almost unknown at that time, the feature was interpreted as a crater produced by an ancient explosion of volcanic gases. The meteor impact origin was first proposed in 1959 by Robert Dietz and confirmed in 1966 by Nicholas Short, who studied "shocked quartz grains" from Manson cores. These appear as thin parallel zones of melting along microscopic crystal faces and are recognized worldwide as irrefutable evidence of extraterrestrial impacts.

In 1991 and 1992 the Iowa Geological Survey and U.S. Geological Survey began to investigate the possibility that the Manson impact played a role in the extinction of dinosaurs and other species at the end of the Cretaceous Period, 65 million years ago. During this study, 12 research cores, totaling over 4,000 feet, were obtained throughout the cra-



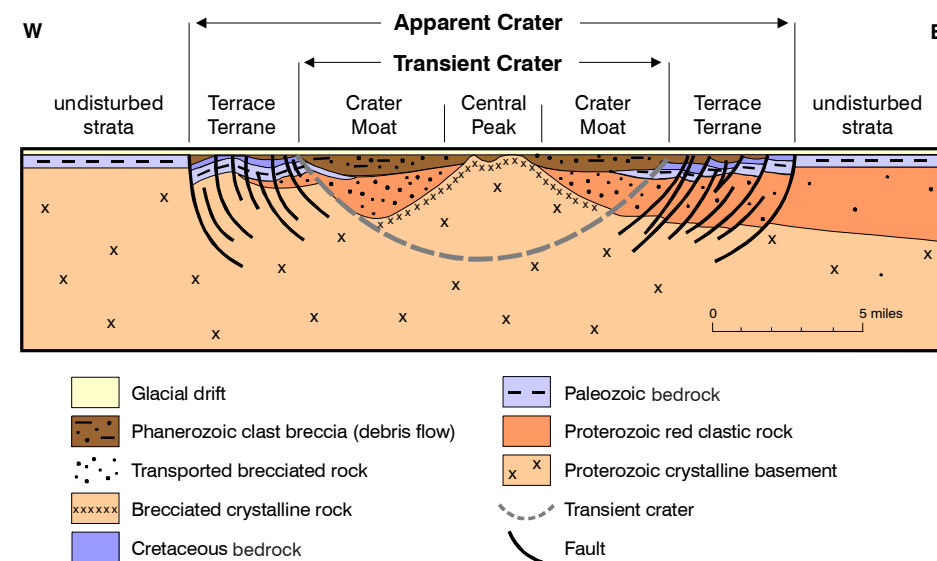
Location of Manson Impact Structure and principal features of its crater.

ter area. This investigation showed that the Manson Structure included an outermost "Terrace Terrane" of down-dropped blocks, an inner "Central Peak" of up-thrust rocks, and a "Crater Moat" in between (see diagrams, lower left and above). A significant finding from the research cores was a more accurate age for the impact – about 74 million years.

Six different types of impact rocks were identified within the structure. Four units of deep-lying crystalline "basement rocks" rebounded to form the Central Peak. A fifth rock type, "Ejecta," includes material thrown from the crater during its formation and today is found only in the Terrace Terrane. A sixth impact rock is called "Phanerozoic Clast Breccia." It consists of material originally stripped from the land surface, mixed with ejecta in a ground surge moving ahead of the growing crater, and quickly carried back into the crater by returning sea waters. This material has been found in all three regions of the crater.

The shallow seaway retreated from the region of the Manson Structure within the next few million years, thus exposing the area to erosion. About 1,000 feet of rock was eroded away over a 70-million-year period, including all impact rocks beyond the crater. However, with its thick cover of Phanerozoic Clast Breccia for protection, only small areas on the Central Peak and Terrace Terrane were eroded.

During the last 2.5 million years of Iowa earth history, continental glaciers repeatedly covered the Manson area. These ice sheets further eroded the impact feature and blanketed it with the glacial sediments that cover it from view today.



Cross-section view of the geologic features of the Manson Impact Structure.

For in-depth information on this subject see our website (www.igsb.uiowa.edu).