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The Story of Meteor Crater (Video Script)

Approximately 50,000 years ago, a uniform composition iron-nickel meteoroid drifted through outer space on a collision course with Earth. It may have been traveling as fast as 44 miles per second. The meteoroid was 150 feet in diameter, weighed several hundred thousand pounds, and contained enough iron to build 42,000 cars.

At the time, the Colorado Plateau, where the meteoroid would strike the Earth, was an open grassland plain inhabited by wooly mammoths. Humans would not arrive for tens of thousands more years. The climate was cooler and damper than it is today.

When the meteoroid collided with atoms and molecules in the gaseous atmosphere 100 miles above Earth's surface, some of it's energy of motion was converted into heat. The meteoroid slowed to a speed of 11 miles per second and became a meteor. Friction from the atmosphere instantly superheated and vaporized about 1% of the meteor's total mass from its leading surface, creating a fireball of incandescent gas around the falling meteor. Five seconds later, 50,000 miles above Earth's surface, the meteor began to fragment due to the difference in pressure between its leading and trailing surfaces.

After a total of ten seconds falling through Earth's atmosphere, the meteor impacted the surface of Earth in what is now northern Arizona, instantly releasing its remaining energy of motion with the explosive force of more than 20 million tons of

TNT. The impact threw 175 million tons of material out of the ground, and formed an impact crater nearly a mile in diameter and 700 feet deep. A small percentage of the meteor's mass vaporized into a plume of metallic gas on impact and then re-condensed into tiny spheroids that rained down in a 7 mile radius from the point of impact. Another 50% of the meteor's mass was blasted into tiny fragments that landed on the surrounding plain and rim of the impact crater.

The tremendous heat and pressure produced by the impact was instantly transferred to the rock strata in the Earth's surface. Rocks from underground were blasted out of the crater, and some rock layers were folded over, reversing their naturally occurring order. The remaining mass of the meteor melted and dispersed beneath the crater floor to a depth of 3,000 feet in very small to microscopic iron-nickel spherules and fragments. This all happened in an instant.

The impact also produced a fireball hot enough to kill or severely burn anything living within a 7 mile radius. The resulting shock wave leveled everything within about a 14 mile radius, and sent hurricane force winds out to about 25 miles.

Local plant life probably re-colonized the crater within 100 years of the impact event. Erosion has worn away some of the crater rim, from its original depth of 700 feet to today's depth of 550 feet. The shift from damp to dry and arid climate helped prevent more extensive erosion. Meteor crater remains the best preserved impact crater site on Earth.

European settlers discovered the crater in the 19th century, though the Native American population of the area would have observed it much earlier. The crater was thought to be formed by volcanic activity until the early 1900s, when Daniel Barringer

found meteorite fragments there and suggested the crater had been caused by meteorite impact. His company, the Standard Iron Company, bought the crater and worked to determine its origins. Barringer documented and presented evidence for his impact theory, but was met with skepticism from the scientific community. Barringer thought most of the meteorite was buried under the crater floor, and spent 27 years drilling in an attempt to mine the iron he felt sure would be there. He never found a significant iron deposit.

In the early 20th century, a man named Holsinger found the largest known meteorite fragment that broke off from the main meteor and fell through Earth's atmosphere as a separate piece. Its holes and ridges were formed as it burned and melted while falling through Earth's atmosphere. Its average composition is 92% iron, 7% nickel, with other trace elements including cobalt, platinum and iridium.

In 1960, planetary scientist Eugene M. Shoemaker was able to confirm Barringer's impact hypothesis. He discovered shocked minerals in the crater while analyzing its geology.

Coconino Sandstone is a grayish-white rock layer about 260 million years old and 720 feet thick. The upper portion of the Coconino sandstone layer is exposed on the floor of Meteor Crater and provides excellent examples of the range of shock metamorphic effects produced by massive meteor impacts. As the pressure and temperature generated by an impact gradually decrease, permanent alterations are made to the crystalline structure of the minerals in the surrounding rock. Shoemaker's discovery of shocked minerals at Meteor Crater provided the first definitive proof of extraterrestrial impact on the Earth's surface. Evidence of this process has been found at

impact crater sites on the Earth and our Moon.

From 1963 to 1970, Apollo Astronauts trained at Meteor Crater because of its similarity to lunar craters. Gene Shoemaker assisted in their training.

Barringer's family still owns Meteor Crater today, and keeps it open as a tourist stop near I-40 between Winslow and Flagstaff, Arizona. The crater also remains available for scientific research.

150 impact craters have been identified on Earth using information that was first learned by studying Meteor Crater in Arizona.

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