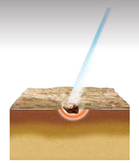
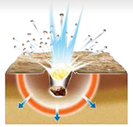
As a result of geological activity and weather conditions, the Earth's surface is constantly changing. These circumstances can cause impact craters to get worn down, and often they go undetected from our terrestrial perspective. Some landforms caused by meteorites were misinterpreted to be volcanoes, sinkholes, or other common, naturally occurring geological phenomena. Using satellite imagery to investigate these landforms, scientists now recognize that Earth is host to more than 170 impact craters.

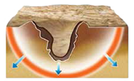
WHAT HAPPENS
When meteors strike Earth?



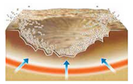
Meteorite Impact - The meteor (the "projectile") collides with the surface of the Earth, transferring a huge amount of impact energy to the surrounding ("target") rock. This transfer of energy, comparable to the forceful explosion of TNT, is extremely powerful.



Shockwave - Starting at the point of collision, energy ripples outward away from the impact and down into the earth, where kinetic energy converts to thermal energy, heating up the surrounding material. Fan-shaped fracture lines called shatter-cones are indicators of this process.



Molten rock and meteorite fragments - This transference of energy and pressure is so intense that it can displace, fracture, deform, melt, or even vaporize rock material at the impact site. In this same moment, most of the projectile (meteorite) also vaporizes. Small cracked and fractured fragments of the meteorite can get thrown away from the site of impact, or become embedded in the crater.



Rebound - Material with elastic strength attempts to return to its original formation, often bouncing back with enough force to cause the crater to change shape. For a small crater, the shape after rebound is a simple bowl shaped crater. In larger craters the middle of the basin rebounds upward, causing a central peak. Scientists recognize these as complex craters.

Ejecta - Rubble, dust, and other debris from the fragmented target rock are thrown out of the crater and away from the impact site. This material is called ejecta.

Fragments ejected from the surface - Often this ejecta material will settle on the outside rim of the crater. This build-up of material is called the ejecta blanket. After the shockwave has dissipated, gravity causes some of the debris to fall into the crater, settling towards the center.

Sikhote-Alin
Fell: February 12, 1947
Mass: 23 t
Classification: Iron, IIAB
Specimen Wt: 238.4 g
Provenance: Gipo Meteorites
C. Whitford

Sikhote-Alin Mountains, Eastern Siberia
Around 10:30 a.m. on February 12th, 1947, a fireball as bright as the sun appeared in the sky above eastern Siberia, streaking southward and trailing smoke. It passed over several towns and disappeared over a wooded area, where it exploded with a thunderous boom. The resulting shockwave could be felt hundreds of miles away from the impact site. The point of impact was marked by over one hundred small craters, the largest of which was 26 meters (85 feet) wide. Many tons of iron meteorite fragments, some twisted and warped, and some with thumbprint divots from surface melting, had rained down in the area after the explosion and are still being discovered today.

Gebel Kamil
Found: February 19, 2009
Mass: 1.6 t
Classification: Iron, ungrouped
Specimen Wt: 98.0 g
Provenance: S. Decker, C. Whitford

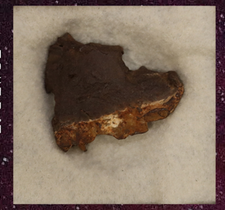


Photo Credit: Istituto Nationale di Geofisica e Vulcanologia, Italy; Luigi Folco, Italy

Kamil Crater, Southern Egypt
Located in the East Uweinat Desert in southwestern New Valley Governorate, Egypt, and sometimes covered by sand, this crater measures at 44.8 meters (147 feet) wide and 15.8 meters (52 feet) deep. Based on the formation of the crater and the well-preserved "rays", or spoke-like lines extending from the crater outward, scientists guess that it is less than 5,000 years old. This crater was first officially studied in February of 2010, when scientists from the Egyptian-Italian Science Year were able to prove that it was caused by an iron meteorite which fell and fragmented upon impact. The meteorite, named Gabel Kamil, is estimated to have weighed a whopping 5,000 to 10,000 kilograms (10,000 to 20,000 pounds)! Researchers were able to recover about 800 kilograms (1,800 pounds) of meteorite fragments from the site, most of which are now housed at the Egyptian Geological Museum in Cairo.

Carancas
Fell: September 15, 2007
Mass: 342 g
Classification: H4-5, chondrite
Specimen Wt: 4.82 g
Provenance: R. Garcia, C. Whitford

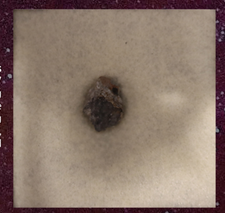


Photo Credit: Michael Farmer Meteorites

Carancas Crater, Peru
On September 15th, 2007, residents of the village Carancas in Peru witnessed a fireball with a smokey trail in the sky. Soon after, a 10 meter (33 feet) chondritic meteorite made contact with the Earth and exploded on impact. The force from the explosion was strong enough that it shattered windows and the debris damaged the roofs of local buildings. The resulting crater was 13.8 meters wide, almost 6 meters deep, and quickly filled with water. Local officials noted that the water within the crater started to boil, releasing noxious gases. Less than 5 days later more than 600 villagers had fallen ill, reporting symptoms like nausea, headaches, and vomiting. Investigations led to the conclusion that the meteorite was rich with troilite, an iron sulfide material that is common in solar system metals but rare at Earth's surface, and that the vaporization upon impact had caused the villagers to become sick.

Canyon Diablo
Found: 1891
Mass: 30 t
Classification: Iron, IAB-MG
Specimen Wt: 460.9 g
Provenance: R. Wesel, C. Whitford

Meteor Crater/Barringer Crater, Winslow, AZ
About 29 kilometers (18 miles) west of Winslow, in the desert of northern Arizona, United States lies a prehistoric crater that is approximately 50,000 years old. This crater was created when a nickel-iron meteorite around 50 meters (160 feet) across struck the ground (which in the Pleistocene epoch was a cooler and damper grassland than the climate in the area now) at a speed that has been subject to debate. Scientists originally estimated the speed of impact to be a cool 20 km/s (45,000 mph), but more recent research suggests that it moved a little slower at 12.8 km/s (29,000 mph). That speed translates to an impact energy of about 10 megatons TNT, which vaporized most of the meteorite upon impact! Yikes!