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Not My Fault: The sky is falling: Meteor impacts have shaped earth history

Lori Dengler for the Times-Standard
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A camera from a school in Olmstead, Ohio, captured the March 17 fireball caused by a 7-ton meteor as it exploded in the Earth's atmosphere.

The first quarter of 2026 is in the books. While a relatively quiet one for earthquakes, the skies lit up for an unusual number of meteors. The American Meteor Society tallied over 2,300 different event sightings with 1,700 considered "long duration" (trails lasting minutes), and 19 events reported by at least 50 people. Two March events were bright enough to be seen and heard by many in broad daylight. The most widely reported was in Western Europe on March 8 with over 3,000 filed observations followed by the St. Patrick's Day fireball that was viewed by hundreds of people in 13 U.S. states as a meteor broke up over Northwestern Ohio.

The Koblenz meteor on March 8, entered Germany from the west and crossed over Luxembourg and Germany's Eifel region before exploding in a bright airburst that was caught on many cameras and observed on the AllSky7 satellite network. The European Space Agency estimates the size of the meteor to be 7 to 10 feet across before exploding at a height of about 30 miles above the earth's surface. Falling fragments damaged several buildings and made a football-

sized hole through the bedroom of a home in Koblenz. A number of fragments have been recovered and are currently being analyzed.

Just before 9 AM EDT on March 17, a meteor entered the atmosphere over Lake Erie and causing a sonic boom recorded on video and seismographs as it broke up over Medina County in NW Ohio. NASA analysis suggests that the meteor was about six feet across and weighed seven tons, traveling at 40,000 mph when it hit the atmosphere. The sonic boom rattled houses and cracked windows. Some fragments have been found but are yet to be analyzed.

The first quarter 2026 sighting rate is nearly double what the American Meteor Society typically receives for a three-month period. Called many things including shooting or falling stars, fireballs, bolides, asteroids, and meteroids, meteors are caused by fragments of space rock and ice burning up as they encounter earth's atmosphere. If the rock survives its fiery journey and lands on the ground, it's a meteorite.

Meteors are very common. Each day, millions of space bits enter earth's atmosphere, briefly lighting the sky as they heat up in their final swan song. On a clear night at any time of the year you are likely to see a few each hour. Most never reach the ground but dust-sized bits constantly rain down, adding roughly 50,000 metric tons of material to the earth's surface each year. That sounds like earth's mass is growing, but other processes are also at work. The lightest gases hydrogen and helium are continuously released into the atmosphere from rock by metamorphism and other processes and drift upwards, eventually leaving the atmosphere. This loss more than compensates for the addition of meteoric dust.

Most meteor sightings are due to comets. Their icy tails include chunks that range from microscopic to several feet across. Every year, earth's orbit takes us on a predictable path through the tails of comets causing meteor showers. 2026 features seven named meteor showers, the most well known being the Perseids on August 12 – 13, and the Geminids December 13-14. I have fond memories of the Perseids viewed from the deck of our summer place on Flathead Lake, Montana with streaks crossing the sky every few seconds.

In August 1984, the Humboldt Geology Department got a call from Sam Merryman. Sam, a longtime restauranteur and community leader in Trinidad, had noticed an unusual feature on the beach just west of the parking area of his beach house on Moonstone and wondered if some geologists could take a look. It was during the Perseids, but just before the school term and most of the faculty were out of town, so it fell to a few of us to investigate.

We found a crater in the sand. Roughly eight feet across and perfectly circular, the delicate sands on the perimeter formed a perfect ring sloping upwards towards the center just less than a foot high. The center was a disorganized jumble. None of us knew much about meteors or impacts so we contacted the Arizona State University Institute for Meteor Studies. They were very helpful and based on the size of the crater suggested a baseball-sized object had likely hit the beach, but don't get your hopes up on finding anything because most Perseid meteorites are ice and not likely to last very long.

We spent much of that day carefully excavating. Digging in sand can be dangerous and we were careful to create a wide zone on one side of the crater and remove the sand safely away. About two feet below the surface, the surrounding sand was damp and more compacted. Right in the

center, a well-defined circular conduit about a foot across had formed, filled with softer sand. We continued to excavate that conduit for another six feet. It was straight down, suggesting the object had hit nearly perpendicular to the ground surface. And then it just stopped. No rock fragments, nothing else. Perhaps if we had collected some of the sand near the bottom and examined it under the microscope and analyzed its chemistry, we would have found something. But the odds were slim, and it was way out of our areas of expertise.

Most meteors are fleeting light shows across the sky. The handful that make landfall every year may startle witnesses it but have no significant effect on the planet. And although most are due to comets, some are caused by larger and potentially more hazardous rocky or iron chunks. Not all meteors are small, and some have changed the course of earth history.

Anyone who has viewed the spectacular videos and photographs from the Artemis II mission around the moon should have noticed the details of the moon's surface and the startling contrast between the near and far sides. Impacts are the primary process that operates on the moon and a reminder of how important our atmosphere is in mitigating their effects. The lunar contrast in the surface textures between faces are the result of how those impacts affect the warmer, thinner crust on the side that faces us and the thicker, colder crust of the dark side.

It's not just comet tails that fill space with debris. Wayward rocks from the Asteroid belt between Mars and Jupiter are the most frequent non-comet source of meteors as their disorganized rotations cause collisions and random ejections. There were many more objects when the solar system was first forming and protoplanets frequently collided. Many astrogeologists believe the largest of these collisions occurred within the first 100 million years of solar system history, a direct hit that resulted in a large chunk of the proto earth being flung into space but not far enough to escape the earth's gravity. The result – our moon. The moon wasn't the only result of this early impactful period. Impacts likely contributed to the differentiation of the core, mantle, and crust, setting up the conditions for plate tectonics.

When asked to name great impact events of the past, most of you will think of the asteroid that ended the age of dinosaurs. But the impact 66 million years ago is not the only time that collisions with space objects have affected the course of evolution. A study from Rutgers University published last month argues that impacts enhanced hydrothermal vents early in earth history, creating the incubators for all future organisms on the planet. The S2 impact of 3.26 billion years ago, considered far larger than the dinosaur-killing asteroid, is argued to have "fertilized" the early oceans with phosphorous and iron, spurring the development of life forms. Ordovician times nearly 470 million years ago appears to be a prolonged period of far higher meteor impacts affecting climate and biodiversity.

We can thank impacts for creating some of the largest ore bodies on the planet. Impacts shatter rock and cause sharp increases in temperature and pressure, concentrating and exposing valuable deposits. The outlines of the impact that created the Sudbury Basin in Canada can be seen on Google Earth, creating some of the largest deposits of nickel, copper, and precious metals. The Vredefort Crater in South Africa is known for massive god deposits.

The 2026 spike in meteors remains unexplained. The data might be partly biased by the increase in cameras and detection equipment. There is no long-term trend, and it is considered unlikely to indicate that more large impacts are likely in the near term. But it did catch my

attention and an appreciation that our planet's characteristics and life itself owe a debt to meteors.

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