

The Meteor



Sergei Bobunets, lead singer of a Russian rock band, had just stepped outside when the sky fell apart.

"I looked up, and suddenly the sky lit up with a bright light, and something that looked like the sun fell," Bobunets said, trying to make sense of one of the most powerful events on Earth: a meteor strike. Bobunets was standing 125 miles north of Chelyabinsk, a city in Russia which on February 15, 2013, witnessed perhaps the best-documented meteor fall in human history.

Eyewitnesses recorded the fireball with their phones and digital cameras. A European weather satellite took a photo of the meteor as it streaked through the atmosphere, and a Chinese satellite captured the meteor's vapor plume. Thousands of people saw the flash of light and felt the shock wave after the meteor crashed into Earth.

"I looked out the window and saw a huge line of smoke, like you get from a plane, but many times bigger," Sergei Serskov, an office worker in Chelyabinsk, told the BBC. "A few minutes later the window suddenly came open, and there was a huge explosion, followed by lots of little explosions. It felt like a war zone."

The meteor was not very big. It was about 57 feet long, a little longer than a normal city bus. But it was super dense, weighing about 11,000 tons—more than the Eiffel Tower. And it was moving extremely fast. Scientists estimated its speed at 41,000 miles per hour, or about 50 times the speed of sound. Its tremendous speed was the main factor in its enormous destructive power. When the meteor exploded 14 miles above the Earth it released a bright flash of light, a powerful heat wave, and a shock wave with roughly 20 to 30 times more energy than the atomic bomb detonated at Hiroshima. The explosion damaged 7,200 buildings in six cities and about 1,500 people were injured, mostly from flying glass.

“My eyes are still hurting,” an eyewitness wrote on an Internet forum soon after the impact. “Oh, my God, I thought the war had begun.”

The widespread destruction caused by the Chelyabinsk meteor gives proof to the rule of physics that the faster an object is moving, the more energy it has. A bus on the street that loses control could slam into a building and kill a few people. A bus flying through space at 50 times the speed of sound could wipe out an entire city.

The Chelyabinsk meteor is also an example of how energy moves. First there was the meteor itself, which was moving energy simply by its movement through space. As it encountered Earth’s atmosphere, the meteor ran into increased resistance from air and dust molecules, which released some of its energy in the forms of heat and light. And when it exploded, the meteor radiated its energy over the Russian sky in the forms of blinding light, piercing sound, a shock wave strong enough to collapse buildings and knock people off their feet, and continued physical motion in the form of thousands of rocks falling to the ground. The only known type of energy the meteor did not give off was electricity.

While the Chelyabinsk meteor was the best-documented in history, it was not especially large or powerful as meteors go. The most destructive event in recorded history is believed to have been a meteorite that crashed into Earth above Russia’s Tunguska River in 1908. Scientists estimate the object was about 330 feet across. It flattened 80 million trees over 830 square miles of forest, and created a destructive force 1,000 times more powerful than the atomic bomb dropped over Hiroshima. The shock wave shook buildings and knocked people off their feet hundreds of miles away. For the next few nights, night skies across Europe and Asia glowed, possibly caused by sunlight bouncing off particles left by the meteor’s tail and dust raised by its impact.

Widespread casualties were avoided because the area was so thinly populated, but there were eyewitnesses to the explosion. “The sky split in two, and fire appeared high and wide over the forest,” a witness named S. Semenov told a researcher. “At that moment I became so hot that I couldn’t bear it, as if my shirt was on fire...I wanted to tear off my shirt and throw it down, but then the sky shut closed, and a strong thump sounded, and I was thrown a few meters.”

No other object visible to humans travels as fast or carries as much energy as meteors do. As the world fills with electronic cameras and sensors, we may be able to learn more about smaller meteors such as the one at Chelyabinsk before once more facing the destructive power of a mammoth meteor like the one at Tunguska.

Name: _____ Date: _____

1. What did Sergei Bobunets witness?

- A a meteor strike
- B a plane crash
- C the bombing of Hiroshima
- D the sun falling

2. How does the author describe the meteor strike at Chelyabinsk?

- A The meteor strike had very few witnesses and was not well documented.
- B It was the most destructive meteor strike in documented history.
- C The meteor strike created a bright flash of light, a heat wave, and a shock wave.
- D The meteor strike was in a thinly populated area and did not hurt anyone.

3. The Chelyabinsk meteor was a little longer than a normal city bus and moved at 50 times the speed of sound. A bus on the street that loses control could slam into a building and kill a few people. A bus flying through space at 50 times the speed of sound could wipe out an entire city.

Which conclusion does this information best support?

- A Objects release energy.
- B The faster an object is moving, the more energy it has.
- C Bus-sized objects can be dangerous.
- D The size of an object determines how fast it can move.

4. When did the Chelyabinsk meteor most likely contain the most energy?

- A after it exploded
- B when it exploded
- C as it encountered Earth's atmosphere
- D before it encountered Earth's atmosphere

5. What is this passage mostly about?

- A Sergei Bobunets
- B atomic bombs
- C meteor strikes
- D astrophysics

6. Read the following sentence: "As the world fills with electronic cameras and sensors, we may be able to learn more about smaller meteors such as the one at Chelyabinsk before once more facing the destructive power of a **mammoth** meteor like the one at Tunguska."

What does "mammoth" mean in this context?

- A very, very large
- B a hairy animal from the Ice Age
- C something frightening
- D lacking in force

7. Choose the answer that best completes the sentence below.

When a meteor explodes in the sky, it radiates its energy in various forms, _____ light, sound, and heat.

- A consequently
- B above all
- C currently
- D including

8. What object visible to humans travels the fastest and carries the most energy?

9. What were the differences between the meteor strikes at Chelyabinsk and Tunguska?

10. Explain why it is important to study meteors. Support your answer with details from the passage.
