

# CRASH *Cover*

Scientists wonder  
if a space rock could  
destroy life on Earth



BY NANCY HONOVICH

# Crash?

On July 16, 1994, astronomers around the world turned their telescopes toward Jupiter to witness an extraordinary event. A group of icy objects known as the Shoemaker-Levy 9 comet hurtled toward the giant planet at a speed of 60 kilometers (37 miles) per second.

As the *comet* hit the gaseous planet, it generated shock waves, causing large plumes of gas to shoot into Jupiter's upper atmosphere. When the blasts finally subsided, scientists discovered that Jupiter had been scarred: Gray areas of gas and dust had formed in the planet's atmosphere and remained there for several months. But for astronomers—and anyone else who had observed the catastrophic event—the effects were more lasting. People everywhere were left wondering: Could this happen to Earth?

After witnessing Shoemaker-Levy 9's collision with Jupiter, people began to pay closer attention to objects that could pose a threat to Earth. As comets and large *asteroids*—chunks of space rock that often measure hundreds of meters in diameter—orbit the sun, their paths occasionally take them within 160,930 km (100,000 mi) of Earth. That may seem far. But for most scientists, it's a little too close for comfort.

Mike Shara, an *astrophysicist* (scientist who studies the universe) at the American Museum of Natural History in New York City, is an expert on cos-

mic collisions. He tells us that roughly every 10 years, a space object the size of a cruise ship narrowly misses Earth. Could one of these objects actually strike our planet? And if so, is there anything we can do to prevent the impact? Shara discusses the possibilities.

### Why do asteroids and comets collide with other objects?

All objects in the universe—including asteroids, comets, planets, and stars—exert a pulling force, called *gravity*, on every other object. Because these objects are constantly tugging on each other, they gradually change each other's paths. Sometimes, this causes two objects to move toward the same place at the same time. Because these objects don't have eyes, they can't sense that they are headed for each other—and they sometimes collide.

### Are there any objects that are headed toward Earth?

There certainly are! Ultimately, thousands of objects, scattered all over the solar system, are headed our way. But it's going to be millions of years before most of them run



Mike Shara, an astrophysicist at the American Museum of Natural History.

**DEEP IMPACT:** Scientists predict that if an asteroid were to crash into Earth, the impact would look like a fireball.



**BLACK EYE:** After Shoemaker-Levy 9 collided with Jupiter, dark spots formed in the planet's atmosphere.

into Earth. However, there is one object that is going to pass very close to Earth in the near future. It's an asteroid called MN4. This asteroid measures about 300 meters (984 feet) across—about three times the length of a football field. And on April 13, 2029, it's going to come within approximately 35,400 km (21,997 mi) of Earth. That's pretty close—especially when you figure

that the moon is roughly 385,000 km (240,000 mi) from Earth.

### Could MN4 collide with Earth in 2029?

No. Scientists have been closely monitoring MN4 since they discovered it in 2004. They've actually mapped the asteroid's entire 233-day orbit around the sun. Using this information—and some sophisticated computer programs—they have been able to calculate MN4's whereabouts in relation to Earth for the next 23 years. During that time, scientists foresee no collision. So the chances of an impact in the year 2029 are essentially zero.

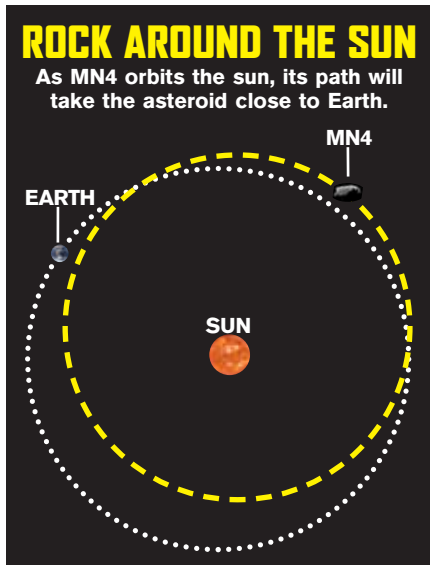
### During its close flyby, will we be able to see MN4?

It depends on where you are and how clear it is outside. If the night is clear, up to a billion people will be able to see the asteroid. It will appear almost as bright as the stars in the Big Dipper. The asteroid won't appear to be travel-

# Check it Out:

In early 2006, the American Museum of Natural History's Hayden Planetarium in the Rose Center for Earth and Space will open a new space show. The show journeys through the night sky to explore collisions of meteorites, stars, and galaxies that shape our dynamic universe. The Museum has been researching and celebrating the natural world for more than 135 years, and has more than 30 million objects in its entire collection, including a database of stellar observations. The Museum's 200 scientists travel around the world on 100 field expeditions each year, studying everything from wasps to ocean life to the universe.

To learn more, ask your teacher, or visit [www.amnh.org](http://www.amnh.org).



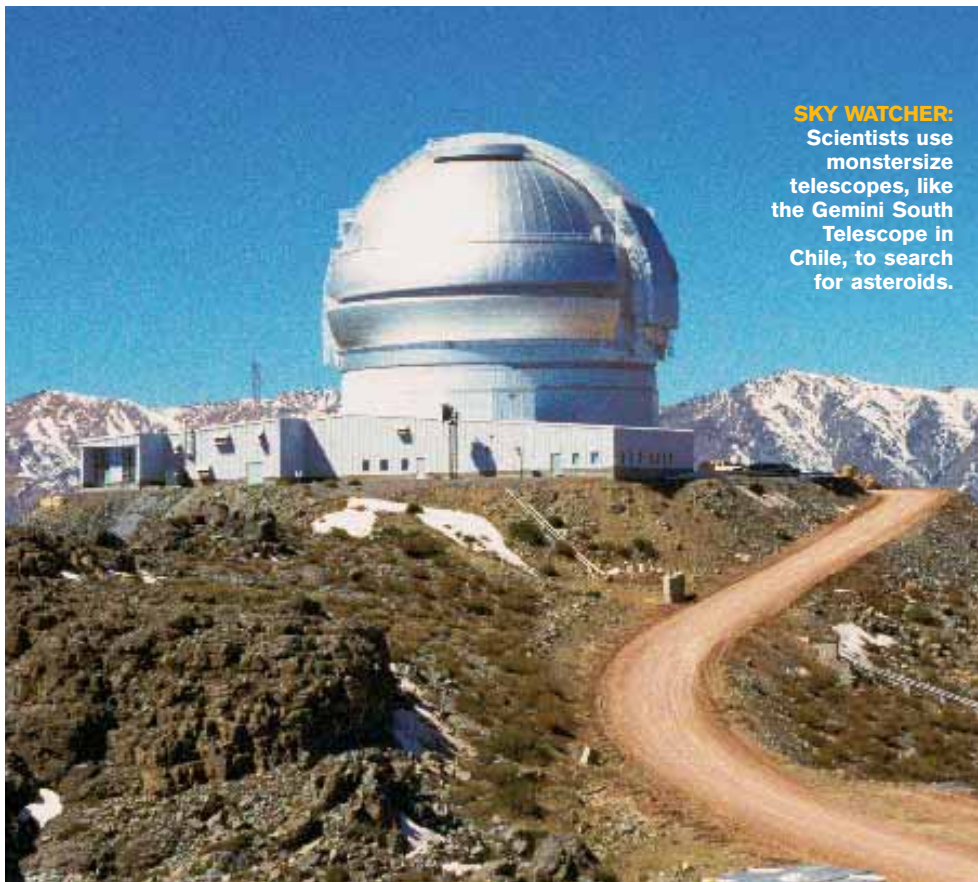
## WEB EXTRA

To learn more, visit: [www.scholastic.com/spacecrash](http://www.scholastic.com/spacecrash)

**HOLE IN ONE:**  
Barringer Crater in Arizona is approximately 174 m (570 ft) deep.



ing as fast as, say, an airplane because it's so far away. But it will be moving very quickly—22 km (13.7 mi) per second. MN4 will appear to move across the sky at about four



**SKY WATCHER:** Scientists use monstrosized telescopes, like the Gemini South Telescope in Chile, to search for asteroids.

moon diameters per minute. The best view of MN4 will be from Asia, Europe, and Africa.

### What would happen if an asteroid like MN4 were to hit Earth?

It wouldn't mean the end of life on Earth, but it would still be terrible. In Arizona, there is a hole in the ground that measures roughly one mile across. This hole, known as Barringer Crater, was carved out when a *meteorite* (space rock that has hit Earth) crashed into Earth about 50,000 years ago. MN4 is approximately 10 times bigger than that meteorite. It has roughly 1,000 times as much mass, and so it would release 1,000 times as much energy during impact.

### Would someone living far from the impact site be affected?

Yes. It's possible that a tremendous amount of heat would be released at impact. That would set off forest fires for hundreds of miles around the impact. The fires would then shoot huge amounts of ash and soot into

the atmosphere. This, in turn, would block sunlight, causing temperatures to drop. In addition, billions of boulders and billions of tons of dust would be blown sky-high during the impact. All this material would then fall back to Earth over the next few days. That's if the asteroid were to strike land. If it were to crash into the

ocean, you would have massive *tsunamis* (series of powerful ocean waves). For example, if MN4 were to land in the Pacific Ocean, a giant tsunami would wash ashore across western North and South America, and eastern Asia—destroying cities along the coastlines.

### If scientists were to spot a large asteroid that was headed toward Earth, what could we do to prevent a collision?

Many solutions have been proposed. One idea is to turn the asteroid into a "sailboat." If scientists were to take a large mast and stick it into the asteroid, they could open a huge sail made from ultralight material. Particles of light, called *photons*, from the sun would bounce off the sail, giving it a gentle push. Over the course of decades, these photons would gently nudge the asteroid slightly off its course. But there's a problem with that idea: Many asteroids are composed of rocks that are held together weakly. So if scientists were to push a mast into it, the asteroid would break apart. Another idea would be to launch a massive object into space and park it within a few football fields of the asteroid. The massive gravity from this object would tug on the asteroid.

Over time, that object's gravitational pull would slowly deflect the asteroid out of Earth's path.



### ASTEROID ROUNDUP

Unlike MN4, most asteroids orbit the sun in a region that's located between Mars and Jupiter. This area, called the *asteroid belt*, consists of asteroids ranging in size from a small grain of sand to several hundred miles wide.

Sometimes, an asteroid is pulled out of its orbit by the gravitational pull of a massive object, such as a planet. When this occurs, the asteroid may become a satellite of that planet. In fact, some astronomers believe this is how Mars's moons—Phobos and Deimos—came to orbit that planet.

### Couldn't we just blow it up?

That's not a good idea: The asteroid would break into smaller pieces, some of which would still rain onto Earth!

### What would you say to readers who are scared that a large asteroid will crash into Earth?

Astronomers are scanning the sky every night to make sure that a large asteroid isn't headed our way anytime soon. The chance that Earth will be struck by a large asteroid or comet during your lifetime is almost zero. ✨