Innovations
How human ingenuity is changing the way we live

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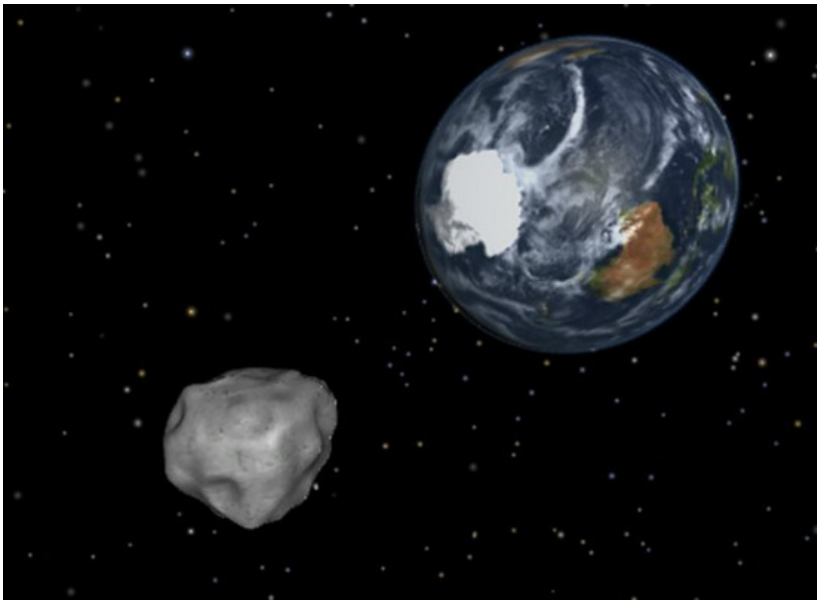
What Can We Do About Big Rocks From Space?



Last week's asteroid pass was the closest ever predicted. Computer graphic courtesy of NASA

Last Friday was, astronomically speaking, one of those days that comes along every 40 years. Actually, a lot less frequently than that. That's how often, according to NASA estimates, an asteroid the size of the one that flew by Friday gets that close to hitting the Earth–it passed 17,000 miles away. But when you throw in the considerably smaller meteorite that exploded over Russia the same day and injured more than 1,000 people–that's *never* happened before–you're talking about one extremely unique moment in space rock history.

Most of us have moved on, taking comfort in the belief that that's not happening again any time soon. But there was something sobering about seeing how much damage could be done by rock about as big as one and and a half school buses. Also, that if the flyby asteroid, which was three times that size, had been on target to hit our planet, we really couldn't have done much about it–the giant rock was spotted by a team of amateur astronomers in Spain only a year ago.

All of which prompted two basic questions: "How much warning will we get before a monster asteroid collides with the planet?" and "What's the plan for stopping it?"

Beware of "city killers"

The good news is that NASA, which really didn't start tracking near-Earth objects until the mid-1990s, believes it has charted almost 95 percent of the 980 asteroids more than a half-mile wide that are orbiting in our part of the universe. These are known as "planet-killers," space rocks so large that if they collided with Earth, it would pretty much end civilization as we know it. None, I'm happy to say, are headed our way.

But move down a bit in size to asteroids roughly between 100 feet and a half mile wide and it's a very different story. NASA figures it's located only 1 percent of the near-Earth objects that small. They may not sound very menacing, but keep in mind that the rock that missed us Friday was roughly 150 feet wide and it would have had a cataclysmic impact if it had exploded over or landed on a populated area. And the one that did blow apart over Russia and hurt so many people was only 55 feet wide.

Scientists at the University of Hawaii, with NASA funding, are developing a network of telescopes designed to find the smaller ones. It's called ATLAS, which stands for the ominous-sounding Asteroid Terrestrial-Impact Last Alert System, and its creators say they'll be able to provide a one-week warning of incoming "city killers"–rocks about 150 wide–and three weeks notice of "county killers"–ones three times as large.

Seek and you shall find

The truth is, though, infrared telescopes surveying from space are better suited for the job, particularly when it comes to spotting asteroids orbiting close to the sun. NASA's WISE telescope identified 130 near-Earth asteroids, but it's been shut down for two years. Instead of replacing it, NASA is reviewing proposals for a sensor that could detect asteroids as small as 100 feet wide, while attached to a communications satellite.

But now private groups have started floating their own ideas for finding rocks flying through space. One, called the B612 Foundation after the fantasy asteroid on which the Little Prince lived, has ambitious plans to launch a deep space telescope named Sentinel. From a vantage point as far away as Venus, it should be able to look back at our planet and see the heat signatures of objects that come near the Earth's orbit.

It's no small undertaking–the estimated cost is $450 million–but among those driving the project are two former astronauts, Russell Schweickart and Edward Lu, who's now a Google executive and has been able to stir up interest for the mission in Silicon Valley. Lu sees last week's double asteroid display as a wakeup call. Sure enough, his group was getting calls all day Friday from people wanting to know when it will have its telescope up. Most likely it won't be until 2018.

And two companies hoping to make a fortune by mining asteroids will also soon be in the business of tracking them. Planetary Resources, which includes among its investors filmmaker James Cameron, Google execs Larry Page and Eric Schmidt and X-Prize Foundation head Peter Diamandis, plans to launch its own asteroid-charting space telescope late next year. The other, Deep Space Industries, has proposed a kind of sentry line of spacecraft circling the Earth that would evaluate and, if necessary, intercept incoming asteroids.

Taking care of business

Okay, but then what? Can an asteroid moving at 18,000 miles an hour be stopped, or at least steered away?

Forget about the *Armageddon* approach. Blowing up an asteroid with a nuclear bomb–good for a movie, bad for Planet Earth. The resulting debris shower might do almost as much damage.

Instead, here are five ideas that have been proposed:

1) A shout out to our old friend gravity: This would involve what's referred to as a "gravity tractor." Actually, it's a large spaceship that would be maneuvered as close as possible to the orbiting asteroid. In theory, the gravitational pull of such a large object would be strong enough to change the asteroid's path. Unfortunately, some scientists say we might need a decade's notice to pull this off.

2) Prepare for ramming speed!: The European Space Agency is working with scientists at Johns Hopkins University on a plan that would involve sending a spacecraft to bump an asteroid off course. Called the Asteroid Impact and Deflection misson, or AIDA for short, it would actually involve sending up two spacecraft. One would be there to observe and gather data while the other does the ramming. The goal would be to alter the asteroid's spin and ultimately, its direction.

3) Okay, so there *is* a nuclear option: But it hopefully wouldn't involve blowing up the asteroid to smithereens. Instead, scientists would prefer to detonate a device close enough that it would change the rock's orbit. This is always referred to as a last resort.

4) Would you like something in an eggshell? Or perhaps a tasteful pearl white?: Then there's the white paint strategy. According to this plan, a spacecraft would approach the asteroid and pummel it with white paint balls. The new white coat would more than double the rock's reflectivity and, over time, that would, in theory, increase solar radiation pressure enough to move it off course. You scoff? This plan, devised by an MIT graduate student, won the 2012 Move an Asteroid Technical Paper Competition sponsored by the United Nations.

5) You knew there had to be lasers in here somewhere: And just in time for last week's space rock event, two California scientists outlined a strategy in which they would use the sun's power to create laser beams that could be aimed at an asteroid. They would start small, creating an array in space about the size of the International Space Station. The laser beams it created would be strong enough to push an asteroid on to a different path, say the plan's inventors. But they wouldn't stop there. They foresee building out the array until it's as large as six miles wide. And then it would be able to produce laser beams powerful enough that , within a year, could vaporize an asteroid.

Sure, it sounds like a George Lucas fever dream. But the scientists say it's eminently feasible. Besides, says one, physicist Philip Lubin of the University of California, Santa Barbara, it's time to be proactive instead of reactive. As he put it, "Duck and cover is not an option."

Video bonus: In case you forgot how bad a movie *Armageddon* was, and that it featured Steve Buscemi as an astronaut, here's the over-the-top trailer.

Video bonus bonus : Or if you want to stick to the real thing, here's a collection of videos of Friday's asteroid flyby.

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