

After another near miss, professor wants to find asteroids that threaten Earth

March 12 2013, by Bjorn Carey



Diagram depicts the passage of asteroid 2012 DA14 through the Earth-moon system on Feb. 15, 2013. Credit: NASA/JPL

(Phys.org) —On Saturday, an asteroid the size of one and a half football fields flew within 240,000 miles of Earth. If the space rock had hit land, it would have leveled an area the size of San Francisco Bay. If it had hit the Pacific Ocean, the impact would have sent a tsunami to every facing shore.

But what is perhaps most alarming about this particular [asteroid](#), called 2013 ET, is that, until March 3, no one had any idea it was headed toward Earth.

Scott Hubbard, a consulting professor of [aeronautics and astronautics](#) at Stanford, thinks we can do something about that. Hubbard, a former director of [NASA](#) Ames Research Center, is also the program architect for the B612 Foundation, which aims to track down the hundreds of thousands of unknown asteroids that could pose a threat to Earth.

Many asteroids that come near Earth – such as 2013 ET, or 2012 DA14, the football stadium-size asteroid that passed inside the orbit of Earth's [communication satellites](#) in February – have unusually long orbits.

There are an estimated million of these near-Earth asteroids longer than 100 meters, or about 300 feet. But because they are relatively small and spend so much time far from Earth, scientists tend to find them only by chance.

"We know about 90 to 95 percent of the asteroids larger than a kilometer," Hubbard said. "But we know only maybe 1 percent of the asteroids in the 100 meter range."

This is worrisome, considering that an impact from a 100-meter asteroid would be equal to detonating a 100-megaton hydrogen bomb.

The first step toward protecting the planet from these asteroids, Hubbard said, is to detect them. To that end, B612 is in the process of raising public funds to build an asteroid-hunting [space telescope](#) called [Sentinel](#).

Near-Earth asteroids are particularly difficult to spot. In addition to being relatively small, they are comprised mostly of [black carbon](#), so they blend in with the equally black background of space. The upside to

being dark is that the rocks absorb a decent amount of heat, which will make them obvious to Sentinel's planned array of infrared detectors.

"Once we detect an asteroid and track it long enough to know what the [orbit](#) is, then we can just apply the laws of physics and know exactly where it will be 50 to 100 years from now," Hubbard said.

Using this method, Sentinel, which will cost around \$450 million to build and launch, should discover nearly all the asteroids larger than 140 meters, and about half of those between 50 and 140 meters.

"The fundamental technology needed to achieve this exists, we just need to demonstrate that the detectors are sensitive enough and scale up to what we need," he said. "We're drawing on the heritage from two previous space telescopes, Kepler, which was used to detect exoplanets, and Spitzer, an infrared telescope. So far it all looks very doable, but we need a prototype to confirm the design."

Should Sentinel find an asteroid on a crash course with Earth, the Hayabusa and Deep Impact spacecraft (asteroid and comet impactors, respectively) would provide a basic strategy for deflecting the rock: run something into it.

"We just need to alter its velocity by about the speed of an ant walking, and over the years its course will be changed enough so that it will miss Earth," Hubbard said. "You don't need a nuclear bomb to do that."

Another plan calls for a gravity tractor, a process that involves placing an object in the vicinity of the rock. The gravitational interaction between the asteroid and the object throws off the asteroid's velocity by a tiny amount that multiplies over time so that it misses Earth.

But neither of these solutions is possible unless we know an asteroid is

bearing down on us a few years in advance, making efforts such as Sentinel all the more important.

Provided by Stanford University

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