

Near Earth Objects (NEOs) – The Cosmic Threat to Civilization's Survival

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By Mark Moidel

What would happen if something the size of a mountain, flying at 26 000 miles per hour (41 843 kilometers per hour), hit the Earth? Do our Governments have a plan in place to protect us from such a calamitous event? Judging by the administration's sluggish response both before and after Hurricane Katrina the likely answer is 'No'.

We live in a busy Solar System with lots of moving parts. Many of those parts consist of stony-iron materials known as asteroids and many of these rocky bodies have yet to be discovered and could impact with Earth at any time.

There are also many icy bodies, known as Comets. They live out past the orbits of Neptune. Any stirring of their orbits, perhaps nudged by gravitational forces of nearby stars can change their trajectories for a visit into the inner Solar System putting them on a potential collision course with Earth, also at any time.

Scientists Study Recent Developments

In January 2008 there was some news that an asteroid, known as 2007 WD5, might hit Mars. The resulting impact was projected to be similar in size to Meteor Crater, an impact crater a mile-wide in Arizona, formed in a flash of white light and fireball, when an asteroid struck there 50 000 years ago.

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Around the same time, another asteroid known as 2007 TU 24 was discovered in November 2007 by the Catalina Sky Survey on October 11, 2007. Calculations determined it would pass near the Earth, on January 29, 2008, just outside the orbit of the Moon, which is considered very close in astronomical terms.

2007 TU 24 is between 150 and 600 meters in diameter. The average interval between actual Earth impacts for an object this size is estimated to be about 37 000 years. Radar Observations of 2007 TU 24 were made at the Goldstone, California in late January and early February. This will permit later 3D shape reconstruction.

In July 1994, twenty-one fragments of Comet Shoemaker–Levy 9 smashed into Jupiter, leaving black and brown blotches on the planet for over a year, each blotch itself, the size of Earth. Astronomers have yet to witness an asteroid impact with another planet.

Therefore the opportunity to witness the 2007 WD5 impact on Mars was exciting to astronomers and scientists who wanted to make measurements of these types of objects as well as calculations and impact scenarios of what might happen should an asteroid, or a comet, impact with the Earth.

The Mars impact never took place as the asteroid cruised by without incident; a disappointment to astronomers who lost an opportunity to observe the direct effects of an asteroid impact on a planet similar to Earth.

Luckily for us though, the asteroid 2007 TU 24 also missed Earth. I couldn't help wondering how we would actually have responded if the scientists had told us that the Earth-bound asteroid was headed directly for us and that, according to their calculations there was no way it was going to miss us!

How Worried Should We Be?

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One of the main problems we have right now is the lack of an effective response. Even if we knew that an asteroid or comet was headed straight for us, and even if we had plenty of warning ahead of time, what would we do? Once we detect them we still have to figure out some way to safely and reliably destroy or deflect them. To date, such methods do not exist in practice, only in theory. No missions to prove the ability to move or destroy an asteroid or comet have ever been undertaken by any country.

If an asteroid were to hit Earth, impact would likely be in the oceans as Earth is over 70% water. The effects of such an impact could include Tsunamis, which would be devastating to small Island nations and coastlines on the main land on both sides of the ocean, or could be as devastating as planet-wide environmental collapse if the projectile is large enough to punch through the ocean floor.

An asteroid could also hit land, including cities, again causing anywhere from local to global devastation depending on the size of the impactor. Food chains, transportation, infrastructure could all be leveled with a moderate impact and civilization itself can be jeopardized.

A big impact would jeopardize the survival of the entire planet, not just food chains and civilization, by kicking up tones of dust and soot high into the atmosphere, similar to gigantic volcanic eruptions which would block out the sun and change climate, killing off vegetation as temperatures plummet and no access to solar energy for photosynthesis.

When looking at the Moon, Mercury, Mars and even the Earth itself, we can see the pock-marks that tell the tale of their respective histories. As the Moon and Mercury are not subject to the forces of erosion, their battle-worn landscapes bear the scars of countless impact craters displayed in plain view; harsh reminders of the reality of every planet's life in the brutal environment of space. These pock-marks should act as a reminder that "It's not a matter of If an impact will happen, but when!"

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According to David Morrison at NASA-AMES in an article he wrote in September 1998, (see link below) on average a NEO with about 1 million megatons energy (roughly 2 km in diameter) collides with the Earth once or twice per million years, statistically speaking. An impact of this size would kill a substantial proportion of the Earth's population and have a devastating and lasting effect on Earth's environment. What such a statistic does not tell you of course is whether the impact will occur one million years from today, or one week from today. What is interesting to note is that the impact that most scientists believe is responsible for causing the extinction of the dinosaurs occurred 65 million years ago. That may well make us long overdue for an extinction-level strike.

Is Anyone Doing Anything About This Situation?

US Military budgets do not include Earth's protection. The US military does not even have a mission to worry about it. The military agenda of all countries is to defend their respective countries' interests. To date, NEO's are not of formal interest to any military. No country or conglomerate of countries has undertaken the task, officially, to protect the Earth from NEOs.

Were an imminent impact to happen, would the government(s) even tell us at all? We have already determined that governments are not prepared to intercede, intercept and save the day. In February 2008 the US Air Force shot down an orbiting US Spy Satellite. The satellite was traveling at near asteroid speeds, at 23 000 miles per hour. Impressive as that was, who would save Earth from an impending impact?

“Space Guardians” around the world are hunting for these potentially hazardous Near Earth Objects. (That term, Space Guardians, was created by myself and based on Sir Arthur C. Clarke's novel “Rendezvous with Rama” which featured an NEO search program called Space Guard. Sir Arthur C. Clarke very much appreciates that reference.)

The major US-based searches include the most productive sky survey, the Catalina Sky Survey, run by Steve Larson, with searches in both the Northern and Southern hemispheres. The remaining searches are all uniquely located in the Northern hemisphere with money provided by NASA. They include: the US

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Air Force operated LINEAR program from Lincoln Laboratories, run by Grant Stokes and NEAT (Near Earth Asteroid Tracking) a JPL run operation. Spacewatch is yet another NEO search founded by Tom Gehrels and Robert McMillan and run by Robert McMillan, based near Tucson, Arizona. Finally, the Lowell Observatory in Flagstaff, Arizona, has a search called LONEOS (Lowell Observatory Near Earth Object Search) run by Ted Bowell. There are also countless amateur astronomers around the world that help in tracking the known asteroids (sometimes even finding a few new ones themselves).

Is Luck a Sensible Strategy?

We know what will happen. It is inevitable. We've witnessed impacts on other worlds. Scientists are convinced that it was a Comet that wiped out the dinosaurs 65 million years ago.

The big impact at Tunguska in 1908 is the latest major event of its kind on Earth. Luckily it exploded over an uninhabited part of Siberia and only one person died as a result. However, the explosion was equal to that at Hiroshima and the trees that were felled for miles around the impact site remain so to this day.

While very few people on Earth consider these very real dangers from Space, thousands of relentless NEO's traveling silently through the night go on indifferently about their business.

Learn More

Videos

For a thorough understanding of the NEO hazard and what is being done about it, watch the seminal film on this subject, "Planetary Defense": <http://spaceviz.com/documentaries/planetarydefense/planetarydefense.html>.

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“Planetary Defense” speaks with military, scientific and governmental experts on the various NEO issues. The film also features eminent science fiction author Sir Arthur C. Clarke and Apollo 9 astronaut, Rusty Schweickart, who will be advising the United Nations about the NEO risk in 2009.

“Planetary Defense”, the DVD, is available for purchase through the Space Viz web site at <http://www.SpaceViz.com>. The DVD is also available for purchase from [Amazon.com](http://www.amazon.com). The film runs 48 minutes and has nearly one hour of Bonus Features in the form of two silent slideshows. One slideshow shows a collection of asteroids and comets from NASA, JPL and other sources; the other is dedicated to impact sites here on Earth.

Articles

For more information about NEO's visit <http://impact.arc.nasa.gov>. There you will find comprehensive coverage about NEO's by David Morrison of NASA-AMES.

A plethora of other material about the NEO hazard can be found online.

Mark Moidel is a film maker, musician, editor, interviewer and author, based on Earth, with a planet to save.

He has a Science background and a Fine Arts degree. He is a science buff, an amateur astronomer and speaks at Special 'Science' Events throughout the world. He is often invited to speak (or Key Note Address) to the general public-at-large in a succinct, educational and entertaining way about astronomical phenomena. His advice is sought after by the local media and press.

Mark's special interests and expertise also include dogs (and pets in general); music composition and publishing; and independent film production and distribution.