

becoming the next cosmic catastrophe. "Apophis is not going to hit the Earth Period," Chesley said. "Whatever the impact probabilities that we compute right now are, we're not going to let it."

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Cosmic Collision

"Throughout their 4.5 billion year history, Earth and its neighbouring planets have been like sitting ducks in a cosmic shooting gallery.

A glance at our moon shows the scars left by countless collisions with asteroids and comets. In fact, the moon is thought to have been created when part of the early Earth was ripped away in a cosmic impact with an object the size of Mars.

Earth also has scars, but most have been hidden by vegetation or eroded by geologic processes such as rain and wind. About 170 major impact sites, including northern Arizona's 4000 foot-wide Barringer Crater, have been identified around the globe.

Within the past century, an extraterrestrial chunk of rock about 200 feet wide is thought to have caused a 1908 blast near Tunguska, Siberia, that leveled 60 million trees in an area the size of Rhode Island. Researchers theorize the object exploded four to six miles above the ground with the force of 10 million to 15 million tonnes of TNT.

Few outside scientific circles took the threat posed by

near-Earth objects seriously until 1980. Then, Luis and Walter Alvarez published a study based on geologic evidence that concluded a cataclysmic asteroid or comet impact 65 million years ago caused the mass extinction of two-thirds of all plant and animal life on Earth – including the dinosaurs.

Dubbed the Great Exterminator, the colossal object was estimated at 7 miles in diameter and created a blast of millions of times more destructive than a nuclear explosion. Objects that size are thought to hit Earth about every 100 million years.

NASA scientists studying satellite photos bolstered the Alverezes' theory with the discovery in 1991 of an impact crater 125 miles wide buried beneath the northwestern corner of Mexico's Yucatan Peninsula. Three years later, NASA photos of another sort drove home the potential for cosmic collisions in our part of the solar system.

Spectacular images from the Hubble Space Telescope of Comet Shoemaker-Levy's collision with Jupiter showed 21 comet fragments, some more than a mile wide, producing colossal fireballs that rose above the giant planet's cloud deck.

"I think the most important development for getting this public awareness going was the Alverezes' research that the dinosaurs went extinct as the result of an impact," Morrison said. "We are faced with a real example where an impact had done terrible damage."

INTENSE RANDOM MAGNETISM IN THE VREDEFORT DOME

In a news item in the recent issue of the *Scientific American* [v.294(5), p.13, May 2006] by Graham P. Collins highlights the fascinating work of Rodger Hart of the Ithemba Laboratory for Accelerator Based Science in S. Africa, along with colleagues from Paris Earth Physics Institution on the Vredefort's "weird" magnetism.

The two-billion-year-old Vredefort dome is the oldest and largest impact structure on the planet. A 10 km long asteroid-impact is presumed to have resulted in a near 300 km wide crater. Owing to its ancestry, many of the original features have been obliterated due to subsequent geological processes. What remains prominently today is the Vredefort Dome, interpreted as a "rebound peak" at the centre of the impact site.

Exceptionally intense and random magnetism is shown by the shocked rocks at the centre of Vredefort structure which did not melt, while the pseudotachylites produced by actual melting show normal magnetism. Impact physics confirms that "chaotic magnetic fields are generated by

currents flowing in the ionized gases produced at the height of the collision"

Surprisingly, this unusual random magnetism is not picked up in aerial geophysical surveys, which show an anomalously low magnetism over the crater. This is perhaps due to the averaging out of the "magnetic madness" recorded on the ground. A helicopter-borne very low altitude geophysical survey has been suggested by the scientists to record and map out the random variations of the intense magnetism shown at the Vredefort dome. These studies by the South African and French scientists are also having implications in the reinterpretation of the magnetic picture over the giant Martian impact craters.

It would be of interest to attempt a study of the magnetics over the Ramgarh Structure in Rajasthan recently described (*JGSI*, v 67(4), pp 423-431, 2006) or at the Lonar crater in Maharashtra or over the domal features in the Cuddapah Basin even, both by ground as well as low-altitude helicopter-borne surveys. — *M.S. Rao*