Earth’S Next “Big Bang”: Asteroid Impact Essay, Research Paper

Asteroids sling through space, celestial debris of diverse origins, leftovers from the formation of the solar system, broken offshoots of parental asteroids or comets that have lost their glow. But if an asteroid were to smash into Earth, the result would mean

a global catastrophe and life on our Planet could come to an end. The explosion

would approach that of a million megatons of TNT- sixteen hundred times greater than the most powerful nuclear weapon ever tested (Barnes-Svarney 234).

“Asteroid” is Greek for “starlike”. They were given this name because early telescopes could see them only as points of light. The asteroid belt, between the orbits of Mars and Jupiter, contains tens of thousands of asteroids with diameters of a mile or more. The larger ones are spherical, but smaller ones, their cohesion greater than their gravity, are extremely irregular. There is no lower limit to asteroid size because they grade down to tiny rocks and particles of dust No asteroid is big enough to hold an atmosphere (Gardner 5).

Almost all asteroids are confined to the asteroid belt, but many wander far beyond the orbit of Jupiter, and others plunge inward past the orbit of Venus. It is estimated that more than a thousand asteroids at least a mile wide are “Near Earth Objects” (NEOs). Some are three or more miles wide. They pose a monstrous threat to humanity if they come close to Earth or hit it (Gardner 16).

According to a report sponsored by NASA in 1992, “The Spaceguard Survey: Report of the NASA International Near-Earth Object Detection Workshop”, the hazards

from asteroids can be divided into three broad categories that depend on the size and/or kinetic energy of the impactor (Barnes-Svarney 225).

A Category 1 impact usually breaks apart before it reaches the surface and it is usually between 10 and 100 meters in diameter. The explosion of the object creates the kinetic energy equivalent to about 50 to 100 kilotons of TNT. The Category 2 impact ranges from 100 meter 5 to 1 kilometer and strike the Earth an average of about once every 5000 years. One of the most frightening scenarios is based on Category 3 impacts. These impactors, ranging from 1 kilometer to 5 kilometers in diameter and traveling at speeds of tens of kilometers per second, were more prolific in early days of the solar system, as seen with the many larger impact craters seen on the Moon, Mercury, Mars and Venus (Morrison 36).

In July 1994 Jupiter experienced the crash of Comet Shoemaker-Levy 9. After fragments of Comet Shoemaker-Levy 9 exploded in Jupiter’s atmosphere they produced huge fireballs of hot gas and dust that rose high above the planet’s clouds. Jupiter’s atmosphere was literally blown away from above the impact site and hot gas

and dust were funneled up to altitudes of 3,500 kilometers. But in Jupiter’s strong

gravity, whatever went up had to come back down. So for about twenty minutes after each impact, the dust-laden plumes fell back into the atmosphere, reentering with a horrendous release of energy. The heat from this reentry was so intense it was easily detected from Earth (Morrison 37).

Although no known asteroids are currently on a potential collision course with Earth, 108 are nevertheless worrisome enough in the long term for the Minor Planet

Center to catalog them as “Potentially Hazardous Asteroids” (PHAs). The purpose of the list is to identify objects that astronomers should routinely watch (Goldman 36). This does not mean however that Earth has not experienced this phenomenon before. In 1908 the crash of a large NEO occurred in the Tunguska River Valley of Central Siberia. It flattened trees for many miles around and killed a herd of reindeer. Additionally, Earth is spotted with dozens of visible craters that testify to similar impacts, and there surely are thousands of craters that vanished long ago from erosion. It is widely believed the impact of a giant NEO caused a mass extinction of life, including the dinosaurs, 65 million years ago at the end of the Cretaceous era (Shibley 93).

But what would the effect be today if Earth was the target of an asteroid? If an asteroid the size of a kilometer or greater hit our Planet it would push the Earth over the threshold of global catastrophe. If such an impact occurred on land or in the oceans the results would alter the Earth’s overall balance The impact would disperse dust globally, enough to produce a significant, short term change in climate worldwide. in addition to devastating blast effects in the region of impact. At the smaller end of the category 3 asteroid, the devastation would be immense. The larger end of the Category 3 spectrum, civilization itself would be threatened, if not wiped out altogether. The impact would first be accompanied by a massive explosion, enough to fragment and partially vaporize both the projectile and the spot below the impactor on the Earth’s

surface. For about a half an hour, the highspeed ejecta thrown from the impact would

produce enough searing heat to scorch every living thing around the impact and would

create a firestorm from the heat and the falling fiery fragments, that would burn everything around – then spread rapidly over an entire continent. Many lakes, streams, soils, and the upper surface of some oceans would become acidified, as the nitric acid from the impactor’s fireball entered the atmosphere and covered parts of the Earth’s surface (Barnes-Svarney 57).

The major problem would stem from the amount of dust and debris that entered the upper atmosphere. Such dust would be carried around the world by prevailing winds, the dust spreading and blocking out much of the sunlight. The sunsets and sunrises would take on an amazing ruddy glow but the dust would act like a screen during the day. The lack of sunshine would cause the temperatures to drop by tens of degrees Celsius which, according to climatologists studying global warming, even a drop of a few degrees worldwide can cause dramatic climate and physical changes, such as an increase in ice that make up the polar ice caps. This trend would decrease the growing seasons, or even wipe out one or more growing seasons altogether,

creating massive worldwide crop failures Months later, the effect would switch

around – water vapor and carbon dioxide would increase, pushing a greenhouse effect

over the global warming threshold. Temperatures would rise this time but such

warming of the cooled down planet would probably be too late to rectify the global catastrophe. As the surface warming increased the humidity of the troposphere would increase the greenhouse effect Again, caught in a vicious cycle, the ocean would release carbon dioxide as it warmed. This thermal cycling of the planet would only strain the biosphere, decreasing the chances for all organisms to survive. In the midst

of the tragedy, humans would be pushed to their limits trying to survive. The colder weather after the impact would kill crops; the repercussions would include the lack of

food, including loss of livestock and wildlife. In turn, less available food would cause

starvation worldwide. With this, disease would spread from the decay of the organisms

that were killed by the impact. Months later, the warmer climate generated as

greenhouse gases increased would only serve to exacerbate an already devastating

situation. Ice caps would begin to melt and inundate the coastal towns and cities and

populations would move inland. The heat would put strains on the atmosphere, creating droughts or drenching rains in many areas. Humidity would increase around the world, turning much of the remaining landmasses into tropical jungles. The additional atmospheric water would also increase the severity of storms causing extensive flooding and damage from wind and driving rains (Gettschalk 37).

If an asteroid is determined to be on a near collision with Earth, what can be done to prevent disaster? One suggestion is to attach a nuclear bomb to the rock that will blow it into a harmless orbit. Tracking down potential killer asteroids is the job of

researchers involved in several ground-based programs. Examples include the Jet

Propulsion Laboratory’s (JPL) fully automated Near Earth Asteroid Tracking (NEAT) system, the University of Arizona’s Spacewatch program, the Lowell Observatory Near Earth Object Survey (LONEOS), and the Lincoln Laboratory’s LINEAR Program (Gottschalk 38). NASA has announced its goal to locate, by the year 2010, at least 90

percent of all asteroids larger than 1 kilometer across that can threaten the Earth. To

be set up at NASA’s Jet Propulsion Laboratory in Pasadena, California, the Near-Earth Object Program Office will be headed by JPL astronomer Donald K. Yeomans. In

addition the new office will maintain up-to-date orbital elements and assess impact probabilities (Anonymous I 1)

In the end. asteroids will be either our nemesis, causing problems we have never faced before or they will be our saviors in space. They will provide us with resources to carry on throughout the solar system end beyond.

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