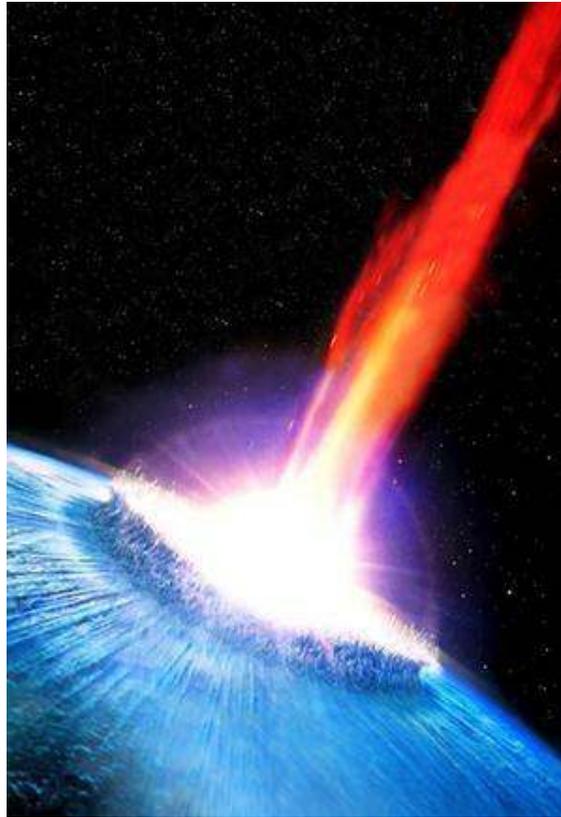


**ORBITING EXTINCTION,
OR
JUST PIE IN THE SKY?**



by

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Introduction

In 1998, Hollywood dramatically reminded us of the fragility of planet Earth and its inhabitants. The movie, "*Deep Impact*", graphically showed an Extinction Level Event (ELE) when a rogue comet collided with Earth.

However, is it all just modern melodramatic fiction?

The answer is no, even writers from the past have issued "impact" warnings in very clear terms. St. John, of the 1st century AD, speaks about future events:

"... and there fell a great star from heaven, burning as it were a lamp, and it fell upon the third part of the rivers, and upon the fountains of waters; and the name of the star is called Wormwood..."

He later continues:

*"... and I saw a star fall from heaven unto the earth... and there arose a smoke out of the pit, as the smoke of a great furnace; and the sun and the air were darkened by reason of the smoke of the pit."
(Revelation 8:10, 9:1-2, King James Version of the Bible)*

Nostradamus

The 16th century "Renaissance Man", Michael de Nostredame, issued the following impact messages:

*"In the year 1999 and seven months, From the sky will come a great and frightening king... There will appear, towards the North, Not far from Cancer, a long-tailed comet... At the eclipse of the sun [11 Aug 1999?], The monster will appear in broad daylight, interpretations will differ, None will have forecast the cost... A burning flame will appear in the night sky... A great fire will be seen at sunrise, its noise and light extending to the north, Death and cries shall be heard inside the circle... The bright star will burn for seven days, The smoke therefrom will cause two suns to appear...!"
(Nostradamus Prophecies, 10/72, 6/6, 3/34, 2/96, 2/91, and 2/41).*

1996

On 19 May 1996 such prophecies were almost fulfilled - an asteroid (designated, JA1), the size of the Millennium Dome in London, came within 280,000 miles of Earth (six hours from impact). Had there been a collision, the explosive force released would have been five times more powerful than the total world nuclear arsenal, and, in all probability, mankind would have been eradicated. This was the largest object to approach our planet since records began in 1833.

65 MYA

However, this event was not unique, and in the past, our planet has not been so lucky. 65 million years ago, a ten kilometre bolide, named "Chicxulub", struck the Earth in the area of the Gulf of Mexico. This left a crater, approximately two-hundred kilometres in diameter, and changed the course of history. It is thought that this event started the dinosaurs, then the world rulers, down the road of extinction, thus leaving the field open for a new species to rise to dominance - us.

1992

Recently, in 1992, the Shoemaker-Levy comet passed close enough to Jupiter to be tidally ripped apart; and in 1994 it passed again, and this time, all its fragments impacted on the planet.

Since its formation, Earth has been peppered with innumerable craters; however, the impacting bodies are typically small, and negligible damage is caused. Each year, over forty tons of impactors survive their plunge through the atmosphere and strike the planet's surface.

Impactors

There are three types of impactor, namely asteroids, meteoroids, and comets, and all are as old as the solar system (c. 4,500 million years) itself.

Asteroids, or small planetoids as they are sometimes called, are celestial bodies that orbit the sun, and vary in size between 1 and 670 kilometres. The typical composition of an asteroid is iron and rock. Thus far, more than two-thousand Earth-crossing asteroids, larger than a kilometre in size, have been identified, and it is estimated that there are thousands more that are potentially threatening. Most asteroids are at a distance of 314.2 to 493.7 million kilometres from the sun, in a belt between Mars and Jupiter. Fortunately, asteroids and their orbits are readily identifiable, and observers can issue warnings of possible impacts.

Meteoroid is a general term for small stony and/or metallic celestial bodies that orbit the sun. They are thought to be the result of asteroid collisions, and/or the remains of comets. These bodies are the most frequent visitors to Earth, and are known as "meteors" when they blaze through the sky, and are called "meteorites" when they strike the planet's surface.

Comets are fast moving celestial bodies that are thought to be composed of ice, dust, and possibly collections of rocky material. It is thought that some 12,000 million comets exist in a large moving spherical mass known as the Oort Cloud, located 7,480,000 million kilometres from the sun. A second collection of approximately 1,000 million comets exist in the Kuiper Belt that orbits the sun at a distance of 5,236 to 149,000 million kilometres. Long-period comets have orbits that take longer than 200 years to complete, whereas, short-period comets complete their orbits in less than 200 years. Hale-Bopp, discovered in 1995, is an example of a long-period comet, with its last Earth-visit in c. 2214 BC. In contrast, Halley's is a short period comet, with an orbital period of approximately 76 years, and its last Earth-visit was in 1986.

Regarding comets, Dr Brian G. Marsden (Director, Planetary Sciences Division, Harvard-Smithsonian Centre for Astrophysics) points out that with current technology, it is unlikely that an Earth-impacting long-period comet could be detected more than a year or two in advance, and the actual warning would probably be, at most, weeks. Nevertheless, he adds that object for object, the fraction of danger related to long-period comets is scarcely larger than perhaps two per cent. Asteroid impact is, by far, the more common threat. However, for the record, a one kilometre comet, hitting an ocean, would release an explosion equivalent of a 300,000 megaton nuclear bomb.

What about the future?

According to the Minor Planet Centre (Harvard University, USA), between February 1998 and December 2093, there will be fifty-three potentially hazardous bodies passing within 7.5 million kilometres of the Earth, and four of them will pass by as close as 0.9 to 1.3 million kilometres.

The four near misses will take place:

October - 2053
February - 2060
October - 2069
October - 2086

In astronomical terms, it's going to be a very close shave; however, at this time, none of the bodies are on a collision course with Earth.

Fallout

Nevertheless, what would happen if one of them did hit us?

For example, if a collision took place 30 miles off the south-west coast of England, by impact plus eight seconds, millions of tons of debris, superheated by friction to 3,000 degrees Fahrenheit, would have been launched into orbit.

Earthquakes would hit the UK and Europe by impact plus forty-three seconds - all cities would be flattened, and Ireland would plough into mainland UK.

After impact plus ten minutes, the superheated debris would start to re-enter the atmosphere, and uncontrollable firestorms would rage over Europe and the United States. By this time all communication with Europe would have ended. The firestorms and earthquakes would continue out of control, and by impact plus fifteen minutes, tidal waves would have swept away anything that was left on the surface of the UK and Europe.

The United States would be targeted next, and by impact plus twenty minutes, earthquakes followed by tidal waves would hit the eastern seaboard with countless people and property being destroyed. By this time, all communication with the northern hemisphere would have ended. Dust and smoke would block out the sun by impact plus sixty minutes, and a post impact winter, that could develop into a new ice age, would begin. The overall prognosis for human survival is very poor, with Australasia as the last outpost.

Dr Marsden indicated, regarding a major impact, that we, too, could go the way of the dinosaurs.

However, it's not all bleak, science could provide us with advance knowledge of the danger.

How far in advance would that knowledge be?

The current answer is, with only a matter of days, it might be better that we do not know, because our preparations would be largely futile.

1996

Edward Teller, a Hungarian-born American physicist issued a warning in 1996:

*"Every few human lifetimes, there is a bombardment event like that which occurred in Siberia in 1908 (Tunguska), wiping out most life over an area of about 10,000 square miles... The advent during the last half-century of reasonably large-scale rocket propulsion has given us the technological means necessary to avert such impacts."
(Extract from a letter to British Prime Minister, John Major, 4 November 1996)*

Unfortunately, warnings of this nature have, in the main, gone unheeded and Earth is basically still defenceless against a large impactor travelling at a speed in excess of 70 kilometres per second.

Our current ability to deal with rogue impactors was outlined by Colonel John M Urias, and his colleagues, of the academic-research section of the US Department of defence, to the US Air Force in 1996:

*"Due to a lack of awareness and emphasis, the world is not socially, economically, or politically prepared to deal with the vulnerability of the EMS (Earth Moon System)-to-ECO (Earth Crossing Object) impacts and their potential consequences. Further, in terms of existing capabilities, there is currently a lack of adequate means of detection, command, control, communications, computers, and intelligence (C41), and mitigation... In terms of courses of actions in the event of a likely impact of an ECO, other than a nuclear option, no defensive capability exists today. However, new technologies may yield safer and more cost effective solutions by 2025. These authors contend that the stakes are simply too high not to pursue direct and viable solutions to the ECO problem. Indeed, the survival of humanity is at stake."
(Col J M Urias, Planetary Defence: Catastrophic Health Insurance for Planet Earth - a research Paper, 1996)*

Rosetta

In view of the world threat, and the need to develop an understanding of impactors and how to deal with them, the "Rosetta" mission was created by the European Space Agency. The plan is to place a robotic probe on a comet's surface and to gather first-hand information. Comet 67P/Churyumov-Gerasimenko is the target, and the project will run from 2004 to 2015 when Rosetta will deactivate as the comet makes a close approach to the sun.

Rosetta will be launched in 2004, and will rendezvous with Comet 67P/Churyumov-Gerasimenko in 2014. A probe will be then be placed, and pictures and information will be relayed from the comet's surface.

It is thought that projects like Rosetta will provide the much needed information to help in the development of defence systems against Earth impactors.

So, after all said and done, is all this danger just pie in the sky and media hype? The answer is no, it is very real, but it must be kept in proper perspective. We cannot, we must not, live our lives cowering in terror of the sky falling on our heads. It is essential that life be experienced, by each individual, as full as possible, for as long as possible. And if the worst should happen, at least our species did all it could, and broke all records on the evolutionary ladder... And we certainly believe that we are the best so far!

"What the Hell's that glow in the sky? Oh Shit...!"

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Postscript

It is now December 2010 and we're still here.

Rosetta update:

Rosetta Mission Update	
http://www.esa.int/esaMI/Rosetta/SEMYMF374OD_0.html	
Event	Date
Successful Launch by an Ariane-5G rocket, from Kourou, French Guiana	02 March 2004
1st Earth Swing-By	04 March 2005
Mars Swing-By	25 February 2007
2nd Earth Swing-By	13 November 2007
Steins Fly-By	05 September 2008
3rd Earth Swing-By	13 November 2009
Lutetia Fly-By	10 July 2010
Future Activity	
Event	Date
Comet Rendezvous Manoeuvres	22 May 2014
Lander Delivery	10 November 2014
Escorting the Comet around the Sun	November 2014 - December 2015
End of Mission	December 2015

End

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