

Near-Earth Objects: Finding Them Before They Find Us

Reviewed by Roger D. Launius

Near-Earth Objects: Finding Them Before They Find Us by Donald H. Yeomans. Princeton, NJ: Princeton University Press, 2012. 200 pages. ISBN: 978-0-691-14929-5. \$24.94 USD (hard cover with dust jacket, 20 halftones, 19 line illustrations, 6 tables, 6 x 9 inches).

The premise of this book by Jet Propulsion Laboratory scientist Donald H. Yeomans is that of all of the threats to life on this planet, perhaps the most significant is a mass extinction coming from either a comet or asteroid impact. In *Near-Earth Objects: Finding Them Before They Find Us* Yeomans offers a general audience an introduction to the science of near-Earth objects – especially the history, applications, and ongoing quest to find these celestial objects before they hit Earth.

I was introduced to this reality twenty years ago at the annual meeting of this professional society when a noted scientist gave a presentation entitled "Chicken Little Was Right." He claimed that humans had a greater chance of being killed by a comet or asteroid falling from the sky than dying in an airplane crash. This is true, especially as one projects the risk over a very long period of time. Mathematical calculations confirm that every person alive today faces one chance in 5,000 that he or she will be killed by some type of extraterrestrial impact during his or her lifetime since several thousand meteorites, comets, and asteroids cross Earth's orbit, and many small pieces enter the atmosphere every day. One need only look at the craters on the Moon, and such wonders as Meteor Crater in Arizona, to verify the fact that solar system bodies make fine targets for comets and asteroids. More than ever before, as Yeomans's makes clear, throughout history asteroids and comets have struck Earth with destructive consequences.

The reality of a massive threat to life on Earth from space entered the public



consciousness in 1980 when scientists – especially Luis and Walter Alvarez – proposed a hypothesis that dinosaurs became extinct after an asteroid or comet only six to nine miles wide left a crater 186 miles wide in Mexico's Yucatan Peninsula and threw enough dust into the atmosphere to cause global climate change. This "*K-T extinction*" – occurring at the boundary between the Cretaceous period (K) and the Tertiary period (T) – has become common knowledge as the reason for the dinosaur mass extinction, and it has engendered all manner of responses in popular culture. Notably, two blockbuster films in 1998 – *Armageddon* and *Deep Impact* – used a potential asteroid impact as the premise for space adventures to avert a mass extinction. Additionally, some entrepreneurs have developed and sold asteroid survival kits consisting of a hard hat and surgical mask, a measure of the fact that everything in modern society is considered a commodity from which to turn a profit.

In this work, Yeomans presents a compelling account of the origins of the solar system, taking notice of all of the ingredients orbiting the Sun including those smaller bodies that are attracted to larger gravitational fields and slam into them on a regular basis. Of course, comets and meteors have evolved over time, and some still crash into bodies in the solar system, notably Shoemaker-Levy 9 that hit Jupiter in 1994 with spectacular results.

Some of these objects journey near Earth, and these "near-Earth objects" represent a threat that could destroy all life on this planet. Yeomans lays out this story,

commenting on the many known and possible impacts in history. He makes much of the destruction wrought by the famous Tunguska event in 1908 near what is now Krasnoyarsk Krai, Russia, resulting from an air burst of a large meteoroid or comet only about 300 feet in diameter. By inference, something a few miles in diameter could bring about mass extinction. This prompts Yeomans to discuss how we might be able to reduce this threat with a survey to catalog and track these objects.

Understanding the reality of the impact threat that could destroy all life on this planet is a critical component of future efforts to mitigate it. Efforts to catalogue all Earth-crossing asteroids, track their trajectories, and develop countermeasures to destroy or deflect objects on a collision course with Earth are important, but to ensure the survival of the species, humanity must ultimately build outposts elsewhere. Astronaut John Young said it best in the November-December 2003 issue of *Space Times*. To paraphrase Pogo, "I have met an endangered species, and it is us." While Yeomans does not go quite this far with his discussion, it is one rational response to a very real concern.

Yeomans's book offers a strong introduction to the subject of near-Earth objects. In addition to the threat posed by these objects, the author advocates for their study for purely scientific purposes. "In terms of their chemical composition and thermal history, many of them are among the least changed members of our solar system" (p. 56). This could help scientists understand the evolution of the cosmos. Yeomans urges an aggressive exploration program to understand these small bodies, rogue or not. Thus far it is a modest program. Perhaps it will grow in the future.

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