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Book review: 'Near-Earth Objects: Finding Them Before They Find Us' by Donald K. Yeomans

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'Tis the season to be jolly. But for merrymakers, "Near-Earth Objects" is just the book to sober you up — and quick.

For centuries, humanity feared comets as they flew past us from deep space, their luminous tails looming over the Earth. But more dangerous are our unseen solar-system neighbors, the dark asteroids that reside relatively nearby, traveling within tens of millions of miles of Earth's orbit. The first near-Earth object found, called Eros, was not discovered until 1898. Since then, telescope surveys have revealed several thousand sizable ones — a 10th of a mile across or larger — and it's estimated that there are hundreds of millions that are smaller, down to a yard in width (not to mention all the pebbles and sand grains).

Why should we be concerned? Because, Donald K. Yeomans writes, an object with a diameter of a mile or more has "the capacity to wipe out an entire civilization in a single blow." There are about 1,000 objects of that size out there, though no huge one is threatening us at the moment. So we can sit back and enjoy the light shows when boulder-size asteroids create blazing fireballs as they disintegrate in the atmosphere or when tinier particles light up as shooting stars.

Yet despite the low probability of a devastating hit this century, Yeomans notes, such an event would be of high consequence. There was that little matter of the dinosaurs being exterminated some 65 million years ago in the aftermath of a catastrophic impact. As the science fiction writer Larry Niven once put it, "The dinosaurs became extinct because they didn't have a space program." That's why it's comforting to know that NASA has a Near Earth Object Program looking out for us; Yeomans manages it.

These objects were not always near us. After the birth of the solar system 4.6 billion years ago, they gradually arrived in our neighborhood as the asteroids in the belt between Mars and Jupiter collided with one another, throwing off fragments that headed toward the inner solar system and settled in. There are important scientific reasons to track them: "They are the remnants of the planetary formation process itself," Yeomans writes, "and as the least changed bodies from that process they offer clues to the chemical and thermal conditions under which the planets formed."

Nor was the Earth's colliding with one always a bad thing. When solar system debris was far more plentiful, the infant Earth was bombarded by strikes, which furnished generous amounts of carbon-based materials and water, the building blocks of life. One super-colossal hit gave us the moon to spoon under; the one that decimated the dinosaurs opened the way for mammals, and eventually us, to reign over the planet.

Despite its title, "Near-Earth Objects" offers a concise and informative overview of the formation of the entire solar system: why the planets differ, the latest theories on how they lined up and the origin of such leftovers as comets and asteroids. Yeomans also makes a good case that a near-Earth asteroid is an accessible target for our next space adventure, readying us for Mars and preparing us for a time when we might depend on them as a source of rare minerals.

But concerns about the devastating potential of near-Earth objects are the prime focus. By the 1990s, NASA had made it a goal to identify the biggest threats, the ones that could cause global havoc. We're talking worldwide firestorms, a blackened atmosphere that cuts us off from sunlight (stopping photosynthesis for our food), acid rain and possibly herculean tsunamis.

Dedicated telescopes in the United States, Australia and Europe are on the watch. Once an object is identified, its orbit is derived at computer centers at NASA's Jet Propulsion Laboratory in California, as well as in Italy and Spain. "If a particularly close approach to Earth within the next century or so is noted as being possible . . . the object enters the Sentry system, which computes potential future Earth-impact probabilities," Yeoman writes. Scientists are now surveying for objects as small as a 10th of a mile in size, the ones that could cause regional devastation (such as the 1908 Tunguska blast in Siberia that leveled millions of trees).

Is the Sentry working? You bet. In 2008, near-Earth-object surveyors spotted an incoming asteroid — fortunately only a few yards across — which the next day arrived exactly when predicted, producing a glowing fireball over Sudan and a treasure trove of meteorites. And just this month, one roughly 120 feet wide zipped between Earth and the moon, just two days after it was spotted.

What keeps the reader going is the ultimate question: Can we avert a disastrous collision? Yeomans saves that for an all-too-brief section at the end. Clever minds have devised dozens of harebrained schemes, but he favors the clean and simple. Run into the menacing asteroid with a spacecraft or detonate a nuclear bomb just off its surface, generating a shock blast that pushes it off course. Simply using the gravitational attraction between the cosmic rock and a thrusting spacecraft could be enough; a gentle and sustained push far out could translate into a big miss for Earth.

But all these ideas are dependent on getting early notice and knowing the asteroid's composition and structure. And as yet, there is no global policy on who would make the call or pay for Earth's rescue.

As we wait for those decisions, let's hope that the incoming object is no bigger than the one Michelle Knapp encountered in 1992. A small asteroid fragment hit the back of her car parked in Peekskill, N.Y., and her insurance company wouldn't pay for the damage, declaring it an "act of God." But meteorite hunters were more than willing to cart off the remains for $69,000. Now that happy ending puts the jolly back into the season.

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