1. Mark your confusion.
2. Show evidence of a close reading.
3. Write a 1+ page reflection.

Earth 1, Asteroids 0: The Next Generation of Planetary Defense Takes Shape at JPL

Source: Corinne Purtill, *Los Angeles Times*, March 26, 2025

There is a nonzero chance that somewhere in the nearby solar system is a rock that might kill us all. This stony assassin may well be orbiting the sun at this very moment, careening down a celestial path that could, one day, intersect with ours.

And if that rock is big enough and hits in the right place — boom. Fire and smoke and death and extinction. *Homo sapiens* goes the way of *T. rex*.

To save ourselves from a killer asteroid, first we have to find it. A spacecraft now under construction at NASA's Jet Propulsion Laboratory may be our best hope.

The Near-Earth Object (NEO) Surveyor is a $1.4-billion infrared telescope with a single mission: to hunt asteroids and comets that could pose a danger to Earth. Astronomers have already identified roughly 2,500 asteroids larger than 140 meters — 459 feet — that could come worryingly close.

Statistical models suggest that there could be as many as 25,000 such objects in the solar system, in addition to countless smaller asteroids that could also do considerable damage, said Amy Mainzer, a UCLA professor of planetary science who is leading the NEO Surveyor mission for NASA.

"We still don't know everything that's in our own backyard," Mainzer said. And if we do need to mount a defense against an incoming threat from space, she said, "it all starts with knowing that there's something there and having enough time to really make an informed plan."

Asteroids are essentially construction debris left over from the formation of the solar system. A collapsed cloud of gas and dust condensed in places to create planets, including the one we're on right now. It also produced smaller rocks that never achieved planet size or status.

The NEO Surveyor fulfills a 2005 act of Congress ordering NASA to catalog 90% of near-Earth objects larger than 459 feet, which is roughly the size at which an asteroid could take out a city, or "vaporize the L.A. Basin," said Tom Hoffman, JPL's project manager for the mission.

Within the first five years after its planned Sept. 13, 2027, launch from Cape Canaveral, Fla., the mission is tasked with identifying at least two-thirds of the estimated 25,000 asteroids larger than that size believed to be circling Earth. Within its first decade, astronomers expect to have tracked at least 90%, Mainzer said.

Most of what we know about the asteroids in our celestial neighborhood comes from ground-based telescopes. When viewed here on Earth, the most elusive asteroids look like ink spots traveling through a dark sky, Hoffman said.

But those dark objects absorb enough energy from the sun to raise their temperature. Through an infrared telescope, they glow like red Christmas lights.

The telescope's destination is the first Lagrange point, or L1, one of five known places in the solar system where the balanced gravitational forces of the sun and Earth tend to hold objects in place. From a fixed distance of roughly 1 million miles above Earth — five times the distance from here to the moon — it will follow our planet around the sun, taking in an exponentially broader view of the field around Earth's orbit than existing telescopes do.

The more images it captures of a potentially hazardous object, the more accurately astronomers can plot the object's future movements and calculate the risk.

The most famous collision between Earth and one of these objects took place about 66 million years ago, when a rock 7.5 miles wide smashed into what is now the Yucatan Peninsula.
The impact incinerated everything in the vicinity and sparked massive fires. Toxic clouds of pulverized rock, sulfate aerosols and wildfire soot soon blanketed the planet, blocking all but a tiny fraction of the sun's energy and bringing photosynthesis to a virtual halt for the only known time in history.

Much smaller rocks can still wreak havoc. In 2013, an asteroid approximately 60 feet in diameter entered the atmosphere near the city of Chelyabinsk, Russia. It exploded before hitting the ground — a common fate for smaller asteroids that can't withstand the compression of entry — and shattered enough windows to send roughly 1,600 people to the hospital with minor injuries.

"Anything bigger than that — it's not just going to be broken glass," Mainzer said.

Real-life asteroids don't come hurtling toward Earth from the outer reaches of space the way they do in the movies. They tend to orbit elliptical paths around the sun, passing within sight of our telescopes years, decades or even centuries before any potential collision.

Technology has, fortunately, come a long way since the late Cretaceous. The sooner we find these asteroids, the more time we have to figure out the right way to prevent a catastrophe, and the less work it takes to successfully pull that off.

"It all comes down to doing things as early as you can, because then you barely have to do anything," said Kathryn Kumamoto, head of the planetary defense program at Lawrence Livermore National Laboratory.

"If we did want to, say, deflect the asteroid, we only have to nudge it a very little bit if we can get to it very far in advance," Kumamoto said. "A change of a millimeter per second over decades will add up to thousands of kilometers, and that can be enough to make the asteroid miss the Earth entirely."

NASA's Double Asteroid Redirection Test, or DART, confirmed in 2022 that it's possible to successfully change the trajectory of a near-Earth object when it deliberately crashed a spacecraft into a tiny asteroid 7 million miles away.

But brute force isn't our only option. Other proposals include painting part of the object with a light-colored coating that would redistribute its heat and eventually change its spin and orbit, Mainzer said, or parking a large spacecraft nearby whose gravity would reshape the object's trajectory.

"It all starts with knowing that there's something there and having enough time to really make an informed plan," Mainzer said.

Possible Response Questions

- What are your thoughts about our planetary defense effortsT? Explain.
- Did something in the article surprise you? Discuss.
- Pick a word/line/passage from the article and respond to it.
- Discuss a "move" made by the writer in this piece that you think is good/interesting. Explain.