

SCIENCE

Asteroid Measurements Make No Sense

Is this space rock the size of a train car or 22 penguins?

By Marina Koren



Matt Chase / The Atlantic; Getty

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A couple of newly discovered asteroids whizzed past our planet earlier this month, tracing their own loop around the sun. These two aren't any more special than the thousands of other asteroids in the ever-growing catalog of near-Earth objects. But a recent news article in *The Jerusalem Post* described them in a rather eye-catching, even startling, way: Each rock, the story said, is “around the size of 22 emperor penguins stacked nose to toes.”

Now, if someone asked me to describe the size of an asteroid (or anything, for that matter), penguins wouldn't be the first unit that comes to mind. But the penguin asteroid is only the latest example of a common strategy in science communication: evoking images of familiar, earthly objects to convey the scope of mysterious, celestial ones. Usually, small asteroids are said to be the size of buses, skyscrapers, football fields, tennis courts, cars—mundane, inanimate things. Lately, though, the convention seems to be veering toward the weird.

Also this month, the same *Jerusalem Post* reporter, Aaron Reich, described another pair of asteroids as “approximately the size of 100 adult pugs.” Last year, a *Daily Mail* article wrote that an asteroid that had recently disintegrated in Earth’s atmosphere was “about half the size of a giraffe.” A scientific magazine, capitalizing on that article’s popularity, announced that astronomers would launch a “new asteroid-classification system based on animal sizes”—then revealed that it was only joking, dismissing the idea as “nonsense.” But maybe we shouldn’t scoff at the practice of comparing asteroids to penguins or other delightfully odd things. Asteroids, like other space objects and phenomena, can be tricky to contextualize. Maybe there’s room for whimsy. A new era of asteroid communication may be upon us.

Scientists don’t have formal guidelines for describing the nature of asteroids on a human scale. “It’s a real challenge to try and communicate physical properties of something that people aren’t going to actually lay eyes on or have any personal experience with,” Eric Christensen, a University of Arizona astronomer who oversees a program that detects near-Earth objects, told me. “Nobody’s ever visited an asteroid, so not even astronauts have firsthand experience of what it’s like.” And if they did, they probably wouldn’t think,

Ah, yes, just as I expected—it's as tall as 40 sea turtles stacked like a sleeve of crackers.

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So when astronomers talk about asteroids, they reach for the familiar. (As for the journalists who write about asteroids, I tried to contact the authors of the *Jerusalem Post* and *Daily Mail* stories, but they haven't responded). Consider last year's marquee space-rock event, when NASA crashed a spacecraft into an asteroid as practice for deflecting any future, actually hazardous visitors. Some scientists likened the size of that asteroid, named Dimorphos, to a football stadium; others compared it to an Egyptian pyramid.

These can be helpful images, but the approach has its limitations. “You can be into sports, but if you're not into

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U.S. football, these football fields make no sense,” Carrie Nugent, a planetary scientist at Olin College who studies asteroids, told me. And the pyramids of Egypt sound cooler than a stadium, but the analogy is certainly less effective if you’ve never been to Cairo. The same goes for the Eiffel Tower in Paris, the Empire State Building in New York City, and the Burj Khalifa in Dubai—all of which have been used as units of measure in asteroid comparisons.



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Penguins, cute as they are, have the same shortcoming. (Sorry, penguins!) “I don’t know how many people actually have a good sense of scale for penguins,” Daniella DellaGiustina, a scientist at the University of Arizona who works on a NASA asteroid mission, told me. “I remember seeing some penguins at the zoo when I was in the Southern Hemisphere, and they were bigger than I thought they would be.” Even if people can fairly accurately picture a penguin, comparing something to 22 of them “requires the reader to

imagine 22 (cute!) penguins standing on each other's shoulders—something no one has ever seen before,” David Polishook, an astronomer at the Weizmann Institute of Science in Israel, told me in an email. “A comparison with one train car, for example, is much simpler.”

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Then there's the problem of shape. A stadium, a pyramid, the Eiffel Tower—these objects all have very different outlines. The asteroids that orbit near Earth are, for the most part, lumps. They are not long and narrow like

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other, but it doesn't really tell you how big the asteroid is. Using penguins may even be “a bit misleading,” Andy Rivkin, a planetary astronomer at the Johns Hopkins Applied Physics Laboratory who works on NASA's asteroid-

deflection mission, told me. “If you think about the *volume* of that body, it’s more like—boy, I don’t know, hundreds of penguins?”

Without a convention to guide them, scientists follow their own preferences (and so, it seems, do journalists). DellaGiustina likes to invoke landforms, such as mountains and ridges. “These asteroids are little worlds,” she said. Not only can we picture a mountain, but we can also probably imagine ourselves hiking on a trail and feeling the craggy ground beneath us—a thought exercise that could make a faraway cosmic object less inscrutable. Nugent likes to tackle as many dimensions as possible. The asteroid that led to the mass extinction of the dinosaurs is thought to have been about 10 kilometers (32,000 feet) wide—which, she notes, is close to the cruising altitude of an airplane. So “imagine yourself in a plane, and imagine a giant, round rock that goes from your wing tip all the way to the ground, and which takes you over a minute to fly over,” she said. Adding a pile of penguins to this scenario would likely make it more confusing.

Animal parallels have one clear advantage over buses and the like: They're guaranteed to draw more attention. Christensen said he isn't very amused by the trend, calling it clickbait. Asteroids are already easy targets for sensationalist coverage; some publications treat close approaches to Earth as panic-worthy near misses. Exhibit A, from *The Daily Mirror* in 2019: "Asteroid the Size of BIG BEN Is Hurtling Towards Earth, NASA Warns." In reality, no known asteroid poses a threat to Earth in this century, and we'll probably be safe for even longer than that.

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When you're picking an unconventional unit of measurement, context counts. People have a tendency to anthropomorphize just about anything space-related, whether it's a robot or a comet. Some of the public reaction to NASA's asteroid "redirection" last year carried a tone of "Oh no, poor asteroid"; indeed, Dimorphos was just minding its own business when NASA came along and smashed into it. Imagine how much more violent that would have felt if scientists and journalists had compared the asteroid to something squishier than a stadium. Rivkin suspects that if astronomers had compared it to, say, a blue whale, "you'd have these cartoons about us beating up a blue whale."

Lighthearted comparisons would also be the wrong choice in the hypothetical event of a large space rock hurtling straight toward Earth. If a truly dangerous asteroid were ever approaching, the most important thing for the public to understand would be not its size, but the extent of the potential destruction it could cause. Scientists would have to consider darker metaphors, perhaps tallying the energy of the impact in nuclear detonations.

But for garden-variety asteroids, the ones that pass right by us or burn up in the atmosphere, animal comparisons might not be so bad. Nugent is delighted by the development. Sure, a reader might be disappointed to discover that the asteroid in question isn't shaped exactly like an alligator, but they might also learn something illuminating about asteroids that they wouldn't have otherwise. Still, let's take some extra care with certain comparisons. After all, describing an asteroid as "half the size of a giraffe" prompts readers to consider a rather horrifying question: *Which half?*

