Asteroids, anyone? Catalina Sky Survey invites you to help discover space rocks

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Discovering celestial objects has been a privilege reserved for astronomers – until now. Carson Fuls, a science engineering specialist at the University of Arizona Lunar and Planetary Laboratory[1] has expanded this opportunity to anyone who owns a computer, tablet or even a smartphone.

As part of the NASA-funded Catalina Sky Survey, Fuls recently launched an online portal[2] that allows volunteers to help find unknown asteroids and comets in space. Here's how it works: Software flags telescope images with detections that may or may not be asteroids. Participants then click through these snapshots of the sky, trying to decide if the flagged specks of light in the images are actual celestial bodies or just false detections.

If enough participants think a detection looks promising, the scientists analyze it and decide whether to send the candidate to the Minor Planet Center – a large database that tracks and records potential celestial objects.

Even before the online portal was released, Catalina Sky Survey had discovered nearly half of the entire known population of near-Earth objects – asteroids with orbits that may come close to Earth's at some point. Fuls hopes these numbers will rise now that volunteers are invited to be part of the discovery process.

With International Asteroid Day coming up on June 30, Lo Que Pasa asked Fuls about the success of the public asteroid discovery portal – known as The Daily Minor Planet – how people can get involved with a wide variety of citizen science projects, and whether we should be worried about an asteroid hitting the Earth.

Since The Daily Minor Planet went live, how many people have signed up to look for asteroids?

I can honestly say that in the three weeks since the project launched, it's been more successful than we ever imagined. So far, there have been 2,398 individual volunteers who have reviewed our data. Some of these people have just tried it out once or twice, others have looked at thousands and thousands of images. These people come from all around the world, which you can tell by seeing all the different languages in the comments.

Because of the news release[3] the University issued three weeks ago and NASA's social media presence, we got a huge influx of people to try the project at the beginning. But I still see new users posting all the time. You know, as an astronomer, I keep weird hours. I check on the portal quite a bit, and there are usually anywhere between 15 and 30 people actively working on the project at any given time.

How many unknown asteroids have the participants discovered?

The number of candidates we've identified has gone up dramatically. We have submitted 163 main-belt asteroids – asteroids found among a large population orbiting between Mars and Jupiter – to the Minor Planet Center, and probably 90% of these cannot be linked to any known objects at this time. Even better, we've submitted nine near-Earth object candidates. We just submitted another one and I'm pretty sure it's going to get a publication dedicated to it that will include all the names of the volunteers who were the first to identify it. Then, it will become an officially identified asteroid that you can look up in the Minor Planet Center database, find its current position and so on.

Why is it important to search for asteroids?

Asteroid detection programs allow us to give another chance to the very dim and marginal detections we get from our telescope each night, which otherwise might get tossed or overlooked. To some degree, we're trying to ensure real detections don't get lost and valuable telescope images don't go to waste.

Of course, we look out for potential threatening asteroids to our planet, which is something that's generally relevant for everyone's physical safety and well-being. But more than that, I think of finding these asteroids and cataloging their positions as like filling in the map of our solar system. These are individual worlds that we are discovering with their own unique composition and geology. From a science perspective, these discoveries are important because any theory of solar system formation and evolution must account for where these objects are today.

Should we be worried about asteroid impacts?

We get this question a lot. But believe me, there are very dedicated groups around the globe that are looking out for you. And really, there is such a low probability of an enormously catastrophic impact event that it's not worth your time worrying. You know, I'm a scientist, and we don't like to deal in absolutes. But I will say that with above 90% confidence, we have found all the asteroids that are 1 kilometer or larger that come near the Earth, and none of those pose any threat for the foreseeable future.
Thankfully, the larger ones are easier to spot. At Catalina Sky Survey, we are currently dedicated to looking for smaller objects that may cause a disaster on a regional level but pose no threat to life on Earth as a whole. So, for the time being, there are other, more salient issues that you could invest your time worrying about rather than a deadly asteroid impact.

What are the challenges and opportunities for future asteroid detection?

It's always a challenge to manage the sometime sensational rhetoric around this touchy topic. Because truly, the real level of threat asteroids pose to somebody's everyday life is very, very small. Another smaller issue is that the more resources are moved into near-Earth space, such as satellites, chances to misidentify them as asteroids go up. It's even possible that they move through our images and obstruct the view of real asteroids.

When it comes to future asteroid detection, the University of Arizona is the premier institution in the world for studying asteroids. The Lunar and Planetary Laboratory Spacewatch program, which began in the 1980s, pioneered the modern era of asteroid searches as the first group to use digital cameras and computers to search for asteroids. This program continues to this day, especially to follow-up on new observations. We also operate Catalina Sky Survey, space-based observations, and we even are in the process of bringing back a piece of an asteroid to study, as we speak.

To go along with this, the University's future Neo-Surveyor Space Mission, led by Amy Mainzer, is going to be instrumental in the next evolution of planetary defense. We have been congressionally mandated to find 90% of all PHAs, which is short for potentially hazardous asteroids. So far, there are a couple of thousand. I always give the disclaimer that PHAs fall into this category merely based on their size and proximity to the Earth, not because they actually are going to impact any time soon.

What has been your most memorable experience as an astronomer?

A few years back, I was lucky enough to be in the Santa Catalina Mountains, just north of Tucson, at the Kuiper 61-inch telescope when I got an email about a newly found object that seemed to be moving too fast to have come from our solar system. Right then and there, I pointed my telescope up toward it to look for myself. Indeed, it ended up being the first interstellar asteroid ever found, and its discoverers named it 'Oumuamua. That was a spectacular experience as someone who loves asteroids and solar system science so much, to get to see a visitor from a different solar system. I'm glad I got to be a part of that really special and unique moment in history.

How can people get involved with citizen science projects like yours?

I recommend that people check out the wider Zooniverse site itself. There are all sorts of participatory science projects out there available for people to make concrete discoveries and progress, not just astronomy-based projects. For instance, there are projects that rely on volunteers who can read old calligraphy to translate handwritten notes from logs that were taken hundreds of years ago. Other projects give you the chance to identify plant and animal species. Citizen science projects open up science and other technical fields to everyone. You don't have to have gone to school or have a Ph.D. in astronomy to make significant contributions to science. To me, that's just fantastic.

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