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# Student Aids In Tracking Down Near Earth Asteroids

by Tammy Plotner on November 22, 2011

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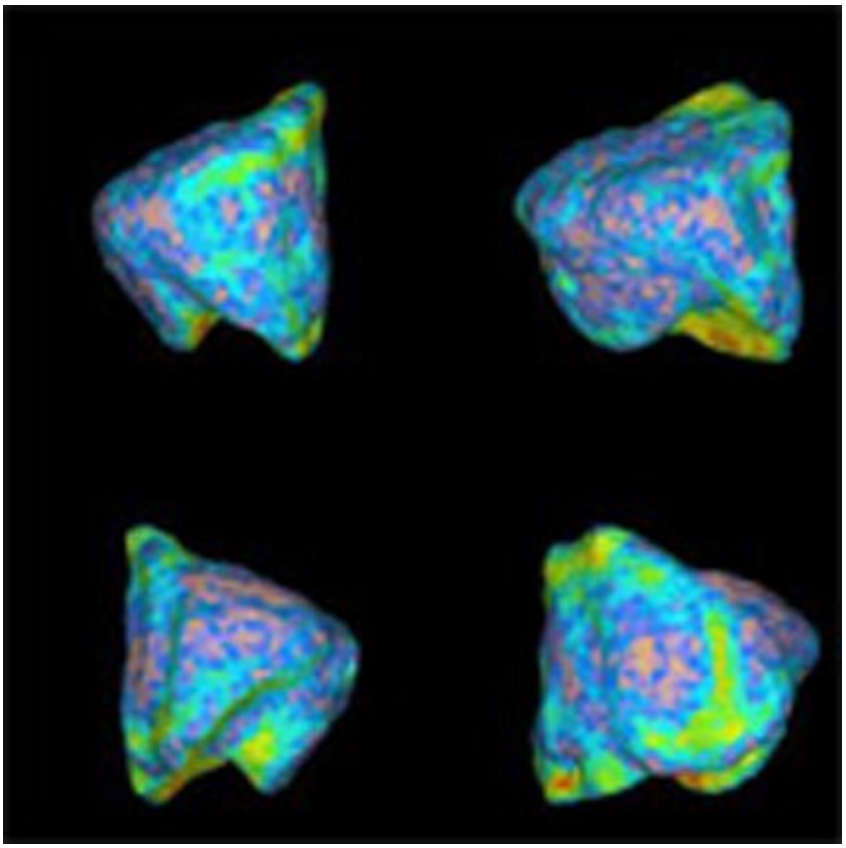

This model is of the half-kilometer near-Earth asteroid Golevka, color-coded for gravitational slope. Credit: NASA

It's one of the scariest scenarios that could face Earth. Can you imagine an asteroid impact? Even if it were a small event, it could have some far-reaching implications for life of all types here on terra firma. Knowing where and what we might be facing has been of constant concern, but one of the biggest problems is that there isn't enough "eyes on the skies" to go around. There's always a possibility that a flying space rock could slip through the proverbial cracks and devastate our planet. But, no worries… We've got a student to put to the test!

While most asteroids belong to the Jupiter-orbit class and pose absolutely no danger to Earth, there are exceptions to every rule. Known as Near Earth Objects (NEO), these orbiting stones also share our orbit – and our paths could cross. However, the juxtaposition is that we need to uncover as many of these stragglers as we can, document and track them for the most accurate information possible. Why? We need precise orbital information… A "somewhere in the neighborhood" just won't do. By knowing exactly what's out there, we stand a true chance of being able to deflect a problem before it arises. Right now a program headed by Mark Trueblood with Robert Crawford (Rincon Ranch Observatory) and Larry Lebofsky (Planetary Science Institute) is being executed at the National Optical Astronomy Observatory to help catalog NEOs – and it's being assisted by a Beloit College student, Morgan Rehnberg, who developed a computer program called PhAst (for Photometry and Astrometry) that's available over the Internet.

Because asteroids have a speedy window of observing opportunity, there can be no delays in reporting and tracking data. Time is of the element. While most astronomy targets are of long term imaging, asteroids require multiple digital images which are viewed via the "blink" method – similar to an old nickelodeon movie. At the same time, the coordinates for the NEO must be perfected and then computed. Right ascension and declination must be absolutely spot on. While there are computer programs currently able to do just that, none of them did exactly what's required to stake the life of planet Earth on. Even though a better software program was required, there simply wasn't enough time for the group to write it – but Trueblood saw it as the perfect opportunity for a summer student.

Many of us are familiar with the Research Experience for Undergraduates (REU) program, supported by the National Science Foundation and part of the National Optical Astronomy Observatory (NOAO). Not only has the REU made some fine imaging contributions, but they've learned what having a career in astronomy is really like and gone on to become professionals themselves. Enter Morgan Rehnberg, who just happened to have the right computer skills needed to tweak the current image viewer program (ATV, written in the code IDL) . Now you have a recipe for checking out as many images as needed in any order, and perform the astrometric (positional) as well as photometric (brightness) analyses.

While Morgan initially put his new software to use on existing image data, the first test happened this October during an observing session using the 2.1m telescope at Kitt Peak National Observatory. It was definitely a yellow alert when the group happened across a Potentially Hazardous Asteroid (PHA) designated as NEO2008 QT3. This wasn't just a close rock… this was a rock that was going to pass within 50,000 km of Earth! Thanks to Morgan's software upgrades, the team was able to correctly compute the brightness and distance of the PHA with 50% of the error margin gone. The resulting positional information was then submitted to the Minor Planet Center and accepted.

It's a good thing they did it… PhAst!

*Original Story Source: NOAO News. The computer program PhAST is available at http://www.noao.edu/news/2011/pr1107.php. In addition to the multi-object support, it contains the ability to calibrate images, perform astrometry (using the existing open source packages SExtractor, SCAMP, and missFITS), and construct the reports for the Minor Planet Center.*

Tammy is a professional astronomy author, President Emeritus of Warren Rupp Observatory and retired Astronomical League Executive Secretary. She's received a vast number of astronomy achievement and observing awards, including the Great Lakes Astronomy Achievement Award, RG Wright Service Award and the first woman astronomer to achieve Comet Hunter's Gold Status.

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