

# From Space, To Earth, And Back Again



Collaboration by Dr. Scott Fisher and Isabel Lopez  
University of Oregon

In addition to the intellectual opportunities and the social experiences, college is a time for young adults to explore their futures and how they're going to leave their mark on the world.



Everyone has different passions and skill sets



So college offers the resources and guidance students need to find their path.

Some walk into their classrooms knowing



their trajectory, and some hope to find



their spark along the way.





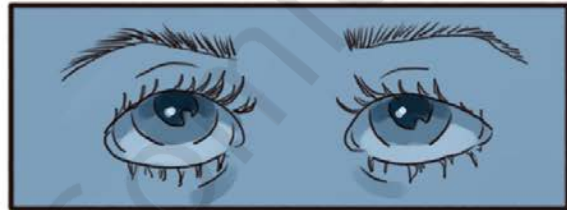
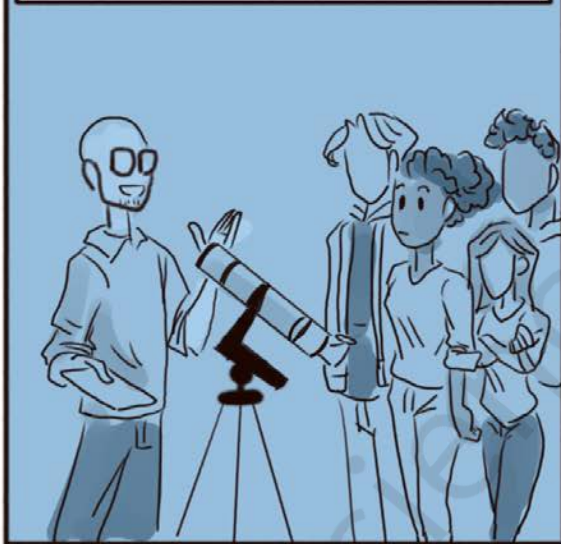
Maybe it is astronomy and the study of the universe which calls out to them. At UO, the physics department encourages students to pursue scientific advancement



through undergraduate level research projects.



Every scientist starts off as a beginner, and every astronomer starts with a basic observing instrument:



Their eyes.



They also begin their astro-careers as the rare solo-astronomer as they build connections



which will benefit them throughout



their college careers.

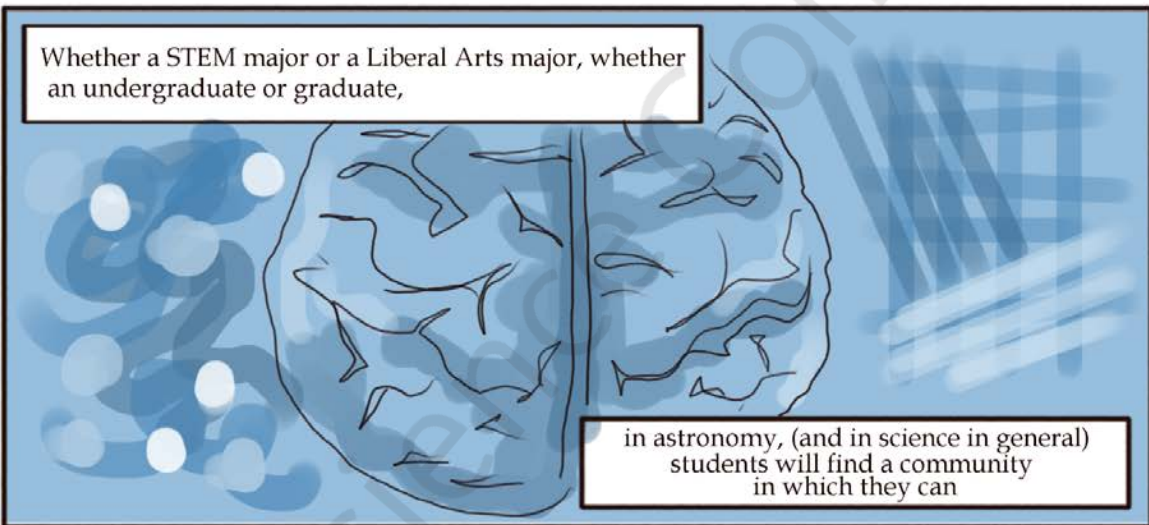
Especially in the realm of astronomy study, the classroom is not a place of division; in fact, the astronomy community is open to a wide spectrum of people



And it invites all to participate and utilize their skills.



Whether a STEM major or a Liberal Arts major, whether an undergraduate or graduate,

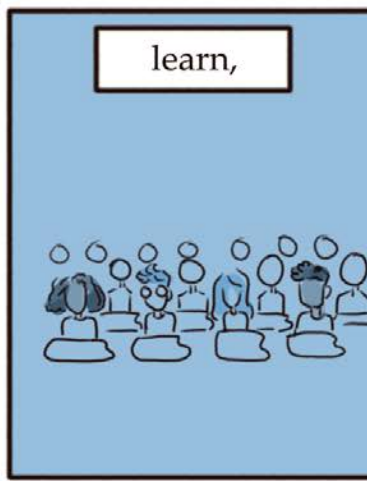


in astronomy, (and in science in general) students will find a community in which they can

grow,



learn,



and live with each other.





After expanding their understanding of the basics, and after finding their community, students in an astronomy program are encouraged to develop their skills as a scientist through research projects.



Those who are interested in observational astronomy are often invited to visit and use Pine Mountain Observatory (PMO).

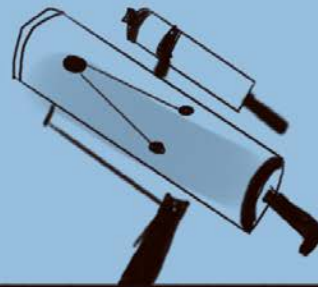


Our own observatory

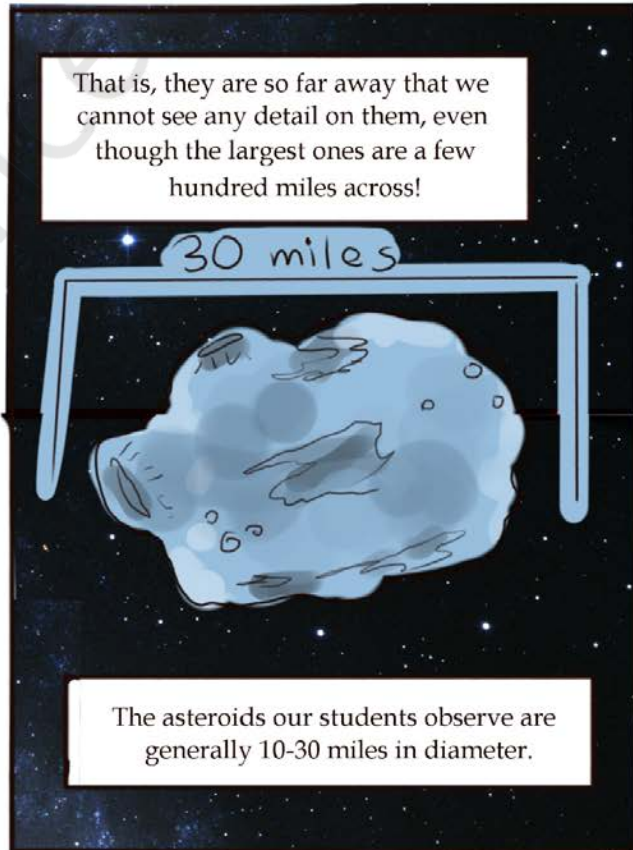
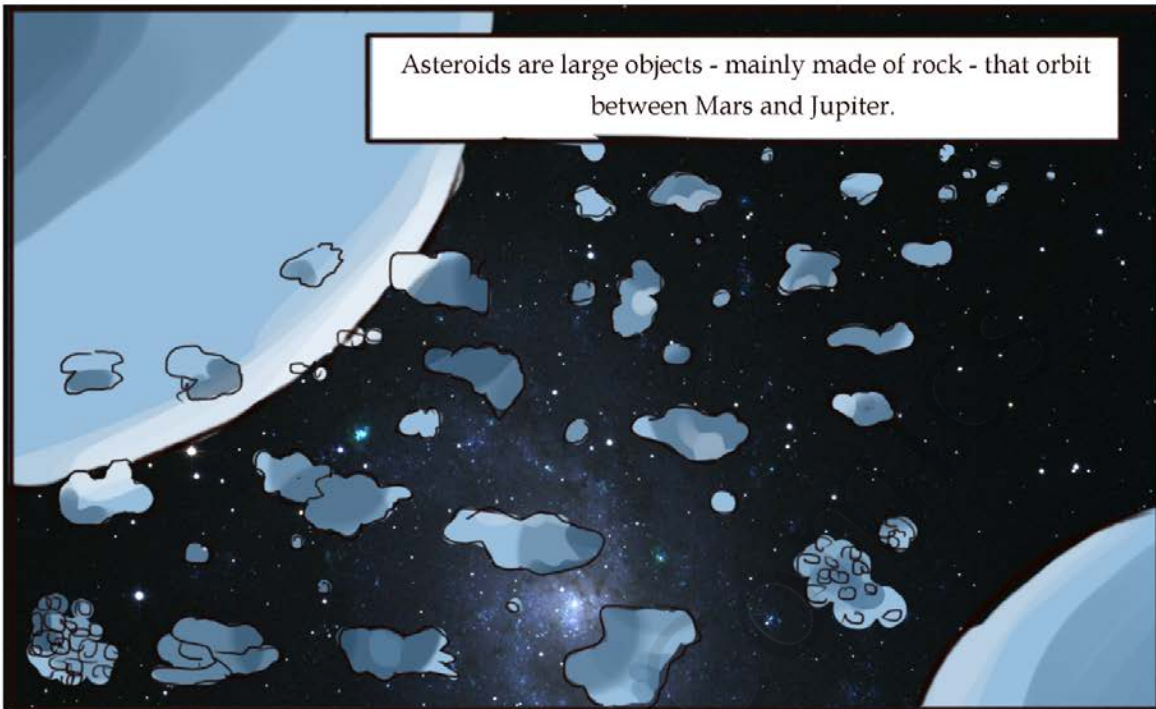


located roughly 170 miles from the UO campus in Central Oregon.

PMO is equipped with advanced telescopes and technology under one of the darkest skies in the nation:



the perfect place for research on orbiting asteroids to take place.

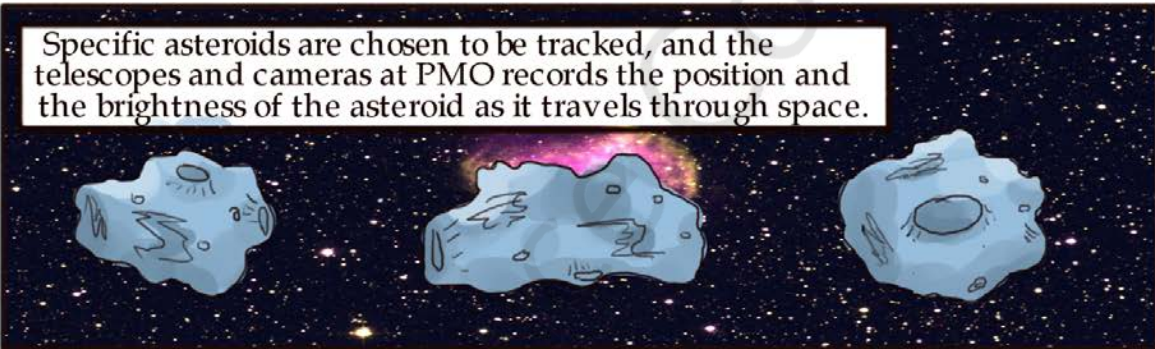




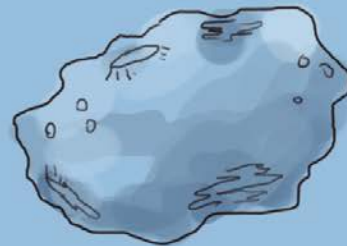
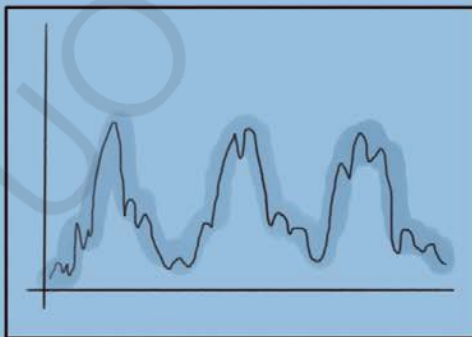
Our scientific team, which is made up of students and faculty work together, and observe together to understand these asteroids better.



Specific asteroids are chosen to be tracked, and the telescopes and cameras at PMO records the position and the brightness of the asteroid as it travels through space.



Our students may take 3 or 4 hundred images of an asteroid in a single night of observing! Afterwards, this data is analyzed and these images are used to produce a "light curve" which shows how the brightness of the asteroid changes as it tumbles along its orbit around the Sun. By computing the light curve of an asteroid, students can derive the shape.



The work of our students doesn't stop at Pine Mountain though, as modern science transcends the barriers of distance, language and culture.



The collaborative efforts of scientists all over the world help research projects like this one become even bigger and better.

In understanding the knowledge or technology we may lack, cooperation becomes a necessary tool in unlocking the secrets of the universe.



The light curves produced by UO students are sent to partners at the University of Kobe in Japan.

These students and faculty have developed software and technology which uses the light curves measured at PMO to create models of the asteroids themselves.



Using these programs, students at the University of Kobe are able to produce 3D CGI models of the asteroids.





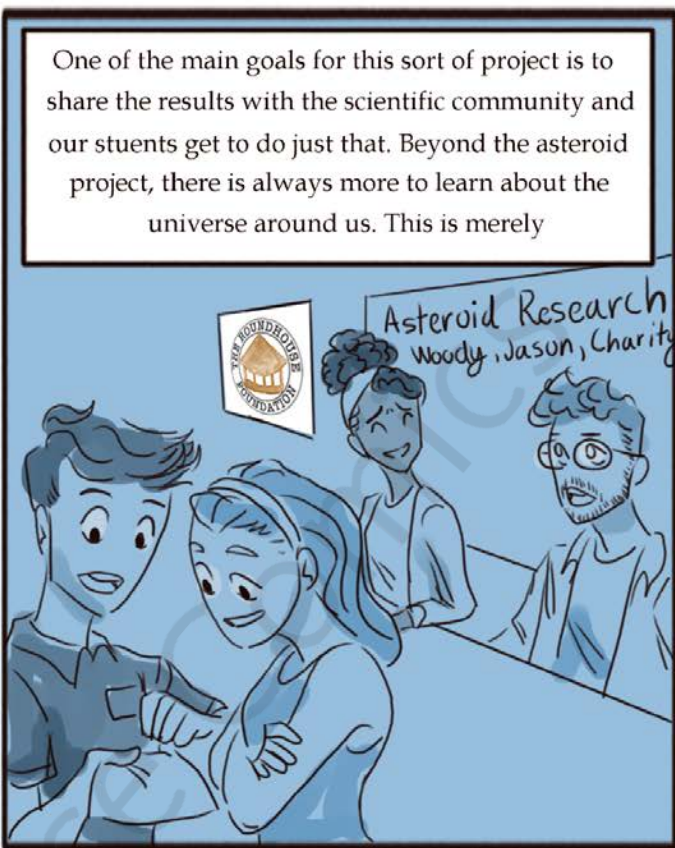
From observing the targets as unresolved points of light to becoming a 3D model, the journey through a collaborative research project is almost complete. There is still much our students want to accomplish.



The 3D models of the asteroids are incredible, but scientists are working on methods to use light-curves to help distinguish between asteroids that are a single solid object and the rare "rubble pile;" that is made up of many millions of small rock held together by mutual gravity.



Once the 3D models are complete, our students continue to collaborate by writing up their results to be presented at a conference like the UO Undergraduate Research Symposium.



One of the main goals for this sort of project is to share the results with the scientific community and our students get to do just that. Beyond the asteroid project, there is always more to learn about the universe around us. This is merely



a launching point,



a courageous start,



for our peers to begin their journey.



