Can you tell us about the award winning research you've done as an undergraduate at Utah State University (USU) in Logan?

For the past two years, my research has focused on light pollution. I have been measuring the brightness of the night sky to determine how efficient street lamps are. Many streetlights emit light radially rather than focusing the light on the ground, which can be an issue for ground-based astronomy. The light that goes into the sky is wasted energy and wasted money, a loss of 2.2 billion dollars annually in the United States. It also poses a huge threat to nocturnal creatures. Tens of thousands of sea turtle hatchlings die heading toward the light of cities instead of the ocean; disoriented birds crash into buildings; the circadian rhythm of frogs is disastrously disrupted; and so on. Light pollution can even disrupt the lives of humans, potentially contributing to depression, insomnia, and obesity.

Using a portable device that allowed me to move around while I collected data, I made a light pollution map of USU’s campus. By measuring the light output at different angles from various street lamps, I determined which fixtures were most efficient (i.e., delivering more light toward the ground than to the sky). I also deployed stationary sky quality meters that collected data for months at a time and revealed temporal trends in the pollution.

How did your research open doors for you in the physics and astronomy community?

This research allowed me to work at the National Optical Astronomy Observatory in Tucson, Arizona, last summer. Astronomy is a big part of the economy in Tucson, and I helped to create an automated way to interpret light pollution levels measured at the observatories and in the city. This method of analyzing data will also help the citizen-science project Globe at Night, in which people around the world measure light pollution in their areas.

How have science and the Society of Physics Students connected you to the lay public?

As an SPS member I have volunteered at USU’s Science Unwrapped seminars, where kids learn about science through hands-on activities. I also volunteer with SPS as an amateur astronomer at USU’s Public Observatory Nights, in which we teach visitors about celestial objects.

Once I started uploading my research to the Internet, local media agencies began contacting me. There has been much public interest. I was interviewed by local newspapers, magazines, and blogs. At one point FOX 13 News in Salt Lake City interviewed me for TV; I’m considered to be an expert on Utah’s light pollution. I still periodically get e-mails asking for advice on what individuals can do to combat light pollution.

As you prepare to finish up your bachelor’s degree, what are your plans for the future?

Light pollution has many ecological aspects to it, so I’ve become interested in ecology. My plan is to use my physics degree to go to graduate school in ecology and apply my scientific background to that field.

Effects of Light Pollution

“One of the beauties of modern civilization is seeing the city lighting at night. It provides a feeling of security and is indicative of the power and endeavors of humanity, but overlighting is a form of pollution. Many outdoor light fixtures spread light in all directions, sending a majority of the light into the sky, away from where we want the light to be on the ground. This light spreading upward is not only wasted light, but it is wasted energy and money, destroys our ability to view the night sky, and has profound effects on nocturnal creatures. The direct harm to certain species then affects the ecosystem it interfaces with, causing damage on a much larger scale than expected. Small changes in lighting practices would positively affect energy use and economies, ecosystems, and the efficiency of astronomical endeavors.”

—from “Mapping Light Pollution at Utah State University” by Rachel Nydegger and Shane Larson.

See: http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1000&context=poth_slc.