Increased light pollution harms training of future generations of Puerto Rican astronomers [1]

Submitted on 14 July 2023 - 1:11pm

Calificación:

CienciaPR Contribution:

No

Original Source:

El Nuevo Día [2]

By:

Rose Schnabel

Poorly directed poles, billboards and outdoor lighting systems contribute to a phenomenon known as "skyglow," a diffuse illumination of the sky that makes visibility difficult. (Shutterstock)

The phenomenon increased at an annual rate of 9.6% between 2011 and 2022.

Every week during the spring, when the sun sets, 30 students from the Astronomy class at the University of Puerto Rico (UPR) in Cayey cross the campus carrying their telescopes and notebooks. They come to study the orbit of the planets and the properties of celestial bodies, but, increasingly, light pollution obstructs their view of the night sky.

Light pollution refers to excessive, misdirected or intrusive light. Poles, billboards and misdirected outdoor lighting systems generate discrete light that interrupts observations, but also contribute to a phenomenon known as "skyglow," a diffuse illumination of the sky that hinders visibility.

A study published this month in the journal Science compiled some of the most alarming data on light pollution. It has increased at an annual rate of 9.6% between 2011 and 2022, and two UPR professors have noticed its effects firsthand.

"As light pollution increased, I had to change some labs because it was already very difficult to make measurements that gave results with little error," said José Alonso Costa, professor of Astronomy and coordinator of Physics at UPR in Cayey.

Last year, he designed a lab in which students use a sky quality meter to measure the brightness of the night sky on campus. The ideal value is 22 Mag/arcsec2, which corresponds to a "pristine" sky. The lower the number, the higher the light pollution. The average of the measurements made by the students was 18 Mag/arcsec2, which the National Park Service rates as "far deviating from

the natural condition."

For Mayra E. Lebrón Santos, a professor in the Department of Physical Sciences at the UPR Río Piedras Campus, it is almost impossible to carry out observation activities with her students. "We are in the middle of the city," she said. "Obviously, we work on astronomy in the classroom and make observations of the skies, but of course, what we can see is very limited"

The increased use of LED lights, despite their energy efficiency, contributes greatly to light pollution. These lights produce a high level of blue light, which contaminates astronomical observations, disrupts the circadian cycle and damages ecosystems. "It has a wavelength that systems or organisms had not evolved to handle," Alonso Costa noted.

In recent years, several organizations have worked in La Parguera (Lajas) and San Juan to replace LED lights with red lights, which are less intrusive to wildlife.

When asked if there was any similar initiative to protect astronomical observation areas, Alonso Costa left no room for doubt: "No. In Puerto Rico, unfortunately, even though we had for many years the Arecibo Observatory, the role of astronomy has been far below what one would expect".

The famous Arecibo radio telescope was a source of astronomical innovation in Puerto Rico for more than 70 years. Its collapse in 2020 represented a great loss to the island's astronomical infrastructure. However, the Arecibo Observatory is still active as an educational and research center. It has a 12-meter radio telescope, which is affected by another type of contamination: electromagnetic. When a satellite passes over the radio telescope, its radio frequencies block the "view" of the telescope.

"I remember observing at the Arecibo radio telescope. Before GPS, we could observe galaxies," Lebrón Santos said. "But now that you have GPS, every time a satellite passes by it causes a lot of interference and all that data is thrown away." The authors of Science predict that, by 2030, there will be more than 400,000 satellites in orbit, thousands of which will be above astronomical observatories at any given time.

> "As light pollution increased, I had to change some of the laboratories."
> JOSÉ ALONSO COSTA, PROFESSOR OF ASTRONOMY

The increase in light pollution, the loss of the Arecibo radio telescope and the increase in the number of satellites have made astronomical studies on the island more difficult. As a result, many Puerto Ricans interested in astronomy opt to go to the United States or Mexico for their studies and careers in this field. Lebrón Santos wants to motivate the next generation of Puerto Rican astronomers to stay and develop their passion for astronomy in their own country.

In 2022, he received $1 million from the National Aeronautics and Space Administration (NASA) for his project called "Paving the Way for Astrophysics Research in Puerto Rico," in which students and professors analyze data from the James Webb Space Telescope. Lebrón Santos explained that this initiative arose "in response to the fact that we lost the Arecibo radio telescope. So we can expand that field of work opportunities with first-rate telescopes. It is very important

that we do it from here, that we don't have to go elsewhere to do that science.

While universities in Puerto Rico struggle to keep astronomy alive, the Department of Natural and Environmental Resources (DNER) strives to preserve the dark night skies.

Law 218 of 2008 created the Program for Control and Prevention of Light Pollution, which establishes eight classes of permitted luminance. These classes range from near total darkness on beaches used by sea turtles to a high level of ambient light in metropolitan areas. The objective is to regulate and control the quantity and quality of artificial lighting to minimize the negative impact on night skies and the environment.

Luis Márquez, acting manager of the DNER's Noise and Light Pollution Area, said that light pollution in coastal areas has decreased significantly since the law's implementation. "The purpose and commitment of the secretary (Anaís Rodríguez) is to continue working on this, to bring it to more people," Márquez said.

However, Lebrón Santos and Alonso Costa expressed doubts about the impact the law has had. Both mentioned that many people are unaware of the legislation or are unwilling to make the necessary changes - such as directing light downward or using low-pressure sodium lamps - in their homes to reduce their contribution to light pollution.

"There are not the resources or the staff to go out there to those areas and actually see if the light that is there complies with that law," Alonso Costa said. "The communities have to take responsibility themselves for protecting their areas, their environments. Citizens have to enforce the law."

The author studies Biology and is a fellow of the American Association for the Advancement of Science at El Nuevo Día.

Tags:

- astronomía [3]
- astronomy [4]
- contaminación lumínica [5]
- light pollution [6]

Content Categories:

- Environmental and agricultural sciences [7]
- Chemistry and Physical Sciences [8]

Links
[1] https://www.cienciapr.org/en/external-news/increased-light-pollution-harms-training-future-generations-puerto-rican-astronomers?language=es [2] https://www.elnuevodia.com/ciencia-ambiente/espacio-astronomia/notas/aumento-en-la-contaminacion-luminica-perjudica-la-preparacion-de-las-generaciones-futuras-de-astronomos-boricuas/ [3] https://www.cienciapr.org/en/tags/astronomia?language=es [4] https://www.cienciapr.org/en/tags/astronomy?language=es [5] https://www.cienciapr.org/en/tags/contaminacion-luminica?language=es [6]

https://www.cienciapr.org/en/tags/light-pollution?language=es [7] https://www.cienciapr.org/en/categorias-de-contenido/environmental-and-agricultural-sciences-0?language=es [8] https://www.cienciapr.org/en/categorias-de-contenido/chemistry-and-physical-sciences-0?language=es