

LESSON 5: LIGHT POLLUTION

OBJECTIVE

Some of the most breathtaking images in *In Saturn's Rings* are views of the night sky from Earth. These beautiful starscapes were seen by everyone for thousands of years, inspiring great artists, musicians, and scientists. Far from city lights, you may still enjoy seeing the Milky Way galaxy stretch across the night sky. Unfortunately, since the late 1800's invention of electric streetlights, people have slowly seen less of the night sky.

Through observation and discussion, this activity allows you to understand the nature and causes of light pollution and to explore solutions.

While we need lights for safety and security, the misdirected overuse of artificial outdoor lighting is a growing problem.

There are **three** basic types of light pollution:

- 1 **Glare** occurs when bright lights are directly visible and interfere with seeing; e.g., problems seeing when riding in the car at night. (Why is this worse on a rainy night?)
- 2 **Light Trespass** happens when unwanted light crosses onto someone else's property; e.g., light from a neighbor's house or a streetlight shining in your bedroom window.
- 3 **Sky Glow** is the upward directed and reflected light often visible above urban areas; e.g., orange glow in the sky, especially visible on a cloudy night, or the bright glow around a convenience store.

Along with hiding the night sky, each type has other costs:

Ecosystem Disruption: For wildlife, excessive light alters predator/prey relationships and confuses migration and sleep patterns. For plants, excess light alters the normal patterns of light and dark needed for normal growth.

Human Health Problems: Studies show light pollution affects human health, whether by consequences of glare, disruption of melatonin production, or changes in sleep patterns. Fatigue, stress, obesity, and some cancers may also be linked to light pollution.

Wasted Energy: Any light shining where it is not wanted or needed wastes energy and money. Also, most existing streetlights were not designed for energy efficiency.

How can we cut light pollution but still provide useful light? Combine directional shielding with energy-efficient lighting. Unshielded lights lose energy in all directions, while directional shielding shines light only where it's needed, saving energy at the same time.

LESSON LENGTH

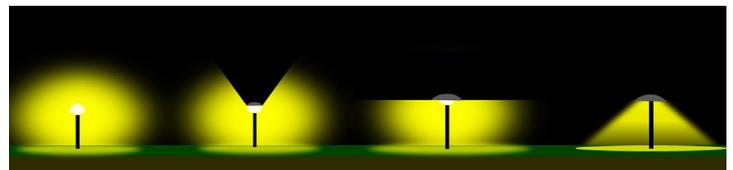
This lesson can be completed in **two** parts, with extra time for nighttime observations between days.

PART I - DISCUSSION

- 1 What are your reactions to the "Night Sky" section of *In Saturn's Rings*?
- 2 Have you ever seen the Milky Way? Why have most people in developed countries never seen the Milky Way?
- 3 Give examples of works by artists, poets, or musicians who have been influenced by seeing the stars.

PART II - OBSERVATION

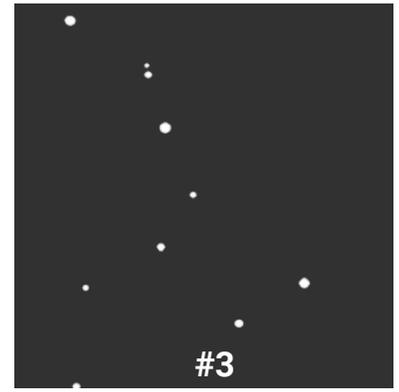
- 1 View images from different areas of the world by exploring the galleries in *The World at Night* www.twanight.org/newtwan
- 2 Observe the night sky at your home
 - On a clear night, use the Dark Sky Chart (p.11) to analyze the quality of the night sky at your home.
 - Select the image that most closely represents the number of stars you see; the darker the sky, the more stars will be visible.
 - If you can only see the stars shown in image 1, the sky quality is low and many stars are being blocked by the artificial light.
 - Teachers may tabulate and chart students' night-sky observations. How many students picked images 1, 2, or 3?
- 4 Answer the following questions:
 - What problems did you encounter when making observations?
 - Identify the three different types of light pollution that you can see. How can you minimize each type of light pollution?
 - Discuss the benefits of and problems with different types of outdoor lights and streetlights: exposed lamp, shielded, or full cut-off.



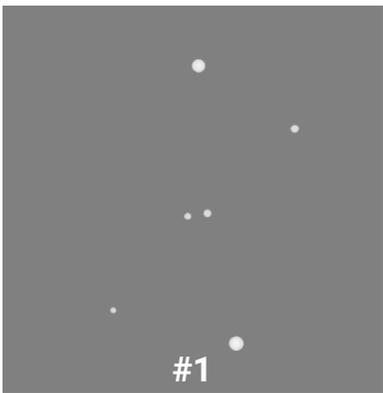
Examples of streetlights from unshielded to full cut-off fixtures.

LESSON 5: LIGHT POLLUTION (DARK SKY CHART)

Which image below most closely represents the number of stars you see?
The darker the sky, the more stars will be visible.



BIG DIPPER STAR CHART: Use in Summer or Fall - look to the North.



ORION STAR CHART: Use in Winter or Spring: - look to the South.



Example of night sky with no light pollution. Photo courtesy of Colin Legg Photography. Eleven day, eleven night, five camera timelapse of night sky in Australian Outback. 2014

YOU CAN HELP!

- Encourage your neighbors and local businesses to adopt good lighting practices.
- Participate in Globe at Night www.Globeatnight.org, or learn more about light pollution through the International Dark Sky Association at www.darksky.org
- Contribute to a citizen science data collection about light pollution. Look for downloadable free apps such as "Dark Sky Meter" (iPhone) or "The Loss of the Night" (Android).