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LIGHT POLLUTION: WHY WE NEED TO TURN OFF THE LIGHTS

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YOUNG REVIEWERS:


ISHAAN
AGE: 8


THOR
AGE: 13


VEDANT
AGE: 9

LIGHT POLLUTION

The brightening of the environment from streetlights, house lights, high-rise buildings and car lights.

You might have heard that looking at bright lights like TVs and phones at night can affect your sleep and be bad for your health. But did you know that lights at night are also bad for animals and plants in nature? Human-made light that reaches the environment at night is called light pollution. Lights at night often kill many insects, baby sea turtles, and migrating birds. Light pollution is easy to fix—only turn the lights on when they are needed! In this article, we review how light pollution affects people and the environment, and we describe some ways you can help.

WHAT IS LIGHT POLLUTION?

Light pollution is the brightening of the environment caused by human-made lights. Light pollution can be caused by many types of light: streetlights, house lights, lights from high-rise buildings, and car

lights are a few examples (Figure 1). Have you ever noticed that some lights are helpful for seeing walkways or parking areas, but they also light up areas where light is not needed? This is an example of using too much light. Sometimes people use lights just for decoration, and they keep those lights on when they are not using them. Some people might forget to turn off lights or may not close their blinds. These are also examples of light pollution.

Figure 1

This nighttime scene shows several types of lights that make light pollution. Notice how there are different colors of light. Some light pollution happens in city areas and some in wild areas like woodlands, coastlines, and the ocean. Types of light pollution include glow from the city, streetlights, vehicles, and other sources. Animals like the birds, mammals, insects, and turtles shown here may all be affected by light pollution. What are some ways we can reduce this excess light?

Electric lights like lightbulbs have been used since the 1880s. Before that, people used types of fire, like candles or lanterns, to light up their homes and streets. Because newer types of electric lights, like **LED lights**, use less energy than older lightbulbs, people can save money, buy more lightbulbs, and leave lights on longer. This is one reason that our cities have gotten brighter. As the human population grows and people continue to spread across the globe, cities spread across the land, too. Our world keeps getting brighter (Figure 2). In bright areas like North America, only 80% of people can see the Milky Way from their homes. In Europe, where it is very bright, 99% of people live under light-polluted skies [2].

LED LIGHTS

A newer type of lighting that uses a light-emitting diode (LED). These lights need less energy than older lightbulbs and come in a variety of colors and brightnesses.

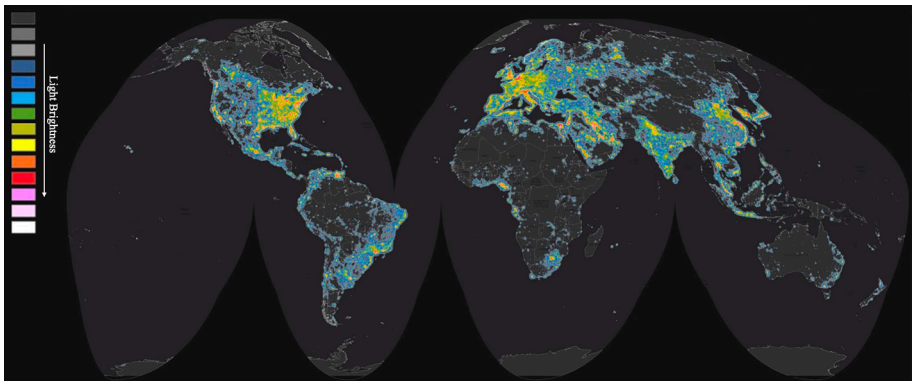

Figure 2

This map shows how much light pollution covers the globe. Land areas with warmer colors (red, yelow) have more light pollution, while areas with cooler colors (blue) have less. Land areas with no color (gray) have natural night skies (adapted from Falchi et al. [1]).

WHY DOES IT MATTER TO PEOPLE?

Electric lights have improved our way of life. But there are also problems that come with living in a brightly lit world. Light influences the way we sleep, behave, and function. We are able to sleep because of a **hormone** called **melatonin** that builds up in the body at night, when it is dark. The buildup of melatonin helps us fall asleep and stay asleep at night. Melatonin is an important hormone for our general health. It affects the ability to fight diseases and relax, and it also affects hunger levels. However, we do not produce as much as melatonin when we are around light.

Sleep is critical—it impacts our feelings, energy, and health. So, when light pollution makes us sleep less, it also hurts our bodies. This can cause stress, headaches, and low energy. Long-term loss of sleep from light pollution can create more serious health problems, too. These might include cancer, heart disease, or diabetes [2]. This is a problem you can easily fix—turn off the lights at night!

HORMONE

A messenger molecule that the body releases to help organs and tissues communicate with each other and the brain.

MELATONIN

A hormone that the body makes when it is dark, to help us sleep.

WHY DOES IT MATTER TO THE ENVIRONMENT?

Plant and Animal Health

Like humans, plants and animals are also affected by light pollution. Light pollution changes the way plants grow and behave. Many plants rely on the sun to help get the energy and food they need to get taller and grow their leaves. Plants cannot get the energy they need from artificial light. Electric lights can also interfere with how plants get their energy from the sun.

Light pollution makes it hard for wild animals to sleep at night. They often get restless because of the light. For example, some wild birds sleep less and wake up earlier when there is light pollution. Scientists have noticed that birds in bright areas start singing and eating earlier in the day [3]. This means that, in bright areas, birds and other animals are not getting enough sleep.

There are other ways that artificial light influences animals' health, behavior, and survival. Most research on how light pollution affects wildlife has looked at bats, birds, insects, rodents, and plants. For example, hamsters, birds, and crickets have more health problems in environments with light pollution. Coral reefs can also get sick from too much light. Wildlife is also more likely to be negatively affected by global warming in bright areas because the animals are already a little less healthy from being exposed to light pollution.

Finding Food

Sometimes birds use bright lights to hunt for moths and other insects. For example, some **nocturnal** (night-active) hunters, like owls, use light at night to hunt. This can have a lot of benefits for the hunters.

NOCTURNAL

Animals that sleep during the day and are awake at night.

Birds that see well in dim light raise healthier babies. But this is not always a good thing. Some birds can have more babies in polluted areas, while others struggle to reproduce. In bright areas, some birds have health problems because of light, just like humans do.

If you have ever seen an outdoor lamp, odds are you saw some dead bugs stuck inside it. This is because many insects move toward light sources, and these insects can get trapped inside streetlamps and car headlights, for example. Lights kill insects all over the world, and many places in the world are seeing decreases in insect populations. Insects are important they are food for many birds and bats. Flowers also rely on insects like bees, moths, and butterflies to pollinate them. With fewer insects to spread seeds for flowers, some plants could start to go extinct.

Moving Around

Sadly, light pollution causes many animal deaths from collisions with buildings, getting trapped in lamps, or exhaustion after moving around too much. Birds are attracted to city lights and can die from crashing into buildings or from tiredness after flying in wrong directions. Seabirds can get stranded on land after flying around outdoor lights for too long. If we use less lighting in areas near coasts, we could reduce bird deaths from light pollution by almost 60% [4].

Sea turtles can also suffer negative impacts from light pollution. When sea turtles hatch from their eggs on beaches, they use the reflection of the moon on the water to find the ocean. But sometimes, if they are near cities, they get confused. Instead of following the moon reflected off the water, they crawl toward streetlights, and some baby sea turtles die because of this. Now that people know this is happening, they are trying to make beaches darker at night to save turtles.

Light pollution can also confuse animals that are on the move. The beautiful orange and black monarch is one of our most well-known butterflies. Yet, monarchs are also harmed by light pollution. Monarchs rely on the sun to decide what direction to fly during their **migration** from Canada and the northern United States to central Mexico each fall. Monarchs mistake our lights for the sun, causing them to stray from their southward path [5]. Migrating birds can also get confused by city lights. Sometimes they will spiral toward bright lights, and they can get lost or too tired to keep flying. Other birds might not survive because cities are dangerous places. This means that light pollution can hurt visiting animals, too.

MIGRATION

Seasonal movement of animals from one place to another, often across entire continents.

Nocturnal Animals

Nocturnal animals are active at night, thanks to their large eyes that help them see and move around in the dark. Nocturnal animals that live in cities include bats, owls, raccoons, foxes, and coyotes. Even some common pets are nocturnal, including hamsters and cats.

Light pollution is dangerous for nocturnal animals because it provides constant light at times when it is supposed to be dark outside. Like sea turtles, nocturnal animals use the moon and stars to know where to go. But light pollution makes it harder for nocturnal animals to see the moon and stars. Some nocturnal animals also use darkness to hide from predators. When there is light pollution, it is easier for predators to find them. Turning off the lights at night can keep these animals safe.

WHAT CAN YOU DO ABOUT IT?

There are lots of ways you can help stop light pollution. Even though light can influence how humans and animals sleep and behave, we can change that (Figure 3). We need lights and sometimes it is important to have them on. However, we do not need them all the time. At home, you can keep your lights off to protect animals and close your blinds to protect yourself from the lights outside. Only use decorative lights when you or others are enjoying them. These are some things you can do right now!

Figure 3

There are many ways you can help reduce light pollution! Use this checklist or make your own to make lighting safer for human health and the environment.

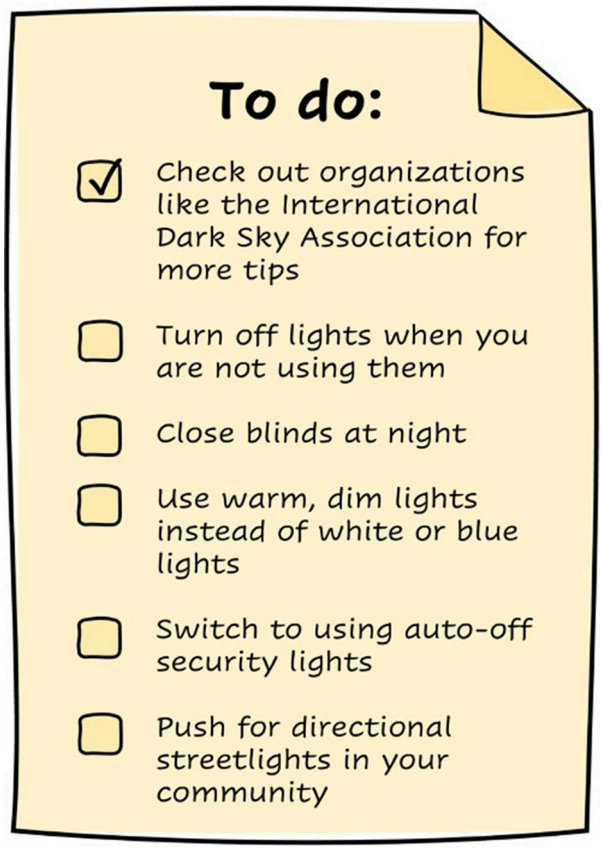

Figure 3

How do we stop light pollution across the globe? You can help by spreading the word about light pollution to other people you

know. Streetlights and other outdoor lights should point down, to light up only the necessary areas. You can talk to your family about switching your light bulbs to be less bright or select bulbs that are more yellow-orange in color, since these colors have less of an effect on wildlife. Finally, your family can also switch your outdoor lights, like security lights, to motion sensor lights. This is helpful, too.

Small changes can lead to big changes. By being mindful of your actions and telling others how to do the same, you can help reduce light pollution. Some natural areas and towns are now called "dark sky areas" because groups of people have come together to stop light pollution. These natural areas are great places to stargaze, and they are also great shelters for wildlife. Dark areas are also healthier places to live. The International Dark Sky Association and National Parks Service are leaders in stopping light pollution. Together we can turn off the lights!

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CONFLICT OF INTEREST: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

YOUNG REVIEWERS

ISHAAN, AGE: 8

I am a curious little one who loves to laugh... a lot!!! I just want to know too many things too fast hence I keep asking lots of questions to everyone I meet. Science and history fascinate me. I love to learn more things about our planet. My current obsession is Soccer and Lionel Messi is my idol!

THOR, AGE: 13

Thor is 13 years old and lives in Oslo, Norway. He likes video games, airplanes, basketball, and being in nature. Thor has a dog named Bo. He speaks English, Norwegian, and Korean and has travelled the world a lot.

VEDANT, AGE: 9

I love playing Minecraft and enjoy creating different worlds in it. I am very curious. I am a chatterbox, and I also love asking questions.

AUTHORS

HANNAH GURHOLT

My name is Hannah Gurholt. I am a Ph.D. student in the Department of Ecology and Evolutionary Biology at Cornell University. I study how artificial light at night impacts how butterflies develop, move, and behave. One way I try to eliminate light pollution is by closing my blinds at night. *hg459@cornell.edu

COLLEEN R. MILLER

My name is Colleen Miller. I am a global change ecologist at the University of Minnesota. I have a Ph.D. in Ecology from Cornell University. I research how light pollution, like streetlamps and city skyglow, affects animal behavior and ecology. I

also have a Master's Degree in Climate Change Ecology. I love to talk about light pollution with our community. I make sure to turn the lights off when I can!

BRETT SEYMOURE

My name is Brett Seymoure and I am an organismal biologist. I study how animals, mostly insects and spiders, interact with their natural light environments like sunlight, moonlight, and starlight. I also study how human lighting affects organisms, especially their survival and ability to find food. I help the US National Park Service and the Department of Energy fight light pollution. As a professor at University of Texas at El Paso, I also teach students about insects, vision, and animal behavior—and why saving insects is so crucial for human beings!

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