

POV

Community
Engagement & Education

DISCUSSION GUIDE

The City Dark

A Film by Ian Cheney



When I set out to make a film about light pollution, I knew nothing about bird migration or melatonin; I just knew I missed seeing the stars.

I spent a lot of my childhood in rural Maine, where I fell in love with the night sky. From an early age, I sought to capture it on film. I experimented with long nighttime exposures using Dad's old indestructible Pentax K1000, a simple cable-release and an unforgivable amount of Kodak Gold film. I was lucky to get one decent shot per roll. But under countless Maine summer night skies, I succeeded in becoming something of an amateur astronomer, eventually attending teen astronomy camp and building my own telescope out of an old cardboard construction tube.

Years later, in 2008, working as a documentary filmmaker under New York's neon skies, I stumbled upon a curious statistic: For the first time in history, more than half of the world's population was now living in urban areas. As a species, we'd gradually moved from countryside to city. What struck a chord was the parallel with my own life, my own progression from dark, starry skies to the brilliant, hazy skyline of America's largest city. There was no denying I'd gained a lot since coming to New York—but what had I lost? And what might we all be losing?

Some three years later, I'd talked to astronomers, biologists, ecologists, wildlife veterinarians, criminologists, lighting designers and Boy Scouts about the myriad ways that artificial light affects our world. **The City Dark** chronicles that journey and represents an attempt to put into images and words a surprisingly complex set of reasons why, despite our love of the light, we may also need the night.

Shooting a film about darkness presented some obvious technical challenges. After all, the very word *photography* means writing with light. Even in a city as bright as New York, our trusty HD video camera couldn't capture what my eyes were seeing. But our production solution proved instrumental in shaping my new relationship to the night. Forced to spend hours every night clicking long-exposure still images (which we would then string together into motion pictures), I had plenty of time to slow down and think about the fact that, to my initial horror, I was falling in love with the New York City skyline. The antagonist of my film had won me over. Was it the fact that the twinkling lights somehow resembled the stars? Or was it my own desire to acknowledge that we humans have a very real—perhaps innate—attraction to light?

Either way, I don't believe the story of artificial light is a black and white one, a story of good versus evil. Our efforts to curb bad lighting must include acknowledging that there *is* such a thing as good lighting. And that shouldn't be hard: We *can* light our world, for security and navigation, for beauty and art, without ruining our night sky, harming ecosystems or disrupting circadian rhythms.

But to do so—to bring back the stars—requires a few shifts. First, we need to think of the night and the dark as part of the environment, a part of the wilderness that deserves our attention and preservation efforts. Second, we might need to allow simple design solutions—shielded lights, pointed downwards—and the energy savings that come with them to overcome ancient instincts telling us always to push for more light. And finally, crucially, we might simply need to look up more.

I gathered quite a constellation of bruises from walking the streets of New York with my head craned backward, gazing up at all that I could and couldn't see; and I caught more than a few strange looks as I lay on the sidewalk clicking photos of what few stars appeared above my Brooklyn apartment building. But it was worth the bruises and the puzzled glances: At a time when our knowledge of the universe is accelerating at a dizzying rate, stargazing—even under a city sky—is a humbling reminder of how many questions we have yet to ask.



Filmmaker Ian Cheney.

Photo courtesy of
Wicked Delicate Films LLC

Ian Cheney, Director/Producer

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INTRODUCTION

The City Dark is a feature documentary about light pollution and the disappearing night sky. After moving to light-polluted New York City from rural Maine, filmmaker Ian Cheney asks, “Do we need the dark?” The film develops out of his search for an answer to that question.

Exploring the threat of killer asteroids in Hawaii, tracking hatching turtles along the Florida coast and rescuing injured birds on Chicago streets, Cheney unravels the myriad implications of a globe glittering with lights—including increased breast cancer rates from exposure to light at night, and a generation of kids without a glimpse of the universe above.

Featuring stunning astrophotography and a cast of eclectic scientists, philosophers, historians and lighting designers, **The City Dark** is a story of light pollution and the disappearing stars. The film asks viewers to stop and ponder what light, darkness and the stars mean to us, spiritually, physically, intellectually, socially and economically.

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The City Dark is well suited for use in a variety of settings and is especially recommended for use with:

- **Your local PBS station**
- **Groups that have discussed previous PBS and POV films relating to environmental issues, astronomy or the relationship between humans and nature, including *Nostalgia for the Light*, *Alice Sees the Light*, *If a Tree Falls: A Story of the Earth Liberation Front* and *SALT*.**
- **Groups focused on any of the issues listed in the Key Issues section**
- **Middle and high school students in classrooms and after-school programs**
- **Faith-based organizations and institutions**
- **Cultural, art and historical organizations, institutions, museums and science centers**
- **Civic, fraternal and community groups**
- **Planetariums and observatories**
- **Youth organizations, such as Girl Scout and Boy Scout troops and 4-H groups**
- **Academic departments and student groups at colleges, universities and high schools**
- **Community organizations with a mission to promote education and learning, such as local libraries**

The City Dark is an excellent tool for outreach and will be of special interest to people looking to explore the following topics:

- | | |
|------------------------|-----------------------|
| Astronomy | Ornithology |
| Biology | Philosophy |
| Breast cancer | Public safety |
| Chronobiology | Science |
| Cosmology | Spirituality |
| Conservation | Stargazing |
| Criminology | Turtles |
| Environment | Urban planning |
| Green building | Wildlife |
| Health | |
| Light pollution | |
| Lighting design | |
| Nature | |

USING THIS GUIDE

This guide is an invitation to dialogue. It is based on a belief in the power of human connection, designed for people who want to use **The City Dark** to engage family, friends, classmates, colleagues and communities. In contrast to initiatives that foster debates in which participants try to convince others that they are right, this document envisions conversations undertaken in a spirit of openness in which people try to understand one another and expand their thinking by sharing viewpoints and listening actively.

The discussion prompts are intentionally crafted to help a wide range of audiences think more deeply about the issues in the film. Rather than attempting to address them all, choose one or two that best meet your needs and interests. And be sure to leave time to consider taking action. Planning next steps can help people leave the room feeling energized and optimistic, even in instances when conversations have been difficult.

For more detailed event planning and facilitation tips, visit www.pbs.org/pov/outreach

Light Pollution Basics

The **International Dark-Sky Association** (IDA) describes light pollution as any adverse effect of artificial light. Established in 1988, the IDA was the first organization to call attention to the hazards of light pollution and it is dedicated to protecting and preserving the nighttime environment through quality outdoor lighting. The IDA promotes one simple idea: Light what you need, when you need it.

The IDA defines the four components of light pollution as:

Urban Sky Glow: the brightening of the night sky over inhabited areas

Light trespass: light falling where it is not intended, wanted or needed

Glare: excessive brightness that causes visual discomfort (high levels of glare can decrease visibility)

Clutter: bright, confusing and excessive groupings of light sources, commonly found in over-lit urban areas; the proliferation of clutter contributes to urban sky glow, trespass and glare

The Growth of Artificial Light

In 2007, the United Nations estimated that for the first time in history the world had a predominantly urban population: 51 percent urban versus 49 percent rural.

Light pollution is a direct outgrowth of industrialization. While at least 2,500 individual stars should be visible in an unpolluted night sky, in a typical suburb only 200 to 300 stars are visible, and in a city, that number is often fewer than a dozen. According to astronomer Andrew Fraknoi, it is estimated that as many as 80 percent of people in the world have never seen the Milky Way.

In the film **The City Dark**, filmmaker Ian Cheney describes light pollution as light reflecting off moisture and dust in the air, creating a glow in the sky. The most common cause of light pollution is over-illumination—streetlights and outdoor security lights that spill outward, billboard and landscape lights directed upward and businesses like convenience stores and gas stations operating with excessive light output. Though light at night has brought indisputable benefits, its excessive and unregulated use has been problematic. According to the Institute for Local Self-Reliance, each night almost one third of the light used outdoors escapes into the night sky, where, rather than providing useful illumination, it causes glare, sky glow and other types of light pollution. According to estimates from the International

Dark-Sky Association, each year in the United States more than \$1 billion dollars are spent to generate this wasted light.

While there has been no global-scale data on the distribution and magnitude of artificial sky brightness (“ecology of the night” is a fairly recent area of study), many amateur astronomers use the Bortle Dark-Sky Scale to rate the night sky. The scale ranges from class 1—the darkest skies—to class 9—skies typical of the inner city. Class 1 skies can be found in places like remote areas of Chile, Antarctica or the Australian outback. According to a comprehensive study of night sky quality conducted by the U.S. National Park Service, the Natural Bridges National Monument in southeastern Utah is the only Bortle class 2 location in the United States. New York City rates as class 9.

According to Jane Brox (the author of *Brilliant: The Evolution of Artificial Light*), the brightest spots on the map correspond to prosperity and urbanization rather than population density. The National Bureau of Economic Research released a report in 2011 proposing satellite images be created of light at night and used as an indicator for measuring GDP growth. As of 2012, both Western Europe and the Eastern seaboard of the United States are brighter than any place in China or India.

To find the darkest skies near you, visit the International Dark-Sky Association (IDA) at <http://www.darksky.org/> and access the Dark Sky Finder or the Clear Sky Chart, which shows sky conditions over the following 48 hours for specific observation sites in North America (over 3,500 currently listed).

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Wide Ranging Effects of Light

Along with limiting how deep into space we can see, light has had a wide ranging (and sometimes hidden) impact on ecology, energy waste, human health and social well-being.

ASTRONOMY

The City Dark introduces Irving Robbins, a Brooklyn-born astronomer running the last remaining observatory on Staten Island, New York. He is a reminder that stars could once be studied in New York City. Now only the brightest objects shine through the light-polluted sky. Robbins says, "I've seen the Milky Way twice—when there were blackouts."

Filmmaker Ian Cheney leaves New York City seeking darker skies and finds his way to Sky Village, a dark-sky haven for astronomers in rural Arizona. The village's denizens come from all walks of life. What draws them together is their need to be close to a dark night sky. Cheney visits a mountaintop in Mauna Kea, Hawaii, considered the best site for professional astronomy in the world. Here, astronomers rely on

Pan-STARRS, the world's newest, largest telescope-camera, to detect Earth-killing asteroids, but urban

growth in the valley below creates a luminous haze that impedes their work. "It's as though you're looking through fog," says John Tonry of the University of Hawaii.

Beyond the problems of decreased visibility due to urban sky glow, light trespass, glare and clutter, astronomers face another problem caused by light pollution. Not only is the night sky harder to see, but the objects astronomers can see are more difficult to analyze. Astronomers analyze the physical properties that make up stars, galaxies and other objects in the sky through spectroscopy. Spectroscopy is the analysis of the color components of light of an object. For astronomers, this means creating a spectrogram showing the optical spectrum of a given galaxy. The spectrogram allows the astronomer to use these color components of light to figure out the chemical properties and temperatures of the objects they are observing and make determinations about how fast the objects are moving. Spectroscopy has long been considered the most valuable tool in the astronomer's toolbox. As telescopes become larger and more sensitive to refracted light, there is an increasing need for observation in light controlled environments.

Some of the best locations for conducting telescopic observation are high and dry places, such as the Atacama Desert in Chile or the South Pole. Dry locations at high altitudes allow for the least sky noise, or background atmospheric interference caused by atmospheric pollution, humidity and light. Astronomers have been stationed in these remote locations for more than 50 years, but as more and more astronomers leave behind less useful stations and flock to these, many once populated stations are out of commission.

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ECOLOGY

The City Dark explains that astronomers are not the only ones losing the night. Biologists along the Florida coast trace the death of thousands of hatching sea turtles to their disorientation by coastal lights. Volunteers at the Field Museum in Chicago collect from city sidewalks thousands of dead birds, about one-third of which are victims of light-induced disorientation and collisions into lit buildings. As Chad Moore of the National Park Service explains, “When we add light to the environment it has the potential to disrupt habitat, just like running a bulldozer over the landscape can.”

While our understanding of the full spectrum of ecological consequences of light pollution is limited, we do know that artificial light at night contributes to disruption of natural behaviors. Some less recognized implications include the interruption of reproduction, foraging and inter-species communication. These are all light-sensitive cycles that are disrupted during unexpected periods of attraction to or repulsion from artificial light sources. For example, sockeye salmon fry stop swimming downstream when exposed to any light above 0.1 lux (the standard of measurement for lighting) and often end up in low-velocity waters near shore, which brings them into close contact with predators. Researchers believe this phenomenon explains the recent decline in the sockeye salmon population in Cedar River, Washington, a location that is exposed to both direct light and sky glow.

Many species of slow-flying bats, such as the horseshoe bat, have increasing difficulty procuring food. Bats are genetically predisposed to avoid light, and now that the hours of darkness are limited, they don't have as much time to seek out food. Also, bats eat insects, which tend to swarm around lights, so fewer are left to be caught in the dark. Other species are affected, too. For example, when days were extended to 16 hours due to artificial light, white-tailed bucks began feeding two weeks earlier than usual and weighed 20 pounds more than previously at winter's end.

Territorial singing in birds is also changing. While northern mockingbirds have evolved to sing only shortly before sunrise during mating season, they have recently been observed singing at night in artificially lit areas. When exposed to high levels of artificial light, American robins will often initiate their morning songs earlier, sometimes up to 100 minutes before the onset of dawn. According to Wildlands CPR's quarterly journal, prolonged singing could result in higher energy demands, greater predation risk and earlier yearly feeding times. These changes may

become serious for threatened and endangered species.

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HUMAN HEALTH

In **The City Dark**, epidemiologist Richard Stevens of the University of Connecticut suggests a link between light at night and breast cancer. In 1987, Stevens wrote in the *American Journal of Epidemiology* that “the use of electric lighting, resulting in lighted nights, may produce circadian disruption,” which causes changes in hormone levels in the body.

Human beings (and nearly all living things) have evolved under a natural rhythm of day and night. The 24-hour cycle during which the body goes through physiological changes is called a “circadian rhythm,” or colloquially the “internal body clock.”

Circadian rhythms respond significantly to light and darkness. In fact, melatonin is often called the “hormone of darkness” because it is secreted in the dark and it is believed to play an important role in fighting off cancer. If bodies are consistently exposed to artificial light at night, or LAN—whether from streetlights or a television glare—melatonin hormone production can be disrupted.

Stevens' LAN research has included studies indicating that night-shift workers are almost twice as likely to develop breast cancer as day-shift workers, and the World Health Organization has classified shift work as a probable cause and

risk factor for cancer. Although the research linking LAN to increased risk of cancers is still hypothetical, many chronobiologists suggest limiting one's prolonged exposure to bright lights during nighttime hours.

According to the National Institutes of Health, a change in a person's internal body clock impairs his or her ability to sleep and wake at appropriate times and leads to a decrease in cognitive and motor skills. Disruption of these rhythms can contribute to insomnia, depression and cardiovascular disease. However, the Lighting Research Center emphasizes that stimulation of the human circadian system at night is not necessarily a health risk and that the type of light is a major factor, as are the intensity and the duration of light exposure of the retina.

On June 15, 2009, the American Medical Association voted unanimously to adopt resolutions to reduce light pollution and glare, advocating for use of energy efficient, fully shielded outdoor lighting.

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LIGHT AND CRIME

In **The City Dark**, historian Roger Ekirch states that humans have long feared the dark, and that crime was the original impetus for widespread street lighting on the planet.

While there is strong indication that an increase in lighting decreases the fear of crime, there are mixed opinions regarding a direct correlation between light and crime, and the evidence is inconclusive.

A recent *New York Times* article on the rise of crime in Oakland, California states that research has long shown a correlation between street lighting and crime. Brandon Welsh, a criminology professor at Northeastern University, says that streetlights act as "natural surveillance" and may reduce crime by 20 percent. In a review of the effects of improved street lighting on crime, Welsh and co-author David P. Farrington explain the recorded impact (that crime fell both at night and during the day) and conclude that lighting increases community pride and confidence

and strengthens informal social control. **The City Dark** shows residents in Newark, New Jersey, agreeing that the introduction of bright new lampposts have made the community more livable and sociable.

However, some research indicates that an increase in number and brightness of streetlights actually increases the occurrence of crime, noting that street lighting allows perpetrators to monitor their own actions without the use of flashlights or other lighting devices that would make them visible to others. A case has also been made that offenders need lighting to detect potential targets and low-risk situations. In 1996, the National Institute of Justice published an assessment of crime and violence and considered the case of lighting outside ATM machines. The report posited that while an ATM user might feel safer when the ATM and its immediate surrounding area are well lit, this same lighting may make the patron more visible to passing offenders. A report from 2000, written by the Illinois Criminal Justice Information Authority, presented the effect of increased lighting levels in Chicago alleyways. In a one-year analysis after the upgrading and installation of brighter lights, the group cited an increase of 21 percent in reported offenses. Index offenses increased 14 percent (from 119 to 136), property offenses increased 20 percent (from 30 to 36) and non-index offenses increased 24 percent (from 279 to 347).

Most criminologists agree that crime is more complicated than light versus dark. Local factors can often determine whether a particular lighting strategy will be effective in deterring crime or not, and research is ongoing as more and more communities debate the merits of dark-sky friendly lighting.

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Did you know...

- **As awareness of the danger of artificial light to sea turtles grow, an increasing number of communities are restricting coastal illumination. Countries all over the world have passed ordinances that control the amount and type of light used in coastal environments. As the list grows, hatchling sea turtles are starting to be able to find the sea without the help of human volunteers to guide them. Learn more about local and regional action by visiting www.seaturtle.org. (International Dark-Sky Association)**

Reducing Light Pollution

Many municipalities, counties and states have begun taking piecemeal approaches to curbing light pollution. For example, in the state of New Hampshire citizens proposed a code that stipulated that street lights require full shielding to reduce light trespass and glare. Maine recently adopted similar proposed legislation into law, becoming one of the first states to do so. Maine's state highway law also now sets maximum limits on light output in an effort to reduce glare. Additionally, the city of San Jose, California, enacted a policy to preserve the night sky for astronomical research by converting street lamps so that they use monochromatic light sources and forbidding light sources to be directed at the sky, which causes urban sky glow. Florida now regulates outdoor lighting strictly for wildlife conservation purposes. For example, Florida has developed a turtle lighting program that requires light sources to emit in narrow bandwidths and at low intensity levels. However, designers struggle to meet light levels required by code when using light sources at their lowest intensity.

On a federal level, new light bulb efficiency standards came into effect on January 1, 2012. Manufacturers are now required by law to produce light bulbs that use 25 percent less energy than incandescent bulbs. More importantly, the U.S. Department of Energy is making an effort to change consumers' understanding of light bulbs by using luminous flux, or lumens, instead of radiant flux, or watts, to categorize light bulbs. Rather than identifying a light bulb according to the amount of power it consumes, lumens identify a light bulb according to its perceived brightness. The Federal Trade Commission requires light bulb labels to include lumens in addition to watts.

Finally, the International Dark-Sky Association (IDA) and the Illuminating Engineering Society of North America (IES) have developed a model lighting ordinance that communities can use to reduce light pollution and glare. These groups propose the implementation of four

defined lighting zones to assist in the customization of lighting within communities. Placing areas within a community in the appropriate lighting zone will allow that community to choose lighting based on the recommended amount of lumens for the zone.

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Did you know...

- It is estimated that at least 100 million birds are killed annually due to collisions with manmade structures, which include wind turbines, power lines, glass and towers. Collisions due to urban light represent approximately one third of all collisions, while two thirds of collisions occur during the daytime. 90,000 birds are killed flying into buildings in New York City alone. (American Bird Conservancy <http://www.abcbirds.org/abcprograms/policy/collisions/index.html>)
- Glass building typology is responsible for the majority of bird deaths, two thirds of which occur in the daytime. The U.S. Green Building Council recently issued a new pilot project under the Leadership in Environment and Energy Design (LEED) program to reduce bird collisions with buildings that focuses on alterations to building materials, such as glazing. (U.S. Green Building Council <http://www.usgbc.org/ShowFile.aspx?DocumentID=10402>)
- The lights of Las Vegas, Nevada, are visible from eight different national parks and are the dominant cause of light pollution in Death Valley National Park, 93 miles from the city. (*Science News Online* http://www.phschool.com/science/science_news/articles/light_all_night.html)
- According to Energy Star, a U.S. Environmental Protection Agency and U.S. Department of Energy program, replacing a single incandescent bulb with a compact fluorescent light (CFL) bulb in every U.S. household would be the environmental equivalent of taking 800,000 cars off the road. (Energy Star http://www.energystar.gov/ia/partners/promotions/change_light/downloads/Fact_Sheet_Mercury.pdf)
- LEED provides building owners and operators with a framework for identifying and implementing practical and measurable green buildings and reducing light pollution and light trespass. Nearly 9 billion square feet of building space participate in the LEED rating systems and 1.6 million feet are certified daily around the world. (U.S. Green Building Council. <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988>)
- The Phoebus cartel (1924-1939) was formed by light bulb manufacturers Osram, Philips, Tungsham and General Electric, among others. Manufacturers in the cartel not only fixed prices so that no manufacturer had to fear the competition of the others, but also secretly signed a commitment, pledging each other that light bulbs would be designed and constructed such that their expected life time would not exceed 1000 hours. (Glaubitz, John Paul Adrian, "Modern Consumerism and the Waste Problem." http://users.physik.fu-berlin.de/~glaubitz/mnses9100_essay.pdf)
- Worldwide, 1.6 billion people do not have access to electricity (UNESCO. "Global Climate Change." http://portal.unesco.org/science/en/ev.php-URL_ID=6480&URL_DO=DO_TOPIC&URL_SECTION=201.html)
- About 63 percent of the world's population and 99 percent of the population in the European Union and United States (excluding Alaska and Hawaii) live in areas where the night sky is above the threshold set for polluted status. (Chepesuik, Ron. "Missing the Dark: Health Effects of Light Pollution." *Environmental Health Perspectives*, January 2009.)

Selected People Featured in **The City Dark**

Neil deGrasse Tyson, astrophysicist and Frederick P. Rose director, Hayden Planetarium

Timothy Ferris, author, *Seeing in the Dark: How Backyard Stargazers Are Probing Deep Space and Guarding Earth From Interplanetary Peril*

Ann Druyan, writer, Cosmos

Irving Robbins, associate professor and observatory director, College of Staten Island

Roger Ekirch, historian, Virginia Tech

Mark Van Baalen, planetary scientist, Harvard University

Jack Newton, astrophotographer

Chris Impey, cosmologist, University of Arizona

Jeffrey Kuhn, astronomer, University of Hawaii

John Tonry, astronomer, University of Hawaii

Nick Kaiser, astronomer, University of Hawaii

Kirt Rusenko, marine conservationist, City of Boca Raton

Susan Elbin, director of conservation and science, NYC Audubon

David Willard, ornithologist, The Field Museum

Chad Moore, night sky team leader, National Park Service

Steven Lockley, neuroscientist, Harvard Medical School Division of Sleep Medicine

Richard Stevens, cancer epidemiologist, University of Connecticut

George Brainard, neurologist, Thomas Jefferson University

David Blask, cellular biologist, Tulane University School of Medicine

Jon Shane, criminologist and retired Newark police officer

Herve Descottes, lighting designer

Peter Lord, founder/president, Astronomy Institute of Maine

Stephanie Clement, conservation director, Friends of Acadia

Anne Krieg, (former) planning and development director, Town of Bar Harbor, Maine

Immediately after the film, you may want to give people a few quiet moments to reflect on what they have seen. You might even pose a general question and give people some time to themselves to jot down or think about their answers before opening the discussion.

One way to get a discussion going is to pose a general question, such as:

- **If you could ask anyone in the film a single question, who would you ask and what would you ask him or her?**

- **What did you learn from this film? What insights did it provide?**
- **If a friend asked you what this film was about, what would you say?**
- **Describe a moment or scene in the film that you found particularly disturbing or moving. What was it about it that was especially compelling for you?**

DISCUSSION PROMPTS

The Meaning of the Night Sky

The filmmaker opens the film by asking, “What do we lose when we lose the night?” How would you answer that question?

Bronx-born astrophysicist Neil deGrasse Tyson suggests, “When you look at the night sky, you realize how small we are within the cosmos. It’s kind of a resetting of your ego.” What are the benefits of occasionally reminding ourselves of our modest place in the universe? What do you think about when you stop to look at the night sky?

What is it about the night sky that has inspired mythology in so many cultures over time? What do the stories and the specific questions that people ask teach us about humanity and our relationship to the universe?

What wouldn’t we know about the universe if we could never see the night sky?

Ecology

In what ways is light pollution like and unlike other types of pollution? In what ways is it connected to other environmental issues? How might tackling the light pollution problem help us solve other pressing problems?

How do the lights in your city or town affect local wildlife? What has been the response to that impact? Are you satisfied with that response? If not, what changes would you like to see?

As scientists identify specific instances where lights disorient wildlife or disrupt the natural cycles that allow them to survive and reproduce (e.g., the turtles in Florida or birds in Chicago), what is the responsibility of government to respond? What would you recommend in terms of action at the federal, state and/or local levels?

Are the stars part of nature? Should the night sky be considered part of the environment? How does the way that we classify the night sky affect how it is treated and protected?

What does your faith or belief system teach about human responsibility to care for the planet and all its inhabitants? How would those teachings apply to light pollution?

Health

What do you notice about the ways that light and dark affect your body or mood?

From a public health perspective, how would you balance the economic benefits of night-shift employment with the potential risks to employees’ health?

If you were surgeon general of the United States and researchers reached a consensus on a link between risk of breast cancer (or other life threatening illness) and shift work, what policy recommendations would you make in response?

Urban Planning and Safety

In what ways does light increase social interaction and make people feel safer? How would you balance those benefits with the benefits of darkness?

In your town, what zoning regulations currently exist to govern lighting? Do the codes adequately address light pollution? If not, what would it take to convince your city or town to adopt new regulations? What obstacles would need to be addressed and how might you address them?

Additional media literacy questions are available at www.pbs.org/pov/educators/media-literacy.php

SELECTED QUOTES

You might also use these quotes from **The City Dark** as discussion prompts. Address participants by asking, “What is your reaction?” or “Why is this significant?” or “Do you also see things this way, or do you have a different view?”

From the film:

“Two-thirds of all humans now live under skies polluted by artificial light.”

“You could think of our era as the one in which stars disappeared from the sky and reappeared in our city skylines.”

“Though we might love the light, we might also need the dark.”

“We can trace the development of our inquiry into the universe to the ability to look up to the sky, to see things that you don’t understand that you want to be able to touch and understand. Every civilization that we know about built a science around explaining the sky that was above them that they saw at night.”

“[Light pollution] is like I have a beautiful painting but now I come along with an eraser and I erase all of it and just leave a few spots.”

“Reducing light pollution hurts virtually no one and it saves money.”

“If we didn’t have a good view of a dark sky, we wouldn’t know we lived in a galaxy like the Milky Way.”

“It has been said, correctly I think, that there is no better symbol of modern progress than the advent of electricity in general, but electric lighting in particular.”

“When we add light to the environment, that has the potential to disrupt habitat, just like running a bulldozer over the landscape can.”

“The estimate is that there’s a billion birds killed across the United States every year by collision into buildings.”

“Our society is moving more and more towards a 24/7 lifestyle where everything’s open all night long, people are being asked to work very long hours and working all through the night and we really don’t understand what the long-term health consequences are.”

“It’s only been in the last 120 years where the masses of people now have had their dark period dramatically eroded by the use of electric lighting.”

“We have lived under the stars for the vast majority of our experience... This is the mystery that we were all born into.”

“You could live your life at home never looking up. Do you know what’ll happen? You’ll start thinking of your own environment as all there is. And if that’s how you think about where you are, then it rises to an artificial level of importance.”

Additional media literacy questions are available at:
www.pbs.org/pov/educators/media-literacy.php



TAKING ACTION

Each of the following suggestions can be implemented in conjunction with or as follow-up to a screening of **The City Dark**:

The Meaning of the Night Sky

- Have you ever been inspired by a majestic night sky? Create a piece of artwork, video, poem, essay or song that expresses your experience. Invite others to do the same and share your work by creating an online gallery, convening a poetry slam or serving as curator for a show at a local library (or other public space).
- Study the history of the constellations. What were the sources of images that were chosen and how did they reflect the societies that chose them? Which of the constellations are visible from the region where you live and how does what is visible change with the seasons? Once you are familiar with the constellations, try your hand at stargazing. Take a trip to a dark spot and see how many constellations you can spot. As part of your stargazing experience, invent and draw your own constellations so that others can spot them.
- Neil deGrasse Tyson observes that “every civilization has a mythology about the night sky.” Have each person in your group or class choose a civilization and research its sky mythology. Share and compare and contrast everyone’s findings. What do you learn about commonalities and differences over time, place and culture?

Science

- Hold a career day. Invite astronomers, astrophotographers, aerospace engineers, astrophysicists and environmentally friendly lighting designers to help young people in your community learn about sky-related careers.
- Make your facilities more energy-efficient. Learn about the California Energy Commission energy efficiency standards and its efficiency financing program for local government, hospitals, schools and colleges. Savings have proven to reduce annual utility costs by an average of 20 percent.

- Get updates on the work of the scientists in Hawaii who are part of NASA’s Near-Earth Asteroid Tracking program at <http://neat.jpl.nasa.gov/>. Share your views with your elected representatives about continued funding for this NASA program.
- Visit a planetarium. Note what you see there that you can’t see in the night sky from your home. Think about what it might be like if, at some point in the future, the planetarium were the only place people could go to see the night sky. How might such a society differ from our own?
- Discuss what is visible in the night sky where you live in a letter to a pen pal, a post on your Facebook page and/or a post on an astronomy bulletin board or chat room.

Nature

- Consult with local nature centers, museums or conservation groups about threats to local wildlife from light pollution. Find ways to work together to mitigate the threat.
- Listen to EarthSky’s radio shorts on your local NPR radio station or online at earthsky.org. Use EarthSky’s programs as a model to create your own podcasts on light pollution and habitat.
- Learn how to navigate using the stars. As background, investigate historical figures who used the stars to navigate, such as 15th- and 16th-century explorers and conductors on the Underground Railroad. Seek out folkloric discussion of navigation by stars, such as the folk song “Follow the Drinking Gourd.” Then, find a class to learn navigation by the stars (sometimes available at local camping or nature centers), or visit one of the many resources available on the Internet, such as www.science-teachers.com/north_star.htm. Once you gain some confidence, plan a night hike using the stars to navigate.
- Host a stargazing party. Invite guests to bring their own telescopes or make supplies and instructions available so that guests can build their own telescopes.
- Participate in the worldwide star survey Globe at Night, in which citizen-scientists count the stars visible from their towns and cities and add their tallies to a map of the earth’s night sky quality. Visit www.globeatnight.org to learn more.

TAKING ACTION

Health

- Craft a public health policy that covers night-shift work. Share with your local and state health departments and work with them to recommend workplace regulations to the Occupational Safety and Health Administration and other regulatory agencies.
- Work with local unions and employers to disseminate wellness strategies to night-shift workers and, where possible, to eliminate the need for night-shift work.

Urban Planning

- Brainstorm a list of all the things that you think could be done in your community to reduce light pollution. Choose one or two items from the list and, together with local civic groups and clubs, create an action plan to implement them.
- Reach out to lighting professionals through a local chapter of the Illuminating Engineering Society of North America (IES). Good lighting design is economical, energy-efficient and dark-sky friendly, in addition to being aesthetically pleasing. Consult with lighting professionals to educate your community on good lighting practices.
- Learn how the U.S. Green Building Council's LEED program helps reduce light pollution and learn how architects can incorporate bird-safe design elements into new architecture for commercial and residential buildings at <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988>.
- Learn more about lighting design by examining your own environment. Ask yourself how lighting affects your perception of where you live. Think of a place in your surrounding area that you enjoy or do not enjoy. Consider how this space is lit.
- Visit the American Bird Conservancy website (<http://www.abcbirds.org/>) and find out how you can take steps to make buildings in your community bird-friendly.

- Calculate the lumens of various light fixtures in your home, business or community. Compare them to the lumens of alternative light sources, such as candles or other types of bulbs. Determine whether or not there are locations where you could decrease the lumens and still get the illumination you needed. Create a plan to act on your findings.
- Learn about organizations like Engineers Without Borders (<http://www.ewb-international.org>) and recent efforts to bring new light and power to small towns in the developing world.
- Find out more about lighting design, a field whose professionals have expertise in the art and science of light and lighting.

FILMMAKER WEBSITE**www.thecitydark.com**

Visit the filmmaker's website to learn more about the film, the filmmaker and upcoming screening events.

Interact with THE CITY DARK at PBS.org

*POV's Webby Award-winning website offers a broad range of exclusive online content to enhance the broadcast of **The City Dark**. Watch the full film online for free for a limited time following the broadcast (July 6, 2012 to Aug. 5, 2012), download this discussion guide, lesson plans and other viewing resources, view photos from the film, and interact with the filmmaker through video interviews and an online Q&A soon after the documentary airs on POV.*

What's Your POV?

*Share your thoughts about **The City Dark** by posting a comment at <http://www.pbs.org/pov/citydark/>*

Additional Resources**EARTHSKY****www.earthsky.org**

Familiar to many NPR listeners because of its daily broadcasts about earth science and astronomy, this organization provides updates and photos of what stargazers can see in the current night sky on its website.

GLOBE AT NIGHT**<http://www.globeatnight.org>**

This citizen-scientist project encourages communities to measure their own night sky quality and add their results to a global map accessible online.

INTERNATIONAL DARK-SKY ASSOCIATION**www.darksky.org**

This group's website serves as a one-stop shop for all things related to dark sky conservation, including research, sample ordinances, action alerts, lighting fixture design recommendations and more.

LIGHT POLLUTION SCIENCE AND TECHNOLOGY INSTITUTE**<http://www.lightpollution.it/dmsp/artbri.html>**

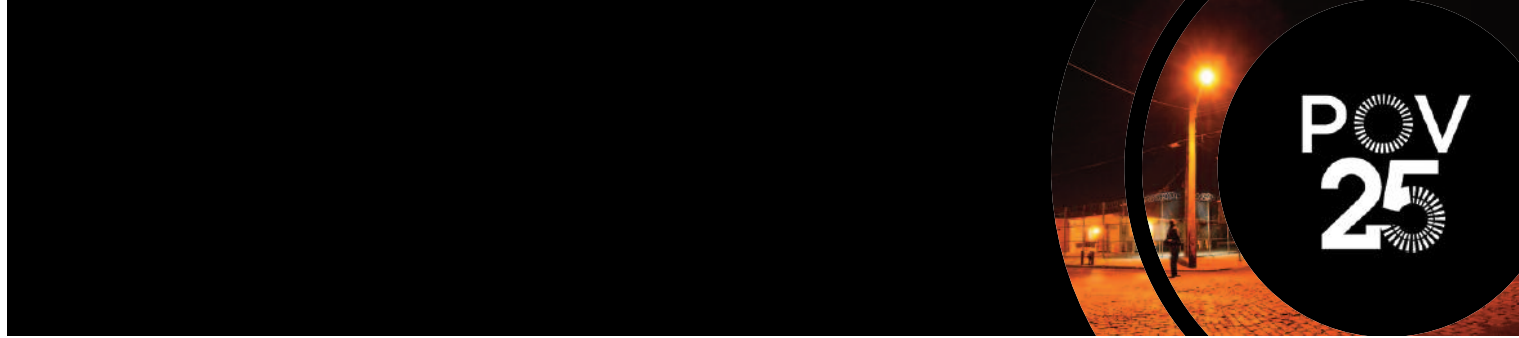
This website features satellite maps showing night sky artificial brightness across the globe.

PHOSCOPE**<http://www.phoscope.org/>**

PhoScope is an independent nonprofit organization that advances lighting practices in the built environment by bringing visionary thinking into design research collaborative projects, public programs and publications. PhoScope forges critical alliances between city agencies, not-for-profit agencies, community groups and design and planning experts.

SEEING IN THE DARK**www.pbs.org/seeinginthedark**

The official website for the film *Seeing in the Dark*, based on the work of Timothy Ferris (who appears in **The City Dark**) includes a wide range of information on astronomy and the night sky, including a set of how-to videos on subjects such as reading a star chart, choosing a telescope and astrophotography.



Produced by American Documentary, Inc. and beginning its 24th season on PBS in 2011, the award-winning POV series is the longest-running showcase on American television to feature the work of today's best independent documentary filmmakers. Airing June through September with primetime specials during the year, POV has brought more than 300 acclaimed documentaries to millions nationwide and has a Webby Award-winning online series, *POV's Borders*. Since 1988, POV has pioneered the art of presentation and outreach using independent nonfiction media to build new communities in conversation about today's most pressing social issues. Visit www.pbs.org/pov.

POV Digital www.pbs.org/pov

POV's award-winning website extends the life of our films online with interactive features, interviews, updates, video and educational content, as well as listings for television broadcasts, community screenings and films available online. The *POV Blog* is a gathering place for documentary fans and filmmakers to discuss their favorite films and get the latest news.

POV Community Engagement and Education www.pbs.org/pov/outreach

POV films can be seen at more than 450 events across the country every year. Together with schools, organizations and local PBS stations, POV facilitates free community screenings and produces free resources to accompany our films, including discussion guides and curriculum-based lesson plans. With our community partners, we inspire dialogue around the most important social issues of our time.

Front cover: Filmmaker Ian Cheney on a Brooklyn rooftop. Photo courtesy of Wicked Delicate Films LLC

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American Documentary, Inc. www.amdoc.org

American Documentary, Inc. (AmDoc) is a multimedia company dedicated to creating, identifying and presenting contemporary stories that express opinions and perspectives rarely featured in mainstream media outlets. AmDoc develops collaborative strategic-engagement activities around socially relevant content on television, online and in community settings. These activities are designed to trigger action, from dialogue and feedback to educational opportunities and community participation.

Join our Community Network! www.amdoc.org/outreach/events

Learn about new lesson plans, facilitation guides and our other free educational resources and find out about screenings near you. Joining our network is also the first step towards hosting your own POV screening.

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