

80% OF THE WORLD'S PEOPLE AND MORE THAN 99% OF THE U.S. AND EUROPEAN POPULATIONS LIVE UNDER LIGHT-POLLUTED SKIES.

STAR LIGHT, STAR BRIGHT. WHY CAN'T WE SEE THE STARS AT NIGHT?

THE PROBLEM WITH OUR VANISHING DARK SKIES

by Alison Main

WHAT IS LIGHT POLLUTION?

When you think about environmental pollution, you most likely envision innocent seagulls caught in slick, black oil spills, smokestacks blanketing our atmosphere with chemical clouds, and trash heaps overflowing our street corners.

However, there is another form of anthropogenic pollution that often goes unrecognized, yet is just as harmful to human and ecological health.

Light pollution is the detrimental environmental effect of the inefficient and unnecessary use of artificial light. With serious consequences for human health, wildlife, and our climate, this type of pollution comes in many forms,¹ including:

SKY GLOW: the bright halo that appears over urban areas at night, a product of light being scattered by water droplets or particles in the air.

LIGHT TRESPASS: the unwanted artificial light from, for example, a floodlight or street light that spills onto an adjacent property, illuminating an area that would otherwise be dark.

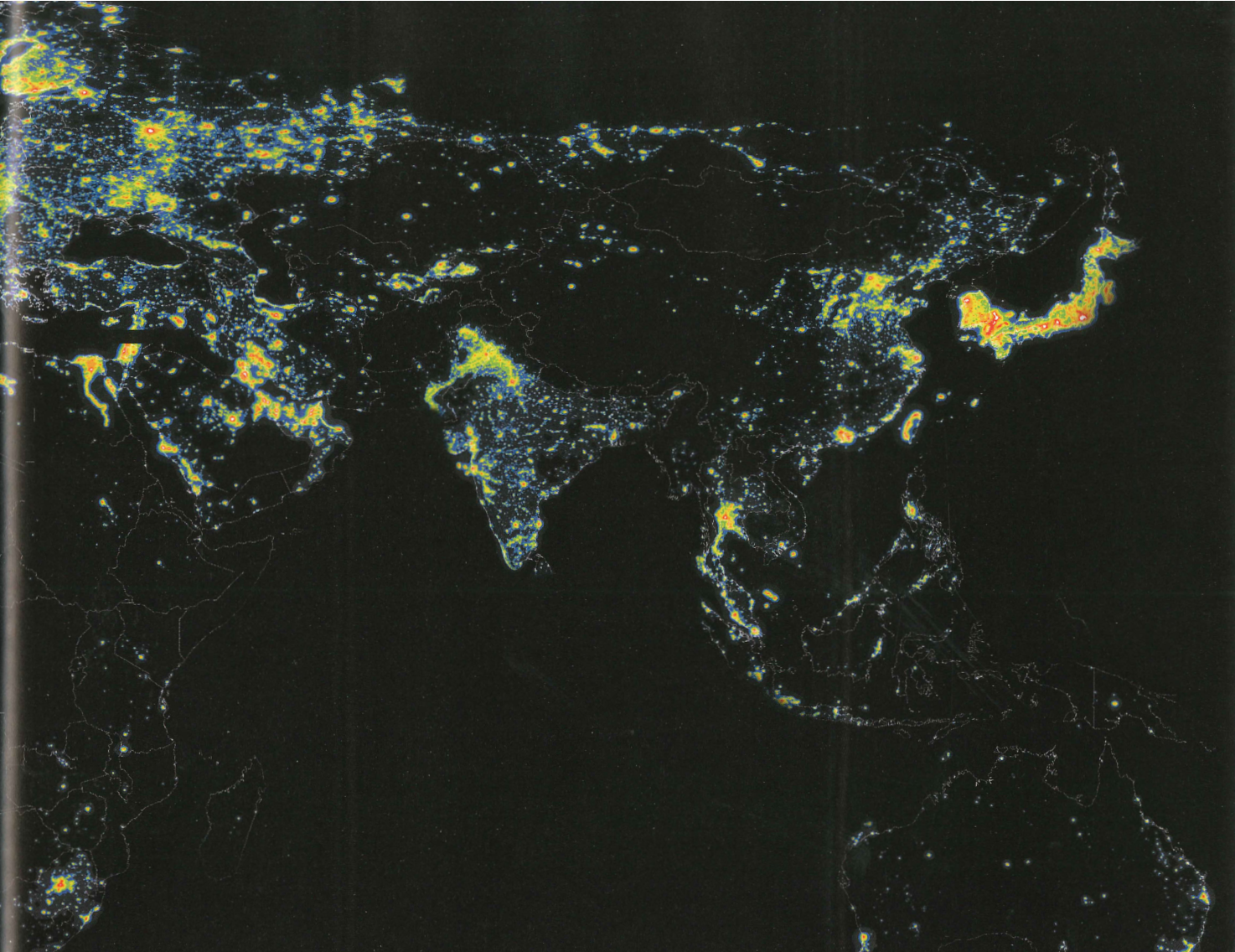
GLARE: a vision-disrupting effect created by light that shines horizontally.

OVER-ILLUMINATION: the use of artificial light well beyond what is required for a specific activity, such as keeping the lights on all night in an empty office building.

It is currently estimated that 80 percent of the world's people and more than 99 percent of the U.S. and European populations live under light-polluted skies.² Remember the Milky Way? It didn't suddenly vanish into a giant black hole. Like our ancestors, we *should* still be able to gaze up at the night sky and, with our naked eyes, see our majestic galaxy. But today, most of us around the world are unable to view this enchanting solar-system formation. And that is directly correlated to the artificial-light pollution we've created down here on Earth.

BRIGHT LIGHTS, BIG CITY

According to the National Park Service, 50 percent of the light from a typical unshielded light fixture is wasted, shining



upward where it is not needed. About 10 percent of the light is emitted horizontally, tending to create glare. Only the remaining 40 percent of the light shines downward to illuminate its intended space.¹

The International Dark Sky Association (IDA) recommends that all lighting be installed such that no light is emitted above a horizontal plane running through the lowest part of the fixture.³ This means that well-designed lighting is shielded to direct all the light where it is actually needed, with no waste or excess to pollute our night skies.

Another significant problem with our current lighting is a phenomenon called flicker, which is the variation in luminance over a period of time. All AC-powered light sources flicker. However, flicker is often more pronounced in LEDs, the type of lighting which has come to dominate our private homes and public spaces.

What primarily determines the degree of flicker in LEDs is the driver. From an engineering and marketing standpoint, this often boils down to cost and efficiency, in that it's more costly to make drivers that minimize flicker. Plus, such drivers often must be larger than the standard size to accommodate the necessary components that smooth out the light emission. In addition, the use of dimmers can cause or exacerbate flicker.^{4, 10}

Riun Ashlie, certified electromagnetic-radiation specialist and founder of Neural Vitality Networks, explains that his overall goal is to get the home environment to reflect nature as closely as possible, which includes the aspect of lighting: "What I look at when I evaluate lighting is the flicker rate, or the frequency of the light. What we don't realize is that we're subjecting ourselves to a continuous strobe effect with our artificial light and our

screens. In contrast, natural light doesn't have any pulsed or strobed effects."

For home lighting choices, Ashlie recommends standard incandescents or halogen-filled incandescents. He explains that it's important to pay attention to your lighting environment in order to maintain homeostatic balance. "There's so much we're bombarded by everywhere, that we're challenged to resonate in a healthy way, and to know in our bodies what vitality feels like." The least we can do is choose the right lighting.

DISCONNECTION FROM DARKNESS

Dr. Paul Bogard, author of *The End of Night: Searching for Natural Darkness in an Age of Artificial Light*, says we've lost a lot by lighting up our skies. "Darkness is hugely valuable—to our spirits, our souls, our creative processes. Think about all the

art, music, and writing that was inspired by night and the night sky. We don't see that anymore. We've taken what was one of the most common human experiences—that of walking out your door and coming face to face with the universe—and we have made it one of the rarest of human experiences.”

A few generations ago, we still had a naturally dark night sky. But Bogard says, “If you're younger than 40, you've grown up swamped in light. You've never experienced what night is like without light pollution. Some people don't actually know the night could look different.”

As a society, we've become significantly more self-focused, seeing only what's literally right in front of us, and that's often whatever's emitted from our bright, glowing screens. Bogard explains, “When you can look up and see the universe, you start to ponder what else is out there, what is greater than yourself. You can sense your own insignificance. But that all gets taken away with our light-polluted skies. I think it can contribute to that narcissism in our culture, that idea that human beings are the be-all and end-all of everything.”

If you've ever trekked down a remote mountain peak at night, you may recall the sense of panic invoked with the realization that you've lost cell reception and your GPS is no longer active. But humans used to navigate the dark with nothing but a fire torch and their directional instincts. As Bogard says, “Darkness has been part of the human experience for so many generations, but we've become numb to it; we now avoid it. I love the idea of navigation, making our way through darkness both literally and metaphorically. It's part of being alive. I think we really lose something when we're not asked to navigate the darkness.”

EFFECTS ON HUMAN HEALTH

There's a natural order to the day/night cycle that resonates with the human body at the metabolic level to regulate numerous organic functions. But light pollution significantly disturbs the human nocturnal environment, throwing this whole cycle off balance.

Our circadian rhythms affect our physiologic processes, including brain-wave patterns, hormone production, cell regulation, and other biological activities. This 24-hour, internal clock, which depends fundamentally upon the light/dark cycle of day/night, has become compromised by our overly electrified world, one in which most of us no longer enjoy a truly dark night.

Disruption of the circadian clock has been linked to several medical disorders in humans, including depression, insomnia, cardiovascular disease, and cancer.¹ One cycle in particular that is quickly disturbed by light pollution involves the pineal gland and blood melatonin rhythms. According to recent studies, the repeated suppression of melatonin by light at night is sufficient to promote tumor growth and increase humans' vulnerability to cancer.^{5,6}

In December 2007, the International Association of Research for Cancer (IARC) classified shift work as probably carcinogenic to humans.⁷ Based on studies with nurses and flight attendants, it's been shown that long-term night workers have an increased risk for breast cancer. Consistent with animal studies on this same topic, the constant light, dim light at night, and simulation of chronic jet-lag can substantially increase tumor development.¹

The Department of Energy and the IEEE reported that there are serious health risks posed by LEDs with inexpensive drivers. Flicker is not just annoying, but can also cause eyestrain, blurred vision, and impairment of performance on sight-related tasks. In individuals who are flicker-sensitive, it can also cause debilitating headaches and migraines. Flicker has also been reported to contribute to autistic behaviors, and can be a trigger for epileptic seizures.^{4,10}

EFFECTS ON WILDLIFE

Artificial-light pollution also has a detrimental effect on a variety of flora and fauna, including birds, reptiles, mammals, amphibians, fishes, invertebrates, and plants. It has been shown to disorient animals, perturb mating behavior, alter predator-prey behavior, confuse migration, and influence animal physiology.⁹

Some prime examples of such disturbances include:

AVERTING SEA TURTLES: Many species of sea turtles lay their eggs on beaches, with females returning yearly for decades to nest on the beaches where they were born. When these beaches are brightly lit at night, females may be discouraged from nesting on them. They can also be disoriented by lights and wander onto nearby roadways, where they risk being struck by vehicles.¹

CONFUSING BIRDS: Bright light also attracts birds and disorients them, as they are confused during flight passage by brightly lit buildings, communication towers, and other structures.^{1,8}

SILENCING FROGS: When exposed to excessive light at night, frogs have been found to limit their mating calls, thereby reducing their reproductive capacity.¹

DISORIENTING MOTHS: Artificial light interferes with the navigational abilities of moths and other nocturnal insects. As a consequence, night-blooming flowers that depend on moths for pollination may be affected. This can lead to the decline of a plant species and alter a region's long-term ecology.⁹

REPELLING ZOOPLANKTON: Light pollution around lakes prevents zooplankton, such as *Daphnia*, from eating surface algae, thus contributing to algal blooms that can subsequently kill off a lake's plants and reduce water quality.⁹

BLINDED BY THE LIGHT

In cities and neighborhoods around the world, there is a strong push to install LED streetlights as public-infrastructure upgrades, based upon the assumption that these lights save energy and money. Unlike our old, warm-yellow streetlights that served as emotive inspiration for many an Edward Hopper painting, these new LEDs are painfully bright and starkly white with harsh, cold blue tones. And some residents are not too thrilled to have a beacon shining right into their bedrooms at night.

From California to Texas to New York, many community residents are opposing





this invasive and glaring light. The EMF Safety Network worked with the City of Sebastopol, California, to prevent the integration of bright LED lights into local infrastructure. Sandi Maurer, director of the EMF Safety Network says, “Our group presented research on the problems with LED streetlights, including the health hazards and environmental risks of blue light and flicker, which can cause eye-strain, headaches, and even seizures. In addition, LED lights add dirty electricity to the power grid.” As a result of the EMF Safety Network’s efforts, the city voted to keep their warm-yellow streetlights.

THE LIGHT AT THE END OF THE TUNNEL

Humans are diurnal creatures, meaning that our eyes have formed to function optimally in the sunlight. Hence, to a degree, it is instinctual for us to prefer to illuminate the darkness. Still, there’s a way to shine a light and also preserve the heritage of our night sky.

As Bogard says, “We’ve lost touch with a big part of what it means to be a human being. Life on earth evolved with bright days. So we do need light. But we also need dark nights. Darkness has been part of us forever. We’ve lost the inspiration that comes from being face-to-face with the universe. That said, darkness is still out there. If we can get our act together, we can bring it back.”

TAKE BACK THE NIGHT

Light pollution is a reversible problem. The International Dark Sky Association recommends the following simple steps:

- 1 Check the lighting around your home, and illuminate only what you need.
- 2 Shield outdoor lighting, and direct lights downward to minimize light trespass beyond your property lines.
- 3 Use automatic timers and motion detectors to limit light use to times when you really need it.
- 4 Choose warm, white lightbulbs.
- 5 Talk to your neighbors. Explain that poorly shielded fixtures waste energy, produce glare, and reduce visibility.

+ Source: International Dark Sky Association. <http://www.darksky.org/light-pollution/>

