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Opinion

Is the Evening Sky Doomed?

Light pollution is threatening our ability to see the cosmos.

By Kelsey Johnson

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If you go outside on a cloudless night and look up in the sky, what do you see?

If you are among the 80 percent of Americans living near urban areas, the answer is probably “not much.” The lights we use to illuminate our cities and suburbs don’t just shine on our sidewalks and streets; they also shine up into the sky, where they bounce around in the atmosphere, creating a smog of light. That featureless glow of our nocturnal skies is called “light pollution.”

As an astrophysicist, I’ve had the opportunity to bask in some of the darkest night skies on the planet, which is a rare gift in our modern world. The farther a location is from populated areas, generally the less light pollution there is.

But in recent years, with populations swelling and demands for lighting increasing, the global amount of artificial light at night has been growing by at least 2 percent per year. At this rate the amount of light pollution originating from Earth-based sources alone will double in less than 50 years.

Even rural areas are now subject to this nighttime glare. In the United States, east of the Mississippi there remain only two very small pockets of truly dark nighttime sky — one in northern Minnesota, the other in northern Maine — that allow us to see the night sky as our distant ancestors did.

This is a global problem. The night sky in Saint-Rémy, France, which once inspired the iconic van Gogh painting “Starry Night,” now suffers from so much light pollution that the Milky Way is virtually imperceptible.

All of that light at night comes with costs. For one thing, it drains economic resources. Satellite images of Earth are stunning, but the light we see in those images is shining *up from the planet* into outer space, where it isn't illuminating roads or sidewalks but being wasted — to the tune of \$3 billion per year in the United States alone.

Artificial light at night is also associated with negative effects on health, including a significant correlation with all forms of cancer. It affects our circadian clock, which in turn affects the production of melatonin, a hormone that plays a role in sleep. A recent study in the *Asian Pacific Journal of Cancer Prevention* recommends that “immediate measures should be taken to limit artificial light at night in the main cities around the world and also inside houses.”

There are also environmental concerns. Nighttime light blasts flora and fauna, affecting their feeding, mating and migration. Artificial lights in coastal areas disrupt nesting sea turtles and disorient the hatchlings when they emerge. Even creatures at the bottom of the coastal food chain, such as dogwhelks (a type of sea snail), change their behavior in response to artificial lighting, exposing them to more risk from predators.

I think there is even an existential cost. A dark night sky, unpolluted by artificial light and thousands of artificial satellites, serves as a visceral reminder that we are part of something unfathomably large, that our petty differences on this tiny speck of a planet are ultimately insignificant. In the face of the universe, human arrogance is absurd.

One of the challenges of light pollution is that the problem is worse than we can detect with our own eyes. The visible spectrum of light that our eyes have evolved to see is only a small portion of the full range of light. Some of the *invisible* light from outer space that we try to detect — using technology like radio telescopes — is increasingly getting masked by overwhelmingly strong signals from Earth emitted by things like cellphones and car radars. After traveling across the vastness of space for billions of years, this light finally reaches our planet, only to be obscured by modern technology.

Not only do we rely on this invisible light to figure out what's happening in the universe but we also use it to communicate with space missions throughout the solar system. For example, the Hubble Space Telescope and the coming James Webb Space Telescope rely on radio light to communicate with NASA.

Wavelengths of light that can be used for commercial, government or research purposes are regulated by government and international entities, and a handful of wavelengths of light deemed critical for observing the universe were “protected” for astronomical use before the early 1970s. But astronomers have little influence here, having extremely shallow pockets relative to commercial and government interests, and the wavelengths set aside for astronomy have been slowly losing their protected status.

Moreover, given the advances in astronomy over the past 40 years, the originally protected wavelengths do not include those that have become important today as astrophysical diagnostics. As a result, we astronomers are slowly becoming blind to the universe around us.

In addition, a new source of light pollution is now coming from space itself, courtesy of the multibillion-dollar communications industry. In May, the private aerospace company SpaceX sent 60 internet communications satellites into space as part of a system called Starlink. If and when the full proposed

suite of 12,000 Starlink satellites are in their low-level orbits, they will outnumber the visible stars in the night, and the natural evening sky may truly become a thing of the past.

Still, there are some slivers of hope. According to the International Dark Sky Association, thousands of cities have adopted “lighting ordinances” that help to limit light pollution. Good outdoor lighting can be installed in ways that save money and protect the night sky. For example, Tucson has long led the way in reducing light pollution and recently reduced “sky glow” by 7 percent after converting streetlights.

Invisible light pollution, such as radio emission, is harder to control, in part because we don’t see it with our own eyes. But we do have a National Radio Quiet Zone, straddling the Blue Ridge Mountains on the Virginia-West Virginia border, which serves both scientific research and military purposes. In this area, broadcast emissions are strictly limited, which rules out common modern conveniences like cellphones, Wi-Fi and microwave ovens. (However, even in this “quiet” zone, emissions from orbiting satellites still bombard the radio telescopes and contaminate data.)

If you’ve never seen a truly dark night sky, don’t wait too long — it’s getting harder and harder. As we grow accustomed to light pollution, we become less aware of what we are missing. I worry that as each new generation perceives blank, tepid, gray night skies as normal, fewer and fewer people will work to protect our precious view of the universe around us.

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