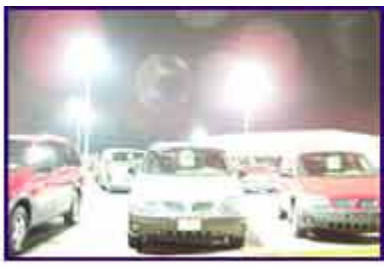
Blinded by the light

POSTED 20 APRIL 2000

Feeling light-headed

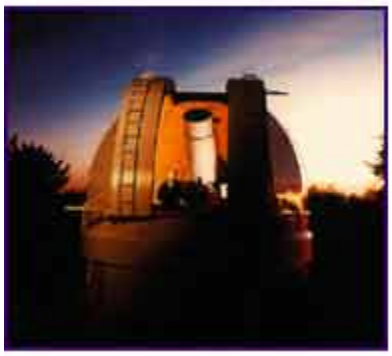


In most cities, there's little point in gazing at the sky -- unless you're fascinated by the sight of a few stars and some airplanes against a glowing background. If you have not seen a truly dark sky, you may not know that the urban glow conceals a network of uncountable stars in intriguing constellations.

Whether or not you've given the subject a second thought, astronomers are certainly having nightmares about the rapid brightening of the night sky. Already, light pollution has ruined major observatories like California's Mount Wilson for deep-space astronomy. An equally pressing but invisible problem emanates from radio-wave pollution. As the world lunges toward a wireless future, the transmitters and satellites at the backbone of the global network are drowning faint signals from distant galaxies.

Light and radio pollution pose a growing problem to astronomers who use ever-more sensitive instruments to view the strange conditions of the early universe. After all, astronomers can only "see" objects that are brighter than the background. When the background brightens, faint objects get lost.

It's ironic and a bit sad, says Johannes Andersen, general secretary of the International Astronomical Union. Photons -- particles of light -- that have traveled for literally billions of years may get swamped by pollution in the last thousandth of a second before they reach a telescope. Simply putting telescopes in space is not a surefire solution, he adds, due to staggering costs and the increasing hazard of space junk.



Animal agony

It's not just astronomers who suffer, says Andersen. Lots of people find the ever-brightening night annoying, and animals that are programmed to prefer the dark may avoid brightened habitat. Sea turtles can get lost searching for a beach to lay eggs, and their hatchlings may confuse over-lit beachfront resorts for the ocean horizon, wasting precious energy needed to find the sea and escape predators.

The solution to light pollution is pretty simple, according to these outdoor lighting suggestions: Avoid making excess light, and use reflectors and shields to direct light toward the ground. Tucson, Ariz., for example, is credited with a forward-looking plan to reduce light pollution at the nearby observatory at Kitt Peak.

Wasted light, Andersen emphasizes, produces glare that "prevents you from seeing rather than helps you." Since that wastes money, Andersen hopes that economics may someday overpower the urge to turn night into day.

Surfing the radio waves

As astronomers try to stem visible light pollution, they face a second, more insidious form of pollution: radio waves. This form of electromagnetic radiation gives a picture of cool objects in the universe, and may carry signals from remote civilizations.

To grasp the delicacy of radio astronomy, Andersen urges you to consider this fact: "The total radiation collected by all the world's radio telescopes during the last half century would suffice to light an ordinary flashlight bulb for a millisecond."

That's one-thousandth of a second!

Unlike light pollution, which tends to be local, communications satellites cover essentially the entire Earth, threatening every potential site for a radio telescope. If we could see radio waves, Andersen stresses, "We'd not have a dark sky at all."

Radio astronomers have some protection from regulations that have placed certain frequencies -- such as the radiation emitted by hydrogen -- off limits to broadcasters. However, some satellites, like those in the Soviet global positioning system, are notorious for emitting noise at frequencies outside their assigned slots, Andersen says. And as radio astronomers peer further out, they detect ancient radio signals from objects that are rapidly moving away from us. Due to the Doppler effect, these signals appear in unprotected bands. More pollution is on the horizon: Andersen notes that a recent United Nations conference heard about plans to launch 1,700 communications satellites in the next decade. And astronomers are also losing sleep over proposals to launch giant satellites carrying advertising to be "enjoyed" from the ground.

Orbital advertising, anyone?

It doesn't take a genius to realize that astronomers are in the unfortunate position of standing in the way of progress, defined as advertising, universal communications and urban growth. Their current strategy is to prevent disasters rather than trying to clean them up. "We want to negotiate agreements," Andersen says. "We don't imagine we can prevent satellites from being sent up ... but we're trying to be proactive, to take action with authorities, trying to get rules in place before things get set up, rather than find out about them when it is too late."

-- David Tenenbaum

BIBLIOGRAPHY

Astronomy and the Degrading Environment, Johannes Andersen, Science, 21 April 2000, pp. 44