



**CORNELL  
UNIVERSITY**

# LIGHTS A GREEN PATH

by Cynthia Mwenja





Photo by Robert Barker/Cornell University

Touting savings of both energy and costs, Cornell University recently completed a lighting upgrade project by replacing outdated lighting fixtures and switching to energy-efficient LED bulbs across campus.

According to Cornell's Campus Sustainability Office, the project has saved the campus "over 18,000 tons of carbon and \$2.9 million to date." Replacing older, energy-inefficient fixtures and bulbs can be an easy way for campuses to decrease expenses and reduce carbon emissions, but universities can realize even more benefits in addressing campus lighting more broadly.

### Maximizing Natural Light for Energy Savings

When planning renovations or new building projects, university campuses can generate the most energy savings by maximizing the use of natural light. According to the Intergovernmental Panel on Climate Change (IPCC), lighting energy use can be reduced up to ninety percent through architectural design "to increase the use of natural lighting through building form, skylights, and windows."

While these remarkable savings can only occur with significant building or renovation projects, they represent one of the best ways for campuses to save energy costs and natural resources over the long term.

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Additionally, natural lighting continues to provide illumination throughout the life of the building, whereas even the most efficient light bulbs will eventually need to be replaced.

## Beyond Budgetary and Environmental Issues

Natural light provides advantages far beyond energy and resource savings, however—it can improve the mood and performance of those on campus, as well. According to the World Health Organization, “Sufficient natural light exposure is a factor in biophysical performance, mental health, and injury prevention. Exposure to natural light is important for vitamin D production, sleep cycle regulation and mood.”

This wide range of effects means that lighting is not just a budgetary or environmental issue—students, faculty, and staff enjoy mental and physical advantages when surrounded by natural light in campus spaces.

## Red Light, Blue Light—and Timing

People need natural light for good health, but certain kinds of light affect people differently at different times of day. As optometrist Gary Heiting states, “Sunlight is the main source of blue light,” which is “essential



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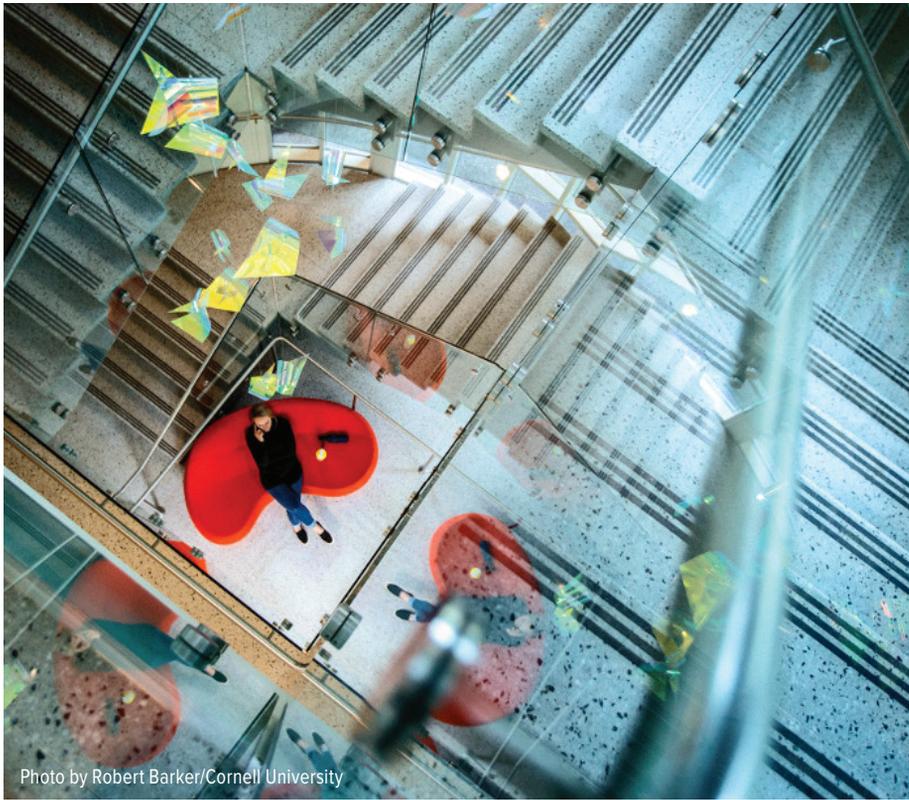


Photo by Robert Barker/Cornell University

for good health ... [this] high-energy visible light boosts alertness, helps memory and cognitive function, and elevates mood.”

In providing natural lighting or light from blue-containing LEDs, campuses can help everyone living and working on campus to feel more alert and think and feel better.

As the Harvard Health Letter warns, however, “Blue wavelengths—which are beneficial during daylight hours because they boost attention, reaction times, and mood—seem to be the most disruptive at night.” Because blue light promotes alertness, people can have difficulties falling and staying asleep when they are exposed to blue light after sunset.

Individuals can minimize the effects of blue light by putting blue light filters on phones and computer screens. Campuses can help by using lights toward the red end of the spectrum for fixtures that are only used at night.

Research completed by neuroscience and psychology professor Randy Nelson indicates that “if we could use red light when appropriate for night-shift workers, it may not have some of the negative effects on their health that white light

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does." These findings suggest that campuses can promote the health of those who are on campus after dark by changing the color of bulbs used in night lighting.

## Light Emitting Diode (LED) Bulbs Are a Good Choice

When renovation or new building projects are not feasible, universities can produce many benefits similar to those of natural light by switching to LED light bulbs across campus, as Cornell did.

The IPCC recommends using "efficient lighting devices such as solar-powered LED lamps or light-bulbs." While a change to solar-powered fixtures may be cost-prohibitive—at least in the short term—simply replacing incandescent bulbs with LEDs can still yield significant savings.

The U.S. Energy Star program states that LED bulbs "produce light approximately 90% more efficiently than incandescent light bulbs." Such efficiency can dramatically decrease costs associated with energy use, as Cornell's results indicate.

Additionally, as LEED designer Jill Fehrenbacher says in "Green Building 101," LEDs "last longer and are more energy efficient than both traditional



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bulbs and CFLs.” When building redesign for natural lighting is not feasible, universities can still save energy costs and natural resources by switching to LED lightbulbs.

### Controlling When and Where Light is Produced

Beyond natural lighting and efficient light bulbs, campuses can maximize lighting efficiency by controlling when and where light is produced. The International Dark-Sky Association (IDA) says that lights should only be on when required, should only be as bright as needed, and should provide light in each area only when necessary.

To meet these goals, many campuses have installed motion-detection sensors with timers to make indoor and outdoor light available on demand. Such installations make energy savings more automatic, yet provide light to campus inhabitants.

Outdoor light pollution has become an increasing issue in recent years, interfering with both studies of the night sky and with wildlife. The fix is fairly straightforward, according to the IDA: outdoor lighting should be directed downward rather than radiating in all directions. Such directional lighting minimizes light spills and targets the light where people actually use it.

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## A Campus Upgrade That Pays for Itself Many Times Over

Cornell University and its Office of Sustainability were motivated by important goals of energy and cost savings in planning and completing their lighting replacement project. As they report, “The payback period for the combined projects is projected at 3.5 years” and “with an anticipated lifespan of 10-20 years for the lightbulbs, the project will pay for itself three times over by the end of 2033.”

Such savings are important considerations for campus budgetary planning, and light bulb replacement is certainly a “low-hanging fruit” for decreasing expenditures. The savings of natural resources are significant, as well: “The upgrades will remove over 45,500 metric tons of CO<sub>2</sub>e from the campus carbon footprint in the next five years alone.”

As other campuses consider emulating Cornell’s impressive and successful lighting replacement project, they can build on that success by thinking about the availability, direction, and color of light to realize benefits beyond energy savings.



**ABOUT THE AUTHOR:** Cynthia Mwenja teaches Composition and Rhetoric at the University of Montevallo.



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