LED WATCH

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SCIENCE, NOT SOUND BITES

Broadening our knowledge base—not simplistic headlines—will move the ball forward

Blue light has been in the news a lot lately—specifically, the portion of the visible spectrum that falls between 450 and 530 nanometers. Light within that range can have powerful effects on our visual acuity and circadian rhythm, as well as on the growth of plants, the behavior of animals and the darkness of the night sky. White light sources that emit significantly in this blue range are becoming increasingly prevalent for outdoor use, especially with the emergence of solid-state lighting (SSL)—which, in comparison to high-pressure sodium and other incumbent technologies, offers such advantages as increased energy efficiency, improved color rendering and greater optical control. But questions are being raised about possible adverse effects on our health and the environment from increased blue content of these light sources.

The answers to those questions, however, are not nearly as simple as the news stories would suggest, and some journalists, as well as other non-lighting specialists, have drawn conclusions that aren't supported by the facts as science knows them. While science has made significant advances in understanding the physiological effects of light, it has really only begun to scratch the surface, which is why there's a great deal of related research that's either ongoing or in the planning stages. The goal of that research is to fill gaps in our knowledge, so that we can make better decisions about the use of light.

IDENTIFYING THE GAPS

The U.S. Department of Energy (DOE) recently facilitated a series of roundtable meetings with experts to determine just where some of those knowledge gaps lie.

- An April roundtable focused on three areas of animal research: livestock productivity and wellbeing, wildlife and landscape ecology, and animal testing for human medical research. Attendees indicated that determining the necessary lighting spectrum, control protocol, distribution and intensity to achieve a desired benefit would enable the development of SSL products that increase animal wellbeing and the productivity of livestock operations, minimize wildlife and ecological impacts, and improve the effectiveness of human medical research.
- At a July roundtable focusing on human physiological responses to light, experts agreed that with better understanding of the specific effects of light on alertness and sleepiness, light could potentially act as a tool to support a healthy circadian rhythm, but that additional research is needed to determine whether, for any kind of light source, there are any spectral power densities that can cause problems with prolonged exposure.

  They noted that research coordinated between physiologists and LED lighting experts would not only help clarify light's physiological effects, but would also enable better metrics for describing those effects and for creating products that optimize them.
- Regarding the presence of blue-wavelength light in the night sky, DOE is currently working with astronomers to quantify the actual contributions to sky glow from the ongoing transition of outdoor lighting to broader-spectrum sources, with particular focus on LEDs. The investigation is using the model SkyGlow Simulator, which models sky glow caused by ground sources based on the distribution of light from the light source, the number of sources, the total lumen output and the spectral power distribution—with additional parameters including city size and shape, atmospheric conditions and observer location relative to city center.

  The results are still under review as

of this writing, but a number of things are clear. One is that luminaire output has a direct/scalar influence on sky glow; that is, reducing output by either downsizing or dimming the luminaire brings a corresponding linear reduction in sky-glow contribution. A second finding is that direct uplight has a disproportionately large influence on sky glow. This means that minimizing direct uplight can bring significant sky-glow reductions. And because of their directional nature, it's easier to reduce uplight with LEDs than it is with other lighting technologies.

PART OF THE SOLUTION

These research initiatives illustrate an important point that's been overlooked in many recent news stories: namely, that because of its directionality, controllability and spectral tunability, SSL—far from being the villain some of those stories have implied—is actually better suited than any other lighting technology to minimize potential negative effects of lighting on people and the environment, and to optimize the beneficial effects.

What we know to date about the effects of lighting on humans, animals and plants is incomplete and forms a picture that's nuanced and complex. And nuance and complexity don't lend themselves well to news sound bites. Let's not forget that when it comes to science, it's the *scientists* who actually *make* the news—which, for accuracy's sake, needs to be reported carefully and on their terms. If it's not, and instead is prematurely packaged into neat and tidy headlines and sound bites that distort what the scientists are really saying, it ceases being news and becomes merely another form of entertainment. Lighting affects each and every one of us—not only in ways we take for granted, but in ways we're only just now beginning to understand. As always, we need to keep the health and wellbeing of humans and other living things carefully in mind. But we also need to make sure that in selecting the most appropriate course of action, we aren't throwing out the baby with the bathwater.

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