



LANTANA  LED

# Circadian Lighting: Illuminating Human Well- Being and Productivity

Circadian lighting is a revolutionary approach to lighting design that aligns artificial light with our natural biological rhythms. By utilizing advanced technology and understanding the science behind our internal clocks, circadian lighting aims to optimize our well-being, productivity, and overall health.

# How Circadian Lighting Works

At the core of circadian lighting lies the understanding that light is not just about visibility but also a powerful regulator of our body's internal clock. Light exposure's quality, intensity, and timing influence our sleep-wake cycles, alertness levels, and hormone production. Circadian lighting systems replicate the natural progression of daylight throughout the day, mimicking the dynamic changes in color temperature and intensity from morning to evening.

By providing cool, blue-enriched light in the morning and warm, amber-toned light in the evening, circadian lighting helps to promote wakefulness and alertness during the day while facilitating relaxation and restful sleep at night. This synchronization with our natural rhythms establishes a harmonious relationship between our bodies and the built environment, resulting in many benefits for users.

## Benefits of Circadian Lighting

The adoption of circadian lighting brings an array of advantages to individuals across various settings. Here are some key benefits:

- **Improved Well-being:** Circadian lighting promotes a healthy sleep-wake cycle, helping individuals achieve restorative sleep and wake up feeling refreshed. It regulates melatonin production, positively impacting mood, cognitive function, and emotional well-being.
- **Enhanced Productivity:** By providing the right light at the right time, circadian lighting boosts alertness, concentration, and cognitive performance. It reduces fatigue, increases energy levels, and facilitates optimal daily productivity.
- **Health Optimization:** Circadian lighting positively influences our hormonal balance, supporting the regulation of critical physiological processes such as metabolism, immune function, and cardiovascular health. It can also aid in mitigating the impact of seasonal affective disorder (SAD) by replicating the natural light changes that occur across seasons.

## Industries Leveraging Circadian

Numerous industries can effectively leverage circadian lighting to improve their environments and enhance outcomes:

- **Healthcare:** Hospitals and healthcare facilities are leveraging circadian lighting to create healing environments that support patient recovery, reduce stress, and enhance the well-being of both patients and staff.
- **Workspaces:** Offices and workplaces are adopting circadian lighting systems to improve employee productivity, engagement, and overall satisfaction. Aligning lighting with employees' natural rhythms supports concentration, reduces eye strain, and fosters a healthier work environment.
- **Education:** Schools and learning institutions recognize the impact of lighting on students' focus and academic performance. Circadian lighting in educational settings helps to regulate attention levels, improve mood, and create an optimal learning environment.

# The Science Behind Circadian

Melanopsin ( a receptor found within the ganglion cells in our retina) can only sense the blue-cyan light. This is why a blind person can still utilize light for circadian entrainment, but if you had no eyes at all, your body would not receive these non-visual cues. When evaluating circadian lighting, ensure the melanopic ratio is greater than 0.9 for awake/alert and less than 0.4 for twilight.

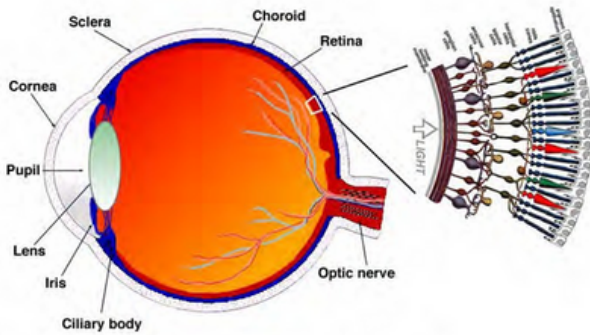
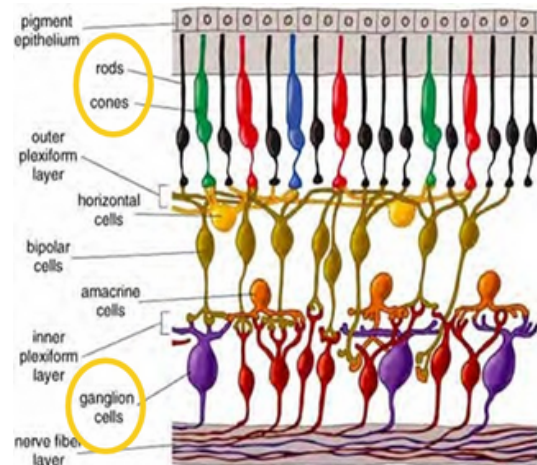


Fig. 1.1. A drawing of a section through the human eye with a schematic enlargement of the retina.



## PHOTOPIC LUX:

Light that supports photopic vision and visual processing **via cones**

## MELANOPIC LUX:

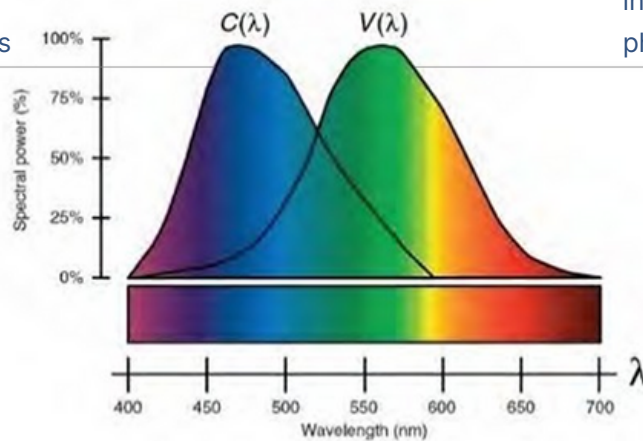
Measures the light source's contribution to melatonin suppression via intrinsically photosensitive **ganglion cells**

## Light relevant for non-visual, biological impact

includes ipRGCs:  
Melanopic photoreceptors

## Light relevant for visual performance

includes rods: Photopic photoreceptors



To evaluate biological impact use specialty metric, such as Melanopic / Photopic (M/P) ratio, specified in WELL Building Standard

# Standard vs. Circadian Lighting

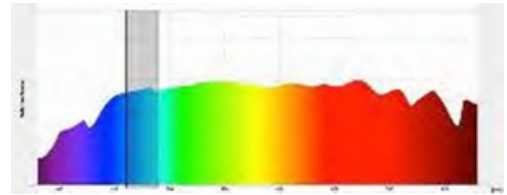
While standard lighting serves its purpose, it often lacks the dynamic qualities necessary to support our biological needs throughout the day. Standard lighting typically remains static, with fixed color temperatures and intensity levels. In contrast, circadian lighting systems dynamically adjust their lighting parameters, replicating the natural progression of daylight and providing the right light at the right time.

Lighting to support human vision differs from lighting to support human physiology and health. The system regulating health-related functions is most sensitive to light at ~460-490nm (circadian-blue); however, the visual system sensitivity peaks at ~555nm.

## SUN + DAY LIGHT

Full spectrum source

Circadian blue (460-490nm) daytime trigger for human biology



## STANDARD LIGHTING

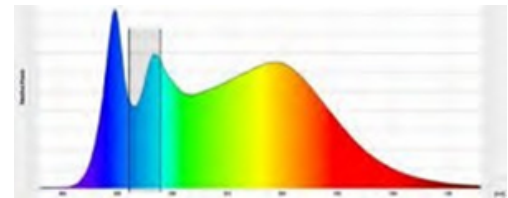
Optimized only for vision, not optimized for energy relevant for biological impact

Leads to insufficient light exposure during the day, and too much at night



## TRUE CIRCADIAN LIGHTING

Customized spectrum maximizes energy exactly where it is relevant to regulate your circadian rhythm naturally and help improve sleep, productivity, mood and well-being



Circadian lighting has emerged as a groundbreaking technology that has the potential to impact our well-being and productivity significantly. By mimicking the natural light patterns throughout the day, circadian lighting systems can enhance our sleep quality, mood, and overall health. The growing body of research on circadian rhythms and their connection to our physiology underscores the importance of incorporating biologically optimized lighting into our built environments. Circadian lighting holds immense promise for creating healthier and more comfortable spaces for work, education, healthcare, and beyond as we continue to delve deeper into understanding the intricate relationship between light and human biology. By harnessing the power of light, we can improve our daily lives and unlock the full potential of our natural biological rhythms.



*For more information about LED lighting and its applications, as well as specific product details and specifications, visit our [website](#) or [contact us](#). We can give you expert guidance and help you select the right LED fixture for your particular needs.*