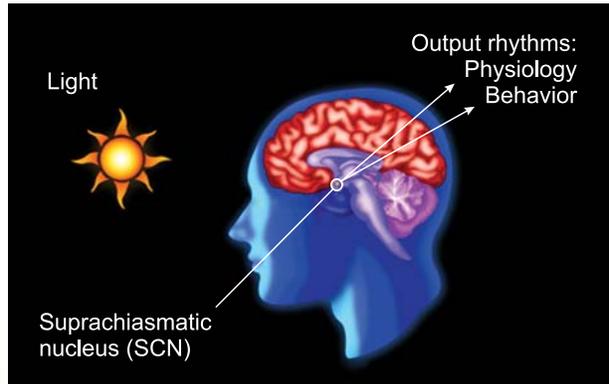


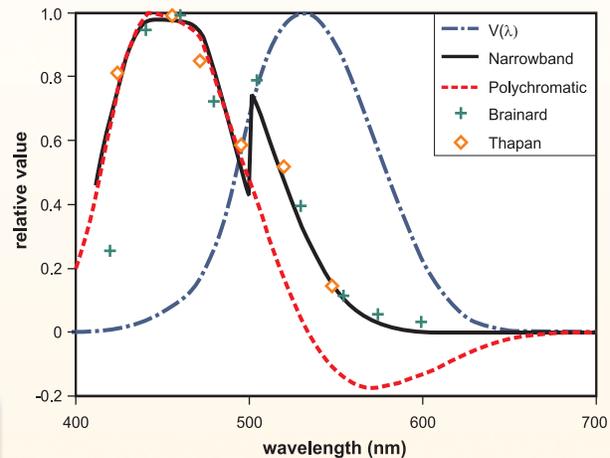
Circadian Light Defined

In a paper published in the *Journal of Circadian Rhythms*, researchers at the LRC have defined light as it impacts the human circadian system. Circadian rhythms are biological rhythms that repeat approximately every 24 hours. Exposure to the natural sunrise and sunset synchronizes our circadian rhythms to exactly 24 hours. Circadian disruption by trans-longitudinal flight or rotating shift work have been associated with increased risks for breast cancer, diabetes, obesity, heart disease, sleep disorders, and other ailments.

Formally, light is defined in terms of how optical radiation stimulates the human visual system, but this limited definition belies the impact that light has on other biological systems, such as the circadian system. Because exposures of light and dark on the retina regulate the circadian system, and because circadian disruption has broad health implications, it is important to develop a new definition of light that characterizes the impact light has on this important biological system.



The suprachiasmatic nucleus (SCN) in the hypothalamus hosts the master circadian clock that organizes and orchestrates the timing of all daily biological functions, from complicated physiological systems to single cells.



The photopic luminous efficiency function ($V(\lambda)$) together with the spectral sensitivity of the human circadian system to narrow-band and polychromatic sources based upon the model of circadian phototransduction (Rea et al. 2005). Relative sensitivity to different narrow-band spectra based on data from Brainard et al. (2001) and Thapan et al. (2001) are also shown.

LRC researchers coined the term 'circadian light' as spectrally weighted retinal irradiance that stimulates the human circadian system. The definition of circadian light is based upon the potential for light to suppress melatonin synthesis at night.

Light source	Illuminance (lx)	
	25% suppression	50% suppression
Daylight (CIE D65)	80	270
2856 K incandescent A-lamp	147	511
2700 K CFL (Greenlite 15WELS-M)	207	722
3350 K linear fluorescent (GE F32T8 SP35)	144	501
4100 K linear fluorescent (GE F32T8 SP41)	214	708
5200 K LED phosphor white (Luxeon Star)	154	515
8000 K Lumilux Skywhite fluorescent (OSI)	79	266
Blue LED (Luxeon Rebel, $\lambda_{\text{peak}} = 470 \text{ nm}$)	9	30

A selection of light sources and photopic light levels that can suppress melatonin in humans by 25% and by 50% relative to baseline levels at night when in the dark.

For More Information

Rea, M., M. Figueiro, A. Bierman, J. Bullough. 2010. Circadian Light. *Journal of Circadian Rhythms* 8(2).