

# LIGHTING THE WAY

The Quality of Lighting's Impact on Functionality

**Rachel Fitzgerald, LC, IALD, MIES,  
LEED AP BD+C**

*RNL Design*

*Director of Lighting Design*

*Denver, Colorado*

Rail Conference



# Key Presentation Take-Aways

- Light and Human Health
- Define Circadian Lighting
- Light in the Built Environment
- Why does Quality Lighting Matter?







Think like a Caveman

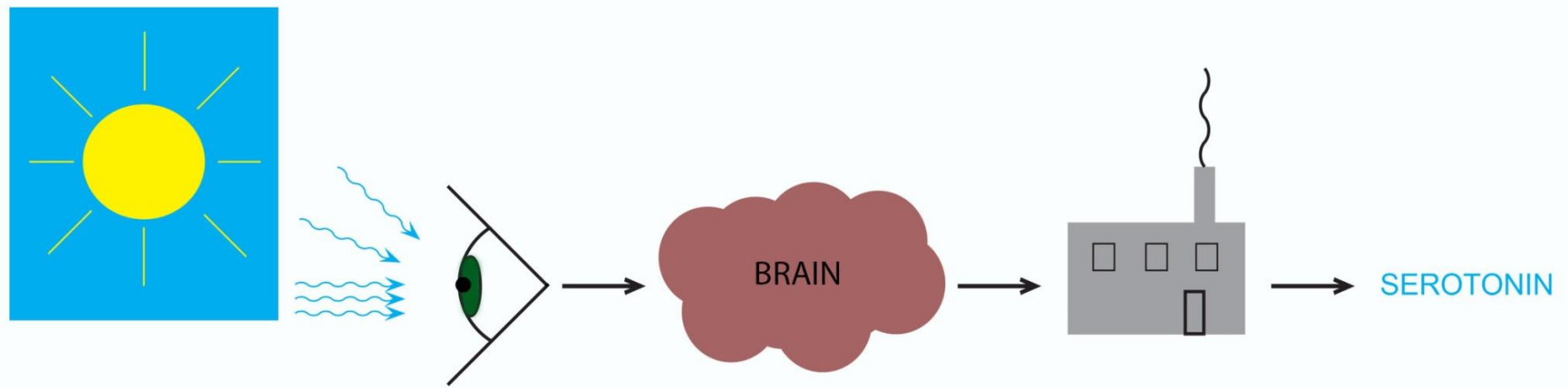


# Light and Health

“If light were a drug, I’m not sure the FDA would approve it.”

Charles A. Czeisler, PhD, MD, FRCP  
Professor of Sleep Medicine  
Harvard Medical School



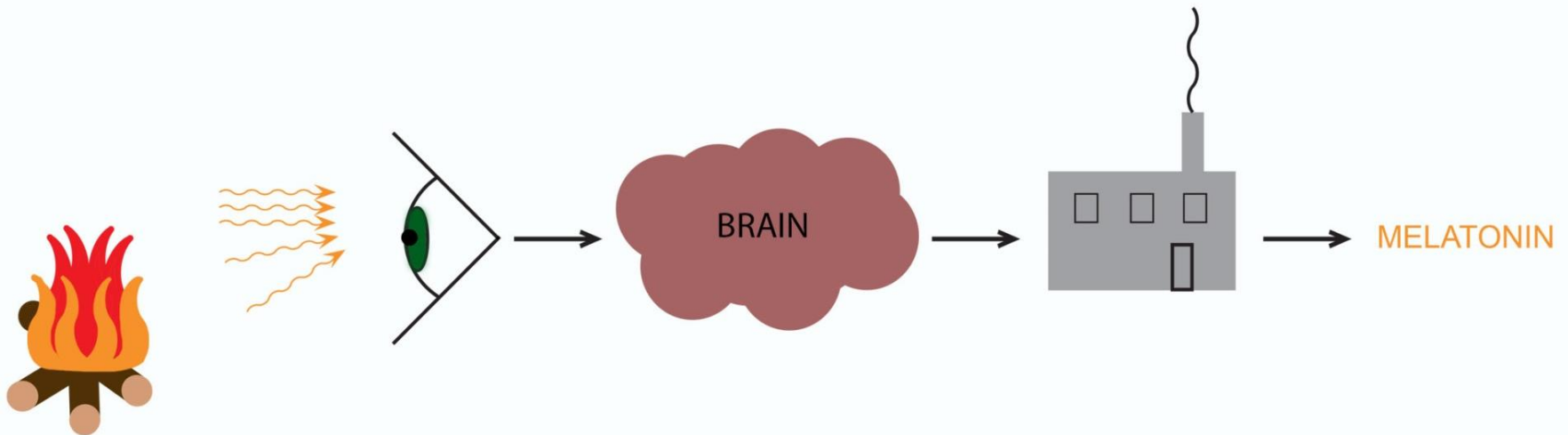


## SEROTONIN:

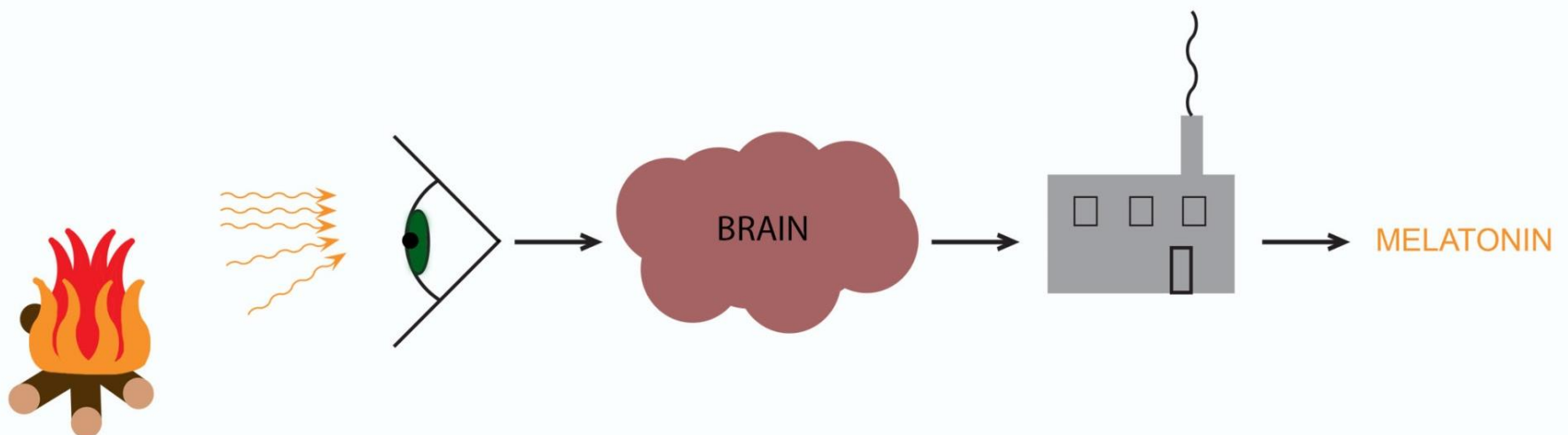
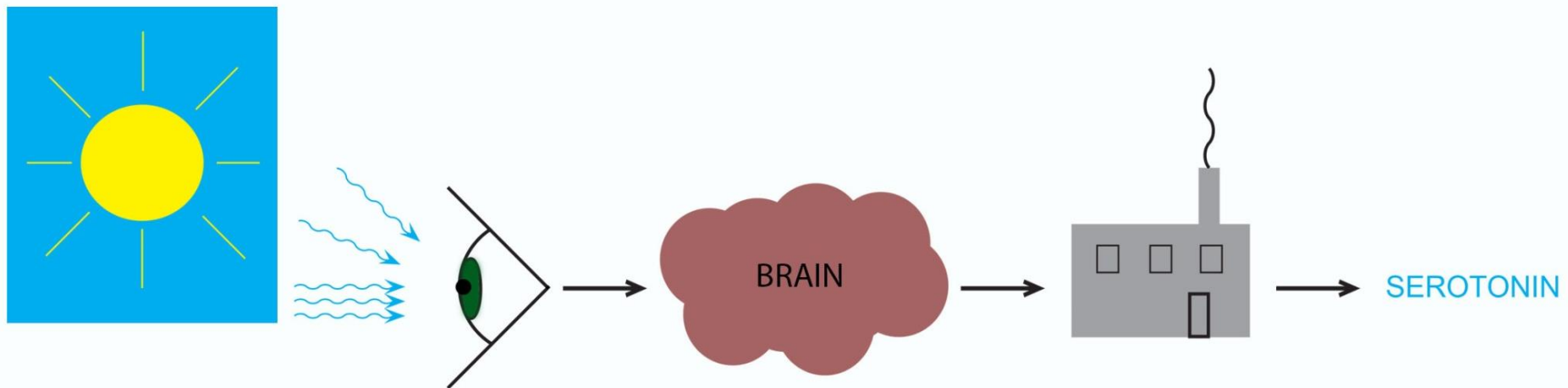
- production stimulated by light
- regulates mood, appetite and sleep
- contributes to feelings of wellbeing and happiness

# MELATONIN:

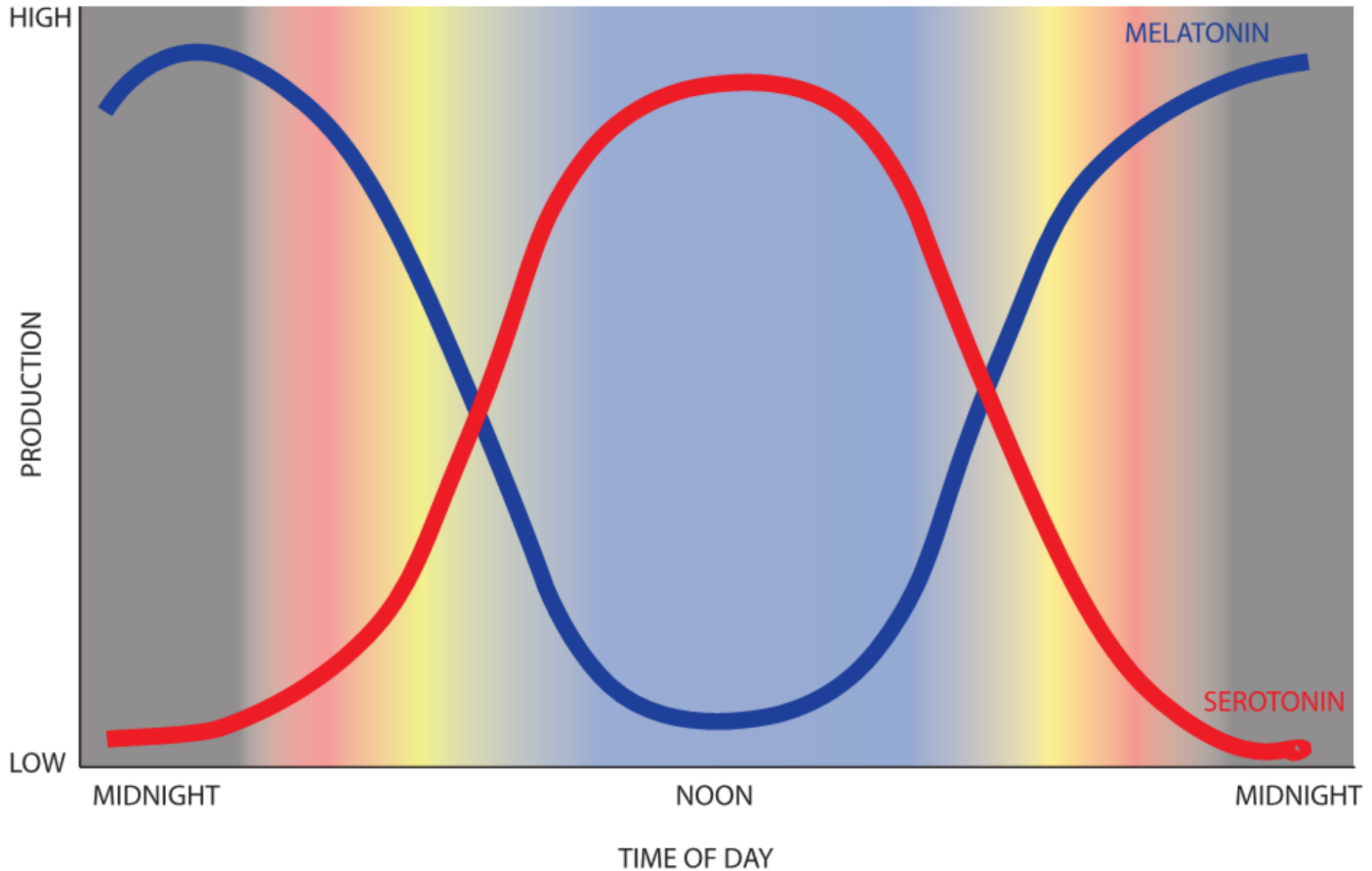
- production stimulated by darkness
- regulates sleep, blood pressure, reproduction
- contributes to sleep-wake cycle and health







# Melatonin, Serotonin & Light



# 24 HOUR CIRCADIAN RHYTHM

MELATONIN LEVEL



WAKE UP



BEST PHYSICAL PERFORMANCE



SLEEP



2 AM

4 AM

6 AM

8 AM

10 AM

12 PM

2 PM

4 PM

6 PM

8 PM

10 AM

12 AM

2 AM

4 AM



LOWEST BODY TEMPERATURE



HIGHEST BLOOD PRESSURE



POST LUNCH DIP

# What is RNL's Definition of "Circadian Lighting"?

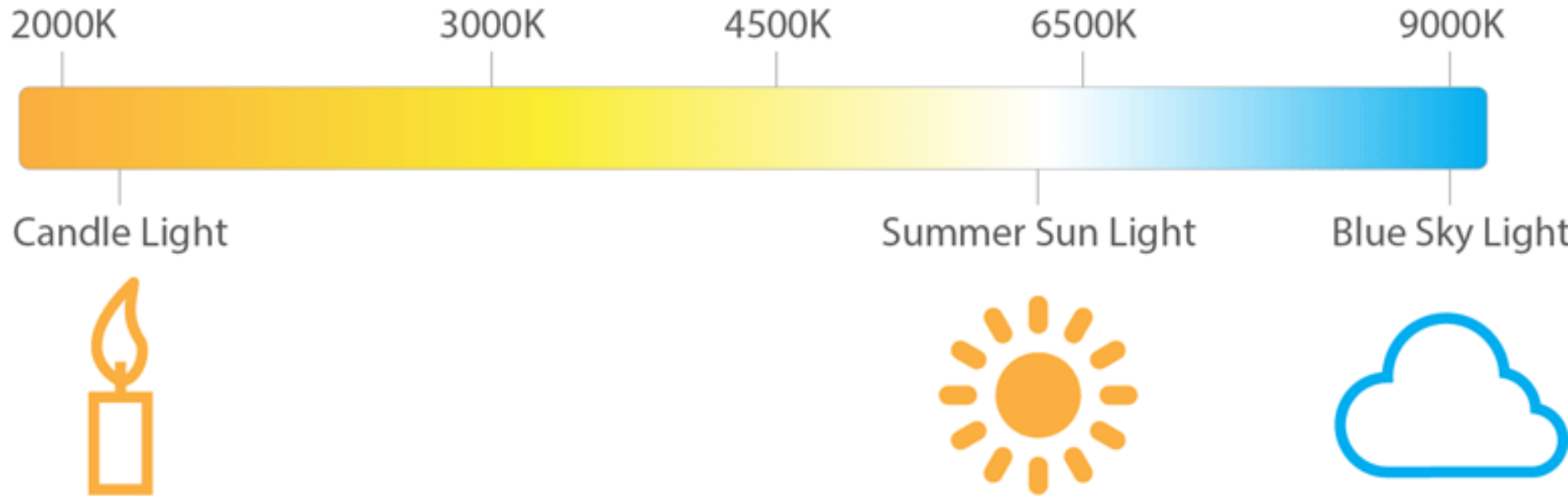
The term circadian lighting essentially refers to a system with the potential to produce lighting sequences that stimulate cortisol production (*blue light*) during peak daylight and suppress melatonin production (*elimination of blue light*) at night

Put simply, circadian lighting tries to imitate the light patterns we would have experienced before the built environment and technology came along.

Caveman lighting, if you will.



# It's About More Than Just Color Temperature





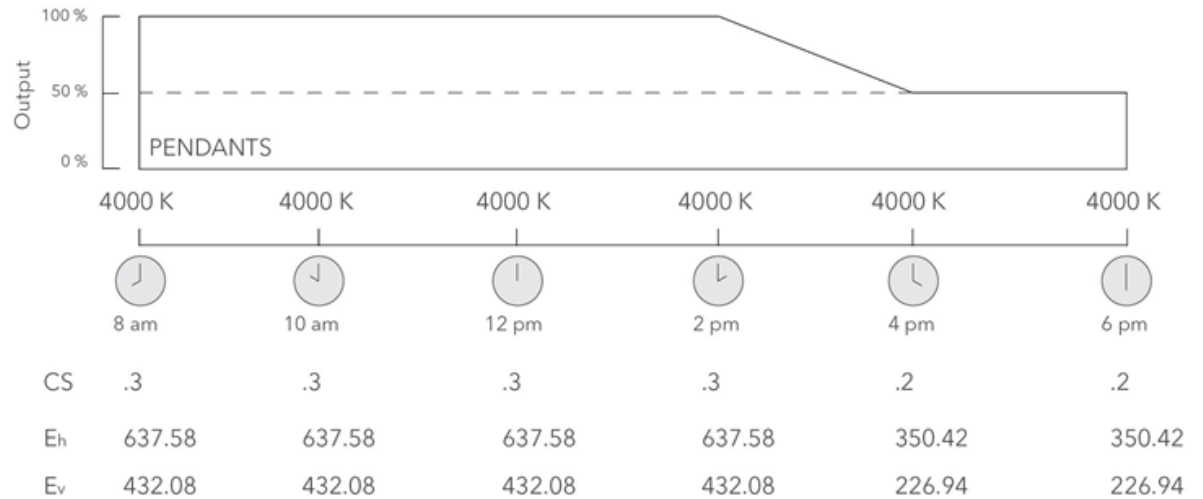




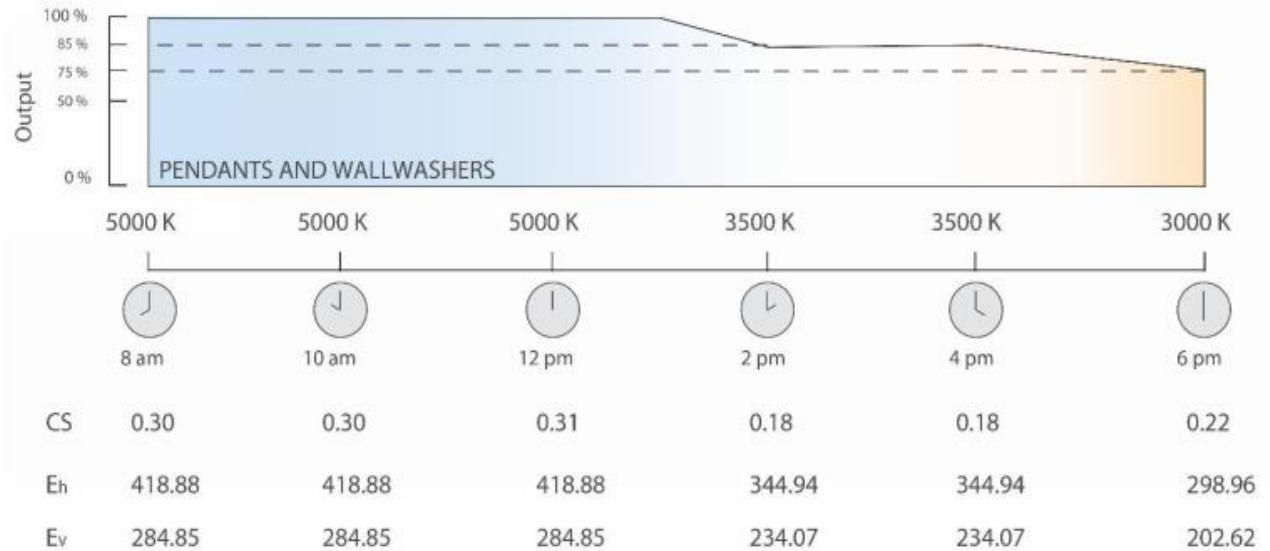
# Biophilic Design Offices by Sky Factory



# Static White Lighting



# Dynamic White Lighting





TRUCK SHOP

5B1 2A

2B 5B1



NOTICE  
LOCKOUT  
SYSTEM

Graybill

RECYCLING  
WASTE ONLY  
NO OTHER WASTE





Metro







Metro Division 13  
Bus Operations and Maintenance Facility



# Lighting Quality

- It's about more than just the basics
  - Levels of Illumination
  - Uniformity
  - Aesthetics
- Think like a Caveman
  - Time of Day
  - Color
  - Intensity
  - Connections to the Natural Environment



# Why Does this Matter to our Clients?



# Resources



- Illuminating Engineering Society (IES)
- Lighting Research Center (LRC) at Rensselaer Polytechnic Institute
- Publications:



- Measuring And Using Light in the Melanopsin Age; Lucas et al, January 2014
- Biological Implications of Artificial Illumination; Wurtman, October 1968
- Blue-Light Hazard and LEDs: Fact or Fiction?; Liao, August 2016
- Bad Rap of Blue Light; RNL's Bannon-Godfrey et al, February 2016
- Circadian Distruption and Phychiatric Disorders: The Importance of Entrainment; Wirz-Justice et al, June 2009

# Key Presentation Take-Aways

- Light and Human Health
- Define Circadian Lighting
- Light in the Built Environment
- Why does Quality Lighting Matter?



**Thank you!**



[Rachel.Fitzgerald@RNLdesign.com](mailto:Rachel.Fitzgerald@RNLdesign.com)

RNL

