

Designers Lighting Forum

The Sun, the Perfect Spectrum; what
you see and what you don't

Jay Goodman

Date

Credit(s) earned on completion of this course will be reported to **AIA CES** for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

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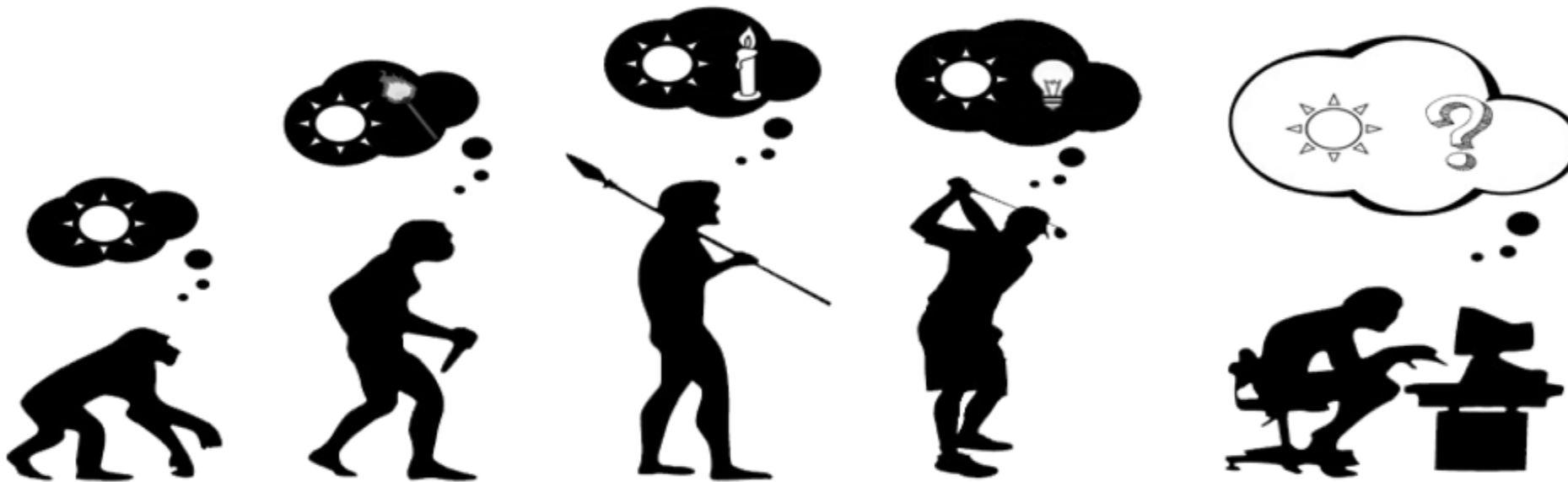
Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Learning Objectives

At the end of this course, participants will be able to:

1. Understand the balance of the sun's spectrum
2. Understand the ratio of visual vs. non-visual energy of the sunlight
3. Understand the basics of how sunlight affects circadian rhythms, sleep, immunity, recovery and hormonal balance
4. Understanding the basics of how phosphor converted, white LEDs are disrupting sleep

People, plants and animals have evolved in the **shaded sun**.. our most natural state.

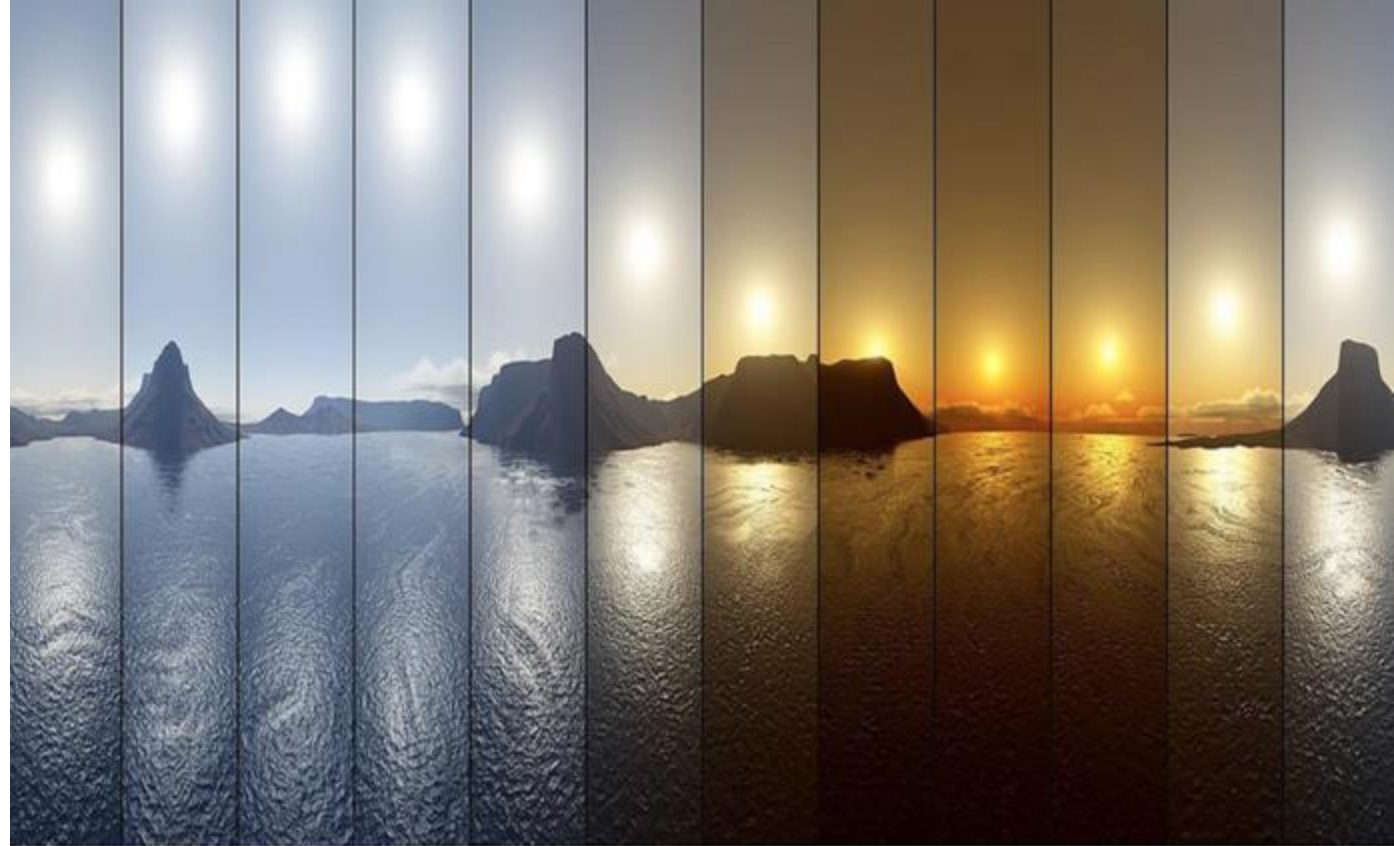


Lets just mimic the sun



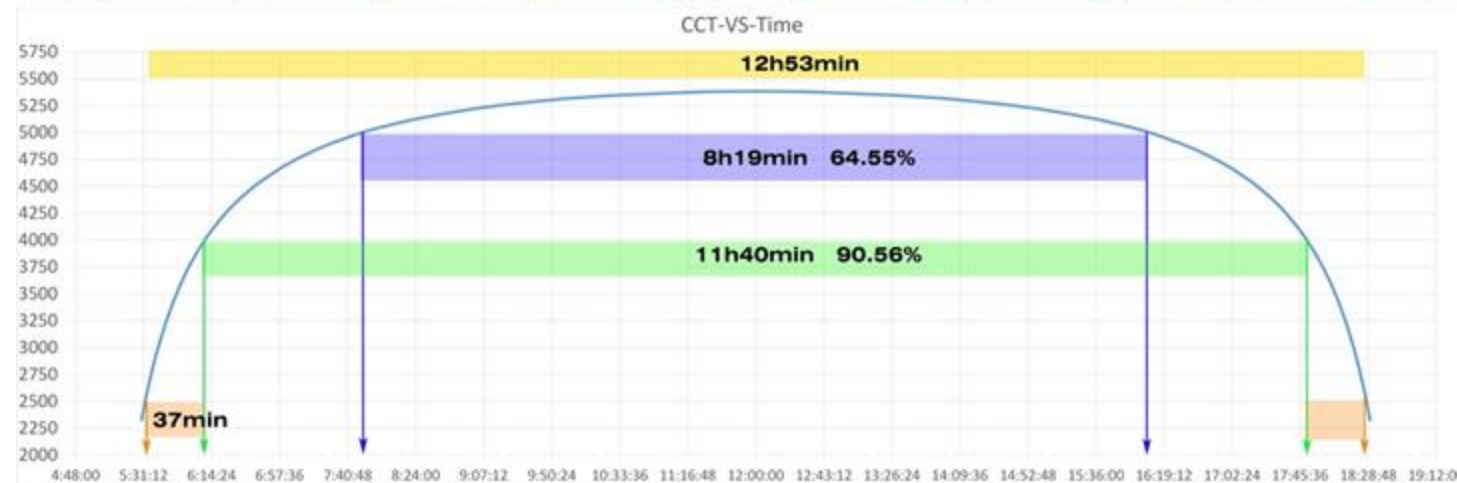
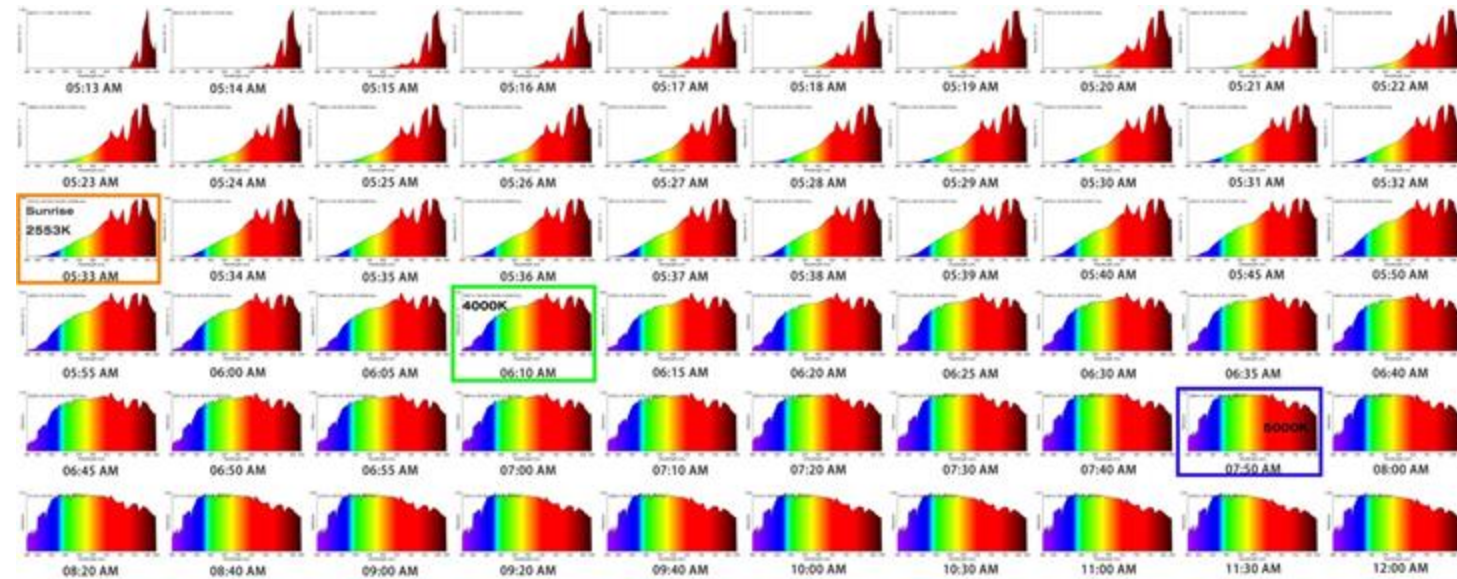
“The Sun”

- Dynamic
- Direct Sun
- Shaded Sun
- The Sky
- Visual vs Non Visual



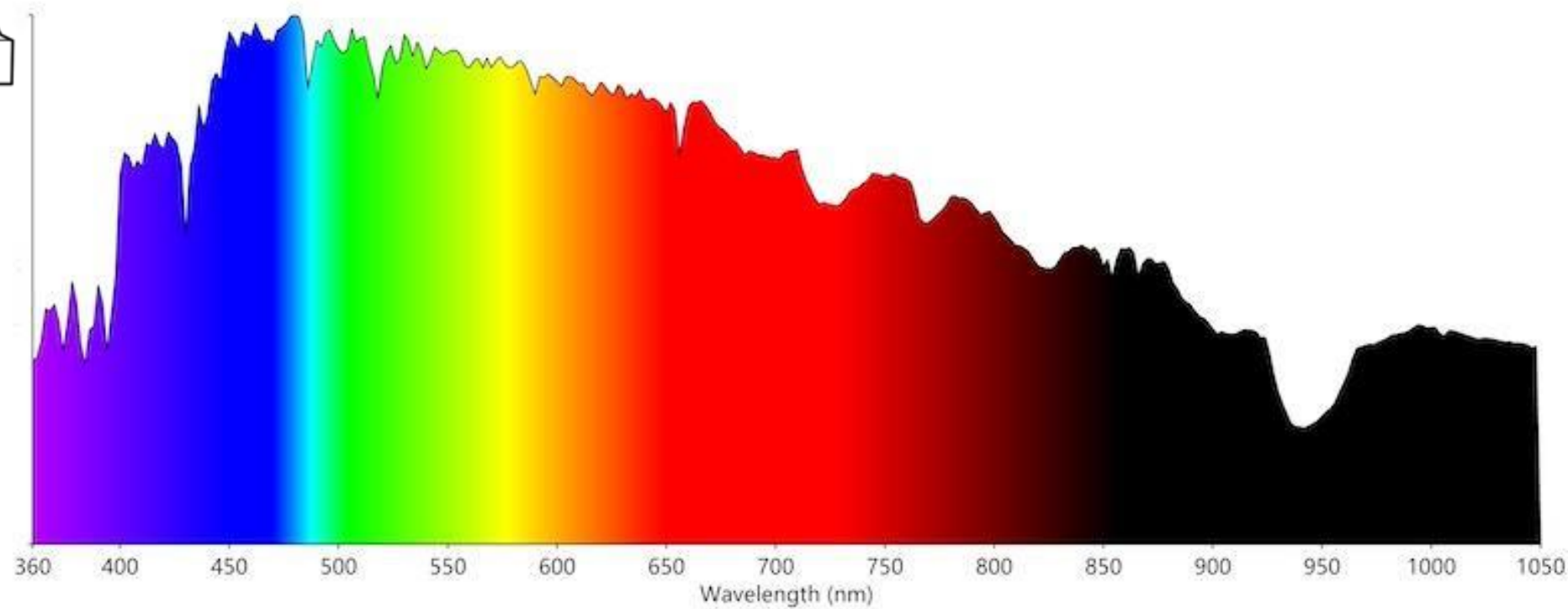
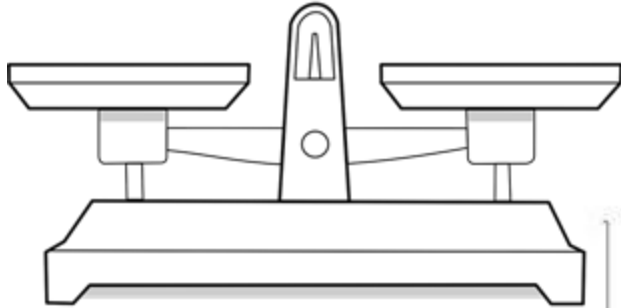
Direct Sun Spectral Readings

5:33am 2553K
6:10am 4000k
7:50am 5000k
Noon 5600k

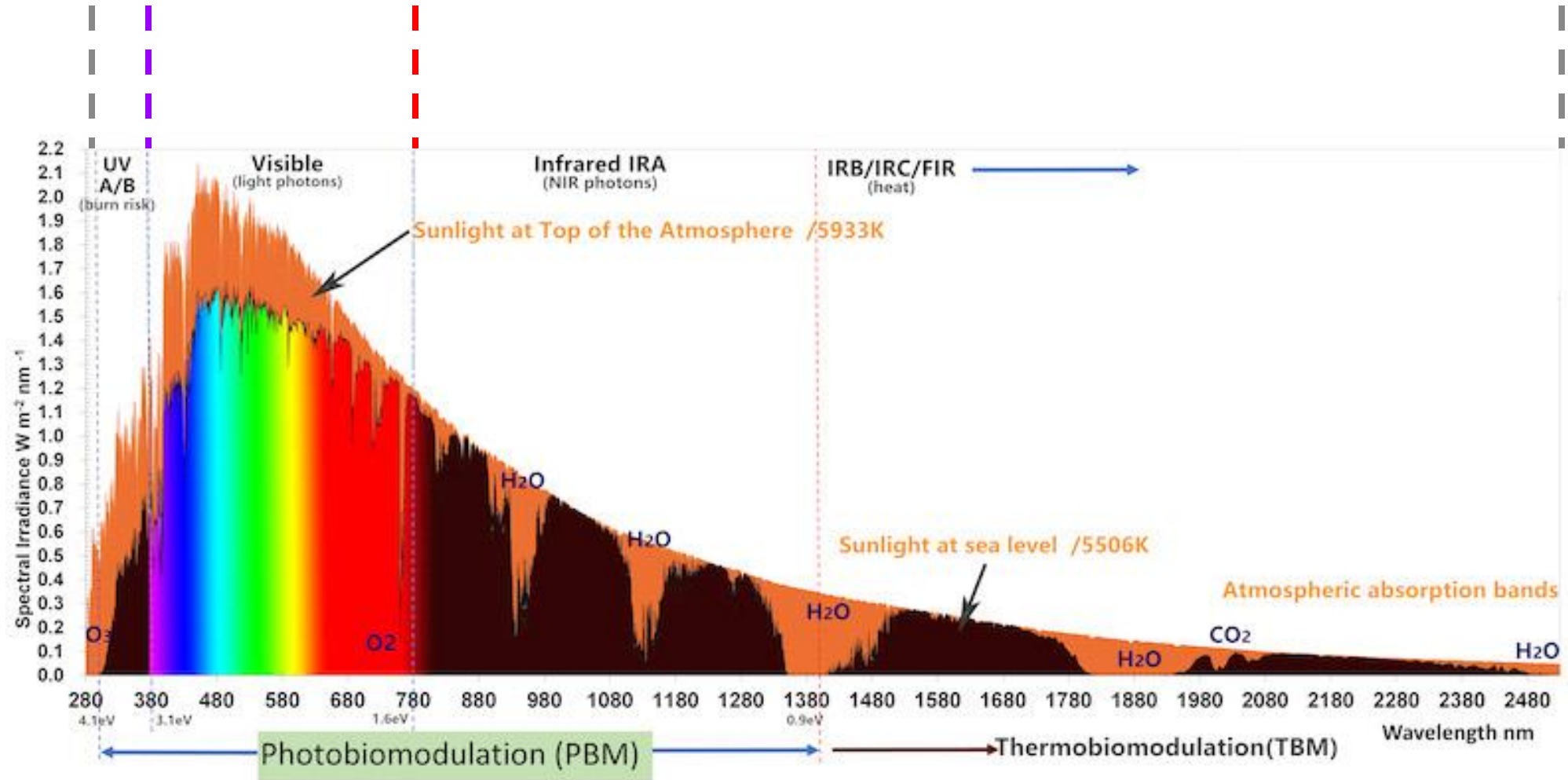


“The Sky” can be anywhere
from
9000K-12000k

Sunlight is about **Balance**

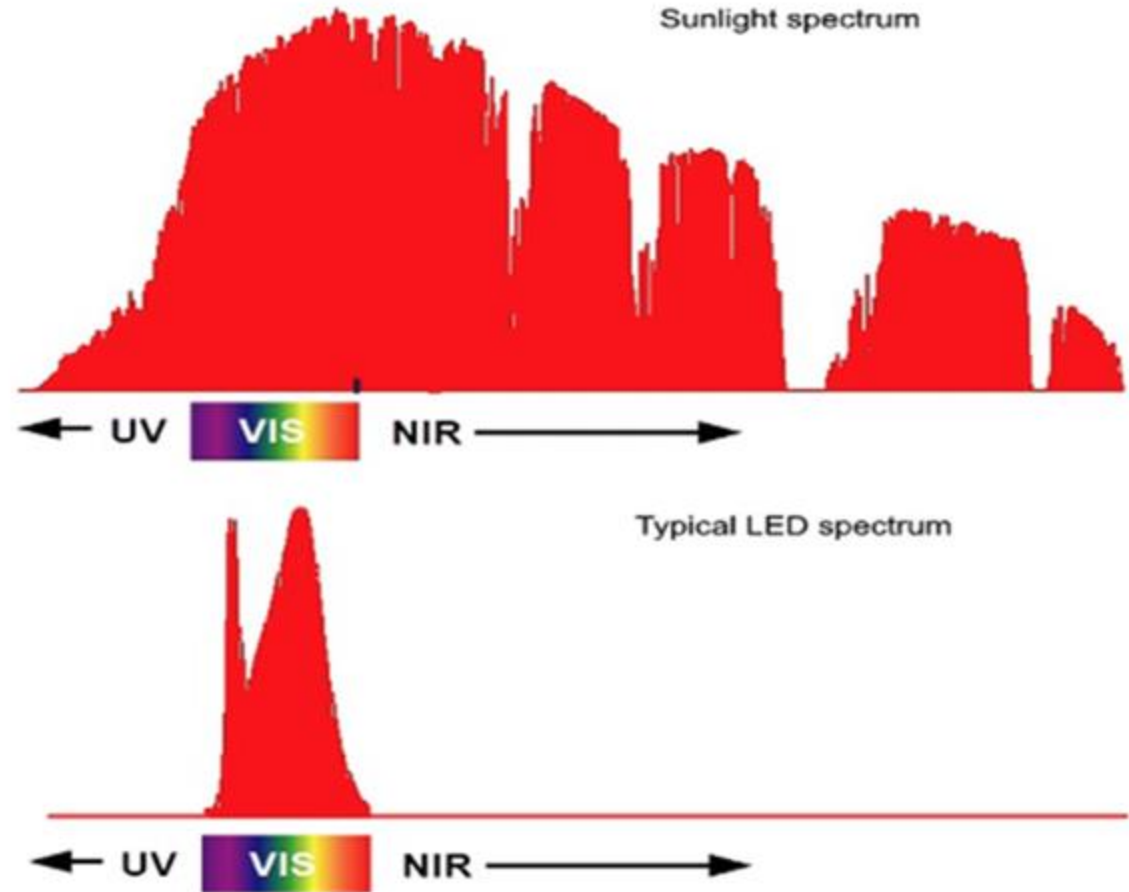


Sunlight vs. Sun Energy



Visual vs. Non Visual

50% direct sun is infrared



Our Natural State: Shaded Sun

75% shaded sun is infrared

Visible light gets absorbed
by grass, trees, dirt etc.

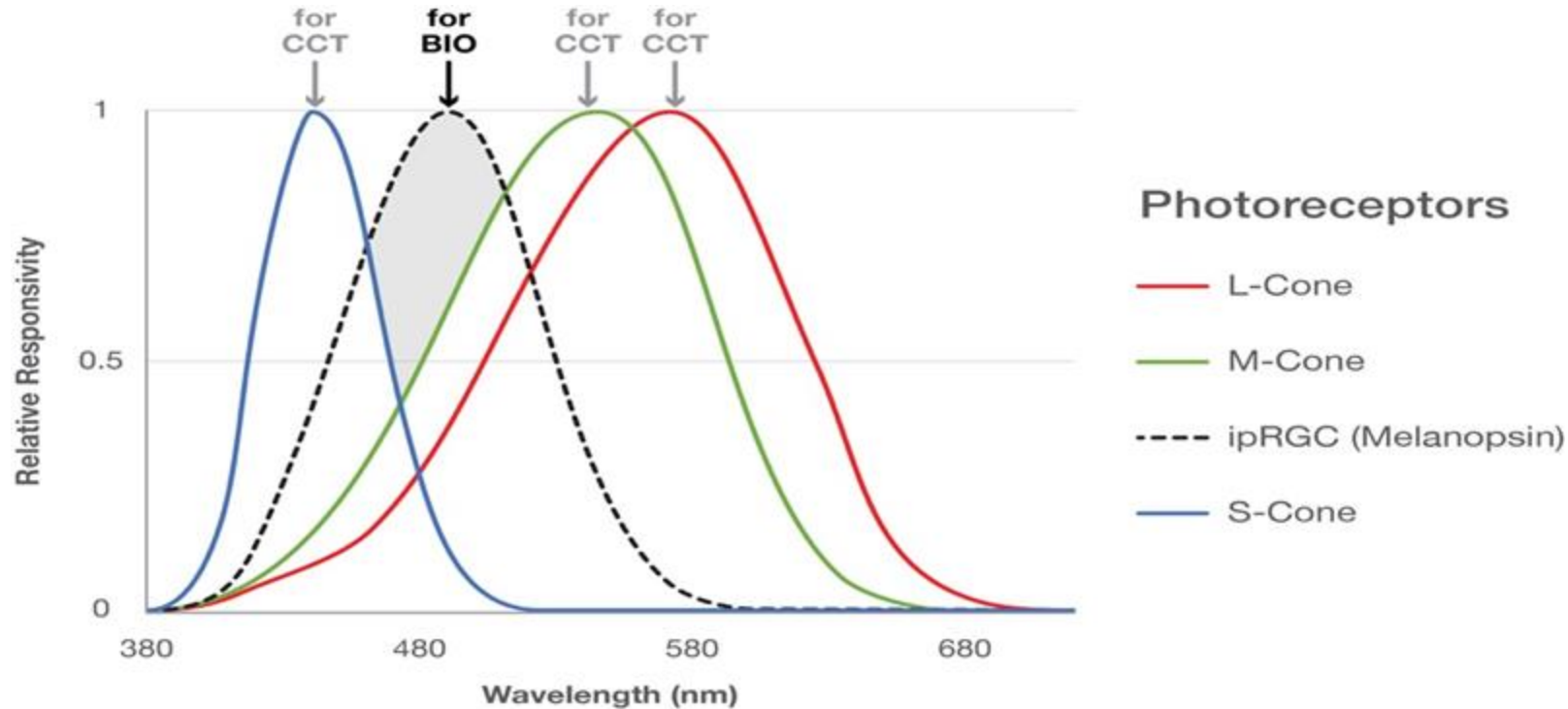
Infrared gets reflected



Image Credit: Przemyslaw Kruk, "The Trees"

Sun & Circadian Rhythms

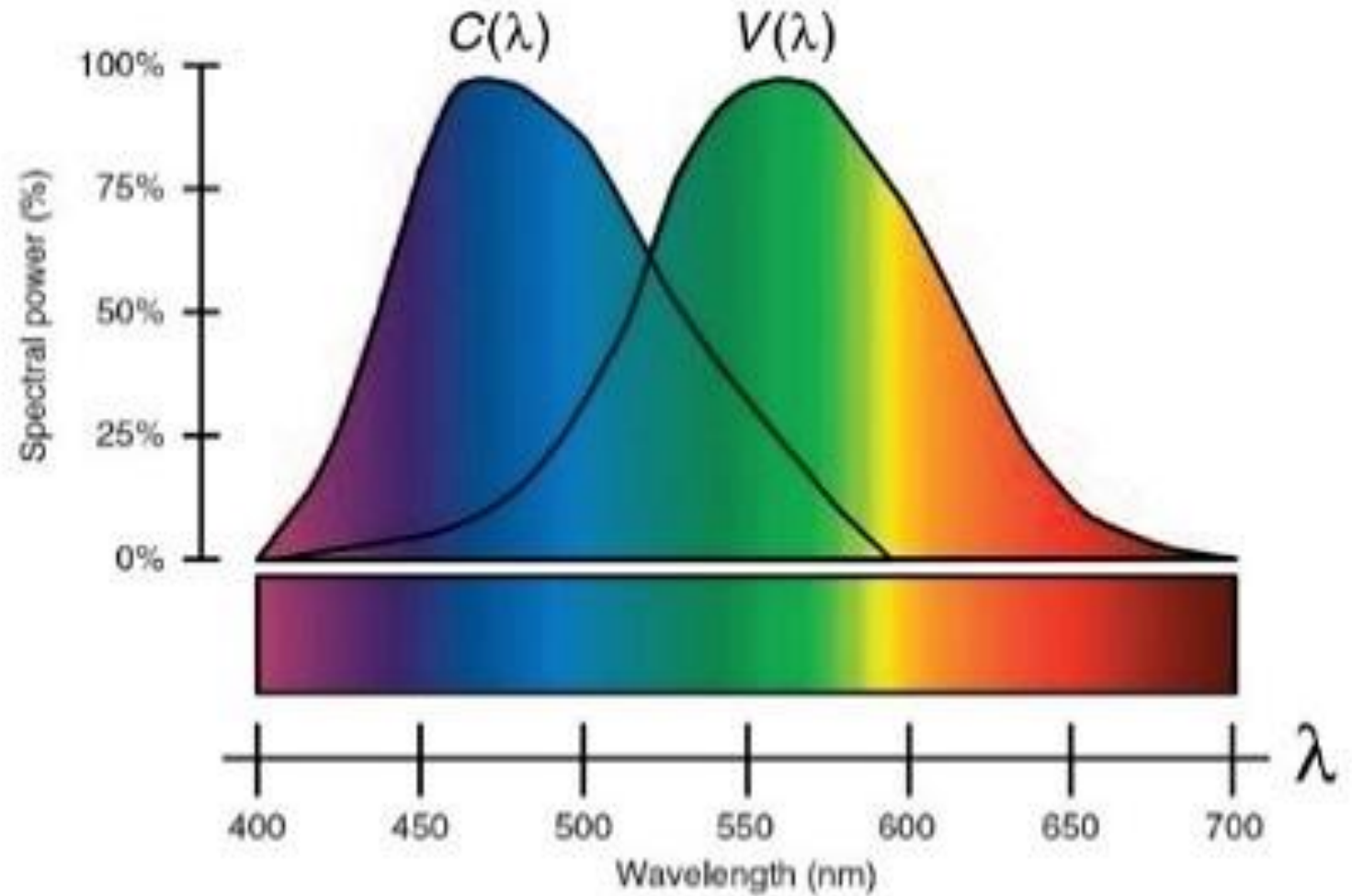
Dr. George "Bud" Brainard 2001



V-Lambda vs. C-Lambda

V-Visual Sensitivity peaks at 550nm

C-Circadian (melanopic action) peaks at 480nm



Sun & Circadian Rhythms

Dr. David Berson 2002- iPRGC

480nm +/- light hits iPRGCs

Melanopsin / photoreceptor

Signal to Suprachiasmatic
Nucleus

Sets the body's clock

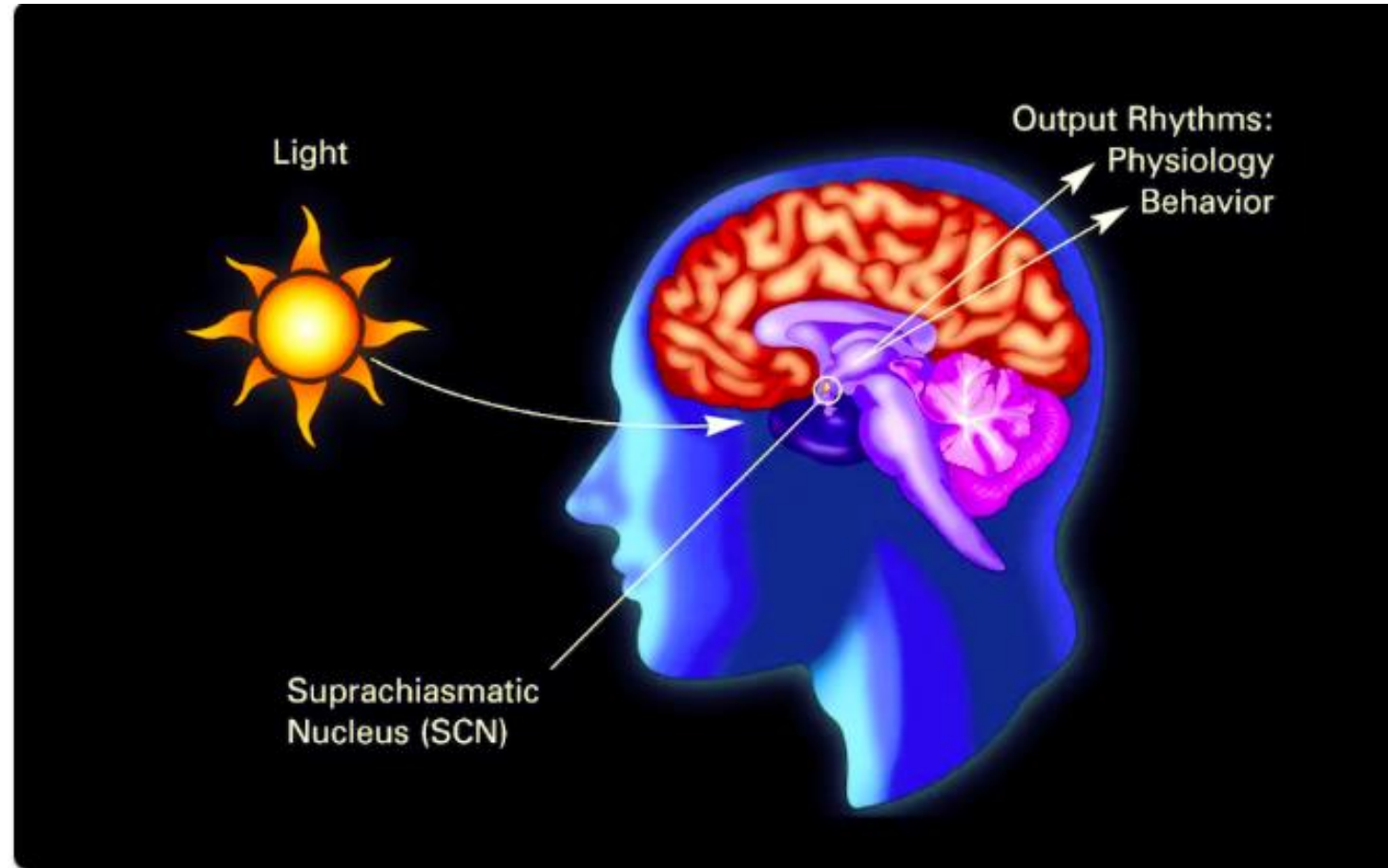


Image Credit: Circadian Rhythm Illustration, National Institute of Health, US
Dept of Health and Human Services

Circulatory Pineal Melatonin

Marker for Sleep

Energy in the melanopic action spectrum (daytime) to the iPRGC triggers inhibiting melatonin release, storing for later.

Absence of energy in the melanopic action spectrum (night) triggers release for sleep onset

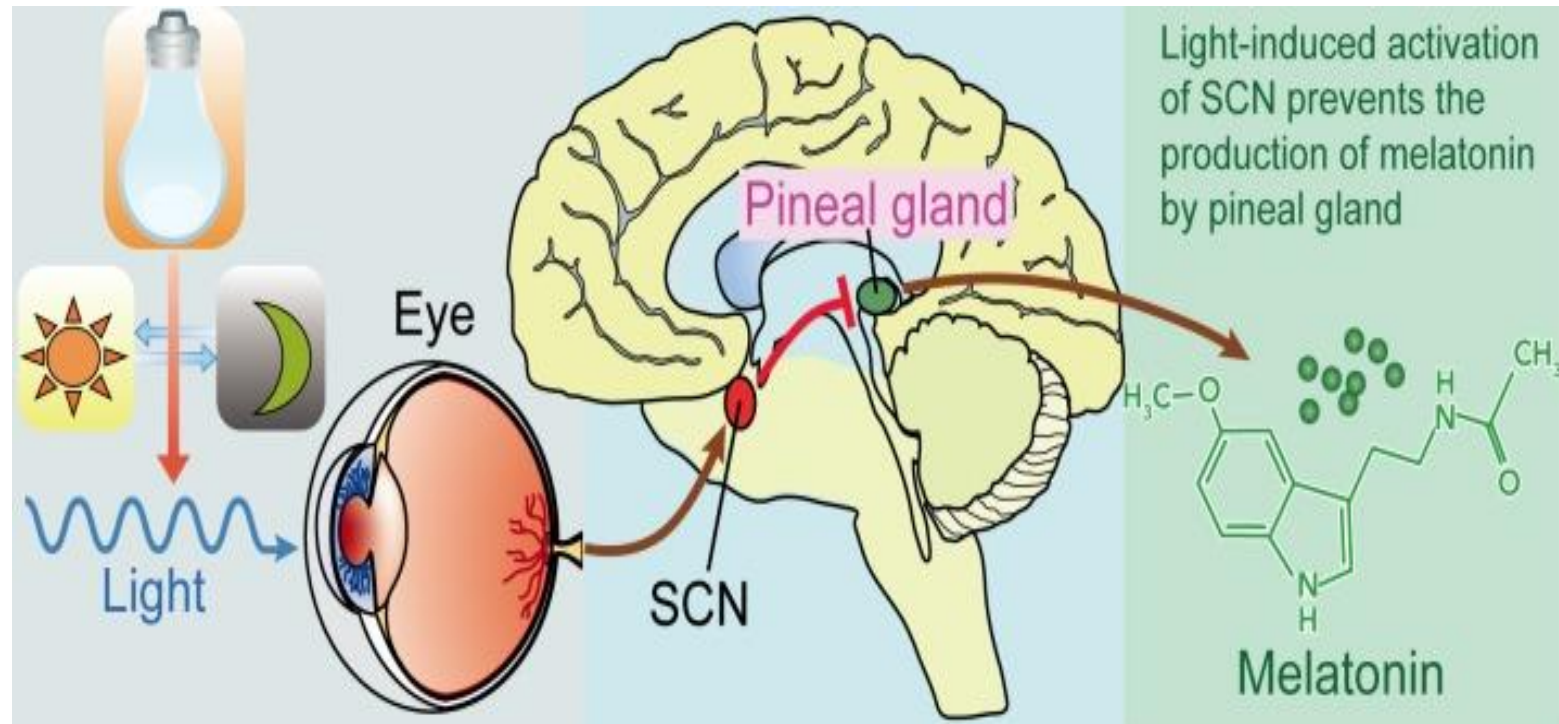


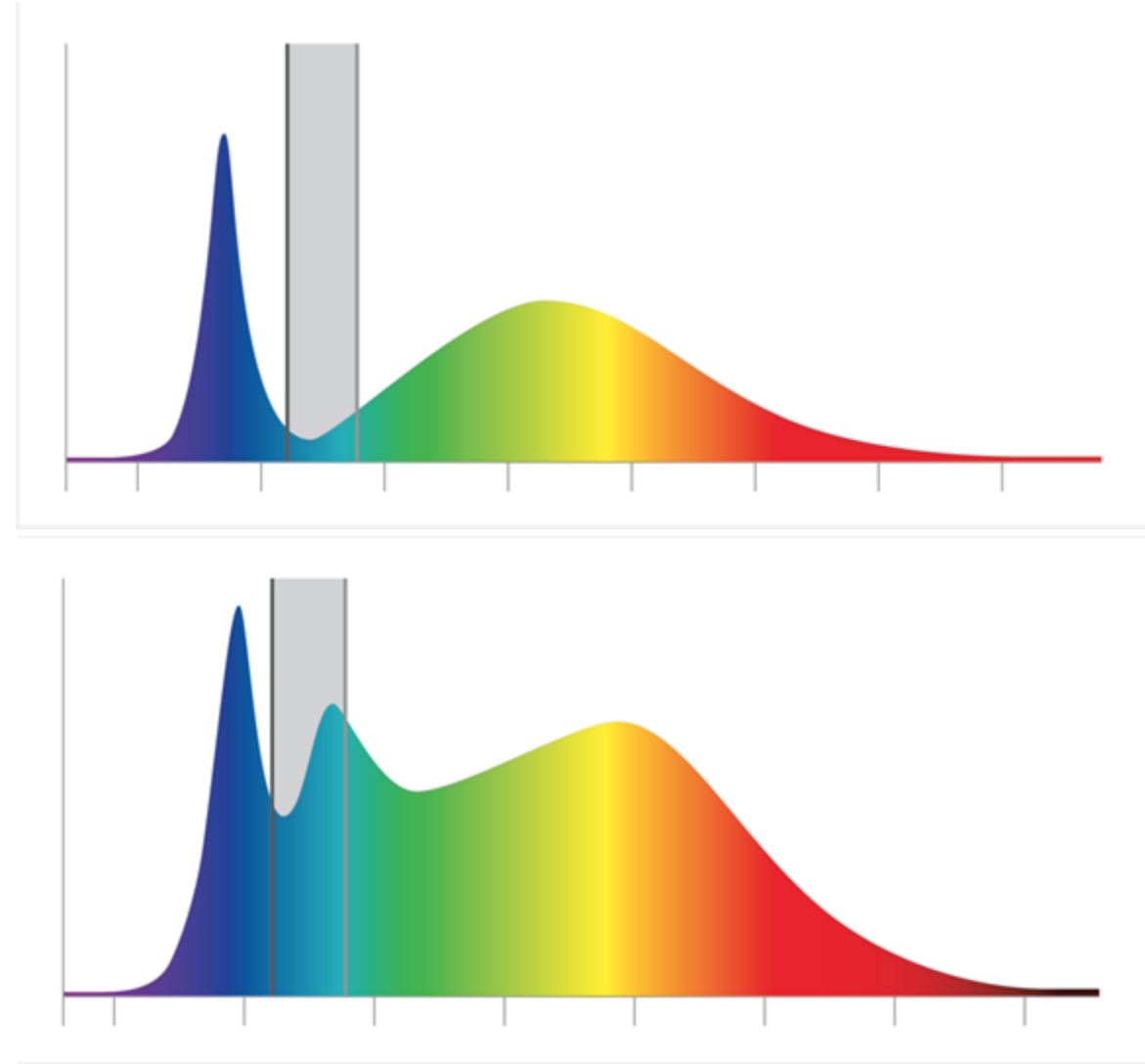
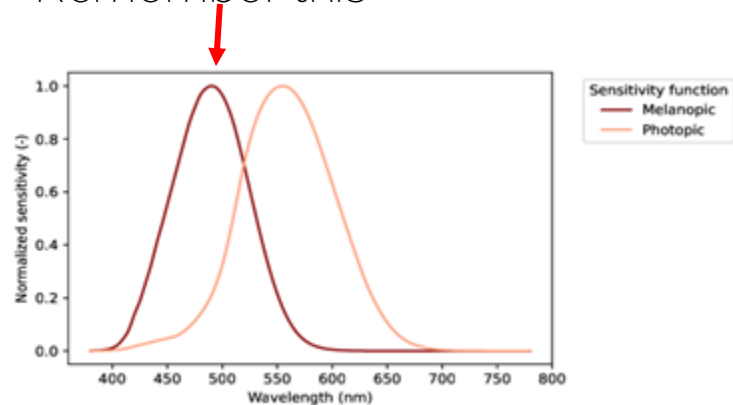
Image Credit: www.physio-pedia.com

“Cyan Gap” for Daytime

480nm is the peak of the melanopic action spectrum (circadian sensitivity) and most typical LEDs are weak in those wavelengths.

Enter, “Cyan Enhanced” for daytime

Remember this

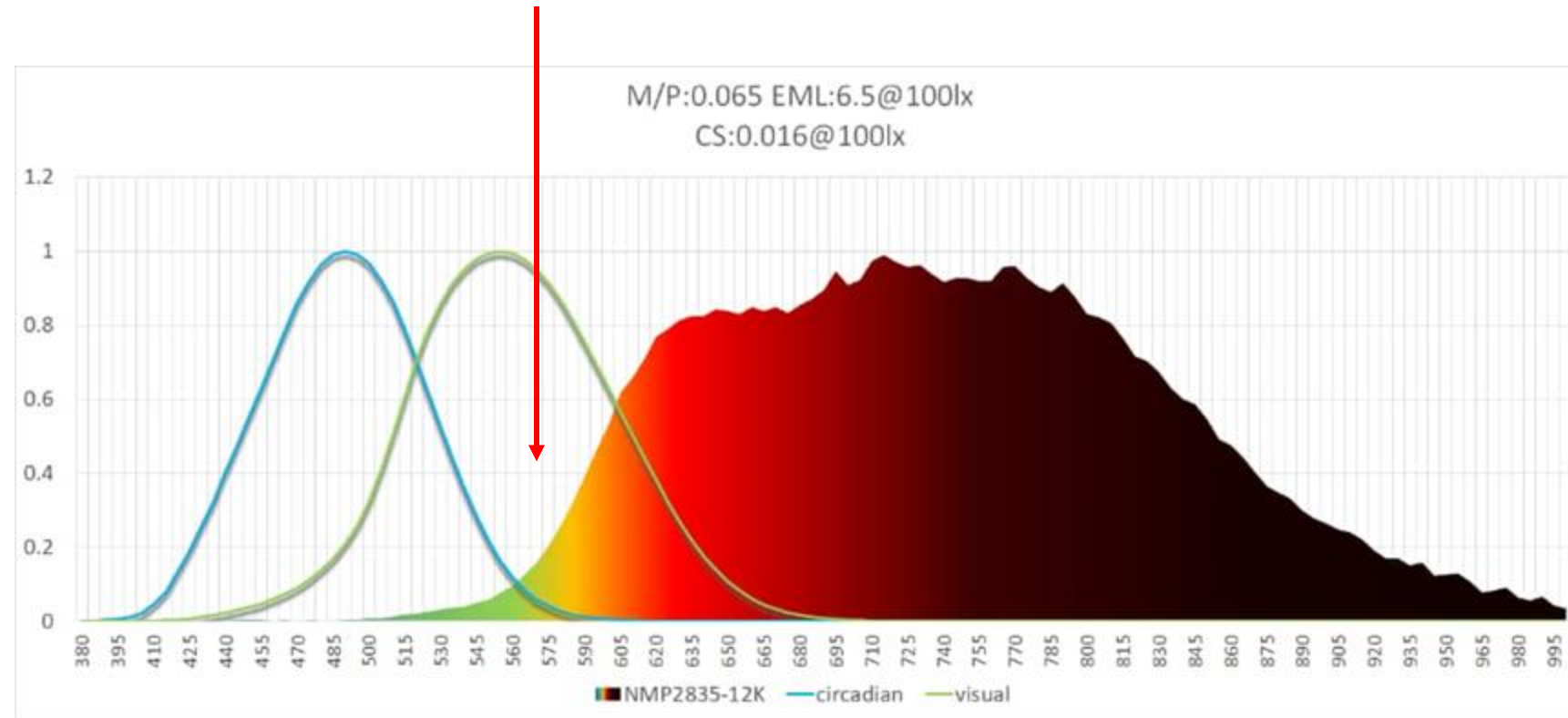


Minimize sleep disruption

“Circadian Safe” Gap

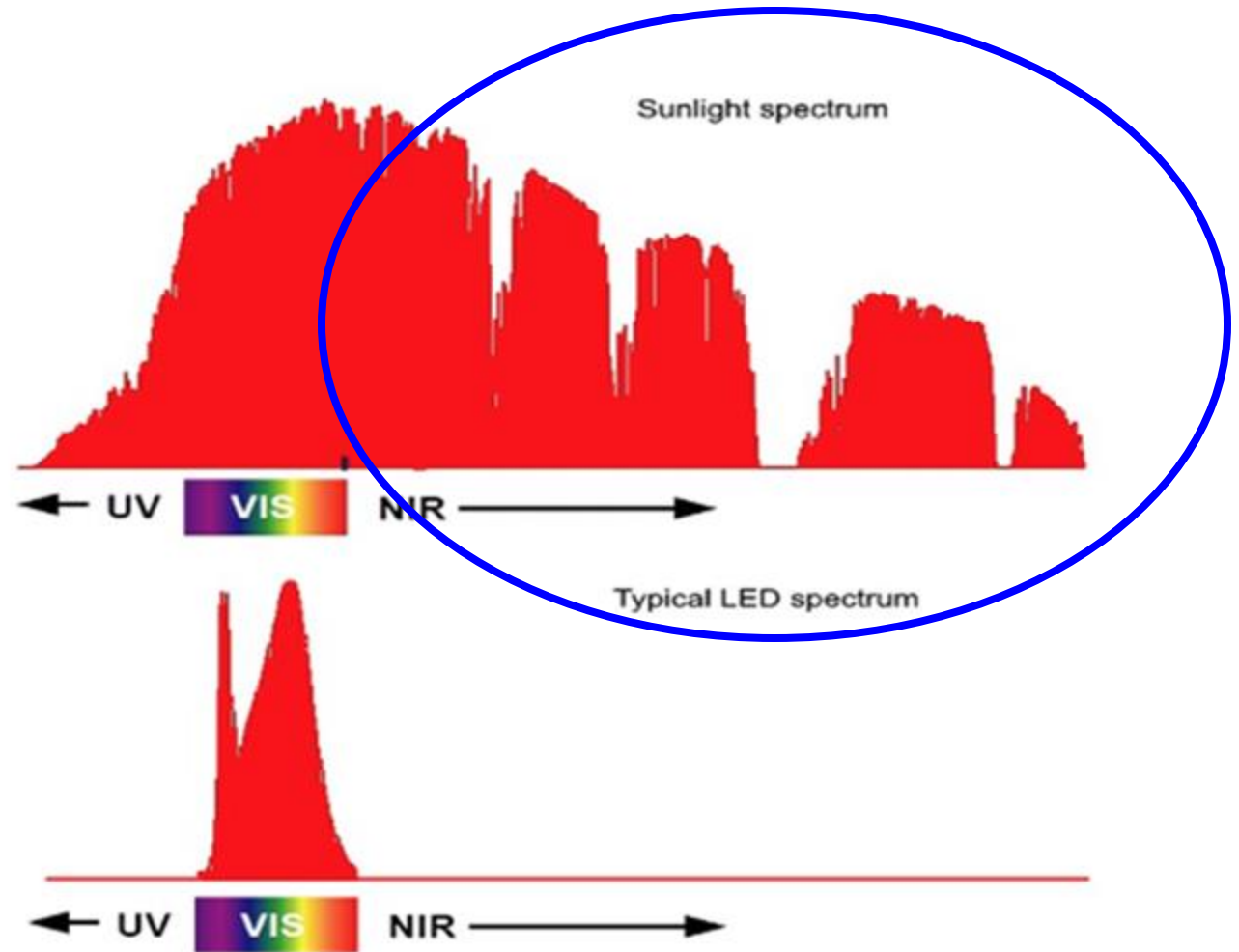
Outside C-Lambda

Inside V-Lambda



What about the other 50%?

50% direct sun is infrared

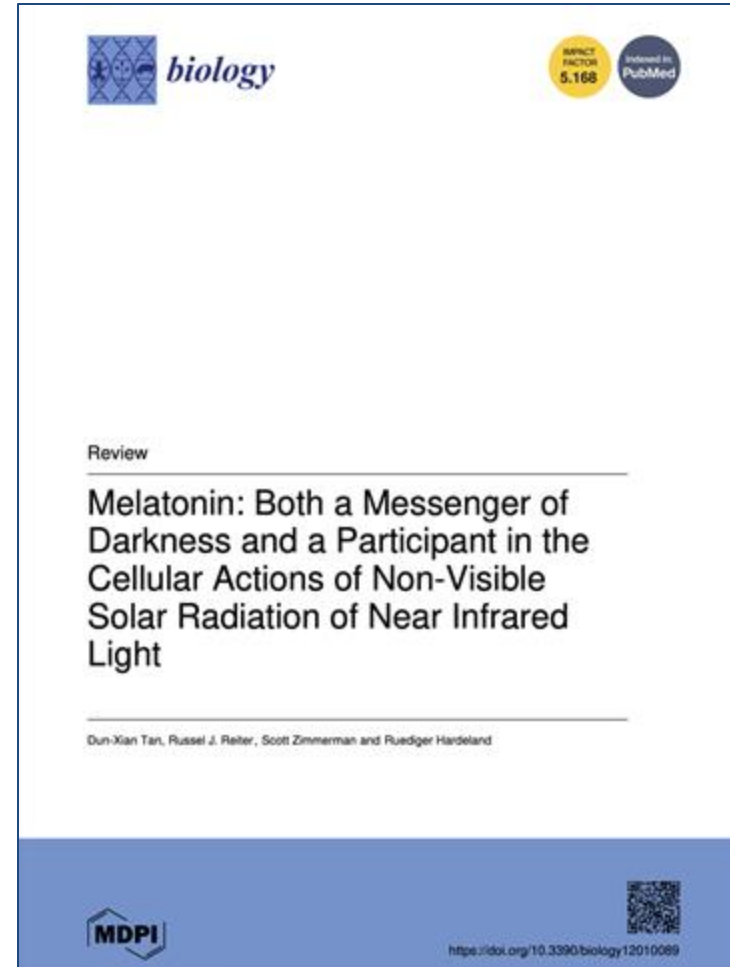


Groundbreaking Paper

Scott Zimmerman,
Russell Reiter et. al.

Published January 2023

A second melatonin production
system, sub-cellular that
produces orders of magnitude
more melatonin than Pineal
gland

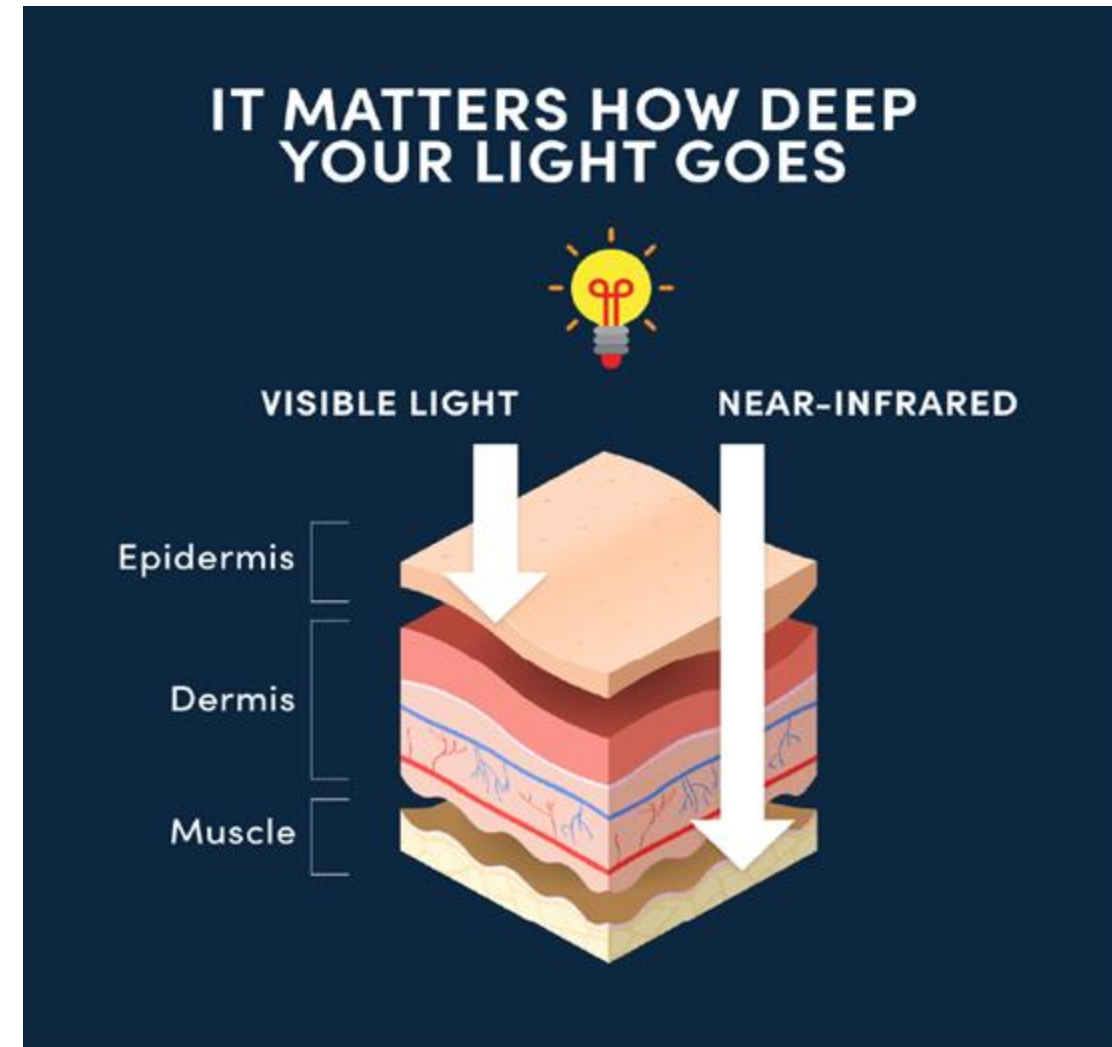


What about the other 50%?

Infrared penetrates the skin up to 1 ½"

Reduces Inflammation
Increases Blood Flow (Vasodilator)
Promotes healing and recovery
Maintains Homeostasis

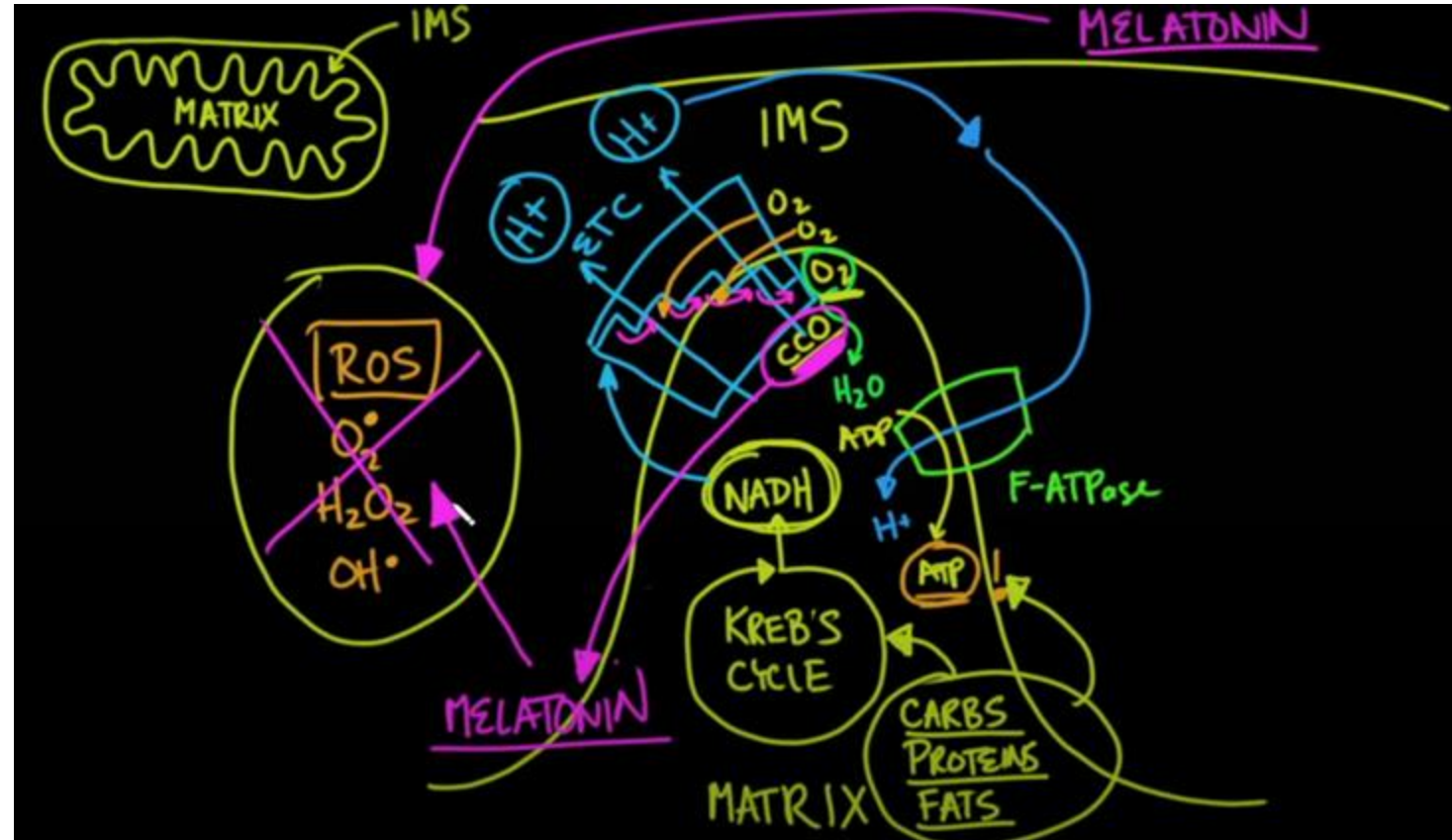
And is the primary trigger for our second melatonin system; **sub-cellular melatonin**



What about the other 50%?

Infrared through the skin triggers mitochondria to produce sub-cellular melatonin, the body's most powerful antioxidant.

Subcellular melatonin fosters healing & recovery, it attacks reaction oxygen species in supporting immunity, and it balances CORTISOL to help maintain homeostasis



MedCram: Sunlight: Optimize Health and Immunity
(Light Therapy and Melatonin)

YouTube: https://youtu.be/5YV_iKnzDRg?si=ZyfaGeinCUDuo5vr

What about the other 50%?



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Volume 100, December 2024, 102484



Effects of near-infrared radiation in ambient lighting on cognitive performance, emotion, and heart rate variability

Charlotte M. Roddick ^a, Yuxiao Wang ^a, Frances S. Chen ^a, Dorukalp Durmus ^b, Michael P. Royer ^c, Jennifer A. Veitch ^d, Jiaying Zhao ^a, Yeon Soo Seo ^a, Wenjing Cao ^a, Lorne A. Whitehead ^a

Significant Improvements in Cognitive Performance Post-Transcranial, Red/Near-Infrared Light-Emitting Diode Treatments in Chronic, Mild Traumatic Brain Injury: Open-Protocol Study

Margaret A Naeser ^{1,2,*}, Ross Zafonte ^{3,4}, Maxine H Krengel ^{1,2}, Payla I Martin ^{1,2}, Judith Frazier ³, Michael R Hamblin ⁵, Jeffrey A Knight ⁶, William P Meehan III ⁷, Errol H Baker ¹

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PMCID: PMC4043367 PMID: [24568233](#)

Abstract

Unleashing light's healing power: an overview of photobiomodulation for Alzheimer's treatment

Aakash Ramanishankar¹, Ankul Singh S² , Rukaiah F Begum² , Narayanan Jayasankar² , Afreen Nayeem¹ , Bhupendra G Prajapati⁴ & Shanmugasundaram Nirenjen^{*,2}

¹Department of Pharmacy Practice, School of Pharmaceutical Sciences, Vels Institute of Science Technology & Advanced Studies, Pallavaram, Chennai, India

²Department of Pharmacology, SRM College of Pharmacy, SRM Institute of science & technology, Chennai, Tamil Nadu, India

³Department of Pharmaceutics, Anand College of Pharmacy Agra-Delhi Highway (NH2) Keertham, Agra, Uttar Pradesh, 282007, India

⁴Department of Pharmaceutics, Shree SK Patel College of Pharmaceutical Education & Research, Ganpat University, Kherva, 384012, India

*Author for correspondence: nirenjen1999@gmail.com

Liebert et al. *BMC Neurology* (2024) 24:381
<https://doi.org/10.1186/s12883-024-03857-z>

BMC Neurology

RESEARCH

Open Access



Improvements in clinical signs and symptoms of Parkinson's disease using photobiomodulation: a five-year follow-up

Ann Liebert^{1,2,3*}, Brian Bicknell^{3,4}, E-Liisa Laakso^{5,6}, Sharon Tilley⁷, Gillian Heller^{8,9}, Hosen Kiat^{3,10,11,12} and Geoffrey Herkes^{1,11}

Abstract

Background Parkinson's disease is a progressive neurodegenerative disease characterized by clinical motor signs and non-motor symptoms that severely impact quality of life. There is an urgent need for therapies that might slow, halt or even reverse the progression of existing symptoms or delay the onset of new symptoms. Photobiomodulation is a therapy that has shown potential to alleviate some symptoms of Parkinson's disease in animal studies and in small clinical trials.



LEDucation.org

Hospitals had sun decks?

Ever hear of "heliotherapy" or
"climatotherapy" ?

Late 19th early 20th century hospitals
believed in the therapeutic benefits of
sunlight and fresh air

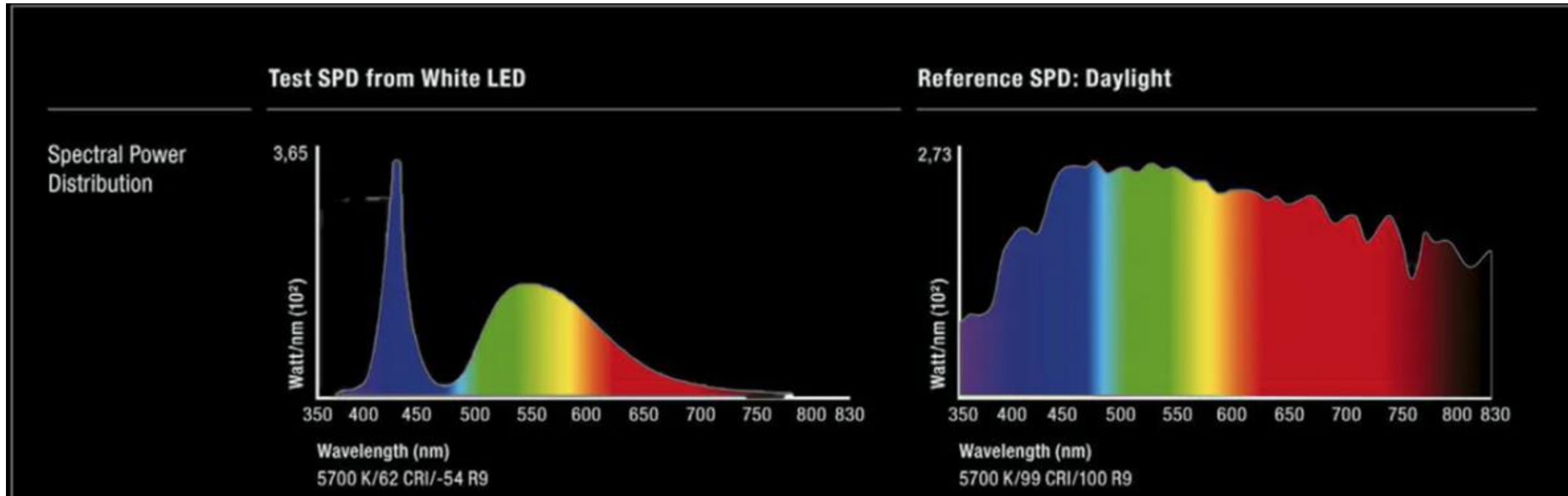


1918 Flu epidemic had outdoor
hospitals for recovery in the sun and
fresh air.

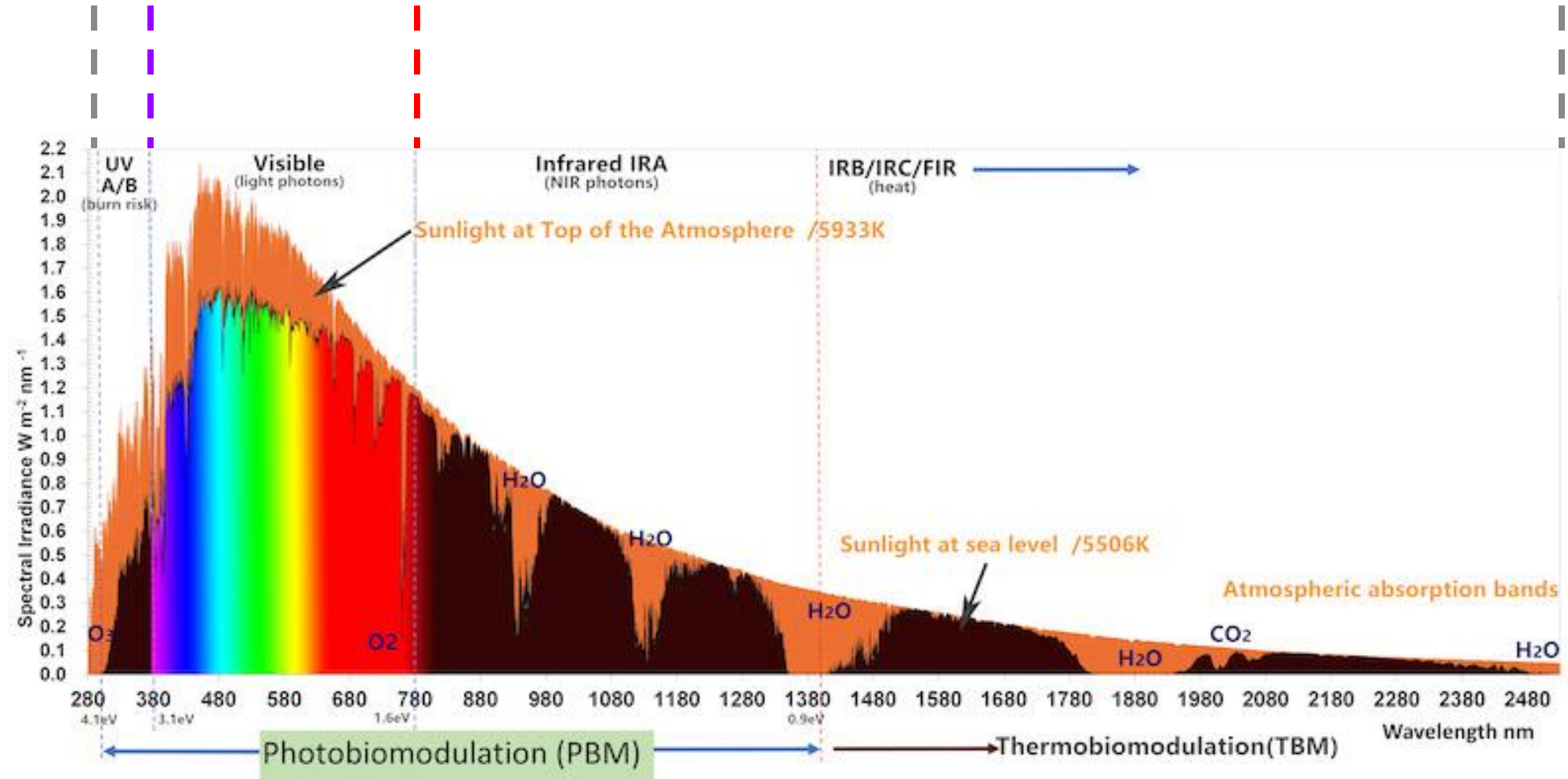
Back then they knew the sun was a
healer and disinfectant



If we need it.....



Circle back...



The Indoor Generation



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