Effects of Light on Health

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and
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Wilmington, NC

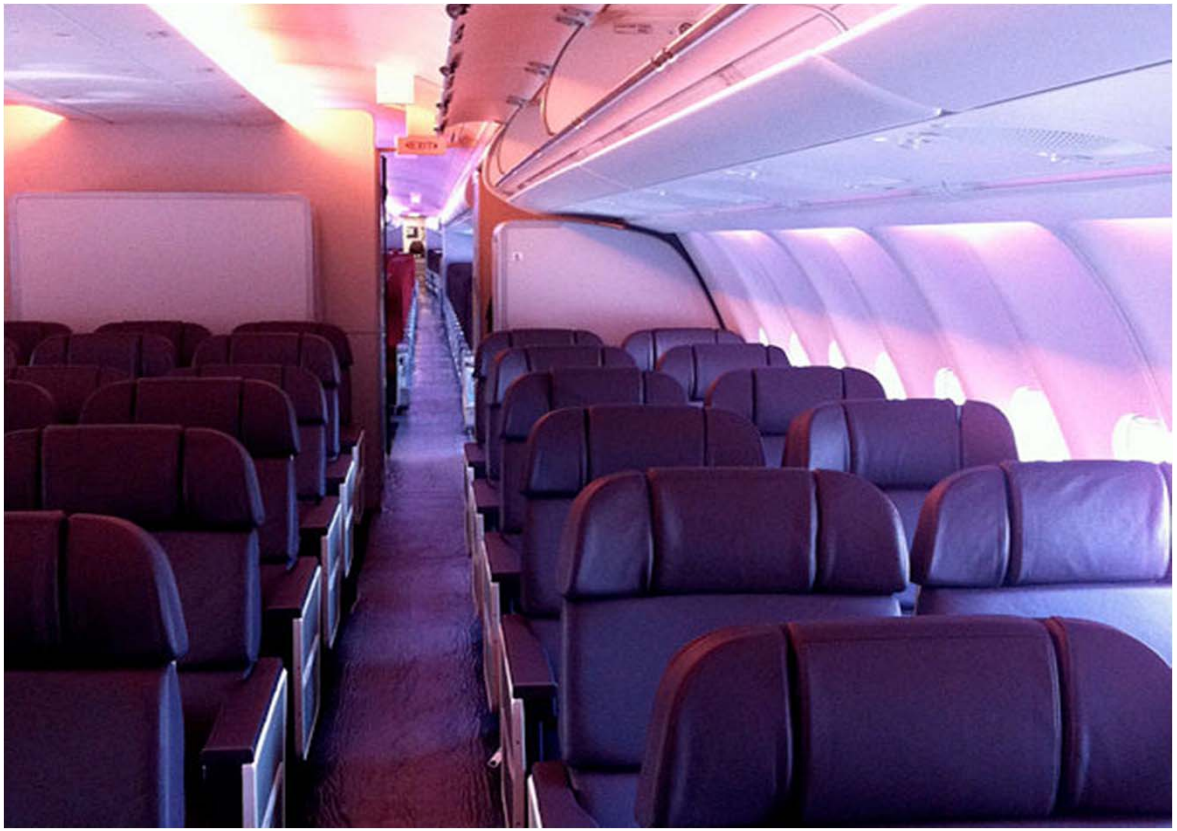
Light and “Health” on Aircraft

What’s new in aviation lighting?

Boeing 787

Boeing 787

Virgin Australia 737-800



Boeing 787 Customized Lighting

- Boarding/de-boarding: blue top, white sides
- Take off and landing: blue top and sides
- Cruising: light blue top, sides off
- Night/Sleep: dark blue top, sides off
- Meals: amber top and sides
- Sunrise/Sunset: deep orange tones

What does Lighting Innovations LLC do?

- Small group of physicists working on lighting development projects
- Largest project:

  12+ years developing prototype lamps, mainly for airport runways
- Latest:

  6 years ago, began extensive study of the health effects of artificial light at night

How we got started on light and health:

"Can you develop a blue LED lamp to treat seasonal affective disorder?"

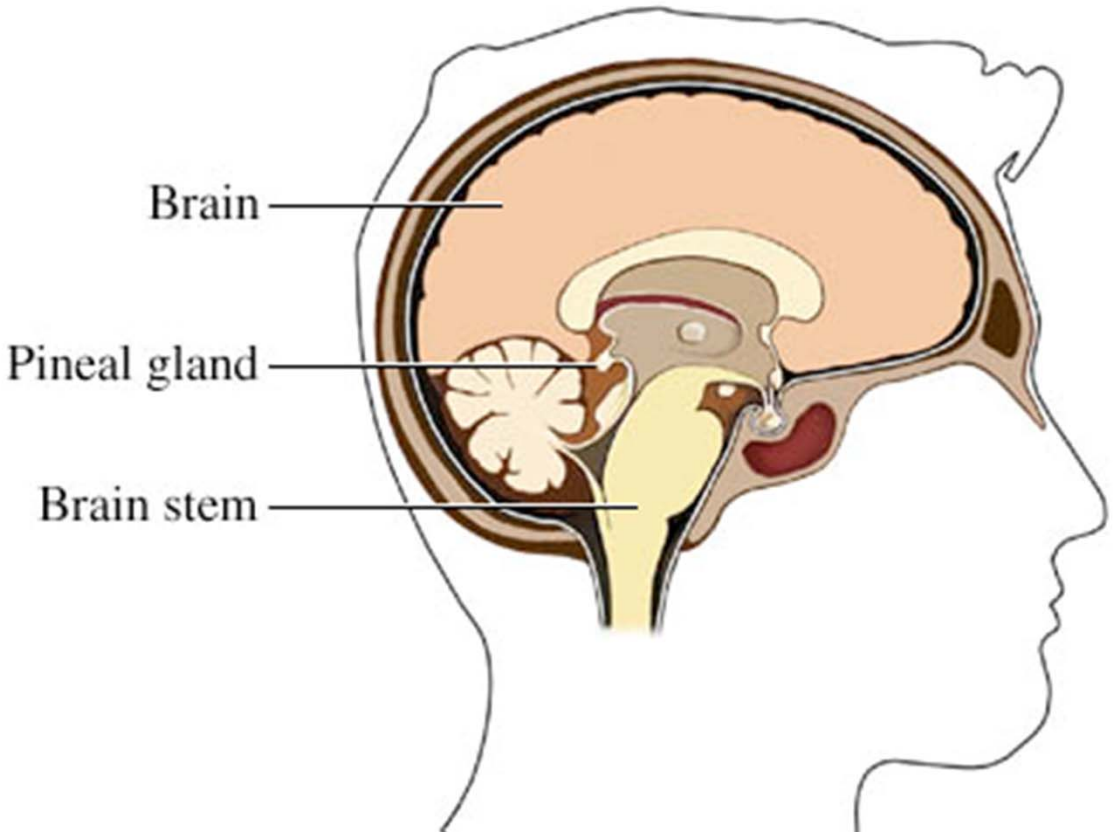
A Healthy Use of Light

- One cause of SAD is the presence of the hormone melatonin in the system in the morning.
- One treatment for SAD: Expose the eyes to bright light first thing in the morning
- New treatment for SAD: Expose the eyes to blue light first thing in the morning
- Results: Both quickly stop melatonin production by the pineal gland

What Is Melatonin?

- Melatonin is known as the “sleep hormone”
- Medically known to enhance sleep
- Found in all living creatures, even algae
- In humans, produced by the pineal gland and released directly into the blood stream
- Easily synthesized from plants and animals
- Available over-the-counter in the U.S.

Pineal Gland



Duration of Melatonin Production

- Melatonin was thought to be produced only during darkness.
- Humans evolved with 10 to12 hours of darkness.
- The pineal gland is capable of producing melatonin for 10 to 11 hours each day.
- This is true even for the blind who effectively are always in darkness.

What We Learned During This Project

- Cancer rates in developed countries are five times those in underdeveloped ones.
- Nurses who work the night shift have a higher rate of breast cancer.
- Blind women have a much lower rate of breast cancer than the sighted.
- Our use of artificial light at night may be one of the reasons.

What Increases Our Cancer Risk?

- The hormone melatonin is a very strong cancer fighting antioxidant.
- It was long believed melatonin is produced naturally by the body only during darkness.
- Artificial light reduces the time of darkness.
- Melatonin production has been reduced from 10 to 11 hours to 6 to 8 hours.
- This has led medical researchers to postulate:

Less darkness, more cancer

An Important Lighting Discovery

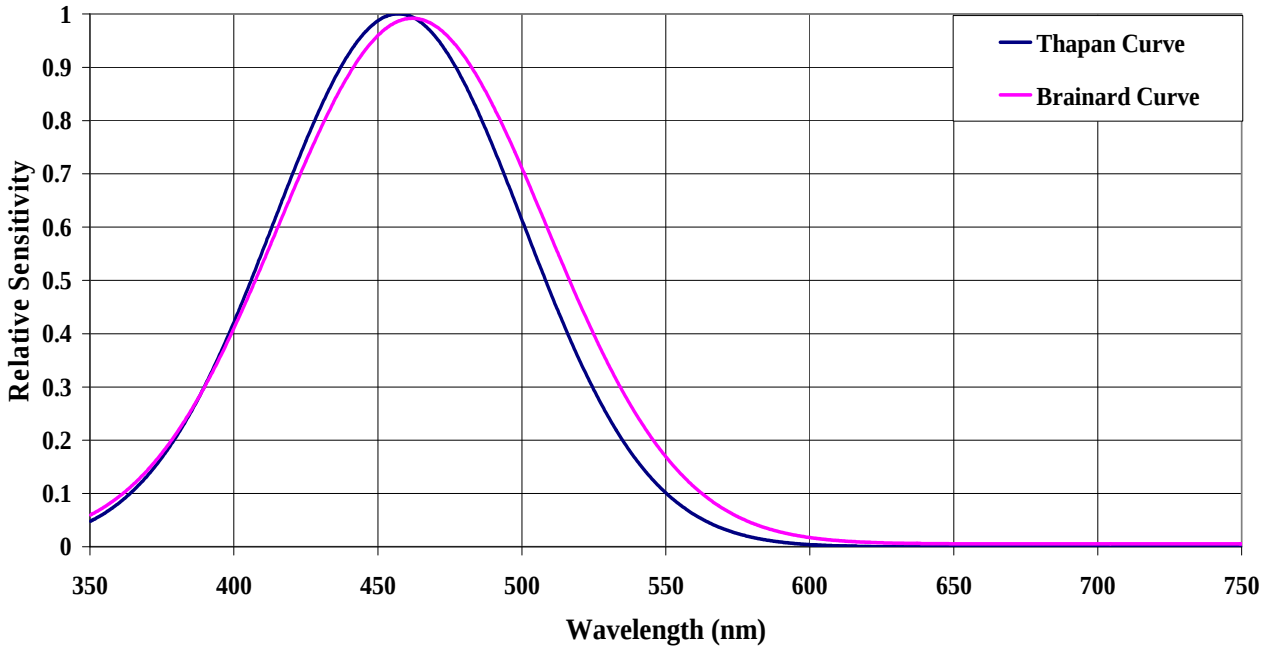
In 2001 two groups of medical researchers, one in the U.S. and the other in England, reported an important discovery.

Only
BLUE LIGHT
Suppresses Melatonin Production
by the Pineal Gland

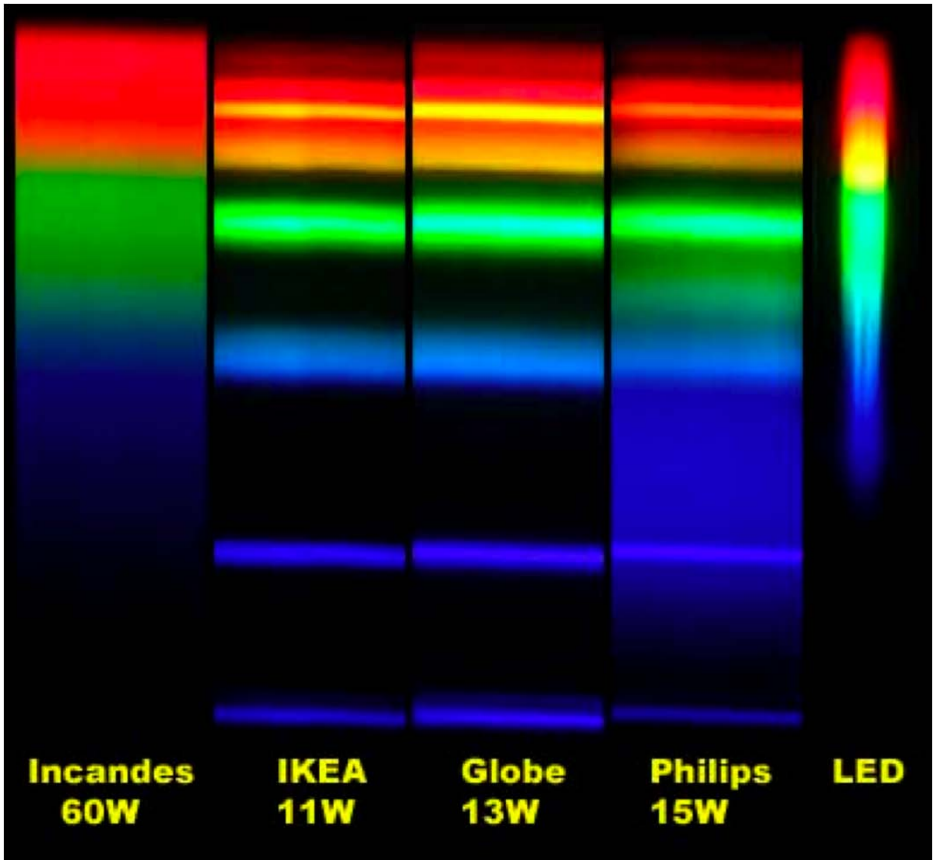
The Nature of Visible Light

- Light consists of electromagnetic waves of different wavelengths.
- These affect sensors in the retina.
- We “see” the combination of this rainbow of wavelengths as ordinary “white light”.

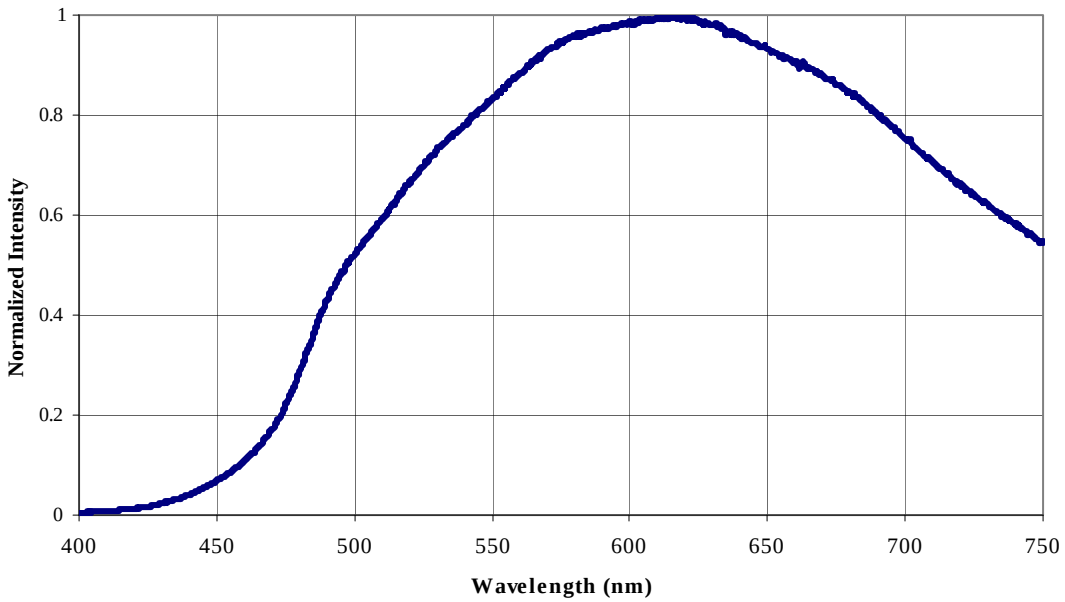
Melatonin Suppression Curves



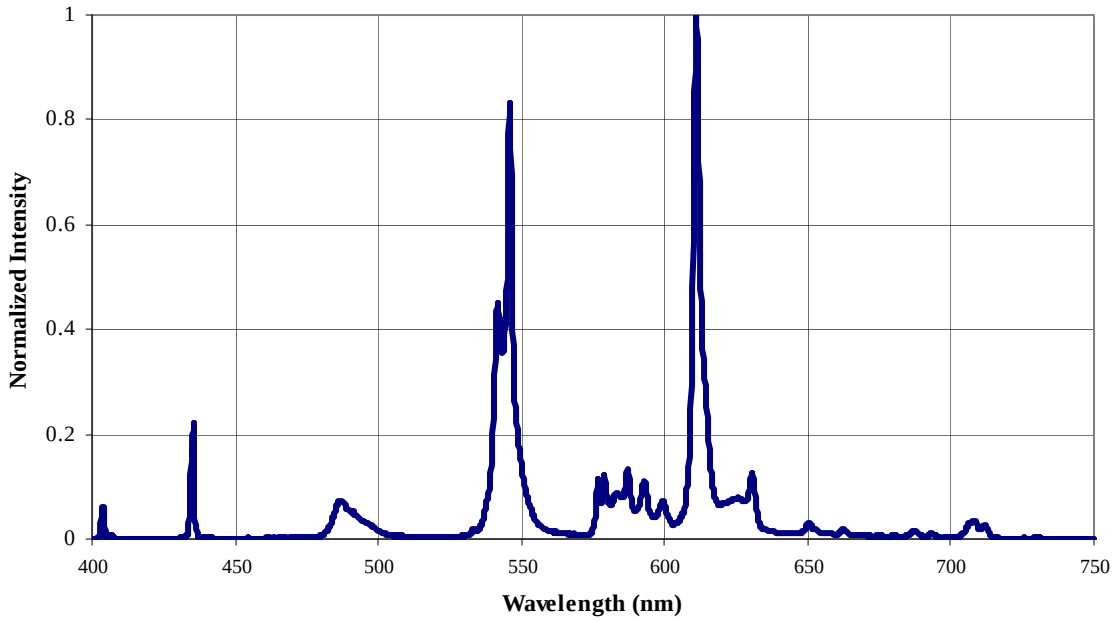
Artificial Light Spectra



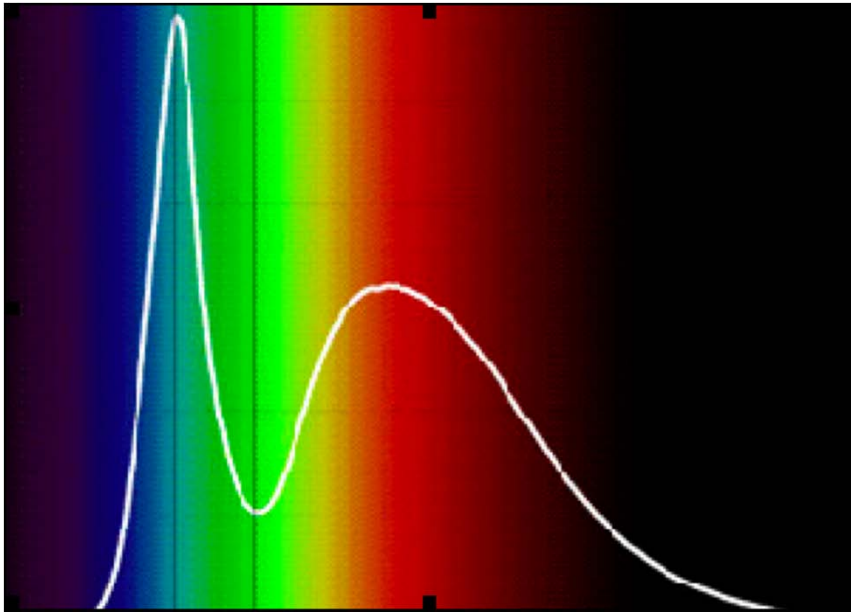
100 Watt Incandescent Spectrum



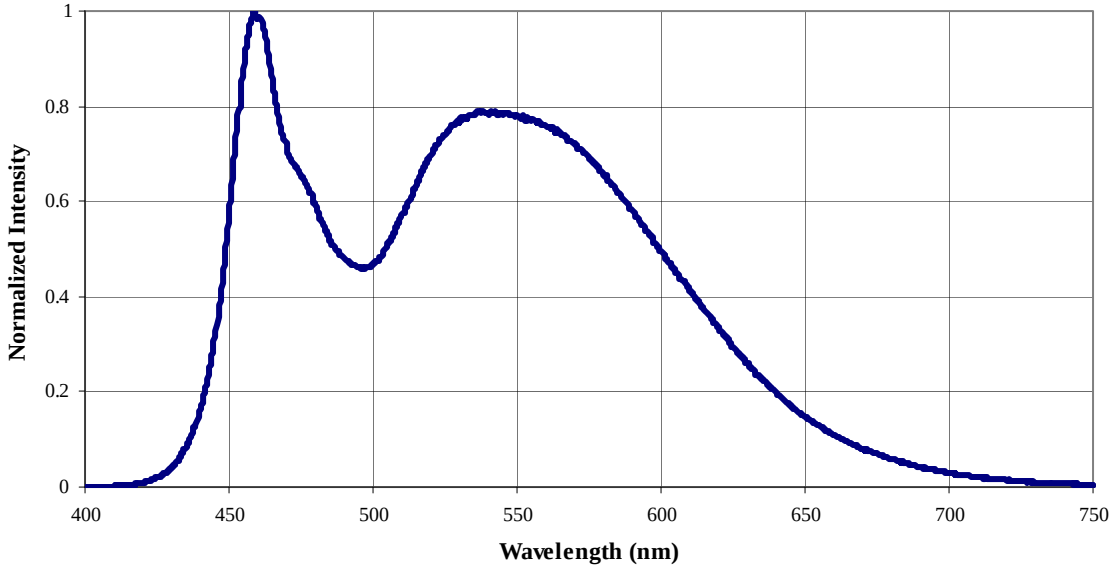
23 Watt CFL Spectrum



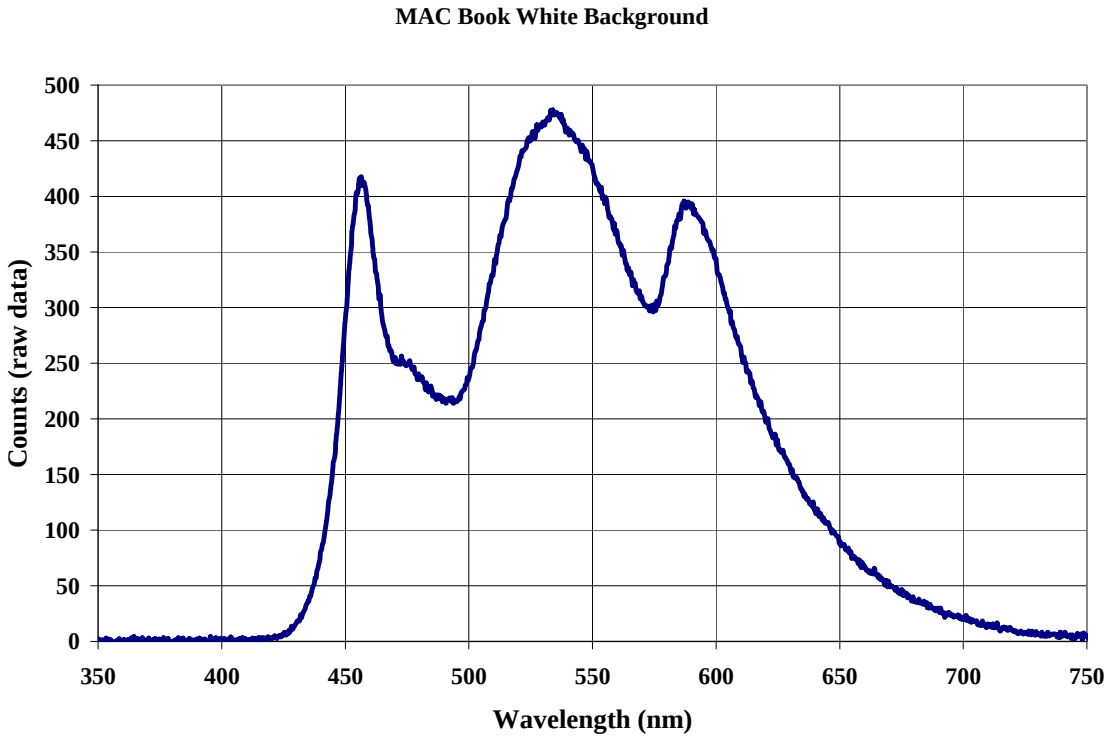
“White” Light LED Spectrum



“White” Light LED Spectrum



MacBook Computer Screen Spectrum



LIC Use of the Discovery

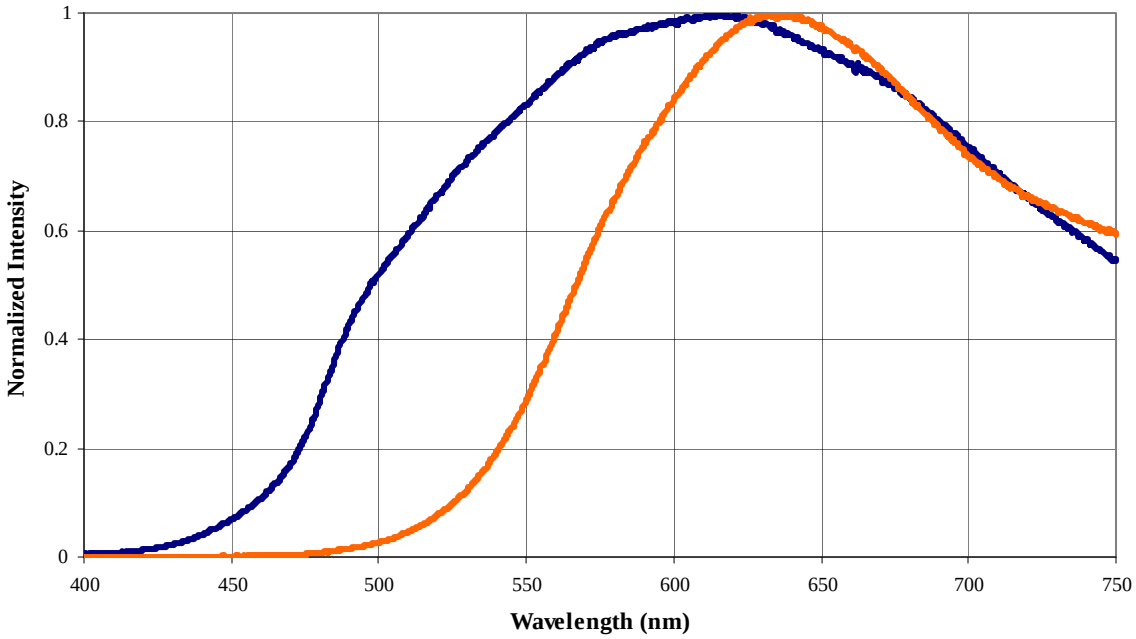
- We developed “LowBlueLights” products:
  - Artificial light sources
  - Eyewear
  - Filters for TV and computer screens

“LowBlueLights” Devices

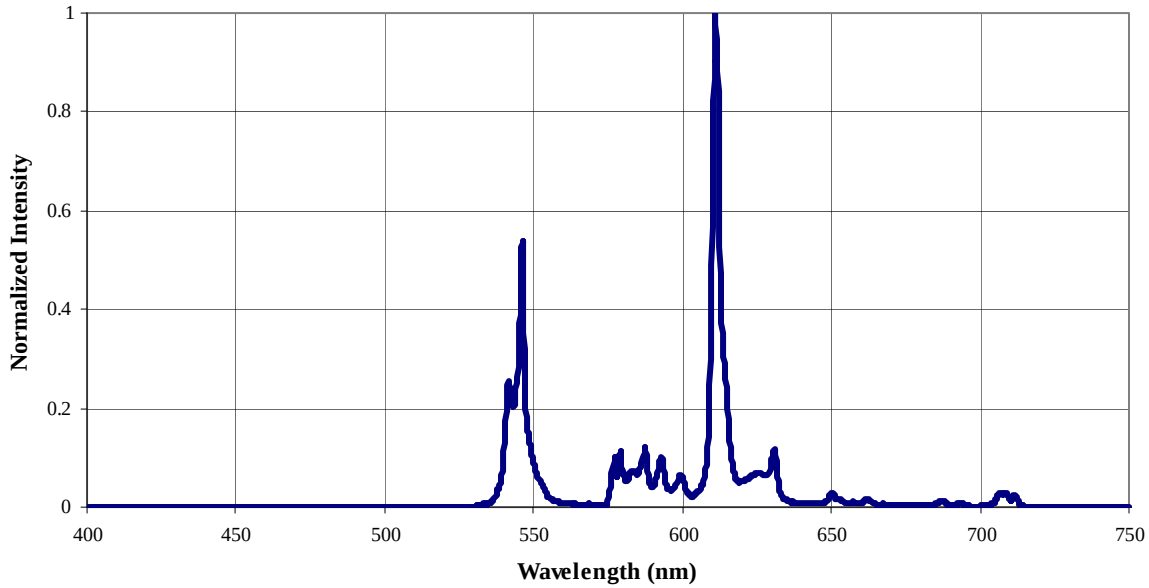
The Nature of Visible Light

- Filtering out only the blue produces amber colored light.
- Filtering out only the blue provides sufficient light to see “perfectly” after dark.
- Filtering out only the blue allows full production of melatonin.

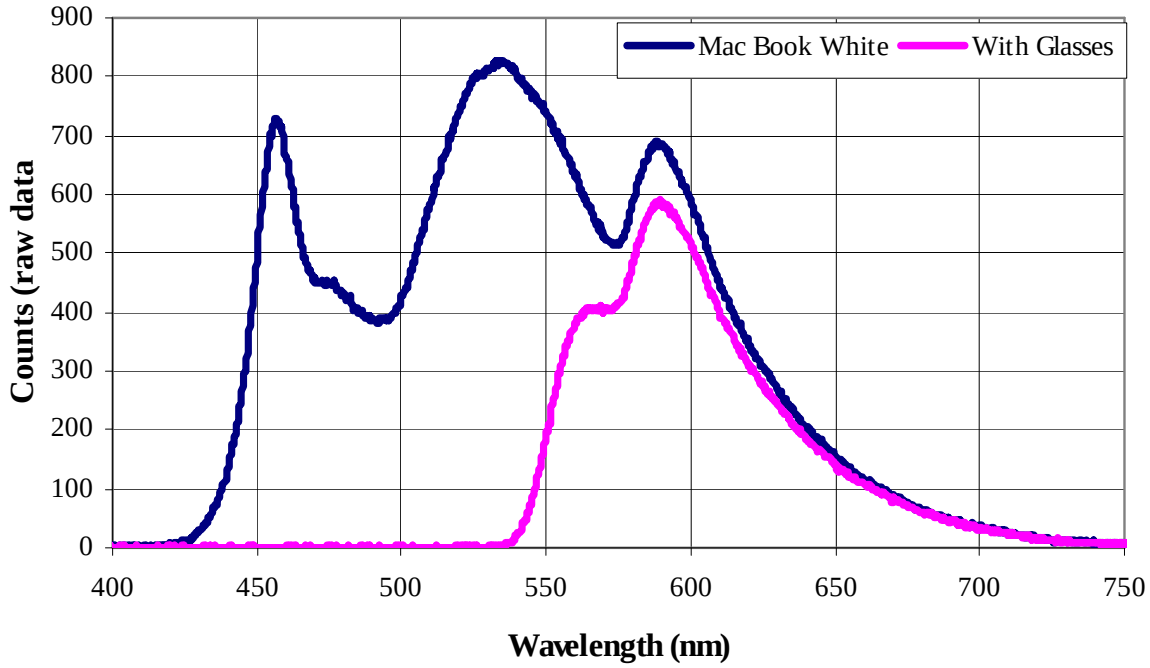
LowBlue Filtered Incandescent



LowBlue Filtered 24 Watt CFL



LowBlue Filtered MacBook



Use: To Reduce Cancer Risks??

- Melatonin is a very active cancer fighter.
- The blind have half the rate of some cancers as the sighted.
- They produce melatonin for 9 to 10 hours.
- The sighted now produce melatonin for only 6 to 8 hours.
- Amber glasses can increase the sighted melatonin production time to 9 to 10 hours.

Can physicists solve health problems?

Possibly reduce the risk of cancer?

“No Way!!”

“Where’s the Data?”

How about helping people sleep?

- Possibly, since sleep problems may be just in their minds.
- Lots of minds!!! More than 50 million sleep aid drug prescriptions written in the US each year.
- The drug companies think we may be on to something:

A non-pharmaceutical sleep aid!

To Improve Sleep Habits

- **Simply wear glasses that do not allow blue light to reach the eyes.**
- Wear only for 2 to 3 hours before retiring
- Little or no restriction of normal activity
- Use “lowblue” nightlights if up during the night

To Improve Sleep Habits

- Blocking blue light creates “artificial darkness”
- Melatonin flow starts well before retiring
- Falling asleep occurs quickly on retiring
- Sleep is deep with reduced disturbance (Possibly get up less often)
- Positive results frequently within a few days

USE: To Treat Sleep Disorders

- Several sleep specialists conducting tests using “lowblue” devices
- Head of integrative medicine at a Cleveland hospital reports “miraculous” results when used by long-term insomniacs
- Study now in progress at a Chicago area cancer treatment center to determine if the use of our glasses can improve the sleep of cancer suffers

The Word Is Getting Out

Current Medical Uses

- To treat various sleep disorders
- To treat seasonal affective disorder (SAD)
- To prevent or treat postpartum depression
- To treat rapid cycling bipolar disorder

Use: To Reduce Cancer Risks??

- Our original reason to develop devices and techniques to eliminate blue light
- Will require close collaboration with oncologists and other medical specialists
- Will require long term studies
- However, possibly one of the most important uses

Conclusion

- Sleep is important for good health.
- 9 to 10 hours of melatonin production by the body is important for good health.
- In today's world, less than 6 to 8 hours is the norm due to the use of artificial light at night.
- 9 to 10 hours of melatonin production is possible simply by using "lowblue" devices.

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More Information?

Re bipolar disorder:

www.psycheducation.org

Re medical research:

www.pubmed.gov

Re lowblue products:

www.lowbluelights.com

Questions???

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