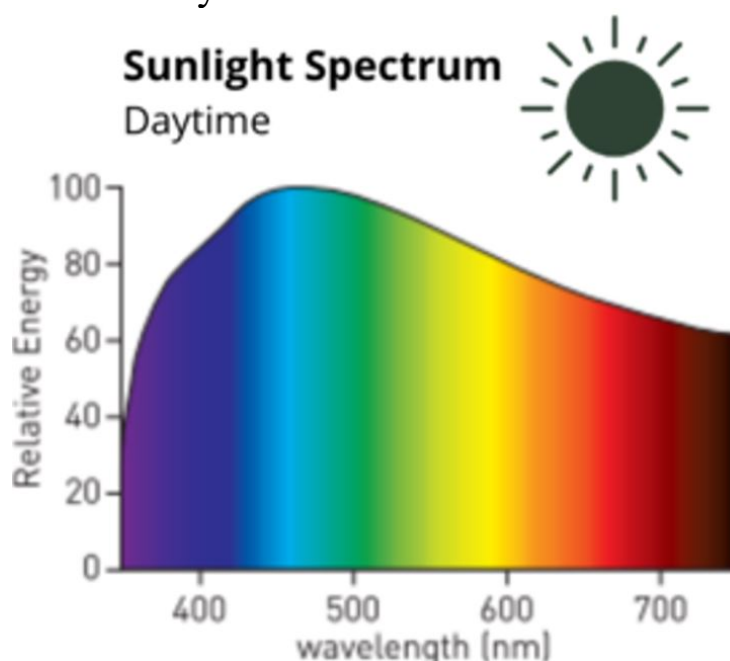
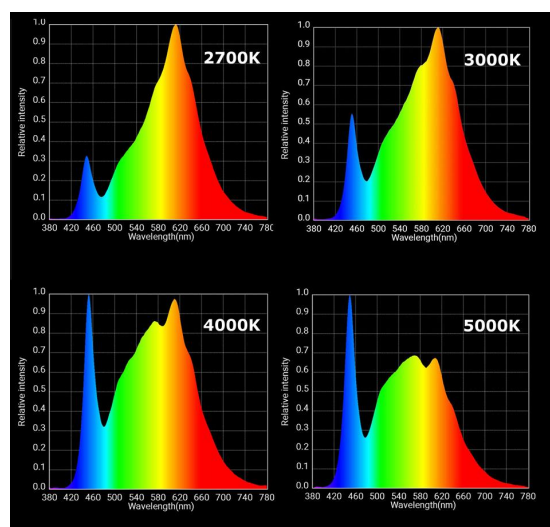


The Dark Side of LED Light

by Robert K. Stevenson



For millions of years humans and other forms of terrestrial life on Earth have evolved under the influence of daylight, produced by the sun. Note in the above illustration of the color spectrum of daylight how the various colors' relative energy does not significantly differ from one another. In recent years humans in the developed countries on Earth have become exposed, often for many hours each day, to a new form of light—LED (light-emitting diode) light. What does its color spectrum look like?



Four different color spectrum illustrations of LED light

Note in the above illustrations that no matter what the LED light's color temperature (K) is, with K being the measure of the light's hue or "warmth", its color spectrum wildly differs from that of daylight, with the most striking feature being the quite dramatic spike of energy seen in the blue light region. Now, in viewing LED light's color spectrum versus the color spectrum for daylight, one might well conclude that long-term exposure to LED light cannot possibly be beneficial to one's health. Such a conclusion, in fact, is correct. Let us see what science has found with respect to LED light's impact on human health.

Blue light exposure at night significantly increases risk of various cancers

A landmark study by the Barcelona Institute for Global Health of 4,600 participants (ages 20 to 85) across regions in Spain, focusing on individuals who had never worked night shifts, linked high exposure to artificial light at night (ALAN), particularly blue light of which LED light emits a great amount, to a **1.5 times higher risk of incurring breast cancer and a 2-fold higher risk of incurring prostate cancer**. The ALAN exposure was evaluated via high-resolution blue-light-sensitive nocturnal images captured by astronauts aboard the International Space Station. Calling it the Circadian Disruption Mechanism, the study's lead author, Dr. Ariadna Garcia-Saenz, and 23 co-authors explained the primary biological theory behind the ALAN/cancer link this way: blue light exposure suppresses the production of melatonin—a hormone that regulates sleep-wake cycles and possesses tumor-suppressive properties. Hence, exposure to ALAN essentially dysregulates the body's natural circadian rhythm.[1] A follow-up study by Dr. Garcia-Saenz and 12 co-authors of 2,000 residents of Madrid and Barcelona came up with this key result: "Exposure to blue light spectrum was positively associated with colorectal cancer (OR=1.6)," meaning those exposed to blue light had a 60% greater risk of developing colorectal cancer.[2]

A sophisticated study by Doctors R. A. Al-Naggar and Shirin Anil, titled "Artificial Light at Night and Cancer: Global Study," explored the impact that ALAN exposure had on the development of cancer. This study utilized 1) data obtained from the Global Assessment on Light Pollution by the Centre for International Earth Science Information Network, and 2) data regarding the age standardized cancer incidence rate (ASR) for 158 countries from the International Agency for Research on Cancer (IARC). Given that up to 70% of streetlights globally are now LEDs, this study's following result, while alarming, is understandable. The authors state: "**Artificial light at night is significantly correlated for all forms of cancer** including lung, breast, colorectal and prostate cancer. **Immediate measures** should be taken to reduce artificial light at night in the main cities around the world." [3] The "immediate measures" Doctors Al-Naggar and Anil have called for, of course, have not been taken, as city after city worldwide continues to sleepwalk its way to producing a cancer-ridden population.

Bright artificial light at night exposure significantly increases heart attack and heart failure risk

An astounding 2025-published study in *JAMA Network Open* by Dr. Daniel P. Windred and seven co-authors, "Light Exposure at Night and Cardiovascular Risk," researched over a 9.5-year period the impact that bright artificial light at night exposure had on 88,905 adults. Key data were obtained via the use of wrist-worn light sensors by the participants, one important finding being that ALAN exposure between the hours of 12:30 A.M. and 6 A.M. causes the most disruption to the body's circadian rhythm and melatonin production. The UK Biobank served as the primary source of data regarding any cardiovascular health problems requiring medical attention experienced by the study participants. So, did the efforts of the study's 8 co-authors and its 88,905 participants yield a result that all public health agencies worldwide need to be aware of? One would think that the answer is yes, because the study found that participants who were exposed to bright artificial light at night experienced a 47% increased risk of incurring a heart attack and a 56% increased risk of developing heart failure.[4]

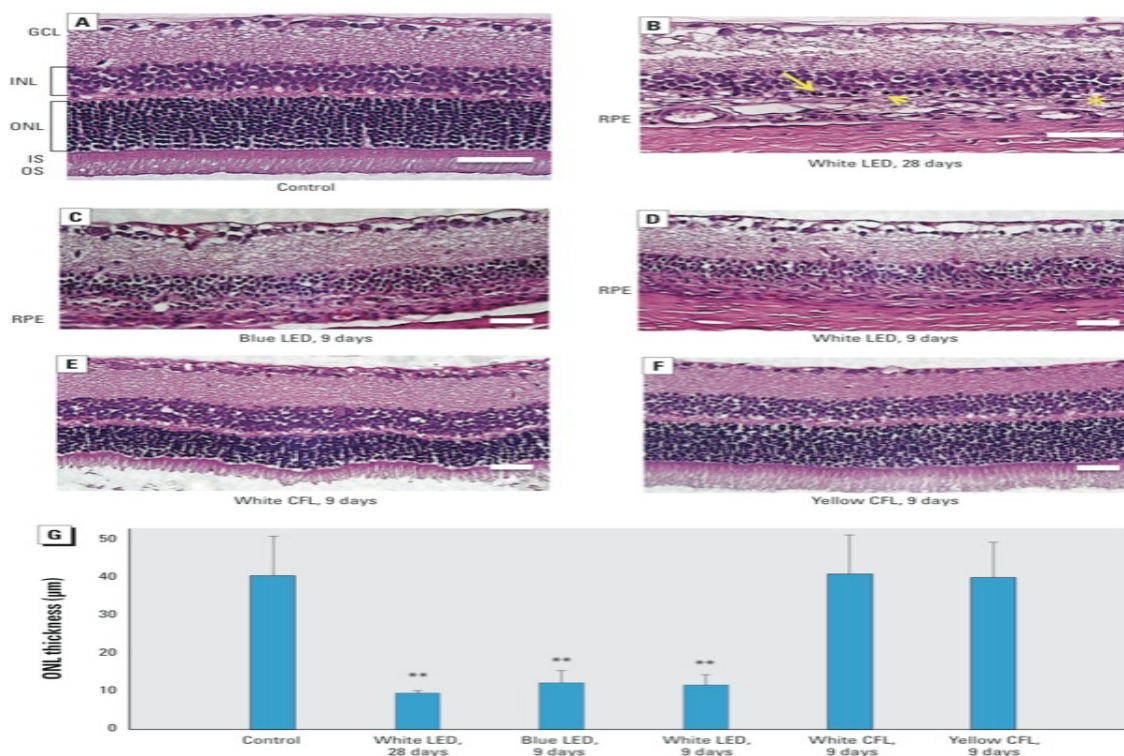
Artificial light at night exposure reduces human lifespan and accelerates biological aging

With scientific studies having found that exposure to blue-rich artificial light at night significantly increases the risk of developing heart failure as well as incurring a heart attack and all sorts of cancers, it makes sense for one to believe that a large amount of ALAN exposure would also result in a reduction of the human lifespan. Now, the group of people who receive the most ALAN exposure are night shift workers. Dr. Yangwei Cai, a medical researcher and cardiologist at Sun Yat-sen University in China, along with 9 co-researchers, decided to determine how much, if at all, the lifespan of night shift workers differs from that of regular daytime workers. They conducted a 2025-published study of 192,764 participants and compared blood biomarkers of the

two different groups of workers. After adjusting for such possible confounders as sex, age, race, physical activity, etc., they arrived at the key finding that **night shift work accelerates biological aging, resulting in a nearly one-year reduction in life expectancy for 45-year-old regular night workers.** The study was titled “Night shift work accelerates biological aging and reduced life expectancy: a prospective cohort study” which largely mirrors the study’s stated conclusion, it being: “Night shift work was significantly associated with accelerated biological aging.” [5]

LED light exposure can cause serious eyesight damage

Exposure to the blue light of LED light comes from other sources besides outdoor and indoor LED light bulbs. Presently, 99% of modern flat panel TVs are LED-backlit and 95-99% of desktop computer monitors are LED-based. Importantly, over 50% of smartphone displays are a type of LED called OLED (organic LED). People exposed to so much LED light from so many different sources are at risk of having their eyesight seriously damaged. A groundbreaking study conducted by Dr. Yu-Man Shang, a medical researcher at Taiwan National University’s Institute of Environmental Health, and 4 co-researchers, showed why it is wise for one to avoid or at least minimize one’s LED light exposure. Titled “White Light-Emitting Diodes (LEDs) at Domestic Lighting Levels and Retinal Injury in a Rat Model,” the authors stated that their study “examined LED-induced retinal neuronal cell damage in the Sprague-Dawley rat using functional, histological and biochemical measurements. We used blue LEDs (460nm) and full-spectrum white LEDs, coupled with matching compact fluorescent lights, for exposures.” This study, conducted on rats, and not on humans, for ethical reasons yielded the following Result: **“H&E staining and TEM revealed apoptosis and necrosis of photoreceptors, which indicated blue-light induced photochemical injury of the retina. Although we found serious retinal injury in LED groups, the compact fluorescent lamp (CFL) groups showed moderate and mild injury.”** One can visually see this serious retinal injury in the study’s below illustration. Look at the top two photos and note the striking difference in appearance of the retina in Photo A (the control), which had no LED light shined at it, to the retina appearing in Photo B, which had White LED light shined at it for 28 days. Multiple components of the retina exposed to the White LED light were damaged, with the study’s authors citing, for example, that its “outer nuclear layer was significantly decreased” while its inner nuclear layer suffered “degeneration.” The illustration’s bottom bar graph shows the tremendous amount of thickness that the White LED light-exposed retina lost compared to the Control’s retina. [6]



The importance of preventing damage to one's retina is that retinal damage may result in macular degeneration, which is a leading cause of blindness and vision loss. The American Macular Degeneration Foundation has emphasized the seriousness of this threat, stating as follows:

“In 2026, the state of age-related macular degeneration (AMD) remains alarming. According to the most recent data published by the CDC:

Nearly 20 million Americans age 40+ have been diagnosed with some form of macular degeneration.

1.49 million Americans are living with a late-stage vision-threatening form of AMD.

By the age of 75, roughly 1 in 3 people living in the United States will have some form of age-related macular degeneration, and about 1 in 4 of those will have a vision-threatening, late-stage form of AMD.” [7]

Students in classrooms with daylight as the primary lighting source learn Reading and Math 20-26% faster

The top priority of any civilized society is to protect the health of its children. Although more and more schools in the US are now installing harmful-to-health LED lighting in classrooms—all in the name of energy efficiency and saving money on the school's electric bill—is there a way that a school could save even more money on the lighting portion of its electric bill and also in the process significantly improve the academic performance level of its students? The California Public Utilities Commission wanted to learn the answer to this question, and in 1987 funded a comprehensive study of daylighting's impact on 2nd through 5th graders in three different school districts. The study's researchers produced a 29-page-long report, published in 1999, titled “Daylighting in Schools: An Investigation into the Relationship Between Daylighting and Human Performance.” **The researchers found “that students with the most daylighting in their classrooms progressed 20% faster on math tests and 26% faster on reading tests in one year than those with the least.”** The greatest improvement in the students' math and reading scores occurred in classrooms that contained a unique, good-sized skylight, which the researchers called Skylight Type A. Skylight Type A possessed a diffusing lens which spread the daylight evenly throughout the classroom. In addition, this skylight was manually controlled via dimming louvers, which allowed the teacher, if necessary, to dim the skylight (in order to show movies, for example).



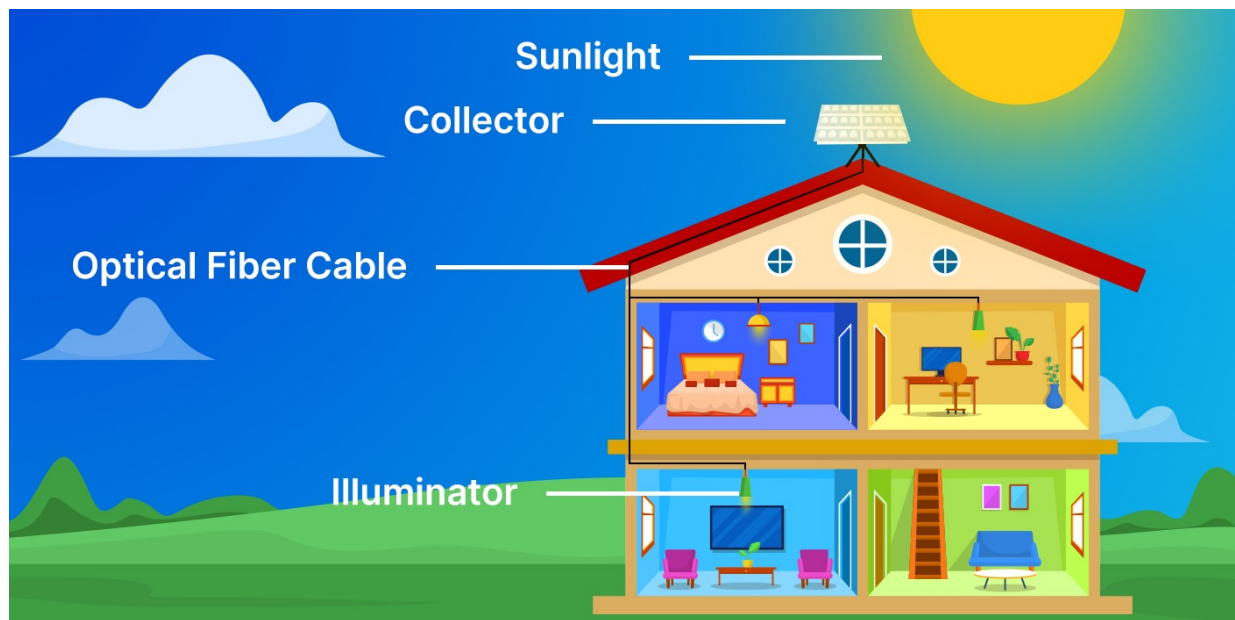
**Classroom lit by skylight possessing a diffusing lens.
Note how the light is spread evenly throughout the classroom.**

All by itself, Skylight Type A with its diffusing lens resulted in, as the researchers reported, “a 19% to 20% faster improvement when compared to classrooms with no skylights.” The “Daylighting in Schools” study researchers concluded by reporting what students attending schools that used diffusing lens type of skylights alongside some side windows in the classroom would likely experience: **“Students in daylight classrooms could**

save up to one month of instruction time in the reading and math curriculum that could be used for other areas of learning.” [8]

Although the cost and installation of diffusing lens skylights can easily be handled by most public school districts, especially if the installation of the skylights is accomplished over a 2-3 year period, still many school districts may claim that they cannot move forward on providing a healthy classroom lighting environment for the students and teachers until they get “more money.” In that case, the “more money” can be obtained by either a local school bond measure or a state school bond measure being passed. **The key provision in such a school bond measure would be: “For all new and replacement classroom lighting, the primary lighting source shall be natural daylight delivered into the classroom by: 1) diffusing lens skylights, 2) windows, and/or 3) a solar fiber optic system.”**

The solar fiber optic system mentioned above is one that would permit a classroom located on the first floor of a 2-story building to be lit by daylight. In the below illustration one sees that on the building’s roof is a light collector. Attached to the collector is an optical fiber cable which then is connected to the room located on the first story; light thus travels through the fiber cable, instantly illuminating the first-story room. Importantly, the illuminator is designed to spread the incoming light evenly, and not as a bright solid beam, into the room.



For one’s own residence, if installing a diffusing lens skylight on the roof cannot be done, perhaps because you live in a rental apartment and the owner will not agree to having such a skylight installed, then you have to find an alternative way to provide yourself and your family healthy indoor lighting because the US federal government has banned the manufacture and sale of standard incandescent light bulbs—from 40 Watt to 100 Watt. Fortunately, this ban does not apply to full-spectrum incandescent lights whose color spectrum is very similar to that of daylight. Among online businesses that provide a variety of such lights which fit into standard light bulb sockets, the reader may wish to review the offerings of Healthylighting.com and Wellnessbetter.com.

Providing healthy indoor daylighting to yourself and your family will save you much money, as light from a skylight or windows adds \$0 to your monthly electric bill. Indoor light from a full-spectrum incandescent lightbulb will, of course, add to your monthly electric bill. But, here’s really the only question that matters: Do you want to save money on your electric bill by using LED light, only to die from cancer or a heart attack 10 years earlier than you would have if you had instead prioritized your home and work life around natural light exposure? A low monthly electric bill does you no good whatsoever once you are dead.

Be wise. Protect yourself and your family. Avoid harmful-to-health LED light.

References

1. Ariadna Garcia-Saenz *et al*, “Evaluating the Association between Artificial Light-at-night Exposure and Breast and Prostate Cancer Risk in Spain,” *Environmental Health Perspectives*, April 23, 2018, 126(4), 047011.
2. Ariadna Garcia-Saenz *et al*, “Association Between Outdoor Light-at-Night Exposure and Colorectal Cancer in Spain,” *Epidemiology*, 2020 Sep; 31(5): p. 718-727.
3. R. A. Al-Naggar and Shirin Anil, “Artificial Light at Night and Cancer: Global Study,” *Asia Pacific Journal of Cancer Prevention*, 2016; 17(10): p. 4661-4664.
4. Daniel P. Windred *et al*, “Light Exposure at Night and Cardiovascular Disease Incidence,” *JAMA Network Open*, 2025;8;(10); e2539031.
5. Yangwei Cai *et al*, “Night shift work accelerated biological aging and reduced life expectancy: a prospective cohort study,” *QJM: An International Journal of Medicine*, Vol. 118, Issue 8, August 2025, pages 575-583.
6. Yu-Man Shang *et al*, “White Light-Emitting Diodes (LEDs) at Domestic Lighting Levels and Retinal Injury in a Rat Model,” *Environmental Health Perspectives*, 2013 Dec 20; 122(3); p. 269-276.
7. <https://macular.org/amdawarenessmonth>
8. L. Heschong, *Daylighting in Schools: An Investigation into the Relationship Between Daylighting and Human Performance*; Fair Oaks, CA: Heschong Malone Group, 1999. Prepared for Pacific Gas and Electric Company.