



Sun LifeLight, Inc.
Product Definition and Scientific Support

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Abstract

Sun LifeLight is on a mission to bring the benefits of the sun, indoors so that those of us who spend much of the day at a desk, can still receive the natural, life giving and energy boosting effects of the sun to where we need it most...at work!

The company was organized to produce smart, personal light fixtures along with control and management software applications built with unique ergonomic designs and functional innovations that bring the clinically proven and well documented, energy amplifying, mood enhancing and productivity boosting benefits of sunlight to the more than 300 million, global, computer using, working professionals that are sunlight deprived during their workday. Corporations and individuals alike will prosper by virtually transporting their computer workstations to sun drenched destinations.

Background

We all understand instinctively that the sun gives life. Science shows us how sunlight is partly responsible for keeping us productive during the day. Summarily, certain wavelengths of sunlight are absorbed by non-visual receptors in the eye. These receptors initiate a complex sequence of events balancing hormone levels and orchestrating many other events in all of us that make us alert, energetic and productive during the day.

Greater than 30 years of clinical research, discovery and use has demonstrated the direct impact of these wavelengths of sunlight in the regulation of "mood, energy and productivity" in vertebrates, including humans. The National Institute of Mental Health, in the early 1980's, first demonstrated this physiological phenomenon. Since then and as a result, an entire industry has

developed around the use of sunlight (artificial or natural) in the treatment of certain mood related disorders.

Norman E. Rosenthal and colleagues at the National Institute of Mental Health, described and named one such disorder, Seasonal Affective Disorder (SAD), in 1984. The confluence of identified mood disorders and the discovery of sunlight effects on mood regulating hormones, has created an opportunity for psychiatrists, psychologists and other medical doctors, to prescribe light therapy as an alternative to pharmaceutical based serotonin re-uptake inhibitors (SSRI) so often prescribed. The light therapy has, in many cases, proven notably more effective.

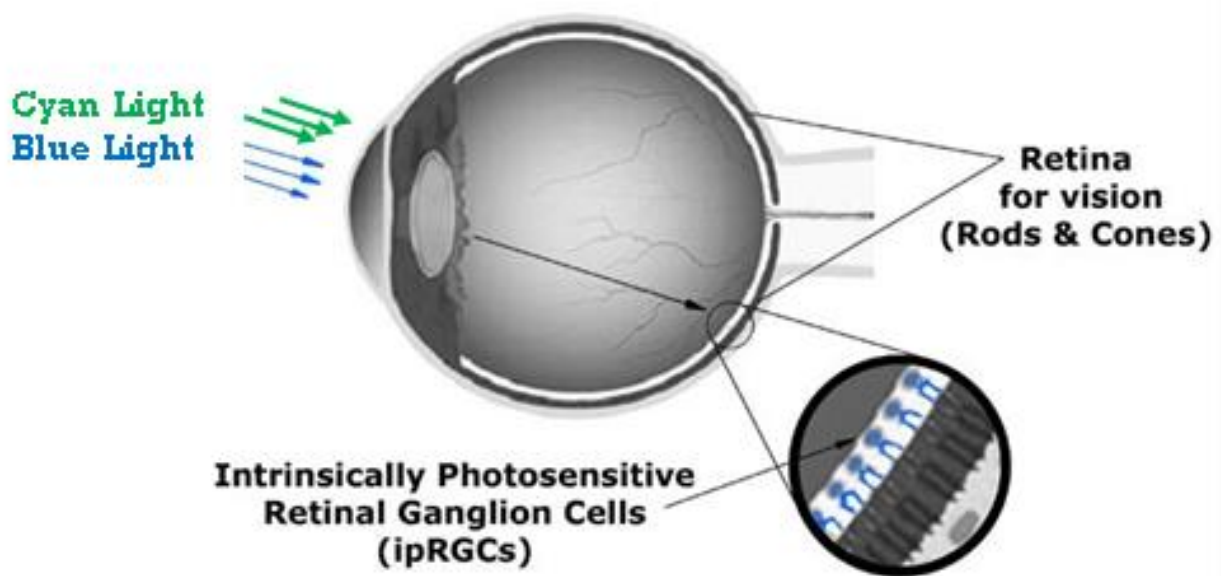
Light therapy is an excellent treatment for such disorders because it has a direct and almost immediate impact on the body's regulation of serotonin and melatonin levels. (Melatonin being the "sleep" hormone and serotonin being the "wake" hormone). Given the preponderance of evidence showing how effective certain wavelengths (colors) of light, blue and cyan, are at producing these results, Sun LifeLight is on a mission to be the first and only company to bring the mood enhancing, productivity boosting and energy amplifying benefits of sunlight to the masses, while we're at work...

SEROTONIN PRODUCTION & MELATONIN SUPPRESSION

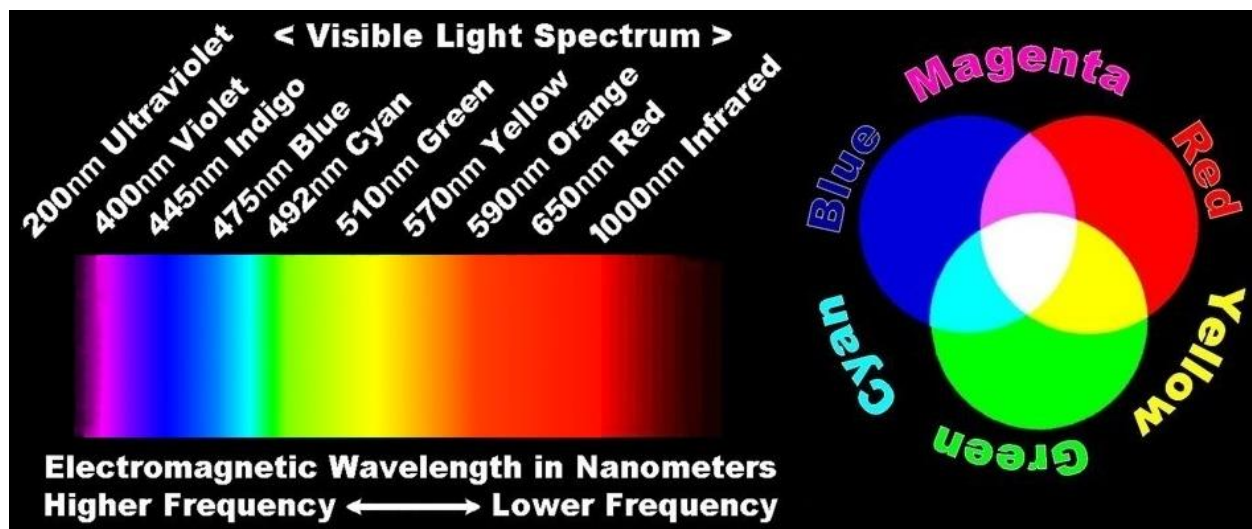
Approximately 90% of the human body's total serotonin is located in the enterochromaffin cells in the alimentary canal (abdomen), where it is used to regulate digestion processes. The remainder is synthesized in serotonergic neurons of the Central Nervous System (CNS), where it has various other functions. These include the regulation of mood, energy, alertness, metabolic rate, and sleep. Serotonin also has some cognitive functions, including memory and learning.

Voluminous data has been gathered over the past 30 years through research focusing specifically on the chemical processes responsible for these mechanisms. In 2002 the journal *Science* announced that a breakthrough discovery had been made. A new set of light sensitive receptors in the eye were discovered and surprisingly, these receptors are not used for vision. These intrinsically photosensitive Retinal Ganglion Cells (ipRGCs), found in all vertebrates, were eventually linked directly to the regulation of serotonin, melatonin and other hormones.

What is exciting about this research is that these receptors are separate from those that we use for vision. The fact is, they are located throughout the retina and addressed most effectively when the light enters the eye from above. These ipRGCs that contain a unique photopigment called melanopsin rendering these RGCs intrinsically photosensitive, it has been discovered, are particularly sensitive to blue and cyan colored light spectrum. These findings are also logically supported by their sampling of the amount of blue and cyan light in the sky, well above our normal field of view (about 30 degrees above horizontal) thereby minimizing any glare or other negative impact on our visual acuity.



Researchers at Rensselaer Polytechnic Institute (RPI) have shown that blue and cyan light, positioned above the field of view, provides significantly superior light therapy results in clinical environments as compared to full spectrum light (located in any position).

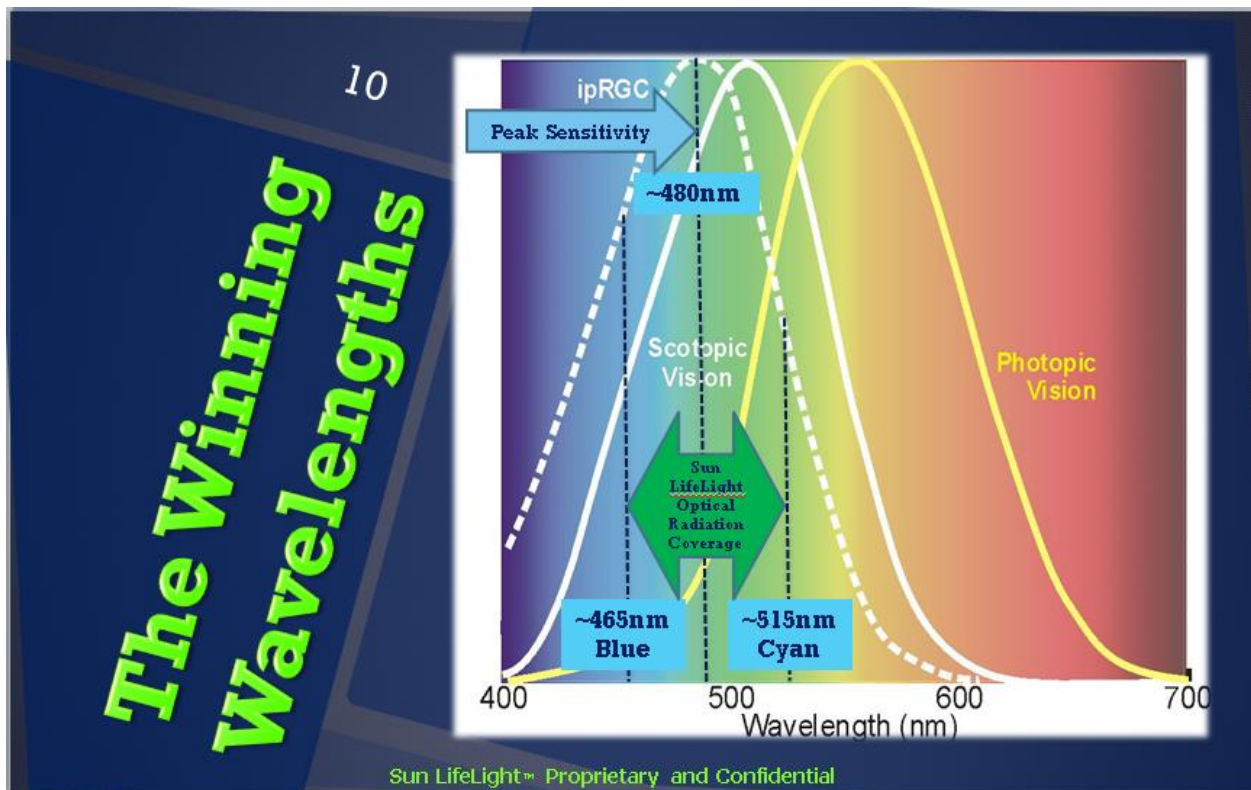


These ipRGC receptors do more than just regulate hormone levels. They also control the levels of a number of other hormones, and they do it in a smooth cyclical manner that we call our 'circadian rhythm'. One of the major discoveries made during circadian rhythm research has been that the body needs different hormones at different times of the day. Certain hormones such as melatonin are released to help us slow down, withdraw, and go to sleep. Other hormones such as serotonin are not needed at night, but are released during the day. Our

internal "clock" uses light signals to know when to produce the active energetic hormones, and when to produce the nighttime hormones.

The *LifeLight* is designed to stimulate the ipRGC receptors to maximize energizing effects, while minimizing visual discomfort. This is made possible because the *LifeLight* provides high intensity photons at the precise blue and cyan wavelengths required to activate the ipRGC receptors (Circadian response), while minimizing response of the rods and cones used for normal vision (Photopic response).

The result is, the *LifeLight* provides maximum therapeutic intensity, while minimizing the normal side effects experienced with high brightness, full spectrum light therapy. Full spectrum side effects include blinding glare, headaches, dizziness, and even nausea (all of which add to reduced ongoing patient compliance).



With its proprietary technology, the *LifeLight* is able to deliver the equivalent of nearly 15,000 lux of optical radiation that is received and processed most effectively by the melanopsin laced ipRGCs while providing less than 3,000 lux of visual energy thereby minimizing the glare that is caused by colored lights that center around the 555nm wavelength (depicted above on the yellow curve).

This is a very important distinction. While many light therapy devices on the market are therapeutic, the number one reason why most of these devices are unsatisfactory is that patients do not want to stare at bright lights for any length of time. Patients do not tend to stick

with a daily regimen that requires them to sit in front of light boxes that cause discomfort, for two hours every day - they just don't comply over long periods.

The *LifeLight*, unlike any other similar lighting product, is built using both blue and cyan colored LEDs delivering the precise wavelengths of light that the ipRGCs respond to. The light is housed in a unique, stylish and ergonomically effective, smart, personal light fixture that, by virtue of innovative attachment mechanisms, can be mounted onto or around virtually any computer workstation monitor. These same mechanisms allow the *LifeLight* to be adjusted for height and angle to allow for the perfect entry into the eye for maximum effect. Further, through a sophisticated yet simple control and monitoring software application running on a computer, smartphone or tablet, users can:

1. Vary the LED color choice from blue to cyan or both
2. Adjust the intensity for comfort
3. Monitor daily "sunlight dose" through a sophisticated dosage algorithm, accounting for light intensity, color selection and duration, the user will see their incrementing dose in the application window and be able to adjust the variables for comfort, efficacy and simplicity as required.
4. Premium service includes a daily profile recommendations to the user based on user defined links to different social schedules including sports teams, individual social calendars, etc. along with a connection to local weather data. Sun LifeLight's inference engine provides daily recommended dosing for each individual based on the information they provide and data gathered by the application. An example might include a user linking his/her lighting profile to a local weather forecasting application and his/her local professional football team schedule. In turn, the Sun LifeLight application might recommend a higher relative dose on a Monday following this user's football team having played late on Sunday night only to find that the Monday weather conditions are rain throughout the day. The application will continue to refine its recommendations as it learns the patterns of efficacy the LifeLight has on any particular user.
5. These settings can all be logged into up to 5 profiles for recall on any given schedule.



The result is a solution that delivers the benefits of energy producing, mood enhancing and productivity amplifying sunlight, in a stylish, useable fixture, where it's needed most...at work!