

Título del trabajo/ Title of paper

Iluminación Integradora 4.0

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Tema:

Iluminación Integradora 4.0



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DESCONOCÍAMOS PARTES
DE NOSOTROS MISMOS.



Conos

Las células capaces de procesar altos niveles de luz se denominan "conos". Se encargan de la visión fotópica y la visión mesópica directa, donde el reconocimiento de los colores(**CRI**) contribuya a un mayor rendimiento visual.

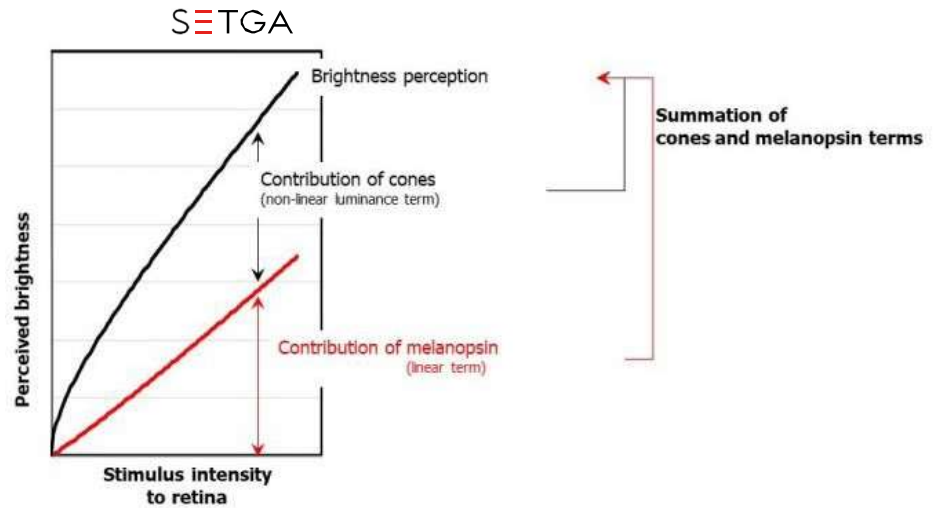
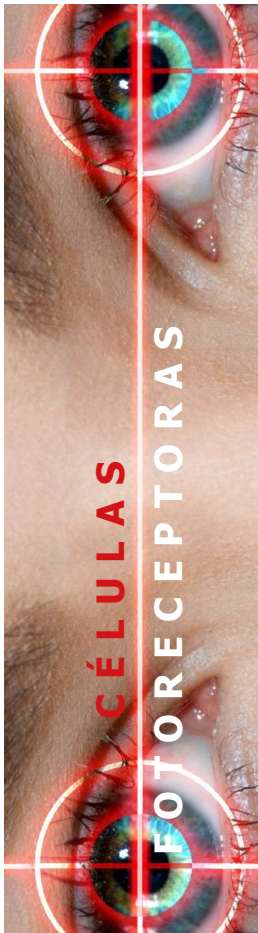
Bastones

Procesan niveles más bajos de luz: visión escotópica con alta sensibilidad en longitudes de onda corta. Bajo luz artificial, los bastones entran en juego junto a los conos a través de la visión mesópica indirecta cuya efectividad aumenta con luz blanca azulada.

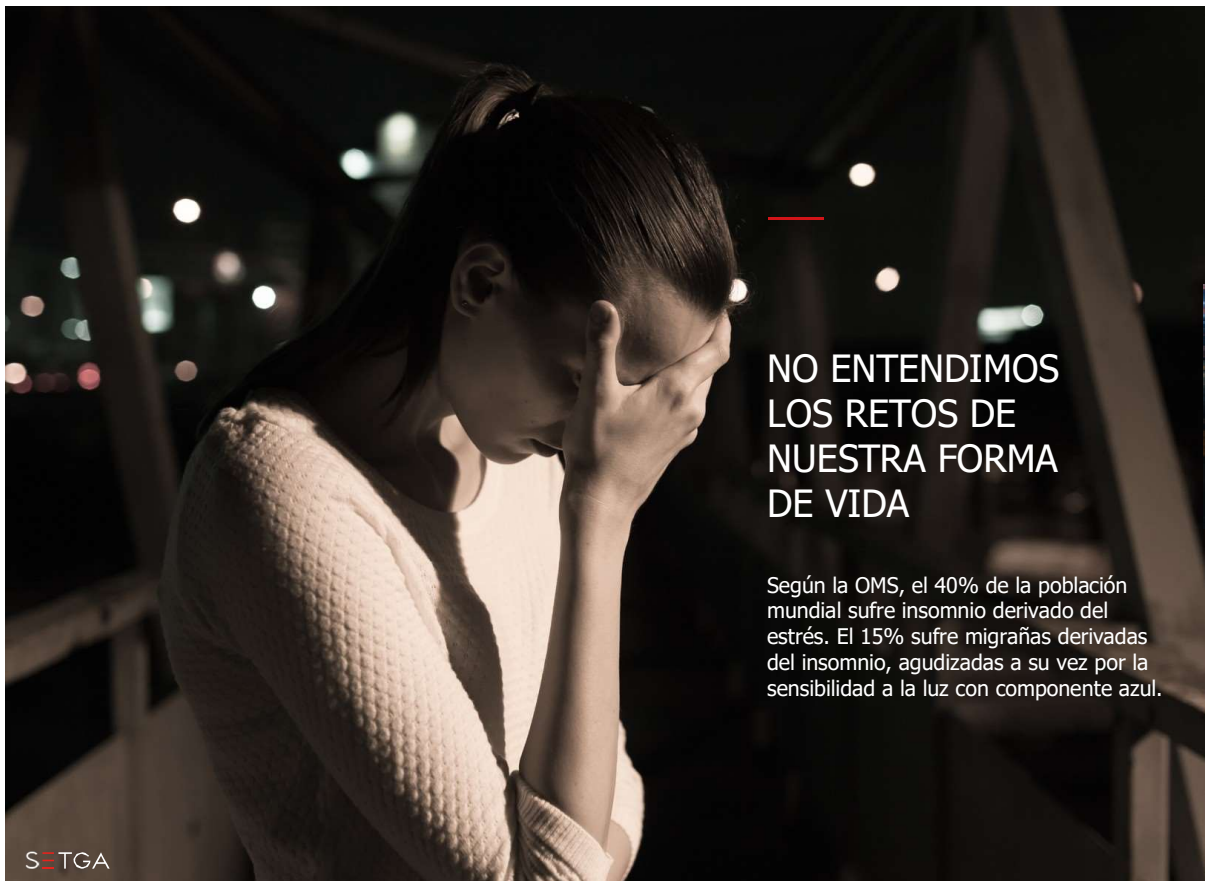
¿Y las células ipRGC?

Células ganglionares de la retina intrínsecamente fotosensibles (ipRGC), involucradas en el mantenimiento de **los ritmos circadianos**.





*La melanopsina es un fotopigmento encontrado en células ganglionares fotosensibles de la retina, las que están involucradas en la regulación del ritmo circadiano y los reflejos pupilares y otras respuestas no visuales a la luz.



NO ENTENDIMOS
LOS RETOS DE
NUESTRA FORMA
DE VIDA

Según la OMS, el 40% de la población mundial sufre insomnio derivado del estrés. El 15% sufre migrañas derivadas del insomnio, agudizadas a su vez por la sensibilidad a la luz con componente azul.

SUBESTIMAMOS LAS CONSECUENCIAS PATOLÓGICAS DEL COMPONENTE AZUL DE LA LUZ.



Insomnio

La Organización Mundial de la Salud (OMS) reconoce 88 tipos distintos de trastornos del sueño, pero el insomnio es el más frecuente. El insomnio crónico afecta al 8-10% de la población adulta, y el insomnio transitorio lo sufren alrededor del 40% de la población de cualquier país occidental.

Cefalea y fotofobia

Ley del **80% / 85%**

Según la AEPAC*, el 80% de población sufre algún tipo de Cefalea (Dolor de cabeza) entre las que se encuentra la migraña. El 85% de quienes sufren migraña sufren un trastorno conocido como fotofobia.

Cáncer

A su vez, Mario Motta, cardiólogo de la Asociación de Medicina Estadounidense, señaló que ya existen numerosos estudios que asocian la sobreexposición a la luz artificial con componente azul con el desarrollo de cáncer de mama y próstata, acelerando su avance cuando hay una exposición excesiva.

LA LUZ NO ES IGUAL PARA TODOS.

La luz blanco-azulada (valor S/P elevado) es menos efectiva para las **personas de avanzada edad**, tanto en el caso de visión directa como de visión indirecta, que la luz blan-co-cálida. Debido a que este efecto de absorción del azul minimiza el efecto de un mayor ratio S/P.

**Y PASAMOS DE UN EXTREMO A OTRO:
FIJAR ÁMBAR, 2500 O 3000K PARA TODOS LOS VIALES**



¿Seguridad vial?

Travesías con tráfico de alta densidad en horas punta colindantes con áreas residenciales.

Pasos de cebra y atropellos.

¿Horario comercial?

En invierno las zonas comerciales requieren una atmósfera lumínica que induzca a la actividad y segregación de cortisol con luz neutra entre las 17:30 y las 21:00.

¿Emergencias?

La efectividad de la visión mesópica indirecta de un Policía o un Bombero aumenta con luz blanca azulada.

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**ANTES DEL NUEVO POSICIONAMIENTO DE LA CIE SOBRE
ILUMINACIÓN INTEGRADORA, NADIE HABLABA DE..**



Salvo un fabricante.

Introducir conceptos de iluminación circadiana y biodinámica en alumbrado público mediante tecnologías de blanco dinámico compacto era inexplorado por el "main stream" del mercado.

En 2018 Setga lanza



"Light and building" 2018 y en el Symposium de ese mismo año. (2200k-4200k).

Y en 2019

cie



introduce su posicionamiento sobre los efectos no visuales de la luz en beneficio de la salud, rendimiento y bienestar. Habla de células ganglionares y supresión de melatonina.

POSITION STATEMENT ON NON-VISUAL EFFECTS OF LIGHT -
RECOMMENDING PROPER LIGHT AT THE PROPER TIME, 2NDEDITION
(OCTOBER 3, 2019)

For download:

CIE Position Statement on Non-Visual Effects of Light - Recommending Proper
Light at the Proper Time, 2nd Edition, October 2019

Translations:

Danish Version October 3, 2019



Background

Light is defined as any electromagnetic radiation that can create a visual sensation by directly stimulating the retinal photoreceptors of the visual system. In addition to enabling vision, these photoreceptors also drive biological effects that powerfully regulate human health, performance and well-being. Light is the main synchronizer of the human biological clock. It can shift the pha-

se of the circadian rhythm and can regulate the timing and quality of our sleep.

Light in the evening and at night can disrupt sleep and can cause acute suppression of the nocturnal release of the hormone melatonin. There are also reports that light can increase heart rate, improve alertness, alleviate seasonal and non-seasonal depression, influence thermoregulation, and affect brain activity as measured with the electroencephalogram (EEG). Exposure to light elicits fast responses

(in the range of milliseconds and seconds) in the pupillary reflex or in brain activity. To reflect their distinction from perceptual vision, these effects are often referred to as non-image-forming (NIF) or non-visual (NV) responses to light.

In recent years various marketing terms, such as “human-centric lighting” (HCL), “circadian lighting”, and “biodynamic lighting”, have come to describe lighting solutions that target such effects. In the upcoming 2nd edition of the CIE International Lighting Vocabulary, currently available as DIS (CIE 2016), “integrative lighting” is the official term for lighting that is specifically intended to integrate visual and non-visual effects, producing physiological and psychological effects on humans that are reflected in scientific evidence. The above-mentioned biological effects of light are elicited by stimulation of ocular photoreceptors.

The classical receptors for vision, the rods and cones, are relatively well understood and characterized by existing CIE publications. Pioneering work over the last 25 years revealed that the eye has another kind of photoreceptor. These photoreceptors play an important role in non-visual effects of light and have a peak sensitivity in the shorter wavelength part of the visible spectrum. Such photoreceptors are known as intrinsically-photosensitive retinal ganglion cells (ipRGCs), and their intrinsic photosensitivity is based on the photopigment melanopsin.

Based on the outcome of an independent workshop of leading scientists in the field of quantifying light for non-visual effects in Manchester in 2013 (see CIE TN 003:2015 (CIE 2015)), the CIE issued an international standard, CIE S 026:2018 (CIE 2018), that defines a system for metrology of optical radiation for light-induced responses that can be elicited by ipRGCs (ipRGC-influenced light (IIL) responses).

Lighting regulations and practice often still focus on visual and energy efficiency aspects of light, with little or no attention being paid to IIL responses. Conversely, there are many lighting products entering the market that are intended primarily to influence IIL without careful consideration of other lighting quality aspects. An improper

balance between these two approaches can result in lighting conditions that compromise human well-being, health and functioning and that fail in terms of overall lighting quality. Since the first edition of this Position Statement in 2015, the CIE has issued relevant publications and engaged in collaborative activities to advance this exciting aspect of lighting fundamentals, technology and applications.

1. How to characterize light with respect to its non-visual effects: CIE S 026:2018 “CIE System for Metrology of Optical Radiation for ipRGC-Influenced Responses to Light”

The International Standard CIE S 026:2018 (CIE 2018) defines spectral sensitivity functions, quantities and metrics to describe the ability of optical radiation to stimulate each of the five (a-opic1) photoreceptor types that can contribute, via the melanopsin-containing intrinsically-photosensitive retinal ganglion cells (ipRGCs), to retina-mediated non-visual effects of light in humans². The units of these a-opic quantities are in compliance with the International System of Units (SI) (BIPM 2019a, BIPM 2019b), which is essential to enable traceable measurements and international guidelines.

For non-image-forming effects of light, a description of optical radiation solely according to the photopic action spectrum is not sufficient. Moreover, there is no single action spectrum or proxy that can describe all eye-mediated non-visual responses to light. All five receptor types can contribute to these responses (Lucas et al. 2014). The relative contribution of each individual photoreceptor type can vary depending on the specific response and upon light exposure properties such as intensity, spectrum, duration, timing (external and internal/circadian), prior light history

and sleep deprivation state of the individual. It is worth noting that in many cases light exposure for ILL responses is better represented by using the vertical measurement plane rather than the horizontal plane to determine a-opic irradiance (or a-opic equivalent daylight (D65) illuminance (a-opic EDI)).

1 The term a-opic represents S-cone-opic, M-cone-opic, L-cone-opic, rhodopic or melanopic.

2 The CIE S 026 action spectra of the five human a-opic photoreceptor classes (S-cones, M-cones,

L-cones, rods and ipRGCs), tabulated in steps of 1 nm, are available at http://files.cie.co.at/S026_Table2_Data.xlsx.

2. Identifying the proper light at the proper time This remains a key question for many people. As outlined in the 2015 position statement, the CIE is actively engaged with the international community in attempting to provide guidance that is based on solid scientific evidence and consensus. The CIE and ISO/TC 274 are developing the first international consensus-based technical report concerning integrative lighting (ISO/CIE TR 21783, in preparation), noting both its potential beneficial effects and its possible risks that are to be avoided. Furthermore, in August 2019, a second independent workshop of leading scientists in this field took place in Manchester to discuss how insights in this field can be translated into guidelines for a healthy daily pattern of light exposure. A consensus publication on the outcomes of the workshop is currently being prepared by the workshop participants and will be followed by a CIE Technical Note reporting on the workshop in detail.

The CIE recognizes that spending adequate time outdoors during the day is associated with better health and well-being, and that exposure to natural light is a significant causal component in these effects. CIE also recommends not to unnecessarily restrict daylight within indoor settings.

For two important, well-studied human non-visual responses to light (melatonin suppression and pupil control), evidence is accumulating that the overall light sensitivity of these responses is largely controlled by melanopsin-based photoreception (Nowozin et al. 2017, Souman et al. 2018, Prayag et al. 2019, Spitschan 2019). In order to provide some initial guidance while waiting for the participants of the August 2019 workshop in Manchester to develop further insights and consensus in this field, the CIE recommends the manipulation of melanopsin-based photoreception as a useful strategy to manipulate overall light input into non-visual responses. This means that specifications in terms of melanopic EDI are a reasonable route

to provide initial guidance on how to manipulate the human (polychromatic) lighting environment in typical everyday life for non-visual responses in people

with a regular, day-active schedule (as long as these specifications are not compromising visual comfort and visual performance):

A high melanopic EDI during the day is usually supportive for alertness, the circadian rhythm and a good night's sleep.

A low melanopic EDI in the evening and at night facilitates sleep initiation and consolidation.

Suitable light patterns for night-shift workers are more complex, as they depend on the specific schedule.

Further CIE Strategy Delivering proper light at the proper time will require integrative approaches that meet the needs of all the people within a space. Ongoing CIE projects in this field include the joint activity with ISO/TC 274 to revise the international standard for indoor workplace lighting, ISO 8995-1:2002/ CIE S 008:2001 (ISO/CIE 2002).

The CIE is committed throughout all of its work, to providing scientifically-grounded recommendations and to advancing science that will support the next generation of standards. The development of proper evidence-based recommendations continues to demand concerted research efforts, and the CIE in its Research Strategy calls upon the research community to engage in developing this knowledge base. As a support to researchers and practitioners in this field, a toolbox to facilitate the application of CIE S 026:2018 will shortly be available on the CIE website. Researchers proposing to study topics relevant to the CIE Research Strategy may apply to the CIE for a letter of support for the proposal by emailing a request form to ciecb@cie.co.at.

References

BIPM (2019a) The International System of Units (SI), 9th Edition

Downloadable at <https://www.bipm.org/utis/common/pdf/si-brochure/SI-Brochure-9-EN.pdf>

BIPM (2019b) The International System of Units (SI), 9th Edition – Appendix 3: Units for photo-chemical and photobiological quantities

Downloadable at <https://www.bipm.org/utis/common/pdf/si-brochure/SI-Brochure-9-App3-EN.pdf>

CIE (2015) CIE TN 003:2015 Report on the First International Workshop on Circadian and Neuro-physiological Photometry, 2013

Downloadable at http://files.cie.co.at/785_CIE_TN_003-2015.pdf

CIE (2016) CIE DIS 017:2016 ILV: International Lighting Vocabulary, 2nd Edition



DE 254 nm A 700 nm



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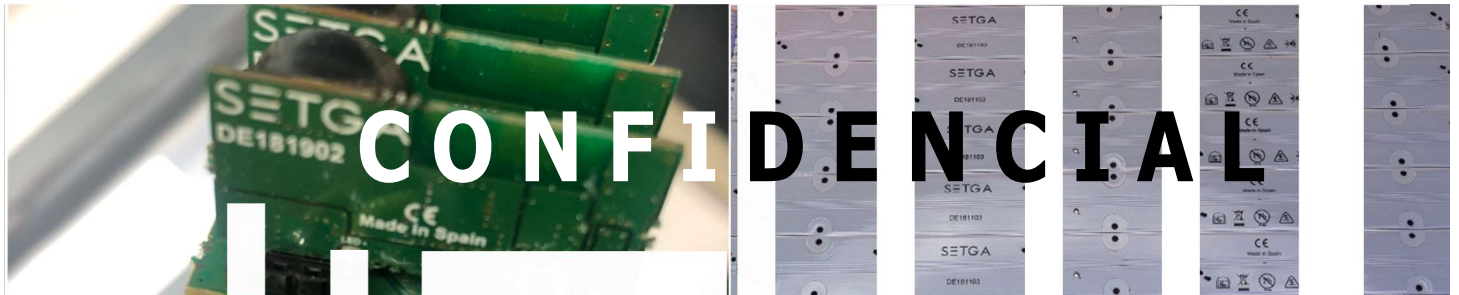
L=DGUADO



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AL CONTROL TOTAL DEL ESPECTRO.



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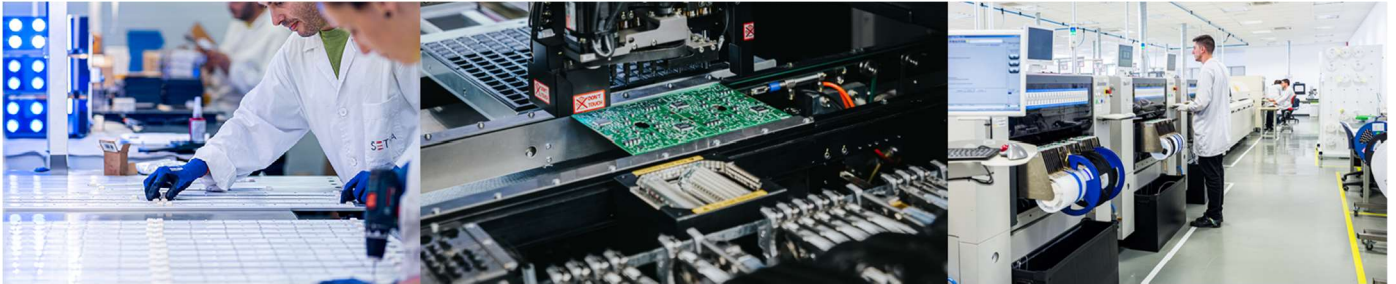
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ELECTRÓNICA MADE IN SPAIN
NO ES COSA DE LOCOS



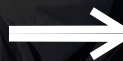
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**¿CÓMO JUZGAREMOS EN 2031
LA INFRAESTRUCTURA DE
ALUMBRADO PÚBLICO?**



¿Nos arrepentiremos de algo?



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