The Rise of Human Centric Lighting

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Outline

• Context
• Defining *Human Centric Lighting*
• Opportunity for *Integrative Lighting*
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• Opportunity for *Integrative Lighting*
Temporal Pattern

Spatial Pattern

Light Level

Light Spectrum

Temporal Pattern
Outline

• Context

Defining *Human Centric Lighting*

• Opportunity for *Integrative Lighting*
Google Trend* for **Human Centric Lighting**

- **Rise of Awareness of Non-Image Forming Effects†**
- **Euphemism for “Lighting Quality”†**
- **Rebranding of “High S/P” or “High CCT”†**

* [https://trends.google.com/](https://trends.google.com/)
Google Trends for **Lighting Quality** and **Human Centric Lighting**
Human Centric Lighting is a marketing term

2018 $1.3B†

2025 $6.4B†


Setting aside the marketing of *Human Centric Lighting*, what do people generally mean by the phrase?

**Integrative Lighting** [CIE DIS 017:2017, revised, in preparation]*

Lighting specifically integrating both visual and non-visual effects, and producing physiological and/or psychological benefits upon humans.

Note 1: The term “integrative lighting” applies only to humans.
Note 2: Lighting primarily for therapeutic purposes (light therapy) is not included.
Note 3: The term “human centric lighting” is used with a similar meaning.

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• Context
• Defining Human Centric Lighting

Opportunity for Integrative Lighting
Optical radiation is a complex stimulus that can be manipulated to affect people.

Optical radiation affects human physiological functioning.

- Changes pupil size \([1 – 3]\)
- Acutely suppresses melatonin \([3 – 9]\)
- Modulates alertness, body temp, and heart rate \([6, 10, 11]\)
- Shifts the timing of circadian rhythms \([12]\)
- Extended periods in windowless spaces have detrimental effects on vitality, activity levels, and sleep quality \([13]\)

On average, people spend 87% of the time indoors*

Effective design, construction, and maintenance of buildings can have a big impact on **quality of life**
(and on productivity, absenteeism, recruitment, retention, and profitability)

Temporal Pattern

Spatial Pattern

Light Level

Light Spectrum

Temporal Pattern
Temporal Pattern is the #1 influence on health related aspects of light.
Quantity is the #2 influence. Spectrum is #3.
Spatial Pattern should be considered with Quantity and Spectrum.
What then, is “human centric lighting”?

Light that is high in melanopic content

Light that is low in melanopic content

Darkness
Buildings where people **sleep** require **three** lighting conditions (for physiological health).

- Light that is high in melanopic content
- Light that is low in melanopic content
- Darkness

- **6**
- **12**
- **18**
- **24**
- **6**
Building where people **work/learn** require one static lighting condition (for physiological health).

Light that is high in melanopic content

Light that is low in melanopic content

Darkness