

Lighting Design, Circadian Health, and Metaphorical Realism: A Comprehensive Briefing

This briefing document synthesizes technical specifications for circadian lighting, architectural principles of light perception, and the artistic philosophy of Metaphorical Realism. It explores the transition of lighting technology from simple "visual performance" to a sophisticated medium that influences human biology and emotional subconsciousness.

Executive Summary

The lighting industry is currently undergoing a paradigm shift, moving beyond mere visibility toward "Integrative Lighting" or "Human-Centric Lighting" (HCL). This evolution is characterized by three distinct stages: a focus on visual performance (1900s), the study of psychological and emotional effects (1970s–1990s), and the recent discovery of non-visual biological impacts (2000s–present).

Key highlights include: * **The Science of Wellness:** The implementation of the **WELL Building Standard** and the use of **Equivalent Melanopic Lux (EML)** to regulate circadian rhythms and hormone production. * **The Grammar of Light:** Adoption of Richard Kelly's fundamental principles—**Ambient Luminescence, Focal Glow, and Play of Brilliants**—to structure visual information. * **Metaphorical Realism:** The artistic mission of

Vladimir Kush to connect seemingly disparate objects through visual metaphors, stimulating the subconscious "recollection" of ideal forms. * **Technological Advancement:** The development of low-cost **RGB color sensors** to accurately measure **Melanopic Equivalent Daylight Illuminance (mEDI)** in smart lighting systems.

Analysis of Key Themes

1. The Grammar of Light and Layering

Lighting design is structured by a specific "grammar" developed by Richard Kelly, which distinguishes between different qualitative layers of light.

- **Ambient Luminescence:** The "base layer" of light. It provides general orientation, minimizes the importance of individual objects, and suggests a sense of infinity or freedom of space. Examples include a snowy morning or twilight haze.
- **Focal Glow:** The "campfire of all time." This is accentuated lighting that commands attention, separates the important from the unimportant, and guides the viewer's eye to specific information or merchandise.
- **Play of Brilliants:** Light that is itself information. It creates a feeling of aliveness and excitement, achieved through point sources on reflective materials (e.g., chandeliers, Times Square at night, or sunlight on a brook).

2. Circadian Health and Biological Metrics

With the discovery of **intrinsically photosensitive retinal ganglion cells (ipRGCs)**, light is now measured for its "melanopic" impact—its ability to synchronize the body's internal clock.

Standard Requirements for Melanopic Light Intensity (WELL Feature 54)

The following table outlines the minimum thresholds for circadian support in various environments:

Environment	Minimum Threshold	Measurement Protocol
Work Areas	200 EML (75% of desks) or 150 EML (all desks)	Measured vertically at eye level (1.2m)
Living Areas	200 EML (Daytime) / < 50 EML (Nighttime)	Measured in bedrooms/bathrooms
Breakrooms	250 EML (Average)	Measured vertically at 1.2m
Learning Areas	125 EML (75% of desks)	Present for at least 4 hours daily

Key Metrics defined by CIE S 026/E:2018:

- **mEDI (Melanopic Equivalent Daylight Illuminance):** The illuminance of standard daylight (D65) that provides the same melanopic efficacy as the test light source.
- **mDER (Melanopic Daylight Efficacy Ratio):** A dimensionless ratio indicating how effective an artificial light source is at influencing the circadian rhythm compared to daylight.

3. Metaphorical Realism in Art and Design

The artist Vladimir Kush defines **Metaphorical Realism** as a genre that uses the "mirror of the metaphor" to reflect the world. This approach bridges the gap between traditional realism and abstract art.

- **The Artist's Credo:** Metaphor is a means of communication that targets the viewer's feelings and subconscious. It creates unexpected connections between different things, a process Kush compares to Plato's concept of the "recollection" of an ideal world.
- **The Business of Art:** Kush Fine Art, co-founded with Oleg Kush, emphasizes the "visual metaphor" as a formula—

connecting distant notions as transparently as a mathematical equation.

- **Materiality and Texture:** Designers like Victoria Yakusha utilize sculptural lighting with organic materials like **ZTISTA** (a blend of clay, hay, and recycled paper) to create "live design" that interacts with light to add soul and narrative to a space.
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4. Technical Innovation: RGB Sensors and Glare Control

Traditional spectroradiometers are often too expensive for mass-market smart lighting. Current research aims to use low-cost **RGB color sensors** to estimate non-visual parameters.

- **RGB to XYZ Transformation:** By applying matrix transformations (typically 3x3 to 3x22), researchers can convert RGB signals into tristimulus values and subsequently calculate mEDI and mDER with approximately $\pm 3.3\%$ accuracy.
 - **Unified Glare Rating (UGR):** A measure of discomfort glare on a scale of 10 to 30. A **UGR of 19** is the standard upper limit for acceptable discomfort in office environments.
 - **Light Preservation:** In commercial spaces and galleries, LEDs are preferred because they lack UV and infrared output, preventing the fading of textiles and delicate sculptures.
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Important Quotes with Context

On the Philosophy of Light and Space

"Space is nothing until interrupted. Light is invisible until interrupted by a surface, line, or point, thus made visible." — **Richard Kelly** *Context: Kelly is explaining that lighting design is not about the light source itself, but how*

light interacts with environment to create psychological sensations.

On the Power of Metaphor

"Imagination is more important than knowledge. Knowledge has its limitations, while imagination has no limits." — **Albert Einstein (cited by Vladimir Kush)**
Context: Kush uses this quote to justify Metaphorical Realism, arguing that the imagination creates the necessary connections between seemingly different things to provoke "sudden insight."

On the Role of Modern Lighting

"Lighting is not an accessory. It is the signature of a space." — **AfterSix Branding Philosophy**
Context: This quote emphasizes the shift from lighting as a functional necessity to a luxury design element that shapes the entire atmosphere of a room.

On the Architectural Intersection

"I wanted to reflect in our design Tiffany's well-known technique... jewelry shines because of light. I wanted to express their delicate transparency in this architecture." — **Kengo Kuma**
Context: Discussing the Tiffany & Co. Ginza Flagship, Kuma explains how 292 special "facet panels" of glass and aluminum honeycomb were used to diffuse light like a cut diamond.

Actionable Insights for Design and Implementation

1. Implementing Healthy Lighting Environments

- **Prioritize Daytime Blue-Rich Light:** To stimulate alertness, ensure a minimum of 250 mEDI during the day. As evening approaches, reduce mEDI to below 10 to allow for melatonin production.
- **Monitor Glare (UGR):** When selecting luminaires, choose fixtures with larger luminous surfaces (e.g., 2'x4' vs 1'x4') and lower candela at angles of 60 degrees or higher to reduce discomfort glare.
- **Layer for Complexity:** Do not rely on a "lonely chandelier." Combine ambient layers (low-glare downlights), task layers (under-cabinet LED strips), and accent layers (miniature spotlights on joinery) for a harmonious scheme.

2. Integrating Art and Architecture

- **Use Light as Narrative:** Treat light as a "spatial invitation." In commercial or hospitality lobbies, spotlighted sculptures can set a brand tone and encourage visitors to pause and connect emotionally.
- **Leverage Sustainable Materials:** Consider hand-sculpted materials like ZTISTA for lighting fixtures to introduce texture and "live" tactile quality that mass-produced materials cannot replicate.
- **Consult Technical Specialists:** For high-end retail or exhibitions, use LEDs to protect artwork from UV damage and employ "wall washers" to allow sculptures to blend or "spotlights" to create high-contrast moods.

3. Smart Technology Adoption

- **Calibrate Sensors for Daylight:** If using RGB sensors for smart lighting, ensure the transformation matrices are calibrated specifically for daylight (D65) vs. artificial LED

sources to maintain accuracy in non-visual parameter tracking.

- **Utilize Control Systems:** Incorporate dimmers (like Lutron's RadioRA or Grafik Eye) to increase lamp life. Dimming a halogen light by 10% can increase lamp life by 80%.