



Ethics of Anthropogenic Light at Night

Exploring the Dilemmas and Wonders of Human-Made Light at Night

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COLLEGE OF ENGINEERING

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Ethics of Anthropogenic Light at Night



- What do we stand for?
- What outcomes demand prioritization?

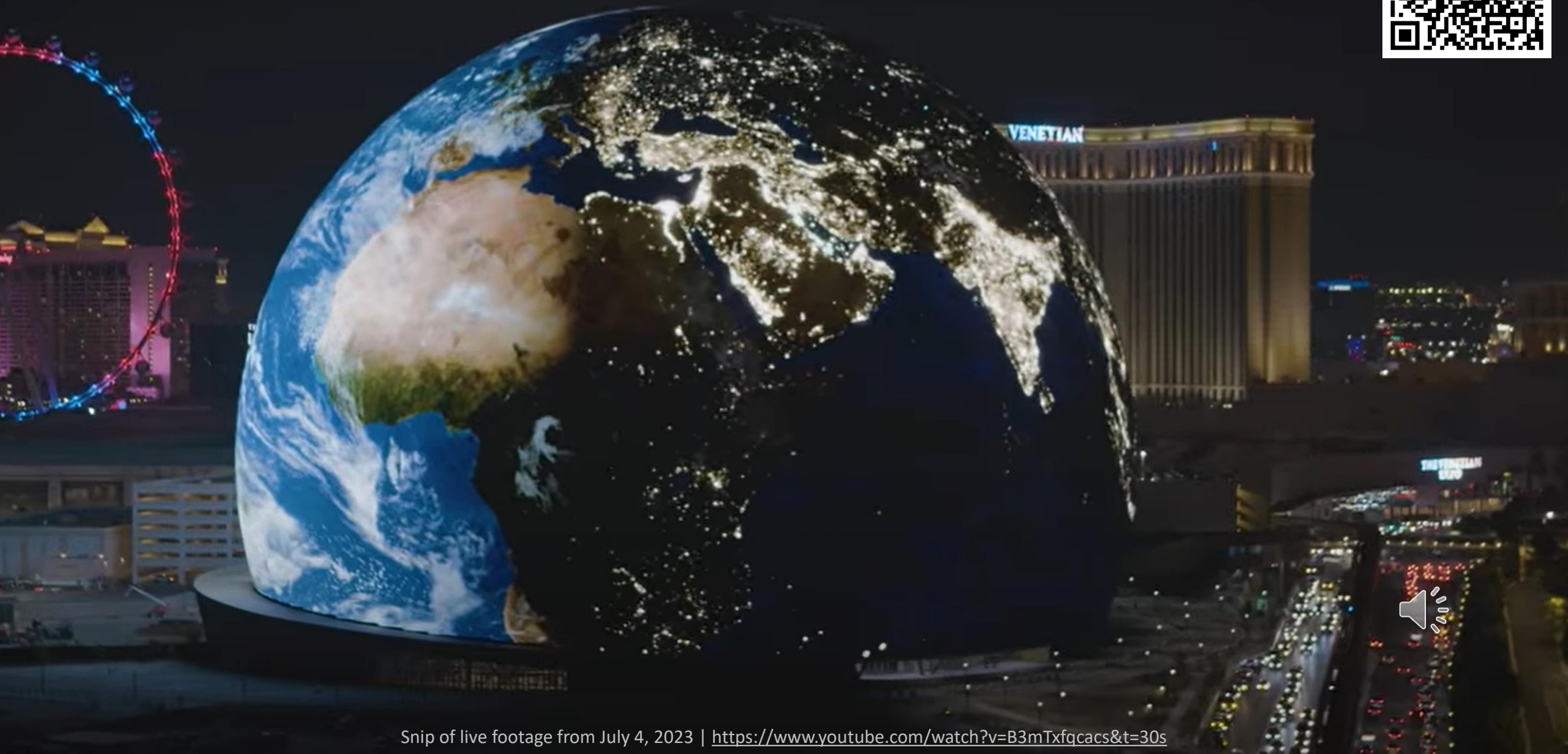


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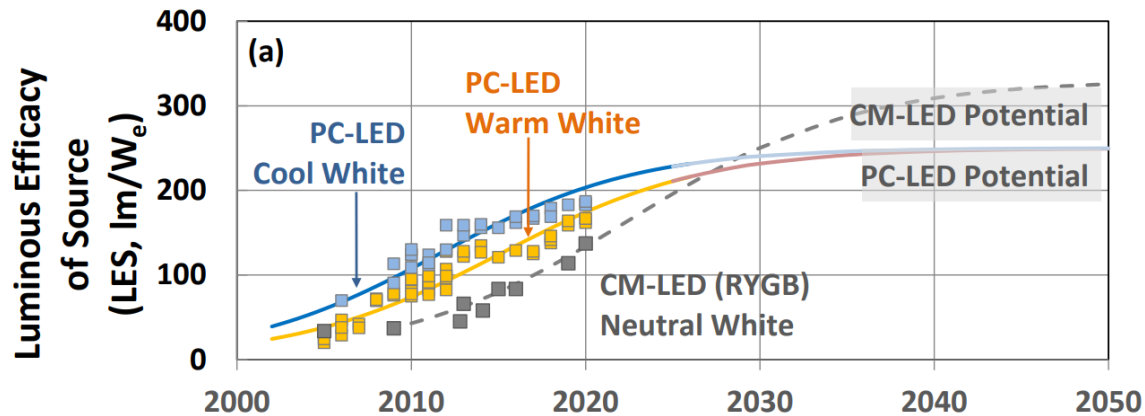
- Light produced by humans



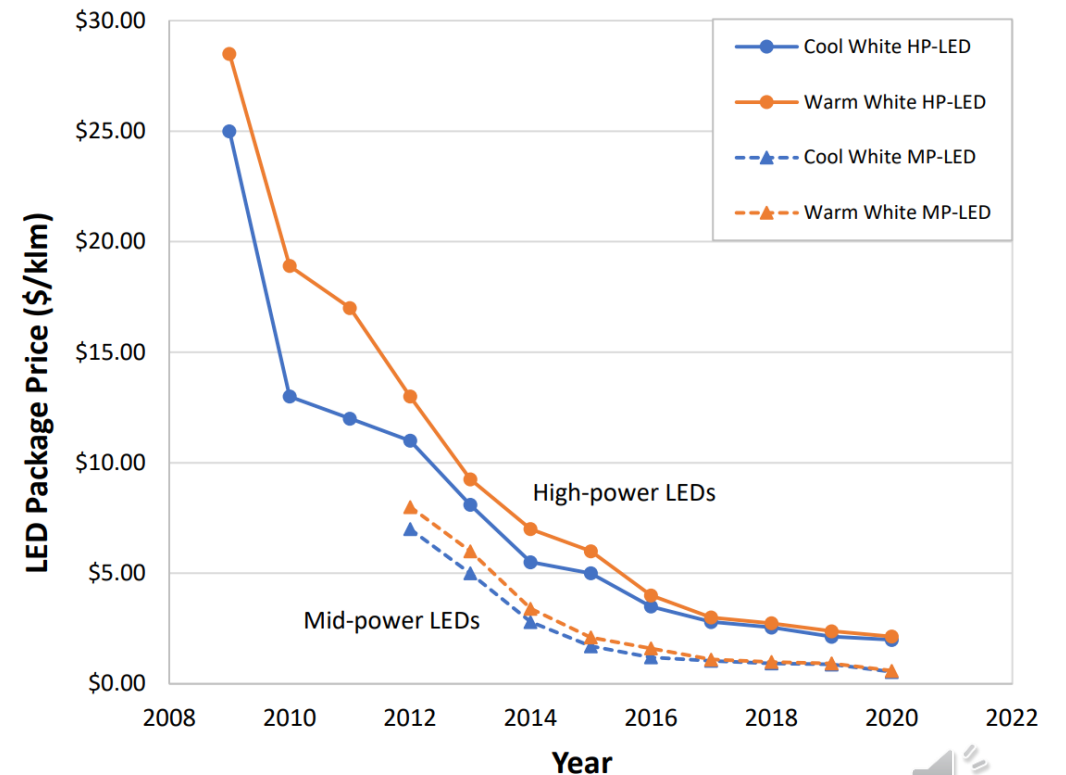


LED luminous efficacy has steadily improved, while price has steadily declined.

LED Luminous Efficacy vs. Time

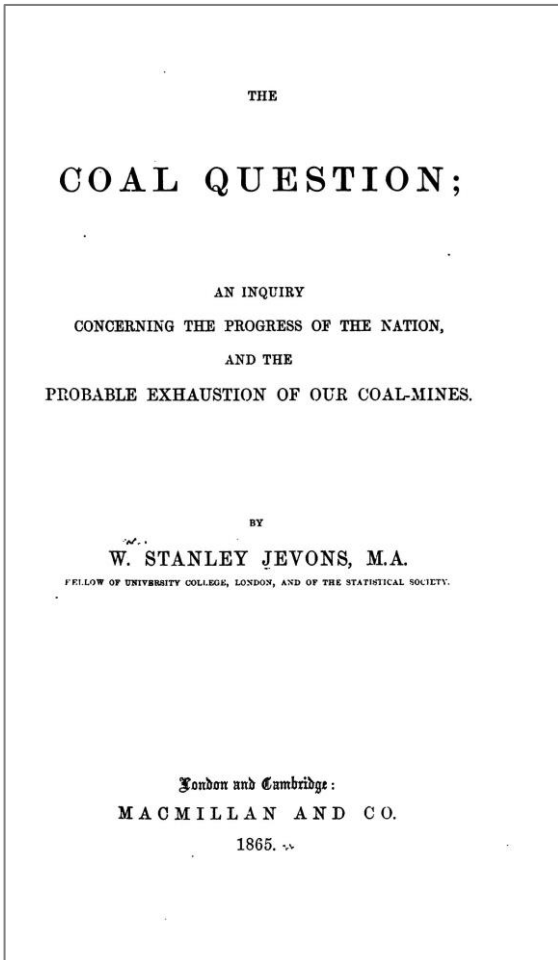


LED Package Price vs. Time




The Jevons Paradox

When technological progress increases efficiency of resource use, the fallen cost often leads to increase consumption of that resource.



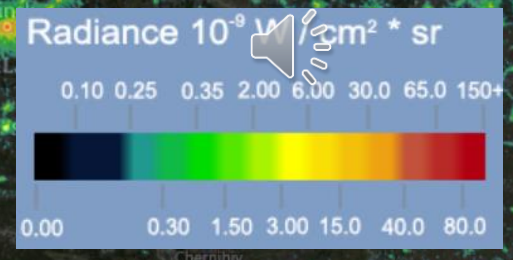
Modern Examples

- More fuel-efficient cars →
People drive more miles
- More efficient air conditioning →
People cool larger spaces to lower temperatures
- Better computer processors →
More energy-intensive applications
- More efficient refrigeration → 
Larger refrigerators and freezers

2012



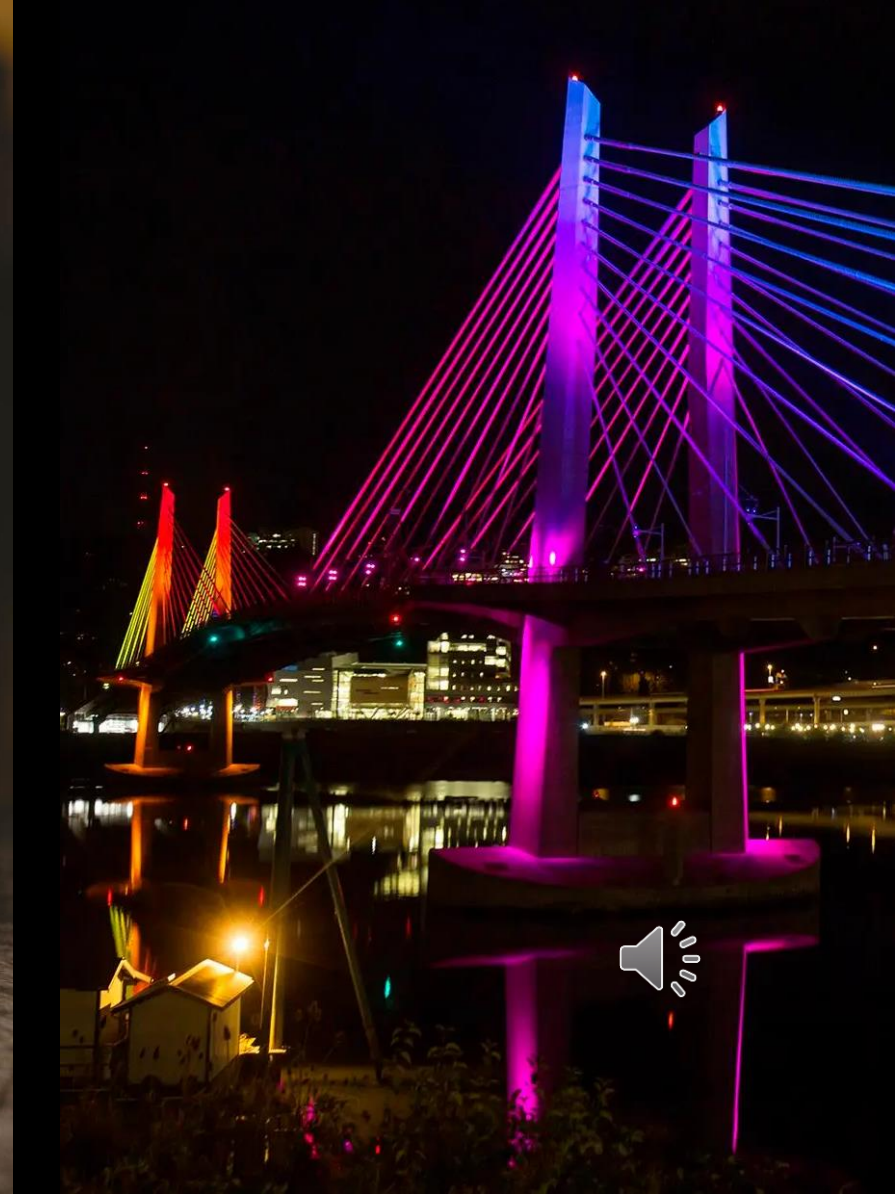
2023



Human-centered design focuses on people first.



Human-centered design focuses on people first,
but it should not be conflated with design quality.



Øresund Bridge



Motalabron Bridge



Frameworks for ethical thinking help guide judgments toward considered positions.

Consequence-Based

Do what is best for the greatest number of people.

Virtue-Based

Do what a virtuous person would do.

Duty-Based

Follow the applicable universal principles.

Care-Based

Do what your relationships demand.

Consequences of anthropogenic light at night are manifold.



Benefits

- Enables visibility after sunset
- To some degree, improves vehicular and pedestrian safety
- May create visual delight—nighttime lighting can be dramatic, romantic, and evocative
- Supports economic activity



Debatable

- Extends the day for work and play, enabling people to have flexible behaviors
- Enables nighttime outdoor entertainment, such as sports, concerts, and pedestrian districts (enjoyable, but biologically problematic)
- For some, improves perceptions of safety
- Lighting costs money to design, install, commission, operate, and maintain
- Might displace crime



Costs

- May create visual discomfort
- Reduces night sky visibility
- Perturbs human circadian rhythms and contributes to poor health
- Alters animal behaviors such as sleeping, eating, reproduction, and hiding
- Perturbs plants
- Sustained ecological disruption leads to habitat collapse—what does this mean for people?
- Contributes to global climate change

Let's consider Nobel Week Lights <https://nobelweeklights.se/>

Key Aspects

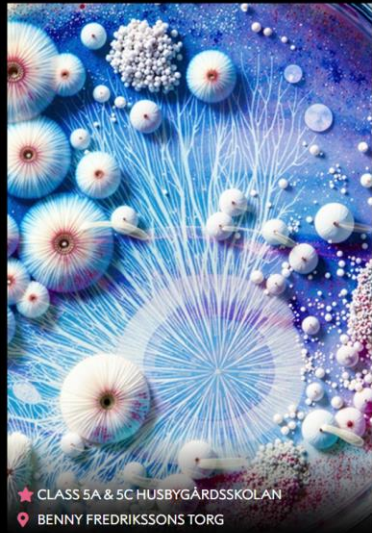
- Outdoor light festival that takes place during Nobel Week
- Free and accessible to the public
- Combines art, science, and sustainability themes
- Installations are often interactive or educational
- Uses public spaces and buildings as canvases



“... there is a clear connection between the light installations and the various Nobel Prizes ... the Västerbron ... is dressed in the green shimmering light that is often associated with radium and physics laureate Marie Curie ... wonderful to see how the light festival makes people move around the urban space and experience the city in a new way.”

Erika Lanner, Head Nobel Prize Museum

Let's consider Nobel Week Lights <https://nobelweeklights.se/>



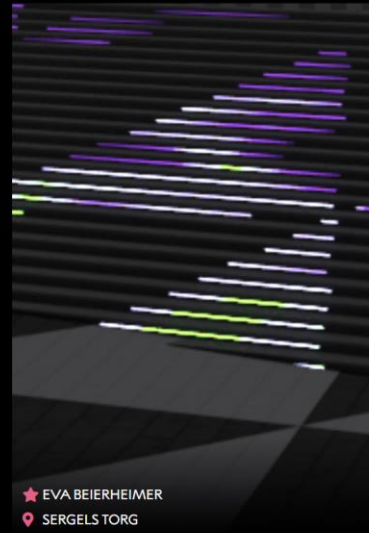
★ CLASS 5A & 5C HUSBYGÅRDSSKOLAN
📍 BENNY FREDRIKSSONS TORG

BIOCANVAS



★ KTH SCHOOL OF ARCHITECTURE
📍 KLARA MÅLARSTRAND
○ UNIVERSITY COLLABORATION

DE ADERTON



★ EVA BEIERHEIMER
📍 SERGELS TORG

EXPERIMENT



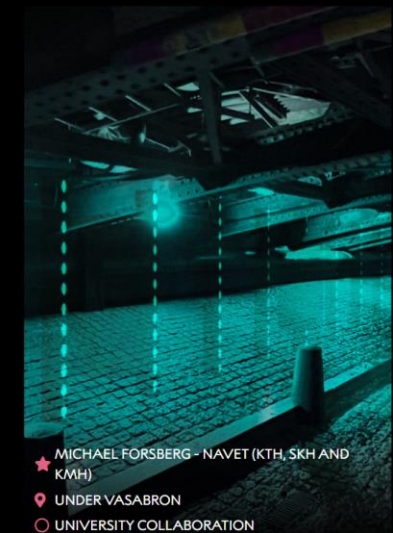
★ DAVID RAM
📍 KARL XIII:S TORG

LOTUS PODS



★ SMASH
📍 THE ROYAL SWEDISH ACADEMY OF FINE ARTS

LOVE AT FIRST SIGHT



★ MICHAEL FORSBERG - NAVET (KTH, SKH AND KMH)
📍 UNDER VASABRON
○ UNIVERSITY COLLABORATION

LUCIFERIN



★ STUDIO DUKTIG (BECKMANS)
📍 KULTURTORGET
○ UNIVERSITY COLLABORATION

NEMATODE



★ ULJANA BAYKEYVICH
📍 GRAND HÔTEL

SOLAR GLORY



★ KRAM (HYPER ISLAND)
📍 THE NODE
○ UNIVERSITY COLLABORATION

THE EYE



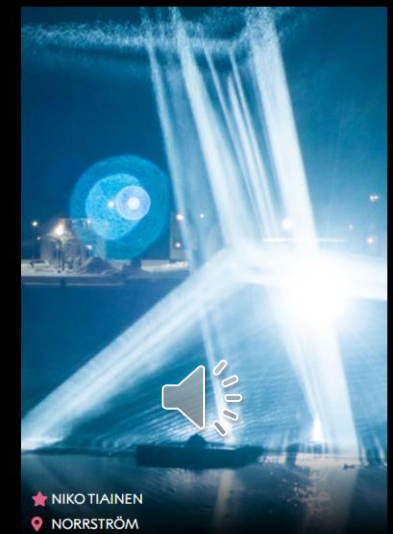
★ UXU
📍 NOBEL PRIZE MUSEUM COURTYARD

THE WATERFALL



★ VERTIGO
📍 NORRBRO

THE WAVE



★ NIKO TIAINEN
📍 NORRSTRÖM

TRANSLUCENS

Let's consider Nobel Week Lights <https://nobelweeklights.se/>

Benefits


- Cultural enrichment during dark winter months
- Public engagement with science
- Creation of community spaces during winter
- Economic benefits through tourism
- Celebration of innovation and human achievement

Challenges

- Temporary increase in light pollution during the darkest time of year
- Potential impact on local wildlife during sensitive winter period
- Energy consumption during peak energy demand season
- Setting precedents for architectural lighting



We do not want today's design decisions to become tomorrow's liabilities.

1. How might one practice lighting design if short-term considerations about human wants yield to long-term considerations about human and planetary health?
2. To what degree, if at all, should building facades and monuments be illuminated?
3. To what degree should window shading devices be employed at night to contain light within buildings?
4. To what degree can we choose to not light something?
5. To what degree can lighting curfews and time controls be employed to preserve night (for the benefit of flora, fauna, and people)? 

Suggestions

Good Ideas for Outdoor Lighting

- Reduce lumens
- Exceptional optics
- Intelligent sensing and control
 - Nightly
 - Seasonally
- Invest in design and engineering
 - “Goldilocks” light levels
 - Light where needed only, including designed darkness
 - Controls design and integration
 - Sensitive spectral control

Bad Ideas for Outdoor Lighting

- Erring on the side of “more lumens”
- One-to-one retrofits for “equivalent” performance
- Dusk-till-dawn operation
- White light with high CCT
- Over-reliance on public input and under-reliance on professionals



The future is what we make it.

Past



Present



This Future?



Or This Future?





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University



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Ethics of Anthropogenic Light at Night

Exploring the Dilemmas and Wonders of Human-Made Light at Night

November 21, 2024 | Lighting Days | Stockholm, Sweden

Presenter

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Brief Biography

Kevin Houser (PhD, PE, FIES, LC, LEED AP) is a Professor of Architectural Engineering at Oregon State University with a joint appointment as Chief Engineer at Pacific Northwest National Laboratory. He has published more than 125 articles about light and lighting and has delivered more than 125 presentations on 6 continents. He's won the CIBSE Leon Gaster and Walsh Weston Awards, IES Taylor Technical Talent Award three times, the IES Presidential Award, is a Fellow of IES, and a recipient of a 2022 Edison Report Lifetime Achievement Award. He was the editor of LEUKOS, the journal of IES, for a decade, and one of the four editors of the 10th edition IES Lighting Handbook. His work focuses on human perceptual and biological responses to light in a context that balances human needs with planetary health.

Presentation Abstract

Human-centric lighting prioritizes short-term human needs, but at what cost? Anthropogenic light at night (ALAN) creates tension between human perceptions and ecological impacts. Enter ethics, whose frameworks can help guide human values in the face of competing considerations. This presentation will employ ethical frameworks to examine the use of human-made light at night. How can we reconcile the many forms of life affected by our illuminated nights? What might responsibility look like in the face of unintended consequences? We'll face both the beauty and disturbances brought about by nighttime lighting, engaging with ethics to carve a thoughtful path forward.

Learning outcomes

After this presentation, participants will be able to:

1. Discuss ways that anthropogenic light at night provides benefits and harms.
2. Explain some of the problems associated with a human-centric approach to outdoor lighting.
3. Connect classical ethical frameworks to lighting design decisions.
4. Form evidence-based perspectives on outdoor lighting, grounded in ethical reasoning and aligned with personal and professional values.

Supplemental Material

I'm pleased to share several key resources to help deepen understanding of the topics presented today and support discussions with colleagues and clients:

1. The "Five Lighting Principles for Responsible Outdoor Lighting" was jointly published by DarkSky International and the Illuminating Engineering Society in April 2020, providing our foundation for responsible lighting practices.
2. The ROLAN (Responsible Outdoor Lighting at Night) Manifesto, published in ARC magazine in September 2022, builds upon these five principles with expanded guidance.
3. For those interested in human-centric lighting and its relationship with artificial light at night, I've included links to articles I've co-authored with trusted colleagues.
4. Finally, BirdCast, developed by Cornell Lab of Ornithology, offers real-time forecasting of bird migration across the US. This system can integrate with lighting controls to reduce illumination during peak migration periods.

Resources (1 of 4): DSI/IES Recommendations

Five Lighting Principles for Responsible Outdoor Lighting



Responsible outdoor lighting is

1 Useful

Use light only if it is needed

All light should have a clear purpose. Consider how the use of light will impact the area, including wildlife and their habitats.



2 Targeted

Direct light so it falls only where it is needed

Use shielding and careful aiming to target the direction of the light beam so that it points downward and does not spill beyond where it is needed.



3 Low Level

Light should be no brighter than necessary

Use the lowest light level required. Be mindful of surface conditions, as some surfaces may reflect more light into the night sky than intended.



4 Controlled

Use light only when it is needed

Use controls such as timers or motion detectors to ensure that light is available when it is needed, dimmed when possible, and turned off when not needed.



5 Warm-colored

Use warmer color lights where possible

Limit the amount of shorter wavelength (blue-violet) light to the least amount needed.



Resources (2 of 4): ROLAN Manifesto

ROLAN Manifesto for lighting professionals

The Responsible Outdoor Lighting At Night (ROLAN) Manifesto sets out ten core principles for external illumination and a plan of action to implement positive change in the lighting community to lead to a more sustainable, healthier, and safer future for all.

1. Everyone should have the right to access darkness and quality lighting, and light needs to be used and distributed fairly without discrimination.
2. Start your design with darkness and only add light if it supports nocturnal placemaking and protects a view of the stars.
3. In all projects, strive to maximise the benefits of outdoor light at night by creating legible, safe spaces and journeys, simultaneously limiting each project's environmental and financial costs.
4. Apply the Five Principles of Responsible Outdoor Lighting in all lighting projects:
 - All light should have a clear purpose.
 - Light should be directed only to where it's needed.
 - Light should be no brighter than necessary.
 - Light should be dimmed down or turned off when not required.
 - Use warmer colour lights where possible.
5. Collaborate with researchers from different disciplines and specialties, such as astronomers, ecologists, biologists, lawyers, etc., so they can provide expertise on unfamiliar topics.
6. Educate your clients about the importance of ROLAN.
7. Ensure the community you work with is an active stakeholder and participant in all lighting projects. Enquire about their needs and wishes at night, and provide them with access to information to make informed decisions.
8. Embrace technology by asking for support from the lighting industry to ensure that night-time biodiversity is sustained, and energy consumption is reduced. Engage with the lighting design industry to deliver an appropriate lighting solution.
9. A circular economy should be integrated into the brief, design, specification, and manufacturing process of your project, as well as its installation.
10. After project completion, visit the site at night with community stakeholders, to verify that your lighting design was fully implemented and meets ROLAN principles.



Because the UN Sustainable Development Goals (above) do not explicitly refer to external illumination and its multiple impacts, the Founding Partners of the ROLAN movement, are keen to address this in support of the SDG Goals. By following the principles outlined in the ROLAN manifesto, governments, businesses, and individuals support the implementation of the following SDG.

The principal authors of the ROLAN Manifesto are Dr Karolina M. Zielinska-Dabkowska - the ILLUME research group/the Gdansk University of Technology; and Ruskin Hartley - the International Dark-Sky Association, with contributions and support from further Founding Partners: the Society of Light and Lighting (SLL), the International Association of Lighting Designers (IALD), the Illuminating Engineering Society (IES), the Institution of Lighting Professionals (ILP) and the Lighting Industry Association (LIA).

If your organisation would like to support ROLAN movement, please contact: k.zielinska-dabkowska@pg.edu.pl

<https://darksky.org/news/responsible-outdoor-lighting-at-night-rolan-manifesto-for-lighting/>

Resources (3 of 4): Balancing Priorities

Human-Centric Lighting: Myth, Magic, or Metaphor?

Kevin Houser, Peter Boyce, Jamie Zeitzer, Michael Herf

<https://doi.org/10.1177/1477153520958448>

In this LR&T article, I and my co-authors unpacked the concept of Human-Centric Lighting. What is old? What is new? What is known? What is unknown? What are the varied roles of different constituencies?

Human-Centric Lighting: Foundational Considerations and a Five-Step Design Process

Kevin Houser, Tony Esposito

<https://doi.org/10.3389/fneur.2021.630553> [OPEN ACCESS]

In this Frontiers in Neurology article, I and Tony Esposito endeavored to write with empathy for a specifier. They are the ones that are tasked with designing light for people, yet the information they need to make good decisions is fragmented and inconsistent. We were trying to provide order to the complexity of information that is out there.

Ethics and Fallacies of Human-Centric Lighting and Artificial Light at Night

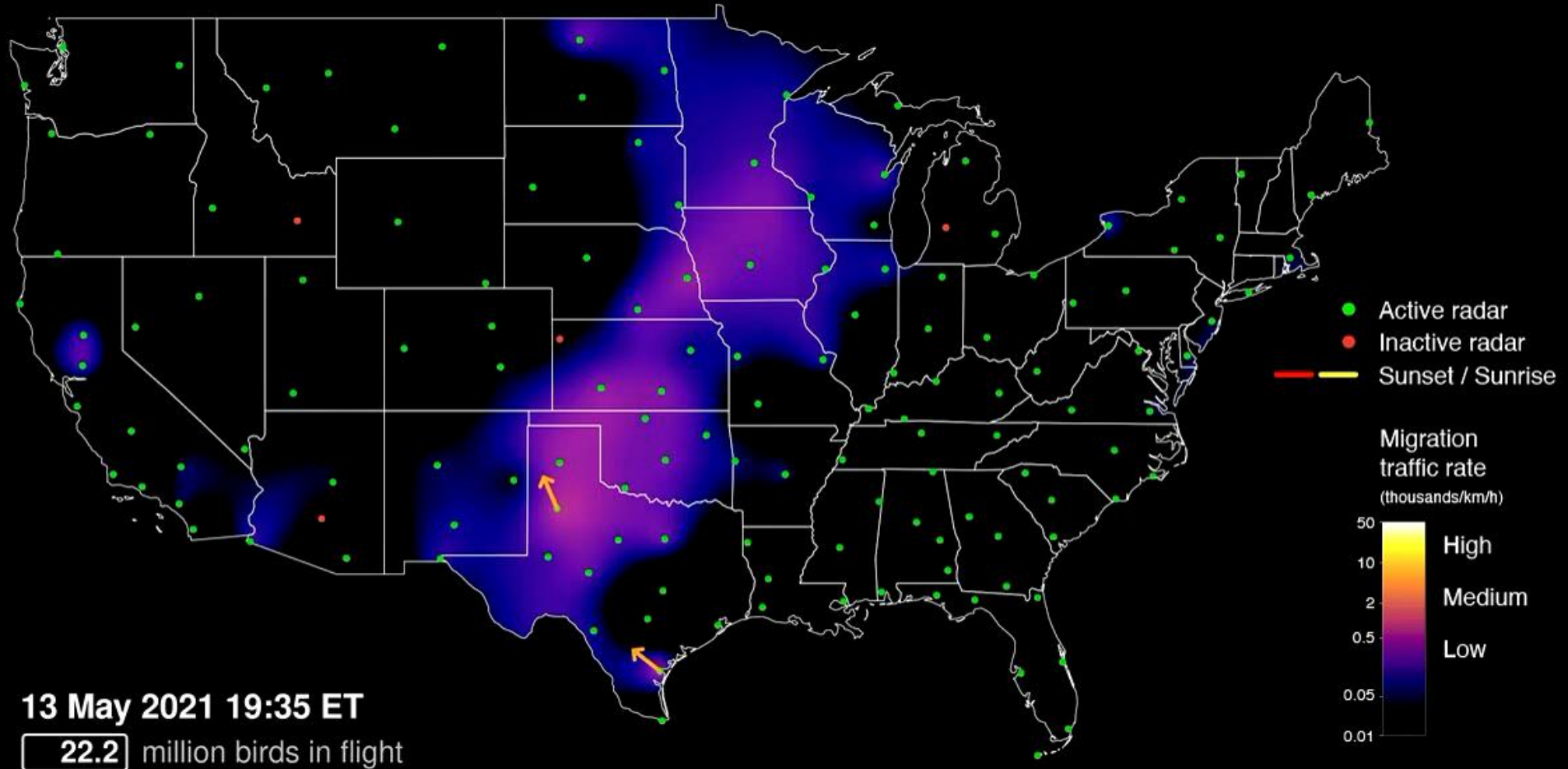
Kevin Houser

<https://doi.org/10.1080/15502724.2021.1951021> [OPEN ACCESS]

In this LEUKOS editorial I comment on the intrinsic problems with human centricity. Lighting causes collateral damage to people and non-human life. Does the lighting community have the collective will to do better?

Resources (4 of 4): BirdCast

Realtime bird migration forecasting tool, but only within the United States.



Live bird migration maps Dokter 2021

BirdCast

<https://www.allaboutbirds.org/news/heres-how-to-use-the-new-migration-forecast-tools-from-birdcast/>