



U.S. Department of Energy

LIGHTING R&D WORKSHOP

Co-sponsored by the Illuminating Engineering Society

# Ideal Lighting ... Design Software

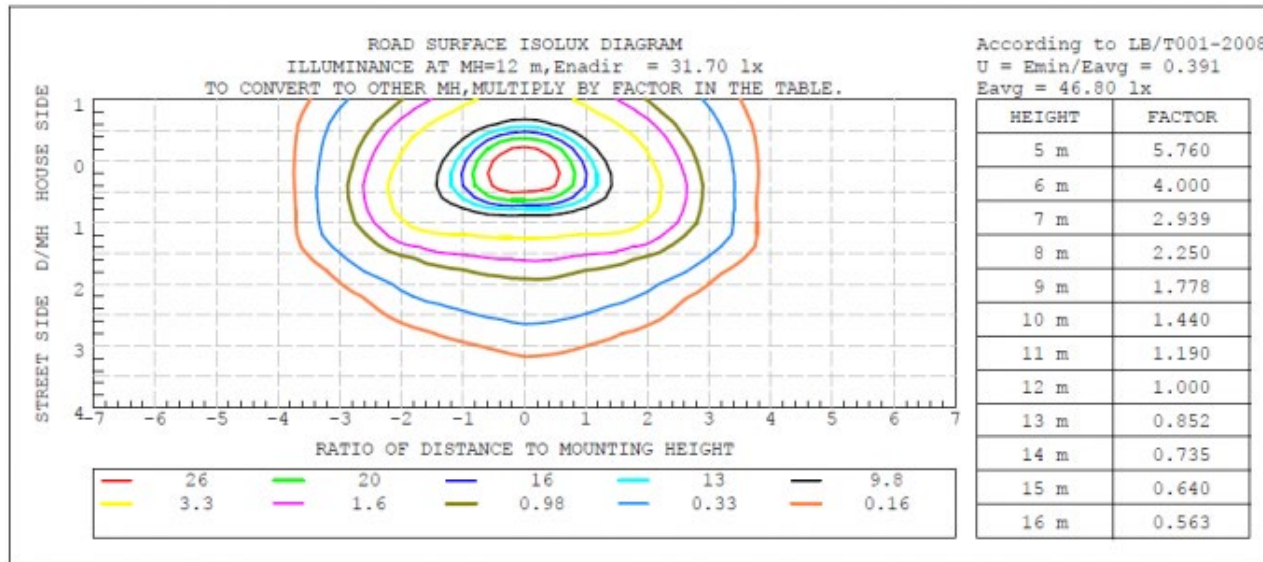
February 1, 2021

## Ideal Lighting ... Design Software

Ian Ashdown, P. Eng. (Ret.)  
Senior Research Scientist  
SunTracker Technologies Ltd.

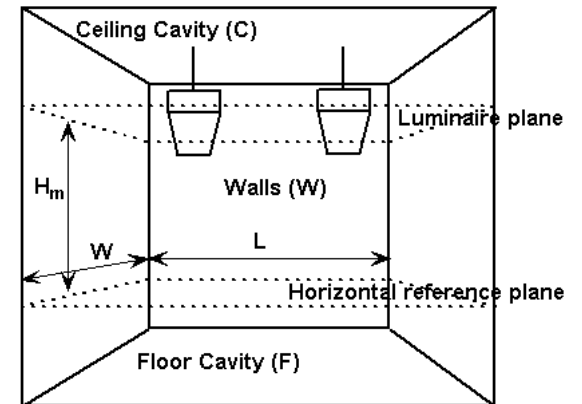
# LIGHTING R&D WORKSHOP

Co-sponsored by the Illuminating Engineering Society



Lumen Method

$$k = \frac{a * b}{h * (a+b)}$$



Point-by-Point

“Forget the numbers ... what is my design going to look like?”

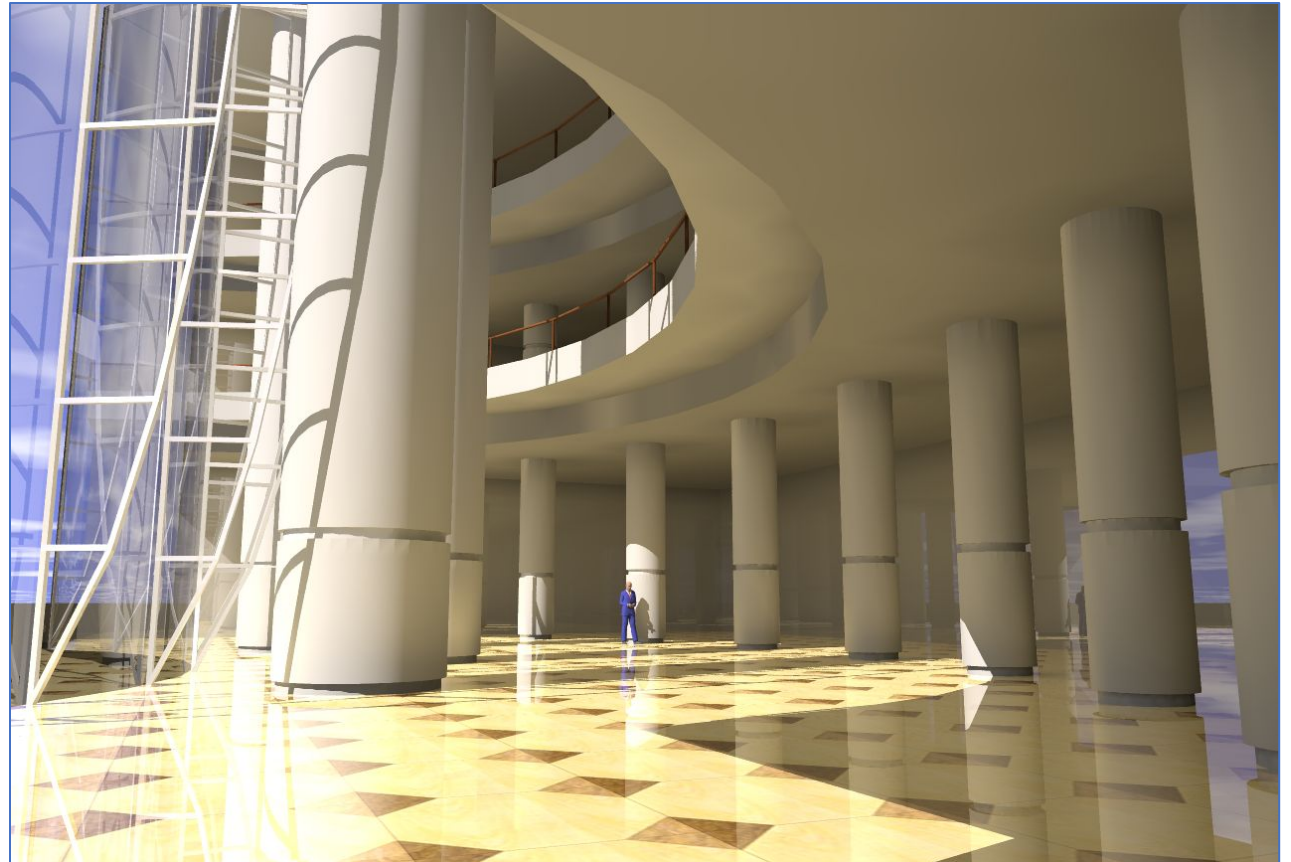
Anonymous

# LIGHTING R&D WORKSHOP

Co-sponsored by the Illuminating Engineering Society

## Lighting Design Software Today

- Physically realistic renderings
- Illuminance and luminance
- Visual glare (UGR)
- Daylight factor (DF)
- Spatial daylight availability (sDA)
- Annual Sunlight Exposure (ASE)





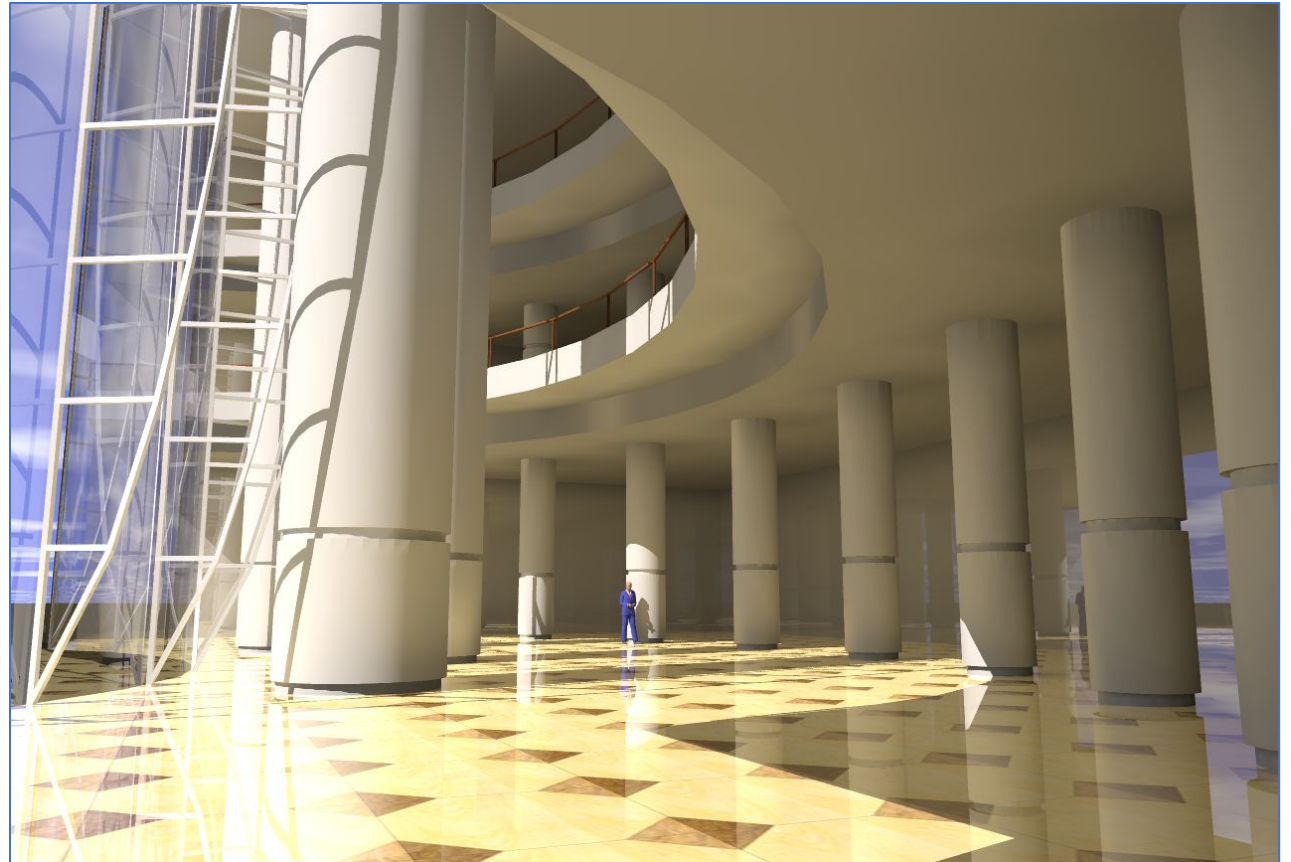
# LIGHTING R&D WORKSHOP

Co-sponsored by the Illuminating Engineering Society

## Lighting Design Software Today

- Physically realistic renderings
- Illuminance and luminance
- Visual glare (UGR)
- Daylight factor (DF)
- Spatial daylight availability (sDA)

NOT IDEAL



# LIGHTING R&D WORKSHOP

Co-sponsored by the Illuminating Engineering Society

## Lighting Design Software Tomorrow

- Visualization
  - Lighting controls
  - Color-changing
  - Dynamic lighting
  - Adaptive lighting
- Virtual sensors
  - Color vision
  - Circadian
  - Germicidal
  - Horticultural



The Jetsons circa 1963 – © Hanna-Barbera Productions



# LIGHTING R&D WORKSHOP

Co-sponsored by the Illuminating Engineering Society

## Lighting Design Visualization

- Networked lighting controls
- Color-tunable luminaires
- Building façade lighting
- Adaptive streetlighting



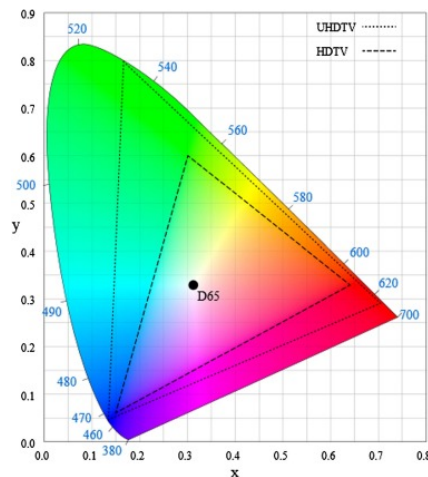
Samuel de Champlain Bridge, Montreal

# LIGHTING R&D WORKSHOP

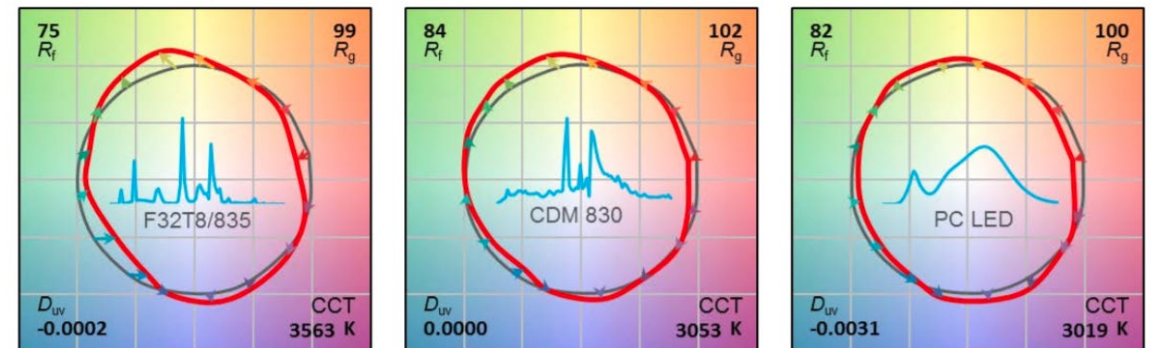
Co-sponsored by the Illuminating Engineering Society

## Virtual Sensors

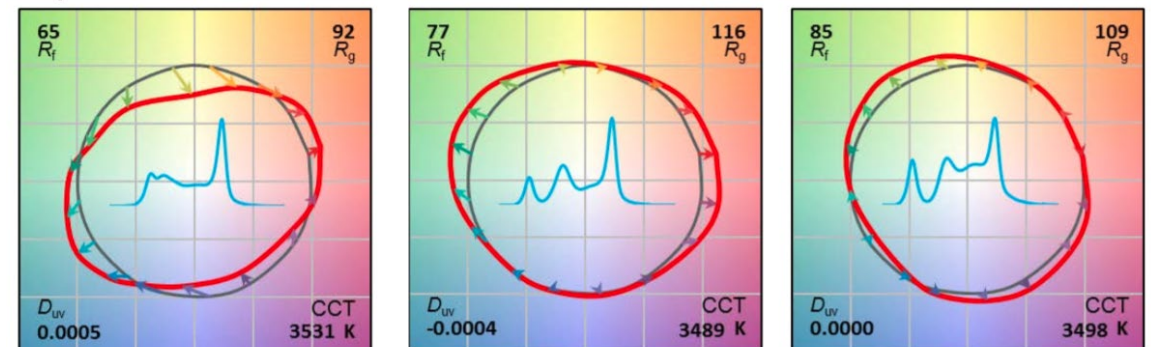
- Human Vision
  - Color sensor (CIE xyY)
  - Color rendering (TM-30)
  - Spectroradiometer



### Commercially Available Sources



### Experimental LED Sources



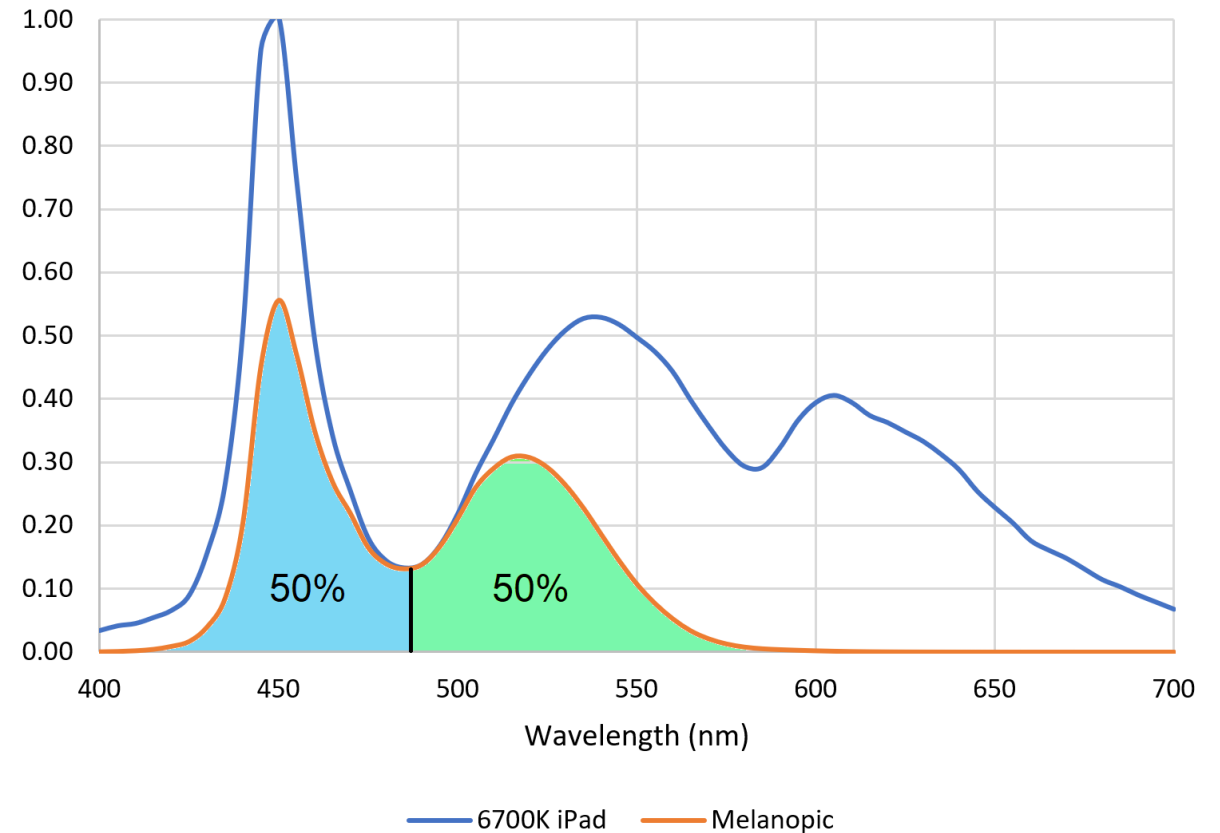


# LIGHTING R&D WORKSHOP

Co-sponsored by the Illuminating Engineering Society

## Virtual Sensors

- Circadian-based lighting
  - Melanopic luxmeter
  - Circadian dosimeter

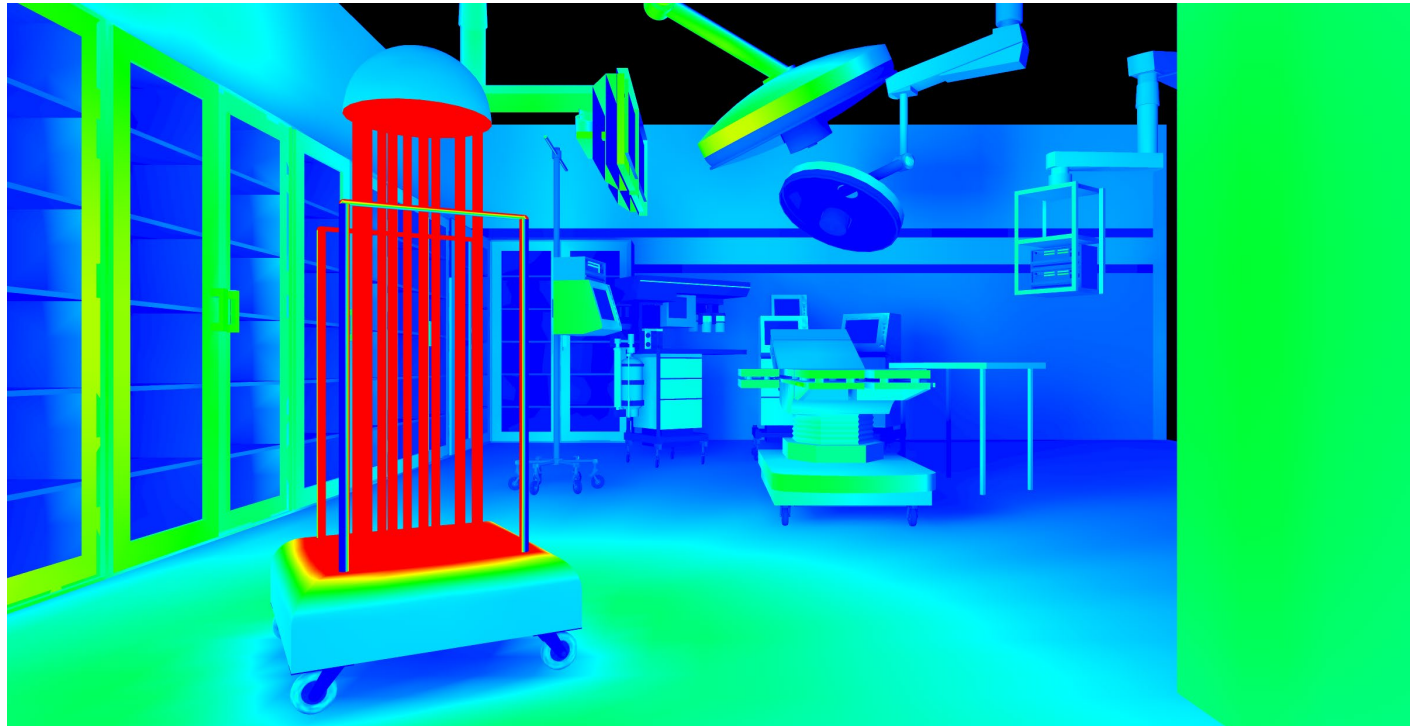
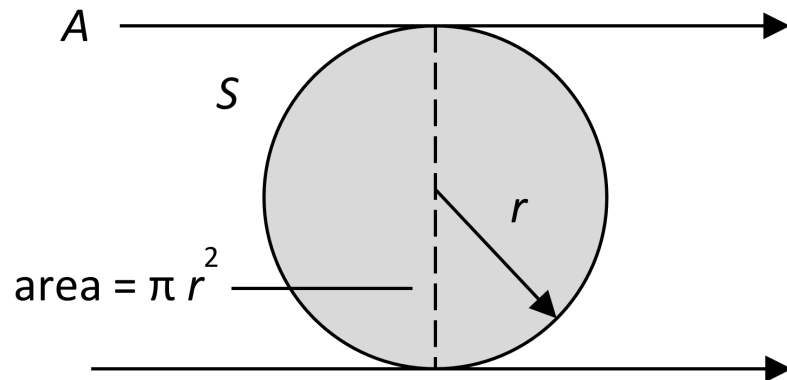


# LIGHTING R&D WORKSHOP

Co-sponsored by the Illuminating Engineering Society

## Virtual Sensors

- Germicidal
  - UV-C irradiance
  - UV-C fluence rate

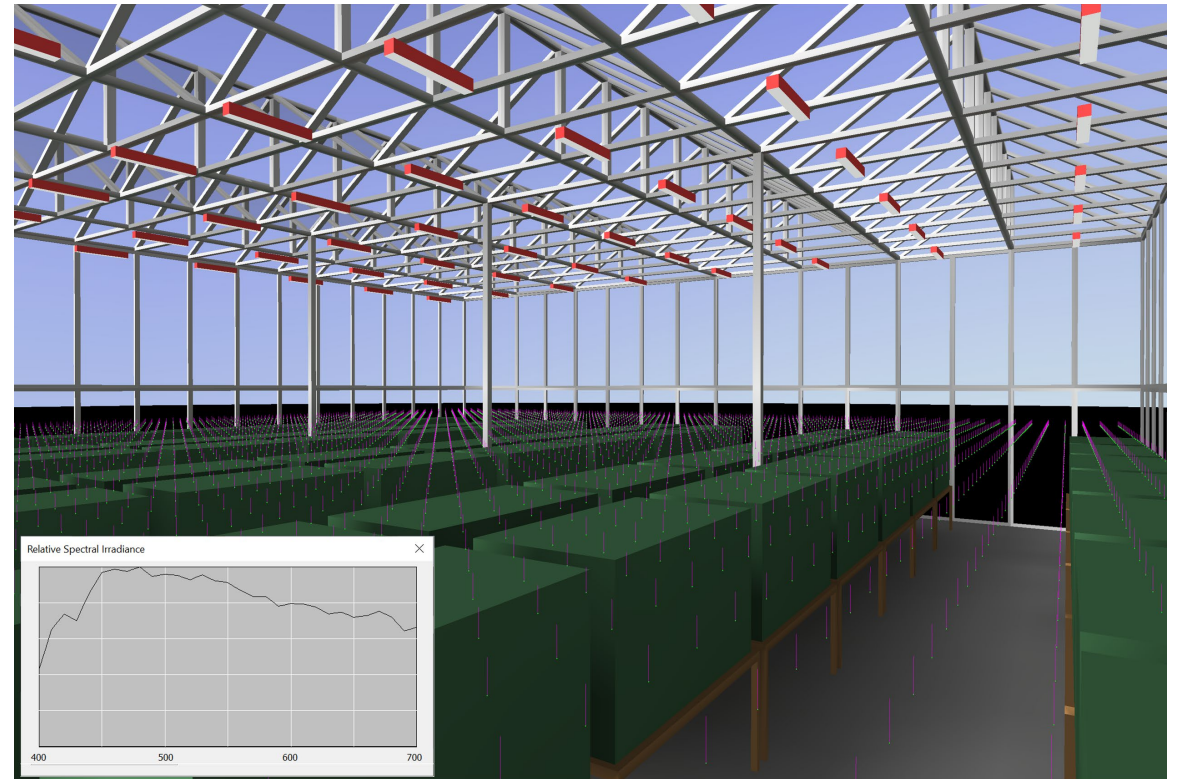


# LIGHTING R&D WORKSHOP

Co-sponsored by the Illuminating Engineering Society

## Virtual Sensors

- Horticulture
  - PAR (quantum) sensors
  - Daily Light Integral (DLI)
  - Spectroradiometer





# LIGHTING R&D WORKSHOP

Co-sponsored by the Illuminating Engineering Society

## Lighting Design Software ~~Tomorrow~~ **TODAY?**

- All tools and features discussed here have been implemented and validated
- Experimental lighting design software only
- Commercial availability dependent on market demand



Pieter Gerritsz van Roestraten



# LIGHTING R&D WORKSHOP

Co-sponsored by the Illuminating Engineering Society

## Lighting Design Software ~~Tomorrow~~ **TODAY?**

- All tools and features discussed here have been implemented and validated
- Experimental lighting design software only
- Commercial availability dependent on market demand

# Thank You



Pieter Gerritsz van Roestraten