THORN

LIGHTING PEOPLE

**SLL Masterclass 2014 / 5**

**Light For Life**

**”Tune Up Your Environment”**

Kevin Stubbs MSLL
UK Technical Manager

# Tune Up Your Environment

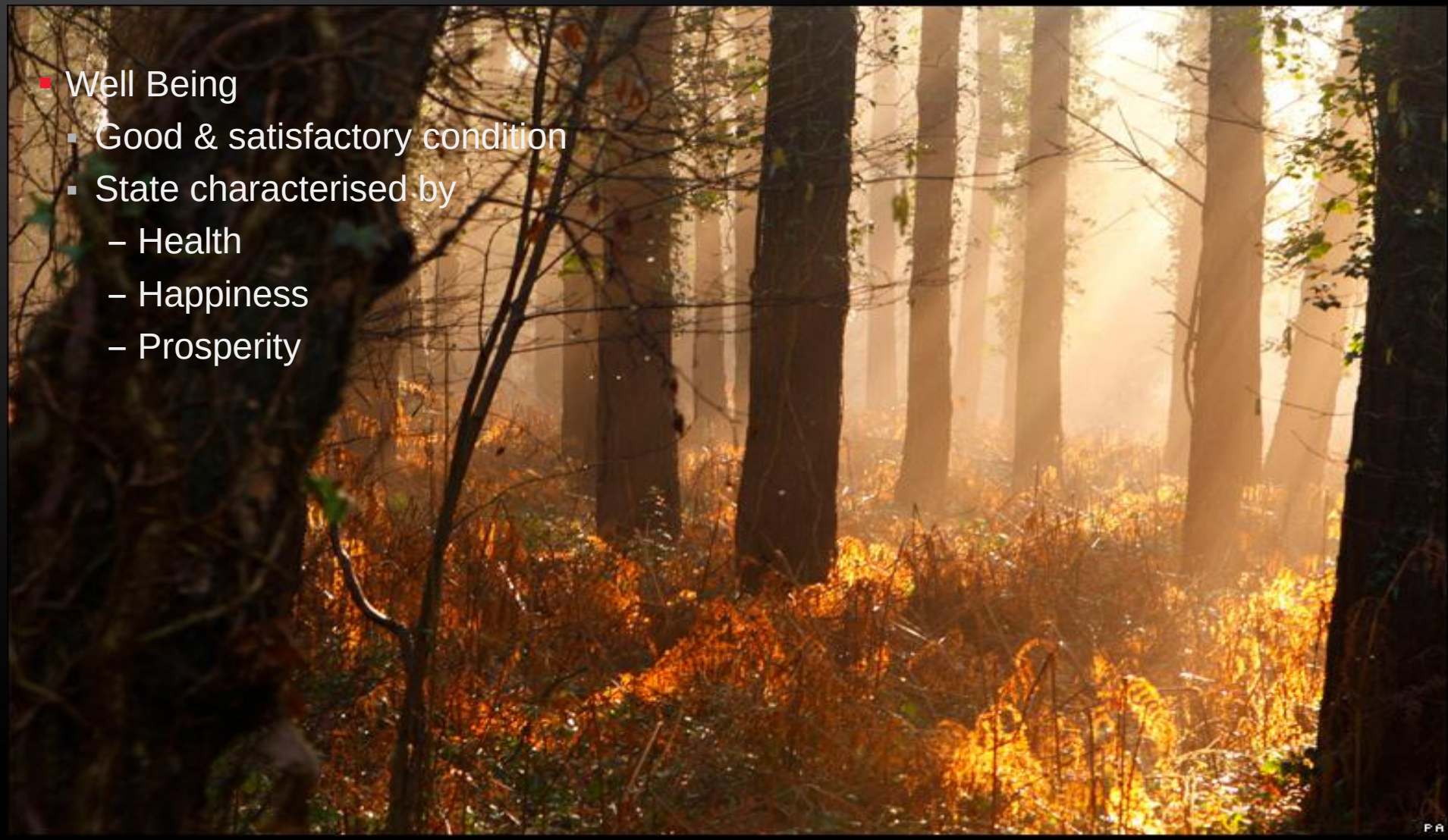
*This is the Year Of Light!*

*Make an impact!*

*Tune Up **Your** Environment!*

- Elements
  - Introduce some elements of lighting that can affect us
- Methods
  - Discuss ways that may be considered when trying to improve lighting
- Technology
  - Look at what simple technology is available to help us (Tuneable White and Colour luminaires)
- Application Example
  - Demonstrate a solution where some of these elements have been used to uplift an installation

# What can affect us?



- Well Being
  - Good & satisfactory condition
  - State characterised by
    - Health
    - Happiness
    - Prosperity

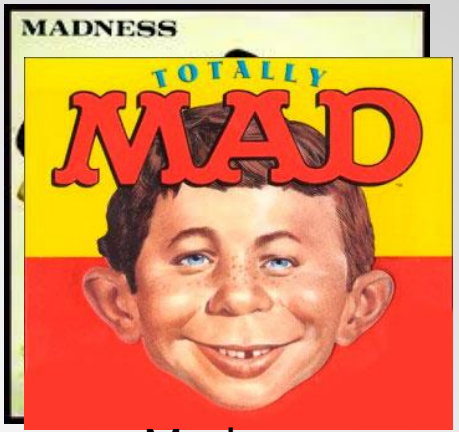
# What can affect us?

- Well Being
  - Measurables?
  - Princetown University Suggests these:

Joy

Affection

Stress




Madness

Anger

# What can affect us

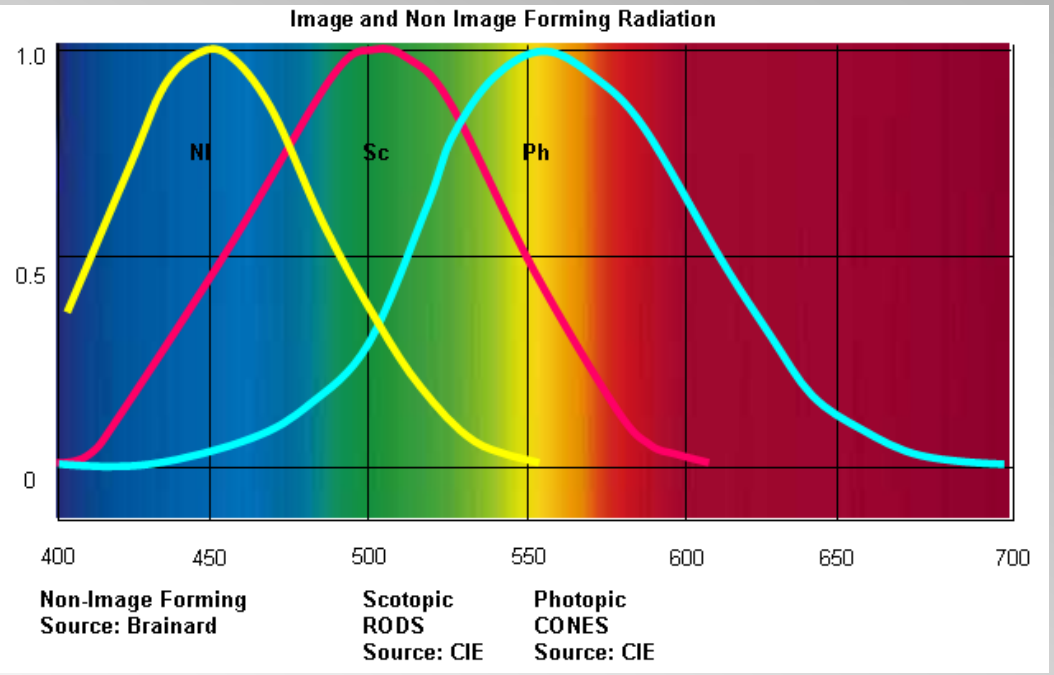
## What do we know?

- The eye has 3 main types of detector and they all work differently

- Rods - < $10^{-2}$ cd/m² *
- Cones - > 10 cd/m² *
- ipRGC – non visual (3rd Receptor)

  *Intrinsically photosensitive retinal ganglion cells*

  ** In terms of luminance as the eye does not see illuminance*




- **Other receptors?**

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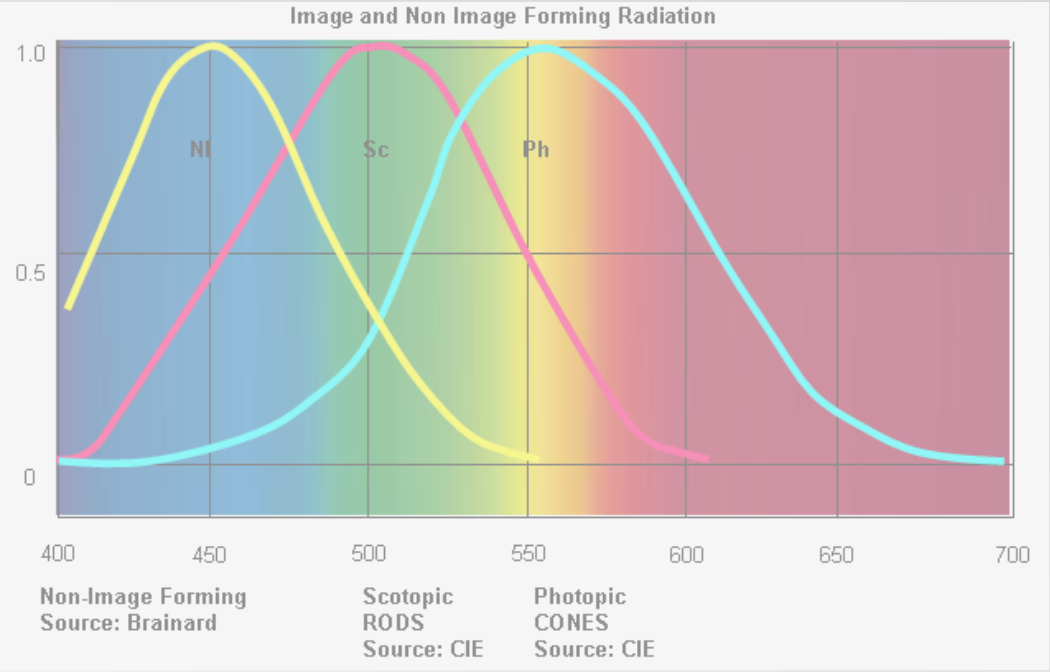
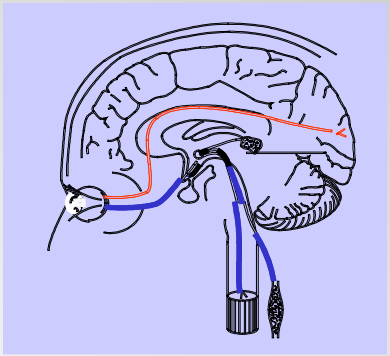



- **Other receptors?**

# What can affect us

## Vision, Mood, Health, Life

| Light | Receptors | Effects |
|---|---|---|
| intensity | Ocular | |
| luminance | Vision rods & cones | • Visual acuity<br>• Visual performance<br>• Emotions |
| spectrum | Non – Vision 3rd receptor | • Hormones (melatonin)<br>• Sleep quality<br>• Biological clock<br>• Mood & depression<br>• Alertness |
| geometry | Skin | • tanning<br>• Vitamin D<br>• thermal |
| duration | | |
| timing | | |



# What can affect us

## Vision, Mood, Health, Life

| Light | Receptors | Effects |
|---|---|---|
| intensity<br>luminance<br>spectrum<br>geometry<br>duration<br>timing | Ocular → Vision rods & cones | • Visual acuity<br>• Visual performance<br>• Emotions |
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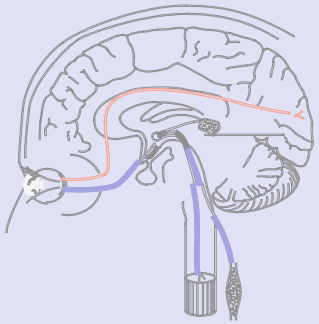
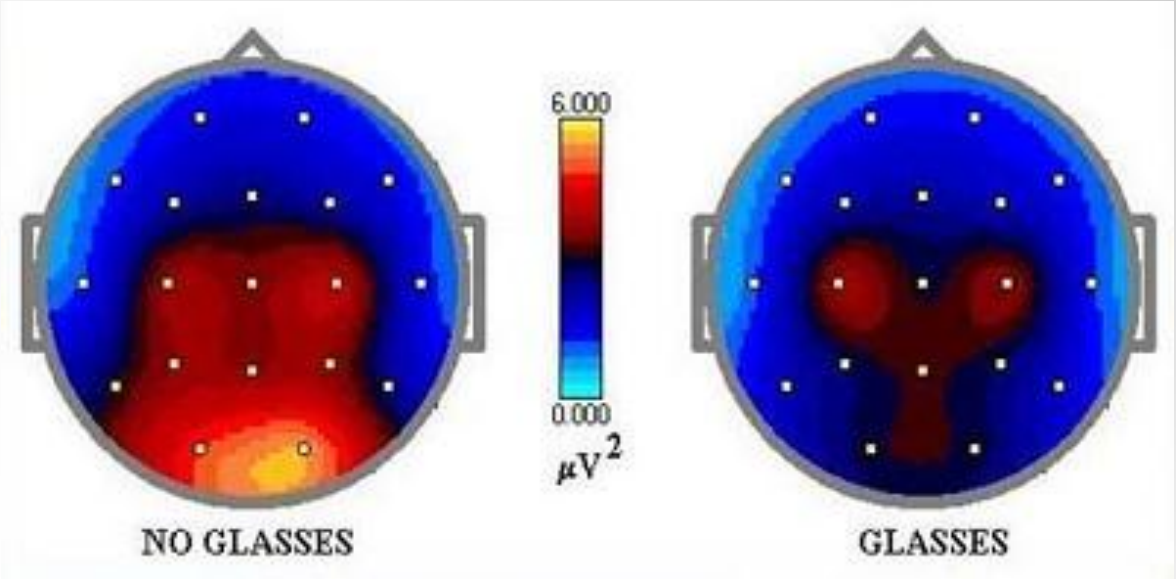


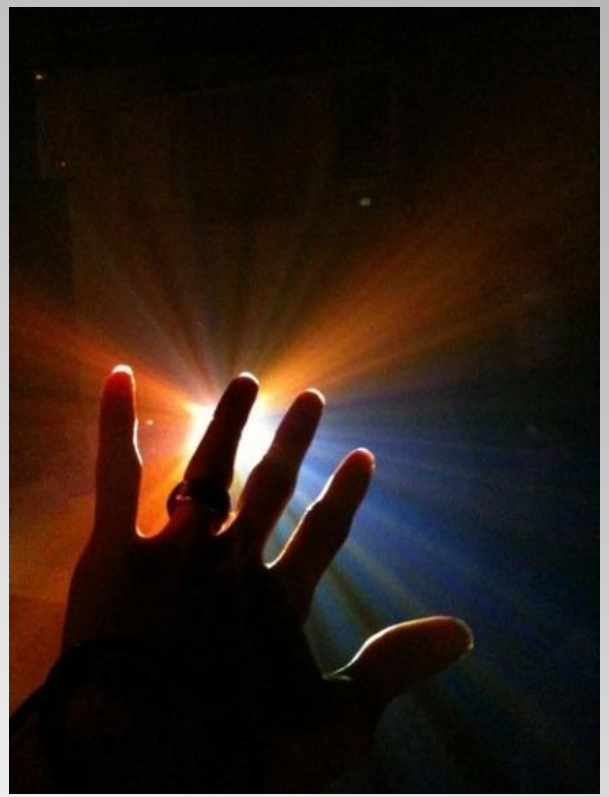
## What can affect us?

# What can affect us?

- Is it the same for everybody?
- Are there more than just 3 receptors?

- Example
  - JordanEyes.com
  - If that can affect us, what else can?



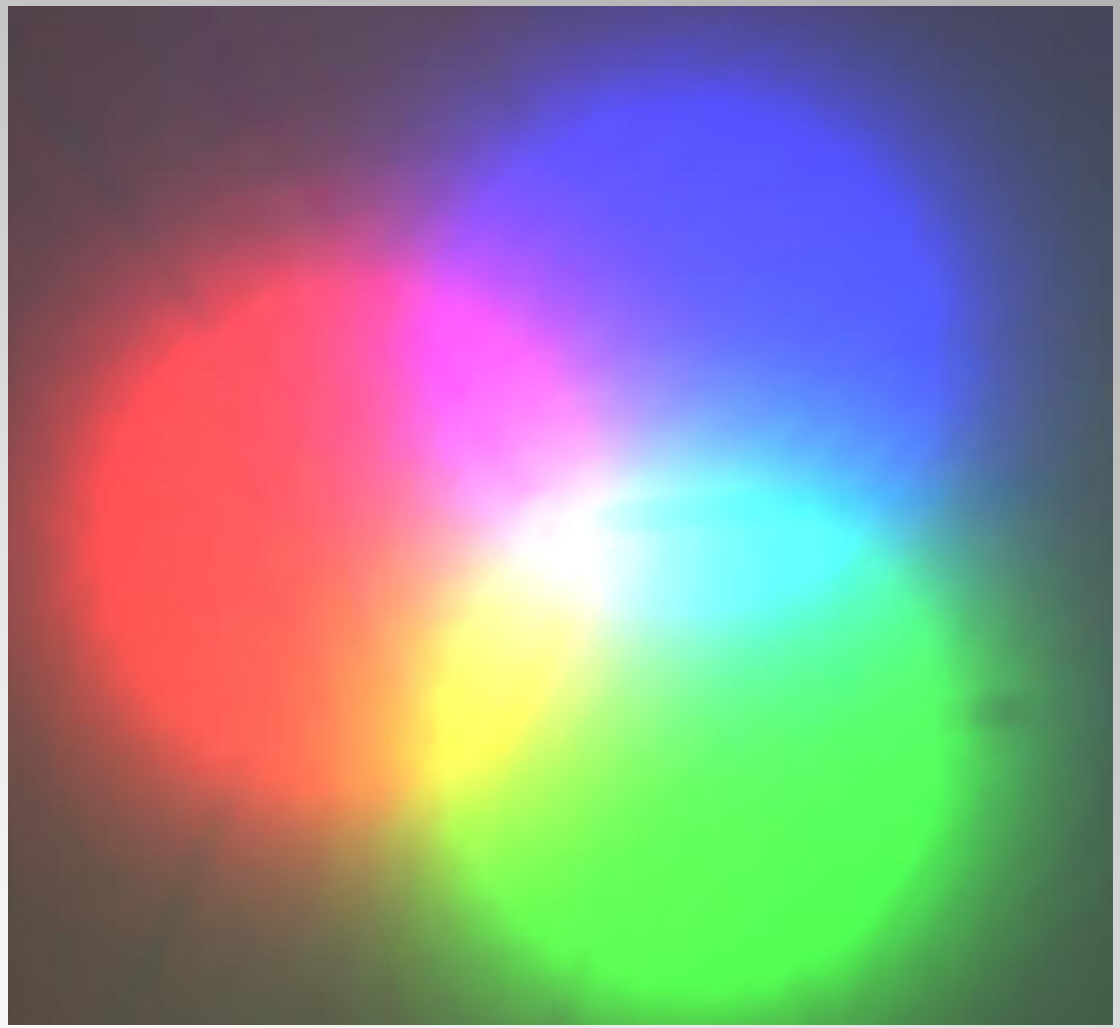



# Considerations

- Biorhythms
- Impact
  - Health
    - Benefits
    - Positive
    - Risks
  - Cost
    - Initial – Equipment - Installation
    - Running
  - Monitoring?
    - Measure effects
    - Feedback and tuning

# Considerations

- What colour?
- When?
- How Much?
- Benefits?
- Risks?

# Considerations

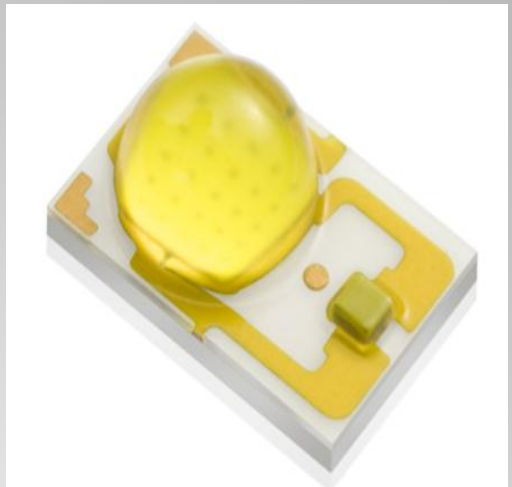
- Mood

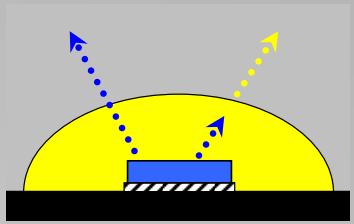
"Uplift"
Or
"Re Programme"?

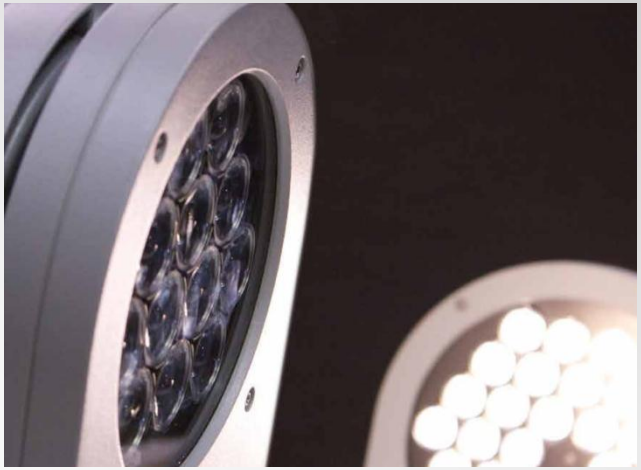
# LED

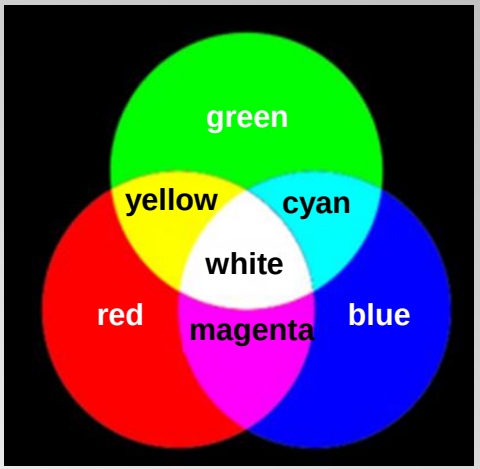
- White LED
  - Efficiency
  - Quality
  - Affordable
- Colour LED
  - *Who remembers filters?*

- Compact
- Flexible Manufacturing



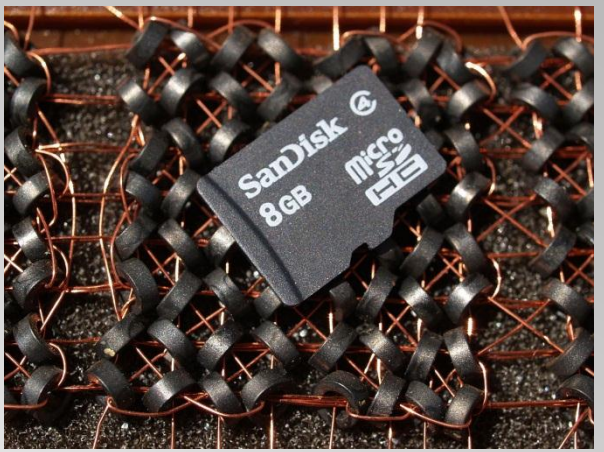


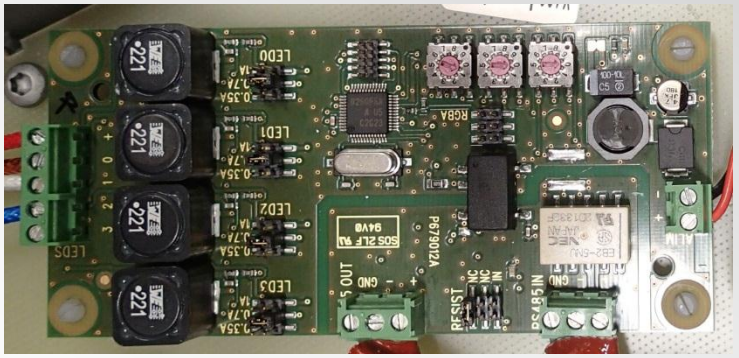




# Controls

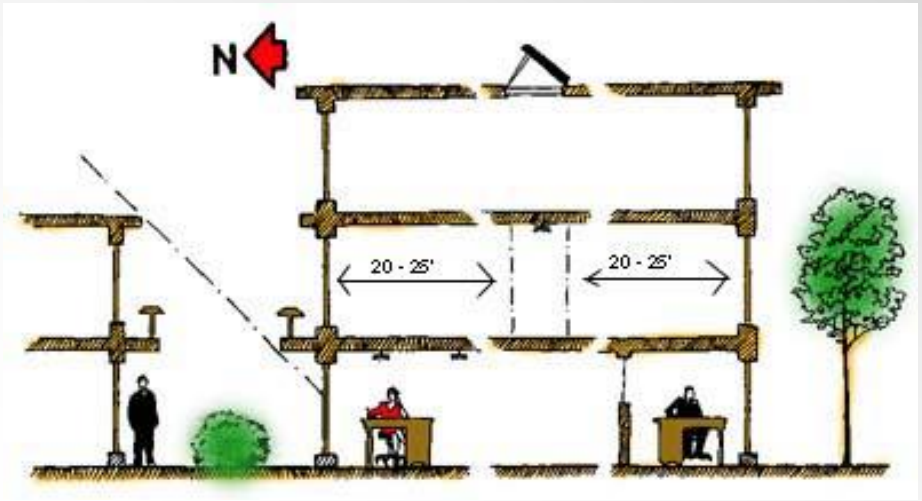
- Progress
- manual to switching
  - Presence control
- Switching to dimming
  - Daylight control
- Consolidation
  - Digital Dimming
    - Consistency
    - Dali control
- Electronics
  - Drivers
  - Computers
  - *Everywhere!*

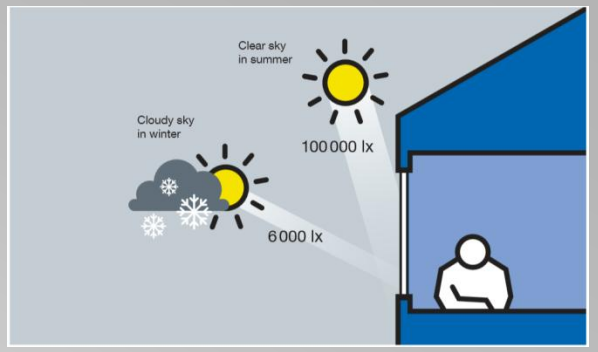


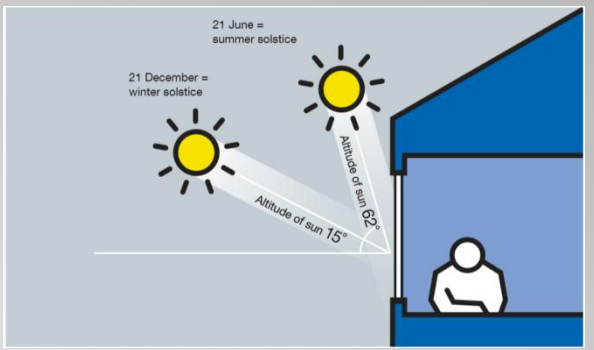



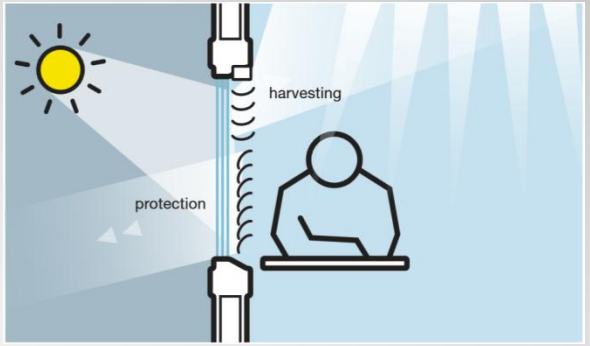
# Daylight

- Free
- Variable
- Building Design
- Complement
  - Artificial Lighting
- Obstruct or Harness?
  - Blinds & Controls



# Tuneable White

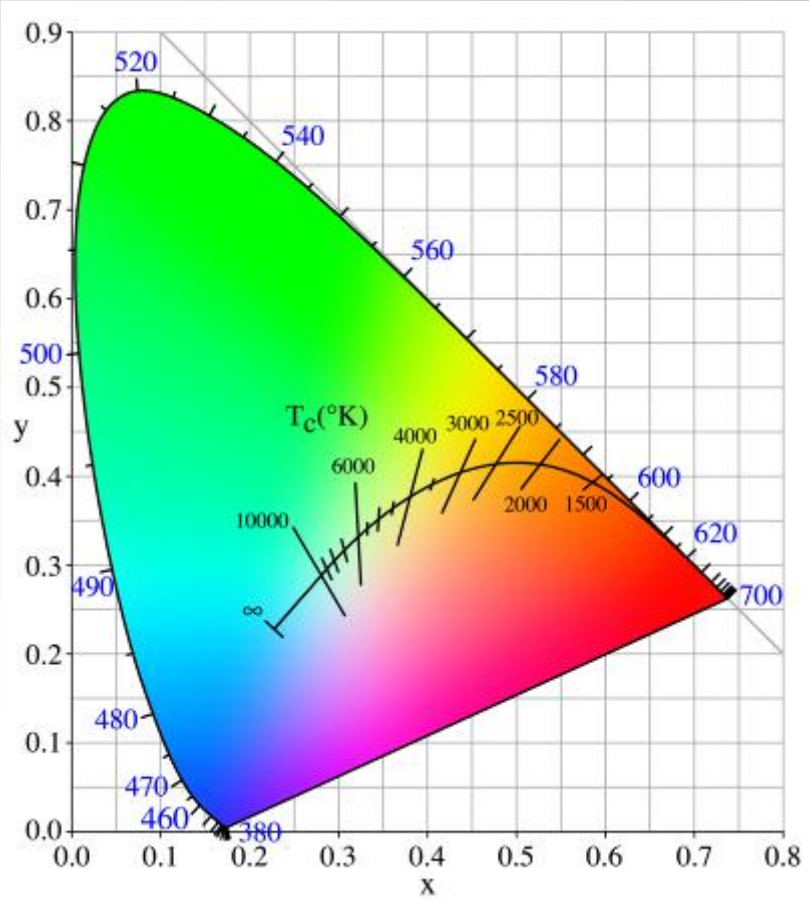
- LED

## Lamp Information

| | Lumen package | W | LLm/W | Equivalent CFL | Saving potential | CCT | Lifetime @ L70 | CRI | SDCM (McAdams) |
|---|---|---|---|---|---|---|---|---|---|
| Eco | 1000 | 14.0 | >70 | 1x18/26 | <70% | 3000/4000 | 50,000 | >80 | 3 |
| | 2000 | 26.0 | >70 | 2x18/26/1x32 | <55% | 3000/4000 | 50,000 | >80 | 3 |
| | 3000 | 38.0 | >70 | 2x32 | <40% | 3000/4000 | 50,000 | >80 | 3 |
| Tuneable | 800 | 15.0 | >60 | 1x18/26 | <40% | 2700-6500 | 50,000 | >90 | 4 |
| | 1800 | 27.0 | >60 | 2x18/26 | <45% | 2700-6500 | 50,000 | >90 | 4 |

# Tuneable White

## Planckian Curve




## Colour Temperature

| Temperature | Source |
|---|---|
| 1700 K | Match flame |
| 1850 K | Candle flame |
| 2700–3300 K | Incandescent light bulb |
| 3400 K | Studio lamps, photofloods, etc. |
| 4100 K | Moonlight, xenon arc lamp |
| 5000 K | Horizon daylight |
| 5500–6000 K | Typical daylight, electronic flash |
| 6500 K | Daylight, overcast |

# Example (Indoor)

- Tune Up Your Office
- An Energy Conscious Better Working Environment

# Example (Indoor)

- Techniques
  - Lighting Design
  - Improve Comfort
    - Balance high luminances (ie. Outdoors through windows)
    - with Task and surround area
  - Add small amounts of light onto perimeter and core walls (wall washing)
  - Consider Blinds to reduce the peak luminances and illuminances

**Task Area**

**Immediate Surrounding Area +0.5m**

**Background Area ≥3m**

# Example (Indoor)

- Techniques
- Light Sources
  - Colour rendering
  - Colour Appearance (Main Office Luminaires)
  - Adjustable white balance during the day

warm – 2700K

cosy, comfortable, secure

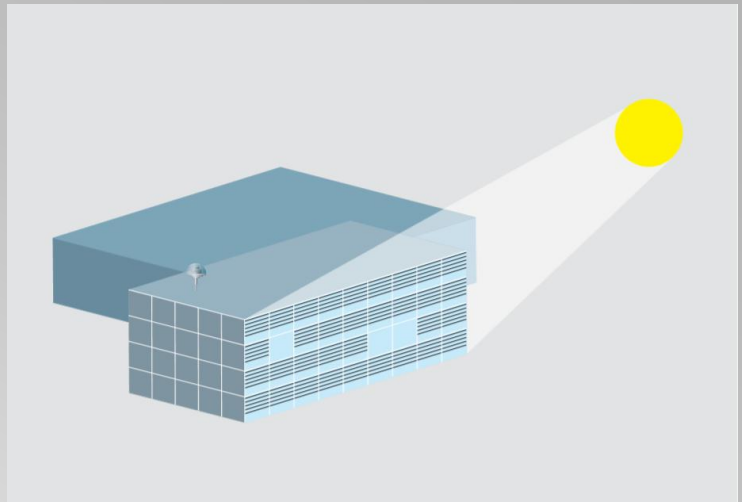
intermediate

Cool – 6500K

Sharpens, enlivens, boosts brisk and businesslike)

# Example (Indoor)

- Techniques
  - Control system
    - Maps outdoor environment and adds boost / comfort to complement
    - Saves energy on bulk office lighting by Absence and Photocell control
    - Balance of the two provides security and comfort via background lighting effect under low occupancy conditions



## Application

# Example (Indoor) – Morning – Off

## Application

# Example (Indoor) Morning - Cleaners

## Application

# Example (Indoor) Morning – Start Working Day

## Application

# Example (Indoor) Morning – Late

# Example (Indoor) Morning – Before Lunch

## Application

# Example (Indoor) Morning – Lunch

## Application

# Example (Indoor) Afternoon – Mid

## Application

# Example (Indoor) Afternoon – Late

## Application

# Example (Indoor) Evening

## Application

# Example (Indoor) Evening - Late

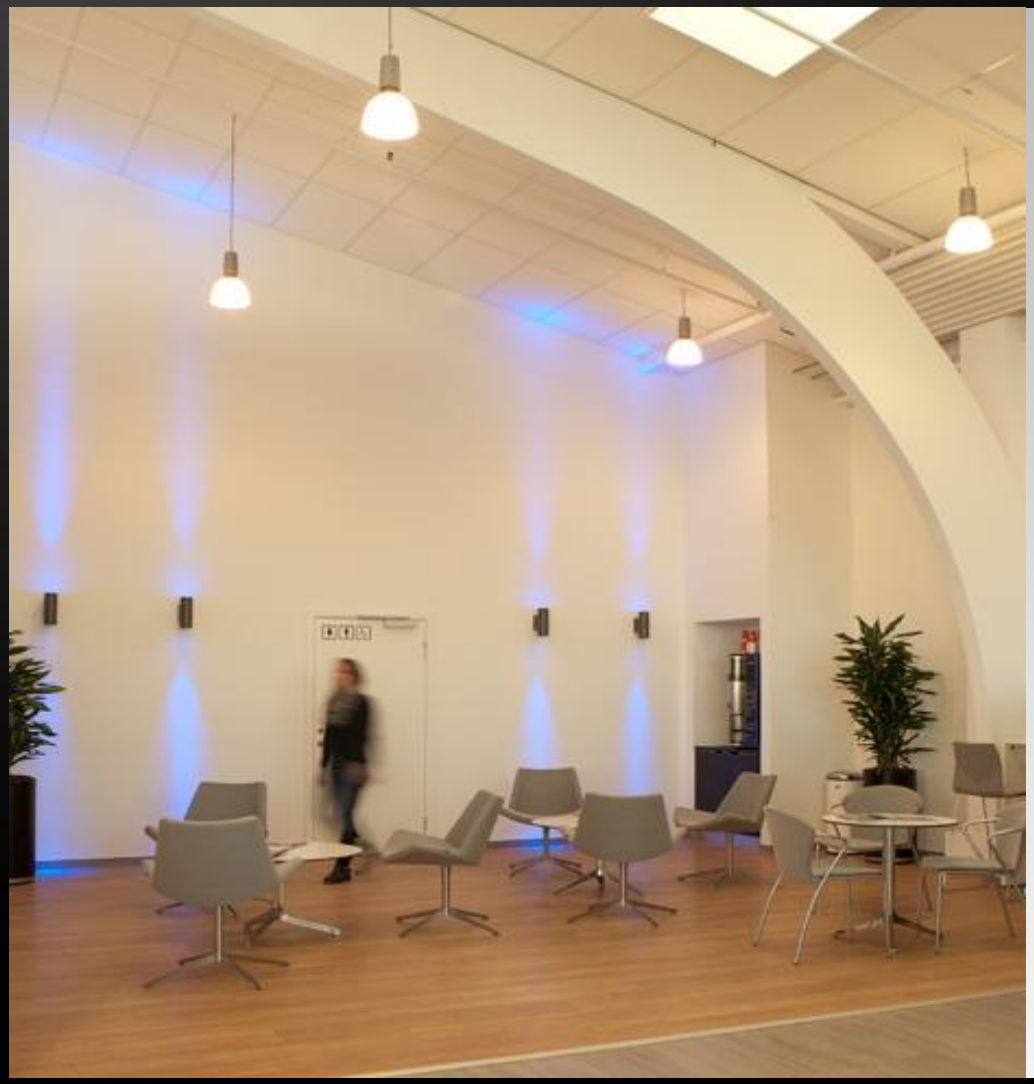
## Application

# Example (Indoor) Evening - Office Closed

## Application

# Example (Indoor) Evening - Office Closed

# Example (Indoor) – Meeting Area



- Tune Up Your Environment
- Improve the mood
- influence who is comfortable there?

# Example (outdoor)

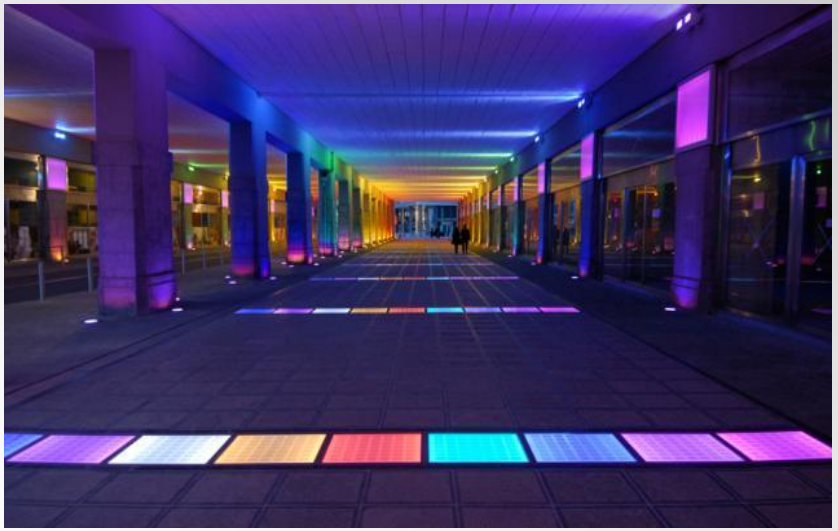
- Tune Up Your Outdoor Environment
- Change the feel
- Highlight only Selected elements
- Where appropriate
  - Add interest and features
  - Personalise
  - Interaction opportunities?

## Application

# Example (outdoor)








## Application

# Example (outdoor)

## Application

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THORN

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**Thankyou!**

**Questions?**

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