View of a lighting company on human centric lighting

SSL Workshop, 12.12.2016

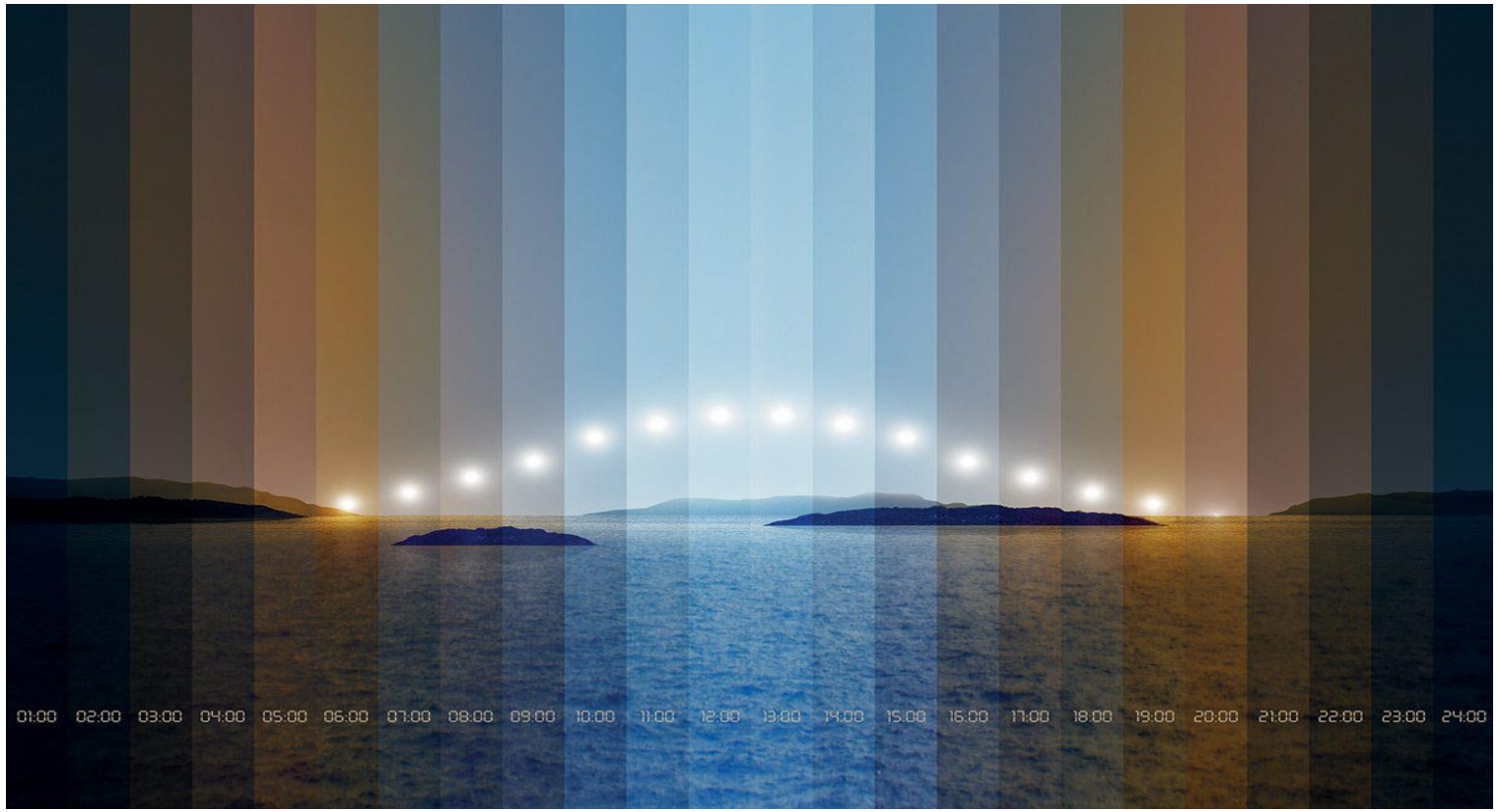
Dr. Heinz Seyringer

Light in our daily life

Sunny day:	100.000 lux
Cloudy day:	10.000 lux
Indoor (office):	500 lux
Indoor (school):	300 lux

90% of our time we are indoor!

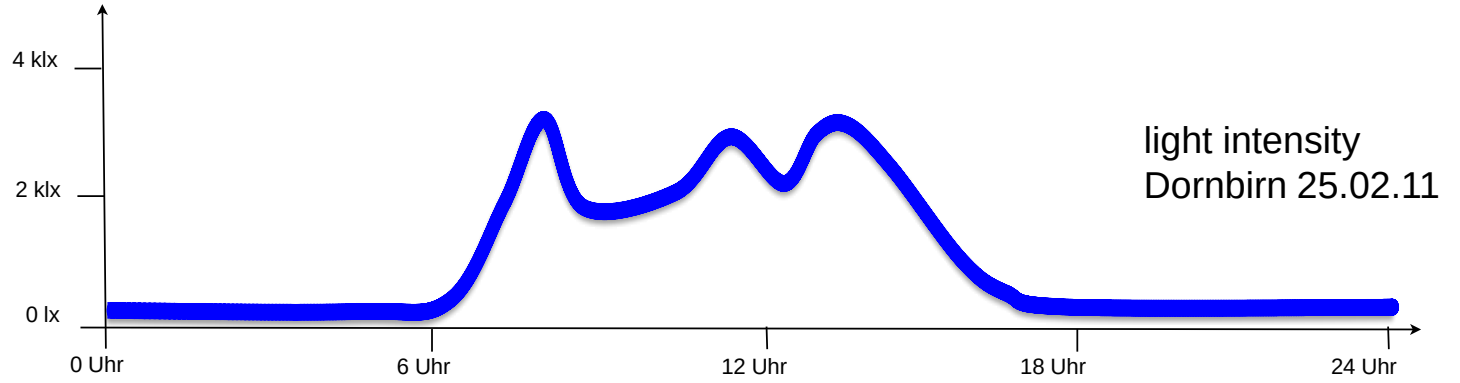
Light changes during the day

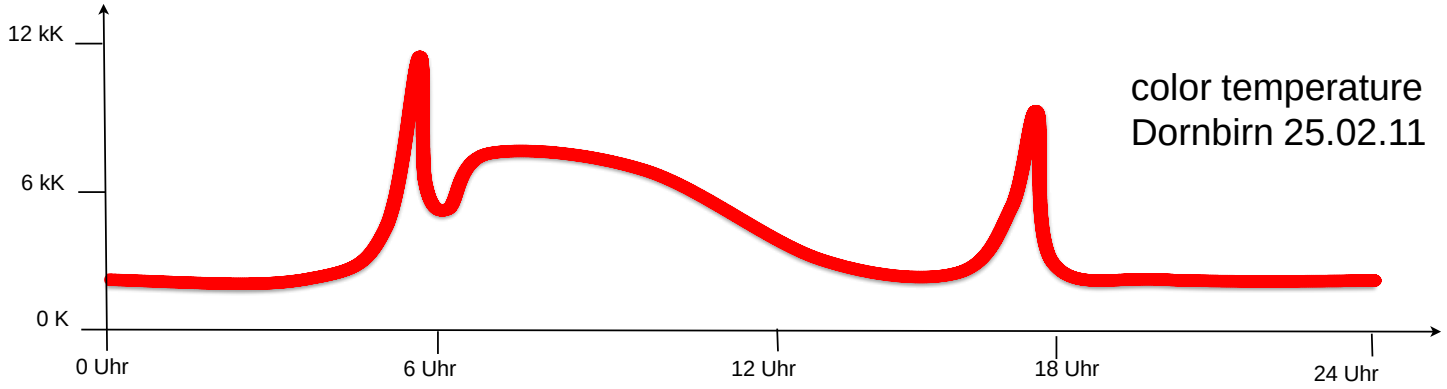


Should we adjust the artificial lighting accordingly?

We could adjust the artificial lighting according to the daylight

The color temperature and intensity of daylight continuously changes during the day:

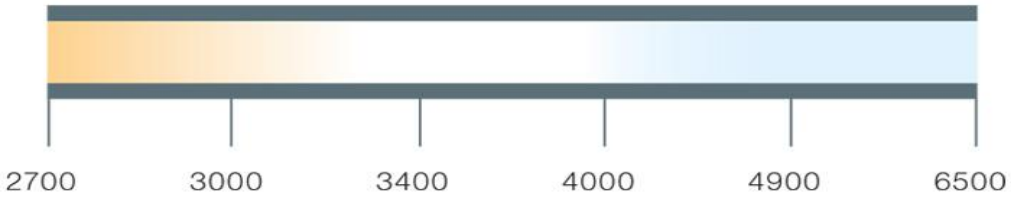




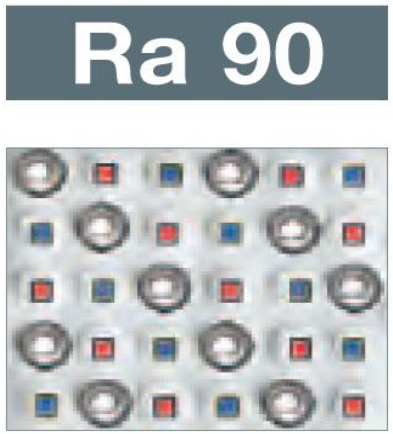
Source: Prof. Guido Kempter, Head of Center for User Centered Technologies, University of Applied Sciences Vorarlberg

The technology exists for tuneable white:

PANOS INFINITY Tunable White | 2700 6500 K



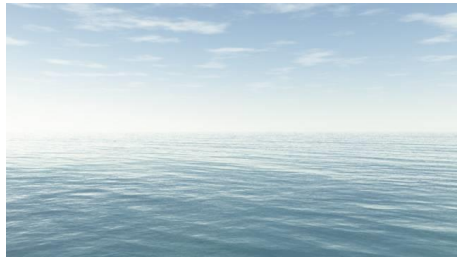
LED printed circuit board Tunable White



Tunable White stands for white LED light that can be adjusted dynamically. Colour temperatures can be variably adjusted, e.g. from 2700 to 6500 K, by using a controller.

In the process, LED luminaires achieve a high colour rendition index of at least Ra 80 to Ra > 90.

Are there other options?



Cold white light is activating. It helps to stay awake and improves performance but it has a strong impact on the hormone production.

Warm white light is calming and has only a small influence on the hormone balance.

Human centric lighting in schools

activating light

calming light

Human centric lighting in offices

7:30 activating light

10:00 neutral light

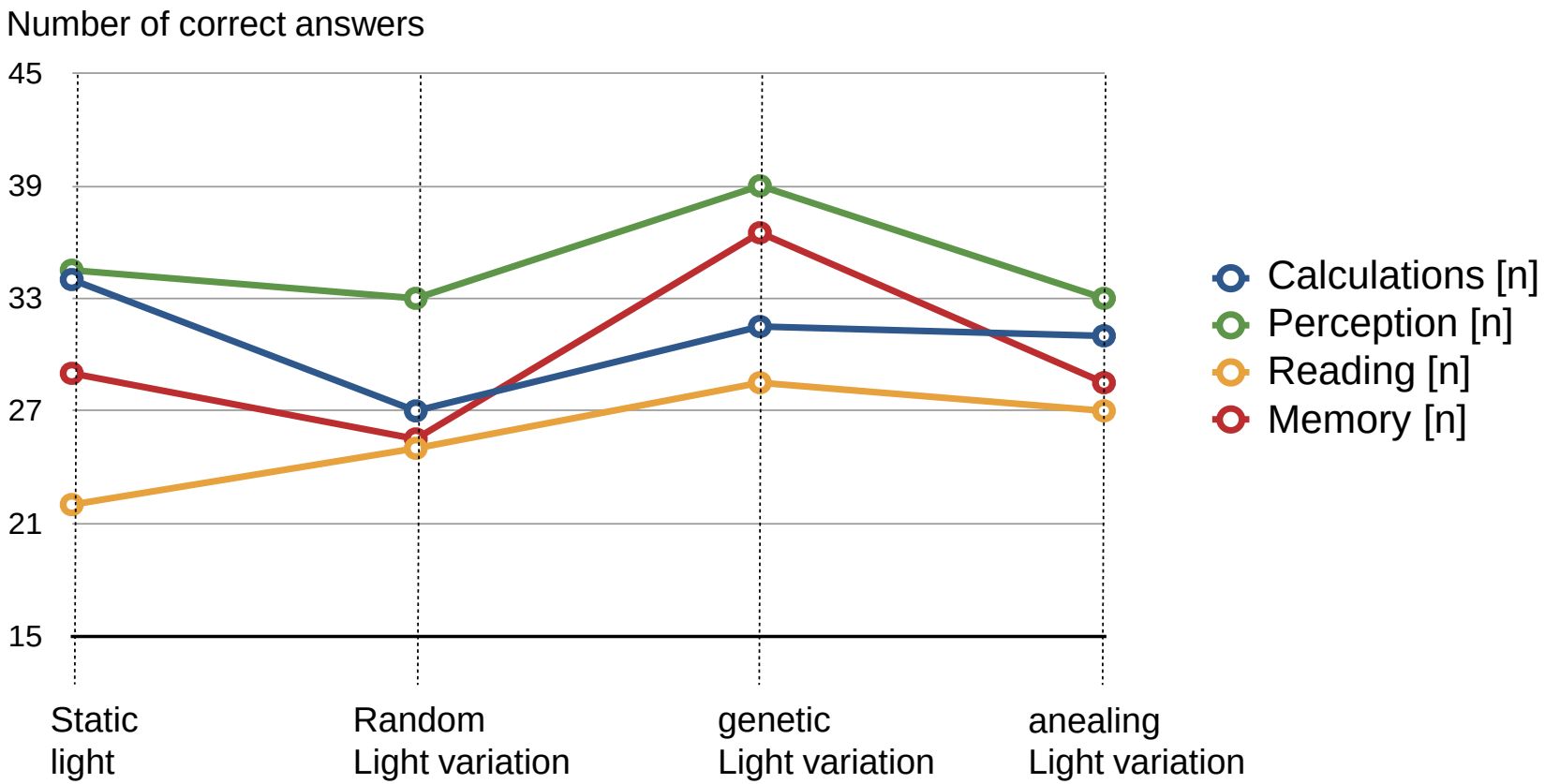
In office environments the circadian light can be used to increase efficiency and reduce sleeping problems in the evening:

13:00 warmer light

17:00 calming light

Human centric lighting is complex

Proper lighting increases the learning efficiency:



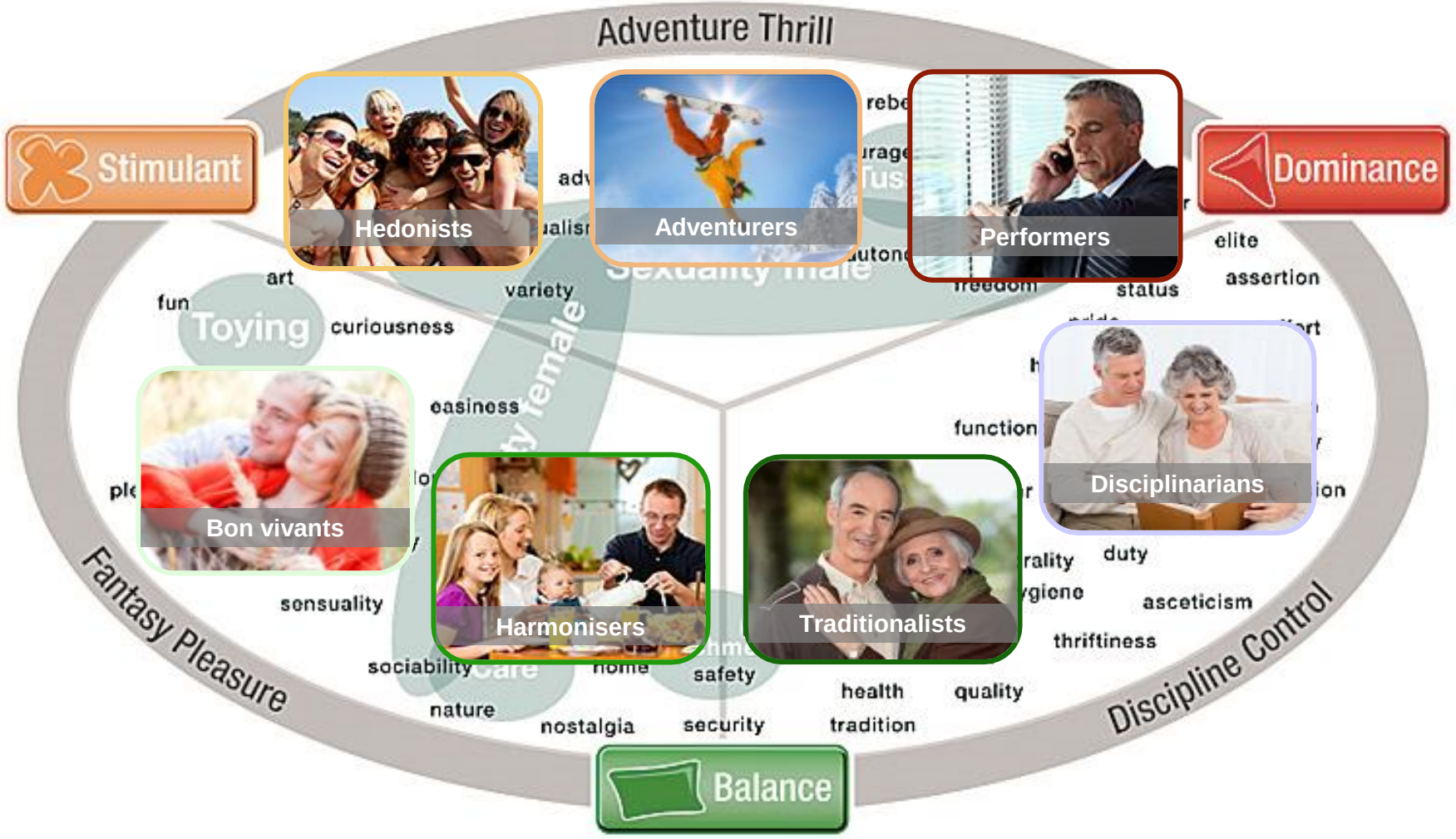
Source: Prof. Guido Kempter, Head of Center for User Centered Technologies, University of Applied Sciences Vorarlberg

Limbic Lighting

More than 95 %
of all our decisions
are made
unconsciously

Limbic Lighting – Study Design

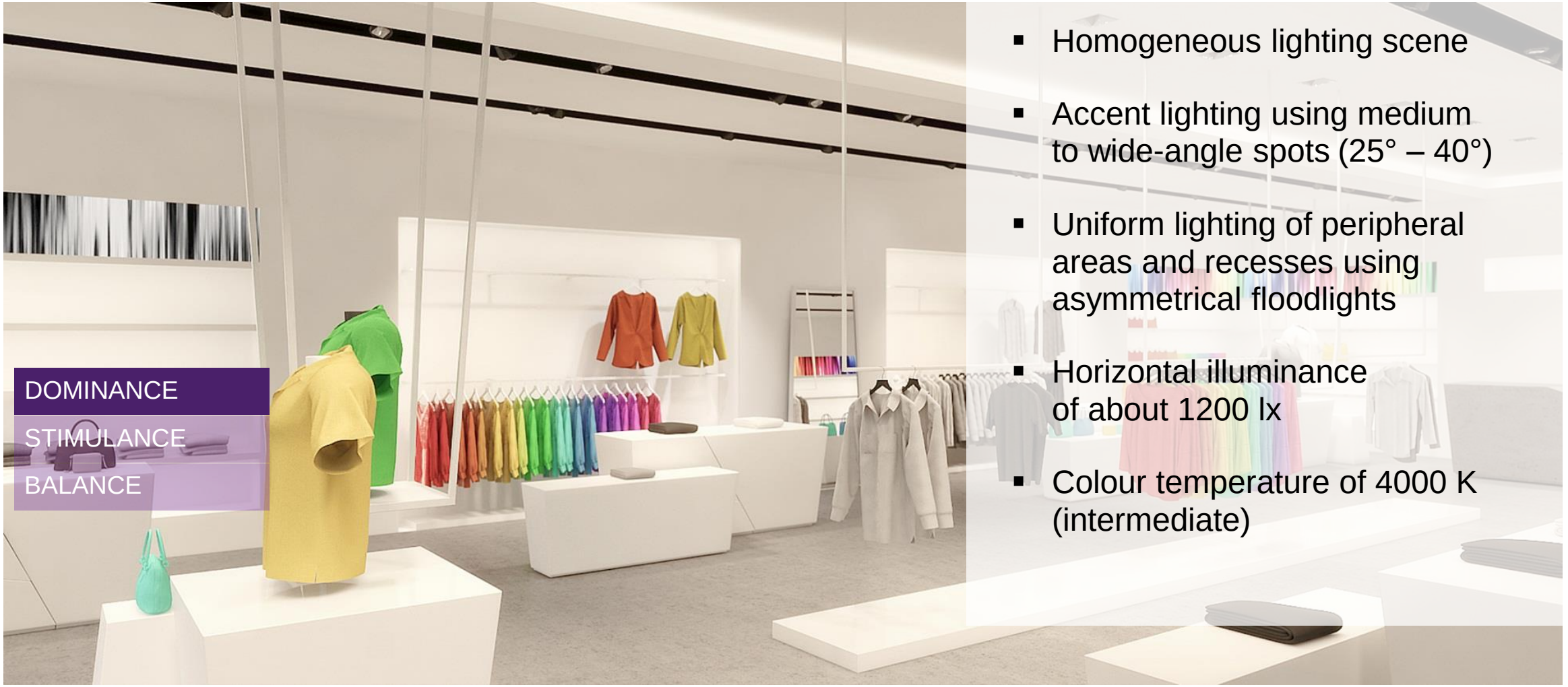
Limbic Lighting – The 3 Limbic Groups



Limbic Lighting – New Products

1. Balanced wide-area lighting
2. Brilliant colour rendering
3. Miniaturisation

Limbic Lighting - Dominance



- Homogeneous lighting scene
- Accent lighting using medium to wide-angle spots (25° – 40°)
- Uniform lighting of peripheral areas and recesses using asymmetrical floodlights
- Horizontal illuminance of about 1200 lx
- Colour temperature of 4000 K (intermediate)

Limbic Lighting - Stimulance

- Powerful accent lighting with plenty of contrast
- Accent lighting using narrow-beam spots (12° – 18°)
- Peripheral areas are enhanced by floodlights and spots
- Horizontal illuminance of only 500 lx
- Colour temperature in excess of 4000 K (cool white)

Limbic Lighting - Balance

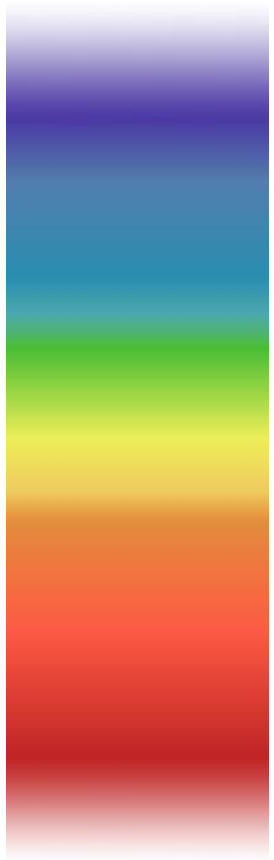
- Soft lighting scene with gentle contrasts
- Medium-angle spots (18° – 30°)
- Moderate mix of accent, vertical and cove lighting
- Integrated lighting in recesses and on shelves
- Average horizontal illuminance of 800 lx
- Colour temperature around 3000 K (warm)

Limbic Lighting - Results

- Increased sense of well-being
- Higher level of stimulation
- Prolonged time spent in the shop
- Enhanced consumer behaviour

Are there other interesting parts of the spectrum?

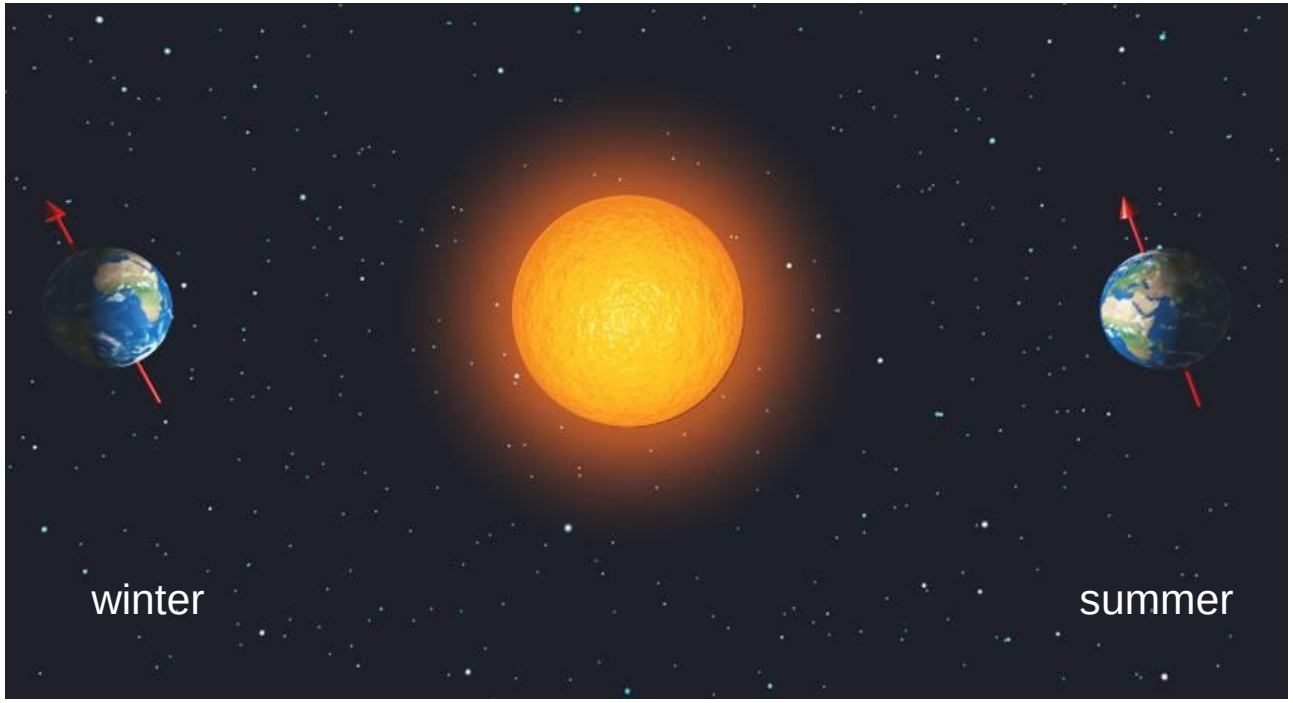
Natural light contains also different ultraviolet components (UV):



Wavelength	Type of light
100 nm – 280 nm	UV-C: highest energy UV
280 nm – 315 nm	UV-B: important for vitamin D production
315 nm – 380 nm	UV-A: „black light“
380 nm – 780 nm	Visible light
780 nm – 2500 nm	Near infrared: IR remote controls
2500 nm – 50000 nm	Middle infrared: thermography

Increasing the vitamin D production

In winter we don‘t get enough UV-B in the northern Hemisphere:



The result of this UV-B lack is a reduced vitamin D production, which can be compensated by artificial lighting with UV-B.

User centric lighting: Sfera - connected lighting with swarm controll

Luminaires talk to each other and configure themselves automatically.

The light adjusts automatically to the user needs.

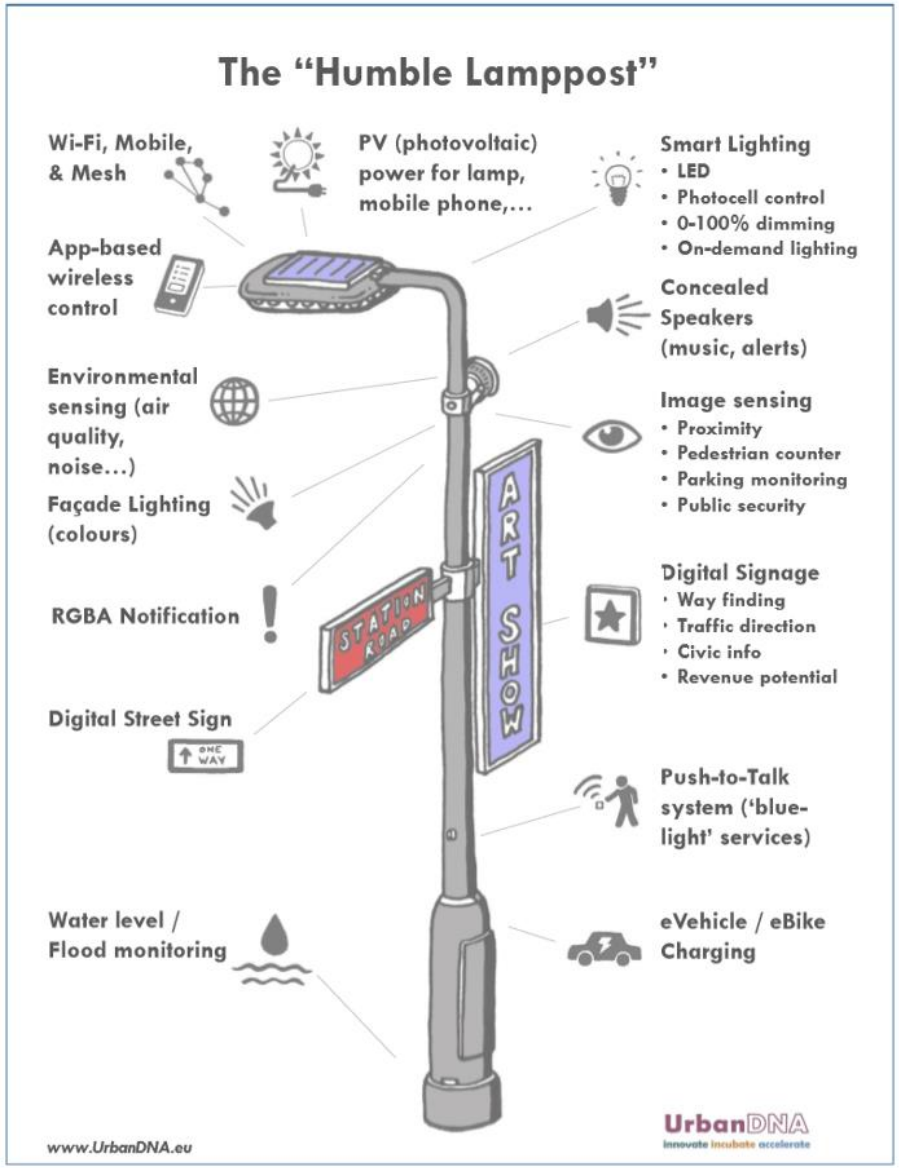
Lighting as IoT Backbone

- Internet of Things (IoT) devices have often limited battery capacity.

-> long distance connections are not desireable

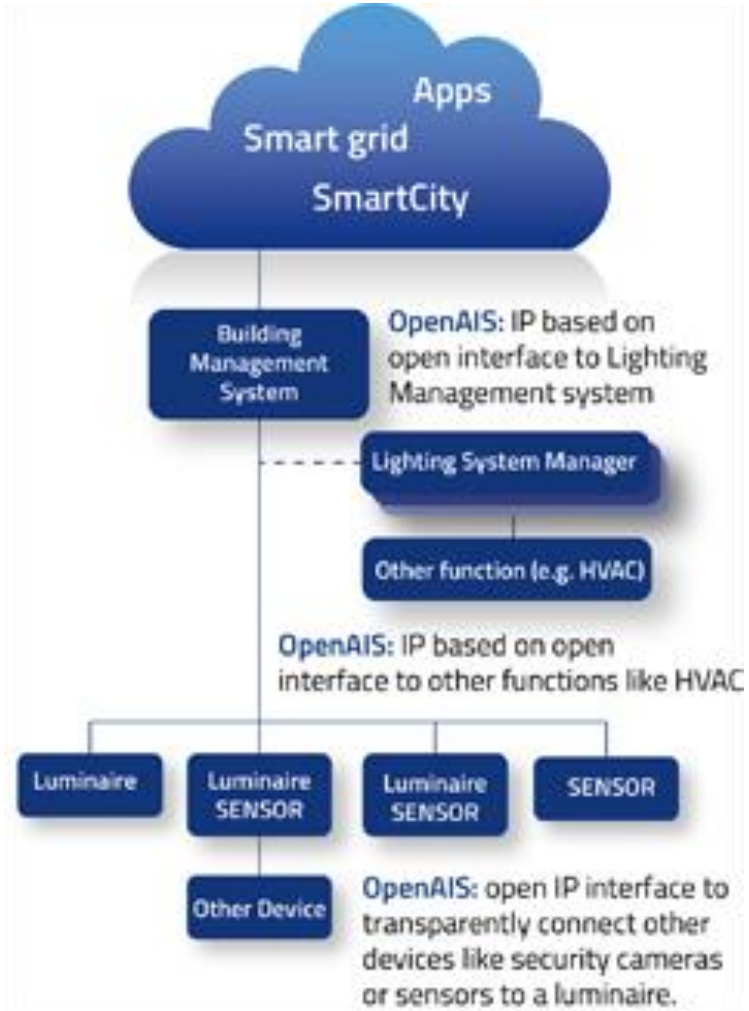
-> Lighting is always near to the persons.

-> Lighting could become an IoT backbone.



Source: www.urbandna.eu

OpenAIS – Open Architectures for Intelligent Solid State Lighting Systems



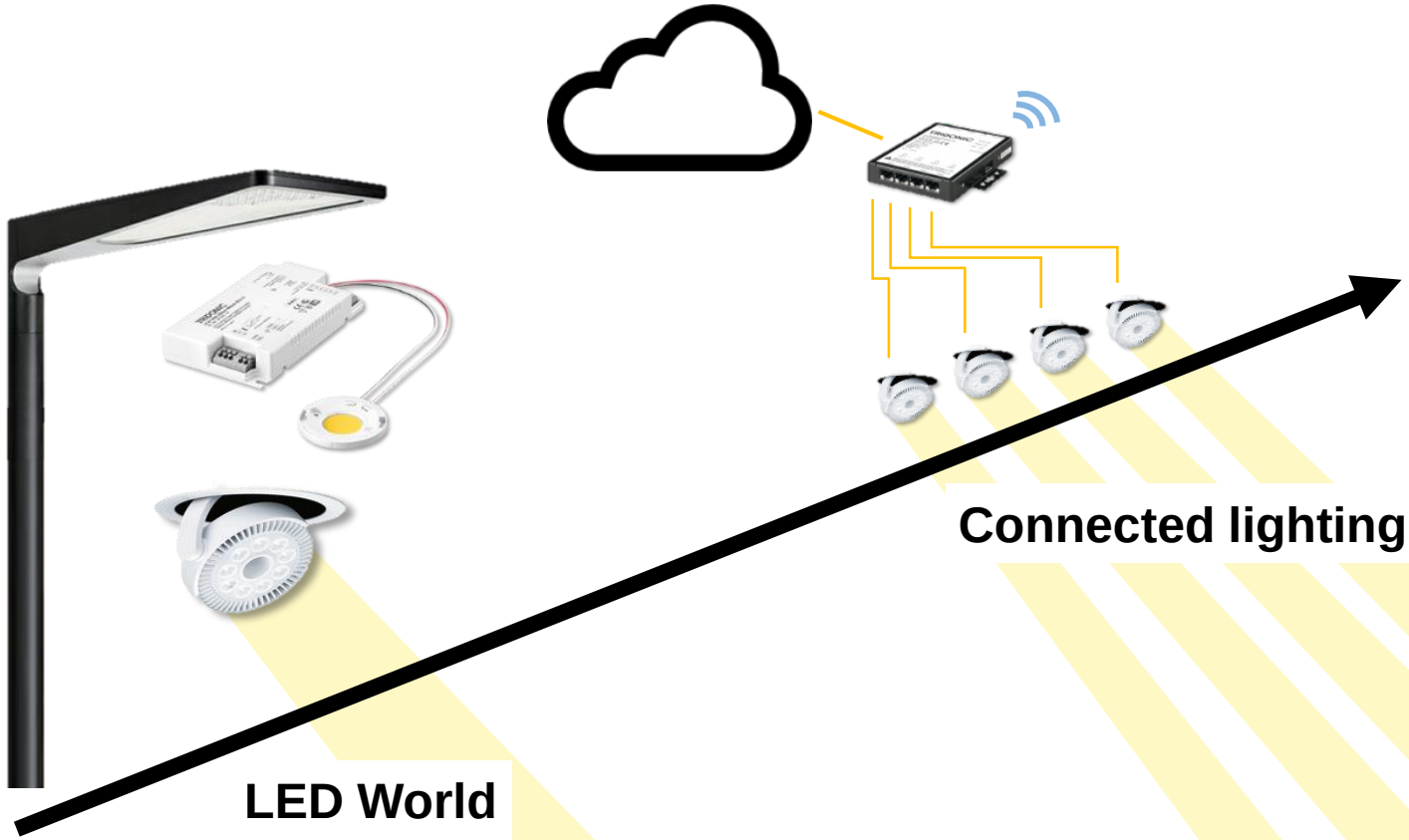
www.openais.eu

Supported by the Horizon 2020 Programme of the European Union

zumtobel group

THORN TRIDONIC ZUMTOBEL acdc REISS

Establishing innovative business models in the Internet of Things



Lighting beyond Illumination

Many different opportunities for new business models

- Lighting already installed in all buildings: ideal basis for new services
- Additional customer benefits through:
  - energy savings
  - reduced complexity
  - added value through data management

Establishing a service business: Light as a service

We take responsibility for your lighting

Benefits for the customer

- Benefit from **energy savings** from the outset
- **Financing** extends over full term of contract
- Zumtobel Group looks after all aspects
- Benefit from technological progress through **regular updates** in the lighting solution
- Flexibility through **service upgrade** option within existing contract

Three core application areas
for smart, connected lighting

Connected Commerce

Indoor Navigation
Easily guide user to selected area via the user's mobile device

People Tracking
Track customer shopping behaviour and presence in-store

Connected Building

Remote Monitoring
Monitor the performance of the lighting infrastructure

Space Management
Track building user behaviour and presence in building

Connected City

Dynamic Lighting
Optimised street lighting in line with traffic and weather conditions

Advanced Parking
Lighing infrastructure used to guide drivers to free parking spaces

- In phase one the Zumtobel Group is concentrating on Connected Commerce and Connected Building
- Cross-brand project group:
  - Technology development via Tridonic
  - Applications expertise and pilot projects via Thorn and Zumtobel

Thank you for your attention!

Contact:

Dr. Heinz Seyringer

e-mail: heinz.seyringer@zumtobelgroup.com