

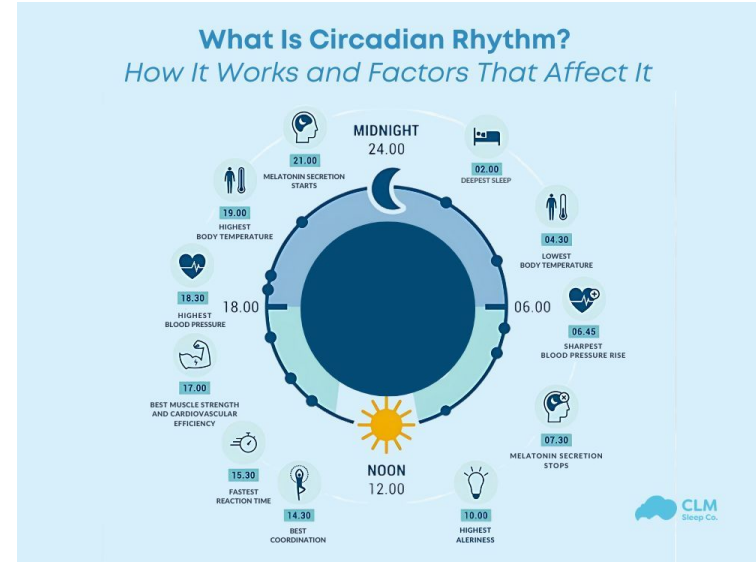


Lighting Integration & Circadian Rhythm

Maurits Roijen

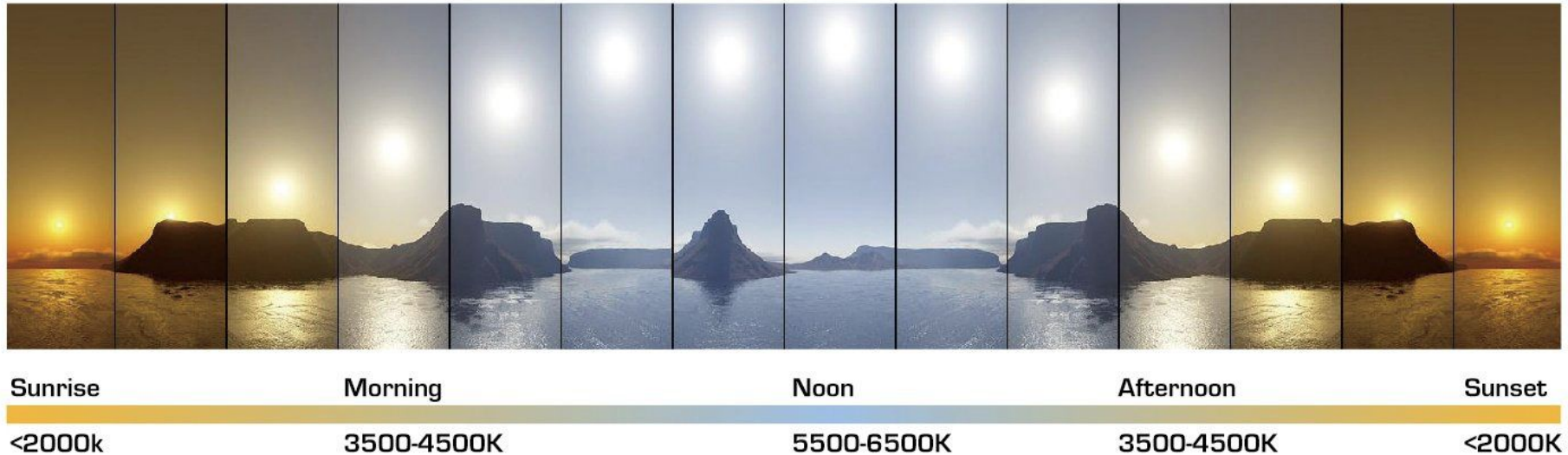
Circadian Rhythm

- Biological Clock
- Natural 24-hour rhythm
- Affects both physical and mental behaviour throughout the day
- Good to maintain for astronaut health as the lunar cycle is very different



Circadian Rhythm - COLOR

Blue hues and brighter light in the afternoon promotes cognitive function and productivity
Warmer red-yellow hues in the evening increase melatonin production to relax and sleep



Circadian Rhythm - ANGLE

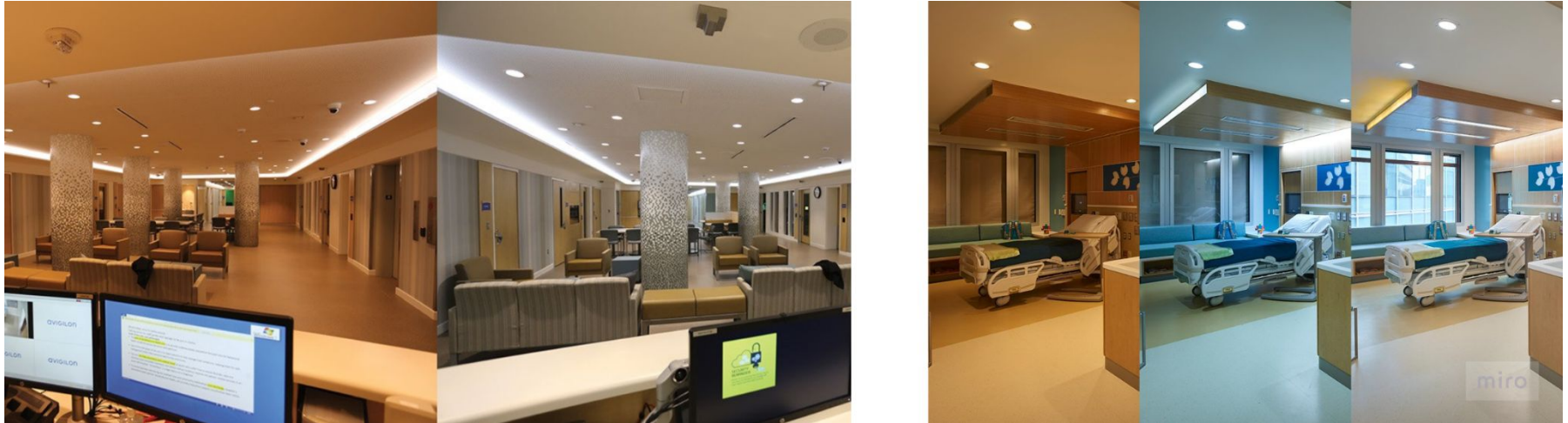
No clear evidence to suggest that the angle of the lighting affects circadian rhythm.



Circadian Rhythm - Hospitals

Examples of lighting indoors

→ research also shows that it helps with sleep and recovery as well as productivity and alertness during the day

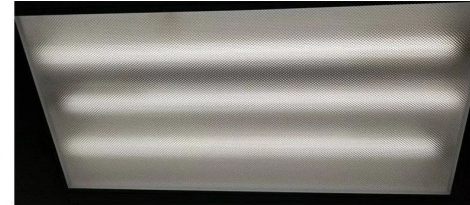


Light Integration Circadian Rhythm



Color changing LEDs

BEFORE:
Prismatic
lens with
LED Bulbs



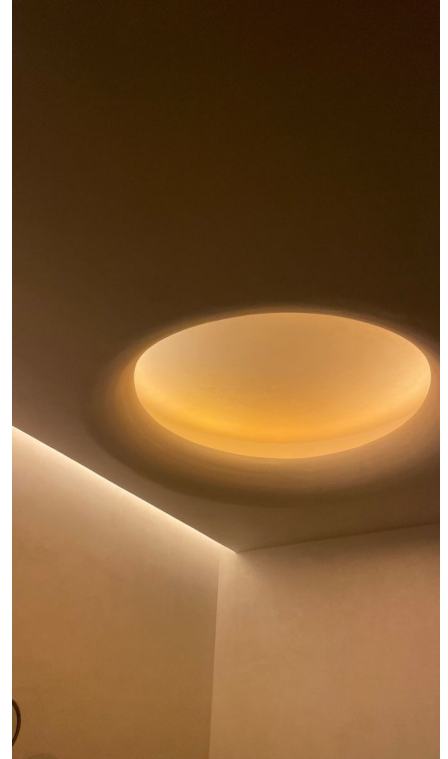
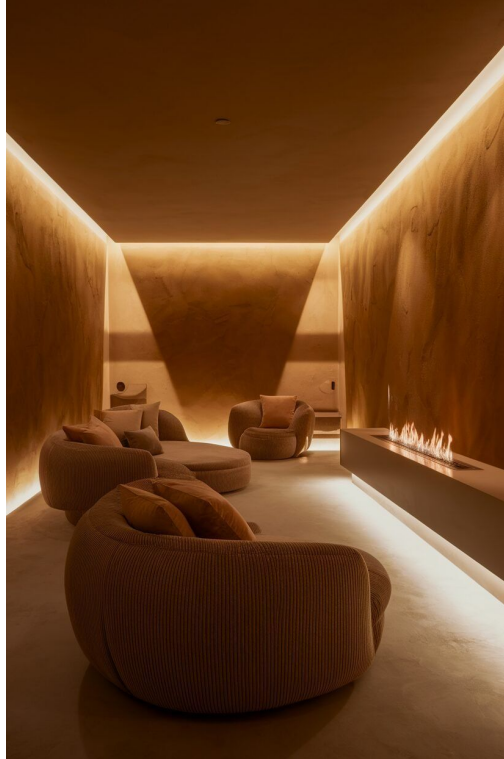
AFTER:
LED
lens with
LED Bulbs



Diffused lighting

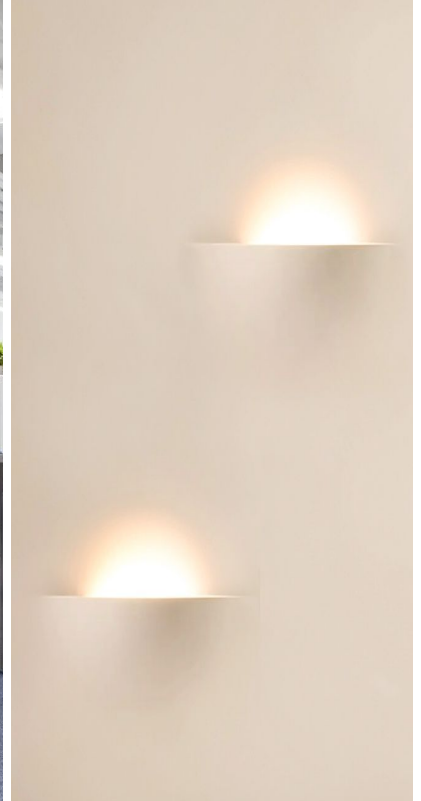
Light Integration Relax

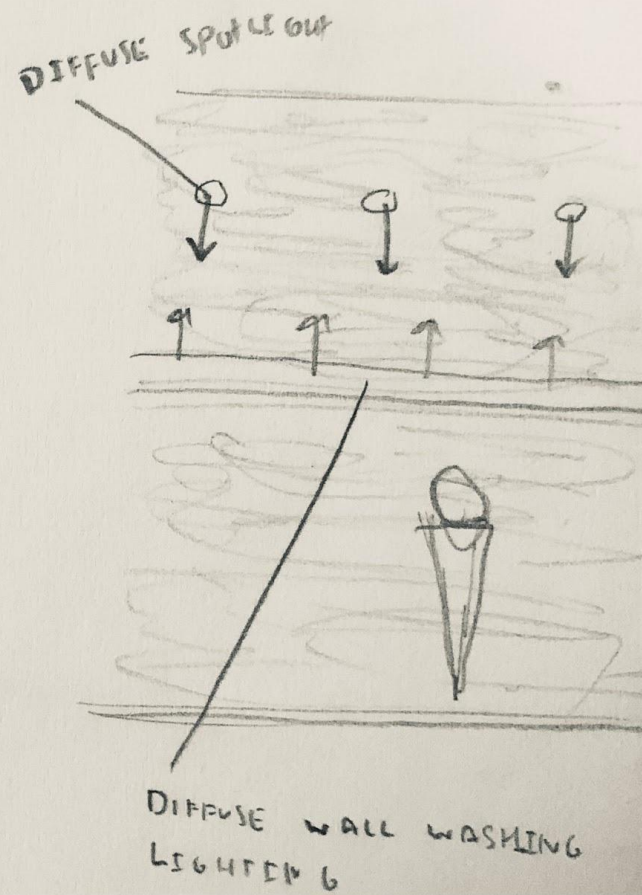
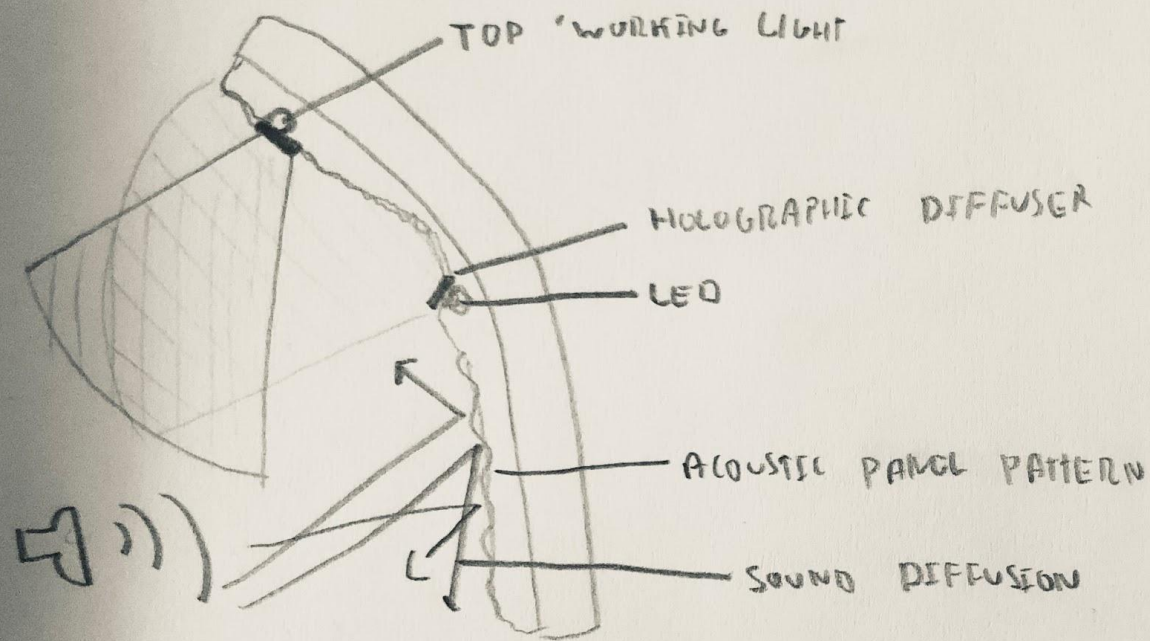
- Warm hues
- Soft diffused light
- Wall washing strips of light
- Organic round shapes



Light Integration Work

- Brighter white/blue light
- Diffused or more focused lighting
- Overhead light
- Eliminate shadows
- Focus on productivity





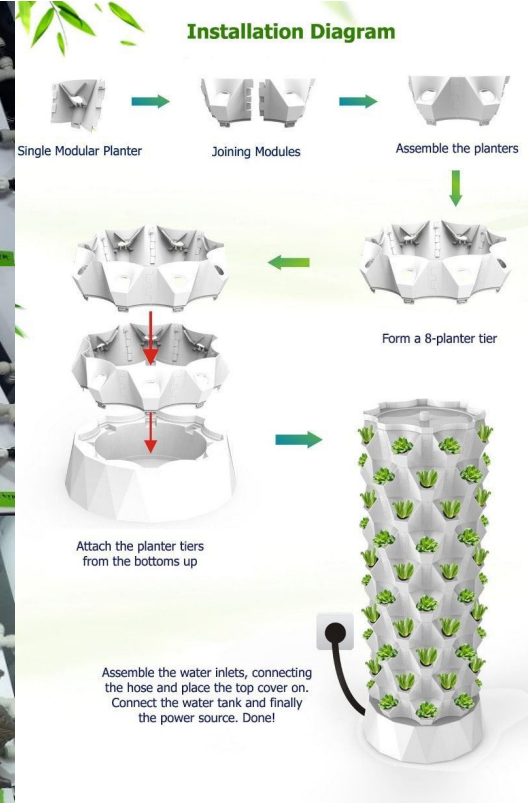
Light Integration Plants

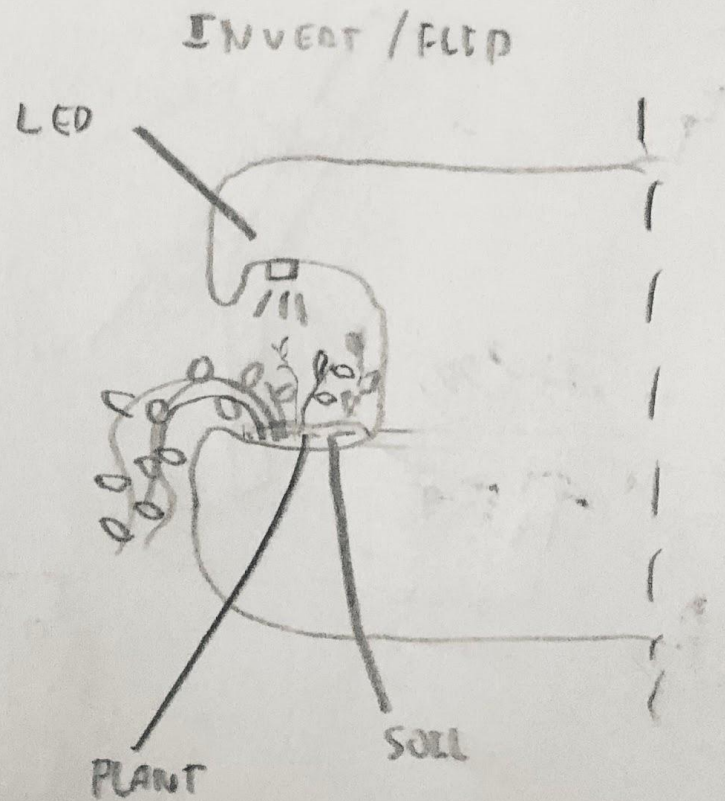
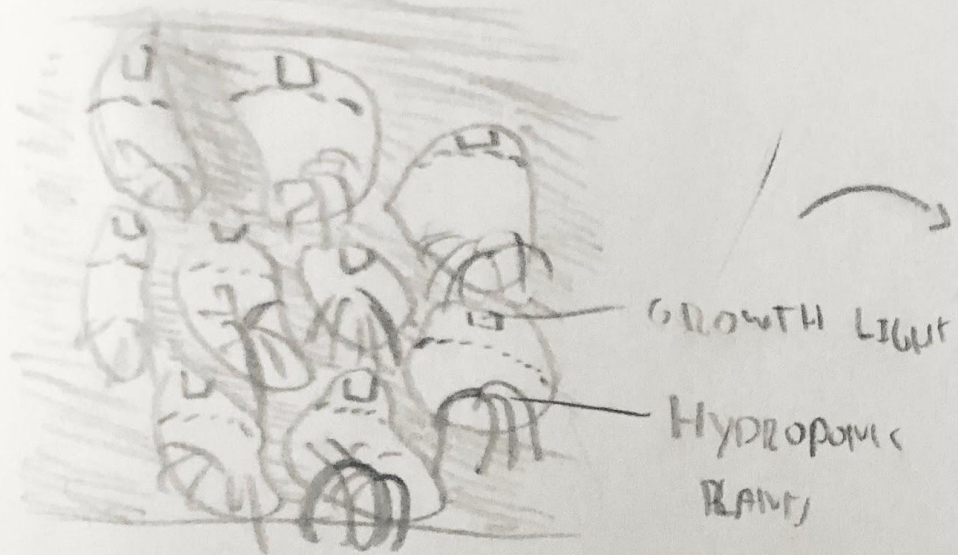
- Red-blue light for plants
- Stimulate growth & photosynthesis
- Integrated plant walls
- Plants for oxygen, food, mental health, medicine and research



Light Integration Plants

- Hang modules on existing wall
OR
- Integrate it into the wall
- Hydroponic tubes that carry nutrients along the wall
- Plants grow in the tubes





Summary

- Circadian Rhythm is important for health, sleep and productivity
- Warmer hues (yellow-orange) = Rest
- Colder hues (white - blue) = Productive
- Diffused light reduces glare and is less intense on the eyes
- Mix of wall washing, ambient and task lighting
- A mix of red and blue light for plant growth
- Hydroponic tube system for plants