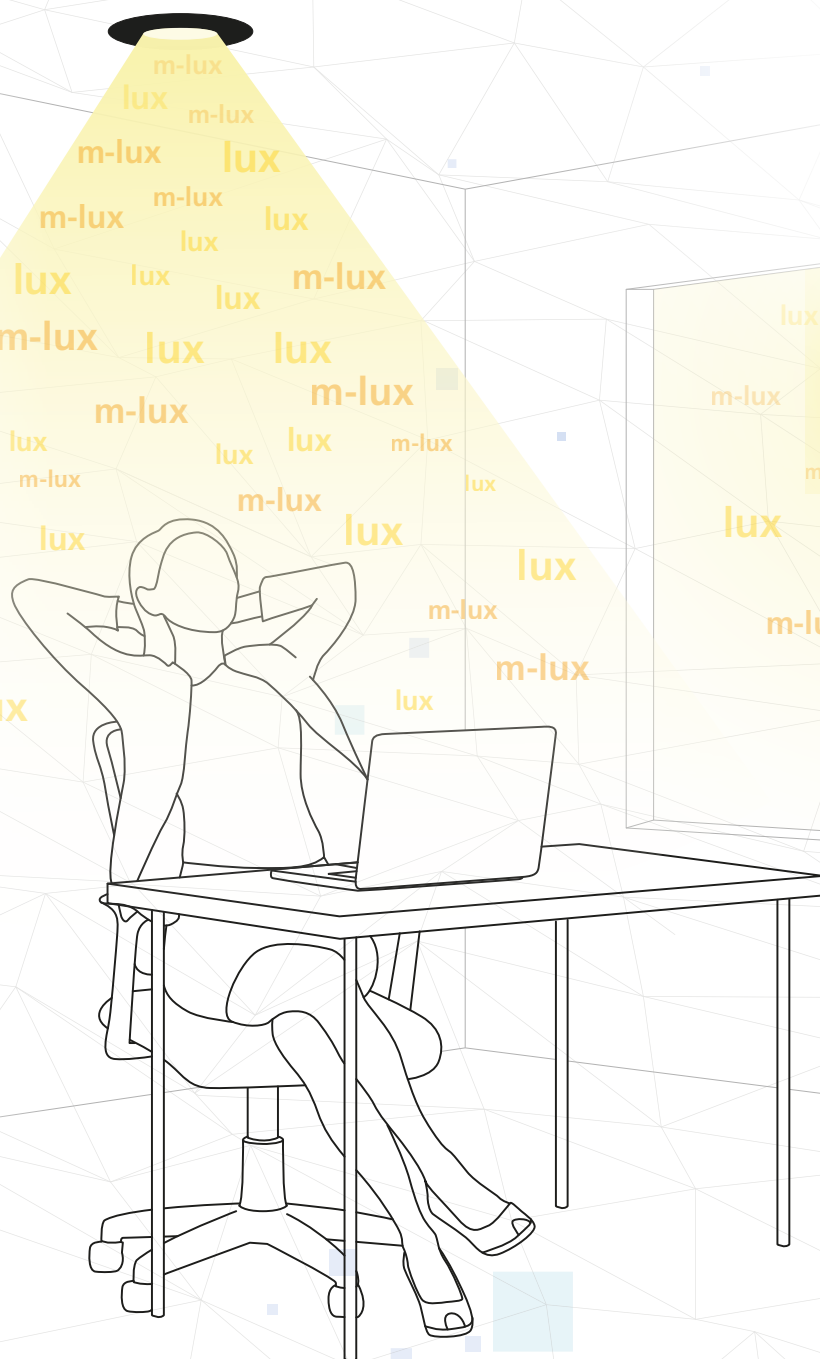


Lighting to enhance
WELL-BEING



An innovative technological approach



CRONOS *range*

LUCIPANEL CRONOS

LED Panel 600x600 mm



ORES CRONOS

Low luminance downlight



RIVOLI ALTO CRONOS

Floor lamp



RIVOLI BURO CRONOS*

Desk lamp



Light intensity and color temperature change throughout the day to match the users' biological clock.

The **melanopic flux** is the light flux absorbed by ganglial cells (melanopsin glands), which activate the **secretion of hormones**. The **ratio between melanopic flux and visual flux** - otherwise called m-lux and lux - is a useful indicator of the impact of lighting on circadian rhythm :

> The smaller the ratio, the more the user will secrete melatonin, the hormone stimulating sleep

> On the contrary, a high ratio can inhibit the secretion of this hormone and activate the secretion of day-time hormones (cortisol and serotonin).

Cronos has been conceived to provide **the closest melanopic ratio to that of sunlight** as well as a sufficient melanopic flux at all times.

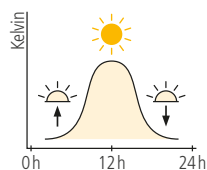
Sun in the middle of the day	1,1
5400K lighting	0,9
Sun at the end of the day	0,7
3000K lighting	0,5

Cronos corresponds to the optimal compromise between biological impact and visual comfort.

Light intensity range:

300 - 1000 lux

Color temperature range:



* on project

Design by Saguez



CIRCADIAN *rhythm*

Definition

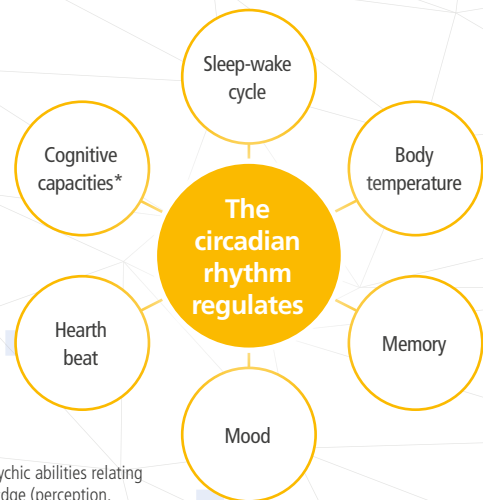
The circadian rhythm is a biological cycle ruling a variety of physiological processes in humans and animals. Its length is approximately 24 hours.

Endogenous, it continues to operate in the absence of contact with an outside environment.

It is regulated by light which has a synchronizing role.



Its role

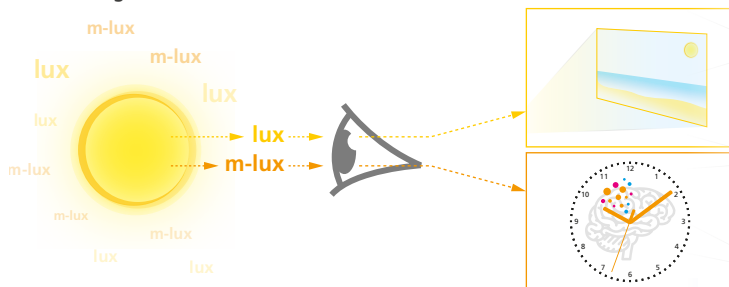


* All the psychic abilities relating to knowledge (perception, language, reasoning,...)

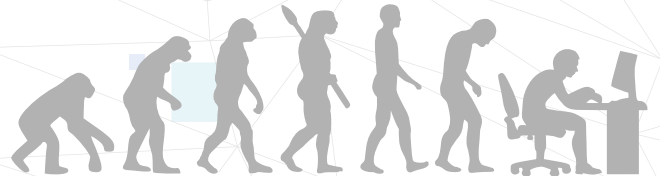
Light, main synchronizer of our biological clock

Light perceived by the eye is composed of **lux** and **m-lux**.

- + **Lux** are captured by photoreceptors located in the retina which ensure the **visual functions**.
- + **M-lux** regulates the hormonal balance, allowing the **synchronization of the biological clock**.



Nowadays, people spend more than **80% of their time indoors** under artificial lighting. This **lack of exposure to natural light** has disturbed the biological rhythm and consequently **has reduced sleep by about 1 hour a day** over the past 100 years.



A disturbed circadian rhythm can provoke:

- Fatigue and sleeping disorders
- Reduced concentration and energy that can affect work efficiency
- Mood disorders
- Seasonal depression



by Lucibel



Lucibel has designed **an innovative lighting solution allowing the synchronization of circadian rhythm by simulating sunlight** and its impact on the body.

Cronos lighting varies in intensity and color temperature, determined by a programmed daily scenario, ensuring optimal **visual comfort** at all times.

This scenario was defined **in collaboration with a team of neurobiologists and sleep doctors**, it is reproducing the natural light cycle on a 8 to 10 hours duration, depending on the client needs.

Thanks to this breakthrough innovation, Lucibel make the circadian lighting solutions, which until now had been reserved for the top-level athletes and the NASA, accessible to the general public.

Scientific collaboration

Cronos results from 4 years of R&D, in collaboration with neurobiologists and sleep doctors with more than 15 years of experience in the field of Chronobiology. The main objective of this collaboration was to create a light with a **real impact on the biological rhythm** and bringing to the users the natural light benefits.



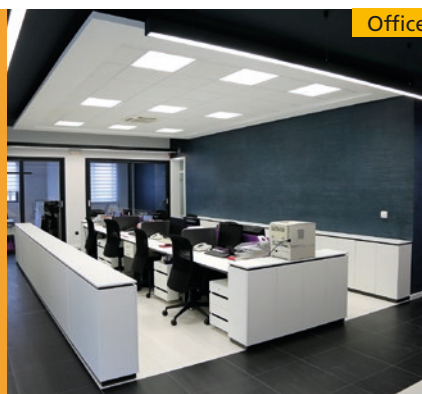
Benefits of a synchronized Circadian rhythm

Education



- Promote attention, learning

Office



- Enhance concentration, performance

Health



- Improve well being for patients and medical staff

Hotel



- Recovering jet lag, better sleep quality



A clinical study shows the Cronos benefits

In order to validate the benefits of the Cronos technology under real conditions, Lucibel tested it within a clinical study, realized by an independent expert : a medical team from the Hôtel Dieu, Paris. The study has been conducted during 28 days on 70 employees from the Nexity group.

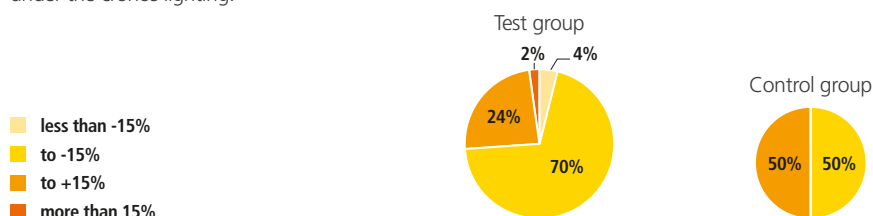
The results are impressing: **under Cronos lighting, 75% of the participants have seen their performances improve, their drowsiness reduce and had a better quality sleep..**

Study results:

Cronos improves the performance and the alertness

(speed test and decision making)

The vigilance measurements show a significant amelioration, with a 15% reduction of the reaction time for 3 out of 4 people under the cronos lighting.



Distribution of reaction time reductions between the two study periods for the Cronos group and the referent group (under traditional lighting).

Cronos is reducing the drowsiness

(KSS* test)

The somnolence is reduced throughout the day under Cronos lighting. The attention is thus improved for 3 out of 4 people.

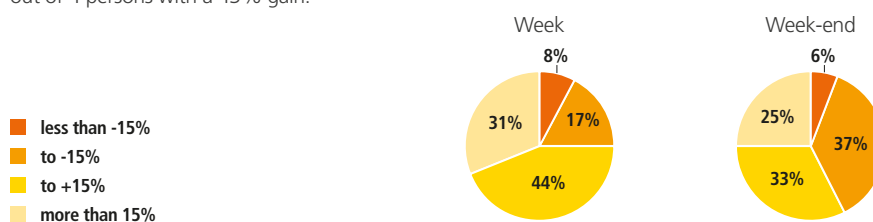


Distribution of drowsiness decrease rates at 2pm between two periods of the study for the Cronos group and the reference group (under traditional lighting).

Better quality sleep

(subjective quality tests and actimetric measurements)

Under the Cronos lighting, the self-perceived sleep quality is improved for 3 out of 4 people. It is extremely improved for 1 out of 4 persons with a 43% gain.



Distribution of the improvement rate in the self-perceived sleep quality between the two periods of the study for the test group.

* Karolinska Sleepiness Scale

Thanks to Cronos, 3 out of 4 users recover the benefits of a whole day under the sun !



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