

Lighten Up!

On Biology and Time

EPFL
Pavilions

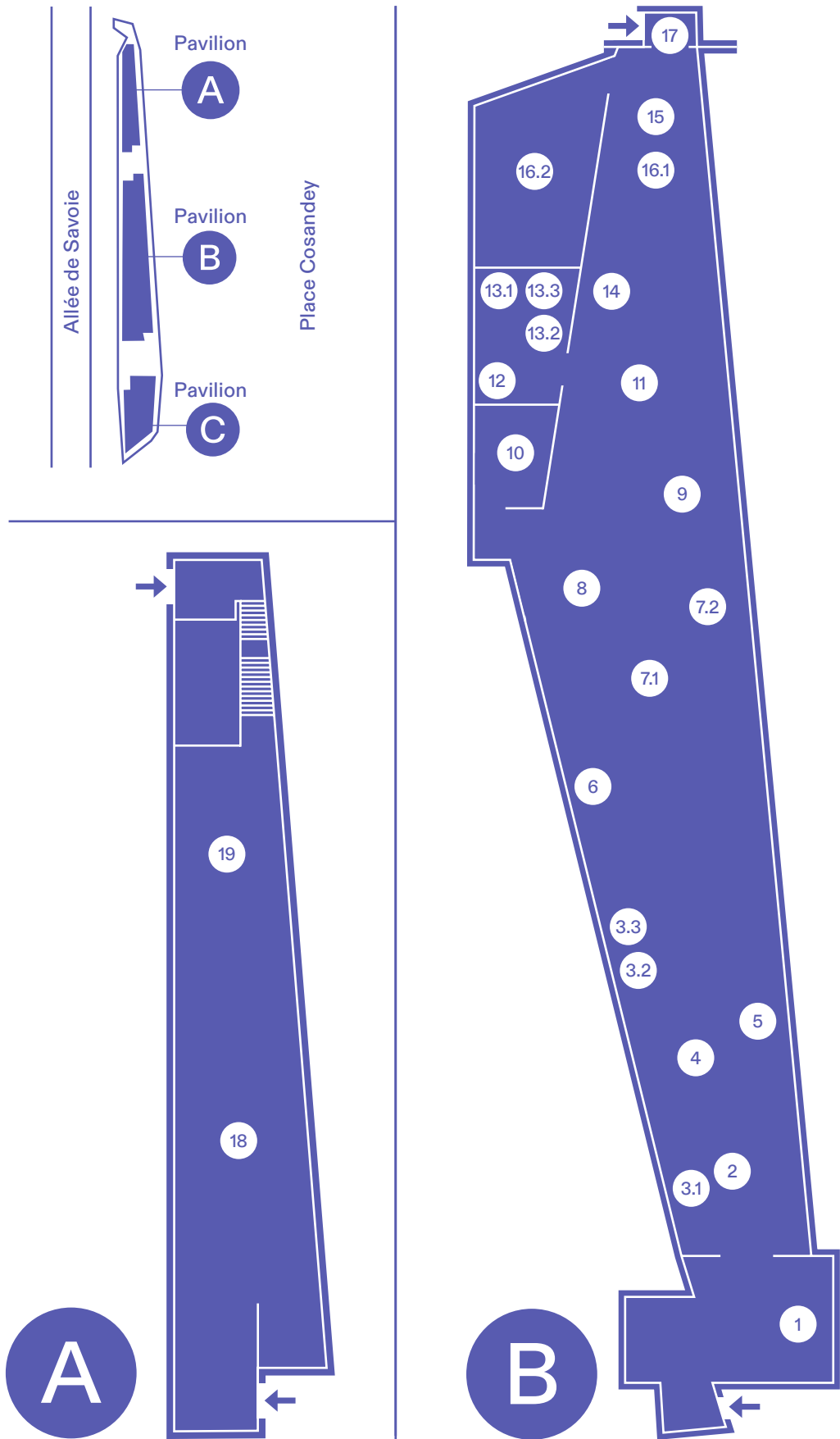
Amplifier for Art,
Science and Society

English

Guide



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Lighten Up!

On Biology and Time

We live on a rotating planet whose geophysical environment, alternating between day and night and changing daylength with seasons, has provided a temporal framework for evolution. All living organisms have internalised the light-dark cycle. Whether cyanobacteria or plants, insects or humans, they all have circadian rhythms (from *circa diem*, about a day) that prepare them for the right behaviour at the right time. Unravelling the secrets of how circadian clocks tick was awarded the Nobel Prize for Physiology or Medicine in 2017.

Light via the eyes is necessary for vision. Light has a second major function, to transduce time-of-day cues through a photoreceptor recently discovered in the retina. Light thereby acts as the key entraining agent (*'zeitgeber'*, or time-giver) for the clock in the brain. Daylight, in particular dawn and dusk, is the natural entrainment signal.

In humans, being exposed at the right time of day to enough bright light with specific spectral qualities can significantly boost the immune system, sleep quality, alertness and mood. Thus, light positively affects most psychological, physiological, and biochemical functions. However, we are learning that in a 24/7 society, urban lifestyles and work habits have gradually diminished outdoor light exposure. The consequences are irregular rhythms out of synch with the environment, that may lead to “social jetlag”, depression, sleep problems, and in the long-term, medical and psychiatric disorders. There is an increasing urgency to raise awareness of the necessity of regular, daily light exposure for overall health and well-being.

Exploring the secrets and importance of circadian rhythms and the crucial role of (day)light is the aim of this exhibition, which features nineteen unique projects, either specifically conceived or newly adapted for *Lighten Up!* Artists collaborating with chronobiologists have integrated the tenets of this scientific field into light- and sound-scapes, immersion spaces, and virtual interfaces.

Lighten Up! employs art to invoke the power and beauty of daylight as our archetypal source of light – and life. Certain artists highlight its crucial role in the built environment (James Carpenter, Marilyne Andersen, Colin Fournier) or seek to catch its physical essence (Alan Bogana). We celebrate the passage of the sun across the sky, and perhaps we may re-learn to live in harmony with our temporal environment (Olafur Eliasson, Siegrun Appelt) and better respect the darkness at night (Lovely is the Night).

Many of the artists explore the structure of a circadian day in individuals (Kirell Benzi), solar-linked patterns of rest-activity cycles and light exposure over long epochs (Andreas Horlitz, Susan Morris), or delve into the mysteries of sleep and dreams (Liliane Lijn, Rafael Gil Cordeiro). Beyond humans, we know that bees navigate using their internal clock and sun position (Anne Noble), and that light can synchronise the spontaneous high-frequency rhythms of fireflies (Robin Meier Wiratunga).

How do we think of and experience time? In 1751 Carl Linnaeus created his *horologium florum* by selecting plants that open or close their flowers at particular times of day. Here the flower clock is reinvented digitally (Anna Ridler). Can we unlearn our conventional experience of time (Helga Schmid) or ask, how does the way we

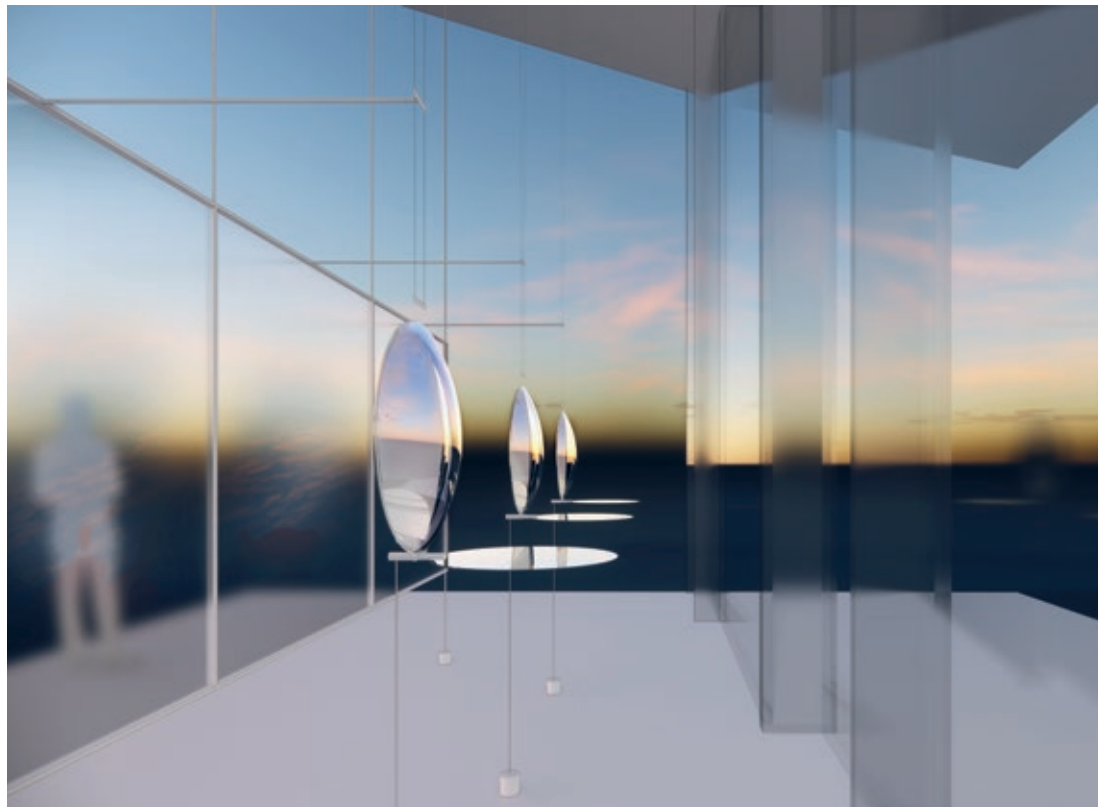
view time influence how we occupy time (Ted Hunt)? An interactive browser (the Linear Navigator) offers a tactile and visual journey into the research that has deciphered how organisms adapt to daily, lunar, and seasonal cycles. This historical and thematic panorama of biological rhythms and light has been documented by leading chronobiologists (*The Clocks Within and Around Us*).

Through a striking variety of forms and experiences, *Lighten Up!* allows art to help us recognise daylight as crucial to our lives. Our objective is to engage the public in a self-reflection on these ubiquitous biological connections to – or rather, disconnection from – the natural day-night cycle, and the implications of these (dis)connections. Many people have experienced jetlag, shiftwork, and the hour lost when Daylight Saving Time begins in spring: all instances of a forced desynchrony between our internal and the external clock. When we consider the fundamental impact of this cycle on all living organisms, then it becomes clear how rapid world-wide urbanisation and expanding light pollution at night can negatively affect behaviour and survival across species.

With contemporary urban lifestyles making much of the world population chronically light-deprived, and with screen-based activities exploding in all areas of work and recreation, there is an increasing urgency to raise awareness of the necessity of regular daily light exposure. Daylight invokes deep emotional and physiological resonance. Adequate, regular light exposure during the day as well as sufficient periods of darkness at night are essential to our psyche, behaviour and somatic health. Let us regain the night and lighten up the day!

James Carpenter

is an American artist based in New York City.



The sculpture's prominent expression of the horizon emphasizes dawn and dusk's vital role in our daily lives. Image courtesy and credit: James Carpenter Design Associate.

Embodied Light invites visitors to engage thoughtfully and physically with three suspended optical devices that are able to heighten an individual's awareness of the informational content of natural light. This thesis postulates that it is the presence of light illuminating the millions of surfaces and textures of the environment that triggers our perceptual and physiological responses. In addition to the transitions of dawn or evening twilight, the mid-day brightness of daylight, and the qualities of light that persist within darkness, light is also embedded in our memory and dreams: light resides within us.

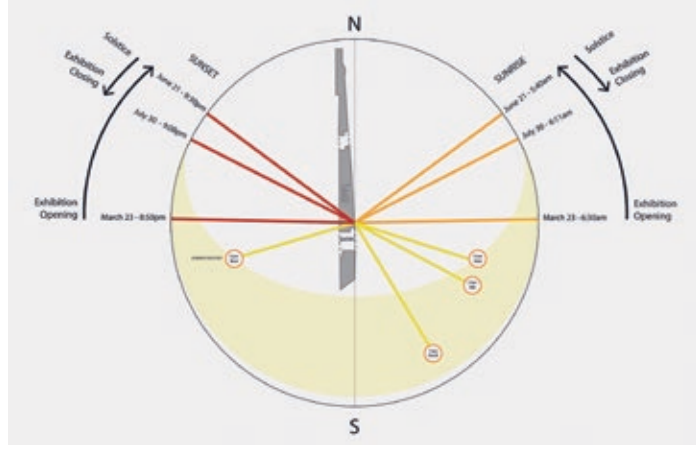
The three lenses redirect and project varied qualities of environmental light onto a diffuse glass surface. The result is an overlay of crisp images and diffused

light, movement, and shadow. The EPFL Pavilions entry foyer has an eastern solar exposure, and observations throughout the day present unique and individually rich experiences of changing light qualities. In the morning, direct sunlight and shadows from outside will be animated and overlaid with the bright landscape beyond, while at sunset indirect light from the west will present an array of ambient colours reaching to the horizon. The path of the sun and moon are captured in the projected image when viewed at certain times of the day and night each month, bringing attention to the connected rhythms of biological and celestial time. The layers of *Embodied Light* reveal varied aspects of light / time which we as individuals experience, absorb, respond to, and cherish.

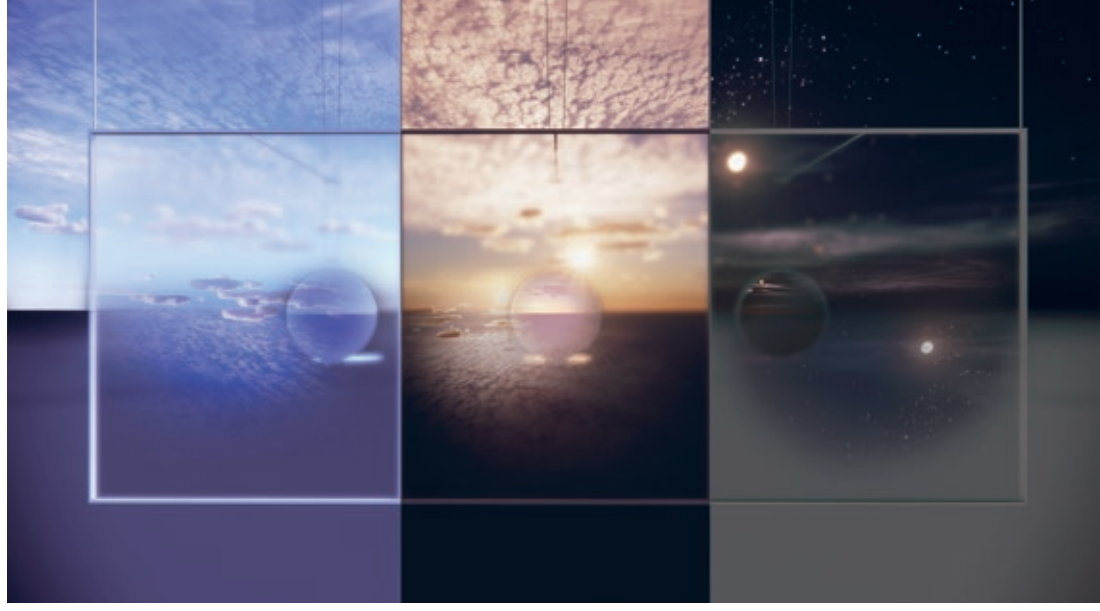
The lens and etched glass collect an array of juxtaposed colours, shadows and projected images. Image courtesy and credit: James Carpenter Design Associates.



Diagram showing the range of the sun's path from opening to closing of the *Lighten Up!* exhibition. Image courtesy and credit: James Carpenter Design Associates.



The layers of light across time bring awareness to the rhythms of biological and celestial time. Image courtesy and credit: James Carpenter Design Associates.



2 10,000 Waking Bees #1 and #2 2012

Photographs, 400×200 cm.

Anne Noble with Guy Warman

Anne Noble is a New Zealand photographer and installation artist.

Guy Warman is a New Zealand chronobiologist from Auckland University.



In the Dead of Night. Image courtesy and credit: ©Anne Noble.

10,000 Waking Bees is a glimpse inside a scientific investigation into the impact of anaesthetics on the circadian clock of honey bees. As an artist and a beekeeper, Anne Noble fell in love with chronobiologist Guy Warman's studies of the time sense of bees. He found that general anaesthesia stops the circadian clock of honey bees so that their time orientation is out of synch when they navigate using the position of the sun in the sky. After six hours of anaesthesia their direction of flight back to the hive is that which they would have taken at the moment of being put to sleep, following the sun's course six hours earlier. This work explains that feeling of "just having being put to sleep" when waking up after a long operation and the studies have shown that this anaesthesia-induced jetlag can be reversed by bright light (in bees and in humans). Watching Warman put the whole colony of bees to sleep, Noble conjured an image of

10,000 waking bees – an event one would never normally see in a beehive. The stillness of a multitude of bees and their transition from the anaesthetic-induced sleep to wakefulness was what Noble was later privileged to see and to photograph. These images echo her experience of wonder at our biological closeness to bees as a species. The immersive scale of the photographs is a poetic gesture to bring the bees closer to us, both physically and metaphorically.

Anne Noble in her bee yard, recording the sounds of her hives. Image courtesy and credit: ©Anne Noble.



10'000 waking bees. Image courtesy and credit: ©Anne Noble.



Susan Morris

is a British artist and writer, living and working in London.

The body has an uneasy relation to the artificial systems of clock and calendrical time that structure our days. Susan Morris is interested in ways in which the individual subject falls in and out of sync with these systems. Between 2004 and 2014, the artist recorded her sleep-wake patterns using an Actiwatch – a wrist-worn recording device used by chronobiologists – initially making small, diaristic, ink-jet prints out of the data but eventually developing the work into large Jacquard tapestries generated directly out of these long-term datasets. Her work reveals a body very much embedded in routines typical to an individual living in a Northern European city during a period of late capitalism, but also a body that frequently went its own unruly way.

Historically, the Jacquard loom was the first invention to mechanise labour, thus bringing into the workplace machines that could work faster and for

longer than any human individual. As a consequence, labourers were organised to become more machine-like. Other externally imposed changes, such as the shift to and from Daylight Saving Time, also have an impact on the body. In the few weeks following this switch in spring, for example, individuals are more likely to feel depressed, have a traffic accident or make mistakes at work.

The Actiwatch also recorded ambient light, both natural and artificial, and the tapestries show that, due to the existence of artificial lighting, alongside high levels of light pollution in the city, less than a third of the artist's time was spent in the privacy of darkness, where she might get sufficient sleep, vital to our health and our sense of self.

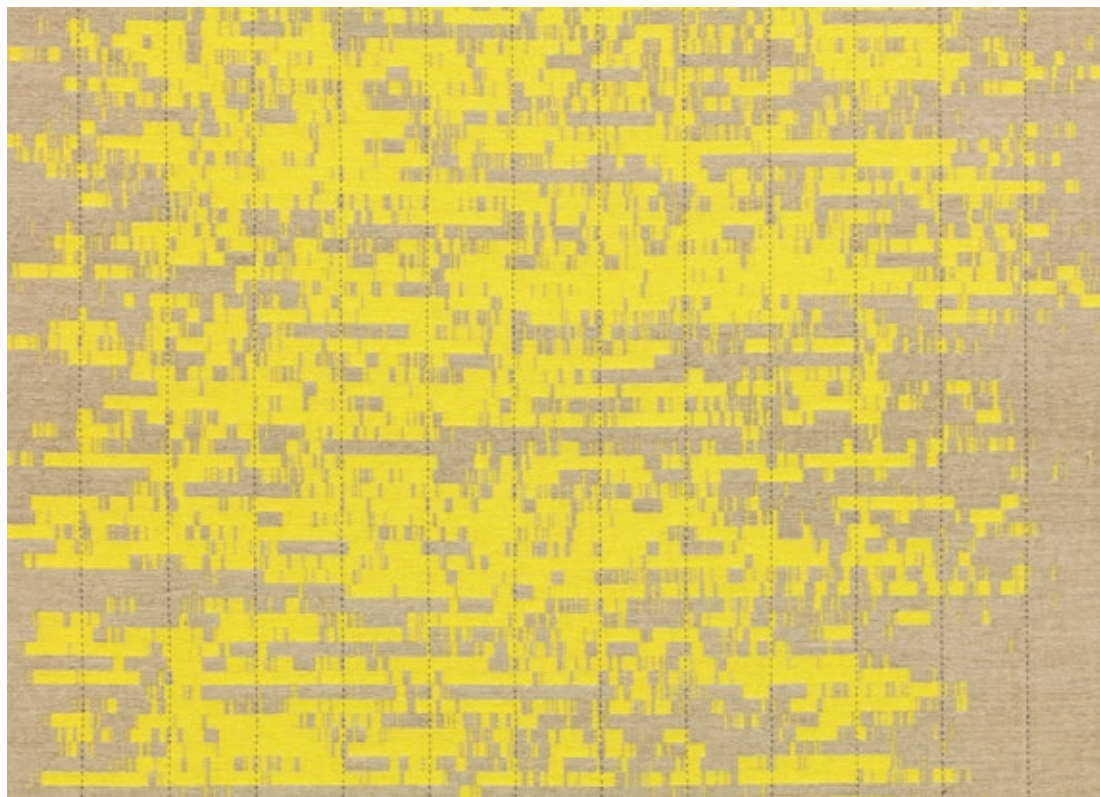
These pieces are part of a series developed within a 10-year partnership with Russell Foster, Professor of Circadian Neuroscience, University of Oxford.



Binary Tapestry (Sunshine) and SunDial/NightWatch_Activity and Light 2010–2012 (Tilburg Verich). Image courtesy of Bartha Contemporary, London. Photo: Steian Rohrer.

Jacquard tapestry: linen and cotton yarn, 366 × 145 cm. Courtesy of Bartha Contemporary, London.

Detail of *Binary Tapestry (Sunshine)* | Image courtesy of Bartha Contemporary, London. Photo: Steve White & Co.



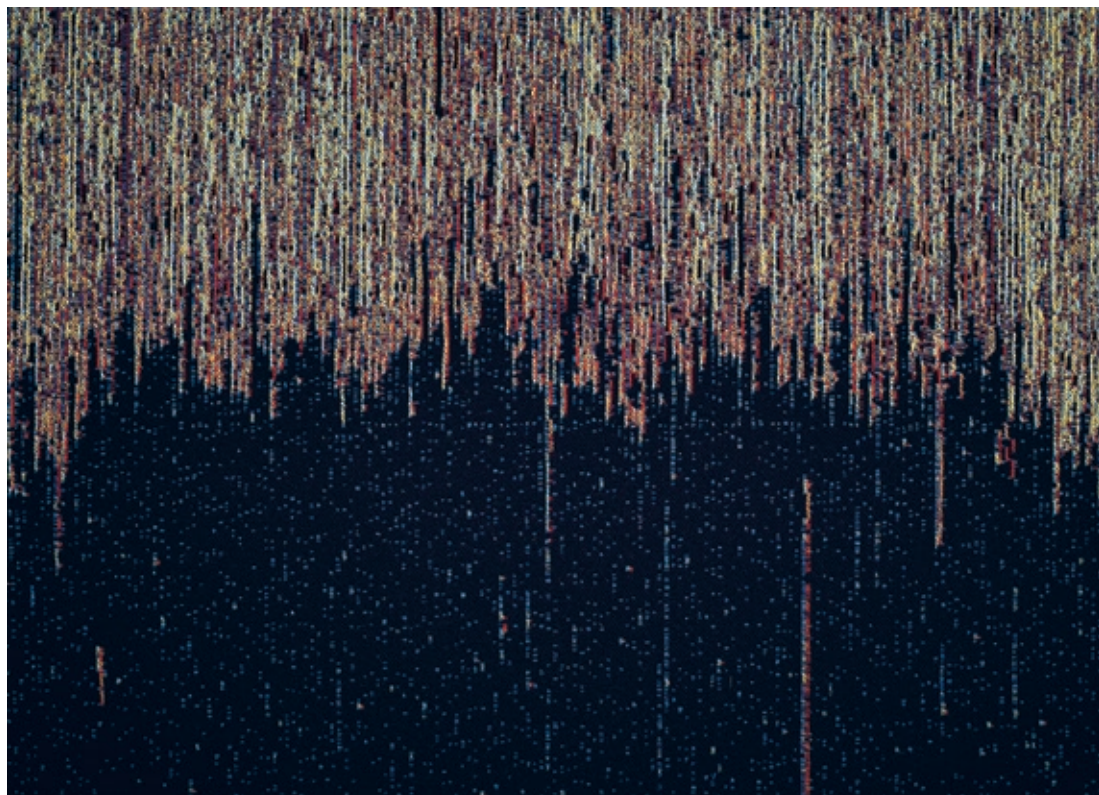
Binary Tapestry (Sunshine) records the amount of light (natural and artificial) that the artist was exposed to over the course of 2012. It shows each minute of the year running across and down from left to right.

The 366 days of the year (2012 was a leap year) also run in horizontal lines down the tapestry, with each day allocated a height of 1 cm — thus dictating the overall height of the piece which echoes that of the window in the gallery space for which this piece was initially made, which itself echoed the proportions of the Actigraph produced by the Actiwatch software.

The width of the piece was decided upon using the same logic. Starting at the top left-hand corner at 00:00 hours on 1 January, the year ends at the bottom right-hand corner, at midnight on 31 December. Black lines, travelling vertically down the length of the piece and made by pulling the warp thread to the surface of the tapestry, separate the hours.

The piece is made from raw linen and a single cotton yarn of bright yellow to give the impression of paint on canvas. Morris's tapestries are not hand-made; recorded data is converted directly into coloured thread and woven automatically on a Jacquard loom — one of the first binary systems and as such a precursor of the computer.

Jacquard tapestry: silk and linen yarn. 155×589 cm. Courtesy of Fondation Collection Centre d'art Pasquart, Biel.



Detail of *SunDial: NightWatch_ Activity and Light 2010–2012 (Tilburg Version)*. Image courtesy of Bartha Contemporary, London. Photo: Steve White & Co.

SunDial: NightWatch_ Activity and Light 2010–2012 (Tilburg Version) records the artist's sleep-wake patterns over a period of three years, alongside the amount of ambient light (natural and artificial) that she was exposed to during that time, collected with an Actiwatch.

The recording begins at the bottom left-hand corner of the tapestry at 00:00 hours on 1 January 2010, and ends at the top right-hand corner at 00:00 hours on 31 December 2012. Time thus moves horizontally across the piece in a kind of coiling motion. Night occupies the bottom third of the tapestry, with artificially-lit evenings along the top section. Midday runs across the centre of the piece. There were 1,096 days in the three-year recording period. These go vertically from left to right across the tapestry, with the two concurrent data streams for each individual day shown side by side.

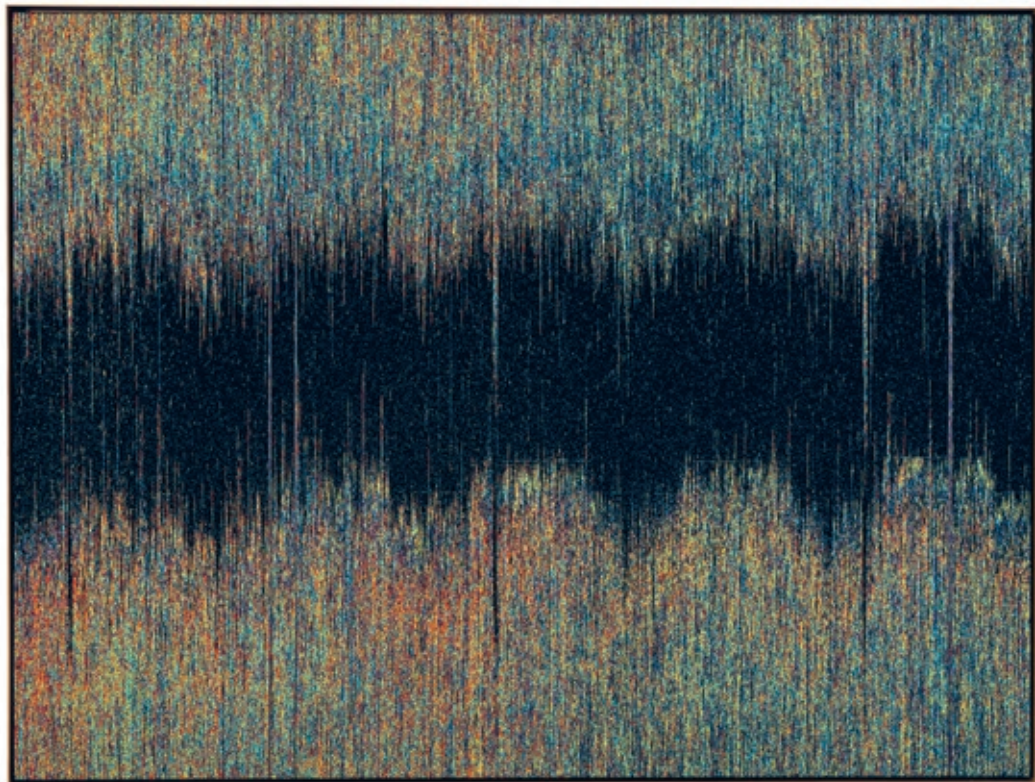
The colours indicate degrees of intensity of light, on a gradient from black (for low or no light) through various blues to light turquoise. Activity is represented on a gradient from black through orange and purple to the red yarn that indicates maximum activity. The seasons emerge clearly over the three-year period, with the long daylength in the summers diminishing in the winter months. The artist also travelled across time zones on two occasions in spring, which is clearly seen in the first and third year.

3.3 Sleep / Wake 2010–2014 (MLS Version)

2015

Jacquard tapestry: silk and cotton yarn, 134 × 178.5 cm. Courtesy Bartha Contemporary, London.

SunDial: NightWatch_Sleep / Wake 2010–2014 (MLS Version). Image courtesy of Bartha Contemporary, London. Photo: Steve White & Co.



SunDial: NightWatch_Sleep / Wake 2010–2014 (MLS Version) records Morris's sleep-wake patterns over a period of five years. Values were recorded for 1,440 minutes of each day; one 'shot' of weft thread was used for each minute, thus conveying both time 'flashing by' and the Jacquard process itself, with the single weft yarn flicking through, up and down, across the warp.

Following the conventions of the chronobiologists the artist was working with, night is configured down the centre of the tapestry, with mornings along the bottom third of the piece. The artist travelled across time zones three times over the five-year period. Most striking of all, are the shifts to and from Daylight Saving Time, clearly apparent in the way the data steps up and down five times.

Finally, in the tiny rows of blue yarn, showing a minute's worth of activity

each morning at the same time, you can see when the artist moved her hand suddenly as her alarm clock went off.

Here the artist used a silk yarn, which is much finer than cotton or linen so, given that the thickness of the yarn dictates the height of the piece, the tapestry that records the greatest length of time is smaller than those that record a shorter duration but that were made with thicker thread. Making recordings for long time periods draws attention to repetitive rhythms and activities that often extend beyond a single year. Therefore, this piece acts as a diary of an individual living in a northern European city, governed by clock and calendar time, where we all wake up at a similar time and extend the working day with artificial lighting.

Digital App and watch. Concept: Ted Hunt.
Production, creative technician and engineer:
Krishna Prajapati.

Ted Hunt

is an independent critical designer
living and working in London.



Circa Solar on Apple Watch / Android Watch. Image courtesy and credit: Ted Hunt.

After centuries with little innovation in chronometry technology, *Circa Solar* represents a new design for time-telling which seeks to realign our sense of time with that of the sun's day-night cycles, and thereby enrich and extend our common understanding of the fourth dimension, time, beyond its mere quantification.

Circa Solar's simple design includes 12 watches presented in *Lighten Up!* as an illustrative spectrum of twelve months of the solar year aligned to a specific location, in this case to London.

It serves as a translational device between the modern division of time into twenty-four equal daily parts, and the ancient knowledge of time as a phenomenon of fluctuating daily and seasonal light cycles that act as 'zeitgebers' (time givers) to our internal body clocks.

Circa Solar visualises localised daily sunrise / solar noon / sunset / twilight times accessed from remote API data for any given latitude and longitude (here London) as continually changing ratios of light, transition twilight, and dark. *Circa Solar* allows us to experience the true 'nature of time' as an emergent phenomenon of celestial cycles while

enhancing our immediate appreciation for the life-defining nature of circadian and seasonal rhythms.

Circa Solar was first developed as part of a 2019 artist-academic commission between Somerset House Studios resident Ted Hunt and Professor Matthew Soteriou of King's College London's Department of Philosophy. The project was subsequently iterated as a successful Kickstarter crowdfunding campaign in 2020, seeing the design released globally as a smartphone and smartwatch app for both Apple and Android platforms.

Circa Solar on smartphones. Image courtesy and credit: Ted Hunt.



Circa Solar on smartwatch. Image courtesy and credit: Ted Hunt.



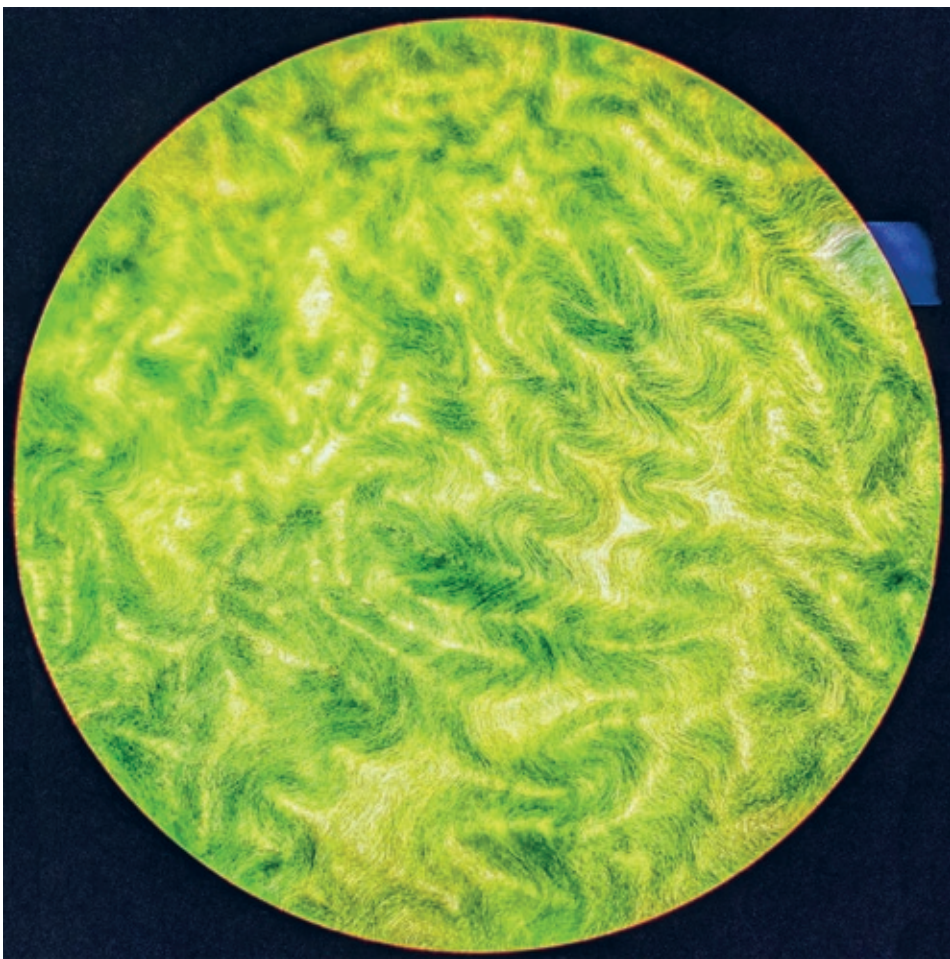
Interactive installation. Linear Navigator, 55-inch LCD monitor on a 10-metre rail. Concept and data collection by members of: the Society for Research on Biological Rhythms, the European Biological Rhythms Society and the Society for Light Therapy and Biological Rhythms. Production: EPFL, Laboratory for Experimental Museology (eM+). Research development, programming: Giacomo Alliata. Interactive graphic design: Patrick Donaldson. See complete list of collaborators at the end of the guidebook.

Anna Wirz-Justice with Bharath Ananthasubramaniam, Steven A. Brown, Horacio O. de la Iglesia, Diego A. Golombek, Carl Hirshie Johnson, Till Roenneberg, William J. Schwartz.

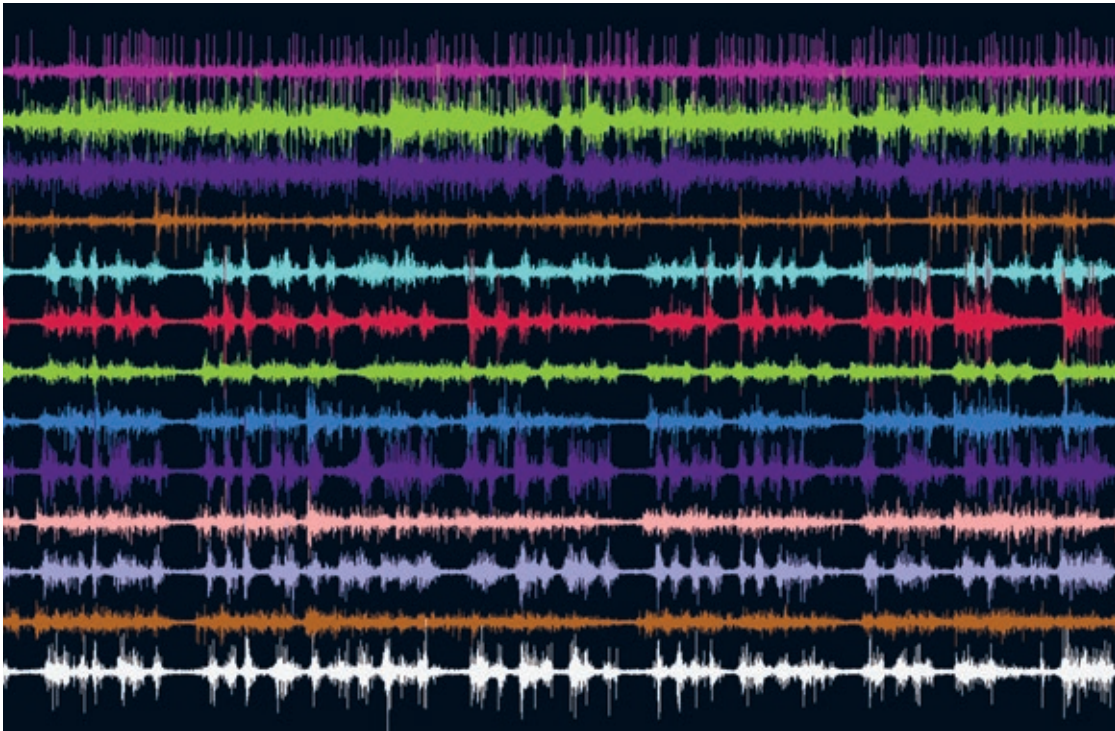
The Clocks Around and Within Us, an interactive interface, explores the history and discoveries in chronobiology in seven themes. *Being healthy: it's about time* reflects on the impact of chronobiology on our everyday lives: why sleep? when should I take my medication? what is melatonin? how does light treat mood and sleep disorders? can we improve daylight access within the built environment? *An owl in the morning is merely conforming* explores the temporal dilemmas we are confronted with in the industrial era, with our body clocks often out of sync with our social schedules. *Generating internal body time* describes the endogenous circadian rhythms present in all organisms and their adaptation to the day-night cycle. *Revealing circadian clock cells and circuits* presents the localisation, structure, and rhythms of internal clocks in a variety of species via images, real-time videos, and reflections of some of the field's pioneers. *How and why do we have clocks?* describes the evolution of clocks as an adaptation to the cyclic environment, whereby they anticipate important daily changes, tell the time of day, recognise seasons by measuring daylength, and enhance reproductive fitness. *Lunar and seasonal clocks* illustrates how the influence of the

moon and seasons on living species has been known since prehistorical times. Yet, the notion that lunar and seasonal rhythms could be governed by clocks like those that regulate our daily rhythms has only been explored more deeply in the last fifty years. *Learning from virtual clocks* deals with the abstraction of rhythms to the world of numbers and equations: How can maths describe clocks? How does it help our understanding and potentially improve our health and our society?

Cyanobacteria. Image: Carl Johnson.



EEG patterns in mice. Image: V.Vyazovskiy, Oxford University.

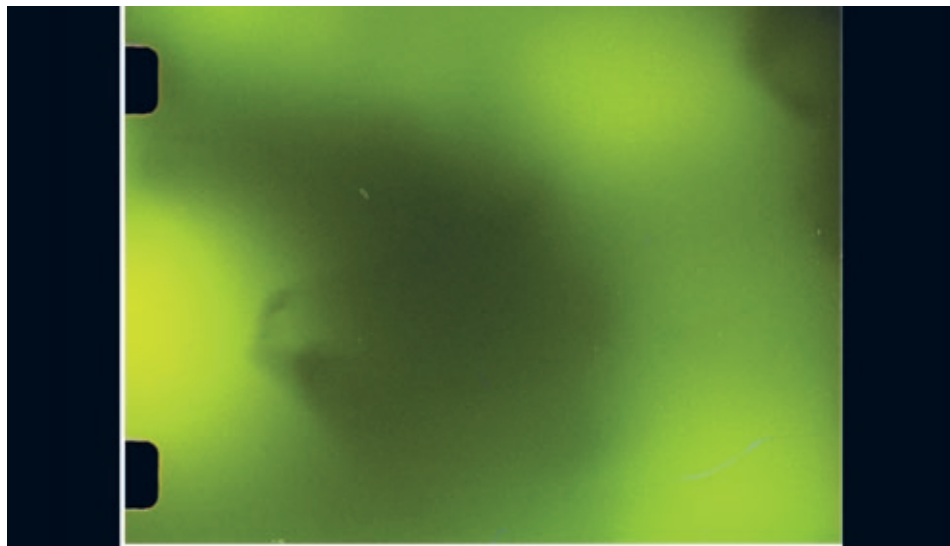


Video installation with three circular projections (digital scan), electro-magnetic pendulums, custom software. Concept: Robin Meier Wiratunga. Firefly handler and scientific advisor: Tanthai Prasertkul. Special thanks to Guy Amichay and Danny Abrams, at Northwestern University and to Anchana Thancharoen at Kasetsart University.

Related work: *Synchronicity*, n°19.

Robin Meier Wiratunga

is a Swiss artist based in Paris.



Images: Video Still *Synchronicity* (16 mm). Image courtesy of Robin Meier Wiratunga. Photo: ©ADAGP.

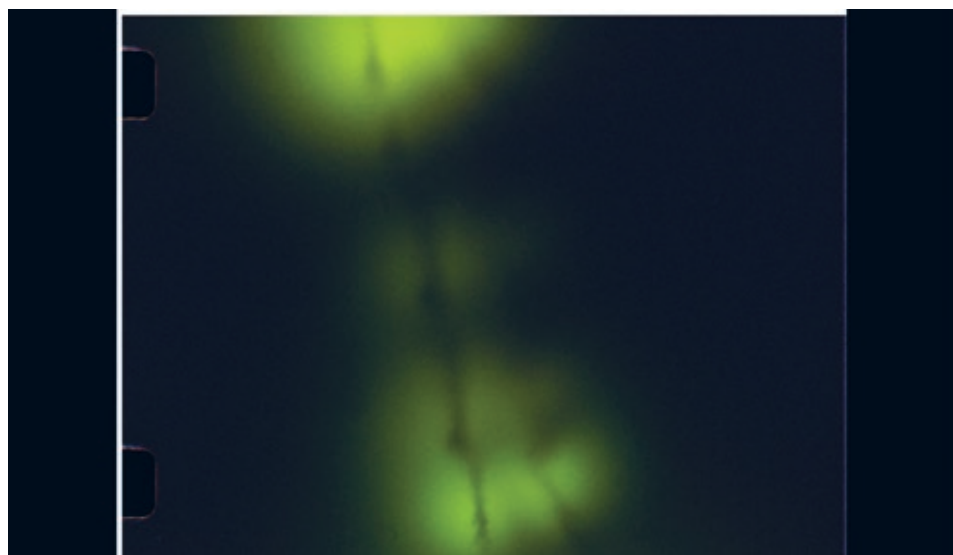
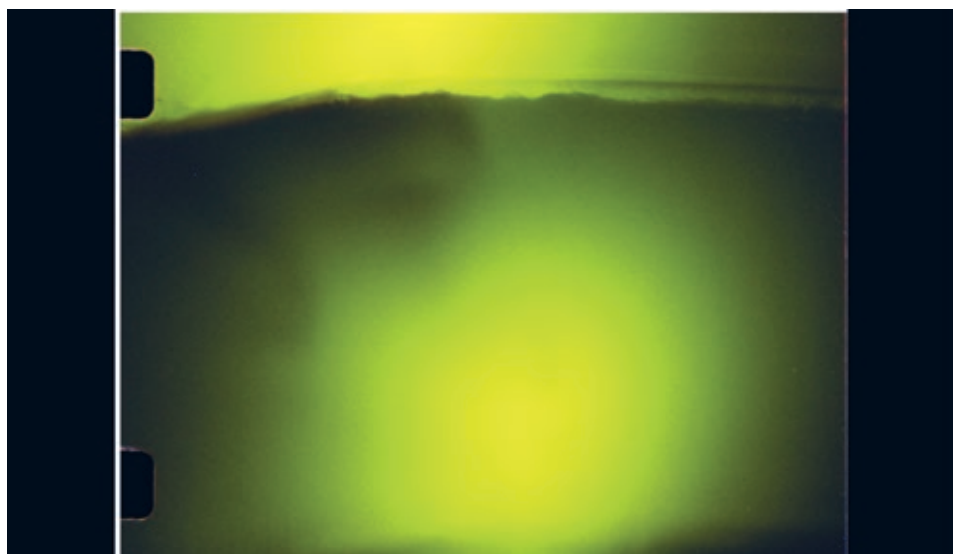
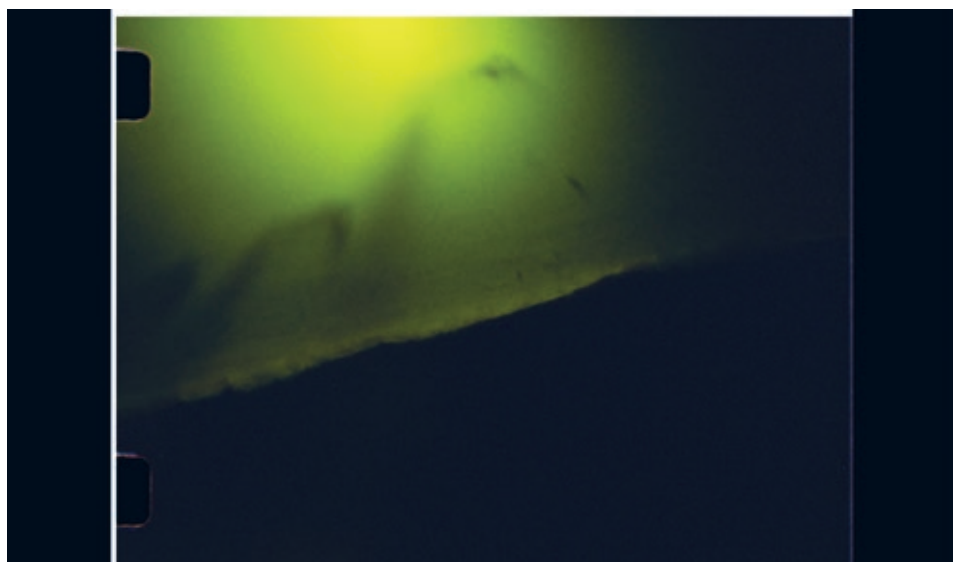
In this work, a 16 mm photographic film was directly exposed to the light of two captive fireflies (*Pteroptyx malaccæ*). Without camera or optics, the insects were simply placed on the film.

Fireflies use their bioluminescent signal to communicate and create collective displays to attract mates. While light is the main 'zeitgeber' (time giver) for circadian rhythms, at a different scale of seconds, its pulses can also synchronise the nocturnal glow rhythms of fireflies.

The projection of the resulting patterns is modulated by two electro-magnetic pendulums. The pendulums are placed close enough for their magnets to slightly influence each other's field. Steadily synchronising, they settle on a common beat, just as fireflies synchronise in nature.

The luciferase enzyme which allows fireflies to produce their light is widely used for imaging and marking in biotech-

nology. The underlying mechanisms that give rise to the synchronous patterns found in nature are still largely unknown. Understanding such self-organising processes can be applied to many domains: from cardiac arrhythmia treatment to efficient coordination of computer networks.



Andreas Horlitz

was a German photographer and artist
(1955–2016), working in Munich.



Andreas Horlitz Sculpture *Cyclus* full scale night view illuminated Gerling Disseldorf.

Our modern obsession for recording our daily activities – number of steps, heart rate, sleeping activity – may seem like a recent product of a highly-connected world. Twenty years ago, Andreas Horlitz was already fascinated by actimetry (the scientifically more accurate version of today's wearables). The artworks here exemplify his interpretations of actimetry-derived circadian rhythm patterns in different formats using mirrored glass, steel, and importantly, illumination.

Andreas Horlitz's oeuvre, with its rich, complex imagery, ranges from photography interwoven with words and images in composite prints, collages, and light sources, to architectural installations echoing the context of the site. His work was often immersed in and inspired by scientific data – DNA sequences, spectral analysis of distant stars, rest-activity cycles.

7.1

Cyclus

2000

Light sculpture made of stainless steel, steel cable, fluorescent tubes. 620 cm, Ø 25 cm. Original installation: 24.5 m height. Courtesy of the Horlitz collection, Centre for Chronobiology, Psychiatric University Clinics, Basel.

Cyclus originally consisted of seven years of actimetry data transformed into a high-gloss 24.5 m stainless-steel column, a floating light sculpture in a multi-storey atrium. The rest / sleep phases

are punched out and illuminated from within. *Cyclus* was his most monumental work. For *Lighten Up!*, the installation consists of 4 modules connected in a 6.20 m-high column.

7.2

Panorama

2001

Light box with partially mirrored glass, 238×29×10 cm. Photograph, 262×93 cm. Courtesy of the Horlitz collection, Centre for Chronobiology, Psychiatric University Clinics, Basel.

Andreas Horlitz *Panorama* detail of light box. Photo: Anna Wirz-Justice.



Panorama is an impressive installation located on the executive floor of a life insurance firm, consisting of twenty-eight engraved light cabinets lighting up the hallways of the building.

The silver mirrored glass cabinets are etched with the actimetry data of the rest-activity cycle covering the

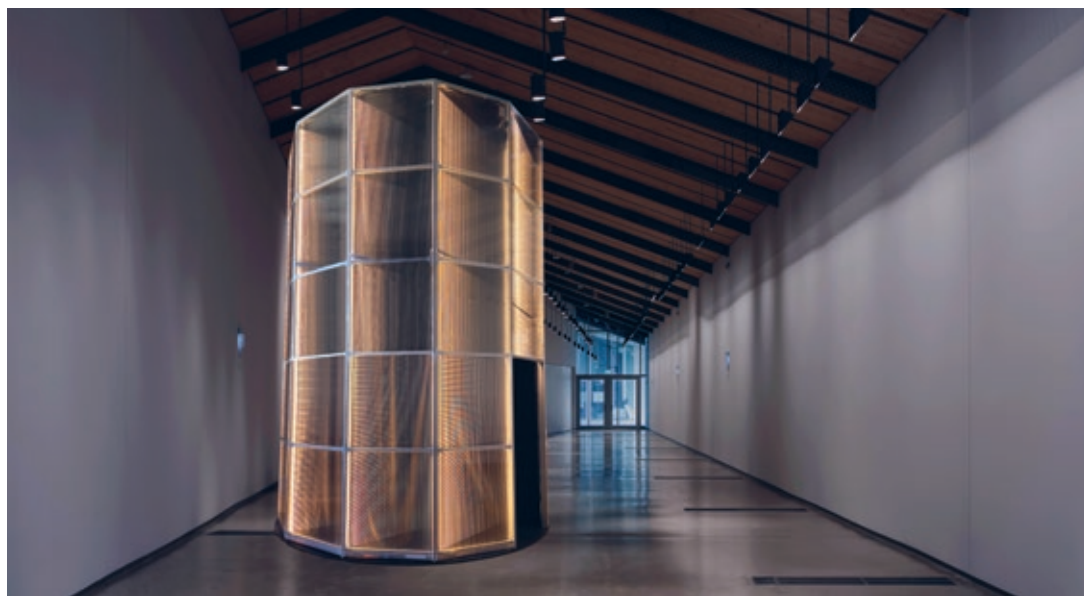
human life span from birth to old age, represented as abstract repetitive black and white patterns.

One of the light boxes and a photograph of seventeen of the original 28 actimetry datasets that were used for the installation are featured in *Lighten Up!*

Immersive installation. Ø 400 × (h) 575 cm. 7:15 minutes. Concept and Production Management: EPFL x HEAD – Genève. Marilyne Andersen, Mark Pauly, Florin Isvoranu, Javier Fernández Contreras. Full project credits at the end of the guidebook.

Marilyne Andersen *et al.*

is specialised in psycho-physiological effects of daylight in buildings.



An illuminated, totemic pavilion with an illusion of depth, generated by light itself. Image courtesy of EPFL-LIPID. Photo: Marilyne Andersen, Megan Danel.

Our daily exposure to light as well as its dynamics over time are crucial elements of a healthy and sustainable life in dense urban environments. Light received at the eye regulates our neurophysiology and profoundly affects the liveability of cities, which we tend to inhabit increasingly indoors and deeper underground.

Circa Diem – ‘about a day’ in Latin – raises awareness of the threat of this disconnection. Inadequate light exposure affects our circadian rhythms and can have detrimental effects on our health, well-being and sleep. Architecture and the urban fabric control our access to daylight by filtering and redirecting light through spatial forms.

Entering a monumental cylindrical space that suggests being deep in an urban canyon, the visitor is immersed into the passage of time through four phases of the 24-hour day – morning, midday, evening and night. This sensorial experi-

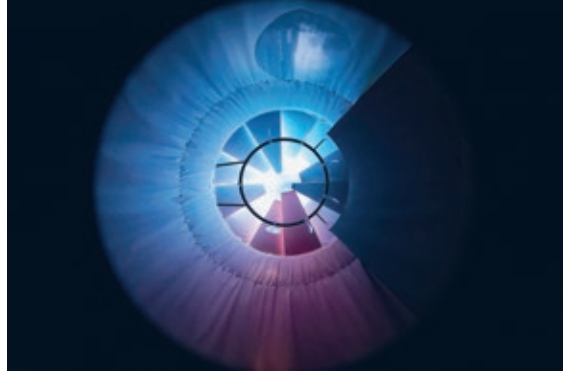
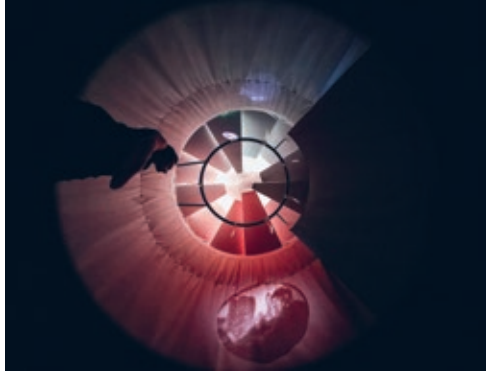
ence involves a dynamic choreography of light and dark, colour and sound, and images generated by a novel light-shaping technology that precisely controls high-contrast patterns evoked by the built environment. Experienced together, they allude to the multiple manifestations of the circadian cycle under which we all live.

Marilyne Andersen joined forces with her colleague Mark Pauly at EPFL and Javier Fernández-Contreras from HEAD – Genève to turn the outcomes of her ongoing research on photobiology into an immersive experience of ‘a day in the life’ – or rather, a day in the light. Together, they co-supervised the work of a collective of designers, engineers and scientists to produce an immersive installation that invites us to reflect on the relationships between urban lifestyles and light hygiene.

Discover the online experience on: circadiem.ch

The passing of day is experienced through mesmerizing visual effects, from morning (right) through midday, evening (left) and night.

Image courtesy of EPFL. Photos: Alain Herzog.



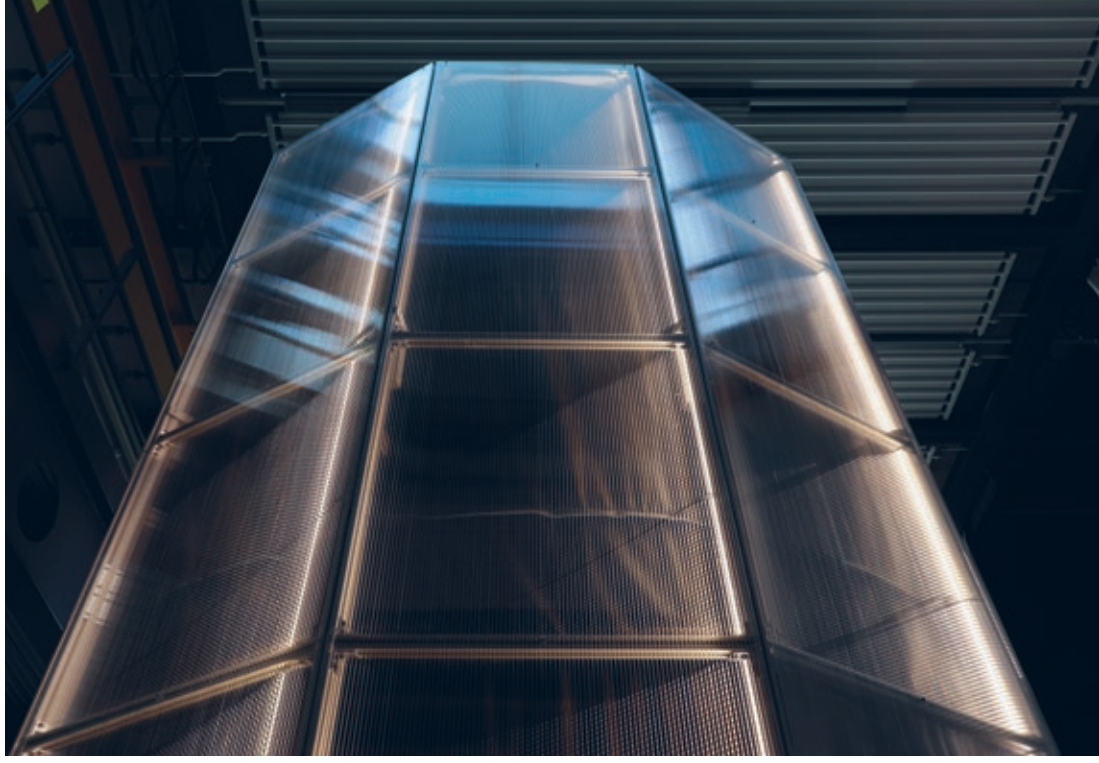
Images form and uniform thanks to rotating freeform refractive lenses and evoke our changing needs when it comes to light hygiene in cities.

Image courtesy of EPFL-GCM/LPID. Photo: Florin Isvoranu, Megan Danelli.



The height of the monumental structure creates the opportunity to feel small.

Image courtesy of EPFL. Photo: Alain Herzog.



Immersive installation, circular bed and curtains.
12 minutes, looped. Sound and light artist: Piotr Ceglarek. Architect: Mále Uribe Forés. Sponsorships: Savoir Beds, LedFlex.

Helga Schmid

is a German artist, designer, researcher and educator working at Somerset House Studio and University of the Arts in London.



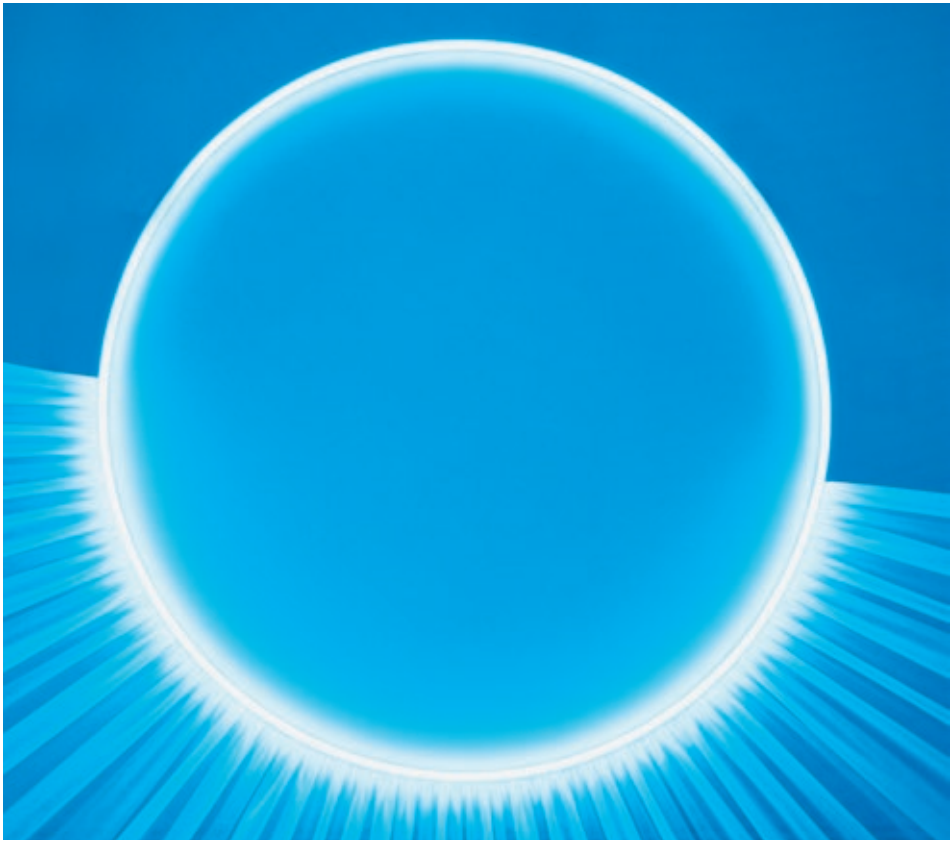
Circadian Dreams by Helga Schmid @Design Museum in 2019. Image courtesy of The Design Museum.
Photo: Suzanne Zhang.

Contemporary life is dictated by external time-givers, but what happens if we concentrate on our body and our individual time signature?

Circadian Dreams is an installation by Helga Schmid, developed as part of her ongoing artistic research on Uchronia (defined as temporal utopia). In this installation the space acts as a clock. Twelve minutes represent one circadian day of ~24 hours, and each minute represents two hours. A light- and soundscape relates to our body phases, with a bright blue tone that activates us, an intensive red-orange which makes us sleepy, and darkness which brings us to a sleep/dream state. The phases are based on what we know of peak daily times for logical reasoning, concentration, muscle strength, nocturnal melatonin secretion and body temperature.

The work investigates an alternative time system in relation to the human body clock. Modern technology has fostered an increasing temporal fragmentation, heralding an era of flexible time with ever more complex processes of synchronisation, leaving us with the feeling of 'no time'. By investigating the topic of time through a transdisciplinary approach of design, chronobiology and chronosociology, Helga Schmid opens up possibilities for a new politics of time.

Uchronian thinking not only involves unlearning conventional time, but is also concerned with developing alternative ways of understanding and using time.



Circadian Dreams by Helga Schmid @Design Museum in 2019, Photos: Francisco Ibanez.

Installation including sculpture, video and sound. Video: 3:12 minutes, looped. Sound: 6 minutes, looped. ©Liliane Lijn. Courtesy of Liliane Lijn and Rodeo London / Piraeus. Collaboration with Christina Schmidt and Vincenzo Muto, GIGA CRC in vivo imaging-sleep and chronobiology, University of Liège, Anna Wirz-Justice, Centre for Chronobiology, University of Basel.

Liliane Lijn

is an American artist, working in London.



Sweet Solar Dream II Detail, 2002. Images courtesy of Liliane Lijn, Rodeo London / Piraeus. Photo: Lewis Ronald ©2023, ProLitteris, Zurich.

Sweet Solar Dreams is a triptych installation of luminous sculptures, with a video projection and sound piece, originally based on Liliane Lijn's interest in dreams. For this installation, there is a murmuring of five different dreams related to the three sleeping heads.

In *Sweet Solar Dreams I* the head is a shadow sinking into sleep on a luminous pillow, green blue for dusk, the bronze head patinated black. The pillow is surrounded by inked rags saved from her day's work in the etching studio. Listen carefully since the rags also relate to one of her dreams.

In *Sweet Solar Dreams II* the dreamer's luminous head rests on a cracked, opaque, purple pillow. She dreams of dropping everything she has carried for so long. Midnight dreams and nightmares. Surrounding the pillow, is a necklace of scanned images of sleeping brains printed on acetate. The glass head is alive with moving, changing

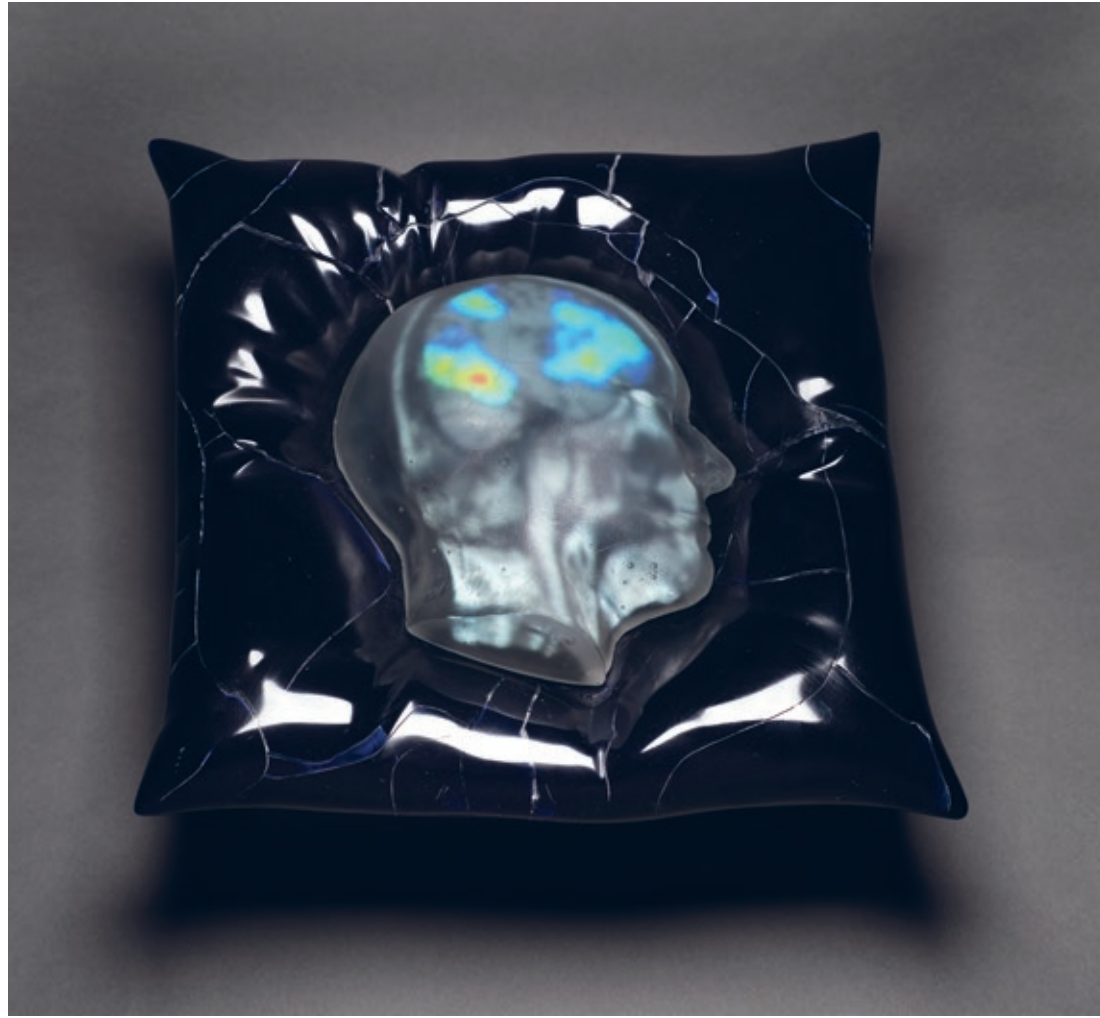
images of the brain at different moments, during sleep, before sleep, near waking, or alerted by light.

Sweet Solar Dreams III is reminiscent of dawn, the bronze head patinated more towards a daytime hue, the pillow surrounded by a billowing feathery white boa. The boa hints at luxurious feminine fantasies, while simultaneously referring to the dreamer's mortal struggle with a gigantic bird.

In this artwork, the artist wants to make the unconscious visible. The psyche becomes more alive than the physical presence of the person. Chronobiology studies the effect of light on the human brain and how different levels of light affect sleep. Might they also affect dreams?

Liliane Lijn's work has been pervaded by sound since 1962. For *Lighten Up!* she uses the sound of her own voice to evoke *Sweet Solar Dreams*.

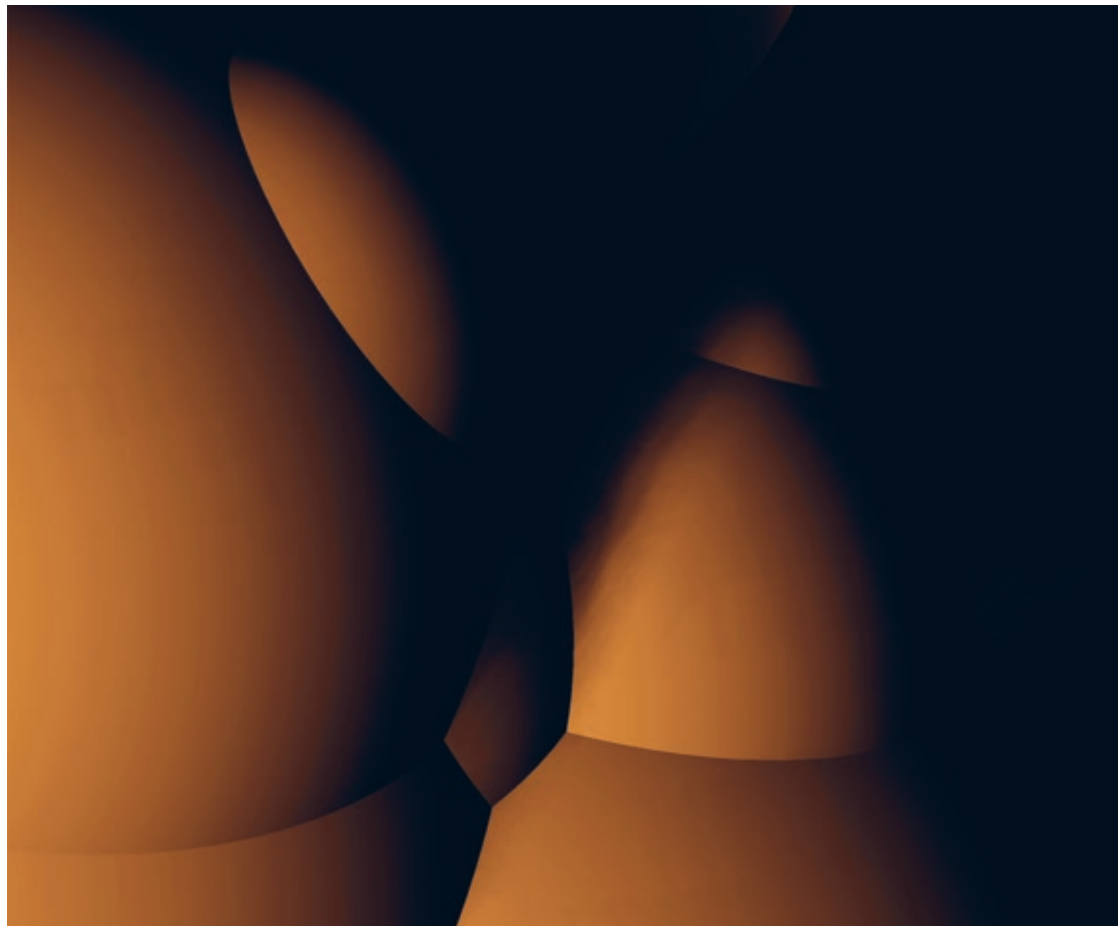
Images: *Sweet Solar Dreams I, II, III* (left, right, bottom), 2002–2022. Image courtesy of Liliane Lijn, Rodeo London / Piraeus. Photos: Lewis Ronald, ©2023, ProLitteris, Zürich.



3D printed sculptures, video. 1:55 minutes.
Concept and production: Rafael Gil Cordeiro.
Programmer: Kevin Hinz.

Rafael Gil Cordeiro

is a Swiss multidisciplinary designer based in Zurich.



Every sleep is individual, which gives each sculpture its authentic form. Image courtesy and credit: Rafael Gil Cordeiro.

The artwork *print my sleep* reveals the invisible and unconscious nature of sleep and translates it into tangible objects. Sleep is variable in duration and complex in structure, with episodes of deep sleep followed by dream (REM) sleep, changes in heart rate, breathing, muscle tonus, and often interrupted by waking episodes. Classically sleep is measured by the electroencephalogram (EEG) to document these details throughout the night. More recently, non-invasive wearables have been developed that use simple physiological changes to document sleep states and heart rate.

Using this technology, designer Rafael Gil Cordeiro frees sleep from the

medical paradigm of optimisation and idealisation and returns some of its original intimacy. The sculptures are created using 3D clay printing, with an individual's sleep data downloaded from the wearable determining the unique shape of each object. The height of the vase represents sleep duration, the position of each bump indicates a sleep phase and the diameter of the bump represents the heart rate of the individual at that specific time.

The materiality of the ceramics is analogous to sleep: the process itself requires time and patience and the result remains uncontrollable despite all deliberate efforts.

The sculptures are constructed using additive printing. Image courtesy and credit: Rafael Gil Cordeiro.



From printing to burning, many intermediate steps are necessary. Image courtesy and credit: Rafael Gil Cordeiro.



Video installation. 24 hours.
Commissioned by The University of
Salford Art Collection, with further
support from the Delfina Foundation.

Anna Ridler

is an artist and researcher, based
in London.



Installation view of *Circadian Bloom* as part of the Digital Serendipity exhibition at Akbank Sanat, 2022. Image courtesy of Akbank Sanat, Anna Ridler and Nagel Draxler. Photo: Görsel Çözüm.

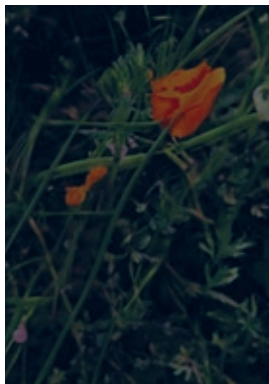
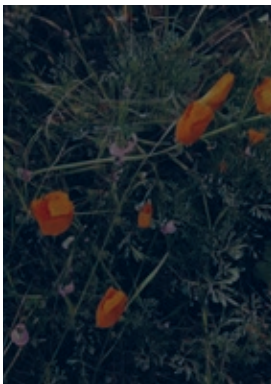
Circadian Bloom is a screen-based visual clock that tells the time through flowers. This piece shows flowers able to keep time, each blooming at a different hour of the day. Constructed using a series of complex algorithms, the digital flower forces the viewer to contemplate other ways of telling time.

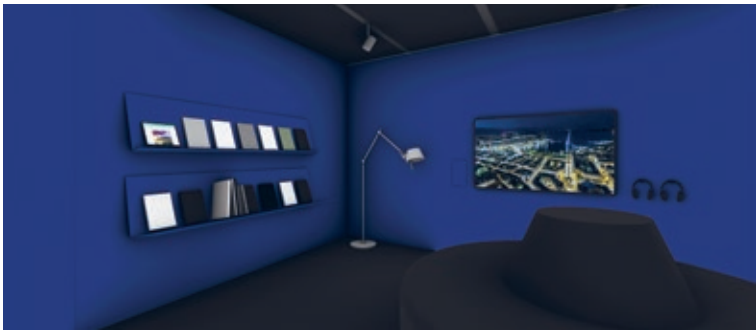
The flower clock is designed to start at dawn and end at dusk. It changes daily to reflect the precise longitude and latitude programmed for. Throughout the day, the imagery of the different flowers evolves in real time in synchrony with their natural counterparts, blooming and closing at the correct time of day. Because the length of daylight changes throughout the year, looking at it at the same time will result in different flowers being shown each month.

The project is inspired by Carl Linnaeus's idea of a floral clock or *horo-*

logium florum that he proposed in his *Philosophia Botanica* in 1751 after observing the phenomenon of certain flowers opening and closing at set times of the day. Since then, the flower clock has remained a concept. A flower's circadian rhythm is 'filled with complications' – geography, climate, light levels, seasonality – making it nearly impossible to grow a true *horologium florum* that would cover the entire day and function as a clock. By working digitally, the artist is able to make it real and create a tension between the highly precise and accurate time keeping methods that sit inside computers and the images that result, revealing that it is not just visuals of flowers but something that is in sync with the natural environment.

Images: Stills from *Circadian Bloom*. Image courtesy of Anna Ridler and Nagel Draxler Gallery.





Render image of Reading the Light. Image: Nathalie Opris. ©EPFL Pavilions

Reading the Light is a space offering complementary insights into scientific and cultural approaches to chrono-

biology through a documentary, scientific and artists' books and a website.

13.1 Center for Environmental Therapeutics

1994

Website. Estudio Manila (Mexico). Wayaweb (Mexico).

Michael Terman, Anna Wirz-Justice

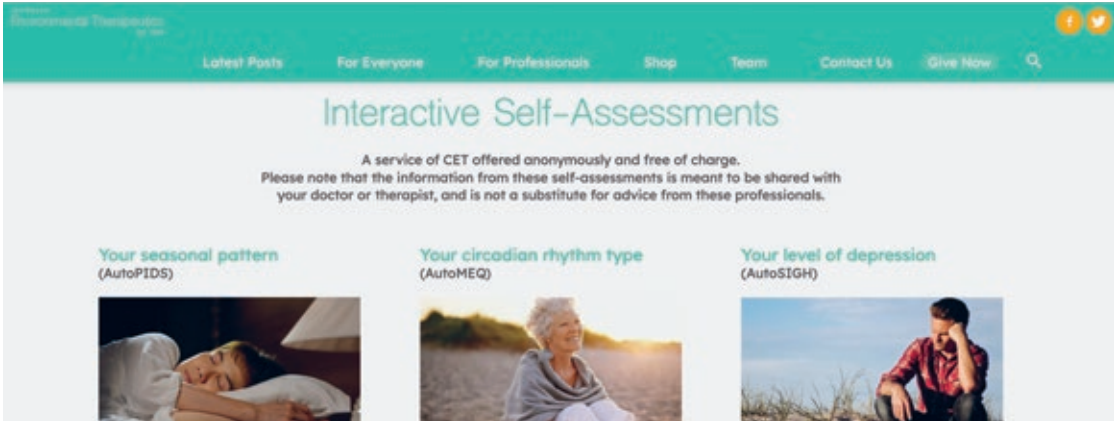


Image from www.cet.org.

Non-profit website for information about circadian rhythms, sleep, depression, and light therapy. The Center for Environmental Therapeutics is a science-based service and resource for the public and professionals addressing the neglected properties of light, dark, and air to meet the challenges of mental and physical health in contemporary life.

- Some resources include:
- Self-assessments for chronotype, seasonality, depression;
 - Circadian rhythms and sleep regulation guidance;
 - Light therapy, melatonin, and ionised air: latest news from researchers and clinicians with practical guidance;
 - A vast library of questions posed by visitors along with answers from experts in the field.

13.2 *Lovely is the Night*

2018

Documentary film. 11:40 minutes. Project managers: Hervé Grosçarret, Pascal Moeschler, Natural History Museum of Geneva. Film direction: Romain Girard, Point prod. Film production: Marie Carrard, Point prod.

Natural History Museum of Geneva

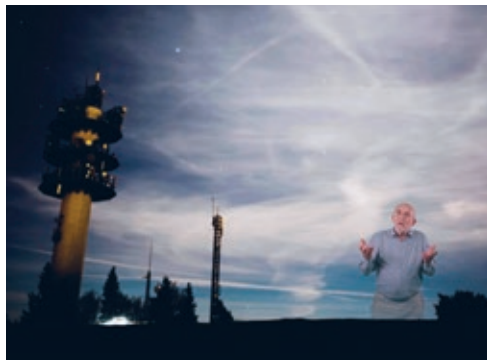
The short documentary film *Lovely is the Night* (*La nuit est belle*) was produced as part of the exhibition and event of the same name, in which the Natural History Museum of Geneva and the Science History Museum of Geneva took part in 2018.

Five personalities share their expertise on the impact of light pollution: Michel Mayor (astrophysicist), Howard Cooper (chronobiologist), Eric Achkar (astronomer), Luc Barthassat (politician) and Xavier Pin (mayor). The video was shot in five locations around Geneva (city-centre, local village, lake-side, from the Salève mountain and from the observatory) over the same night of 26 April as a time-lapse, offering the viewer a visual understanding of the varying impact of light pollution.

The local event *La nuit est belle* first started in the Geneva area before gradually spreading to other parts of Switzerland and France. Since then, every year on the same night, villages and towns switch off their streetlights to enjoy and marvel at the beauty of the night. This action aims to combat light pollution and its harmful effects on health and biodiversity. Activities such as stargazing and lectures are also organised on this occasion.

This year, the event will take place on 22 September 2023 and will focus on the topics of health, inclusiveness and safety.

Michel Mayor at the Salève observatory (left). Howard Cooper in the city-centre of Geneva (right). Image courtesy of Muséum Genève. Images: Point Prod.



13.3 *Reading the Light (books selection)*

► This curators' selection is listed at the end of the guidebook.

Art books, scientific monographs.

Various authors

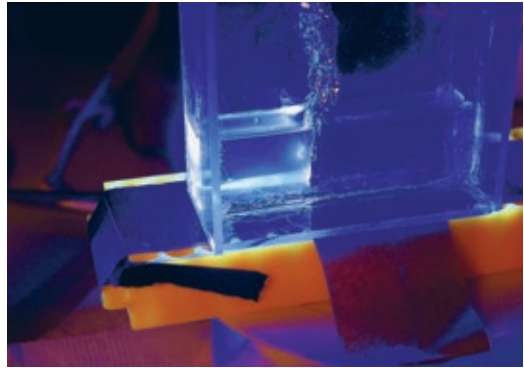
The reading space invites visitors for further enlightenment in the science of chronobiology and the artworks this science has inspired. A selection of

books proposed by the curators as well as some artists of *Lighten Up!* are available for browsing.

Commissioned and produced in the framework of EPFL CDH Artist in Residence Program 2022, Enter the Hyper-Scientific. Residency hosted by the Laboratory of Applied Photonic Devices (LAPD), Prof. Christophe Moser, the Laboratory of Optics (LO), Prof. Demetri Psaltis, and the Center for Imaging, Laurène Donati. Thanks to Jorge Madrid-Wolff.

Alan Bogana

is a Swiss visual artist based in Geneva.



Still images of the artwork. Image Courtesy of the artist. Photo: Alan Bogana.

How did sensitivity to light evolve and shape ancestral living beings on Earth? How can we understand our relationship to light by looking back at the evolutionary roots of this relationship?

The installation *Light-Oriented Ontologies – The Beginnings* explores these questions in a speculative and imaginative way. Alan Bogana's work reflects on the earliest roots of vision, sensing and converting light into energy and information. Circadian rhythms emerged through sensitivity to the electromagnetic spectrum and the predictable geophysical environment of day and night. Temporal organisation optimised the possibility to harvest this invaluable source of energy, which is inextricable from the functioning of complex life forms.

The installation is inspired by techniques that the artist became familiar with during his residency, such as photopolymers used in cutting-edge 3D printing techniques, microfluidics techniques, as well as research on organoids and cell-free synthetic biology.

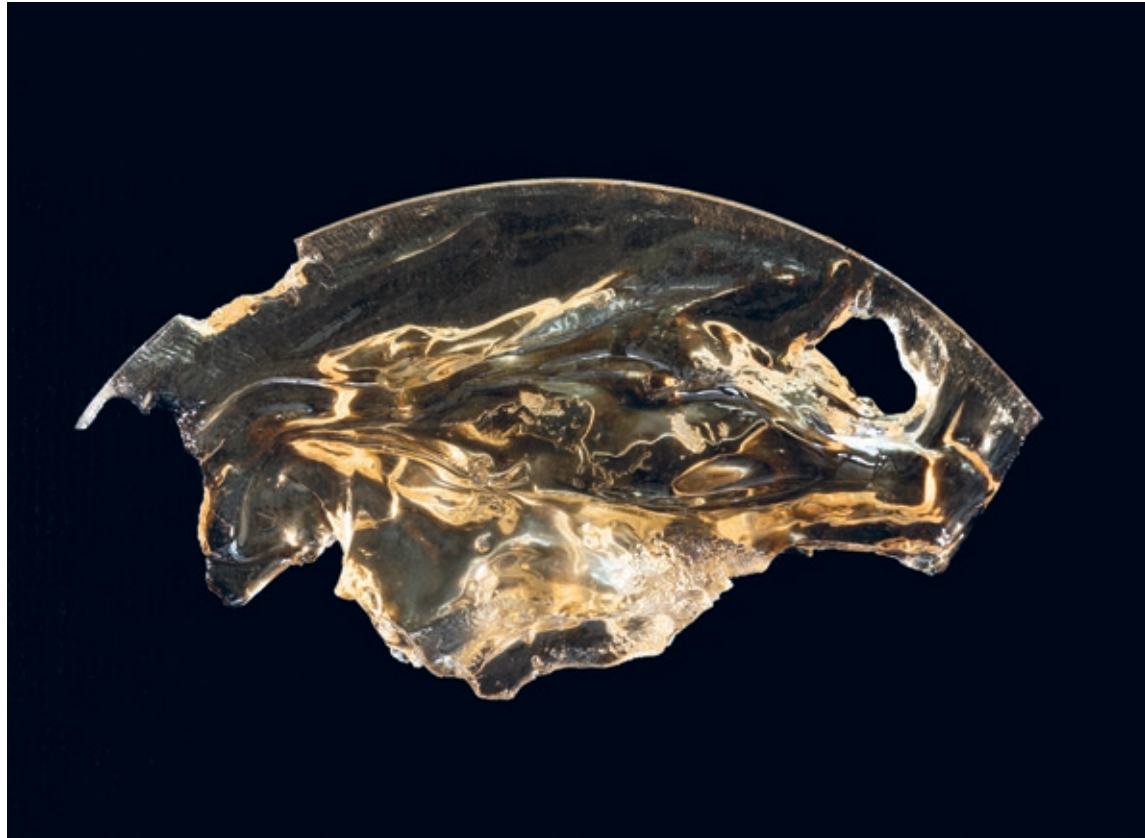
The installation consists of an ensemble of translucent objects presented

on a custom pedestal and a video essay. The objects are direct solidifications of light propagating through photosensitive resin. They are crystallised light beams stemming from the interactions with different types of optical components and spatial movements generated by motors and manual manipulations.

These objects constitute an open ensemble of shapes, ambiguously reminiscent of simple living organisms and organic-looking inorganic structures found in nature.

A driving interest for this research was to imagine the development of the earliest photosensitive cells (soon-to-be photoreceptors) on the earliest living organisms of the planet, as well as fictional developments of living entities born from direct interactions with light.

A speculative video essay complements these objects and include live footages, computer-graphics sequences as well AI-generated footages. This video freely articulates various narratives at the core of this ongoing research.

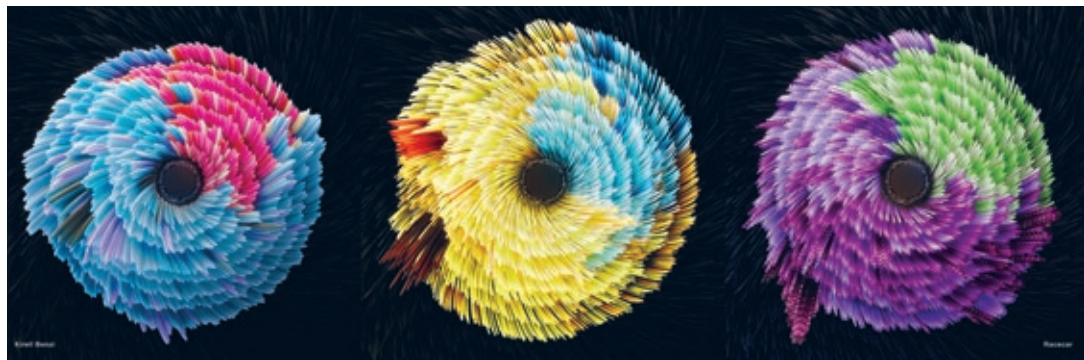


Images: Details of the artwork. Image Courtesy of the artist. Photos: Alan Bogana.

Data visualization, three circular projection screens, 54 seconds. Concept: Dr. Kirell Benzi, Franck Aubry. Production: Polar, Edelman, Racecar (motion graphics design studio). Creative engineer: Bonsak Schieldrop. Data processing: Olaf Dünkel.

Kirell Benzi

is a French data artist, public speaker and researcher at EPFL.



Visual representation of the participants' circadian rhythms. Image courtesy and credit: Kirell Benzi and Racecar.

Kirell Benzi embarked on a journey to visualise the circadian rhythms of three individuals with unique occupations and different backgrounds: a pilot whose sleep schedule constantly changes, a young agriculturalist who mainly spends her active days outdoors and an employee working at a traditional '9-to-5' office job.

Visually representing these individuals' very different lifestyles allows to better understand the complexity and the uniqueness of our circadian rhythms.

Commissioned by Polar, a global company that designs and manufactures sports watches, heart rate monitors and other sports equipment, the artist and Franck Aubry (creative director at Racecar) gathered and analysed more than two million data points coming from wearable devices worn by these individuals. The circular visualization of the data sets reminds of the nature of the circadian rhythm as well as the watch dial worn by the three participants.

As a data artist, Benzi is interested in showing the beauty of data through an emotional and spectacular approach. The basis for the artwork is thus a 24-hour clock with two divergent colour palettes to highlight sleep patterns and day activities. The length of each small individual shape depends on the heart

rate measured by the watch. Lighter colours during night highlight moments of wakefulness, and darker colours indicate peaks of day activity, such as a workout. As every individual's circadian rhythm is unique, the darker and lighter colours will appear in different spots, depending on their sleep-wake pattern.



Architectural design project including several related artworks (real-time interactive and immersive installation, plasticine model, 3D prints, hand-drawings, 2D CAD prints, items of jewellery). Concept and production: Studio Colin Fournier (Colin Fournier, Lorenz Kleemann, Charles Edgar Lincoln, Aidan Newsome, Yufan Zhang). EPFL Laboratory for Experimental Museology (eM+): Sarah Kenderdine, Samy Mannane, Loïc Serafin, Sylvain Cardin. 3D models: EPFL-AFA.

Colin Fournier

is a Franco-British architect based in Paris.



Top view of the *Circadian House* in the early evening, showing all 15 openings. Image courtesy of Studio Colin Fournier. Image: Lorenz Kleemann.

Circadian House is a design project for a small house lit entirely by natural light. Sunlight penetrates the house from sunrise to sunset through eleven skylight ‘nozzles’, at the specific locations and times when (and where) the two meta-humans who occupy the building undertake their daily activities. The orientation of the nozzles, in terms of their altitude and azimuth angles, is set for the summer solstice (21 June) at the latitude of Lausanne. This determines their geometry and thus the form of the building.

The work is inspired by circadian rhythm and daylight research. In the same way that body time is regulated by diverse biological ‘clocks’ in every cell, and synchronised daily by non-visual perception of light, so does the life of a house manifest itself through changing light conditions and through the regular rhythms of the activities that take place within it, both acting as ‘zeitgebers’ to entrain our biological clocks. In the *Circadian House*, the solar rays are used

to spotlight the key activities of the occupants during the day, in a choreography of successive light events, giving a sense of harmony and well-being.

The *Circadian House* seeks to promote physical health and general well-being by synchronising the circadian rhythms of its occupants to the 24-hour day-night cycle and to seasonal changes in daylength. Through its multiple openings, providing views of the surrounding environment and of the changing positions of the sun in the sky, as well as by capturing ambient sounds, air movements and temperature fluctuations, the *Circadian House* offers a sensorial awareness of the passage of time and seasons, a comforting sense of place, of being grounded in the ‘here and now’.

This installation is designed in two parts: sketches, sculptures and art objects on the one hand, and an interactive 3D installation on the other. This prototype is thus the “digital twin” of a “real” building that would be an environment for daylight research in humans.

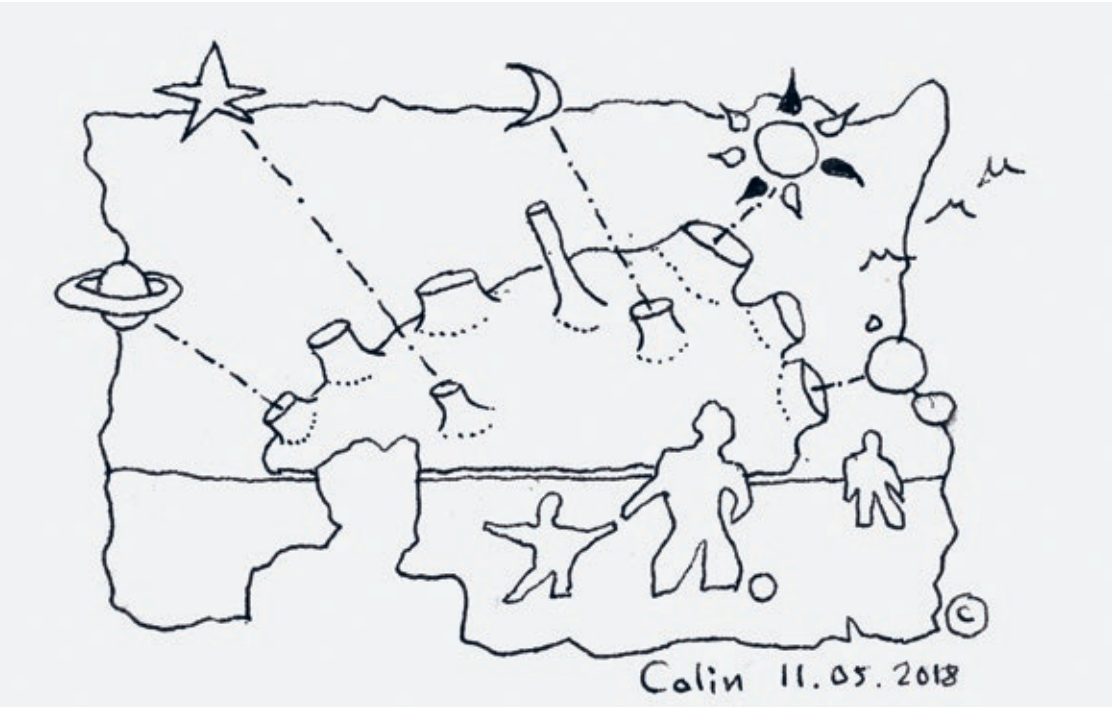
Internal view at eye level. View of the internal space of the *Circadian House* showing light penetrating the inner space through the various nozzles. Image courtesy of Studio Colin Fournier. Image: Lorenz Kleemann.



Fisheye internal view showing sunlight entering from all openings. Image courtesy of Studio Colin Fournier. Image: Lorenz Kleemann.



Image courtesy of Dominique Piwnica private collection. Drawing: Colin Fournier.



Circadian House (models, drawings, jewellery)

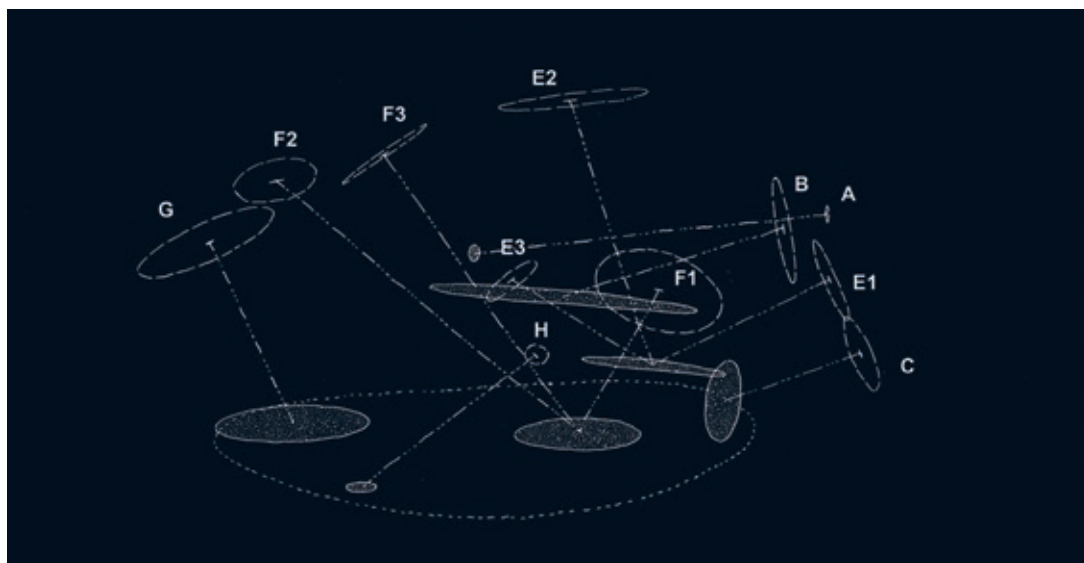
2021

Plasticine sculpture, 3D-printed models, hand drawings, 2D CAD prints, silver jewellery.

1. Plasticine "sculpture":
15.1 cm × 16.6 cm × 7.7 cm working model, (1/100 scale)
2. 3D print Circadian House:
30.205 cm × 33.253 cm × 15.508 cm, (1/50 scale)
3. 3D print of section Nozzle F2:
33 × 28.5 × 15 cm, (1/20 scale)
4. Hand drawings: A4 formats (21.0 × 29.7 cm)
5. 2D CAD prints: A3 formats
6. Ring: 30 mm. Brooch: 32 mm. Pendant: 32 mm



Silver ring in the form of the *Circadian House* design. Image courtesy of Studio Colin Fournier. Production and photo: Lorenz Kleemann.



This conceptual diagram shows the 7 light spots from which the azimuth and altitude angles of all 13 nozzles are generated. Image courtesy of Dominique Pivnicka's private collection. Diagram: Colin Fournier.

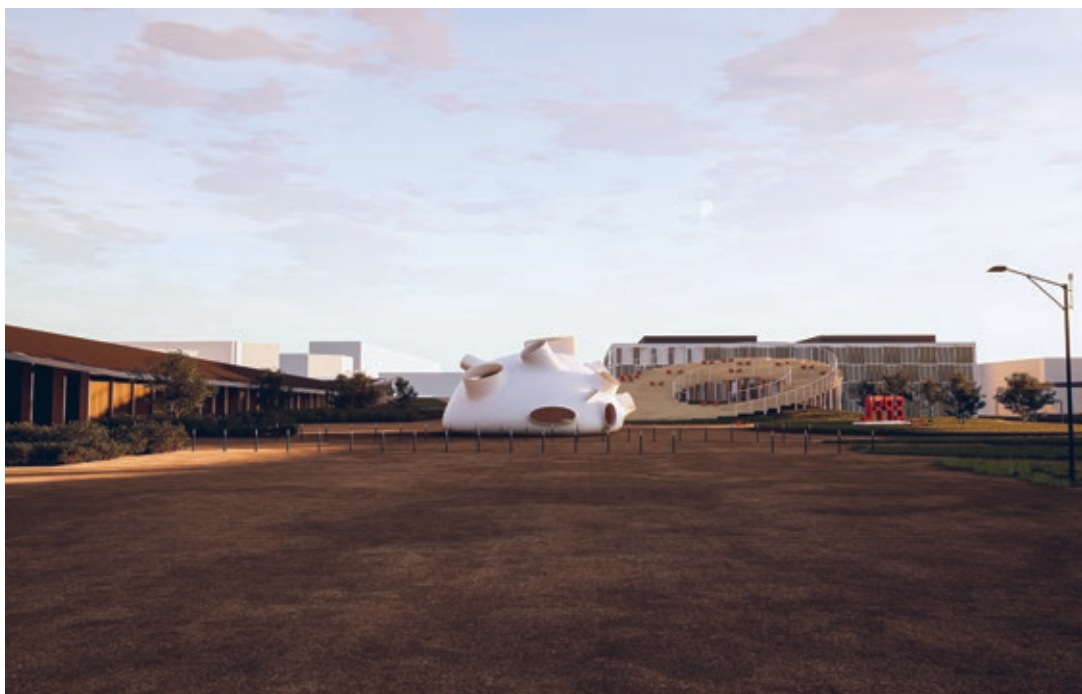
Circadian House is presented in the form of physical models, 3D prints, hand-drawings and small items of jewellery.

Real-time interactive
3D installation. Integration:
EPFL eM+ (Samy Man-
nane, Loïc Serafin, Sylvain
Cardin)

External view on site 1. Render of the *Circadian House* on its site on the EPFL campus, next to EPFL Pavilions, in the afternoon. Image courtesy of Studio Colin Fournier. Image: Aidan Newsome.



External view on site 1. Render of the *Circadian House* on its site on the EPFL campus, next to EPFL Pavilions, in the evening. Image courtesy of Studio Colin Fournier. Image: Aidan Newsome.



In the second part of the installation, *Circadian House* is presented as an interactive and immersive 3D ‘digital

twin’ within which visitors can engage in the lives of its’ inhabitants.

Sound installation with four loudspeakers. 15 minutes looped. Concept: Siegrun Appelt, Constanze Müller. Interview partners are Professors from different renowned institutions detailed on the exhibition website. Voice-overs: Flora Lang, Edith Mayer, Felix Nyqvist, Carissa Oliveras. Voice coach: Victoria Mayers-Gray.

Siegrun Appelt with Constanze Müller

Siegrun Appelt is an Austrian artist, working in Vienna.

Constanze Müller is a cultural scientist from Germany, working in Vienna.



Recording sessions with vocal coach Victoria Mayers-Gray. Copyright: Siegrun Appelt.

Can a balance be found between the preservation of nature and its use by humans – on the one hand as the basis of life and on the other hand as the object of their will to shape it? This is one of the central questions Siegrun Appelt and Constanze Müller are concerned with.

Voice recordings constitute the core of their installation *Habitat*, with texts whispered by children who enter into a dialogue with each other.

Here, the children are given a voice as representatives of the coming generation and future decision-makers. Although the texts for *Habitat* are formulated in a childlike language that can be understood by everyone, they are explicitly directed at adults, today's decision-makers.

The film *El espíritu de la colmena* (1973), by Spanish director Victor Erice, was an inspiration for Appelt and Müller. In the movie, two girls talk insistently

about life and their fears and their whispering unfolds a mood of existential urgency, creating an intimate atmosphere.

The texts stem from interviews conducted by Siegrun Appelt and Constanze Müller with scientists and experts from the Velux Daylight Academy on the topics of climate protection, sustainability, chronobiology, health and daylight. The aim is not only to outline problems, but also to point out possible solutions.

The original German installation, titled *Lebensraum*, was created in 2021 for an exhibition at the Museum for Applied Arts Vienna as part of the Vienna Biennale for Change 2021. The artwork was created in cooperation with the Daylight Academy of the Velux Foundation in Zurich and the Opera School of the Vienna State Opera. The installation was revised and adapted to English for *Lighten Up!*

Carissa Oliveras during recording sessions. Copyright: Siegrun Appelt.



Felix Nyqvist during recording sessions. Copyright: Siegrun Appelt.



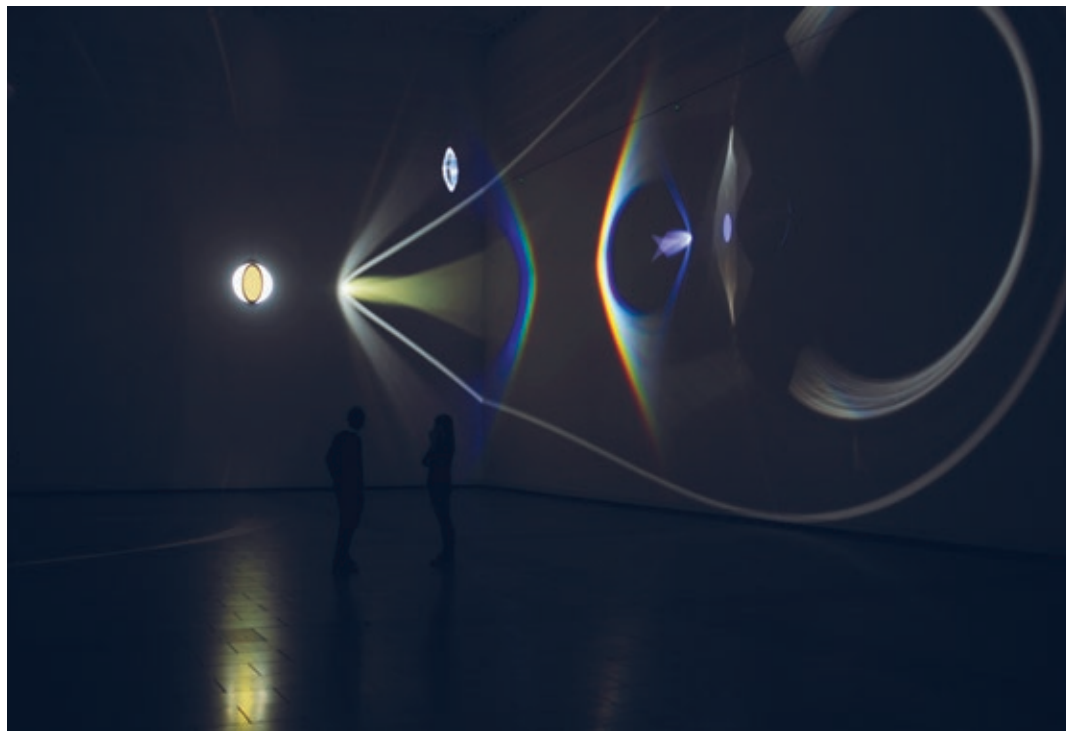
Edith Mayer during recording sessions. Copyright: Siegrun Appelt.



Installation. Dimensions variable, acrylic ring Ø 62 cm. Acrylic prism ring, colour effect-filter glass (yellow), spotlight, LED light, motor, wire, mirror, tripod, steel, control unit, custom electronics, software.

Olafur Eliasson

is an Icelandic-Danish artist, working in Berlin and Copenhagen.



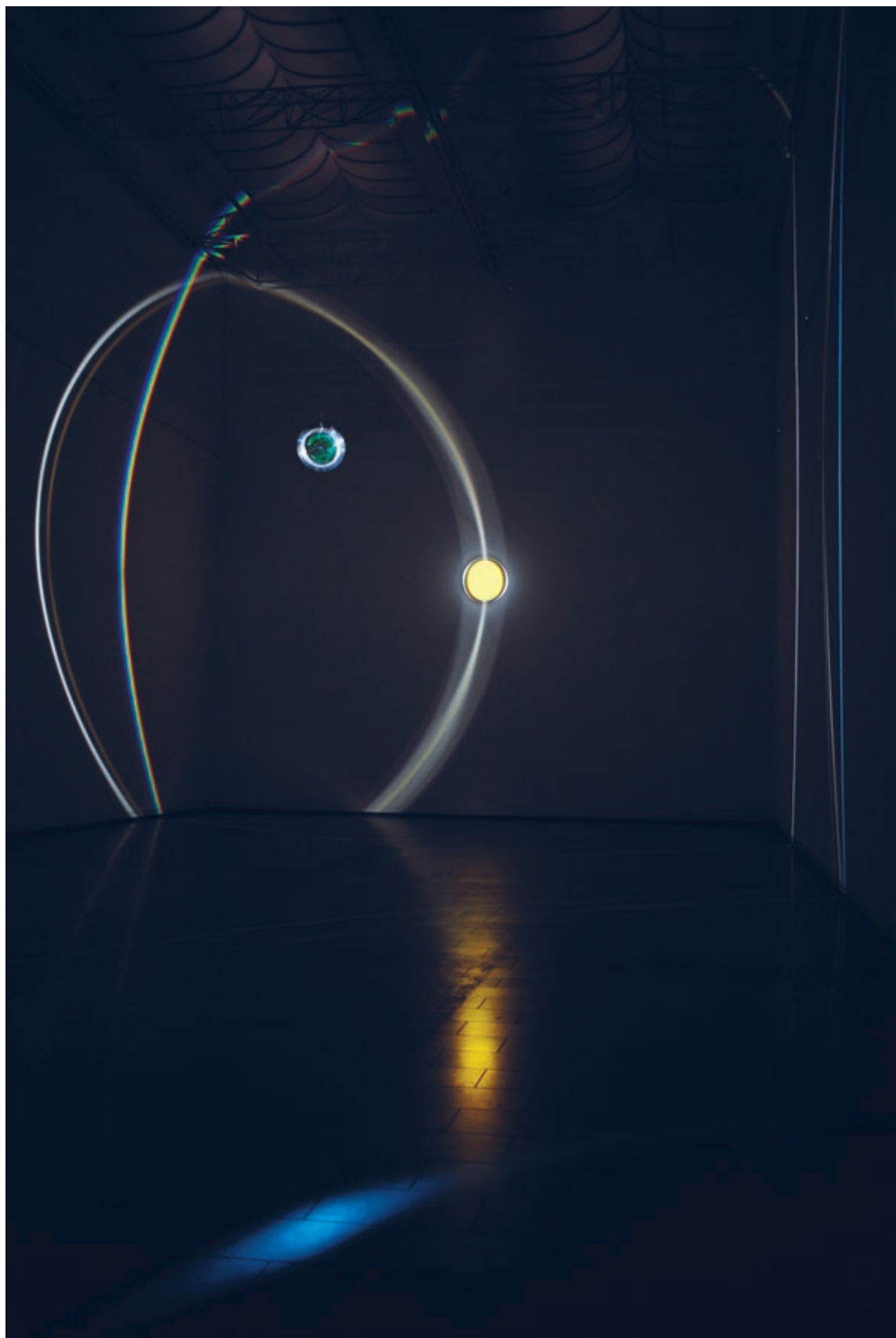
Reference images for *Your circadian embrace*, 2023, depicting *Your Museum Primer*, 2014, installed at K20, Kunstsammlung Nordrhein-Westfalen, Düsseldorf, 2014. Courtesy of the artist, neugierrenschneid, Berlin; Tanya Bonakdar Gallery, New York/Los Angeles. Photo: Christian Uchtmann / Studio Olafur Eliasson.

Specially adapted for EPFL Pavilions, the artwork *Your circadian embrace* is illuminated during the day by the light of the sun. Suspended from the ceiling in the darkened exhibition room, a prismatic ring surrounding a dichroic colour-effect filter slowly rotates within a beam of light. As the ring turns, it casts moving circles and arcs of colourful light on the walls. Some of these are single tones, while others display the full range of colours in the visible spectrum.

Positioned outside of the exhibition building, an heliostat, or sun tracker, redirects sunlight onto the rotating ring using a mirror that follows the 'movement' of the sun across the sky. The normal 'movement' of sunlight through the room is not a result of the motion of the sun, however, but rather, the optical result of the rotation of the earth.

Eliasson emphasizes the heliostat's ability to make a unique position on earth explicit as the planet revolves around the sun. The sun tracker thus links artwork and visitor to the earth's surface, to the weather environments that determine the visibility of the sun, and to the cosmos beyond.

In Eliasson's words: "To track the sun is to track yourself, because the sun tracker locates the centre of your orbital ellipse, giving your position right now and rendering visible your path. The reflexive potential lies in understanding that we are not the centre of the universe, but are in a way the mirrors, circulating, tracking, spinning in concert with others."



Four-channel video, sound and algorithmically controlled lights. 20 minutes. Concept and sound: Robin Meier Wiratunga. Direction: André Gwerder. Editing: Mariko Montpetit. Camera: Nikolai Zheludovich. Scientific support: Anchana Thancharoen and Guy Amichay. Produced by Audemars Piguet Art Commission.

Related work: *Synchronicity (16 mm)*, n°6.

Robin Meier Wiratunga with André Gwerder and Guy Amichay

Robin Meier Wiratunga is a Swiss artist based in Paris.

André Gwerder is a Swiss artist based in Zurich.

Guy Amichay is an Israeli researcher based at Northwestern University in Chicago.



In a mangrove forest in Thailand, fireflies (*Pteroptyx malacca*) align their synchronous flashes with computer-controlled LEDs. By establishing a light-based form of communication with the insects, the artists can influence the rhythmic flashing of large colonies of fireflies. A silent orchestra harmonises without the need for a conductor. With no central control, computers and insects interact in this rhythmic composition of light.



Images: Video Still Synchronicity (16 mm). Image courtesy of Robin Meier Wiratunga. Photo: ©ADAGP.

Curators' Book Selection

13.3. *Reading the Light*

Scientific Books

- *Changing Perspectives on Daylight: Science, Technology, and Culture*, Science / AAAS, Washington, DC, 2017.
- *Chasing the Sun*, by Linda Geddes
- *Circadian Rhythms: A Very Short Introduction*, by Russell G. Foster & Leon Kreitzman
- *Enlighten Your Clock: How Your Body Tells Time*, by Coline Weizsäpfen
- *Findings on Light*, curated and edited by Hester Aardse & Astrid Alben
- *Internal Time*, by Till Roenneberg
- *Life Time: Your Body Clocks and its Essential Roles in Good Health and Sleep*, by Russell G. Foster
- *Sleep: A Very Short Introduction*, by Steven W. Lockley & Russell G. Foster
- *Winter Blues Survival Guide*, by Norman E. Rosenthal & Christine M. Benton

Approach to Quantifying Visual Effects in Architecture, by Siobhan Rockcastle & Marilyne Andersen

- *Liliane Lijn: Light and Memory*, exhibition catalogue, Rocca di Umbertide, Centro per l'Arte Contemporanea, Perugia, edited by Linda Saunders
- *Liliane Lijn: Works 1959–80*, by David Mellor
- *Uchronia: Designing Time (Board of International Research in Design)*, by Helga Schmid
- *Noir c'est noir*, by Xavier Castille, Pascal Moeschler, Eric Achkar
- *The Hypothetical Cabinet of Phlogistronics*, by Alan Bogana
- *Step by Step*, by Alan Bogana
- *A Friendly Alien*, by Dieter Bodner (for Colin Fournier)
- *Slow Light in the Wachau*, by Siegrun Appelt
- *Olafur Eliasson: Experience*, by Olafur Eliasson, Anna Engberg-Pedersen, Michelle Kuo
- *Olafur Eliasson: In Real Life*, exhibition catalogue, Tate Modern, London, edited by Mark Godfrey

Artists' books

(in order of appearance of the artists' installation in the exhibition)

- *Beyond Surface Appeal: Literalism, Sensibilities, and Constituencies in the Work of James Carpenter*, by Sarah Whiting
- *James Carpenter: Environmental Refractions*, by Sandro Marpillero
- *Conversãtiõ: In the Company of Bees*, by Anne Noble
- *Susan Morris: Self Moderation*, exhibition catalogue, Centre d'art Pasquart, Biel, by Briony Fer, Felicity Lunn, Sadie Plant
- *Susan Morris: Marking Time*, by Margaret Iversen
- *A Day's Work*, curated by Susan Morris
- *The Gorgeous Nothings*, curated by Susan Morris
- *Andreas Horlitz: Arbeiten – Works*, by Klaus Honnef, Irene Netta, Sibylle Omlin, Hans Scheurer, Stephan Trescher
- *Annual Dynamics of Daylight Variability and Contrast: A Simulation-Based*

Extended Credits

4. *The Clocks Around and Within Us*

Many thanks to all the data collectors:

- Anna Wirz-Justice – Jo Arendt, Bud Brainard, Steve Brown, Center for Environmental Therapeutics, the Daylight Academy, Derk-Jan Dijk, Elise Facer-Childs, Laura Fernandez, Paul Franken, Marijke Gordijn, Raphael Heinzer, Anita Lüthi, Michelle Luxwoda, Lenka Maierová, Ybe Meesters, Marina Rao, Francesca Siclari, Manuel Spitschan, Irene Tobler, Tom Wehr
- Bharath Ananthasubramaniam – Marta del Olmo, Olivia Walch
- Horacio O. de la Iglesia – Charlotte Helfrich-Förster, Barbara Helm, Kristin Tessma, Akiko Satake, David Wilcockson
- Diego A. Golombek – María de la Paz Fernández, Abhilash Lakshman, Taichi Itoh, Luis Larrondo, Steve Brown, Jürgen Zülley, Susan Golden, Karen Tonsfeld, BioClock Studio
- Carl Hirshie Johnson – Antony Dodd, Kamiel Spoelstra, Maria Luísa Jabbur, Ian Dew, Deidre Lynch
- Till Roenneberg – Luisa K. Pilz, Cátia Reis, Roloef Hut, Fernanda Sbaraini Bonatto, Augusto Manoel Silveira Varella
- William J. Schwartz – Erik Herzog, Anneloes Opperhuizen, Laura Kervezee, Jim Truman, Nils Reinhard, Muriel Williams, Orie Shafer, Gene Block, Anna Wirz Justice, Eric Tam, Alessandra Porcu, Tomoki Mitani, David Welsh, Anouk van Beurden, Dick Swaab, Jens Hannibal, Danyi Ma, Jennifer Evans, David Weaver, Marikko Izumo, Joseph Takahashi, Eric Bittman, Xiaodong Li, Joseph LeSauter, Steve Hughes, Russell Foster, Ignacio Provencio, Tiffany Schmidt, Yifan Yao, Mariko Izumo, Shin Yamazaki, Stephan Michel, Marco Ferrari, Daniel Wreschnig, Fabienne Aujard, Mary Harrington, Jun Yan, Ethan Buhr

8. *Circa Diem, Marilyne Andersen et al.*

Concept and Production Management: EPFL x HEAD – Genève. Marilyne Andersen, Mark Pauly, Florin Isvoranu, Javier Fernández Contreras. Production: Alice Proux, Valentin Dubois, Alain Van Garderen (HEAD – Genève). Engineering and Construction: SKIL platform, Claude-Alain Jacot, GCM and LIPID labs (EPFL). Lens Imagery: GCM and LIPID labs (EPFL), Rayform SA. Electronics and Lighting: PL-MTI and SKIL platforms, Florin Isvoranu (EPFL). Entrance light animation: Aurélien Mabilat, Marilyne Andersen. Soundscape: Marie Limoux. Many other creative students, technicians, designers, engineers and researchers contributed to the project. Full project credits can be found on circadiem.ch.

17. *Habitat, Siegrun Appelt with Constanze Müller*

Interview partners are Prof. Dr. Marilyne Andersen (EPFL-LIPID), Michael J. Balick, Ph.D. (Ethnobotanist, The New York Botanical Garden), Prof. Dr. Christoph Küffer (Institut für Landschaft und Freiraum, OST Ostschweizer Fachhochschule Rapperswil & Departement für Umweltsystemwissenschaften, ETHZ), Prof. Dr. Jean-Louis Scartezzini (Solar Energy and Building Physics Laboratory, EPFL), Prof. Arch. Jean-Philippe Vassal (Architekturbüro Lacaton-Vassal & Institut für Architektur und Städtebau, Universität der Künste Berlin), Prof. Dr. Bernhard Wehrli (Departement für Umweltwissenschaften, ETHZ), Prof. em. Anna Wirz-Justice PhD (Zentrum für Chronobiologie, Universitäre Psychiatrische Kliniken Basel).

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24.3.–30.7.
2023

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EPFL Pavilions

Writing & research:
Anna Wirz-Justice,
Marilyne Andersen &
the artists

Exhibition installation
technical assistance:
G.T.M. Technique Montage,
L'illustre Atelier, Marty

Exhibition Credits

Curation:

- Anna Wirz-Justice, Professor Emeritus, Centre for Chronobiology, Psychiatric Clinic of the University of Basel
- Marilyne Andersen, Head, EPFL Laboratory of Integrated Performance in Design (LIPID)
- Sarah Kenderdine, Head, EPFL Laboratory for Experimental Museology (eM+), Director and Lead curator, EPFL Pavilions
- Giulia Bini, Head, EPFL Artist in Residence, College of Humanities

Artists & scientists:
Marilyne Andersen *et al.*
Siegrun Appelt
Kirell Benzi
Alan Bogana
James Carpenter
Rafael Gil Cordeiro
Olafur Eliasson
Colin Fournier
Andreas Horlitz
Ted Hunt
Liliane Lijn
Robin Meier Wiratunga
Susan Morris
Museum de Genève
Anne Noble
Anna Ridler
Helga Schmid
Anna Wirz-Justice *et al.*

Exhibition fabricators:
Laporch SARL

Painting: Renov'immeuble

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Pierre-Antoine Héritier

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Technical coordination:
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and guide: Knoth & Renner
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Caspar Reuss)

Programs & events:
Anna Wirz-Justice,
Marilyne Andersen,
Marie Carrard,
Anne-Gaëlle Lardeau,
Le Thy Nguyen

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Romon

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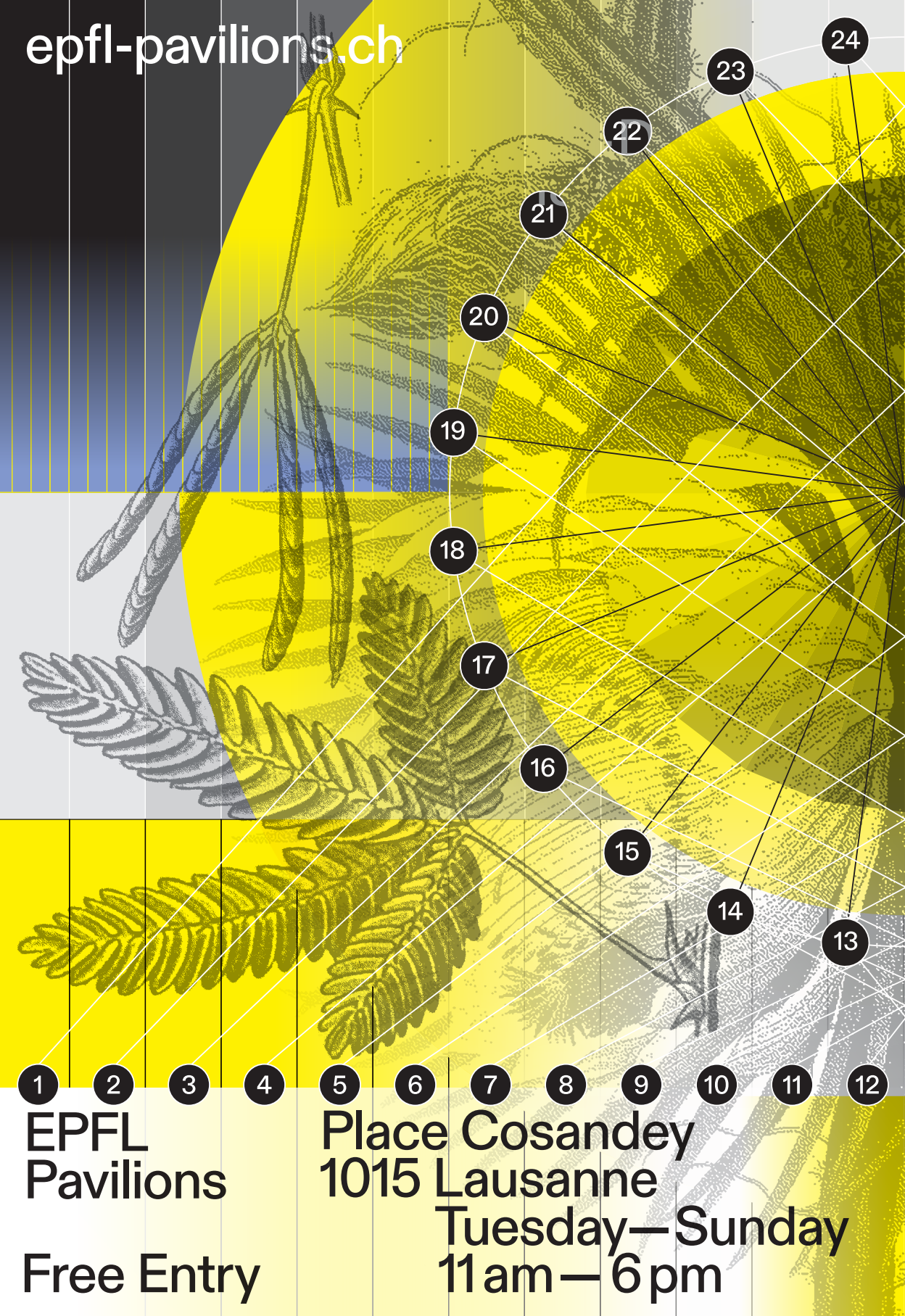
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