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LIGHT

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WELCOME

Welcome to the fifteenth edition of The Journal of Biophilic Design.

The Biophilic Design framework specifies healthier environments for people and all life. When Biophilic Designers specify a room, a building or even a city, we look at everything from sensory impact of our environment to the physical and mental health impact of the materials and products we recommend.

Light is one of the most important aspects of Biophilic Design, and this issue is packed full of the science behind why and how our biology responds to light, exploring everything from evolutionary developments to how light affects our DNA. We also look at how light impacts the natural world around us, so that when we specify, we make sure that lights are angled correctly and the correct temperature lighting so that the impact on the natural world is reduced. We use the 'right light' 'right place' mindset. Plus, we also hear from lighting designers, artists, architects and scientists as well as the RSPB, academics, plant experts and more.

When I first started the Journal, I remember speaking to an interior landscaper who said that we should never put plants at the back of the office where there are no windows and natural light. If we do, they

wither and die. You would think this is common sense. But yet, it's ok to put people at the back of the office where there is no natural light or circadian rhythm perception. We are biological beings, like plants. And just like plants we NEED natural light to survive.

"Light is not merely a technical element, it is a living, sensory material that shapes our experiences. In nature, light drives growth, movement, rhythm, and behaviour. In design, it has the power to influence how we feel, connect, and inhabit spaces," light designer Lilian van Daal in this issue explores how we embrace this in design.

As Ulysse Dormoy describes in this issue: *"All life on earth has evolved under the full solar spectrum, we've understood photosynthesis for the last 250 years, and we are only now starting to understand that there is a mirror image process that takes place in living creatures, humans included."*

Knowledge is powerful, and being armed with the copious amount of research and learning that is distilled for you in this issue of the Journal will, I hope, inspire you. Please use this Journal to show clients and stake holders why you are specifying biophilically. Together our voices are stronger.

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HIGHLIGHTS

Each edition of The Journal of Biophilic Design has regular sections. We highlight them here so you can navigate your way around the Journal. If you would like to contribute to a future edition, please do contact our editor we would love to feature your research and case studies.

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Details of our contributors can be found on our website. Each edition of The Journal of Biophilic Design is published every other month. Next issue's focus is **Sound**.

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If you would like to sponsor the Journal please contact us. Future editions will focus on Sound, Architecture, Interior Design.

LIGHT

Shining the light on circadian rhythms

“Since the Industrial Revolution, much of the Western and developed world has succumbed to the belief that we no longer need nature and that it plays no significant role in our lives. This disconnection has led to long-term environmental harm and a host of chronic health issues for us all.”

Chintamani Bird

My pillow leans against the car door, and though my eyes are shut, I’m surrounded by light. I’m in the back seat of Dad’s car, embarking on a twelve-hour drive back home from Queensland to the western suburbs of Sydney, along with my sister and brother. Sunlight and dappled shadows flash and ripple through the trees, casting extraordinary shapes and colours that dance across my closed eyelids as I struggle to find sleep. The car glides smoothly along the winding New England Highway, gently lulling me into a sleepy state. The sunlight feels like a private, enchanting performance – an orchestra of light playing across my eyelids – perfectly paired with the soothing hum of the engine as Dad drives us home after our holiday visiting our cousins.

As we got closer to home, there were moments when I felt frustrated by the flickering lights that interrupted my quest for rest. I yearned for the comforting embrace of deep sleep, but the bright sun beckoned me to stay awake.

I often think back to my battles with the sun, the moon, and bedtime. Those long summer holiday days were filled with both joy and confusion. My mother insisted that I be in bed before sundown, even as we camped in a caravan park surrounded by new friends who seemed to disregard that rule. I could hear the laughter of children playing outside, and it felt unfair to have a different bedtime. This struggle to stay up later followed me into adolescence, where newfound freedoms became my badge of honour, as I saw my resistance to sleep as a mark of maturity.



In my early twenties, the ability to function on little or no sleep after a night of drinking and partying became a badge of honour. I would return to work or engage in activities while sleep deprived. As I grew older, part of the rite of passage involved pushing the limits of society and my body – whether scuba diving on shipwrecks and reefs or jumping out of aeroplanes.

However, in my fifties, I realise that my body is rebelling against these misguided beliefs about being “cool.” The lack of sleep has more negative effects than positive ones on my mind and body. Now as I rise to greet the sun, my spirits soar alongside it. When the sun sets, I find a moment to set aside my worries, close my eyes, and let my tired body and mind take a break.

Since the Industrial Revolution, much of the Western and developed world has succumbed to the belief that we no longer need nature and that it plays no significant role in our lives. This disconnection has led to long-term environmental harm and a host of chronic health issues for us all.

So, why are so many people drawn to the beauty of a sunrise or the serene charm of an afternoon sunset? Our well-being is intricately linked to the quality of our surroundings, especially our need for sunlight and sufficient sleep.

I can almost hear my teenage self shouting, “BORING!” while rolling my

eyes. “Who cares? We’re here for a good time, not a long time!” But with a playful shake of my finger and a raised eyebrow, I urge you to pay attention.

What makes light, along with its connection to circadian rhythms, vital to the human experience?

Circadian rhythms are molecular processes ingrained in our genetic makeup. They operate in various cells throughout our bodies, including those in the skin, liver, brain, eyes, kidneys, bladder, heart, and stomach, with each organ following its own unique rhythm. Understanding these intricate systems and how light influences our daily routines is key to creating spaces that support our circadian rhythms.

When crafting environments that enhance productivity and creativity, the science behind these factors is truly fascinating. For instance, when considering spaces for mental health, particularly for those with schizophrenia, it’s crucial to recognise that their circadian rhythms differ significantly from those of individuals without the disorder.

The sun plays an essential role in our lives; it fuels our brains with serotonin, fortifies our bones with vitamin D, strengthens our immune systems, lowers the risk of various illnesses, aids in wound healing, boosts energy levels, fights fatigue, eases depression, and helps regulate our circadian rhythms.

We’ve evolved to understand the cycles of seasons and life. As we embraced a diurnal lifestyle, our circadian rhythms became vital for our survival. Within this diurnal state, we find a possible seven variations of circadian rhythms, such as those of early risers and night owls. This diversity has supported human survival, allowing some individuals to rest while others remain vigilant, thereby minimising the risk of predatory attacks. From the moment we are born, our brains begin to interpret the world around us using our senses. It’s not just our eyes that pick up on light, the time of day, and cues for eating or sleeping; our bodies operate on intricate cycles that greatly influence our health. Optimal sleep patterns play a crucial role in maintaining brain health.

The circadian rhythms of our stomach and liver regulate our metabolism and help determine the best times to eat. Meanwhile, the kidney’s rhythms communicate with the bladder’s rhythms, allowing it to expand during the night for a restful sleep. There are specific times throughout the day when our bodies feel more energetic, capable, and productive; the circadian rhythms are the driving force that dictates this for each individual.

Our skin’s circadian rhythm plays an essential role as well, providing the brain with feedback regarding temperature and external conditions. It senses the warmth of the morning and afternoon sun while cooling down in the evening as our core temperature lowers, preparing us for sleep.

Living and working in a temperature-controlled environment can be detrimental to our health in various ways. Our brains, shaped by ancient Palaeolithic lifestyles, are designed to process information at a pace suitable for our ancestors. Previously, time zones changed as quickly as our legs could carry us, but today, with the rapid transport of trains, cars, and planes, our bodies aren’t equipped to keep up.

Regardless of what I thought was important in my twenties, I’ve come to realise that our circadian rhythms are fundamental to how we function in our modern world. The brain gathers data through our senses, allowing us to interpret sensory signals and shape our perceived reality. This includes the light that dances on my eyelids as my dad drives us home. The visual cortex, located at the back of the brain, processes the visual information our eyes receive, enabling us to understand and interpret what we see. This is different for individuals who are visually impaired, and it is the daily routines that support better circadian rhythm function when light cannot be interpreted by the eyes.

Sleep and circadian rhythms are essential ingredients for success. Each stage of the sleep cycle is vital. Recent studies reveal that during REM sleep, spinal fluid rises through the spinal cord, flushing out the toxins accumulated in the brain throughout the day. This groundbreaking finding has been highlighted through advanced technologies and brain scans.



So, what's the significance of light? The quality of sunlight and artificial lighting can greatly affect our well-being. Before delving deeper into this research, I, too, underestimated the powerful influence that light has on us. The implications go far beyond what one might initially think.

Biophilic design not only improves the human experience of the built environment but also promoting the health of humans and biodiversity alike.

Why should I care if I feel worn out and hungover from a lack of sleep? The demands from my job, housework, looming deadlines, and a demanding boss seem to dismiss the importance

of my sleep cycle and whether I feel rejuvenated. The pressures of work, life, and family often overshadow our personal needs.

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But here's the hard truth: our metabolism, kidney and liver function, oxidative stress levels, cardiovascular health, and even mortality rates are all tied to our circadian rhythms. Getting a good night's sleep isn't merely a luxury; it's a necessity. My body doesn't care about the excuses I make or whether I appear "cool." What truly isn't cool is cutting my life short due to poor lifestyle choices.

Poor circadian rhythms and inadequate sleep can lead to a host of serious issues including:

- Fatty liver
- Chronic liver disease
- Chronic kidney disease
- Oxidative stress
- Insulin resistance
- Blood pressure irregularities
- Permanent kidney damage
- Hyperactivity of the sympathetic nervous system
- Inflammation

Circadian rhythms aren't a catch phrase that we can roll our eyes and glaze over with the look of who cares! There is a dynamic reason that circadian rhythms matter.

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Top tips and benefits for biophilic lighting

“Introducing biophilic lighting into workspace or hospitality settings offers a whole host of benefits for both people and the planet.”

As the number of built spaces increases, individuals are looking for new, innovative ways to introduce nature into their environment. Biophilic lighting aims to connect people with the harmony of nature and improve their wellbeing, boost productivity and enhance cognitive function.

Custom biophilic lighting solutions can harmonise the urban environment by evoking natural light patterns and elements in lighting design.

One of the ways to incorporate biophilic elements into your lighting design is

incorporate greenery and planters to bring essential elements of the outdoors inside, improving air quality and blending true nature with artificial elements. Adjusting colour temperature, lighting levels, and dimming to mimic natural lighting also boosts overall health and well-being to align with our natural circadian rhythms and promote relaxation. Plus utilising natural materials and earthy tones, such as wood, stone and glass not only matches the environmentally friendly aesthetic but further enhances sustainability and reduces carbon footprint from the production and waste of synthetic materials.

