A guide to

BIOPHILIC DESIGN

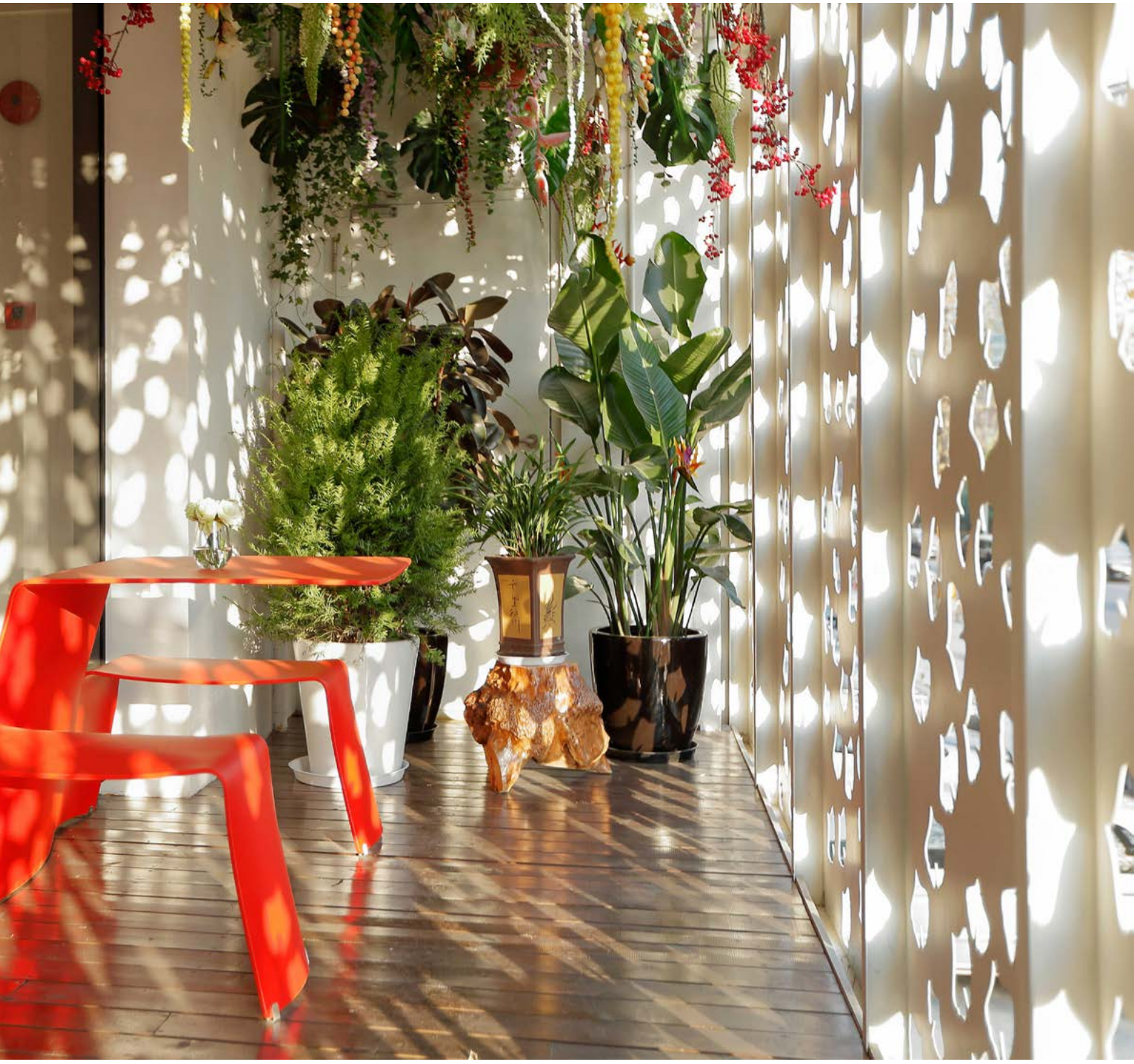
E-GUIDE # 01 – September 2024 – BY extremis

Why and how to bring nature inside

I believe in God,

only I spell it Nature.

Frank Lloyd Wright



PICTURE & LOCATION / *MATSU Group & Matsu Shangai Flagship*

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E-GUIDE # 01

biophilic design

SEPTEMBER 2022

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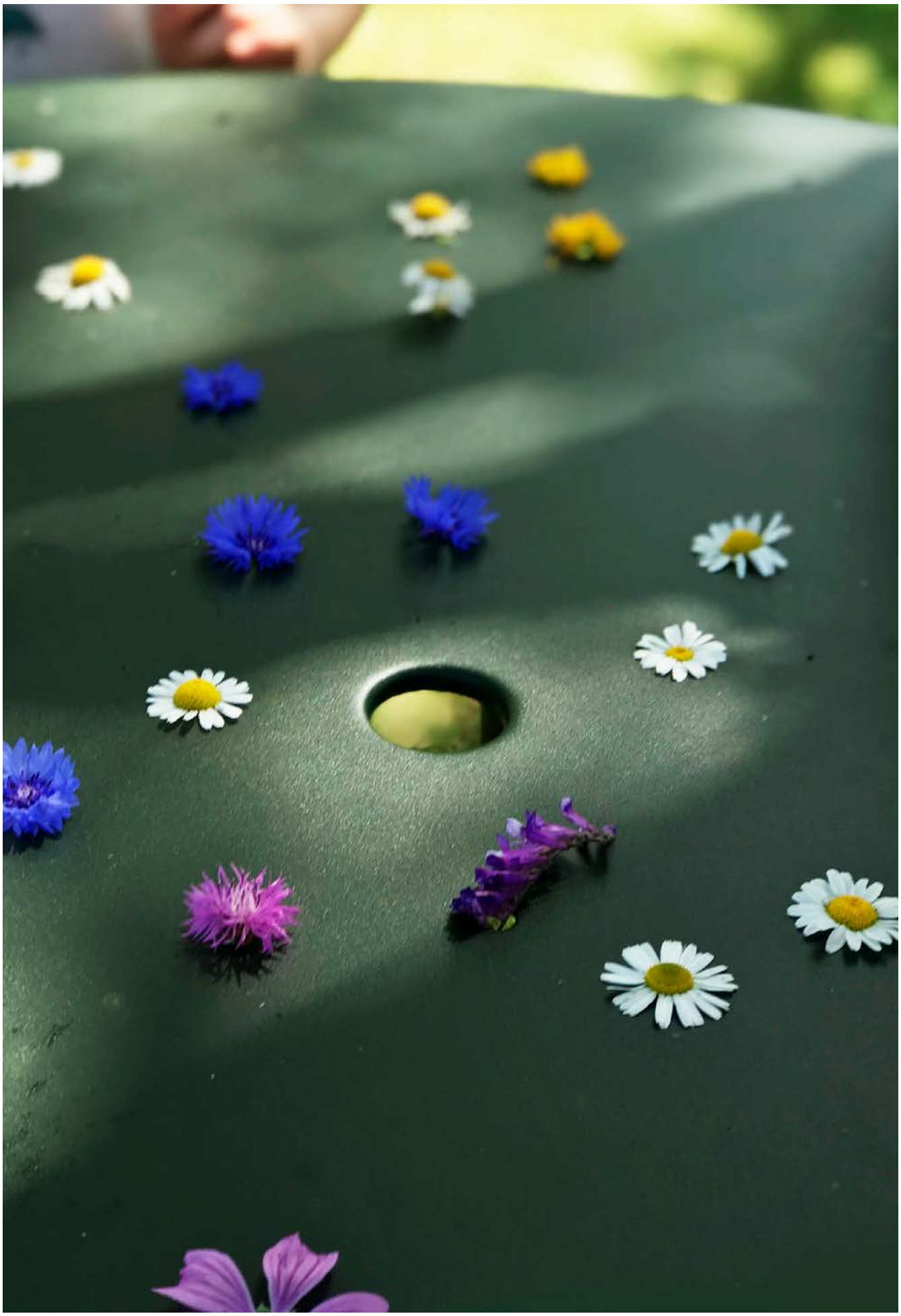
After years of locking ourselves inside clean and lifeless buildings, there is a growing need for design that reconnects us with nature: biophilic design.

This does not simply mean adding a plant or a picture of a plant in every building just because it is pretty. There are numerous reasons and ways to connect with nature in the built environment.

As a brand that aims to make people's lives better by bridging the gap between man and nature with furniture design, it's worth looking into the history and future of biophilic design.

This guide is introduced by sharing what biophilic design is, why we need it so badly and how you can integrate it in your everyday life. The basis for the scientific and economic arguments set out in these parts are mainly sourced from the publications "14 Patterns of Biophilic Design" by Terrapin Bright Green and "The Economics of Biophilia". After this extensive introduction in the field, Extremis explores the future of biophilia and how the design brand interprets these principles in their own works and personal lives.



PICTURE & LOCATION / *Beeldcollectief & Eikenburg*

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Introduction

You probably enjoy leaves turning red, birds chirping, feeling the sunlight on your skin, dipping your toes in the water or smelling a colorful patch of flowers? Can you already imagine it? Nature can be so wonderful, right? But in the meantime, you wouldn't demand to experience these emotions on a daily basis, and definitely not at home, in the office, at school or in the hospital. But maybe you should. It's proven that people have a fundamental need to be connected with nature. As spiritual and non-scientific as that sounds, it's very much true.

Research shows that nature relieves stress, makes people think positively and increases overall health. This is a major insight if you know that more and more people live in cities, suffer from stress at work and are affected by burnouts on an unprecedented scale. Think about employees in offices who will feel more at ease, patients in hospitals who'll heal faster and children in school who'll do and feel better.

This is not only a great advantage for people's health and wellbeing, but it also has economic and social benefits such as less absenteeism, higher productivity and lower costs. And there is more: the more children play outdoors, the better they will take care of nature later in life. So having a connection with nature is not only beneficial for humans, it also helps preserve nature.

And yet, for years now people have been avoiding the outdoors in their everyday lives (yes we're guilty too). Most people live in cities with little access to greenery, where buildings are four walls constructed with artificial materials, filled with sterile furniture, fake light and synthetic air. Luckily, opinions are changing and nature is being rediscovered. Trendy coffee shops often raise an oasis of plants alongside the coffee beans, green walls are being introduced into offices and people are boasting about their sprouting greenery. And it's not because people are suddenly super interested in botanics.

PICTURE & LOCATION / *Studio Volt & De Warande, Kemmel*

It’s clear that people search and need nature, not only outside, but also inside their homes. So how do you bring nature inside? Well, it’s not by spending your entire paycheck on houseplants and freshly cut flowers. Sure, plants, natural products and materials are a part of the process, but there are many more ways to replicate the psychological and emotional benefits people draw from nature. The answer is biophilic design.

Biophilic design aims to optimize every space on multiple levels in order to turn the built environment into inspiring and refreshing places where people feel at ease. This guide carefully explains what biophilic design is, why we need it so badly, and how you can integrate it into your everyday design.

PICTURES & LOCATION / *Studio Volt & Pop-up bar In De Maïs*

The speed of life

Before jumping into the wonderful world of nature and design, we need to talk about humans: they are the essence of biophilic design. Our species has been roaming planet Earth for quite a period of time and it's safe to say that a lot has changed in how we perceive the world, how we live in it and how we get along with it. So let's take a trip down memory lane to learn how our lifestyle has everything to do with biophilia and biophilic design.

Evolution in life

Depending on different points of view, we can state that the modern human life form began some 125,000 years ago. Since the spread of humans across the globe, a lot has changed. From living in caves, to roaming around like nomads, settling on farms, creating cities, disrupting society with a first and second industrial revolution, discovering technology and continuing to grow, right up until today.

Today we stand as a species at the edge of yet another revolution, a revolution that will disrupt society much more than both industrial revolutions: AI – artificial intelligence. Technology has changed and is still changing at a high rate. Digitalization has already transformed life in many ways. Some say that it has made life easier, some would care to differ. Some things for sure have become easier and faster, like getting a message to someone.

We improved the system step by step with typewriters, telex and fax, but still, nobody expected to get an answer in just seconds. So, sure, communicating and other tasks have become easier, but what has happened to all the time people saved thanks to digitalization? The easy, soothing, repetitive and time-consuming tasks have been taken over by technology, but the true thinking still has to be done by humans. Digitalization has made us super performant, but the amount of thinking and decision making to get this performance has multiplied many times.

So, has our life really become easier, has it become harder, or has it simply changed? The speed of life has definitely increased; everything has to be better and has to go faster. Take a look at your life, we all want perfection in every aspect of life whether it be work, health, performance, relationships, food, exercise, education, housing, parenting and so on.

PICTURE & LOCATION / *Beeldcollectief & Extremis*

PICTURE & LOCATION / *Unknown photographer & Ford assembly line, Michigan*

The two industrial revolutions and digitalization have completely changed life as it is. Many people lost their jobs, but even more jobs were created. For example, the change from horse and carriage to car displaced a range of jobs such as manufacturers of wagons, harnesses, saddles and horse breeders; however, ten times more jobs were created in the new field of car manufacturing, dealerships, gas stations and others[1].

According to the Mckinsey Global Institute[2], Artificial Intelligence will disrupt things even more drastically. The change from this era to the era of AI will happen 10 times faster at 300 times the scale than the industrial revolution. In other words, the impact of AI on society will be 3,000 times stronger. This may cause a serious problem for society as it will go too fast for a lot of people.

PICTURE & LOCATION / *CeSViMa & Cajal Blue Brain*

PICTURE / *Guido Reni*

How it was done before digital communication:

Apart from things like smoke signals or sending a herald to communicate, humans invented the postal system: you write your message on a piece of paper, preferably without mistakes and in readable handwriting, you post it, you have no idea when or if it will be received, and wait weeks or longer for a reply. Today, you wouldn't even remember what you even wrote in that letter.

How we do it now:

You type a message – in a preset handwriting with a spellchecker – and hit send. Boom, received.

Evolution in genes

Life changes fast; however, people don't. Genetically, people are still the same as the homo sapiens that spread from Africa 125,000 years ago. Our DNA hasn't had the time to adapt to these new forms of life, and it shows. More than ever, people suffer from stress and burnouts. And it's not just the laggards, even the generations born in the digital era can't seem to cope with the fast and flashing life.

Luckily, there is a solution: restoring the balance in our lives. Connecting people with nature, the nature they have lived close with for over thousands of years.

PICTURE / *RC Photo Stock*

What is biophilia?

Now that it’s clear that most people live a disrupted lifestyle and that the answer to some twenty-first century problems is to embrace nature via ‘biophilia’, it’s time to discover what this funny word actually entails. Just like a true mystery we’ll answer the who, when, where, what, and why of the biophilic concept.

Love of life

PICTURE & LOCATION / *Verne & Kemmel*

Biophilia is the inborn need to connect with nature and all living organisms. Literally translated from ancient Greek, it is 'the love of life'. The term 'biophilia' is first introduced by psychoanalyst Erich Fromm who states that biophilia is "the passionate love of life and of all that is alive...whether in a person, a plant, an idea, or a social group"[3]. It explains why we love the sound of pouring water, crackling fire or crashing waves, why we like to pet animals, breathe in the spring air, walk in the forest, play with shadows and thrillingly seek the edge of heights.

And it's not only when we're out that we notice biophilia, this love for life. Nature is a part of our lives more than we know. Think of all the references to nature we can find in every language; why else would people be 'barking up the wrong tree'? But there's more: many religions incorporate animals in both life and afterlife. Also who can resist the longing eyes of well, almost any young animal? Mammals are attracted to other young mammals and want to care for them to the point that some would risk their own lives to save them from harm.

Biophilia is rooted in human nature. It also explains why many buildings have huge windows, why we like to fill our houses with plants and why every time we're asked to name our dream vacation, we describe a nature scene. It's not that surprising actually. We all descend from nature and it's only since a few hundred years that we started to live in artificial, efficiency-driven, concrete cities. The early human instincts are still present in people, even today.

The term biophilia was later used in 1984 by American biologist Edward O. Wilson in his work Biophilia[4], in which he proposed that a genetic base is the reason why humans focus on and affiliate with nature and other life forms. In his work, Wilson not only states the love humans have for nature, but also focuses on the reciprocal connection between humans and nature. Wilson actually started his research after finding out that dolphins rescue drowning humans. His groundbreaking work clarifies the true meaning of biophilia: a circular and innate connection between both nature and people.

A fairly easy way to incorporate biophilia in our lives is to integrate it in our architecture, furniture and objects. With biophilic design, architects, interior designers, planners and developers try to incorporate the great outdoors into the built world. This way, people's inborn need to be connected with nature is satisfied in the built environment, allowing them to live in this present-day world without feeling some of the disadvantages of the big-city life.

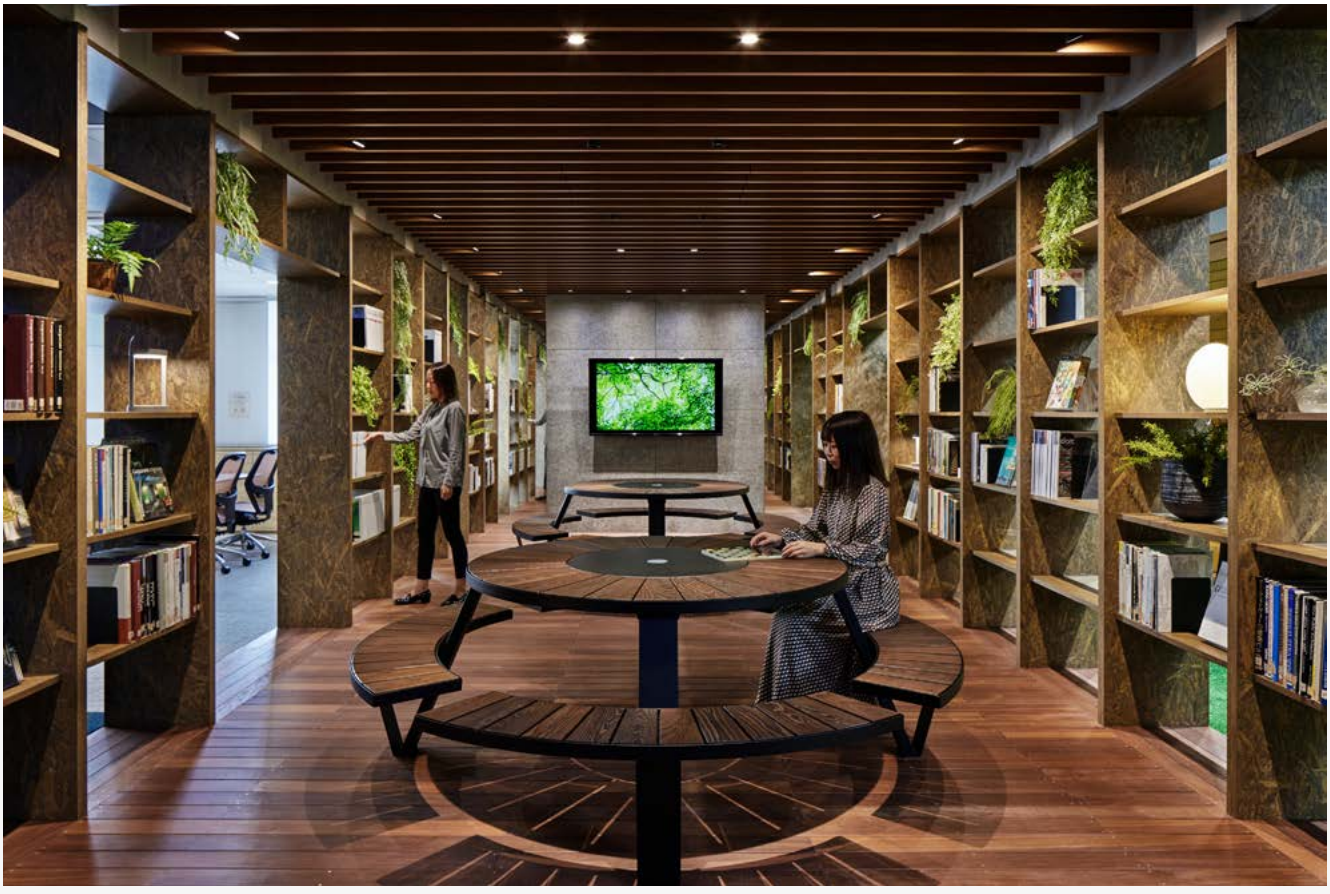
PICTURE & LOCATION / *Beeldcollectief & Ypres*

We care about nature, and other living things care about us.

What embodies nature?

In order to talk about nature however, we have to define it first. Some say nature is each living organism: humans, animals, insects, plants, trees, stars and everything between the earth and the sun (or beyond). Others define nature as everything that has been made by living organisms. Consequently, this also includes all things designed by humans, such as plastic tables, concrete roads, steel facades or even a cardboard cup.

In this guide, we extend nature to all living organisms and non-living components. Those non-living components can either be created deliberately or aimlessly and can be biodiverse and ecological or also monocultural and chemical.



With both real plants, fake plants and even screened greenery, dimmed
lighting and plenty of wooden materials, this office sspace brings nature inside through various layers.

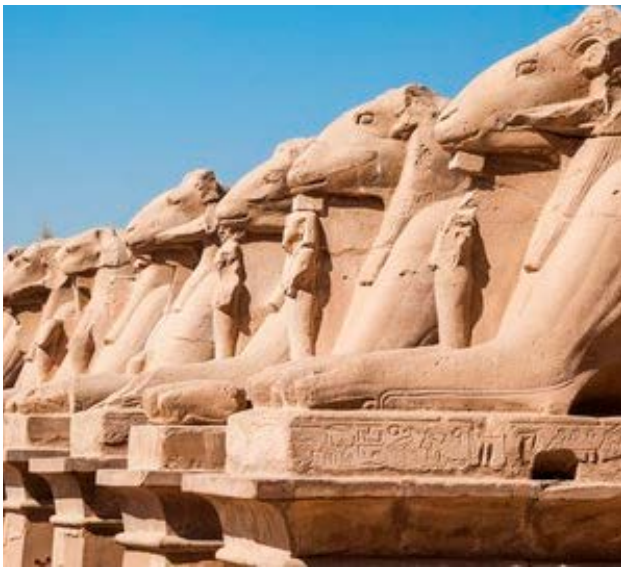
PICTURE & LOCATION / *Nacása and Partners & ENDO lighting Synca-UX Lab, Tokyo, Japan*

Biophilic design: hardly a brand-new concept

Biophilic design is not a recently discovered concept: even the oldest of civilizations used biophilic elements in their architecture. Think about the wide use of animals in Egyptian architecture, the flowering acanthus leaves on Greek temple columns, lotus ponds in ancient China or the hanging gardens of Babylon. It's clearly a human intuition to embed natural elements in architecture.

For thousands of years, people have lived in close contact with nature, step by step improving the way they lived and worked in terms of comfort and productivity. During the industrial revolution, workers became more familiar with the conveyor belt than with the natural world and the majority of mankind started to live in cities. Ever since, life got centered around efficiency, profit and advancement, and people drifted away from nature. Biophilia was still within reach, although mainly for upper-class people;

PICTURE / *Guy Dugas*



PICTURE & LOCATION / *Merydolla & Avenue of Rams, Luxor, Egypt*

think of landscape paintings, hospitals in rural areas or school excursions to the seaside.

In the late 19th century, architects like Victor Horta and Antoni Gaudí re-experimented with vegetal forms, creating a return of biophilic design in architecture. Over the years, architecture continued to change up until today, where we find that many buildings look like sterile, four-walled blocks, often in the name of improvement. These improvements to life are mostly based upon technological advancements and not so much upon subtle physiological needs.

The way people live and build corresponds with an overall mindset: being the supreme species in the world. This human-only perspective accounts for many decisions made and may seem trivial when you compare it to planet Earth that's been around for

longer than humankind. Yet, it appears people are not all that insignificant. Humanity is transforming Earth at a dazzling pace that is comparable to the immense geological time scales of the past. For example, people worldwide are currently moving more rocks and sediments than all the rivers put together[5].

Humans have an influence on the planet, but many people now also recognize a connection we have with the planet. A simple virus like Covid-19, not even a cell, a mere snippet of DNA, reminds us all that we aren't invincible, but rather an integral part of the world. If we want to stop the destruction of our living environment and start living more harmoniously with it, it's time to take action.

The branching columns of the Nave in the Sagrada Familia in Spain mimic a tree where at the intersection of the trunk and the branches, tree knots are used as discrete lighting. It feels like walking in a forest.

PICTURE & LOCATION / *Robert Gombos & Sagrada Familia, Barcelona, Spain*

Why do we need biophilic design?

But what if you're doing just fine without more nature in my life?
Well, you'd lose on some major benefits. Honestly, who wouldn't want to earn more money, reduce their cholesterol, boost productivity at work, enhance their creativity, and save the birds and the bees? Yes surrounding yourself with pieces of nature offers these benefits, and many others.

PICTURE & LOCATION / *CPG Consultants, RMJM & Khoo Teck Puat Hospital, Singapore*

Health benefits

Biophilic design isn't only desired because humans intuitively search for it, it has countless of scientifically proven perks for people's overall health. It is confirmed that being in contact with nature has cognitive benefits: it enhances creativity, gives clarity in thoughts, strengthens memory and builds up the attention span[6]. According to a study by Oliver Heath[7], biophilic design in schools increased student learning rates by 20 to 25%, improved attendance and reduced impacts of ADHD.

This can for example result in a decrease in ADD or ADHD medication. A 10% decrease in this medication could save up to $228 million annually in the US alone[8].

Psychologically, it affects people's mood and reduces emotions like anxiety, anger, fatigue and confusion[9]. Furthermore, biophilic design has physiological advantages such as lowered blood pressure, fewer stress hormones like cholesterol[10], expedited healing[11] and the prevention of sickness[12]. With biophilic design in healthcare, recovery times decrease by 8.5% and pain medication is reduced by 22%[13].

The Khoo Teck Puat Hospital in Singapore is the opposite of a classic sterile white-corridor hospital. The hospital seamlessly blends into nature and has the objective of being "a hospital in a garden and a garden in a hospital," said Donald Wai, Director Hospital Planning AHS.

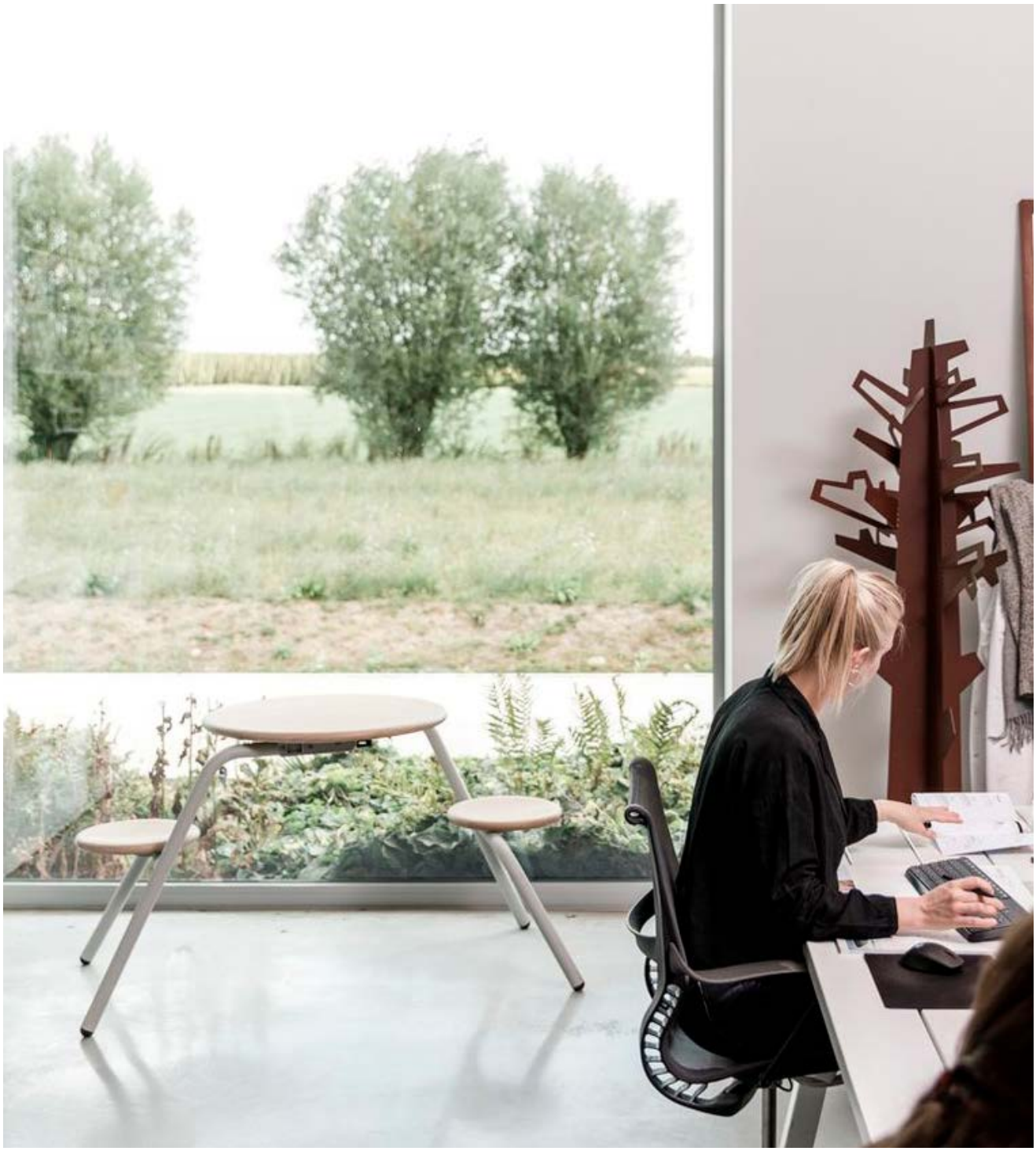
Patients forget pain and recover much faster in the park-like ambiance. Each patient has a window view with sunshades and scented plants that offer both shade and a nice smell.

Not only patients, but also caregivers and the public benefit from the building. "We wanted to make sure the hospital didn't take away anything from the town. Instead, it would enrich the neighborhood," said Liak Teng Lit, AHS CEO. People go to the hospital for the quietness and enjoy the many benches, hideaways and cozy corners. There is also a long promenade along the pond which is used by patients, staff and the community to exercise, recuperate and interact.

The forest-like hospital attracts butterflies and birds, has a waterfall, pond and multiple rooftop gardens with fruit trees, vegetables and herbs that are used for the patient meals.

PICTURES & LOCATION /
CPG Consultants, RMJM & Khoo Teck Puat Hospital, Singapore

It's not just decoration: biophilic design is a competitive advantage.



Economic benefits

Indirectly, biophilic design has considerable economic and social advantages. For one, there are less energy costs when using more daylight[14]. But also, worker productivity influences budgets. The average US employee works more than 43 hours per week in the office (pandemic excluded). Employers hope that these employees are always productive, but being efficient 100% of the time is unlikely, very much given the built environment in which they work. Year after year, people are more stressed than ever, resulting in lost productivity[15], with the main reasons being higher absenteeism rates, less focus, bad mood and health issues.

Biophilic design relieves these undesirable symptoms, improves worker productivity by 8% and reduces work absences. A study shows that a city like New York could save up to $470 million due to increased worker productivity[16].

With online shopping on the rise, retail is forced to rethink in-store shopping. It is therefore good to know that scientists[17] found that consumers are likely to spend 25% more in heavily vegetated streets and that sales increase up to 40% when stores have a skylight in the roof.

Research also shows that guests are willing to pay up to 23% more for a stay in nature or a room with biophilic elements. Properties incorporating biophilic design also fetch higher selling prices[18]. Moreover, it is shown that biophilic design reduces crime rates by 8%[19]. Too often, biophilic design is regarded as a luxury for those who want to showcase their efforts. While in reality, it's an economic investment in health, productivity and profit that is scientifically stated.

A study overwhelmingly showed the influence of the office environment on worker performance. Having a window view, and more so a better window view of vegetation, in comparison to having a view of a wall lead to a 10 to 25% increase in cognitive performance. Workers also reported positive health symptoms and less fatigue[20].

PICTURES & LOCATION / *Skinn & Extremis*

Environmental benefits

As stated earlier, biophilia – and biophilic design – isn't just about humans. A thought-out biophilic design is also beneficial for nature itself. It seems clear that added vegetation filters the air, reduces urban heat island effect and reduces noise pollution[21]. But there's more.

According to the United Nations, people have become urban dwellers; by 2050, two in three people will live in urban areas. With more people living in dense cities, it's becoming ever more challenging to create a good biophilic design. It is, for example, no use having giant windows in your office when the view is just another concrete block across an alley.

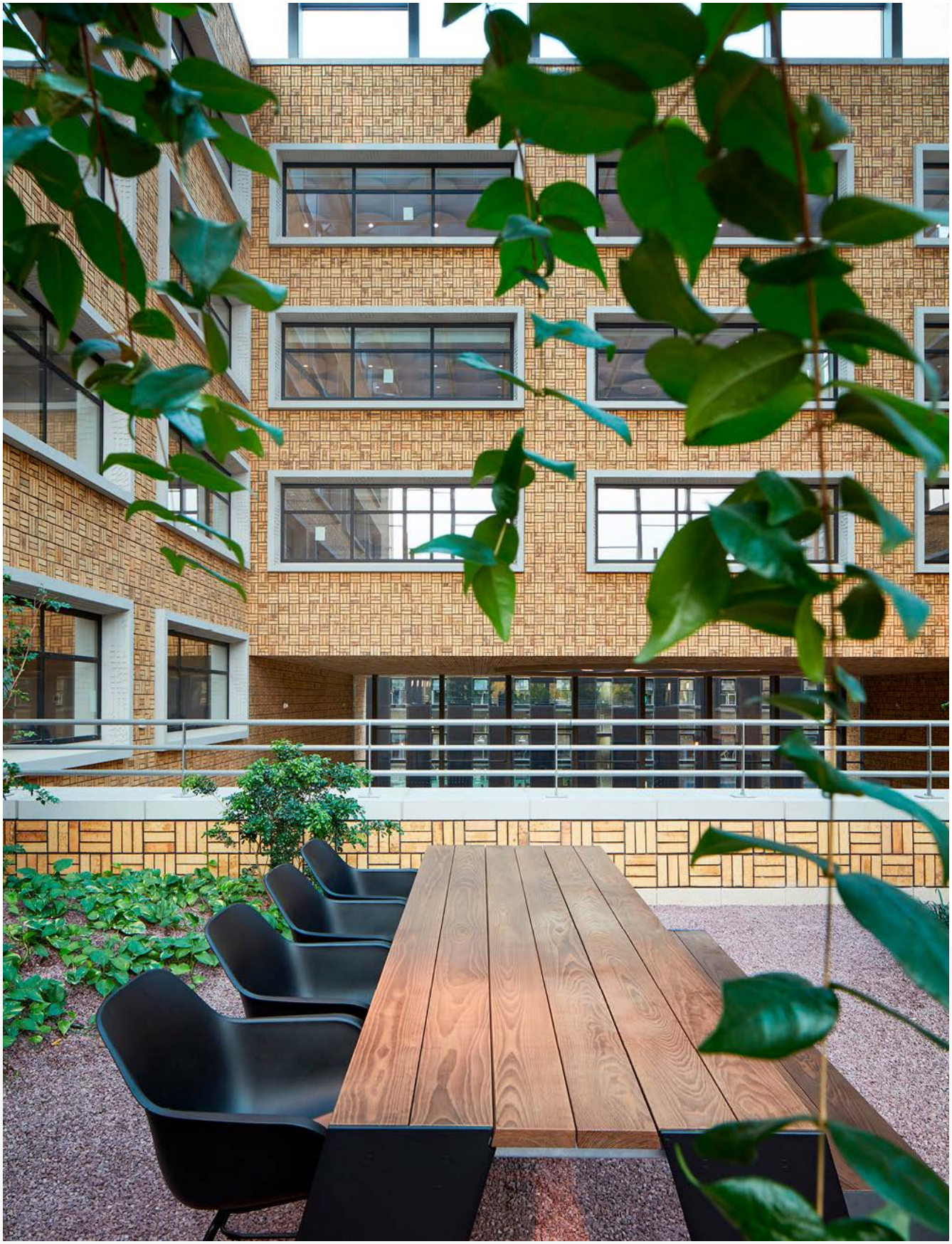
As technology improves and the exposure to nature is reduced over time, people become less likely to care for and preserve this very thing they depend on. It is thus even more important to establish a change in attitudes. For parents, it seems ever more difficult to get the kids off the sofa, TV or iPad and outside in the fresh air. The smartphone and sofa have become an inherent part of a child's world. Research even shows that prisoners spend more time outside than today's children[22]. A dramatic finding. There are however many benefits for children to play outdoors, such as building confidence, enhancing creative play, gaining responsibility, exercise, having more positive relationships and a general place for learning[23].

On top of these many benefits, there is another motivator to push children outside that parents may not even know of. It is proven that children who play outdoors, are more likely to protect nature as adults[24].

Protecting the environment is thus as easy as letting your children play outdoors and installing a passion for nature and a sense of protecting it. Just imagine the impact if all individuals started to care about the environment and become conscious stewards of our world.

The integration of biophilia in our everyday places can be one of the tools in changing existing attitudes and preserving the outdoors. This way, there's a reciprocal interaction in which nature helps people and people help nature.

With this shift in thinking, the need for design that (re)connects people with nature becomes ever more important. Designers, architects and planners have the opportunity to drive change and to contribute to the preservation of nature itself. Biophilic design is not a luxury, it's a necessity for people's health and wellbeing, and in the long run, it is also a necessity for nature itself.



The Flemish Government office in Belgium has four interior gardens for employees who are hungry for a touch of nature.

PICTURE & LOCATION / *Beeldcollectief & Brussels, Belgium*

Patterns of biophilia

As the need and interest in biophilic design grows, research on the topic expands as well. Up until today, Browning, Ryan & Clancy[25] from Terrapin Bright Green have drawn up the most comprehensive list on just how biophilia can be used in design. They list 14 different patterns in nature that can be used when designing a space. We'll use this classification in this guide; note that the body of evidence is always expanding and that the classification could alter over time.

PICTURE & LOCATION / *Hilde Verbeke & Acotée d'o, Gijverinkhove, Belgium*

Each biophilic pattern has proven psychological, physiological, and cognitive benefits.
The 14 patterns are divided into three groups that assist you in the designing process.

In the following part, Extremis summarizes the original 14 Patterns of Biophilic Design publication.
Each pattern is explained individually, tackling what the pattern is, how you can implement it, what you should pay attention to when using the pattern, followed by some examples in present-day architecture.

Nature in the Space

Visual connection with nature

This first pattern is the most obvious and most easy to implement in design.
It is having a view on nature or having (pieces of) it within a space.

Pattern in nature

- Natural vegetation
- The flow of water
- Animals and fossils
- Types of soil and terrain

Pattern in created design

- Plants, green walls
- A view of nature: with floor to ceiling windows that diminish the border between the indoors and outdoors
- Artwork or a video of nature scenes
- Koi pond, aquarium,mechanical flow of water

This Belgian beer brewery has a round-shaped courtyard that features a water fountain, various plants, full-height glazing and a circular opening in the roof that allows for the trees to pass through and for rain to penetrate.

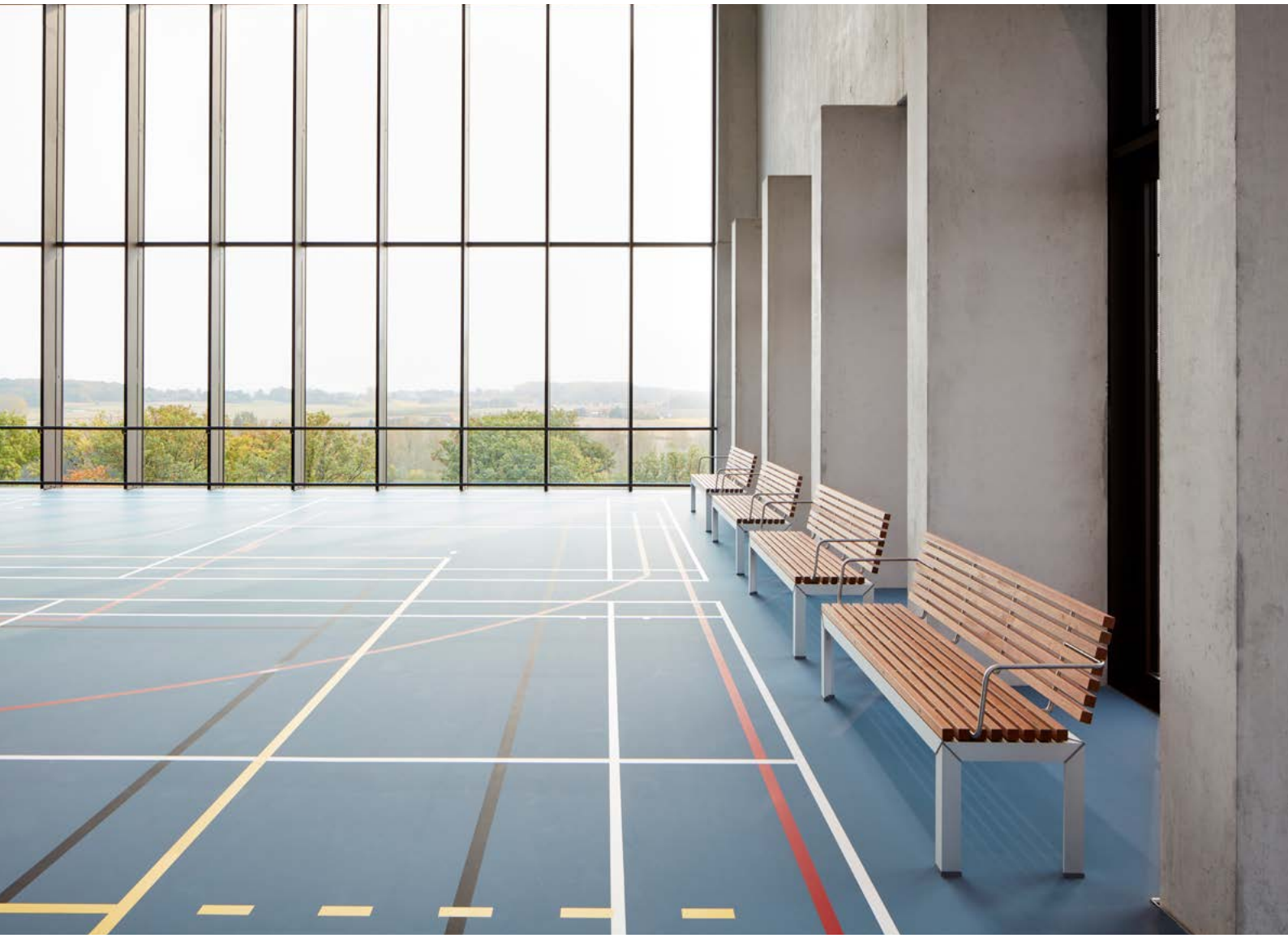
PICTURE & LOCATION / *Jürgen de Witte & Brewery Vanhonseboruck, Izegem, Belgium*

When designing a space with this pattern, consider this:

- Prioritize real nature over simulated nature and simulated nature over no nature.
- Prioritize biodiversity over quantity.
- A visual connection should be experienced at least 5 to 20 minutes per day.
- Make sure that views are not only visible when standing, but also when seated.

The rehabilitation gym of this university hospital is located on the top floor of the therapy tower. With views over the countryside, patients are simultaneously offered peace and stimulation, away from the busy rhytm of the university campus.

PICTURE & LOCATION / *Beeldcollectief & UZ Leuven, Belgium*



Non-visual connection with nature

In this pattern, a connection is made with nature in an indirect way, such as sound, scent, taste or textures that remind us of being outdoors.

Pattern in nature

- Fragrant herbs, smell of fire
- Sound of birds, crackling fire, water flowing
- Textured materials such as wood, stone, fur
- Weather: rain, wind, hail, sunlight

Pattern in created design

- Mechanically released scents, horticulture
- Simulation of nature sounds, fireplace, water
- Textured fabrics and natural materials
- Natural light through windows
- Honeybee apiary, pets

This office space features an indoor patio that mimics a garden feeling via fragrant plants, wooden walls, textured grass carpets, dimmable lighting and impromptu natural sounds.

PICTURE & LOCATION */ Joji Okamoto & ENDO Lighting Synca-UX lab, Tokyo, Japan*

When designing a space with this pattern, consider this:

- Prioritize nature sounds over urban sounds.
- Create connections that can be accessed in multiple locations.
- Opt for interventions that can be experienced in multiple ways.
- Combine with other patterns, such as visual connections.

The Singing Ringing Tree is a sound sculpture driven by wind, it resembles a tree and allows you to hear the wind sing.

PICTURE & LOCATION / *Pete Stuart & Lancashire, UK*

Non-rhythmic sensory stimuli

Unpredictable stimuli trigger people and make a room feel fresh, special and energizing.
Sudden distractions lift up a space in this pattern.

Pattern in nature

- Clouds
- Breezes
- Plants rustling, insect and animal movement
- Water babbling
- Birds chirping and moving

Pattern in created design

- Screens or fabrics that move with breezes
- Reflections of water
- Shadows that change
- Unpredictable broadcasted nature sounds
- Mechanically released plant scents

In the Louvre Museum in Abu Dhabi, United Arab Emirates, a metal dome filters light down like sunrays through palm leaves, creating 'rain of light' shimmering on the water ponds, walls and floor.

PICTURE & LOCATION / *Gabriel Gorby & Abu Dhabi, UAE*

When designing a space with this pattern, consider this:

- A stimulus should occur every 20 minutes for 20 seconds.
- Opt for plants that attract bees, butterflies or other pollinators.
- Mechanical movement has to be unpredictable; a pendulum or ticking clock can be experienced negatively and will not hold someone's attention. A butterfly, on the other hand, will keep inspiring.

In this atrium, green 'leaves' float around in a playful way casting a changing shadow in the atrium.

PICTURE / ***Livinator***

Thermal & airflow variability

Spaces need fresh air, a fitting temperature and the right humidity.
It makes a room refreshing, alive and gives a feeling of flexibility.

Pattern in nature

- Solar heat
- Shadow and shade
- Vegetation that changes in seasons
- Radiant surface materials
- Space orientation

Pattern in created design

- Window glazing and operability
- Cross ventilation
- System controls

Spaces with high ceilings create more air movement, making people feel like they're outside. In nature, people will then seek shelter to feel safe again. In the built world, an indoor parasol can give that shelter while also creating an acoustic solution.

PICTURE & LOCATION / *Joji Okamoto & Tistou HQ, Japan*

When designing a space with this pattern, consider this:

- Give users control of thermal conditions: fans/heaters, window seats.
- Create temperature, humidity and airflow as experienced outdoors.
- A sustainable thermal and airflow is good for climate change and reduces energy costs.

The Sharifi-Ha House in Tehran, Iran, has three rooms that can be turned towards the sun or closed at night. This saves energy in winter and allows more airflow in summer.

PICTURE & LOCATION /

Parham Taghioff, Salar Motahari, Majid Jahangiri, Mandana Mansoori & The Sharifi-Ha House, Tehran

Presence of water

Seeing, hearing and touching water feels compelling and captivating;
it makes a space stimulating and/or calming.

Pattern in nature

- River, ocean, pond, lake
- Wetlands
- Water babbling
- Rainfall and water flowing

Pattern in created design

- Water wall, waterfall
- Aquarium
- Fountain, constructed stream
- Reflections of water (real or simulated)
- Water in artwork

Thin sheets of water in the Hyperlane skypark reflect light and invite people to touch the water. As a replacement for a disused carpark, ASPECT Studios created a vibrant and fun public space that stimulates social connection and community building.

PICTURE & LOCATION / *Lu Bing & Chengdu, China*

When designing a space with this pattern, consider this:

- Take advantage of the sounds of water and the capacity to touch it.
  Pay attention to acoustics: loud water sounds can create discomfort.
- Make sure the water is clean and unpolluted and minimize water loss.
- Prioritize natural fluctuating water over predictable or unmoving water.

The Apple Store in Milan, Italy, has a staircase that descends to the shop through a crystal fountain.

PICTURE & LOCATION / *Flawless Life & Apple Store, Milan, Italy*

PICTURE & LOCATION / *Michelle Tan & Stuttgart Library, Germany*

Dynamic & diffuse light

Light should follow the movement of time during the day.
Play with different intensities of light and shadow to stimulate the eye.

Pattern in nature

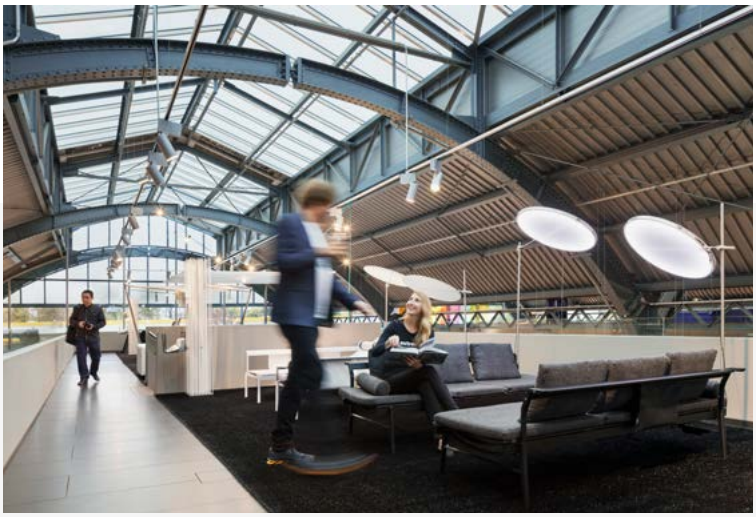
- Daylight during the day
  (yellow in morning, blue around midday, red towards evening)
- Sunlight, moonlight, star light
- Seasonal light
- Bioluminescence of organisms

Pattern in created design

- Electric light sources, ambient lighting
- Windows to catch daylight
- Personal lighting, accent lighting
- Circadian color and color tuning lighting
- Light breakers (parasols, shades, plants)

A range of light is created via floor to ceiling windows, skylights, a large atrium, ceiling lights, and accent lights near the sofas. The latter are shaped like a full moon and add a fun element to the space.

PICTURE & LOCATION /
Constantin Meyer & Designpost Cologne, Germany



When designing a space with this pattern, consider this:

- Natural daylight has many advantages, bring it inside where possible.
- Don’t create a uniform distribution of light in one space.
- Pay attention to extreme differences in light, this causes glare discomfort.
- Install layers of lighting to create the feeling of depth.
- Movement of light and shadows attracts attention.

For the architects and lighting designers, this building in the largest nature reserve in The Netherlands had to form an integral part of the park experience. By mimicking natural light and shadows as perceived in a forest, people subtly enjoy the shooting feeling of nature a while longer.

The mixture of patterns of leaves, small birds and animals in the metal-cut pendants is brought to life via an algorithm based on video footage to recreate a feeling of rustling tree leaves.

PICTURE & LOCATION / ***Stijn Bollaert for Monadnock and De Zwarte hond & The Hoge Veluwe National Park Pavilion, the Netherlands***

Connection with Natural Systems

Natural processes such as seasons, cycles of life and temporal changes make a place feel part of a greater whole.

Pattern in nature

- Deciduous trees, pollination, growth, aging and decomposition of plants
- Weather and seasonal patterns
- Hydrology: surface water, flood/drought
- Geology: erosion, dunes, fossils
- Animal behavior: feeding, mating, habitation
- Tide, moon cycle, light & shadow

Pattern in created design

- Animal habitats: birdhouse, honeybee apiary
- Patina of material: wood, leather, copper
- Water infrastructure
- Daylight systems

When designing a space with this pattern, consider this:

- When integrating the capture of rainwater, give visual access to it.
- Have visual access to existing natural systems.
- Opt for furniture that changes form with exposure to sun, wind, rain, shade.
- Create interactivity via horticulture, community gardens, seasonal cooking.

The green roof of this New York office changes appearance throughout the year. Employees can also see hawks hunting and can taste honey from the local bee colony.

PICTURES & LOCATION / *Cook+Fox & New York, USA*

Bird boxes and nests create a connection with wildlife, you can see birds flying, feeding and breeding.

PICTURE / *Kevin Blanzy*

Natural analogues

Biomorphic forms & patterns

Nature despises straight lines and right angles; it consists of patterns and textures that are easily recognized. It gives positivity and concentration.

Pattern in decor

- Fabrics, carpet, wallpaper design based on The Fibonacci series or Golden Mean
- Window details: glass color, texture, details
- Sculptures and installations
- Woodwork, masonry

Pattern in architecture

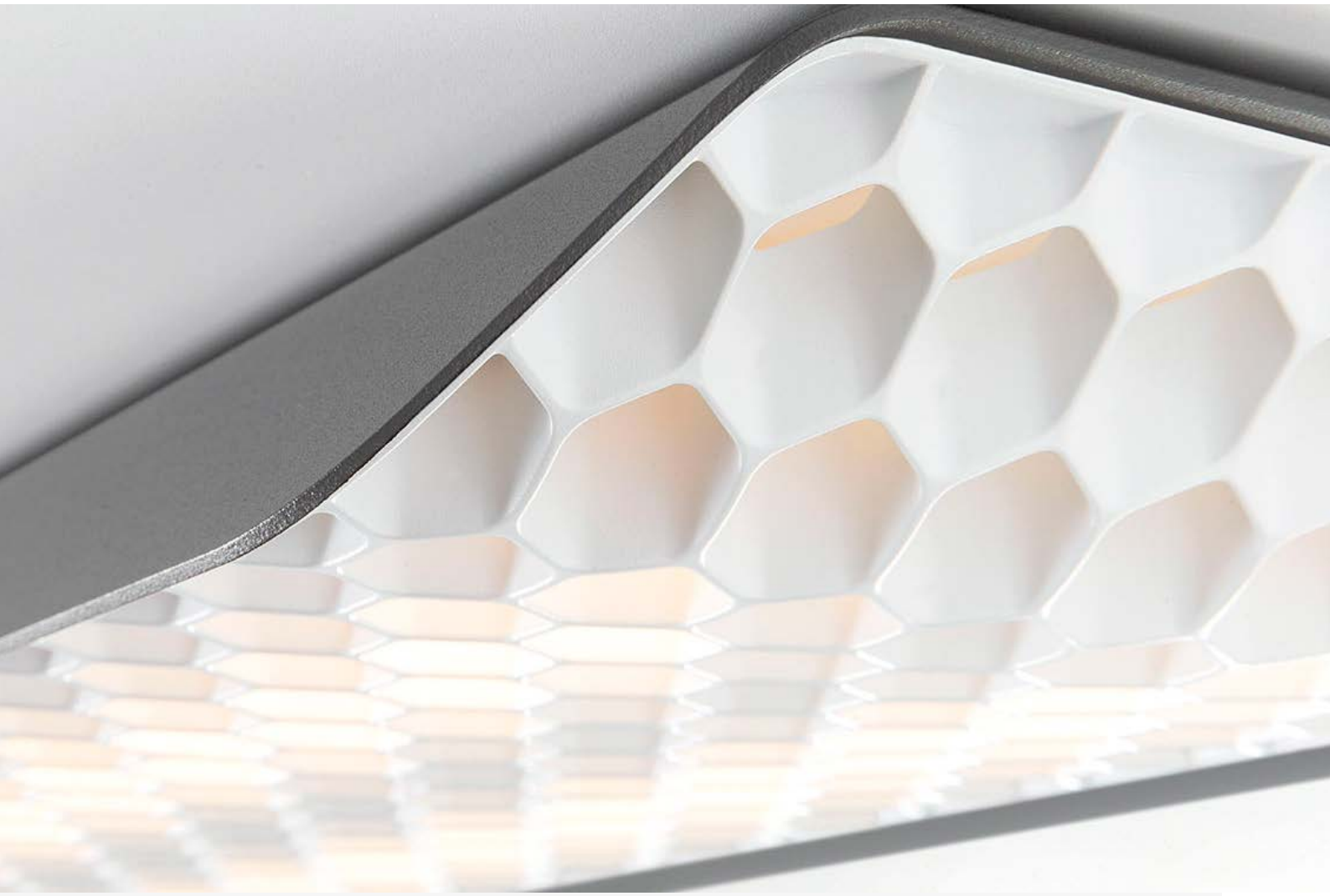
- Arrangement of structure-like columns
- Acoustic paneling
- Fencing, gates, railings
- Pathway and hallway form
- Biomimicry: mirror nature in human design

This 'Acacia' shade is designed like the African Acacia tree; the asymmetrical shape of the tree sparks immediate recognition of the tree.

PICTURE & LOCATION/ *Verne & Kemmel, Belgium*

When designing a space with this pattern, consider this:

- Use two approaches in tandem: decor and architecture.
- Avoid overuse of forms and patterns, this leads to visual toxicity.
- Introduce interventions early in the design process.



Vaeder, a beehive-like office light, is inspired by nature and stays away from straight, clean lines often found in offices. The honeycomb structure reduces glare and feels organic.

PICTURE / ***Modular Lighting Instruments, Belgium***

Material connection with nature

The reflection of local ecology and geology such as timber, stone, colors and climate design makes a space feel rich and authentic.

Pattern in decor

- Accent details in wood, stone, leather, bamboo, cork, etc.
- Interior surfaces like countertops
- Woodwork, stonework
- Natural color palette

Pattern in architecture

- Walls in wood or stone, façade material
- Structural systems like heavy timber beams
- Furniture form
- Footpaths, bridges

This café in Vietnam is completely made of bamboo. Bamboo grows widely and fast in the region and is a strong material.

PICTURE & LOCATION / *Trieu Chien & Vietnam*

When designing a space with this pattern, consider this:

- A variability of materials and colors is recommended over high ratios of one.
- Real materials are preferred over synthetic variations.
- The color green enhances creativity.

The Falling Water House blends into its natural surroundings as it's built on a waterfall, uses locally sourced sandstone, consists of only two colors and has some original boulders left inside. Even before the term was coined, Wright built one of today's prime examples of biophilic design

PICTURE & LOCATION / *Pixabay & Mill Run, Pennsylvania, USA*

This former chapel with its stained-glass windows, orginal tiled floors, wall reliefs and ornamented ceiling has been restored to a high school. The authentic elements offer a richness of forms, motifs and volumes while the tables offer an added dimension to the setting with their bold colors and funky shapes.

PICTURE & LOCATION / *Ann Esprit & Guldensporencollege Kortrijk, Belgium*

Complexity & order

A quality often lost in today's architecture is wild, rich and overwhelming design. In a correct balance though, it makes a place engaging and rich with information.

Pattern in decor

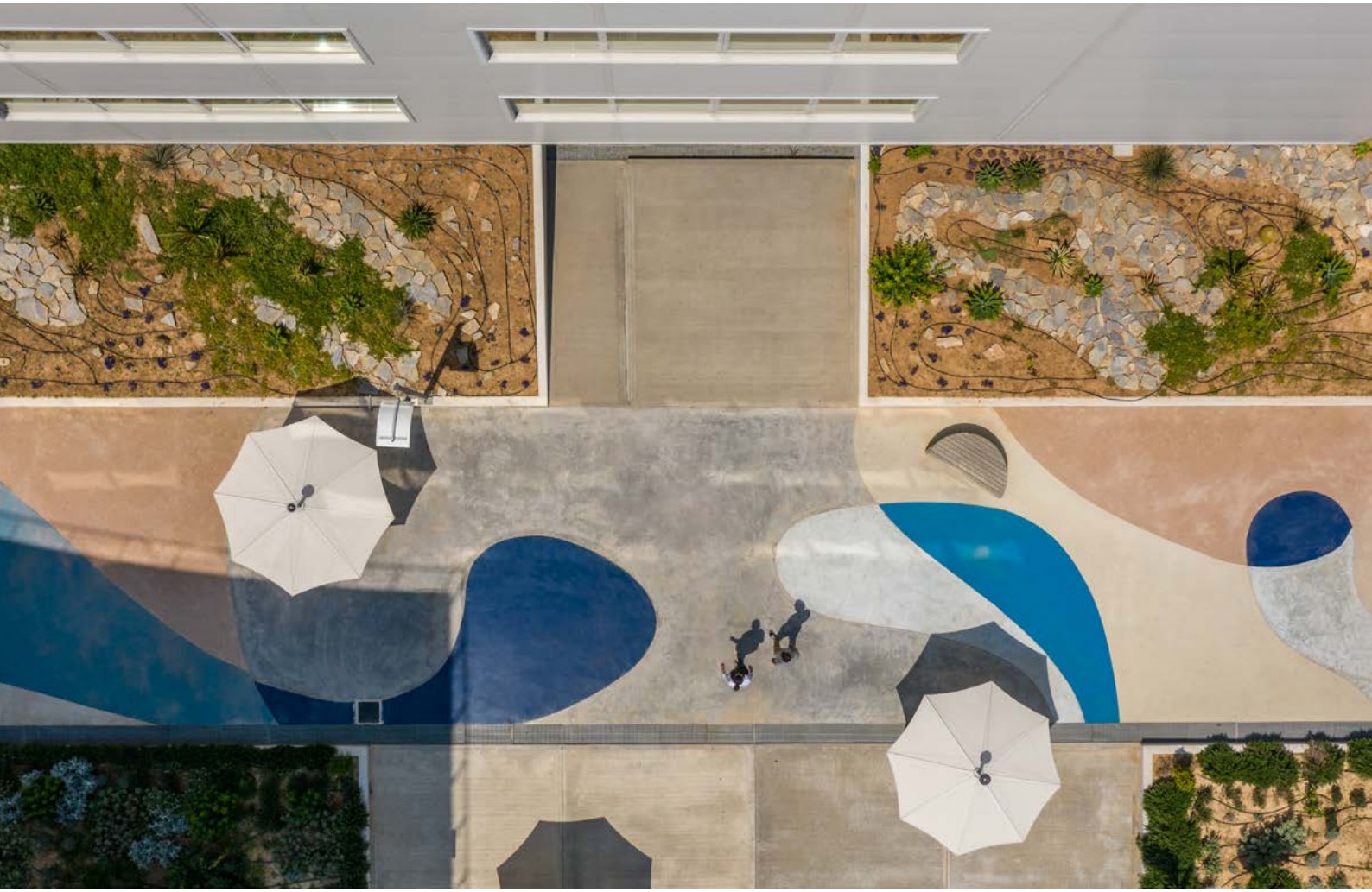
- Wallpaper and carpet design
- Material texture and contour
- Window details
- Plant selection and placement
- Auditory stimuli

Pattern in architecture

- Exposed structures: exoskeleton, façade, etc.
- Building skyline
- Floor plan, urban grid
- Exposed mechanical systems

When designing a space with this pattern, consider this:

- Don’t make things overly complex, this causes stress or even nausea.
- Yet, avoidance of complexity makes a design predictable and disinteresting.
- Create fractals on different scales (textile, façade, city grid).
- Take into account the impact on the existing urban skyline.



A smooth pattern of concrete with blue and sand-colored curves creates a waving floor mural. The same swelling pattern returns in the surrounding green zones offering a fractal on different scales.

PICTURE & LOCATION / *Georgios Sfakianakis & ENA campus, Athens, Greece*

Nature of the Space

Prospect

Humans feel safe and in control when there is a distant view.
Open and freeing spaces remind us of the African savanna where our roots are.

Pattern in decor

- Focal length should be >20 feet/ 6 meters
- Height should be <42 inch/ 106 centimeters, so seated people can view across a space
- Include shade trees, flowers and water

Pattern in architecture

- Transparent materials, oversized windows
- Balconies, landings, staircase, catwalks
- Open floor plan
- Elevated planes

The outdoor patio of this Swiss audit company made sure to use the advantage of the generous views on lake Lucerne. The sight offers a magical, calming experience for employees.

PICTURE & LOCATION / *Peter Würmli & PwC Lucerne, Switzerland*

When designing a space with this pattern, consider this:

- Locate stairs at the building perimeter with a glass façade and a glass interior wall to form a dual prospect condition.
- Combine both interior and exterior, short depth and high depth.
- When possible, design around an existing ecosystem.

In this open-plan office in Belgium, each employee benefits from the light coming through the big windows. Even when seated, employees can overlook the room. .

PICTURE & LOCATION / ***Hilde Verbeke & Extremis HQ, Belgium***

Refuge

People like to feel safe and protected- they search for places that offer protection from behind and overhead to escape in.

Pattern in decor

- Modular refuge: high-back chairs or overhead trellis
- Partial refuge: reading nook, booth seating, bay window, covered porch
- Extensive refuge: private office, reading pod

Pattern in architecture

- Space offers weather protection and privacy
- Space is fit for rest, reflection or difficult tasks
- Lowered ceiling, canopy, porch
- Varied light color, temperature or brightness

In this library, students find a cozy and safe place on this sofa with extra high sides. The circle of the sofa is not completely full, which offers a view to the outside world.

PICTURES & LOCATION / *Arne Jennard & Vives Brugge, BE*

When designing a space with this pattern, consider this:

- Combine this pattern with prospect: create a wide view from the refuge place.
- Provide more than one refuge space when designing for larger populations.
- Give protection from three sides- don't enclose it completely to maintain a relationship with the larger space.
- Differ light levels from the larger space.

In this Slovenian company, employees find small spaces to work individually or to retreat from the busy office life.

PICTURE / *Janez Marolt*

Mystery

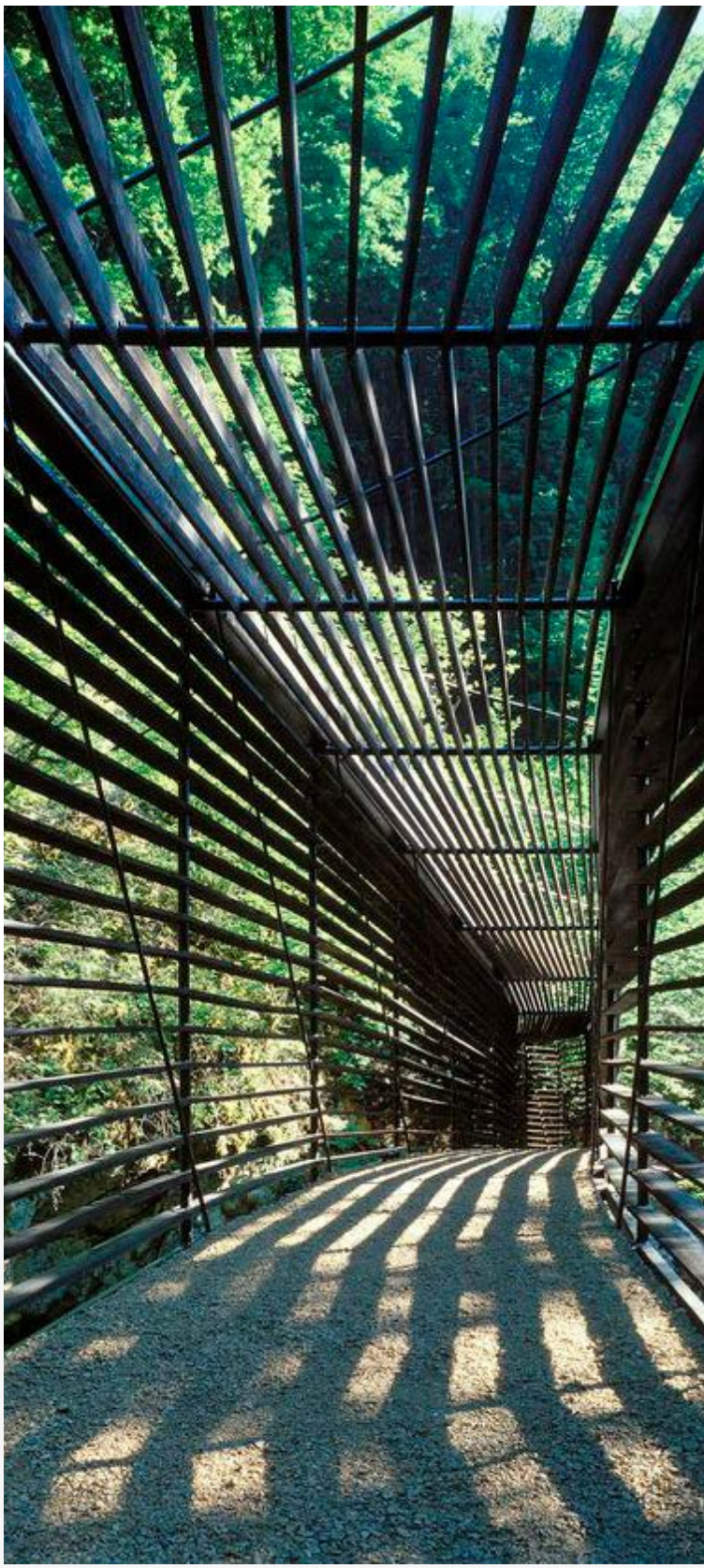
People want to explore and understand. A place with partially obscured views gives a sense of mystery and compels us to investigate.

Pattern in decor

- Peek-a-boo windows
- Winding paths, corridors
- Plazas and parks with bushes, shadows and curves
- Auditory stimulation from unknown source
- A focal point with at least one obscured edged

Pattern in architecture

- Walls in wood or stone, façade material
- Structural systems like heavy timber beams
- Furniture form
- Footpaths, bridges



This footbridge in Switzerland doesn't reveal the end right at the start. It teases and encourages people to explore what's around the corner.

PICTURE & LOCATION / *Architizer & L'Areuse*

When designing a space with this pattern, consider this:

- Curving edges are more effective than sharp corners to reveal a space.
- Consider the speed at which users pass by. The faster, the bigger the object must be.
- Use dramatic shadows and shades.

A moon gate hides a part of this classical Chinese garden. Visitors are immediately curious to find out what can be seen behind the door.

PICTURE / *Jacob Peterson*

Risk / Peril

A dangerous place feels exhilarating, intriguing and worth exploring.
People find it irresistible and even like the naughty element.

Spatial features of pattern

- Heights with risk of falling
- Gravity with risk of getting hurt
- Water with risk of getting wet
- Predator-prey role with loss of control

Pattern features

- Double-height atrium with balcony or catwalk
- Experiences or objects that test gravity
- Transparent railing or floor plane
- Passing under, over or through water
- Proximity to a bee apiary or predatory animals
- Life-sized photography of spiders or snakes

A small village in Analucia, Spain is built under the rocks of the mountain. In some streets, people need to pass under the giant boulder. It feels dangerous and thrilling, yet not threatening as the rock has stood there for ages.

PICTURE & LOCATION / *Diego Grandi & Setenil de las Bodegas, Spain*
Avillfoto & Setenil de las Bodegas, Spain

Inside the Willis Tower in Chicago, people can stand in glass boxes that stick out of the building 103 floors up. Visitors feel as if they are walking on ice and floating above the city.

PICTURE & LOCATION / *Contemplative imaging & Willis Tower*

When designing a space with this pattern, consider this:

- Risk/peril interventions are not appropriate for all user groups and places.
- A long-term exposure to an intense risk leads to over-production of dopamine.
- The element of safety or control must be present.

Challenges for the future of biophilia

Apart from the above-mentioned research and patterns of biophilic design, along the way Extremis has encountered more elements they feel are strongly intertwined with the topic of biophilic design. These additions pose a question to the subject and rely on personal experiences and visions on biophilia and biophilic design.

Ever since new technologies such as the internet and mobile phones have been introduced, people tend to search for nature more. At home, at work, in all aspects of life.

Is this a coincidence? Or is it because life becomes ever more demanding, the speed of life continues to accelerate, and people are pushed towards living in dense cities?

For Extremis, the search for nature isn't a sudden trend, rather an instictive search to keep a healthy balance in life.

The introduction of Artificial Intelligence will only accelerate life more, making it more challenging to keep the important connection with nature alive. The following extra findings show how Extremis feels biophilic design is also tucked into the difficult society we face today.

PICTURES & LOCATION / *Joji Okamoto & Nagano, Japan*

Space scarcity

68% of the world's population is estimated to live in urban areas by 2050, according to the UN[26]. Because of this trend, cities are becoming denser and the available living space per person is shrinking every year. In these skyscraper cities where commuting times are already impossibly long, it's becoming increasingly more difficult to implement biophilic design.

Empty rooftops need to be turned into community gardens; offices can become shared spaces at the weekends. Not only public spaces need special attention to preserve mental health in urban areas, the private living space should also be designed so that each built square meter is used in the most optimal way. Multifunctionality is key when designing new spaces and furniture.

Instead of leaving the streets blank with cars and concrete, a public piece of furniture can offer a moment of rest and bring people together.

PICTURES & LOCATION / *Thomas Sweertvaegher & Aula Gent, Belgium*

In this university in Belgium, students can relax outside in the open air after lectures, or they can dive straight into their books at the communal tables.

PICTURE & LOCATION / *Beeldcollectief & Vives Kortrijk, Belgium*

People need people

Humans are social animals; we crave contact with others. Research even shows how social relationships have an influence on health[27]. One of the pioneers in biophilia research, Judith Heerwagen, even states that socialization, the essence of who we are as people, is an important aspect of biophilia that is often overlooked[28]. The Covid-19 virus made it more clear that people have difficulties not being together. Social distancing and Zooming are not quite the same as live interactions with people. In fact, we can consider 'togetherness' as one of the most important biophilic elements. Places should be created in a way to optimize interactions between humans and between humans and nature.

In the time of hunters and gatherers, life wasn't all fun and games, it was survival. Life was all about finding food and safety, but one thing really moved human evolution further: fire. Before fire, our ancestors had to go to sleep and there was no activity at night. With the arrival fire came a monumental shift as socializing extended into the nighttime: we could sit, dance, protect ourselves and talk. 'We could surely live and survive without fire, but it enhanced our social abilities. All the things we see as 'human' today are thanks to fire', says researcher and university faculty member Judith Heerwagen[28].

Most of the brightest ideas, best memories and funniest moments happen with other people around. In recent years, we've seen that students search for places to study together instead of alone in their own dorms. Libraries, and even churches, are transformed into communal study places. It is very unlikely that this generation will want to spend their career just working from home, alone. Therefore, it is important to design places with the love for 'togetherness' in mind both at home, at work and in public spaces.

Most of the brightest ideas,
best memories and
funniest moments happen
with other people around.

This table is perfect for each gathering. 34 people are enjoying this long garden party and can choose between a bench or comfortable chairs.

PICTURES / *Photographil*

Humor

The fact that emotions and the way we feel have an influence on people's health and wellbeing is no new concept. When you smile, the brain release neuropeptides molecules that fight off stress. This reaction causes neurotransmitters to come into play which each have their specific benefit. Endorphins act as a pain reliever, serotonin as an antidepressant and dopamine as gives a boost in pleasure, satisfaction and motivation[29]. The next time someone says 'you should smile more', they might just be right.

That's exactly what doctor Rabelais must have thought back in the late Middle Ages. Even before there was any research on neurotransmitters, he wrote satirical romans (the most known, Pantagruel in 1532 and Gargantua 1534) to crack his patients up[30]. Assuming that patients would forget their pains for a while, Rabelais drew healthy laughter from sick humor[31].

Much later, laughter therapies and clown care are presented as an alternative form of medical therapy to raise the spirits of ill patients, especially children[32].

PICTURES / *Beeldcollectief, Belgium*

Inspired by the idea of humor, and being a big fan of the works of François Rabelais, Extremis started to play with the idea of humor as a form of biophilic design. Maybe 'good nature' is a sister of 'good humor'?

Humor and architecture seems quite a challenge, but plenty of examples show that big and small interventions, both in entire buildings and in details, can bring a smile to many faces.

The countryside of Yorkshire has plenty of buildings that are built for the sole purpose of giving pleasure. These so-called follies consist of incidental and purposeful frivolities like 'built' ruins or face-shaped doorways[33].

Some other more recent examples come from architect James Wines, who designed retail stores for BEST. Critiquing the boxy supermarket culture he designed thirteen cheeky stores ranging from a peeled off façade, to a cut-through section or a collapsing façade including a pile of bricks[34].

The whimsy use of humor in architecture and design might not be everyone's taste, but there is no doubt that it attracts people and makes them happy. Even more, people feel a little better when they see someone else smile too. Often people can't help but react with a smile of our own when someone is smiling, creating an infectious loop of happiness[35]!

Is that a basket? Yes, but also the company headquarters of a manufacturer of handcrafted baskets.

PICTURE & LOCATION / *Kenneth Sponsler & Ohio, United States*

The crooked house in Poland is one of the fifty strangest buildings of the world.

PICTURE & LOCATION / *Patryk Kosmider & Sopot, Poland*

Yes, this is a real hotel in The Netherlands. Incorporating the traditional houses of the region, it's a funny sight to see them all stacked on each other.

PICTURE & LOCATION / *JeniFoto & Zaandam, The Netherlands*

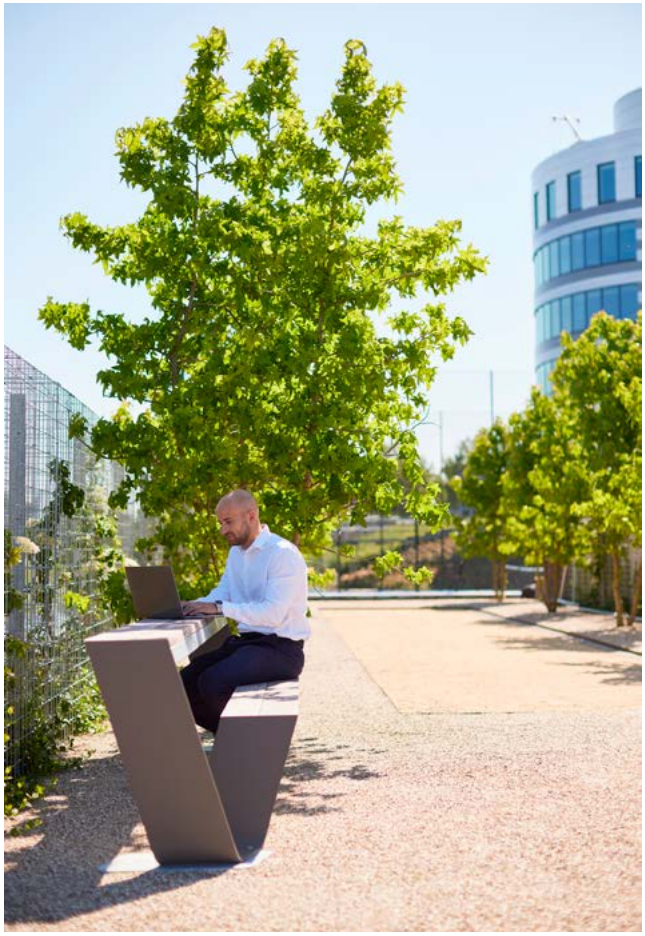
Outdoor working

Bringing nature into the office with a thought-out biophilic design is beneficial, but it's no substitute for the real thing. Why not go the extra mile and rather than bringing greenery into the office, give office workers access to nature? Blur the lines between inside and outside with office patios, decks in natural surroundings, accessible rooftops, gardens, courtyards, balconies and outdoor workrooms.

An outdoor space not only improves health and wellbeing, it also promotes socialization and a sense of community at work[36]. Moving between different work settings provides for interaction and engagement that sparks new ideas and creativity[37].

However, "work" is cited to be the biggest barrier to spending time outside[38]. So why not tackle this barrier and allow for work to be done outdoors as well? Create an outdoor workspace that's not just meant for dining or short coffee breaks, but for real heads-down working.

For Extremis, a true outdoor workspace is the future for a good workday. The fact that workers might be in a happier place if they are in an outdoor office space is a pertinent factor to ponder and act upon. By testing out some outdoor office work, the brand has gathered some tips and tricks to make your alfresco office your second nature!



PICTURE & LOCATION / *Beeldcollectief & AFAS, The Netherlands*

With a shade, outdoor plugs, a monitor holder and different heights, this desk is perfectly fit for outdoor working. Natural and man-made boundaries replace traditional walls while keeping a view of the surrounding nature.

PICTURES / Beeldcollectief

True outdoor furniture

Consider using outdoor furniture rather than taking indoor furniture outside, good outdoor furniture can stay out all year long without a problem. When working outdoors for an extended period, you'll need light at night and power to charge your devices. Some furniture has built-in lighting and power fit for outdoor use.

Throw some shade

Squinting your eyes and being unable to read your screen is no good. Protect your eyes and skin from the sun with shades. It's important to opt for a model that is easy to open, wind-resistant, and easy on the eye. A bunch of ropes and slats hanging above your head aren't calming, but many shades have been reinvented to eliminate this nuisance.

Leave your options open

A workday consists of more than working 8 hours straight – you need a range of spaces for a range of tasks: working solo, conversations, stand-up meetings, lunch breaks, brainstorming sessions… Whether it's a long table with benches and chairs, a collaborative setting for group meetings or a height-adjustable table for a few hours of responding to emails, explore various postures for the outdoor office to offer variety and choice.

Beautiful boundaries

Nobody likes to work in a huge open space. So, in order to concentrate on the job, you'll need some boundaries. Creating a somewhat private, yet inviting space is easily done using room dividers and planters. Opt for space dividers with a natural feel that also still let light through. Provide a secure cocoon without losing touch with the surrounding space.

Biophilic elements

And of course, don't forget about nature, even outside. Include trees, plants, water features, shadow play, animals… the more natural the better. Don't hesitate to take a stroll around and look at the gorgeous plants or listen to the birds chirping. Even the distraction of a ladybird on your desk won't break your drive!

Light and life

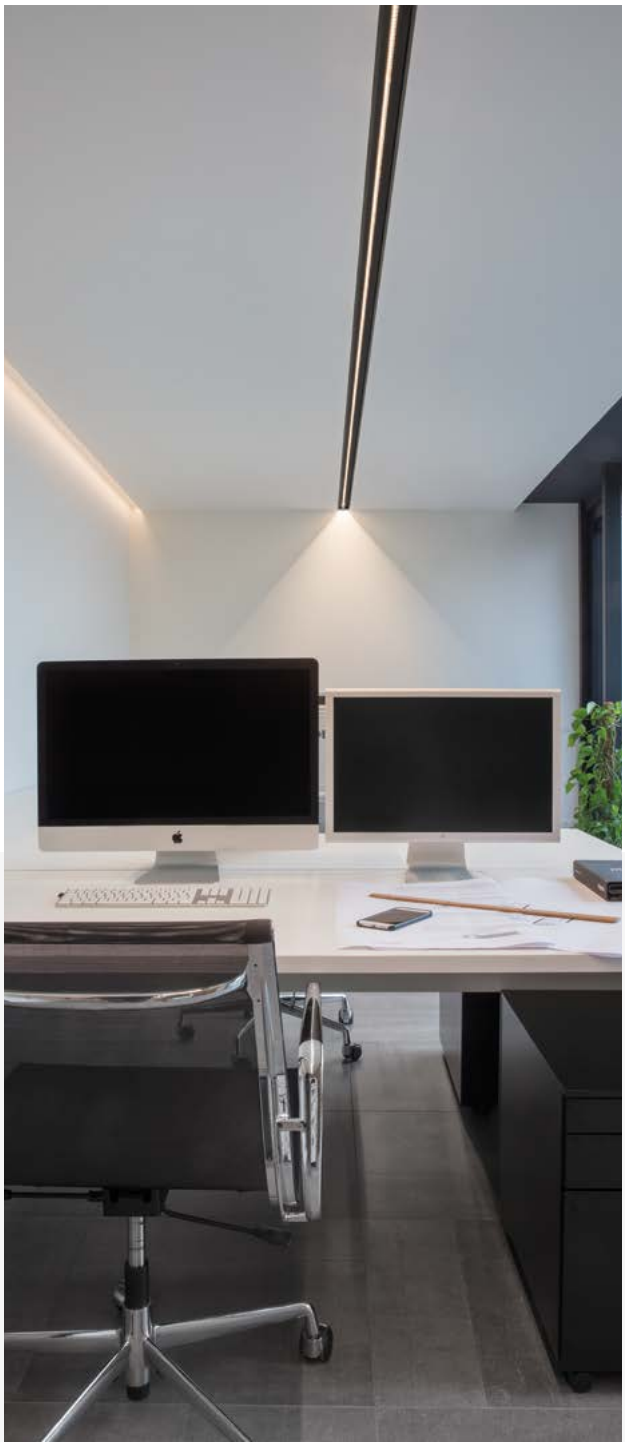
Although we've already encountered the pattern of dynamic & diffuse light in this guide, we'd like to explore the idea of light a bit more. Light was invented in order to see in the dark, and for years, this has been the primary use of it. This notion, however, is changing as scientists are discovering that light has both visual and non-visual consequences [(39)]. Nowadays, light not only allows people to see in the dark, but it also sets the mood, affects people's well-being and supports the natural circadian rhythm.

The more indoor lighting replicates the natural outdoor light, the more it offers advantages for people. Natural daylight is yellow in the morning, blue at midday and redder in the afternoon and evening. The human body responds to these color transitions by producing the right hormone, cortisol for awaking and alertness, and melatonin for sleepiness and fatigue. These changes in color and intensity play a crucial role in the circadian system functioning. When the so-called 'biological clock' doesn't work well it can cause cardiovascular disorders, immunity problems, diabetes, digestive problems, obesity and cancer [(40)].

Yet today, most rooms are still filled with one type of light that has the same color temperature and light intensity throughout the entire space. A better way to illuminate a room is by using tunable light that follows the pace of the day and gives off the right light at the right moment.

PICTURES / *Modular Lighting Instruments*

In dense cities where buildings adjoin one another and people have less access to natural daylight, it is even more important to install the right lighting that offers the best conditions.



The last thing you see before falling asleep.

Before electric light became a thing, people used candles in the dark. The last thing they saw before blowing it out was the warm orange light of the burning flame.

Today, the last light most people see is the bright blue light of their smartphone close to their eyes. This has an enormous downside as this light suppresses the production of the melatonin hormone and so disturbs the circadian system and spoils sleep.

The Drupl light not only lights up the area of focus under the light but also the surrounding walls and ceiling with a lighter light intensity to maintain visual comfort and guarantee uniformity within the space.

PICTURES / *Modular Lighting Instruments*

Non-aggressive shapes

Friendly shapes and colors feel more welcoming. They even lower heart rate and blood pressure. Although most designers fancy straight lines and corners from an architectural point of view, it never feels completely natural.

Rounded corners, funny shapes and soft colors that can often be found in nature feel purer and less hostile.

In this pop-up coffee shop, playful round tables with vibrant colors make the room feel welcoming and kind. Even while being indoors, this room has the advantages of an outdoor setting.

PICTURES & LOCATION /
Jolien Roos & Madam Bakster

The Shellby light is a stylish way to bring light indoors in a playful approach. The asymmetrical shape makes it jaunty and teasing for the eyes. The light is dimmable so that it resembles a sun during the day and a moon at night.

PICTURES / Modular Lighting Instruments

Recognition and the feared unknown

People are creatures of habit. Things that are known give them safety and rest; the unknown sparks fear and confusion. As much as people want to see themselves as conscious and free willed, a good 90% of what people do in any day follows a predictable known routine.

This instinct protected the early humans against unfamiliar and dangerous new things, but today it also holds back the adoption of new and innovative ideas. As Everett Rogers states in the theory about diffusion of innovation[41], new ideas must be widely adopted in order to self-sustain. In this theory, people are divided into different categories according to which they embrace a new idea. The categories are: innovators, early adopters, early majority, late majority, and laggards.

New designs that are easily recognizable or spark recognition will become an established value more rapidly.

This desk light resembles the praying mantis that can be found in nature. The light feels more alive and less like a lifeless object.

PICTURES / ***Modular Lighting Instruments***

This chandelier draws inspiration from the red candles used in Christian churches.

PICTURE & LOCATION / *Dirk Wynants*

The right intervention in the right place

Now that we've tackled the importance and different aspects of biophilic design, you're probably very eager to get started. However, there are some bumps in the road that you may encounter through which we want to guide you. It is important to take a look at the context of your design plans: where are you starting from, for whom are you designing and why are you considering certain patterns?

Context

Each building context is different. The lighting for a school, for example, will be different to the lighting for a spa. Before you start designing and planning, reflect on the needs of the people who'll use the space, whether it be a house, campus, park or hospital.

When designing a space, you have to keep the culture of the place in mind. Or as researcher Judi Heerwagen states: "How can we do biophilia in the most sustainable way possible?" She explains that we should look at the environment where we're building and use it to our advantage. "Should we draw on this environment or do we just do things that are universal anywhere? Do we import plants just because they are pretty? I would say that's not sustainable. We need to create sustainable and biophilic places so that we're helping the environment and at the same time nurturing people."[28] A rural environment is close to nature and already has a lot of restorative qualities. Suburban areas often have an intuitive connection to nature as most houses are slightly raised and have a yard with trees, grass and flowerbeds. In urban areas, space is limited and expensive. It is thus even more important to thoroughly plan ahead the biophilic interventions.

In keeping with the context of a former chapel, this co-working hub highlights the original colors by picking complementing furniture.

PICTURES / *Beeldcollectief & Poperinge, Belgium*

"Man's heart away from nature becomes hard."

Chief Luther Standing Bear [42]

PICTURE & LOCATION / *Dan Nguyen & New York City*

Another aspect is the scale of the building; biophilic design can be integrated in a room, a complete building or even in a neighborhood, district or whole city. In summertime, the city of San Francisco, for example, changes parking spaces into pop-up parks, so called 'parklets' [43], whereas in Singapore, people can benefit from an incentive program for vertical and rooftop greenery [44].

An aspect in the decision process of biophilic design that is often forgotten, is maintenance. When well maintained, most interventions last a lifetime, so, who will clean the fish tank every now and again, and water the plants and scrub the wooden furniture after the cold and wet winter months?

These parklets in San Francisco have been created by architects, shops and the local neighborhood. They form a refuge from the concrete sidewalk for sitting, eating, playing and bike storing.

PICTURE & LOCATION / *Wells Campbell & San Francisco*

In the meat packing district of New York City, an abandoned elevated railroad has been converted into an inspirational urban garden. Thanks to the efforts of local residents, the so-called 'High Line' now offers a green sight in the concrete jungle.

After results of economic success, via growing tourism and an increase in office, hotel and living spaces in the area, other cities got inspired to redevelop obsolete infrastructure as public space as well. Dubbed 'the High Line effect', cities like Paris, Chicago, Calgary, Manchester and Seoul have each built their own skyparks from existing unused space.

PICTURE & LOCATION / *Carlos Yudica & Chicago's Bloomingdale Trail, United States*

Human preferences

A final 'bump in the road' to take into consideration is the difference between humans. Not everybody likes the same interior and not each biophilic intervention has the same outcome for a person. While research shows that landscape preferences are universal to humans to a degree, cultural and socio-economic influences alter those preferences[45]. Difference in ethnicity, subculture, gender and age alter perspectives on what is nature, wild or beautiful[46].

Between different nationalities and cultures, the frequency of use of, participation in or visits to nature varies drastically. This does not mean that some ethnic groups have no or a lower connection with the outdoors. People just interact with it in the way that fits their culture and needs.

Not every place should be the same, says Judi Heerwagen. "We have needs for different kinds of places. We design our homes very differently than we do our offices, that's because homes are fit for our behavior, but offices apparently aren't. Look at office buildings: you go in one and then in another and they look exactly the same. The same furniture, the same kind of everything. I think that is going to change."[47]

Gender also influences the reaction to a biophilic intervention. According to research[49], women have higher levels of stress than men and are less likely to use available outdoor space during a workday. Furthermore, men have a longer enhanced health function than women after contact with nature.

Nature is not a place to visit.

It is home.

Gary Snyder [48]

Research has shown that the immune function of men increased for 30 days after a forest walk, whereas women only had a 7-day immune increase[50]. This shows that interventions for female populations should consider more nature experiences and/or an improved access to the outdoors.

The response to nature changes with age as well. While a child or teenager may like an adventurous place, adults or elderly populations may perceive it as risky[51]. By including the prospect and/or refuge pattern, this obstacle may be solved.

PICTURE / *Vanessa Garcia*

Conclusion

Who would've guessed the impact of nature on so many aspect of our lives? Taking a forest walk will never be the same again – and it shouldn't. As humans, we are a part of nature as well and it's time that we fully reconnected with it. In a world where we drift ever further away from our roots, it's a wonderful surprise to find that Mother Nature still cares for us in thousands of different ways.

PICTURE / *Hilde Verbeke*

It is clear that biophilic design isn't just a trend, it's more than a growing interest in plants. People are looking for new ways to reconnect with nature, although one could state that those ways are not so new after all. The question isn't about liking nature or having it around all day, it's about replicating its physical, psychological and emotional benefits into our built environment.

As human connection with nature has lessened over time, the need for it grows. More and more people spend time indoors, sheltered from nature and the elements. Many argue that good designers and architects mimic the environment intuitively, yet most people still occupy a sterile, four-walled room on a daily basis.

As this need grows, people, designers and architects are embracing biophilic design, making spaces greener while reducing stress, improving cognitive functions and creativity. The science on biophilic design is still growing, but there is already a clear consensus on what involves a good design.

PICTURE & LOCATION / *Sing Studio & Singapore*

We designed ourselves in this predicament,
and we can design ourselves out of it
with the help of biophilic design.

Stephen R. Kellert [52]

Respecting the context of what is locally appropriate, needed and responsive, good biophilic design takes into consideration different perspectives such as health conditions, socio-cultural distinctions, past experiences and the user experience to create spaces that are inspiring, beneficial, and healthy, as well as functional. Above all, biophilic design nurtures the love for a place.

Biophilic design manifests in countless interventions, ranging from sounds and smells to botanical shapes and visual relationships to nature. Biophilic design is not a simple all-in-one solution, it is multiple natural layers that lift up a place.

In many ways, today's biophilic design is the rediscovery of the intuitively obvious. Unfortunately, much modern design is still oblivious to this knowledge. The growing attention and need for biophilic design are hope-giving. Even in the densest cities, places are turned into patches of nature, blossoming urban gardens. It is hopeful for both the human species - because deep down we know that nature is important - and for nature itself, as it can maybe find a durable partner in humankind.

Dirk Wynants on biophilia

Dirk Wynants is the founder and main designer of Extremis. In 1994, he designed Gargantua, a revolutionary outdoor family table. Since that humble beginning, Extremis has grown as a pioneer in durable outdoor and indoor design furniture. Today they make more than just furniture, they make 'tools for togetherness'.

PICTURE & LOCATION / *Skinn & Extremis HQ*

Although I've been designing outdoor and indoor furniture for 25 years now, it was actually not that long ago that I first heard of the word 'biophilia'. A partner had asked me to give a presentation on biophilic design and I didn't have the faintest idea what he was talking about. He told me that I surely knew what biophilic design was since I used it in almost every design. So, I did what everybody would do, I googled it.

Quickly I found that the meaning of biophilic design was indeed nothing new to me, I just didn't know there was a word for it. For years without even knowing it, I had been integrating biophilic design in our furniture, in our premises and in my personal home. For me and for everyone at Extremis, it came instinctively.

After I got to the bottom of what biophilic design is and means, it was easier to put in words what we wanted to achieve with Extremis. We found a frame to work in. We already knew that nature was important, and we knew that we wanted to make people happier, but now we knew why those two aspects were so key. It was only then that we

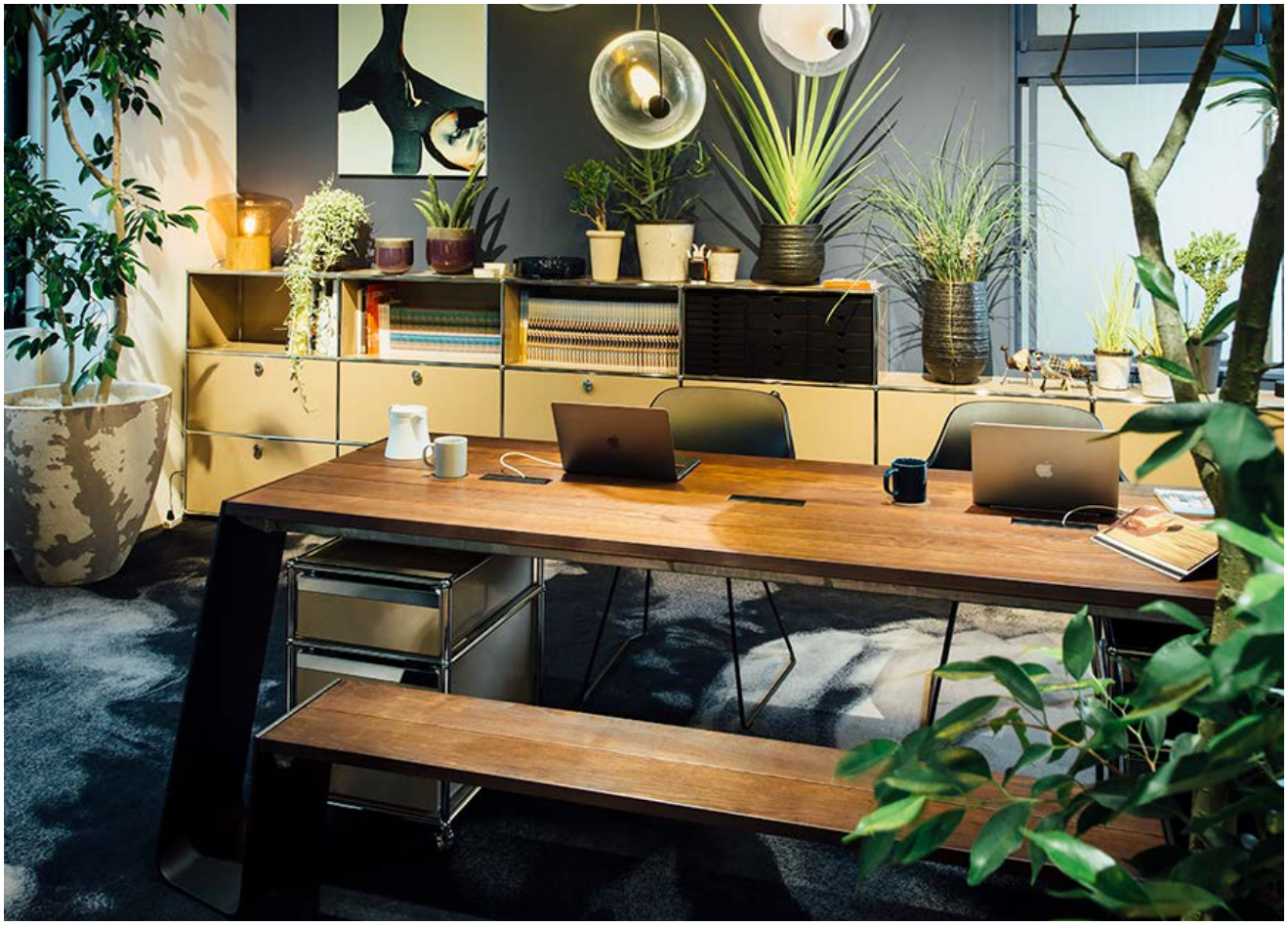
We want to create pleasant spaces where people feel at home. And for us, home is close to nature.

PICTURE & LOCATION / *Adam Morsk & Maersk Tower, Copenhagen, Denmark*

could fully say that nature and people form the DNA and philosophy of Extremis.

Our designing process starts with that: nature and people. We observe how people interact, what nature can teach us and what people miss and need nowadays. We try to fill that gap, make furniture that is functional and that brings joy to people's lives. Of course, we also think of nature as a partner: we make our furniture durable so that it lasts more than a lifetime. In doing so, we like to state that we are creating solutions, not furniture.

We are convinced that humans and nature need each other. People should embrace their love for nature, take care of it and learn from it. This will have a positive impact and reduce negativity, which is something we all need. That is the impact we strive to create. Transforming pure and instinctive ideas into game-changing designs. Designs that are not only useful, durable and beautiful, but also have the power to spark meaningful connections and enhance the way we interact with one another.



PICTURE & LOCATION / *Joji Okamto & Tistou HQ, Japan*

Get inspired

It is very challenging to design a space following each principle of biophilic design; however, you would be surprised how even one well-designed piece of furniture can reflect multiple patterns, lift up a space and improve people's wellbeing. As an illustration, we've picked out three Extremis pieces that are biophilic on multiple levels.

Furthermore, we share the research and sources that impacted our view and vision on biophilia and biophilic design.

PICTURE & LOCATION / *Joji Okamoto & Tistou HQ Japan*

Kosmos

When you sit on this round sofa with fitting shade, it feels like a refuge where you're safe and covered. It's your own tiny world to hide away in. The design of the Kosmos Shade is based on birds. The parasol opens horizontally, just like the wings of a bird. Furthermore, the parasol gives shade and controls temperature during the day, while the dimmable light on the shade serves as ambient lighting with different intensities.

The Kosmos table-seat combination with shade includes a wide range of biophilic patterns in just one piece of furniture:

- Refuge
- Biomorphic forms & patterns
- Dynamic & diffuse light
- Thermal & airflow variability

PICTURES / *Beeldcollectief*

Sticks

Sticks is a biophilic space divider that consists of vertical sticks to create privacy.

Sticks is just like a rich bamboo field – though in no need of any watering or trimming. By obscuring views of passers-by and playing with shadow and light, it creates a sense of mystery: what's on the other side? You can rearrange Sticks as desired, each time creating a new space or a cocoon of privacy.

The space divider comes in different heights, lines, waves, angles or circular forms to create a sense of depth or a whole new look in a room. The optional built-in lights give a shadow play at night, while natural light casts beautiful shadows during the day.

Sticks follows more patterns than you would think at first sight:

- Biomorphic forms & patterns
- Mystery
- Refuge
- Complexity & order
- Dynamic & diffuse light

PICTURE / *Beeldcollectief*

People love mysterious places,
the first thing they want to do
is look what's hidden...

PICTURE & LOCATION / *Joji Okamoto & Tistou, Tokyo, Japan*

Romeo & Juliet

Even in the most unnatural setting, this bench brings nature inside. Depending on the type of plant used, this bench will create its own ecosystem. With a deciduous tree, the leaves will change color, while a plant with flowers will attract butterflies and bees. On a windy day, the leaves will rustle and in springtime, a bird might just pick this tree to build its nest in. The bench itself is made out of durable wood that's also alive. The reddish color will turn more gray and the wood will feel rougher. If you ask us, it's an easy way to bring nature inside while also getting a piece of furniture in return.

The Romeo & Juliet bench is a clear example of how nature and design meet each other halfway. This bench not only accommodates people, but also nature: the perfect marriage!

- Visual Connection with Nature
- Non-Rhythmic Sensory Stimuli
- Connection with Natural Systems
- Material Connection with Nature

PICTURE & LOCATION / *Joji Okamoto & Imagica Lab, Tokyo, Japan*

PICTURE & LOCATION/ *Steelcase & Michigan, United States*

More about biophilia

Can't get enough about this compelling subject? Neither can we! This paper is a culmination of some of the best research in the topic of biophilia and biophilic design. The topic is broad, and new insights are constantly growing. If you're on the lookout to explore some extra sources, we gladly refer you to the most impactful works in the field.

The field of biophilia and biophilic design is broad and very much worth exploring. If you're on the lookout for extra sources, we gladly refer you to the scientific studies of early pioneers Ed O. Wilson, Stephen R. Kellert and Judith Heerwagen and their books "The Biophilia Hypothesis" and "Biophilic Design - The Theory, Science & Practice of Bringing Buildings to Life" [53].

PICTURE & LOCATION / *Beeldcollectief & Roeselare and Knokke, Belgium*

PICTURE & LOCATION /
Cafeine for Rietveld Projects & Oostduinkerke, Belgium

Another interesting source specifically on the impact of biophilic design in healtcare environments is the work of Roger Ulrich, Professor of Architecture at the Center for Healthcare Building Research at Chalmers University of Technology in Sweden [54].

For a more educational source, we refer to the impactful works of Terrapin Bright Green, a consulting knowledge house in the field of design, who condensed the core principles of biophilia in different reports breaking down the science into practical knowledge. A few of our favorite publications are "14 Patterns of Biophilic Design", "Nature Inside", "The Economics of Biophilia", "Working with Fractals" [55].

PICTURE & LOCATION / *Jim Van Loo for A2D Architecture 2 design & Heverlee, Belgium*

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Couthoflaan 20b, 8972 Poperinge, Belgium — T +32 57 346020 — info@extremis.com