



The Theory, Science, and Practice of Bringing Buildings to Life Biophilic Design

Genevieve Goldthorpe, Elkah Devoe, Emma Peeler, Alexis King

- **Stephen R. Kellert** is the Tweedy/Ordway Professor of Social Ecology and Co-Director of the Hixon Center for Urban Ecology at Yale University, and a Partner in the private equity firm Environmental Capital Partners. The recipient of numerous awards for teaching and writing, he is the author of more than 150 publications, including seven books.
- **Judith H. Heerwagen** is President of J.H. Heerwagen & Associates. She is a psychologist whose research focuses on sustainability, biophilia, and the evolutionary basis of environmental aesthetics. She has authored and delivered numerous articles and lectures on the topics of workplace, biophilia, and the psychological value of space.
- **Martin L. Mador**, a researcher on biophilic design at Yale University, has worked on green building and healthy schools issues, including the passage of LEED legislation in Connecticut. He is a board member of the Connecticut Sierra Club, as well as several other environmental organizations.



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A decorative graphic on the left side of the page consists of several overlapping circles and arcs. A large, thin black circle is the central element. To its left, a thick grey arc curves across the page. Above the black circle, another thick grey arc curves downwards. To the right of the black circle, a solid green circle is positioned. The overall composition is abstract and modern.

Short Summary

Biophilic design is a new approach to sustainable development that incorporates the positive experience of nature into the design of the built environment. This book contains original and timely contributions from scientists, designers, and practitioners on the theory, science, and practice of biophilic design.

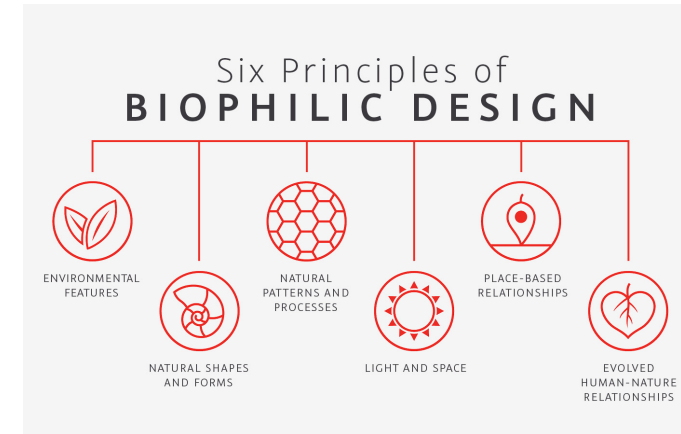
Chapter 1- Dimensions, Elements and Attributes of Biophilic Design

Two dimensions:

- Organic or naturalistic dimension- shapes and forms in the built environment that directly, indirectly, or symbolically reflect the inherent human affinity for nature
 - direct - unstructured contact with self-sustaining features: ex daylight, plants animals, etc
 - Indirect- involves contact with nature that requires ongoing human input ex: potted plant
- Place-based or vernacular dimension- defined as buildings and landscapes that connect to the culture and ecology of a locality or geographic area

Biophilic design element and attributes

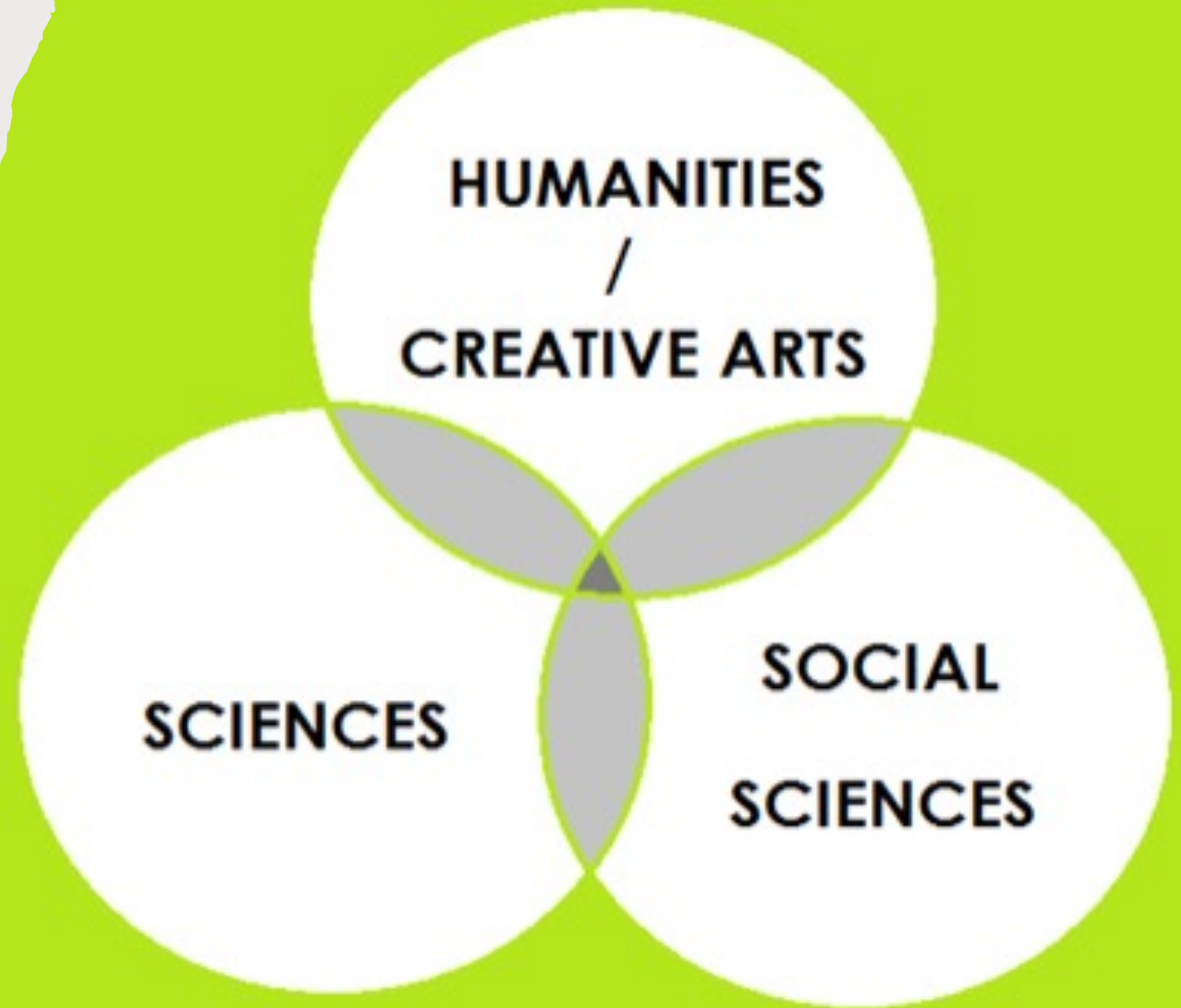
- Environmental features - color, water, air, sunlight, plants, animals, natural materials, views
- Natural shapes and forms - botanical motifs, tree and columnar supports, animal motif
- Natural patterns and processes - sensory variability, information richness, age, change
- Light and space - natural light, light and shadow, reflected light, light pools
- place -based relationships -geographic connection to place, cultural connection to place
- Evolved human nature relationships - prospect and refuge, order and complexity, curiosity and enticement



Chapter 2- The Nature of Human Nature

Consilience- one of the most useful terms to capture the unity of knowledge. It is defined as the cause-and-effect explanation across the disciplines.

relationships between physics, and chemistry; chemistry and biology, and biology and social science



Chapter 3- A Good Place to Settle: Biomimicry, Biophilia, and the Return of Nature's Inspiration to Architecture

Biomimicry- a technological-oriented approach focused on putting nature's lessons into practice

Examples

- Architecture is inspired by termite mounds to design passive cooling structures.
- The aerodynamics of the famous Japanese Bullet train was inspired by the shape of a bird's beak.
- Climbing pads capable of supporting human weight are a mimic of the biomechanics of gecko feet.



Chapter 4- Water, Biophilic Design, and the Built Environment

- Water covers 70% of the earth's surface.
- Water is necessary for life and is a major component of the cellular structure of living organisms.
- **Review of the range of biophilic aspects of water:**
 - **Dominionistic**- a scuba diver successfully completing a trip into a life-threatening environment
 - **Humanistic**- the ability of man to form a bond with water- natural element
 - **Naturalistic**- the thrill of traveling by canoe through a river inaccessible otherwise
 - **Negativistic**- the fear of flooding, drowning
 - **Aesthetic**- from a rainbow to deep blue ocean waves to a sunset over the water
 - **Moralistic**- the sense of valuing the gifts of the resources
 - **Scientific**- lessons of aquatic chemistry ecology and biology
 - **Symbolic**- a brook communicating to us through gurgling of its tumbling waters
 - **Utilitarian**- transpiration; recreating; food production



Chapter 5- Neuroscience, the Natural Environment, and Building

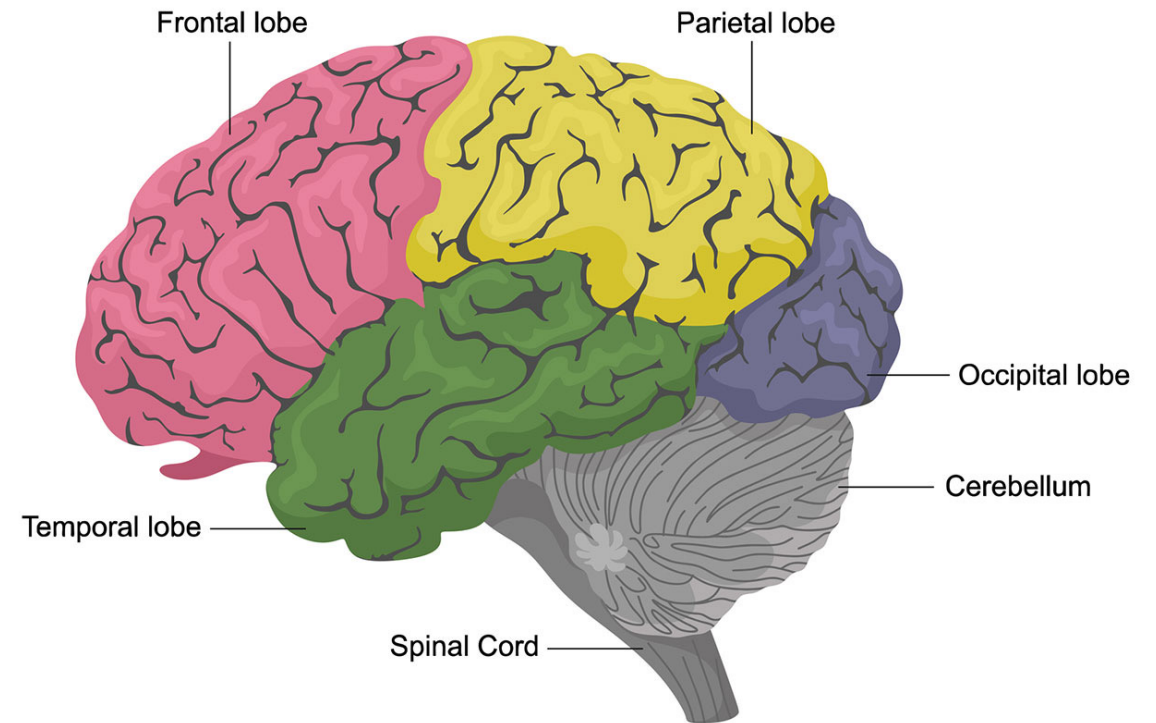
This chapter focuses on the fact that as humans, we instinctively crave physical and biological connection to the world.

The reason humans constructed buildings was because of the compellingly nature to seek shelter. As time went on, the relationship between buildings and design aspects became more intricate with things like symbolisms, social structures, and local mythology.

Biologically, there is a possible innate reaction to the specific geometry of natural forms, details, hierarchical subdivisions, color, and more.

- Three Different Conceptions of Being Human:
- The abstract human being
- The biological human being
- The transcendent human being

Human Brain Anatomy





Chapter 6 - Biophilic Theory and Research for Healthcare Design

This chapter focuses on how biophilic design impacts healthcare settings by reducing stress and promoting better health outcomes.

Health Outcomes:

- Observable signs and symptoms relating to patients' conditions
- Satisfaction and other reported outcomes
- Safety outcomes
- Economic outcomes

Studies have shown that viewing nature produces restoration from stress by declining negative emotions like anxiety and enhancing positive feelings. These positive changes should inhibit pain impulses from reaching the brain, thereby alleviating pain.

There is also the distraction theory, which basically states that as the amount of conscious attention directed to pain increases, the intensity of experienced pain will correspondingly rise. However, if a patient is consciously distracted by something else (nature/biophilic elements) pain will diminish.



Chapter 7 - Nature Contact and Human Health: Building the Evidence Base

This chapter focuses on the benefits one has when connecting with nature. It is backed up with research that has found that connecting with nature can be as beneficial as medication. Thus limiting the medical side effects one gets when taking medicine.

A leading group of clinical epidemiologists at McMaster University has written that we can support our health beliefs with one of three kinds of evidence:

- Induction- concluding from unsystematic observations, or general principles, that something ought to work.
- Deduction- concluding that something works when it successfully withstands formal attempts to demonstrate its worthlessness.
- Seduction- Concluding based on faith, or assurances of other people, that something works.

Many studies have shown that ill patients who are exposed to nature, vs ones who are not, improve at a rapidly quicker rate with less complications.



Chapter 8 - Where Windows Become Doors

This chapter talks about the importance of windows in buildings, natural light, and feeling close to nature. This section of the book also covers the mental and physical health benefits of nature and natural light in your everyday life.

The placement of windows are important when designing. While daylight is extremely beneficial and can improve performance, attention, and mood; it can also cause glare that may compromise performance. Thus is why studying the environment's lighting conditions and implementing features that prevent this are important.



Chapter 9 - Restorative Environmental Design: What, When, Where, and for Whom?

This chapter talks about how even though humans as a society have grown so much, we are damaging our environments. Design needs to evolve and help keep our environment and other species alive. There are three design features that are discussed including:

- **Protective environmental design** which includes walls and roofs that shelter people from the elements, eliminating or mitigating some demands, such as exposure to rain and snow, the sun and cold.
- **Instorative environmental design** which involves some means to deepen or strengthen the ability of people to meet subsequent demands.
- **Restorative environmental design** which as it follows from the premises stated for the restoration perspective, may in some respects, seem indistinguishable from protective environmental design.

Chapter 10 Healthy Planet, Healthy Children: Designing Nature into the Daily Spaces of Childhood

This chapter focuses on how as a society we have overcome many different diseases, yet many humans now have preventable lifestyle diseases.

Not only is this affecting our adult population, but it also is damaging our younger children. Children in today's society are spending a reduced amount of time in nature and way more time using technology.



Chapter 11 - Children and the Success of Biophilic Design

This chapter covers changes in biophilic design throughout history.

For example, the first fully solar-powered housing development in the United States was built in 1976 on 70 acres of tomato fields in the college town of Davis, California, by Judy and Michael Corbett.





Chapter 12 - The Extinction of Natural Experience in the Built Environment

This chapter talks about how although the world of natural experience is changing, perhaps biophilic design can compensate for the losses in direct contact with nature.

More and more, nature comes to us in a less direct way. We now experience nature through television, movies, store designs, architects, developers, and urban planners.

Chapter 13- Biophilia and Sensory Aesthetics

In this chapter it discusses how individuals' inherent connection to nature which form the basis for biophilic design based off of the natural appeal. It includes multiple vocab terms that relate to biophilic design.

Natural Aesthetics: Structures found in nature that one finds beautiful and bringing it within a design. An example such as the photo included.

Sensory Richness:

- Odors
- Sounds
- Tastes
- Smells
- Haptic sensations
- Visual patterns

A walk Through a Biophilic Building: picture the exterior walls reminds the viewer of mountains nearby. The wooden door creaks and the sun on the interior is casting a pattern on the floor from above. The air is fresh, the sound of a fountain nearby is in the distance and the walls have a tree like pattern.



Chapter 14- Evolving an Environmental Aesthetic

The purpose of this chapter is not to explain the substance of sustainable architecture as its form, but it's potential to beauty.

Why is beauty important?

According to James Wines "If it isn't beautiful, then it isn't sustainable." 224



Chapter 15- The picture Window: The Problem of Viewing Nature

The chapter discusses that windows give us the ability to view the outside world, but we can't hide the fact that when behind the transparent glass we are disconnected from the outside world. We have a barrier between us and the natural elements like heat, cold, wind, rain, insects, and animals.

The idea of biophilic design is to step beyond just viewing nature through a window but to bring nature indoors so while being protected from the potential harmful elements in the outdoor environment, we can still be connected with nature.



Chapter 16- Biophilic Architecture Space

Complex Order

We are able to process different objects for what they are

- Ex. before walking into a room we know that we are entering through a doorway.

We are able to tell the difference between people in our lives

- Ex. we can distinguish between man and women, our child from another child, our child ill or injured

Prospect and Refuge

- For 99% of the human existence, we have lived in settings of the natural world, but refuge and prospect should not just be exterior characteristics.
- Refuge: We as humans must have a way to protect ourselves against climate and predators. Interior: Small and dark
- Prospect: hunt animals, gather plants, and fins water while revealing threats that demand flight to refuge. Interior: Expansive and bright
- Women are more drawn to refuge and men to prospect



Chapter 17- Toward Biophilic Cities: Strategies for Integrating Nature

Cities of Nature

- Green features of individual urban buildings and projects can contribute to the green fabric of cities and neighborhoods
 - Green rooftops can reconnect cities to nature, but we must think beyond just adding windows and plants to the interior, it is a great step, but this doesn't allow us to form deeper connections to nature.

Green Neighborhoods should include:

- Internal green courtyards
- Green areas connected to larger natural areas
- Regional systems of green space
- Mobility options designed in like walking and bicycling
- Green features serving major functional elements (ex. stormwater collection)
- Tree planting and preservation of trees, green rooftops, community gardens, water features, and natural habitats.

Rethinking Urban Infrastructure: Green Streets and Beyond

- Rethinking the infrastructure should not just be for the convenience of cars and traffic but a place to have native plants, stormwater collections, and where pedestrians can connect to nature

Thinking Beyond Urban Parks

- For many, urban green spaces fall into a single category: a park, with its cut grass, benches, play equipment and a possible water feature.
- How can we take a step above this? Maybe having a community forest or including abandon elements as many love to visit such places.



Chapter 18- Green Urbanism: Developing Restorative Urban Biophilia

This chapter mentions how when we restore our cities and make them greener, we are also restoring the citizens that are members of the community making the environment more as one.

If there is a purpose for our connection with nature, maybe it is to help individuals find their place on earth because when experiencing elements of nature many express a greater sense of wholeness and maybe with this wholeness, we as people would be less abusive to nature





Chapter 19- The Greening of the Brain

This chapter draws on neuropsychological research to suggest that sustainable building design has the potential for even deeper global ramifications than we might think.

Sustainable design does not just respond directly to the environment but should also satisfy the human brain and need for stimulation.

We design buildings where moments or behaviors allow humans to directly encounter the life cycles of water, energy, food, air, and materials. Biophilic design promotes and aids the reconnection of life around us.



Chapter 20- Bringing Buildings to Life

This chapter focuses on the concept that spaces are not just the shell of a room.

“Living Architecture” dissolves the demarcation long existing in our culture between architecture and landscaping.

Finding the beauty in a building is finding its “life”.

Things like how the building makes you feel and think, or the mood and ambiance are all apart of “living architecture”.

Biophilia is also discussed in this chapter, and how it is not only planting trees around a building but finding a deeper connection with nature within the space.

Chapter 21- Biophilia in Practice: Buildings That Connect People with Nature

This chapter solely focused on reviewing biophilia and its importance in sustainable design.

Biophilic elements have real, measurable benefits to human performance

- Productivity
- Creativity
- Satisfaction
- Emotional well-being
- Stress reduction
- Learning
- Attention
- Healing

Biophilic elements foster an appreciation of nature, which in turn leads to greater protection of natural areas as well as a clean environment.

Biophilic design efforts could be boosted through research into biophilia and human health and performance, education about biophilic design, and incentives to create a want for these concepts.

5 Benefits of Biophilic Design

BENEFITS OF BRINGING NATURE INDOORS

Between work, home, and our commute, we spend a lot of time indoors. In fact, according to the EPA, we spend about 93% of our time indoors. With our busy schedules and limited outdoor time, why not bring the outside in?

PHYSICAL HEALTH

Plants can reduce pollutants and improve air quality.



MENTAL WELLBEING

Biophilic design elements can have a positive impact on mental health, improving mood, reducing stress, and improving confidence.

PRODUCTIVITY

Natural light is important to our body's circadian rhythm. Natural light can increase energy, alertness, and productivity.



STAFF RETENTION

Biophilic office design can create more personalized spaces, ultimately increasing staff retention.

BRANDING

Office design should represent the brand. An aesthetically pleasing office can create a positive brand experience.



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Chapter 22- Transforming Building Practices Through Biophilic Design

This chapter focuses on the increasing population of the United States and how our built environment will need to be constantly adapted to accommodate this growth.

Most Americans spend 90% of their lives within buildings. This means that it is important to determine the effects these environments have on us.

- The 13 biophilic conditions to consider when creating a space:
- Peril
- Enticement
- Access to water
- Natural ventilation
- Prospect and refuge
- Complexity and order
- Local, natural materials
- Dynamic and diffuse daylight
- Educational about biophilic aspects
- Visual connection between interior and nature
- Physical connection between interior and nature
- Material connection between interior and exterior
- Frequent, repeated spontaneous contact with nature

Chapter 23- Reflections on Implementing Biophilic Design

This chapter summarizes and reflects on what was communicated to the reader throughout the book.

Biophilia is a set of ideas we are just scratching the surface of in today's society.

The relationship between a building and the living environment is of high importance. As designers we want to create a place that responds to and celebrates the natural world while gaining positive responses from occupants.

There is still more we can do considering biophilic design. Creating more green buildings will prepare us for a brighter future.

Sustainable design is not set in stone. It will forever be changing to accommodate the population and will look different as time goes on.

“Architecture is an essential dialogue between spiritual and material realms, a conversation that can be trusted to teach us new ways of living in balance”





THANK YOU!