

## APPLYING BIOPHILIC DESIGN



HEALTH & WELLBEING IN THE BUILT ENVIRONMENT  
TERRAFIN BRIGHT GREEN



### BIOPHILIA HYPOTHESIS

"Biophilia...

is the tendency emotional affiliation  
of human beings to other living  
organisms...."

"We are wired to respond to  
complexity and beauty, anything  
else humanity is ever likely  
to encounter."

Edward O. Wilson  
The Biophilia Hypothesis



### FOREST BATHING

Spending time in nature vs.  
urban environments improves  
physiological outcomes.

- Reduced pulse rate and blood pressure
- Reduced stress hormones
- Increased immune function

#### Seminal Publications

The physiological effects of Shinto  
forest bathing in the forest atmosphere  
in forest bathing. (Tanaka et al., 2012)  
Spending time in nature vs. urban  
environments improves physiological  
outcomes. (Bratman et al., 2015)



**PROSPECT & REFUGE THEORY**

People prefer unobstructed view of expanse with a covered back and canopy overlap.

**Seminal Publications**  
*The Experience of Landscape*, Jacobs, 1971  
*The relationship between perceived sensory attributes of urban green space and stress reduction*, Saxe & Topper, 2012



**ATTENTION RESTORATION THEORY**

Viewing nature puts the brain into a state of soft fascination.

- Restores attention functioning capacity
- 40 seconds of viewing nature is enough

**Seminal Publications**  
*The Restorative Benefits of Nature*, Kaplan, 1995  
*40-second green and red views sustain attention: The role of micro-breaks in attention restoration*, Lee et al., 2015



**FRACTAL FLUENCY**

Fractal patterns allow easier visual processing

- Visual Preference
- Mid-range complexity elicit restoration & relaxation
- High complexity can engender stress

**Seminal Publications**  
*Investigations of human EEG response to viewing fractal patterns*, Topper et al., 2008  
*The Implications of Fractal Fluency for Human Performance*, Saxe et al., 2016

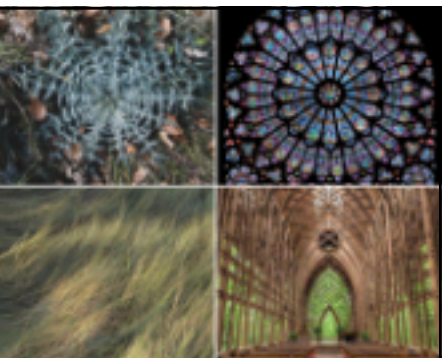


**CONTOUR ORIENTATION**

Colinear, nonlinear, parallel and radial patterns are ubiquitous in nature.

Visual processing is facilitated by recognizable contour patterns.

**Seminal Publications**  
*Characterizing the Architecture of Human Vision*, Saxe et al., 2016



**PSYCHOACOUSTICS & NATURE SOUNDS**

Water and other nature sounds reduce heart rate and stress:

- Perceived ability to mask noises
- Cognitive performance enhanced
- Perceived tranquility

**Bird song promotes:**

- Feelings of safety
- Positive caregiver behavior

**General Publications:**

Effects of Urban Soundscape on Health and Well-being: A Review of the Literature. *International Journal of Environmental Research and Public Health*, 2021.

10 minutes of nature sounds can improve cognitive performance. *The Guardian*, 2019.

Sound and safety: The effects of natural sounds on the perceived safety of public spaces. *Urban Design*, 2020.




**ALLIESTHESIA**

Temperature differentials across the body can lead to a pleasure response.

Often preferable to remaining in homeostasis.

**General Publications:**

Feeling an all-overhead of human thermal perception. *Scientific Data*, 2021.

Thermal comfort: A review of the literature. *Building Research Information*, 2020.



**OLFACTORY RESPONSE**

Varied effects:

- Calming
- Triggering of neurotransmitters similar to anxiety drugs
- Homeostasis of blood pressure and heart rate

**General Publications:**

Climate-related odors: A review of the literature. *Building Research Information*, 2021.

Cardiorespiratory rate and autonomic response to natural and artificial scents. *Building Research Information*, 2021.




**15 PATTERNS OF BIOPHILIC DESIGN**

1. NATURAL LIGHT
2. NATURAL VENTILATION
3. NATURAL SOUND
4. NATURAL TOUCH
5. NATURAL TASTE
6. NATURAL SMELL
7. NATURAL COLOR
8. NATURAL FORM
9. NATURAL TEXTURE
10. NATURAL MATERIAL
11. NATURAL SPACE
12. NATURAL TIME
13. NATURAL PLACE
14. NATURAL PEOPLE
15. NATURAL PLANTS



## 15 PATTERNS OF BIOPHILIC DESIGN

1. Visual Connection with Nature
2. Non Visual Connection with Nature
3. Non Rhythmic Sensory Stimuli
4. Thermal & Air Flow Variability
5. Presence of Water
6. Dynamic & Diffuse Light
7. Connection with Natural Systems

8. Biomorphic Forms & Patterns
9. Material Connection to Nature
10. Complexity & Order

11. Prospect
12. Refuge
13. Mystery
14. Risk/Peril
15. Awe

## HEALTH OUTCOMES MATRIX

	15 Features	Stress Reduction	Cognitive Performance	Emotional Mood & Preference
Nature in the Space	Visual Connection with Nature	Real-time biophilic interface	Real-time engagement	Instant feedback
	Acoustic/Visual/Interactive Elements	Personalized soundscapes	Engaging simulations	Personalized feedback
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## NATURE INSIDE CASE STUDY

- Natural Analogues
- Tactile Connection



OWNER DESIGNED, 2018  
JERSEY CITY, NEW JERSEY  
PHOTOS: CATIE RYAN  
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**NATURE INSPIRED CASE STUDY**  
**RESIDENTIAL**

**Birchrunville Addition**

- Refuge
- Visual Connection with Nature



HELENA VAN VLIET ARCHITECT, 2006  
BIRCHRUNVILLE, PENNSYLVANIA USA  
PHOTOS: HELENA VAN VLIET  
© TERRAPHEN BRIGGIE GREEN







**NATURE INSPIRED CASE STUDY**  
**RETAIL**

**The Forest, Valencia**

- Olfactory Connection with Nature
- Natural Analogies
- Mystery



ATKINS HOWARD ASSOCIATES, 2018  
VALENCIA, SPAIN  
PHOTO: KEVIN HOWARD ASSOCIATES  
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**NATURE INSPIRED CASE STUDY**  
**EDUCATION**

**Green Street Academy**

- Biomorphic Patterns
- Visual Connection with Nature
- Dynamic & Diffuse Light



CRAG GAULDEN DAVIS ARCHITECTS, 2018  
BALTIMORE, MARYLAND USA  
RENDERING: CGD ARCHITECTS  
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**Control Classroom** **Biophilic Classroom**

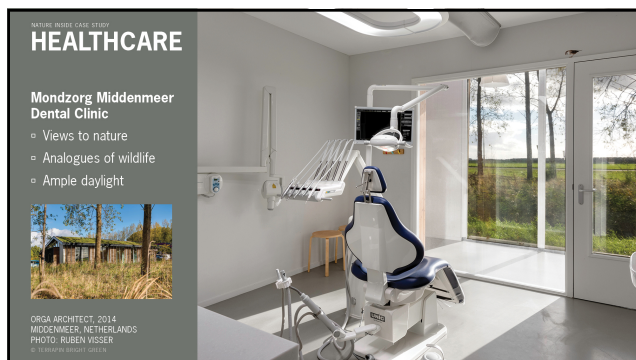
**NATURE INSPIRED CASE STUDY**  
**EDUCATION**

**The Garden School**

- Non-Visual (Tactile) Connection with Nature
- Biomorphic Forms & Patterns
- Refuge



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BALTIMORE, MARYLAND USA  
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## NATURE INSPIRE CASE STUDY HEALTHCARE

**Recharge Rooms**

- Temporary/Pop-up
- Experimental
- Refuge, Multisensory Connection with Nature

STUDIO ELSEWHERE, 2020  
MOUNT SINAI HOSPITALS  
NEW YORK, NEW YORK USA  
PHOTO: STUDIO ELSEWHERE  
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## HOSPITALITY

**citizenM Times Square**

- New Build
- Revenue driven
- Visual Connection with Nature, Prospect, Complexity & Order

CONCRETE (NETHERLANDS), 2014  
NEW YORK CITY, NY USA  
PHOTO AND GRAPHICS: CATIE RYAN  
INSET: ADRIAN GAUT FOR CONCRETE



**AVERAGE USE PATTERNS  
CONVENTIONAL HOTELS**



**BIOPHILIC HOTELS**




## NATURE INSPIRE CASE STUDY HOSPITALITY

**Westin Gen5 Guest Room**

- New Product, Experience
- Brand driven
- Dynamic & Diffuse Light, Material Connection, Refuge

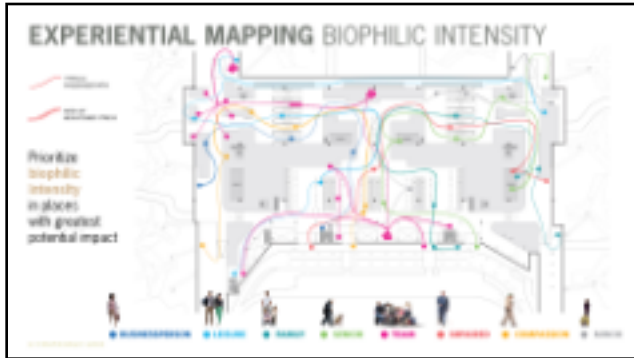
WESTIN HOTELS  
PHOTOS: MARRIOTT INTERNATIONAL  
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## EXPERIENTIAL MAPPING STRESS







### RECOMMENDED READING

BIOPHILIA@TERRAPINBG.COM | TERRAPINBG.COM/PUBLICATIONS