

1 Strategy to Improve the Biophilic Desing on Campus

Based on the 14 Patterns of Biophilic Design (Browning et al., 2014) and the Terrapin Cases Study (Paley Park and Greenacre Park), asses the existence and potential improvements of the following biophilic patterns on the EPFL Learning Center's Esplanade (see Annexe 2.2):

Nature in the Space Patterns

- Non-Visual Connection with Nature (ibid p.26)
- Non-Rhythmic Sensory Stimuli (ibid p.28)
- Presence of Water (ibid p.32)
- Connection with Natural Systems (ibid p.36)

Natural Analogues Patterns

- Biomorphic Forms & Patterns (ibid p.38)
- Material Connection with Nature (ibid p.40)

Nature of the Space Patterns

- Refuge (ibid p.46)

Synthesise and lay out the results of your discussion.

Figure 1 – EPFL Learning Centre's Esplanade ([project perimeter](#))



ANNEXE 1 - Biophilic Desing and Planing Proces

Design Considerations and Process

A step-by-step approach to Biophilic Design¹:

1. Existence - concentrate on what is there.
2. Operate - improve the efficiency.
3. Maintain - focus on resilience.
4. Potential - what existed but not yet manifested.
5. Improve - restorative level.
6. Regenerate - goes beyond improving current sys- tematic performance.

"Ideally, biophilic interventions in cities create a web-like structure of threads and nodes that have an important impact on day-to-day life by supporting personal and community health and wellbeing throughout the city" (Gochman, n.d., p.6)².

Planning for Implementation (Browning et al., 2014, p.13 and ss.)

- Identifying desired responses and outcomes

It is vital for a designer to understand a project's design intent: What are the health or performance priorities of the intended users? What is the most biophilic space we can conceivably design? How can biophilic design improve specific health and wel-bings metrics?

- Design strategies and interventions

Biophilic design patterns are flexible and replicable strategies for enhancing the user experience that can be implemented under a range of circumstances.

- Diversity of design strategies

Patterns in combination tend to increase the likelihood of health benefits of a space. Incorporating a diverse range of design strategies can accommodate the needs of various user groups from differing cultures and demographics and create an environment that is psycho-physiologically and cognitively restorative.

- Quality vs. quantity of intervention

When planning for implementation, common questions recur, such as how much is enough and what makes a good design great. A high quality intervention may be defined by the richness of content, user accessibility and, as mentioned above, diversity of strategies. A single high quality intervention can be more effective and have greater restorative potential than several low quality interventions.

- Duration of exposure and frequency of access

Identifying the most appropriate duration of exposure to a pattern, or combination of patterns, can be difficult. The ideal exposure time is likely dependent upon the user and desired effect, but as a general guideline, empirical evidence shows that positive emotions and mental restoration and other benefits can occur in as little as 5 to 20 minutes of immersion in nature.

¹ Dias, Bruno Duarte. 2015: *Beyond Sustainability – Biophilic and Regenerative Design in Architecture*. European Scientific Journal, ESJ 11 (9). <https://doi.org/10.19044/esj.2015.v11n9p%p>.

² Gochman, Sam, n.d.: *Seeking Parks, Plazas, and Spaces. The Allure of Biophilia in Cities*. Report prepared by Sam Gochman for Terrapin Bright Green. Online: https://www.terrapinbrightgreen.com/wp-content/uploads/2016/06/seeking_parks_plazas_spaces_2MB.pdf.

ANNEXE 2 - Biophilic Desing Paterns and Biological Response

(Browning et al., 2014, p.12)

TABLE 1. BIOPHILIC DESIGN PATTERNS & BIOLOGICAL RESPONSES

Table 1 illustrates the functions of each of the 14 Patterns in supporting stress reduction, cognitive performance, emotion and mood enhancement and the human body. Patterns that are supported by more rigorous empirical data are marked with up to three asterisks (***), indicating that the quantity and quality of available peer-reviewed evidence is robust and the potential for impact is great, and no asterisk indicates that there is minimal research to support the biological relationship between health and design, but the anecdotal information is compelling and adequate for hypothesizing its potential impact and importance as a unique pattern.

14 PATTERNS	STRESS REDUCTION	COGNITIVE PERFORMANCE	EMOTION, MOOD & PREFERENCE
NATURE IN THE SPACE	Visual Connection with Nature <ul style="list-style-type: none"> Lowered blood pressure and heart rate (Brown, Barton & Gladwell, 2013; van den Berg, Hartig, & Staats, 2007; Tsunetsugu & Miyazaki, 2005) 	Improved mental engagement/ attentiveness (Biederman & Vessel, 2006)	Positively impacted attitude and overall happiness (Barton & Pretty, 2010)
	Non-Visual Connection with Nature <ul style="list-style-type: none"> Reduced systolic blood pressure and stress hormones (Park, Tsunetsugu, Kasetani et al., 2009; Hartig, Evans, Jamner et al., 2003; Orsaga-Smith, Mowen, Payne et al., 2004; Ulrich, Simons, Losato et al., 1991) 	Positively impacted on cognitive performance (Mehta, Zhu & Cheema, 2012; Ljungberg, Neely, & Lundström, 2004)	Perceived improvements in mental health and tranquility (Li, Kobayashi, Inagaki et al., 2012; Johncke, et al., 2011; Tsunetsugu, Park, & Miyazaki, 2010; Kim, Ren, & Fielding, 2007; Stigsdottir & Grahn, 2003)
	Non-Rhythmic Sensory Stimuli <ul style="list-style-type: none"> Positively impacted on heart rate, systolic blood pressure and sympathetic nervous system activity (Li, 2009; Park et al., 2008; Kahn et al., 2008; Beauchamp, et al., 2003; Ulrich et al., 1991) 	Observed and quantified behavioral measures of attention and exploration (Windhager et al., 2011)	
	Thermal & Airflow Variability <ul style="list-style-type: none"> Positively impacted comfort, well-being and productivity (Heerwagen, 2006; Tham & Wilen, 2005; Wigö, 2005) 	Positively impacted concentration (Hartig et al., 2003; Hartig et al., 1991; R. Kaplan & Kaplan, 1989)	Improved perception of temporal and spatial pleasure (alliesthesia) (Parkinson, de Dear & Candido, 2012; Zhang, Arens, Huizenga & Han, 2010; Arens, Zhang & Huizenga, 2006; Zhang, 2003; de Dear & Brager, 2002; Heschem, 1979)
	Presence of Water <ul style="list-style-type: none"> Reduced stress, increased feelings of tranquility, lower heart rate and blood pressure (Avarsson, Wlens, & Nilsson, 2010; Pheasant, Fisher, Watts et al., 2010; Biederman & Vessel, 2006) 	Improved concentration and memory restoration (Avarsson et al., 2010; Biederman & Vessel, 2006)	Observed preferences and positive emotional responses (Windhager, 2011; Barton & Pretty, 2010; White, Smith, Humphries et al., 2010; Karmanov & Hamel, 2008; Biederman & Vessel, 2006; Heerwagen & Orans, 1993; Ruso & Atzwanger, 2003; Ulrich, 1983)
	Dynamic & Diffuse Light <ul style="list-style-type: none"> Positively impacted circadian system functioning (Figueiro, Bruns, Pittnick et al., 2011; Beckett & Roden, 2009) Increased visual comfort (Ejezall, 2012; Kim & Kim, 2007) 	Enhanced perception and psychological responsiveness (Avarsson et al., 2010; Hunter et al., 2010)	
	Connection with Natural Systems		Enhanced positive health responses; Shifted perception of environment (Kellert et al., 2008)
NATURAL ANALOGUES	Biomorphic Forms & Patterns <ul style="list-style-type: none"> 		Observed view preference (Vessel, 2012; Joye, 2007)
	Material Connection with Nature	Decreased diastolic blood pressure (Tsunetsugu, Miyazaki & Sato, 2007)	Improved comfort (Tsunetsugu, Miyazaki & Sato 2007)
	Complexity & Order <ul style="list-style-type: none"> Positively impacted perceptual and physiological stress responses (Salingaros, 2012; Joye, 2007; Taylor, 2006; S. Kaplan, 1988) 	Improved creative performance (Lichtenfeld et al., 2012)	Observed view preference (Salingaros, 2012; Hägerhall, Laike, Taylor et al., 2008; Hägerhall, Purcella, & Taylor, 2004; Taylor, 2006)
NATURE OF THE SPACE	Prospect <ul style="list-style-type: none"> Reduced stress (Grahn & Stigsdottir, 2010) 	Reduced boredom, irritation, fatigue (Clearwater & Coss, 1991)	Improved comfort and perceived safety (Herzog & Bryce, 2007; Wang & Taylor, 2006; Petherick, 2000)
	Refuge <ul style="list-style-type: none"> 	Improved concentration, attention and perception of safety (Grahn & Stigsdottir, 2010; Wang & Taylor, 2006; Wang & Taylor, 2006; Petherick, 2000; Ulrich et al., 1993)	
	Mystery <ul style="list-style-type: none"> 		Induced strong pleasure response (Biederman, 2011; Salimpour, Benovoy, Larcher et al., 2011; Ikemi, 2005; Blood & Zatorre, 2001)
	Risk/Peril <ul style="list-style-type: none"> 		Resulted in strong dopamine or pleasure responses (Kohno et al., 2013; Wang & Tsien, 2011; Zaid et al., 2008)

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