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The Significance of Biophilic Architecture in Perceived Restorativeness: Cases of Colonial Churches of Himachal Pradesh

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Abstract – Imperial rule in the Indian sub-continent led to the construction of several European styled churches in the late 19th and early 20th century. St. John in Wilderness, built in 1852 in Mcleod Ganj, and Christ Church built in 1857 in Shimla, are examples of the symposium of extensive natural richness and architectural imperialism carried under the name of 'The Gothic Revival'. This paper presents a biophilic analysis of these two 19th century churches along with the responses from 238 visitors recorded on the perceived restorativeness scale's four contributing factors Being Away, Fascination, Extent and Compatibility, to understand the relationship between the human perception of architecture and nature. The study concludes that St. John in Wilderness due to its close connection with nature has greater Perceived Restorativeness in comparison to the Christ Church. The contributing factors of high restorative quality are identified and highlighted so that improved design guidelines for religious buildings can be prepared for future references.

Index Terms – Biophilic Architecture; Sustainability; Perceived Restorativeness; Gothic Revival; Colonial Churches.

1. INTRODUCTION

India has witnessed several imperial powers within the last two millenniums, and each power had a little or major influence over the architectural developments of the sub-continent in various ways [1-2]. The Sultanate, Mughals, Marathas and the British dominated the second half of this time period which led to the construction of hundreds of religious installations within their territorial boundaries [3-5]. The hilly state of Himachal Pradesh (then part of unified Punjab province) was less active during the early imperial phase and only gained socio-political importance after Shimla became the summer capital of the British Empire in India. The cold and comforting summer of Himachal Pradesh increased the British administrative presence and soon Mcleodganj and Dalhousie became evident on the Indian Map with several churches being built including St. John in Wilderness in Mcleodganj and Christ Church in Shimla [6-7]. Since both the churches were built in 1850s, they were designed to have maximum connection with natural elements and had to utilize them in the function of each building as only limited sources of fossil-based energy were available in that era [8].

1.1. Location and Built Environment

The two Anglican Gothic Revival churches under the study radar are 250 km apart and lie in different climatic zones (Cwa for Mcleodganj and Cwb for Shimla) as per the Koppen-Geiger climatic classification [9]. The selected cases also vary on the type of surrounding environment: St. John in wilderness situated at an elevation of 1750 meter

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from mean sea level has an isolated natural scape environment with dense vegetation of Cedrus Deodara (common name Deodar, Cedar or Devdaru), picturesque view of Mcleodganj town on south east and no other building on the premises. The church compound has a graveyard attached to it which has Grave memorial of James Bruce who was the 8th Earl of Elgin and Viceroy of India during 1862–1863 [10].

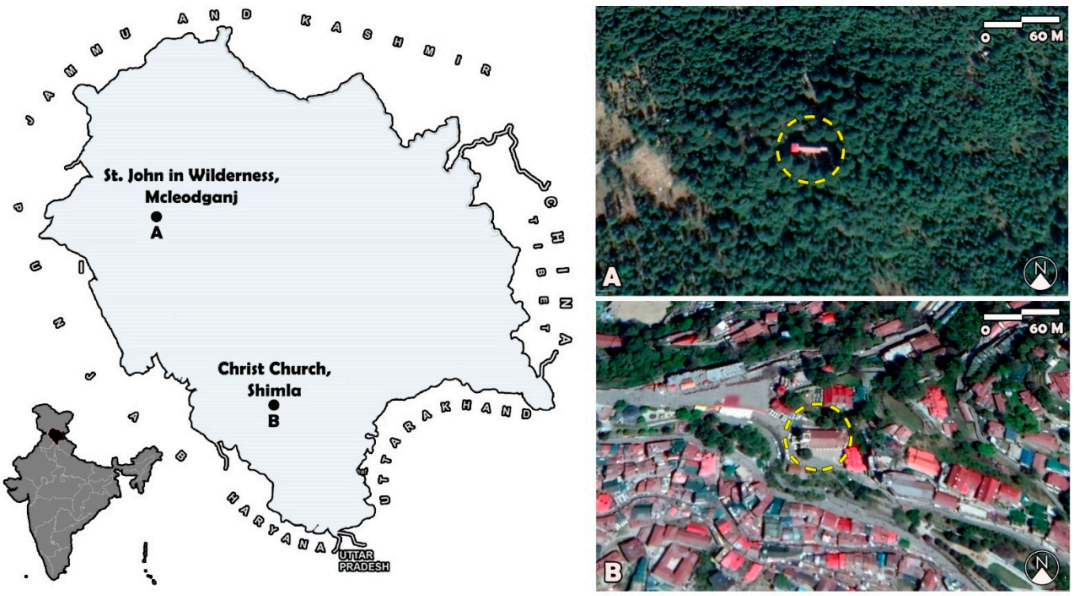

Figure 1. Location Map of A) St. John in Wilderness, Mcleodganj and B) Christ Church, Shimla (Source: Author)

Christ Church situated at an elevation of 2205 meter from mean sea level at the pinnacle of Shimla town is one of the oldest churches in North India (2nd only to St. John's Church in Meerut) [11]. It has a mixed semi-urban built environment around it which includes 'The Ridge' and 'Lakkar bazaar' with picturesque mountainous views on two sides [12-13].

2. ARCHITECTURAL FEATURES

Both the churches were designed in the Gothic Revival style of Architecture (also known as Neo-Gothic, Gothick or Victorian Gothic) and have European church design elements of the 19th century such as pointed arches, stained-glass triple lancet windows, vertical emphasis, rich colors, decorations and a combination of locally obtained natural materials [10]. Stained-glass windows present in the churches were regarded as the 'poor man's Bible' between 5th and 15th century AD, it alleviated those believers who were not familiar with Latin to understand the Gospels. These windows have historical as well as architectural value. Until medieval times, churches had been the prominent patrons of the art. Many renowned painters did their all well-known works for the church [14].

1.1. St. John in Wilderness, Mcleodganj

St. John in Wilderness stands on a Latin cross plan with a 96 feet by 40 feet nave and a significantly smaller transept, has an exposed interior and exterior local stone finish which makes it a gloomy space with light entering through the triple lancet English origin south window arches punctured in the 2 feet

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thick walls. Corrugated metal pitched roof was installed after restoration in 1915, whereas the original roof (1852) had local quarried slate as the covering material over timber purlins & rafters. Piers visible on external façade served as the base for roof and provided stability to the arcades. Purlins supported the timber planks of pitched roof which rested on a Scissor Truss (cast from local timber) held by timber brackets attached to the walls [10]. In late nineteenth century, India experienced significant import of Belgian window glass which is used in St. John in Wilderness and was donated to the church by Lord Elgin's wife [15].

Figure 2. Exterior and Interior view of St. John in Wilderness, Mcleodganj (Source: Author).

1.2. Christ Church, Shimla

Christ Church stands on a longitudinal plan with 100 feet by 42 feet nave and a porch (added in 1873) in front of 90 feet tall clock tower (added in 1860) [7]. It has a smooth exterior finish of stone and brick in lime mortar which provides a bright colored interior to maximize the ambience of light entering through the triple lancet English origin south window arches punctured in the 1.5 feet thick walls [10]. The corrugated metal pitched roof was restored in 1961 after a heavy snowfall damaged several parts of the building [7]. Piers running along arcades on external façade supports the base of Hammer Beam Truss (cast from local timber) [10]. The north aisle of the church faces the largest pipe-organ (added in 1899 and renovated in 1932) in the Indian sub-continent [12]. The stained-glass windows in Christ Church depict the following virtues of Christianity: Faith, Charity, Hope, Fortitude, Patience and Humility [7].

Figure 3. Exterior and Interior view of Christ Church, Shimla (Source: Author).

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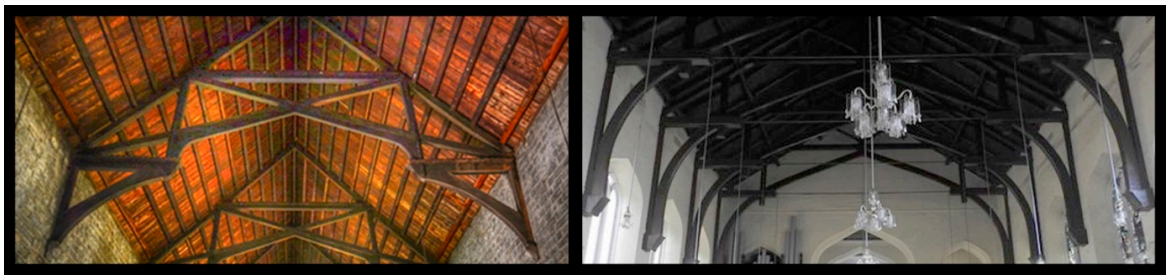

Figure 4. Scissor Truss at St. John in Wilderness (Left) and Hammerbeam Truss at Christ Church, Shimla (Source: Author).

3. RELATED WORK

3.1. Biophilic Architecture

Biophilic Architecture is based on the original ideas proposed by American Biologist E.O. Wilson in 'The Biophilia Hypothesis'. The term 'Biophilia' has ancient Greek origins (*bios: life* and *philia: love)* and Wilson termed it as "the urge to affiliate with other forms of life" [16-17]. The concept of Biophilia has been a part of human life since millenniums and it became a separate discipline of Architecture in late 1980s after Wilson collaborated with Kellert for the development of Biophilic design [16]. Frumkin categorized all aspects of Biophilia under the subheads of Animals, Plants, Landscapes, and Wilderness [18]. The above mentioned aspects are further detailed as '14 patterns of biophilic design' and put into three major subcategories known as: Nature in the Space, Natural Analogues and Human-Nature Relationship. These subcategories are used in identification of biophilic design elements in different environments.

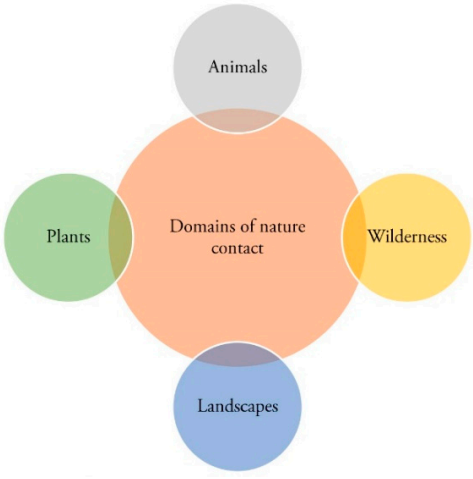

Figure 5. Domains of Nature Contact (Source: Author)

The concept of Biophilic design reiterates the ecological understanding that all environments must possess the duo of biotic and abiotic elements in itself for improved psychological state of humans as well as for the appreciation of the natural realm of the environment [19].

3.2. Attention Restoration Theory

Attention Restoration Theory (ART) focuses on how natural environments can engage involuntary attention, and thus allow recovery of a fatigued directed attention system [20-25]. ART derives its basis from The Biophilia Hypothesis and proposes that a balance between the four characteristics of restorativeness (Being Away, Fascination, Extent or Coherence or Scope and Compatibility) is required to efficiently relax a fatigued mind [26-28]. The four mentioned characteristics carry the following relevance for the environment:-

Being Away: Sense of being removed from the source of mental fatigue; Fascination: A facile process of tackling involuntary attention; Extent: To have interaction within an environment for a considerable time period in the absence of boredom; Compatibility: Fit with a person's propensity and reason to avert use of intellectual or cognitive effort [21].

4. METHODOLOGY

238 visitors (119 from each church as convenient sample) were asked to provide their responses about the church and its built environment on a 7-point scale on the original version of Perceived Restorativeness Scale (PRS-26) developed by Hartig et al, 1997 (which had the previously mentioned four characteristics of restorative environment i.e., Being Away, Fascination, Extent and Compatibility) [29]. The presence and intensity of Biophilic patterns was also recorded on a questionnaire for both the churches separately on seasonal (4 season separate data sampling) basis to understand the significance of Nature in the Space, Natural Analogues and

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Human-Nature Relationship in perceived restorative quality of the built environment. The following methods of data analysis were used to address the research aim: Comparison of means for the two churches on the PRS-26 parameters and Biophilic patterns was done along with a bivariate correlation analysis between the Biophilic patterns and PRS-26 responses. A regression model was created to develop and establish a relationship between the Biophilic patterns' subcategories 'Nature in the Space, Natural Analogues and Human-Nature Relationship' and the perceived restorative quality of the built environment.

1. RESULTS AND DISCUSSION

An equal participant sample of 119 each was taken from the two cases, out of all the responding participants 73% were male and 27% were female who belonged to the age group 20 - 45 years with mean age 29.3 years. The respondents differed in their perception of the restorative environment as shown through Means and Standard Deviations in Table 1. In the PRS domain of Christ Church, 'Compatibility' and 'Extent' recorded the maximum (7.17 and 7.41) and minimum (-3.29 and 4.20) Means and Standard deviation respectively. For St. John in Wilderness, 'Fascination' and 'Extent' recorded the maximum (14.88) and minimum (-5.19) Means respectively. Standard deviation soared higher (5.69) for 'Compatibility' and lower (3.10) for 'Being Away'. Fig. 6 represents the comparison of means of Perceived Restorativeness Scale for both the churches. Whereas, Means and Standard deviation for all the Biophilic Patterns parameters: Nature in the space, Natural Analogues and Human Nature Relationship soared higher in St. John in wilderness and lowered in Christ Church as shown in Fig. 7.

Table 1. Means and Standard Deviation of Perceived Restorativeness Scale and Biophilic Patterns

	Christ Church	St. John in Wilderness
PRS	*N=119*	*N=119*
Being Away	**2.58 (5.09)**	**9.82 (3.10)**
Fascination	**-0.74 (7.11)**	**14.88 (4.86)**
Extent	**-3.29 (4.20)**	**-5.19 (5.00)**
Compatibility	**7.17 (7.41)**	**13.62 (5.69)**
Biophilic Patterns	***N=4***	***N=4***
Nature in the Space	**20.34 (10.24)**	**40.29 (6.27)**
Natural Analogues	**6.81 (5.03)**	**16.33 (4.60)**
Human-Nature Relationship	**10.17 (5.71)**	**15.11 (5.88)**

Note: PRS = Perceived Restorativeness Scale.

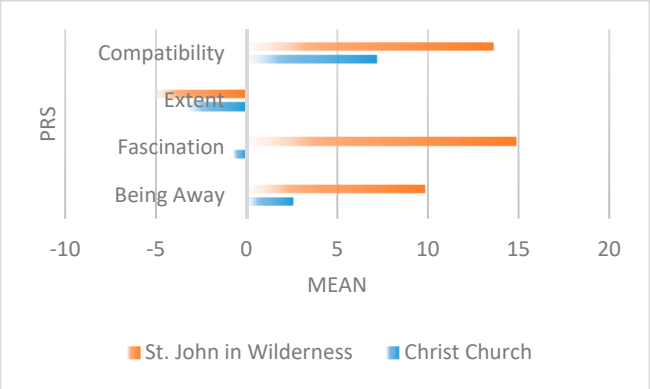

Figure 6. Comparison of Means: Perceived Restorativeness Scale

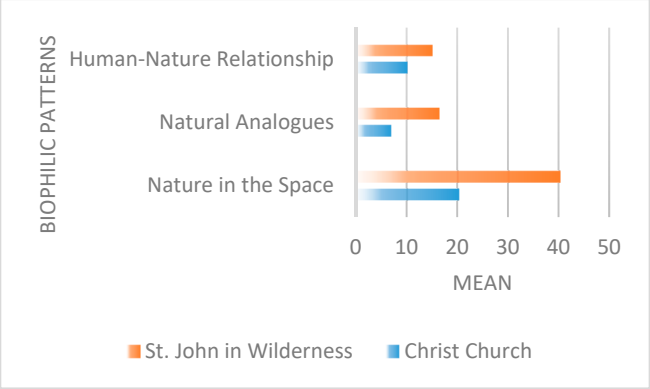

Figure 7. Comparison of Means: Biophilic Patterns

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A bivariate correlation was run to understand the impact of major categorization of each biophilic pattern on the perceived restorativeness of the environment. Table 2 represents the results of the 2-tailed Pearson correlation. A strong and significant correlation was found between all variables of PRS with all Biophilic Patterns, except 'Extent' which showed two significant results out of the three but the strong relationship could not be interpreted. The highest correlation (0.709 with $p < 0.01$) was observed between 'Nature in the Space' and 'Being Away' followed by 'Nature in the Space' and 'Fascination' (0.705 with $p < 0.01$). Out of the 12 different obtained correlations, 9 were found to be strong and significant.

Table 2. Bivariate Correlation Results

Biophilic Patterns / PRS	Being Away	Fascination	Extent	Compatibility
Nature in the Space	.709**	.705**	-.106	.496**
Natural Analogues	.701**	.688**	-.165*	.556**
Human-Nature Relationship	.568**	.501**	-.141*	.690**

Note: PRS = Perceived Restorativeness Scale.
**p<.05. **p<.01.*

A regression model was also prepared to testify and validate the correlation results considering the high impact of Biophilic Patterns on the Perceived Restorativeness of the environment. Biophilic Patterns were taken as the Independent Variables (IV) in the study whereas the PRS parameters were taken as Dependent Variables (DV). The results of the regression model are shown in Table 3 as standardized beta coefficient values along with their significant 'p' values and adjusted R square values. Independent Variable 'Nature in the Space' depicts a strong and significant relationship with 'Being Away' and 'Fascination', 'Natural Analogue' is entirely significant and strongly related to all four PRS parameters. 'Human Nature Relationship' is insignificant in 'Extent' and has a strong and significant relationship with the rest of the three PRS parameters.

Table 3. Regression Results

Biophilic Patterns / PRS	Being Away	Fascination	Extent	Compatibility
Nature in the Space	.354***	.407***	0.161	-.077
Natural Analogues	.275**	.271**	-.254*	.299*
Human-Nature Relationship	.211***	.116*	-.084	.561***
Adjusted R square	0.55	0.52	0.024	0.51

Note: PRS = Perceived Restorativeness Scale.
**p<.05. **p<.01. ***p<.001*

The results of Comparison of Means, Bivariate Correlation and Linear Regression Model concludes that the three major categorization of Biophilic Patterns (Nature in the Space, Natural Analogues and Human Nature Relationship) have significant impact on the perceived restorativeness quality of the environment. The PRS parameter 'Extent' however fails to develop any significant relationship with the Biophilic Patterns under the given environment.

Although both the churches were designed in the same architectural style and within the same era, St. John in Wilderness was found to have higher perceived restorativeness quality due to richness of its built environment's biophilic patterns. Christ Church showed positive aspects of the architectural style but lacked in terms of providing fascination and failed to engage involuntary attention due to its surrounding built environment.

2. CONCLUSION

This study investigated the role of Biophilic Patterns in Perceived Restorativeness Quality of a built environment (Religious and historic in this case). It took inferences from a different era and architectural style in order to standardize the responses to evaluate the data on the same bipolar scale. Future investigations can be conducted to explore the relevance of this study in preparing design guidelines for religious or tourism-oriented buildings. Different built environments can also be studied using the same tool created in this study which uses Biophilic Patterns and PRS-26 as their mode of data collection. The study promotes the use of natural features in architectural design to influence the human psychology in a constructive and balanced way. This is an attempt towards sustainable architecture which takes mental health of the user into account.

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