



A Dialogue with Nature Through Biophilic Design: Focus on the Façade Wall in the Architecture of Laurie Baker's Houses

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ABSTRACT

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Man connects with nature and is inspired by nature. Architects based on this interaction with nature create an architectural language of forms, spatial volumes, shapes, and materials, which develop from their own individual philosophy and their perception of the connection between nature and architecture which can be disseminated into components. A dialogue with nature also includes the impact of nature on design as experience. The paper will suggest that biophilic design is an outcome from this interaction and can be illustrated in the interface between the built environment and nature at various levels seen in the interplay of elements, creation of spaces and in the morphology of shapes, forms, materials, texture and in patterns. The objective of this paper is to study the architectural language of Laurie Baker with focus on the role played by the façade wall in creating multiple experiences which can be assimilated into patterns. The façade wall of a sample of houses built in 1990's in Trivandrum will be analysed to illustrate this connection. A set of patterns based on the analysis will be proposed.

1. INTRODUCTION

Ackerman in 'The Villa' comments that from Roman times villas have been designed on the basis of two models based on their shape and configuration and their subsequent interaction to the environment. Ackerman [1] He elaborates to say "To fulfil its ideological mission the villa must interact in some way with trees, rocks and fields, and the two major types I have defined are roughly coordinated with two types of interaction: the compact-cubic villa is often a foil to the natural environment, standing off from it in polar opposition, and the open-extended type is integrative, imitating natural forms in the irregularity of its layout and profile, embracing the ground, assuming natural colors and textures [1]." Laurie Baker's designs for houses references the cubic model in its compactness of form and follows the language of the open-extended villa model type through modifications in outline through a system of chinks and projections as forms of articulation in the façade which give the building opportunity to interact with the environment. Refer Figure 2 and 3. The discussion of the façade will illustrate further the architectural strategies used to integrate the environment with the house.

2. THEORETICAL FRAMEWORK

2.1 The façade wall and elements-the window

"The 'wall' is one of the most basic elements of architecture [2]." "Elements can play diverse roles in one single building [3]." "Walls frame our existence [4]." Walls have a strong purpose. They "provide safety, security, comfort, and privacy [5]." They are structural as loadbearing members. The façade

wall of a house is a filter and a mask which reveals and conceals information. In this sense it mimics nature in its variable dialogue with it. The façade can be a "space-containing" wall which contains pockets of space [6]. Unwin [2] refers to this as "an inhabited wall." Openings in a facade are significant in their ability to connect to the outside depending on size and shape. "A window can also be understood as a threshold, heralding the passage of vision and light [7]." Pierre von Meiss describes the window as "eye, mouth, nose, and ear concurrently, it is not only a determining feature in the building's appearance, but also the intermediary which allows the occupants of a building to see, hear, and feel the place of which they are part [8]." Windows direct the gaze outwards and invoke an involvement with the external environment. "Commenting on Corbusier's design of a villa for his parents Baderre comments "Only one side of the house has a real window, but this window occupies the whole width of the façade [9]." "The window sufficiently illuminates the whole living space because "not only its dimensions admit enough light, but at both ends it meets the adjoining side walls at a right-angle. These white walls direct the view straight towards the scenery outside, unobstructed by window reveals [9]." Christopher Alexander comments "If there is a beautiful view, don't spoil it by building huge windows that gape incessantly at it. Instead, put the windows which look onto the view at places of transition-along paths, in hallways, in entry ways, on stairs, between rooms [10]." Different opinions exist on validity of shape and detail but the significance of the window in the façade wall as providing a connection to the outside is a constant. The significance of the window in the way it constructs a connection to nature and a biophilic response will be explored with respect to the windows in facades of Baker's houses. "A window can be seen as a bright

area within a wall, an opening framed by a wall, or a void separating two wall planes. It can also be enlarged to the point where it becomes the physical wall plane. Windows and doorways interrupt the wall planes that give a building its form and interior spaces their definition. They are the transitional elements of architecture and interior design [11].”

2.1.1 Ornament

Bloomer comments on the virtuosity of ornament in uplifting our senses and found in the outline of threshold spaces that connect inside and outside like doors and windows which further accentuate our involvement with the exterior. Bloomer [12] Bloomer refers to the natural way of vines and creepers that engulf openings and surfaces and can be translated into architectural ornament continuing our interaction with the environment in a visual manner. “When ornament appears within the liminal senses of construction it produces an expression of metamorphosis. He also comments on the role of natural materials as confirming our engagement with the world. (Bloomer).

2.1.2 Body matrix

“Body experience provides us with a matrix by which we order our essential perception of space. The body matrix not only gives us our essential knowledge of space, it also includes a palate of meanings, transparencies, central places, hard and soft edges, memories and the rhythms which constitute our human identity [13].

2.1.3 Shape and well being

In “Shape of Green” the authors argue on the relationship between shape and form and well-being. “Form affects performance, image influences endurance” This aspect relates directly to the wellbeing of the users [14]. Biophilic design focuses on the way nature can improve well-being through user experience through contact with nature. Architecture of the built environment is the facilitator of this phenomena and the façade wall is an agent which creates opportunity for interfaces with nature.

2.1.4 Phenomenological aspects

A phenomenological perspective looks at the way we perceive architecture psychologically through our senses. Through cognition a sense of empathy is created which acts on our senses and feelings of being rooted to the earth are evoked by the connection between materiality and form which links it to context and allows us to experience a sense of place. Stephen Kellert refers to this quality in the sense of belonging and place buildings evoke. He comments “This attachment to territory and place remains a major reason why people assume responsibility and long term care for sustaining buildings and landscapes [15].” Buildings over time acquire a sense of connection with the landscape and “place” is created. Schulz comments to say that architecture represents a means to give man an “existential foothold” [16] Christian Norberg Schulz in *Towards a Phenomenology of Architecture* describes “presence”. The wall he comments has a presence which is its phenomenological impact on our senses when we perceive it. The quality of the impact is determined by the perceived mass, the verticality and horizontality and the perceived openness of the wall seen in its porosity. Colour, articulation and texture contribute to creating presence. The tectonics of a wall, its construction technique give it a certain texture and the patina of age and region give it a specific colour which combine to

give the wall a character. The wall develops a ‘character’. “The character of a work of architecture is therefore first of all determined by the kind of construction used; whether it is skeletal, open and transparent, (potentially or in fact) or massive and enclosed [16].” A facade wall which responds to the environment and opens up to nature can therefore be porous and give opportunities for dialogues with nature. Its phenomenological impact is generated by its materiality through its tectonics.

2.1.5 Biophilic design

“Biophilic design is about creating good habitat for people as a biological organism in the built environment [17].” Kellert continues to say “Biophilic design requires repeated and sustained engagement with nature.” Stephen Kellert wrote a book where he translated into a language of patterns in the built environment the way Biophilic design could be incorporated into architecture where he “identified more than 70 different mechanisms for engendering a biophilic experience, and contributing authors William Browning and Jenifer Seal-Cramer outlined three classifications of user experience: Nature in the Space, Natural Analogues, and Nature of the Space [15].” Stephen Kellert comments that “biophilia is the inherent human inclination to affiliate with natural systems and processes, especially life and life-like features of the nonhuman environment [15].” Kellert puts forth two dimensions to biophilia. “The first basic dimension of biophilic design is an organic or naturalistic dimension, defined as shapes and forms in the built environment that directly, indirectly, or symbolically reflect the inherent human affinity for nature [15].” “Direct experience, Kellert describes as an informal experience of mechanisms which are self-sustaining and does not require human involvement to survive like daylight, plants, natural habitats and ecosystems while indirect experience refers to something which requires human contact to survive like a potted plant etc. [13].” “The second based dimension of biophilic design is a place-based or vernacular dimension, defined as buildings and landscapes that connect to the culture and ecology of a locality or geographic area. This dimension includes what has been called a sense or, better spirit of place, underscoring how buildings and landscapes of meanings of people become integral to their individual and collective identities, metaphorically transforming inanimate matter into something that feels lifelike and often sustains life [13].” Based on these two definitions, Kellert proposes six biophilic design elements.

- “Environmental features
- Natural shapes and forms
- Natural patterns and processes
- Light and space
- Place-based relationships
- Evolved human-nature relationships” [13].

Kellert further illustrates these six design elements in approximately seventy design attributes. Refer Table 1. Terrapin Bright Green’s “14 Patterns of Biophilic Design” articulates the relationships between nature, human biology and the design of the built environment so that we may experience the human benefits of biophilia in our design applications [18].” Refer Table 1. In the Table 2, the equivalent ways of expression in architectural language of the façade have been enumerated. The term ‘biophilia’ was first coined by social psychologist Eric Fromm (5. Heart of Man, 1964) and later popularized by biologist Edward Wilson Biophilia [15].

Table 1. The complete list of patterns as per Kellert and Terrapin

Kellert-Biophilic Design		Terrapinbrightgreen-14 patterns
Environmental features	Natural shapes and Forms	Nature in the Space Patterns
		1. Visual Connection with Nature
		2. Non-Visual Connection with Nature
Colour		3. Non-Rhythmic Sensory Stimuli
Water	Botanical motifs	4. Thermal & Airflow Variability
Air	Tree and columnar supports	5. Presence of Water
Sunlight	Animal (vertebrae motifs)	6. Dynamic & Diffuse Light
Plants	Shells and spirals	7. Connection with Natural Systems
Animals	Egg, oval and tubular forms	Natural Analogues Patterns
Natural materials	Arches, Vaults, domes	8. Biomorphic Forms & Patterns
Views and vistas	Shapes resisting straight lines and right angles	9. Material Connection with Nature
Façade greening	Simulation of natural features	10. Complexity & Order
Geology and landscape	Biomorphy	Nature of the Space Patterns
Habitat and ecosystem	Geomorphology	11. Prospect
Fire	Biomimicry	12. Refuge
		13. Mystery
		14. Risk/Peri

Source: <https://www.terrapinbrightgreen.com> › report › 14-patterns and Stephen Kellert, Biophilic design, Wiley.

Kellert- Elements and Attributes		
Light and Space	Place based relationships	Evolved human nature relationships
Natural light		Prospect and Refuge
Filtered and Diffused light	Geographic connection to place	Order and complexity
Light and shadow	Historic connection to place	Curiosity and enticement
Reflected light	Ecological connection to place	Change and metamorphosis
Light pools	Cultural connection to place	Security and protection
Warm light	Indigenous materials	Mastery and control
Light as shape and form	Landscape orientation	Affection and attachment
Spaciousness	Landscape features that define building form	Attraction and Beauty
Spatial variability	Landscape ecology	Exploration and Discovery
Space as shape and form	Integration of Culture and ecology	Information and Cognition
Spatial harmony	Spirit of Place	Fear and Awe
Inside- outside space	Avoiding placelessness	Reverence and spirituality

Source: Stephen Kellert, Biophilic design, Wiley.

Table 2. Selected patterns from Terrapin and Kellert in context of their applicability to the facade wall

Terrapin	Kellert	Architectural Translations
Nature in space patterns		Openings in the façade wall that let in light
Visual Connection with Nature	Sunlight Plants Inside- outside space Views and vistas	All types of windows in the facade wall. Windows of varying size, shape and position-bay window, window, clerestory window, slit window. Carved out space in the facade wall - sit-outs, verandahs. Doors, Jalli's. Wall as backdrop to a seat and low wall as seat.
Non-Rhythmic Sensory Stimuli	Sensory variability	Openings in the façade wall that permit breeze to filter, doors, windows, Jalli's etc. Jalli openings in the facade wall that create light patterns. Patterns of light and shadow cast by trees on façade wall.
Dynamic & Diffuse Light	Natural light Filtered and Diffused Light and shadow Reflected Light pools Warm light	Light through windows in façade wall of varying widths and design with combination of fixed glass and openable shutters, of varying sill heights, and depths as in bay windows, and positioned at different levels -clerestory windows, and Jalli openings. Jalli walls of staircase visible in facade wall.

Source: <https://www.terrapinbrightgreen.com> › report › 14-patterns and Stephen Kellert, Biophilic design, Wiley.

Terrapin	Kellert	Architectural translation
Natural Analogues Patterns		
8. Biomorphic Forms & Patterns Symbolic references to contoured, patterned, textured or numerical arrangements that persist in nature.	Botanical motifs Tree and columnar supports Egg, oval and tubular forms	Organic shapes in outline of building Façade wall. Presence of features like arches, niches, alcoves in façade wall. Presence of concave and convex additive and subtractive forms that emulate forms from nature and give an irregular outline to the façade wall, and seen in slanted walls, other than ninety-degree angles seen in overall shape of building.

	Arches, Vaults, domes Shapes resisting straight lines and right angles	
9. Material Connection with Nature Materials and elements from nature that, through minimal processing, reflect the local ecology or geology and create a distinct sense of place.	Sensory variability Historic connection to place Cultural connection to place Indigenous materials Information richness Age, change and the patina of time Geographic connection to place Spirit of Place	colour Local materials-brick, used in the façade wall. Detailing -exposed brickwork, bonding and corbelling and tectonics, that delineate arch openings which frame views, etc. visible in the façade wall. Aging of material over time. Use of vernacular elements that enhance a local connection to place, timber columns etc.
10. Complexity & Order Structure and organisation with detail and variability.	Sensory variability Information richness Transitional spaces Attraction and Beauty Exploration and	Design vocabulary of the façade wall which is based on parts to whole allowing for a degree of variability and complexity and subject to an organising element. Different scales of pattern are seen in the positioning of windows and in the individual patterns of jalli's etc. Combinations of materials and patterns give complexity visible in the façade wall.
11. Prospect Nature of the Space Patterns An unimpeded view over a distance, for surveillance and planning	Views and vistas Landscape orientation	Through its porosity of openings and thresholds, the facade wall offers itself as a frame and offers potential spaces of prospect-bay window, verandah parapet wall, etc from where an unimpeded view of distant lakes and landscape elements can be viewed.
12. Refuge. A place for withdrawal from environmental conditions or the main flow of activity, in which the individual is protected from behind and overhead.	Landscape orientation	The façade wall contains carved out spaces like nooks where it offers the user places of refuge.

Source: <https://www.terrapinbrightgreen.com> › report › 14-patterns and Stephen Kellert, Biophilic design, Wiley.

2.1.6 Pattern language

Like language architecture has its patterns and arrangements, indifferent combinations and compositions as circumstances suggest [4].” The Patterns are a set of tools for comprehending design opportunities. Christopher Alexander devised a system of patterns which act as components of a language which form a network to give solutions addressing social behaviour and answering spatial and architectural requirements. He starts from a general level to then suggest patterns for construction. Architectural style and aesthetic preference are not addressed and the solution is arrived at by individual choices made by selection of patterns that imbibe the qualities required which can be used in combination to arrive at the required solution. The recognition of patterns as a useful tool in designing architecture is recognised by many. Unwin [2] To give an example Pattern, ‘Entrance Room’ Alexander describes the function first “Arriving in a room or leaving it, you need a room to pass through, both inside the building and outside it. This is the entrance room [10].” He then suggests a few solutions. With the framework of Alexander’s pattern language as reference, the aim in this paper is to project his system into the analysis of biophilic design patterns connected to architectural solutions present in the work of Laurie Baker’s houses and subsequently to propose a new set of patterns.

2.1.7 Laurie Baker architectural approach

“Laurie Baker’s architecture and writings have shown that an understanding of existing vernacular architecture needs to be included in future development through a planned evolution, to design house forms based on real user needs, socio-cultural

identities and passive design for climatic comfort, minimising the need for mechanical ventilation, using local materials as low energy resources and building robust houses which can be maintained by communities” [19]. Laurie Baker’s architecture is therefore appropriate for a study on expressions of “Biophilic design” as his architectural approach is humanistic and his architecture falls in the category of sustainability and green architecture. Laurie Baker started architectural work in India in Pithoragarh where he designed primarily hospitals. Baker set up practice in Trivandrum in the late 1960.” His work was influenced by his Quaker principles, his meeting with Mahatma Gandhi and Pithoragarh, where he was exposed to local craftsmanship and learned to value their contributions. Bhatia [20] “Baker has never accepted the idea that the multiplicity of human needs and aspirations can be fulfilled by a standard set of design options and materials. He believes that individual needs stem from India’s diverse environment, the varying cultural patterns and lifestyles; and he feels that these needs must be met through an architecture which is responsive, uses local materials and expresses itself in many different forms [20].” Baker’s use of the Jalli in brickwork distilled from vernacular design is one of his significant contributions. Understanding cultural identity and ecology Baker comments “Since the beginning of recorded art, India’s brains had devised the jali (trellis, lattice, honey-combed walling, pierced stone and wooden screens and walls) to filter the glare and strong sunlight into cool but breeze -filled rooms. India has used this device more than any other country and it is essentially an Indian device. We can study the many and varied components of Indian architectural design and find out what makes them essentially and intriguingly ‘Indian’ [20].”

2.1.8 Summary

To summarize, Terrapin talks about patterns in nature which can be applied to architecture. Terrapin addresses emotive aspects in their proposed patterns and Kellert elaborates on attributes in nature from its capacity to create spaces of a phenomenological character that involve human participation and evoke our senses and emotions, to quote for example, sense of belonging and affection and mystery. Biophilic design shares with the philosophy of sustainability and green architecture a similar approach to materials, interactions with the built environment and a humanistic approach to design which holds significant the value of ecology and place making. The patterns which emerge from the intersections of Biophilic patterns of Terrapin and Kellert in reference to architecture can be a useful tool in today to enhance human experience and well-being.

3. SCOPE AND LIMITATION

The discussion limits itself to the façade wall in Laurie Baker's houses. The study of the Façade wall will restrict itself to elements of the wall which facilitate an interface with nature. Namely shape and articulation of the Façade wall, opening, such as windows, doors, carved out spaces like sit-out and verandahs and jalli openings. Colour and material will be discussed. Climate responsive, cost effective and building construction will not be part of the study. Those patterns which are applicable to the façade wall will be discussed.

4. METHODOLOGY

First patterns suggested by Terrapin will be compared with Elements and Attributes proposed by Stephen Kellert to arrive at a consolidated approach to Biophilic Design with respect to the Façade wall. Architectural translations into elements with respect to the Façade Wall will be highlighted based on parameters stated above. A sample of Baker's houses built in the 1990's in Trivandrum will be examined relating Biophilic ideology and patterns to arrive at a set of prescribed patterns, as an outcome of the analysis, and inspired by the pattern language of Christopher Alexander in A Pattern language, 1977.

5. DISCUSSION

Comparison between patterns of Terrapin and Stephen Kellert.

A combined system of selected patterns of Terrapin and Kellert (relevant to the study) and proposed patterns with architectural translations.

5.1 Architectural aspects of the facade wall

From the review of literature certain architectural aspects of the Façade can be listed as pertinent to biophilic design-

1. Relationship to the ground.
2. Façade wall as frame, space filled 'inhabitable wall'-sit-outs and verandahs.
3. Elements -windows, jallis, doors.
4. Materiality.
5. Surface and Ornament.

6. Light.

All the above will be described in terms of design principles of colour, texture and pattern and phenomenological aspects describing sensory perceptions and bodily experience in context to biophilic design.

5.2 Summary of patterns

A summary of patterns in Tables 1 and 2 show an overlap in patterns, hence the discussion will follow a sequence based on architectural aspects as listed above. Some patterns are similar to aspects of architecture like light and materials.

5.3 Relationship to ground

Relationship to the ground is visible in many ways. The facade wall is a marker with an existential foothold established through colour delineation of the plinth. Refer Figure 1 and in the use of natural stone Refer Figure 5. A sloped site is negotiated with levels such that the house sits with the topography. Refer Figure 5. Further, its connection to the ground is made through the mediation of inside and outside relationships in the location of sit-outs which seamlessly connect to the ground and invite the surrounding environment into the house through the raised plinth of the sit-out through steps. Figures 2, 3, 6 and 7.



Figure 1. Entry to Narayan house, source: Untold stories, Laurie Baker Centre



Figure 2. Kannan house plan: source: Untold stories, Laurie Baker Centre



Figure 3. Narayanan house: source: Untold stories, Laurie Baker Centre

5.4 Facade Wall as frame and ‘inhabited wall’

A visual connection is maintained with nature by opening up to the outside. Two other levels of visual connection are established through the facade wall, one is perception at the level of sight and engagement with the environment through openings in the facade wall and the other is through channels of sensory experiences of the facade wall. A sit out is a frame and focal point from where nature can be experienced. It is an inside-outside space. In Simon Unwin’s words “A frame can be a structure and a boundary: but its helpfulness also comes from being a frame of reference, according to which one develops an understanding of where one is [4].” Entry sit-outs represent a transition space which is inspired by local cultural lifestyle patterns. The sit-out is a space where the garden can be viewed and is private and a place where interaction with the public happens. Refer Figure 6 and 7 “At the fundamental level architecture does not deal in abstractions, but with life as it is lived, and its fundamental power is to identify place [4].” Sit-outs like window seats are examples of placemaking. The verandah offers a space carved out of the facade wall to offer a place of refuge and prospect, as in this case a view of a distant lake. Figure 12 and 16. Refer Figure 13.



Figure 6. Sit-out in George house source: Untold stories, Laurie baker centre



Figure 7. Sit out in Kannan house. source: Untold stories, Laurie baker centre



Figure 8. Bay window in Narayanan house. source: Untold stories, Laurie Baker Centre

5.5 Windows and openings

Refer Figure 1, 4, 5 Figure 6, show the general green lush ambience of the houses. Windows allow for different engagements with nature. Refer Figure 8, Baker provides bay windows with window seats where the inhabitants can be involved in reading or any other activity enjoying the light from the window as well as to ponder and look outside and engage with nature. Views or experience of a natural feature through careful placement of window in the facade wall attribute a quality of placemaking through their ability of capturing time and creating memory. The window becomes a place of prospect and refuge. Refer Figure 8. The window seat offers a place for body and architecture to interact for the purpose of viewing. A low parapet wall is detailed with coping wide enough, Refer Figure 3, to offer a seat in the terrace on first floor. The parapet wall is phenomenologically strong in presence by its materiality and reveals a sense of safety which encourages engagement with it. Refer Figure 12 and 13.



Figure 4. Narayanan House: source: Untold stories, Laurie Baker Centre



Figure 5. John house source: Untold stories, Laurie Baker Centre

5.6 Light

Light is a significant element in architecture and biophilic design. Jalli’s in the Façade allow filtered light Refer Figure 1, 9 and 12 to enter the interior. Glimpses are afforded by jalli slit openings in staircase rooms which offer a sense of mystery and curiosity through concealment and revealment. Main rooms open up to the environment through the framed views of their windows. In all principal rooms large timber framed windows feature. In staircase areas jalli’s are used which offer slit views. Clerestory windows Refer Figure 10, allow light from a height and permit stochastic experiences of the passing of clouds and views of the sky. Light through windows is diffused and pronounced as pools of light. Refer Figure 14, creating different interior atmospheres. Jalli’s in the Façade allow filtered light to enter the interior. Refer Figure 9 variability is also experienced by the contrast in light quality and the patterning of light created by the jalli. In principal rooms large timber framed windows feature Figure 11. (In some houses window frames have been painted).



Figure 9. Jalli work pattern in George house Source: Untold stories, Laurie Baker Centre



Figure 10. Clerestory fan window in Narayanan house
Source: Untold stories, Laurie Baker Centre



Figure 14. Colonel Jacob, arch window with tree design grille. source: author



Figure 11. Subrahmaniam House Source: Untold stories, Laurie Baker Centre



Figure 15. Colonel Jacob, arch window with panes. source: author



Figure 12. George House-patterns of light Source: Untold stories, Laurie Baker Centre



Figure 16. Verandah overlooking lake in George house. source: Untold stories, Laurie Baker Centre

5.7 Surface and ornament

Views are framed as in in Colonel Jacob's house. Refer Figure 14, 15. A picture window effect is achieved with the design of the grille echoing the tree outside. Refer Figure 14. Ornament is significant in Baker's designs and is a medium for transferring nature indirectly into the facade. Ornament is visible in the form of pattern. Refer Figure 1, 9, 12, 13 and 16 Ornament is present in the patterns of jalli's and in the details in windows as indirect manifestations of nature. A window is paned to fragment light as found in nature and give a kaleidoscope of light and nature outside. Refer Figure 15. Ornament is also created by fleeting glimpses of patterns created by the reflection of sunlight on trees seen on the faced wall. Mr George Refer Figure 16, commented on the patterns of light projected on the steps in the staircase by the jalli.



Figure 13. Kanan house, parapet wall house entry sit-out
source: Untold stories, Laurie Baker Centre

5.8 Materiality

Shapes found in nature echo in the outline of the walls. The curve is repeated in arches used in verandahs, Refer Figure 14, 15 and 16 in projections Refer Figure 5 and in window openings. In principal rooms large timber framed windows feature Figure 11. (In some houses window frames have been painted.) "Natural material expresses its age and history as well as the tale of its birth and human use [21]." These materials take us beyond the visual, beyond the bird's-eye view of the tabletop architectural model and the flat forms of geometrical abstraction, into that synaesthesia that characterizes our sense of belonging as participants in the world [21]." Local indigenous materials -bricks and timber are used and exposed in their natural state. Red brick colour and brown of natural timber reflect the earthy tones of the environment. Brick bonding, and corbelling used in framing openings reflect craft traditions. Brickwork in the façade wall is textural of handmade bricks and weathered showing the patina of age and promotes a sense of identity and presence. Refer Figure 12. In all Baker's architecture there is richness of information in the façade wall in the combination of window types, in the pattern used in the jalli's in the patterns found in the arrangement of windows and in the architectural detailing and delineation present in the façade wall.

5.9 Shape and organic nature

Trivandrum has a hilly terrain and angled walls reminiscent of the steep side of a mountain are represented in the faceted planes of the external façade. In principal rooms large timber framed windows feature Figure 11. "However, architecture and nature share common features as they both have the same logic of growth and adaptation [22]." Baker's forms are organic. Refer Figure 2. And his houses allow for expansion. Refer Figure 11, where a room has been added on an existing open terrace following the language of the house.

6. FINDINGS

Following a sequence from general to specific the architectural vocabulary of Laurie Baker seen in the houses above can be organised into a system of patterns or motifs which apply to the design of facades with attributes of biophilic design. There is a common language in terms of components. They answer to Kellert's attributes and translate architecturally into the Biophilic patterns proposed by Terrapin's within the sustainable green architectural vocabulary of Laurie Baker.

Pattern 1. The façade wall is oriented to the breeze direction and views of natural landscape features. Context and specificity are given value.

Pattern 2. The façade wall if it encloses a compact form the shape should be modelled such that the outline includes recesses and projections, with curves and chinks to give maximum wall exposure.

Pattern 3. All rooms to be provided with windows on two external walls.

Pattern 5. Angled walls in façade as representing outer walls of rooms not required to follow ninety-degree angle for corners.

Pattern 6. A carved out space in the façade wall can be optional as a place for entry transition which retains privacy and merges the garden.

Pattern 7. Windows in façade wall to be of varying type, shape and size to give light of varying degrees of brightness ranging from diffused light to light pools through the use of a varied vocabulary of windows varying in size and shape and location and imparting varied spatial experiences in the interior similar to atmospheres found in nature. ie clerestory, eye level, etc.

Pattern 8. Wall façade should reflect a composition of an integrated whole where the parts relate to the whole where there is complexity through difference in openings and pattern as generated by composition of windows and in individually represented by their individual shapes.

Pattern 9. Windows and openings must be suitably positioned to improve airflow and create comfort. Jalli openings which remain maintain continuous air circulation.

Pattern 10. Bodily engagement with the facade wall i.e., parapet wall or a low wall can be provided as seating which create a Sense of Place.

Pattern 11. Arches, ovals and curves derived from nature should be used in the vocabulary of shapes and forms in the façade walls, supporting arches, openings, and niches to create harmony with natural forms.

Pattern 12. Materials in the façade wall must reflect natural tones and be local and to be constructed with craft inspired by local traditions. The ensuing patterns are simplistic motifs which can be used in combinations depending on context.

7. CONCLUSION

It is found therefore through the analysis that a prescriptive set of patterns or motifs can be suggested to ensure a biophilic design approach for designing house facades. individuality and identity are maintained in the combination and detailing of architectural components and the patterns propose provide suggestions for a lexicon of motifs which can be used in different contexts and situations. the tools are not time bound as the patterns are not specific to aesthetics or material.

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