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Biophilic Design: A review of Frank Lloyd Wright Falling Water

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Abstract:
Biophilic design is a recent trend in the building industry but its application is antique, buildings like the falling water house have become famous because of its Biophilic elements and expressions. Humans are part of nature and its inherent need to connect with nature is embedded in our DNA and our physical, psychological and social wellbeing is depended on this continuous connection. In a world where there is technological improvements and innovations these needs can be met by integrating elements of nature into the built environment as Biophilic design have become a tool in achieving this innate connection. Connecting man with nature can be effectively created directly, indirectly or symbolically using the identified Biophilic patterns and parameters. This is a review article which explains the concept of Biophilia and seeks to identify the Biophilic design patterns that were employed in the design of the Falling Water House by Frank Lloyd Wright, 1936-1939. Data used for this research paper were sourced from secondary data; books, articles, photographs and architectural magazines to get detailed knowledge about the building of interest. The research have identified13 patterns of Biophilic design in the falling water house and have expressed in details how it has been used with each of the spaces having a minimum of four (4) identified patterns, the result have also showed that 68% is the nature of the space pattern while natural analogues pattern and nature of the space patterns had 16% respectively. Biophilic designs should be seen as a tradition for contemporary architects to design built spaces, the habitat we create for ourselves should be able to meet our physical, social and psychological needs having less impact on our health and the environment thus, creating a sustainable built environment.

Keywords: *Biophilia, Biophilic design, Falling water, Indoor Space, Nature, Wellbeing.*

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I. Introduction

Several authors have indicated that about 80-90% of our daily lives are spent in built spaces either homes, schools, workspaces, churches etc. (Vats, 2017; Klepeis et al., 2001) but our human nature have always longed for the natural environment to get comfortable. Have you ever wondered why when asked of somewhere soothing, relaxing, calming, and inspiring you happen to think about the natural environment or features? You want to swim or be seated close to a water body, you think of a park or merely taking a walk where you can breathe the earth and feel the subtle effect of air on your skin. These are indications that nature has remained a crucial part of human existence. Evolutionary accounts has it that for vast majority of human existence, certain features of the natural landscape provided the basic resources necessary for individual and group survival chief among them; water, shelter, sunlight, animals, food, building materials, vista and fire (Grinde and Patil, 2009; Taylor, 2007). Frank Lloyd Wright seemed to be well informed about the importance of nature so he took clues from the natural environment in his design of the Falling water which till today continued to welcome millions of visitors across the globe.

The Concept of Biophilia

Biophilia is a word first coined by a German psychologist Eric Fromm in 1964, which simply means the love of life. It is an idea that humans possess an innate tendency to affiliate with nature and other forms of life. Biophilia was later popularised by American biologist Edward O. Wilson in his book 'Biophilia' in 1984 which asserts that the tendency of humans to affiliate with nature and other forms of life is evolutionary. The Early Man found shelter in caves, and depended on the natural environment for survival by hunting and gathering and as a result our developments have been interwoven with natural properties and landscapes. Despite the fact that industrial revolution and technology have brought a shift towards urbanization and drawn a dividing line between the natural world and built environment, surrounding ourselves with nature or elements and sensations that reminds us of being in the natural environment can affect our lives optimistically. "*The concept of Biophilia implies that humans hold a biological need for the connection with nature on physical, mental, and social levels and this connection affects our personal wellbeing, productivity, and social relationships"* (Sheeps Meadow, 2004 in Terrapin 2012). It explains why volcanic eruption instils fear but yet

seems beautiful, why shadows and height instil fascination and fear and why a view of nature can improve healing, creativity and performance.

Up till date, Biophilia have become a topic that is given so much attention by researchers in cross disciplinary field, such as Architecture, Medicines, landscape design, psychology, genetics, biology and evolutionary science to ascertain the practicability and limitations of the concept.

Evidence of Biophilia

Researches have proved that connecting humans back to nature can be through physical contact, simulations or simply creating notions about nature. Kellert et al (2005) recognised three (3) means by which contact with nature can be created; it could

- Direct; this involves a person's direct experience with the natural environment, examples would include walking through a forest, climbing a mountain, fishing and swimming.
- Indirect: this entails human involvement with the natural environment in a controlled form such as viewing aquatic life in an aquarium or gardening.
- Symbolic: this does not require any physical contact with nature, it is simply symbolic, like arts and illustrations, photographs.

There are scientific evidences indicating the influences contact with nature have on our wellbeing: some of which include

- Attention and Restoration.
- Stress reduction.
- Improved productivity and cognitive performance.

Attention and restorative theory

The attention and restorative theory (ART) asserts that having an experience with nature avails us the opportunity to improve our focus and state of the mind. This theory was propounded by Stephen and Rachael Kaplan, They hypothesized that mental fatigue and concentration can be improved by giving attention to natural settings (Kaplan 1989, 1995). According to Kaplan (2006) for an environment to be restorative, the following components must exist: Being away, Soft fascination, Extent and Compatibility.

- Being Away: This is achieved by providing a setting that is different from ones current settings. Being Away psychologically disconnects you from your environments which have had your attention thoughts or concerns.
- Fascination: This is an aspect of environmental setting that engages the attention easily thereby causing relieve from fatigue. There are two kinds of fascination
    1. Hard Fascination: This occurs when your attention is carried away by setting such that you cannot reflect or brood.
    2. Soft Fascination: this engages your attention in a less stimulating way and permits reflection and self-analysis.
- Extent: a setting that provides an opportunity to be entangled in the environment and engage the mind, the environment must be comfortable and familiar in other for it to be restoration.
- Compatibility: Environment must be such that individuals will easily interact with and appreciate, for an environment to be restorative it must be one which is of interest, preferred and the choice of an individual.

Conclusively, the Attention Restorative Theory have found strong evidence in improving Mental Fatigue, Stress Recovery and treating children with Attention-Deficit Hyperactivity disorder (Ackerman, 2018; R.Berto 2014).

Stress reduction theory

This theory was put forward by R. Ulrich in 1991(Wolf, K.L etal 2014) and it states that looking at scenery containing natural elements like greenery or water creates positive emotions and feelings like interest, pleasure, calmness and has restorative effect, easing our state of alertness following a stressful situation. This theory has been confirmed by numerous studies conducted on people in hospitals, prisons, offices, residents and schools and proved to have reduced blood pressure, heart rate and stress just by creating a visual connection with nature. Psycho evolutionary theory have also explained how looking at a savannah type forest could inspire relative calmness, create positive emotions and distract human from the sources of stress (Kellert 1993, Eloise S.P 2019). this is because of our evolutionary past where savannah forest provided most of the needed resources for human survival such as; water, grassy ground cover, canopy trees, caves and rocks which served as a place of refuge and vantage, a rich diversity of plants and animal diversities which served as food and it gave visual depth which allowed them detect danger and predators from afar.

The affiliation and cognitive performance of man in this environment is an evident of the strong bond between the human race and other forms of life.

A study carried out by Rogers Ulrich and Lunden O on 160 hospital patients recovering from heart surgery shows their reactions to different wall arts. The patients were kept in rooms with abstract art works and arts containing natural scenes like water and trees and he discovered that the Patients in the rooms with arts of natural scenes had less pain medications and anxiety as compare to those in rooms with abstract wall arts that got distressed and almost destroyed the piece of art (Ulrich, 1991).

A study in Sweden compared student's classes with windows and those that study under artificial light; result showed that student in the artificial lighted classroom had a higher stress level because they produced less of the cortisol hormone that deals with stress (Rikard and Carin, 1992).

Another study carried out at Harvard School of Public Health and the state university of New York upstate medical University found out that those working in green-certified buildings had 26% higher cognitive function; 73% higher crisis-response scores, 44% higher applied activity level and 38% higher focus as compared to those in same building category but not green-certified (WorldGBC, 2016).

Improved productivity:

A lot of research evidences have recently backed up the benefit of bringing the natural environment into workspaces as little as bringing a motif or an artwork of natural scenery can enhance the productivity of the workforce. Most part of the day office workers spend a lot of their time in front of a computer or have their eyes fixed on office papers, in the course of viewing this at a close range the eye lens becomes rounded with the contracting of the eye muscles, and can cause fatigue which is manifested as headache, eyestrain or physical discomfort but just and a few minute of looking away through a window or at a wall art allows for mental breaks and helps relax the eyes and allow the lens to be flattened.

A UK study called the relative benefit of green versus lean office space compared the level of productivity of office workers who were exposed to different levels of natural contact. The result showed that the productivity level in workers that were exposed to natural greenery had increased by 15% in 3months as opposed to those that that had no exposure to natural elements (Nieuwenhuis et al., 2014).

Biophilic Design Patterns

Biophilic design is a design concept that translates the understanding of Biophilia into the built environment in order to provide the much needed connection man has with nature and in turn improves wellbeing. Studies have proven that Biophilic design can reduce stress, speed up natural healing processes, improve cognitive functions and performance, and so much attention must be given to be able to harness these natural benefits. For decades now research scientist and designers have been working on models in which Biophilia can be integrated into the building successfully, Terrapin Bright Green llc. have identified 14 patterns of Biophilic design which has been grouped into three major categories below (Browninig et al., 2014).

Nature in the Space Pattern:

This takes into account direct contact and physical presence of nature in a space such as sunlight, air flow, aquarium, sound, animals, and plants. This sensory connection can be achieved via

- **Visual connection with nature:** creating views to natural elements, living systems and natural processes such as providing windows with a garden view, flower beds, courtyard and green roofs.
- **Non-visual connection with nature**: This can be achieved by paying attention to texture and using naturally occurring materials like wood or programming a space to mirror something that exist in nature such as a bee hive.
- **Non-rhythmic sensory stimuli**: a random and short-lived unpredicted connection with nature such a water ripple, and motion of leaves can affect our inherent nature to connect with nature, these are movements that cannot be predicted but can later be analysed.
- **Thermal and airflow variability:** The principle suggests that people want to feel refreshed and have that subtle feeling of the changing environmental condition.
- **Presence of water:** A condition that enhances the ability to hear, see and especially touch water.
- **Dynamic and Diffuse light:** This tenet leverages on the use of light to connect us to the natural rhythms of daylight.
- **Connection with natural systems:** An awareness of the seasons and environmental changes that reminds us of the characteristics of a healthy ecosystem.

Natural Analogues Patterns:

This focuses on organic non-living and implied element of nature in a space. It is the natural representation of colours, textures, shapes, ageing processes and materials found in natural processes.

- **Biomorphic forms and patterns:** This often appears as fractals or symbolic representation of the lines, patterns, textures or numerical arrangements found in nature.

- **Material connection with nature:** using materials and textures that depict the regional geography or reflects the native ecology to create a sense of connection and place
- **Complexity and order:** Using the hierarchies, symmetry and geometry found in nature in designing spaces.

Nature of the Space Patterns:
This looks at the design of the built world around us and how we relate to them.

- **Prospect:** These incorporate views of the environment over a long distance, it could include an addition of balconies, skylights, mezzanine levels, glass transparent walls to provide an unimpeded view of the environment and space.
- **Refuge:** Refuge prioritizes the need for safety as it provides views to the environment but from a protected position.
- **Mystery**: The idea of mystery is to engage the senses and compel inquisition.
- **Risk/ peril:** The thrill of danger from an identified threat coupled with a reliable safeguard

II. Methodology

This review explored secondary methods for data collection which entails a study of existing literatures and research related to Biophilia and the falling water house. A thorough literature search was conducted online to identify relevant studies that have been published on Biophilia, Biophilic design, The Falling water House, Nature and Built spaces. Videos and pictures from the falling water house were also sourced for; this became particularly useful as it provided a deeper level of understanding and visual evaluation of the case. The literature described the context while the pictures showed pictorial details for better understanding and analysis. The Review paper analysed individual spaces, identified the Biophilic patterns in the Falling Water House and also provided supporting images for visual presentation and comprehension. Data collated from these secondary sources are analysed qualitatively and results presented through Tables and charts to further clarify in details each of the approaches used.

Study Variable

The 14 patterns of Biophilic design as highlighted by Terrapin Bright Green llc. is adopted in this study as a benchmark for measuring the expressions of Frank Lloyd Wright in the falling water house. These variables are grouped into three major categories

- **Nature in the space pattern.**
- **Natural analogues pattern.**
- **Nature of the space pattern**

III. Discussion/ Results

This section gives a summary of the falling water house describing in details, with photographs, the Biophilic patterns prominent and how they were successfully implemented.

Exploring the Falling water House

The Falling water house is a masterpiece constructed from 1936-1938 as a holiday home for the Kaufmann family of Pittsburgh, Pennsylvania, United State. This three level building is a unique displayed through design, the harmony between man and nature. Falling water as the name implies was constructed on a rock with a waterfall and had walls built with locally sourced Pottsville sandstone and reinforced concrete. A ledge rock on the site protruding through the living room was untouched to allow user have a feel of the outdoor element inside. The architect created an exterior that matched perfectly, the surrounding environment with the use of materials and colours that harmonised with the natural landscape. The lower part of the house was built with rocks within the site to give an impression of the building growing from the natural rock it sits on, while the upper parts of the building had a cream colour that created a contrast from the surrounding forest colours just as the architect mentioned "a building should grace its environment rather than disgrace it". The two level cantilevered living room extending up to the waterfall gave a good view of the surrounding environment and had a staircase running down to meet the ever flowing stream which had a space that connects the guest house to the main house and service quarters. The building Walls were constructed from locally sourced stones and terraces made to resemble rock formation patterns within the environment. The slab of long layered floor reflects the stone patterns in the waterfall outside while the tan paint colour reflected the dry rhododendron leaves surrounding the home.

Figure 3.1 FRANK LLOYD WRIGHT FALLING WATERS
Source: Western Pennsylvania Conservancy (1964)

Frank Lloyd wright had designed this home in a way that the terraces, balconies, kitchen and dining areas all had different views of nature and the building had a sense of the place. Inasmuch as the client wanted a building that will celebrate the landscape of his favourite country hideaway in an innovative way, Frank Lloyd Wright wanted the Kaufmanns family to live with the waterfall as an integral part of their lives.

Recognitions / awards
Today falling waters is used as a museum surrounded by 5,100 acre of natural land referred to as Bear Run Nature Reserve.

- It is also a UNESCO world heritage site (2015).
- It is designated as a National Historic landmark and Commonwealth of Pennsylvania Treasure
- It is the best all time work of American Architecture by the America institute of Architects (AIA)
- It is listed among the smithsonia's 28 places to see before you die.

Biophilic patterns identified.

The 14 patterns of Biophilic design adopted for this study as a benchmark for measuring the expressions of Frank Lloyd Wright in the falling water house are listed on Table 3.1. They are also grouped into three major categories, namely;

- *Nature in the space pattern.*
- *Natural analogues pattern.*
- *Nature of the space pattern*

Table 3.1showing different Biophilic patterns and their presence in the design

NATURE IN THE SPACE PATTERN		
Pattern 1	Visual connection with nature	Present in design
Pattern 2	Non visual connection with nature	Present in design
Pattern 3	Non-Rhythmic sensory stimuli	Present in design
Pattern 4	Access to thermal and Airflow variability	Present in design
Pattern 5	Presence of water	Present in design
Pattern 6	Dynamic and diffuse light	Present in design
Pattern 7	Connection with natural systems	Present in design
NATURAL ANALOGUES PATTERN		
Pattern 8	Biomorphic forms and patterns	Present in design
Pattern 9	Material connection with nature	Present in design
Pattern 10	Complexity and order	Present in design
NATURE OF THE SPACE PATTERN		
Pattern 11	Prospect	Present in design
Pattern 12	Refuge	Present in design
pattern 13	Mystery	Present in design
Pattern 14	Risk/Peril	Not present in design

The living room space:
The living Room features continuous glazed window for visual continuity and prospect creating pattern 1 (visual connection with nature). Walls and floor were finished with cut stones from rocks, which connects to the rocks within the site and the furnitures were made of wood. By this, Pattern 9 on our benchmark table 3.1 (material connection with nature) is identified. The boulder rock left untouched at the fire place and house plants brought into the living room is identified to create pattern 2 (non-visual connection with nature). The space had a skylight from the ceiling which is identified as pattern 6 (dynamic and diffuse light) A total of Five(5) patterns of Biophilic design have been identified within the space and summarised in Table 3.2.

Figure 3.2 Living Room interior

Figure 3.3 Living room showing the boulder and fire place.

Living room

Table 3.2showing different Biophilic patterns as expressed in the living room

BIOPHILIC PATTERNS IDENTIFIED		EXPRESSIONS
P1	Visual connection with nature	The use of continues glazed windows and doors created a visual connection with nature.
P6	Dynamic and diffuse light	Use of skylight in the living room space allowed for a different level of light penetration
P2	Non-visual connection with nature	House plants were brought into the space and a boulder rock was allowed to protrude through the space.
P8	Biomorphic forms and patterns	Concrete and river stone were used for flooring to mimic the natural floor pattern seen within the waterfall.
P9	Material connection with nature	The use of wood, bricks and natural sourced stones for finishing

Bedroom space:
Connections to nature in the bedrooms were both symbolically and indirectly as seen in Figure 3.4, an art of natural landscapes was placed on the wall which symbolically creates pattern 2 (non visual connection with Nature) while figure 3.5 used glazed window identified as pattern 1 (visual connection with nature) the presence of water can also be seen and felt from the space identified as pattern 5 on our benchmark table 3.1. Use of wood and natural stones as finishes created pattern 9 (material connection with nature. Four (4) Biophilic patterns have been identified within this space as shown on Table 3.3.

Figure 3.4 Bedroom interior

Figure 3.5 Bedroom interior

Table 3.3 showing different Biophilic patterns as expressed in the Bedroom

BIOPHILIC PATTERNS IDENTIFIED		EXPRESSIONS
P1	Visual connection with nature	The use of continues glazed windows to give a view of the natural environment.
P2	Non-visual connection with nature	Expressed through the use of arts that depicted nature, bird songs, scents of flowers.
P5	Presence of water	The sound of the ever flowing stream which can also be seen through the window seeks to connect occupants to nature.
P9	Material connection with nature	The use of wood for furnitures and natural stones for wall and floor finishes

Stair hall space:

The flowing stream can be seen and accessed from the staircase on the first floor as pictured in figure 3.6 and figure 3.7, this creates patterns 1 (visual connection with nature and pattern 2 (non visual connection with nature) from our benchmark table. Daylight filters into the space through the skylight identified as pattern 1. The effect of air on water and green can be seen from the stair hall and the cool breeze blowing across the water body felt. By these patterns 3, 4 and 5 on our benchmark table is identified. Five (5) patterns is identified within the space as showed in table 3.4.

Figure 3.6 stair hall

Figure 3.7 Stair hall, Exterior view

Stair hall space:

Table 3.4 showing different Biophilic patterns as expressed in the stair hall

BIOPHILIC PATTERNS IDENTIFIED		EXPRESSIONS
P1	Visual connection with nature	The use of glass door at the exit from the first floor to give a view of the stream and green landscape from the interior. Roof light were also used to allow a good view of the sky.
P2	Non-visual connection with nature	The provision of staircase that led to the outside where the stream and waterfall can be seen and felt.
P5	Presence of water	The sound of the ever flowing stream could be heard from the building and also accessed through the staircase on the 1st floor.
P3	Non rhythmic sensory stimuli	The cool breeze that blows across the water body can be felt in the stair hall.
P4	Thermal airflow variability	The gentle and intense movement of trees resulting from the movement of air across the beautiful landscape is visible.

Access ways:

Access ways to the building site are defined by rows of trees with branches connecting each other to form canopies; this provides variability in the light and thermal intensity, identified as pattern 4. The sound of moving trees and flying birds creates Non Rhythmic sensory stimuli identified as pattern 3 while the trees cast shadows and let different degrees of light rays pass through its branches at different times of the day and seasons, this feature is identified as pattern 6 (dynamic and diffuse light) on our benchmark table 3.1. An element of mystery is seen at the main entrance where one cannot just find the falling water house at a glance, this creates visual intrigue as pictured in figure 3.8 and figure3.9 and is identified as pattern 13 (mystery). Four (4) Biophilic patterns have been identified within this space, see table 3.5

Figure 3.8 Walkway

Figure 3.9 Access

Access ways:

Table 3.5 showing different Biophilic patterns as expressed in the Site access road

BIOPHILIC PATTERNS IDENTIFIED		EXPRESSIONS
P13	Mystery	Elements of mystery is found at the entrance to the site where one cannot just locate the building at a glance thereby creating visual intrigue.
P4	Thermal and airflow variability	Walking through the shades made by trees allows for a feel of difference degrees of thermal comfort and airflow at difference times.
P3	Non rhythmic sensory stimuli	The sound of air movements on trees and green grasses.
P6	Dynamic and diffuse light	Interplay of shadows and light cast by trees at different times of the day.

Exterior and Balcony

The Balcony and Exterior gives an intimate view of nature and focuses attention to different Biophilic patterns on the site. From the balcony one have a distant view of the surroundings, this is referred to as Prospect identified as pattern 11 on our benchmark table 3.1. The difference in airflow and thermal variability can be felt and seen on the trees and landscape, this is identified as patterns 3 (Non rhythmic sensory Stimuli) and 4 (Airflow and thermal Variability). The use of steel frames on the exterior serves as a barrier where one can feel safe and protected; this is biophilic pattern 12 identified as Refuge.

The Exterior view of falling water house is orderly arranged to mimic the formation of rock stratas, this is identified as pattern 10 (complexity and order) and can also be seen when shadows are formed from the two pergolas designed to form an arc around a tree trunk. A connection with natural systems is formed at the terraces where the changing weather conditions can be felt. Six (6) biophilic patterns is identified within the exterior spaces and is summarised in table 3.6

Figure 3.10 Exterior view

Figure 3.11 Exterior balcony.

Exterior and Balcony

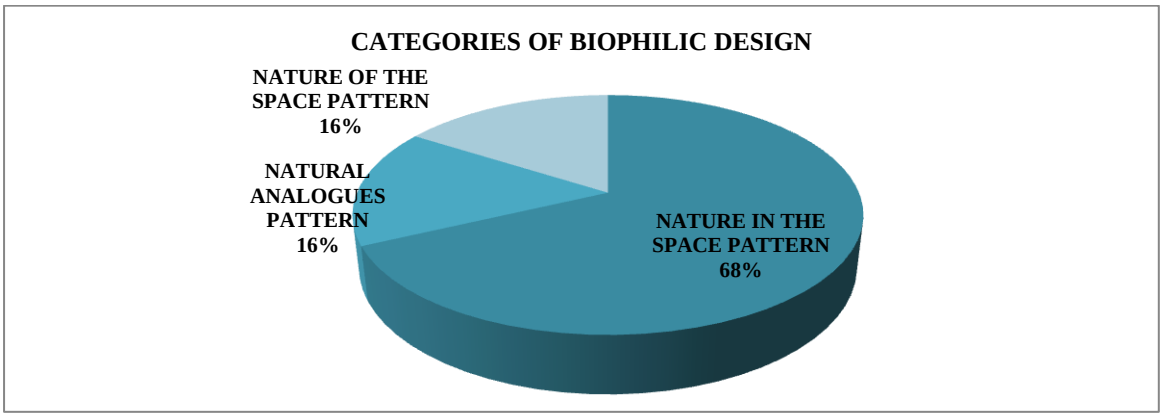
Table 3.6 showing different Biophilic patterns as expressed in the exterior balcony

BIOPHILIC PATTERNS IDENTIFIED		EXPRESSIONS
P11	Prospect	Expressed through the use of balcony and continues window to give a good view of the environment across a distance.
P4	Thermal and airflow Variability	The use of terraces at different angles of the building gives different feel at a time.
P3	Non rhythmic sensory stimuli	The sound of air movements on trees and green grasses, sounds of birds can be heard across the site.
P7	Connection with natural systems	The changing weather conditions can be felt at the terraces.
P12	Refuge	The use of steel window frames act like a barrier where one can see the outside from an interior space. Refuge can also be seen to be expressed in the use of relatively low ceiling across the house.
P10	Complexity and order	The orderly arrangement of the building to the mimic the formation of rock stratas. This can also be seen when the two pergolas that form an arc which goes around the trunk of the tree cast shadows that look like those of the tree trunk.

Table 3.7 Summarises the Biophilic patterns identified within all of the spaces.

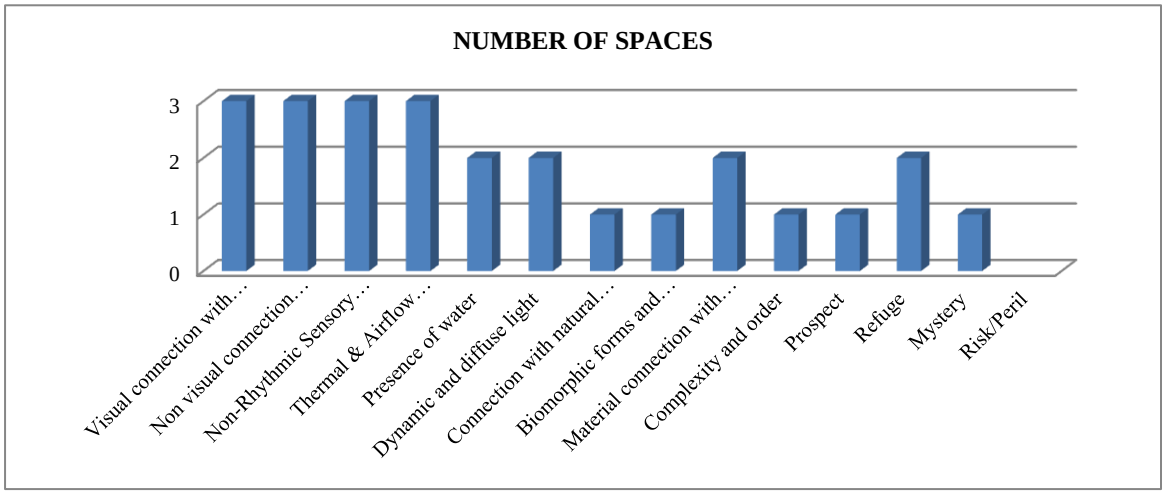
Categories	Biophilic Patterns	Living Room	Bedroom	Stairs	Access ways	Exterior/ Balconies
NATURE IN THE SPACE PATTERN	Non-Visual Connection with nature					
	Visual Connection with nature					
	Thermal and airflow variability					
	Presence of water					
	Dynamic and diffused light					
	Non-Rhythmic sensory stimuli					
	Connection with Natural Systems					
NATURAL ANALOGUES PATTERN	Biomorphic forms and patterns					
	Material connection with nature					
	Complexity and order					
NATURE OF THE SPACE PATTERN	Prospect					
	Refuge					
	Mystery					
	Risk/Peril					

Figure 3.12.showing the percentage of the three categories of Biophilic design pattern as used in the Falling water House.



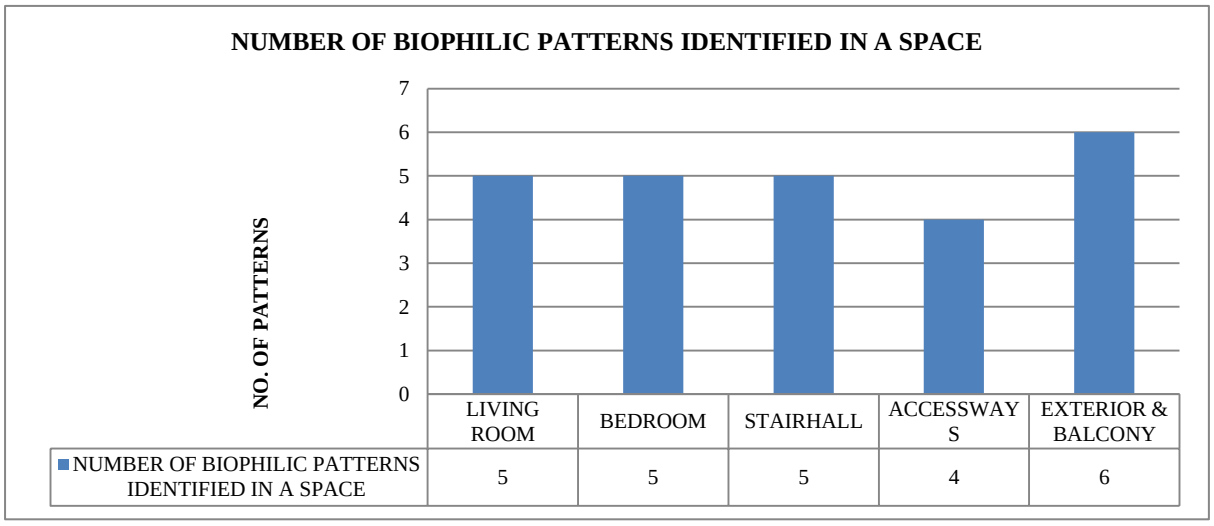
Based on the data collated in table 3.7 above, the result as shown in figure 3.12 has 68% of the Nature in the space pattern used in the falling water house while natural analogues pattern and nature of the space had 16% each. This means that Frank Lloyd Wright harnessed the potentials of nature within the environment efficiently.

Figure 3.13 showing the number of spaces that had the presence of each of the 14 Biophilic patterns in The Falling water House.



Based on the data collated in table 3.7, figure 3.13 have showed that four (4) patterns were evident each in 3 spaces, four patterns were repeated twice(2) in the building while five patterns appeared only once in falling water house.

Figure 3.13 showing the number of patterns identified within a space



Above: from the data collated in table 3.7, five (5) patterns are prominent in the Living room, Bedroom and Stair hall while four (4) patterns were seen in the access ways and six (6) within the exterior space and Balcony.

IV. CONCLUSION AND RECOMMENDATION

Based on the 14 patterns of Biophilic design enumerated, it is concluded that The Falling Water House conforms to the principles of Biophilic design. 13 patterns are identified in this building and every of the spaces created a connection to nature either directly or indirectly. Frank Lloyd Wright understood that people were creatures of nature and designed falling waters such that it is so intertwined with nature that it entertains over 5 million visitors every year; that is because people want to see, interact and experience nature in a built space. Living in a building as such can improve health and wellbeing; it can reduce stress, improve cognitive function

and attention; improve mental fatigue, productivity and creativity and overall, make you feel good. So then we must make it a priority to incorporate Biophilic design elements into our buildings.

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