



## Biophilia and Built Environment: An Implication for Healthcare Facilities

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**ABSTRACT:** The affiliation of the human to the nature and natural environment is innate and genetic hence it has a strong correlation to the human wellbeing and quality of life. This inherent affiliation towards nature has been coined as Biophilia. The Biophilia largely focuses on the growing need of human interaction with nature, nature like elements and natural environment in and around the built form for improving the human wellbeing through realization of happy, productive and meaningful lives. The Biophilic design can also provide physical opportunities offered through its design considerations in realization of the sustainable built form and environment. The recent realization of the benefits of Biophilia as a design co-conspirator among architects and designers, however need more attention. There is an urgent need for the incorporation of the design approach inspired from nature to provide a framework for built environments in the future. This paper accentuate the implication of Biophilia in the design of the built and unbuilt environments in and around the healthcare facilities which is inspired by nature and have emotional and functional relation to nature. The paper also highlights need for the integration of building design considerations and laws of the natural world with cutting edge technology for the user friendly and sustainable environment in healthcare facilities to yield better health outcomes and faster recovery.

**Key Words:** Biophilia, Biophilic Design, Built Environment, Built Form, Healthcare Facilities, Human Wellbeing

### I. INTRODUCTION

The man has always been a nature lover since the beginning, and Biophilia is the attempt made by man to replicate or introduce nature and its various forms in the built environment. Although its likelihood is not supported by a lot of evidences but the recent scientific researches highlight that our inherent ability to exercise nature is due to its noticeable effects on the human psychological and physiological health. This is also evident from the preferences of the construction & design industry to integrate nature into the built environment or building in and around nature. For example, we can observe, how the apartments with bountiful views of nature and lush greens are sought out for, why a walk in the park can be restorative, and the garden can inspire our creativity. The reason though not limited to, is elemental connection to nature. This caves a way for opportunities of living and working in healthier places and spaces with an overall outlook

reconnecting with nature.

Healthcare institutions have been ruled with strict protocols and regulations which often annihilate the need for the patient to look beyond the medicinal and surgical procedures and opt for better, healthier environment for longer lasting results. The Health care facilities need to incorporate the therapeutics of medicine into a more tranquillized environment creating a place where the gesture of an extended stay is as welcoming to patients, general public as well as to the medical staffs. The introduction of Biophilia in spaces like healthcare facilities to manipulate and promote the health and wellbeing of individuals by their unconscious or subconscious response to these attempts may be the next step in healthcare architecture. For example, a window providing a view of nature may become the doorway for better health, can only be a beginning towards our understanding of Biophilia in healthcare facilities, but a thorough study is required to

implication of Biophilia in design of a better healthcare facilities.

This paper attempts at exploring and understanding the implication of Biophilia and biophilic elements in design of healthcare facilities to improve the quality of environment as well as the health and wellbeing of the users, and how benefits can be reaped in terms of users experience as well as the improvement in the quality of built environment. The paper has been divided into eight sections, first being the introduction followed by the basic concept of Biophilia and its impact on human well-being, seconded by biophilic hypothesis and human perception toward it. It is then followed by the sections highlighting the Biophilia as a design tool, its relation to the healthcare facilities and some of its implications in designing of the healthcare facilities. The concluding section emphasizes the need for the incorporation of the Biophilia in achieving the goals of sustainability and quality of built environment and the scope of further researches regarding the same.

## II. BIOPHILIA AND HUMAN WELL-BEING

Biophilia is an innate human inclination to affiliate with nature, especially life and life-like features of the non-human environment, that even in the modern world continues to be critical to people's physical and mental health and well-being (Wilson 1986, Kellert and Wilson 1993, Kellert 1997, 2012). The Biophilic design at the same time is a deliberate attempt to translate an

understanding of the inherent human affinity to affiliate with natural systems and processes into the design of the built environment (Stephen R. Kellert). It has been revealed by various studies, that human beings are deeply affected, both physically and psychologically, by association with nature which is reflected through performance and wellbeing, thereby supporting the argument, that the contact with nature has a profound impact on the fitness and quality of life. The indoor built environment unconnected to the nature on the other hand, sometimes poses problems. The Humans have evolved within the savannah of nature, whereas today, the concrete modern built environment has become the "natural" territory during the contemporary era, and a majority of the population spends a large span of lifetime within this confinement without any given thought. This has huge implications to the health and wellbeing, as evident from various lifestyle and environment related diseases. The reasons among others could be lack of proper connection or contact with nature i.e. the critical environmental features that helped humans to evolve, and dominate in a sensory world through sense of light, air, water, odour, weather, vegetation, animals, and landscape.

The greater part of emotional, problem-solving, critical-thinking and constructive abilities continue to reflect skills and aptitudes learned in close association with the natural systems and processes that remain critical to human health, maturation, and productivity.



**Fig. 1.** UPMC Passavant, Pittsburgh - Bronze Award. A combination of sculpture, form, specialized planting, and lighting comes together to create a unique outdoor environment in the healing garden at UPMC Passavant.

An individual's physical and mental prosperity remains highly contingent upon contact with the natural environment, which is a necessity rather than a luxury for achieving lives of fitness and satisfaction even in our modern urban society. The benign exposure to nature is vital to human health and fitness but its integration into the built environment is highly challenging task especially when the data to support the biophilic urges of man interrelated to health, productivity and well-being is sparse and diverse. But the growing body of knowledge extensively studied by Ulrich (1984), Kellert (1993, 2008, 2015), and others can be assimilated to allow a base for further research.



**Fig. 2.** Do We Really Need Nature? (Sharon Begley 2015) "Perhaps some of the benefits from "nature" have less to do with our supposed affinity for the living world than with simple peace and quiet or getting away from the daily grind."

### III. BIOPHILIAN HYPOTHESIS AND HUMAN PERSPECTIVE

The Biophilian hypothesis suggests that humans need to connect to the living structure in environment, not merely based on simple liking or aesthetics value but also physical requirement quite unlike the need for food, water and air. The importance of biophilic effects can be proven with each step taken to create an environment that nourishes. Biophilia is not limited to introducing living beings and features into the living spaces; rather quite a lot of other factors also come into play. The design/aesthetics of the building, appreciation of the building come in through various other factors such as inclusion of human health oriented design.

The human perception of the built environments is based on the ability to interpret adjacent environmental forces that affect in bodily senses. The rich life experiences are mostly dire to underlying memories;

association of dampness with a smell, perceived dimensions through echoes, and seeing light with shadow. The human perception relies as much on the knowledge stored in our memories as it does on the fresh incoming sensory information and hence it is important to understand the impact spaces have on people, since the built environment has certain effects on the user's behaviour.

The actual contact with environmental features in the built environment includes natural light, water, animals, and landscapes and furthermore, is termed as direct experience. The indirect experience of nature is through representations or images of nature, the transformation of nature from its actual form, the experience to certain forms and procedures found in the natural world. And third is the experience of space and place, which is spatial features that characterize the natural world.



**Fig. 3.** Google's Office Lounge, Dublin.

### IV. BIOPHILIA AS DESIGN TOOLS

The consideration of the biophilic approach mandates the realization of the biophilic design elements that affects different scales of the built environment, from the macro level in creating green networks within urban design schemes to the micro details of providing natural light to interior spaces for human comfort. The experience of nature at a variety of scales is important to ensure a continued sense of connection with nature in an urban environment. The incorporation of the Biophilia attributes into design tools or element to consciously affect the behaviour hence require the 'inbuilt memory' (from evolution and development) and the human perception to be strategically manipulated (through visual and non-visual encounters) to drive performance in the built environment.

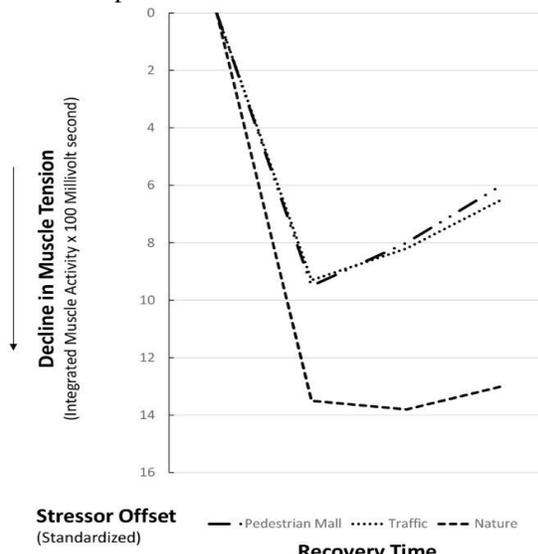
Lewis Mumford said, *'the building must... fit its site, harmonize with or stand out from its neighbours, fulfil its own function as a shelter, a work-place, or a play-place, and give a special pleasure to everyone who passes it or enters it'* (Roth, 1993).



**Fig. 4.** Waiting area with green wall, Visual connection to Nature.

**V. BIOPHILIA AND HEALTHCARE FACILITIES**

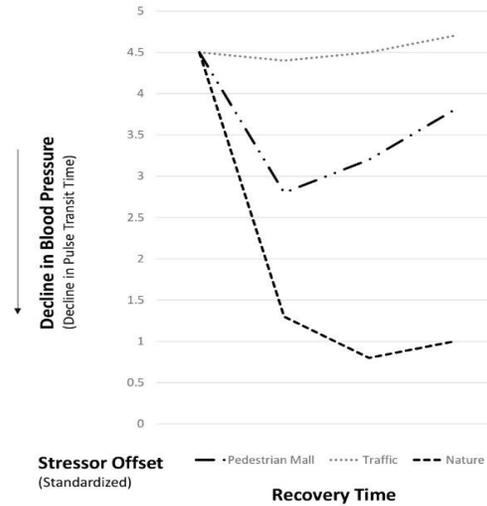
The various studies conducted by Ulrich (1993, 2008); Kellert and Heerwagen (2007); Wells and Rollings (2012) among others, to improve the healthcare environment reveals that designs which promote extended exposure to nature result in, accelerated recovery rates, with lower blood pressure, and reduction in consumption of morphine (pain reliever) along with augmented staff performance and morale, resulting in better work environments. And although our reactions may innately atrophy over time, this has shown some promise



**Fig. 5.** The effect of nature on muscle tension of patients when compared with views of Pedestrian mall and traffic.

The healthcare industry in the past decade has seen a surge of research directed towards this way, not just medically, but also to inform the design of better

healing environments in a healthcare facility.



**Fig. 6.** The effect of nature on blood pressure of patients when compared with views of Pedestrian mall and traffic.

A large number of studies have been conducted to understand biophilic affiliations to a healthcare setting on its users through the elements of daylight, views and non-threatening distractions, etc. These studies have used health outcomes to evaluate the interventions done during the course of the study by observing signs and symptoms of patients. For example, the observation of intake of pain relieving drugs and duration of stay at the hospitals; satisfaction and health related quality of life and staff satisfaction to safety outcomes such as medical failures; and errors to economic outcomes such as cost of patient care, staff turnover and recruitment costs, revenue from patients choice of the facility.

Healthcare providers are under a great deal of pressure to focus on controlling the costs while increasing the quality of care while at the same time focus on adding new key, skilled staff. Upon comparison of the facilities with biophilic interventions to those without these benefits, results reveal actual benefits and cost reduction in the former case. The structure of these buildings triggers healing effect in the body, which the person consequently wishes to experience as much as possible, though the response varies with different user categories and the attributes of designed environment. The application of Biophilia into the designing of various spaces in a healthcare facility also has varied implication on different users. For example, a garden for patients recovering from surgery may decrease anxiety and stress levels, decrease hospital stay and increase recovery rates and satisfaction from the patient itself, whereas the same garden for terminal patients, may focus on improving the quality of living, reducing

family stress, depression and pains etc. In comparison to patients the same garden for the staffs could boost morale and work efficiency by decreasing work stress, rate of absenteeism, etc.



**Fig. 7.** Smilow Cancer Hospital - Yale New Haven Children's Hospital.

## VI. SOME IMPLICATIONS OF BIOPHILIA FOR DESIGNING HEALTHCARE FACILITIES

The experiences of Biophilia in built form especially the healthcare facilities can be evidently found in the works of Kellert (2008) as elements or as patterns described by William Browning and his associates (2014), etc. The core concept of Biophilia i.e. association of human being to nature could be applied into the designing of built form and environment using the elements and patterns through various permutations and combinations to obtain desired results and reap benefits. The benefits at the same time could only be realized fully by integration of biophilic concepts and design elements in the initial stages of designs; hence there is a need for a set of guidelines or design considerations for the implementation of the same. Some of the biophilic attempts and design considerations for improvement in quality of space and environment of the healthcare facilities have been summarized as follows:

**Views & Windows.** Areas dedicated for sitting should have large windows with views of nature, especially areas where the environment is stressful like emergency rooms, waiting areas and staff rooms. Biophilic considerations point to desiring rooms for bedridden patient with the toilet along the hallway or corridor allowing larger exterior windows for views of nature. These nature views should be well thought out with credible research in decreasing stress and aiding in the healing process. Savannah-like characteristics should be

proposed guiding the viewer through visual depths and grassy under cover, along with birds and unthreatening wild life. Views like hardscapes, parking lots and roads with heavy traffic should be avoided to prevent stress. Healthcare buildings should be oriented to get maximum sun to ensure that depressed patients have abundant natural light but windows should be provided to prevent glare patches.



**Fig. 8.** Green Roof at the offices of Cook Fox Architects and Terrapin Bright Green, NYC.

**Plans & Layouts.** Healthcare buildings should also avoid deep plans, since the lack of sunlight would create a distressing and depressing ambience in the room, worsening the condition of the patient and deducting the staff morale.



**Fig. 9.** Sky Lobby, Burjuman Business Tower, Dubai.

**Gardens.** Healthcare facilities should include gardens for patients, family and staff. These gardens would include natural contents (vegetation, water, etc.), flexible seating for socializing, spaces allowing privacy, good way finding and opportunities for physical movement or exercise with ease of access to shaded area.

If the garden is designed for adults and staff, the space should cater to relaxing and sedentary activities, whereas if designed for kids, a separate area with play feature and a calm refuge for the adults should be provided. Decentralized gardens should be proposed in larger healthcare facilities.



**Fig. 10.** A rehabilitation courtyard for ambulation therapy provides walkways to help patients get back on their feet.

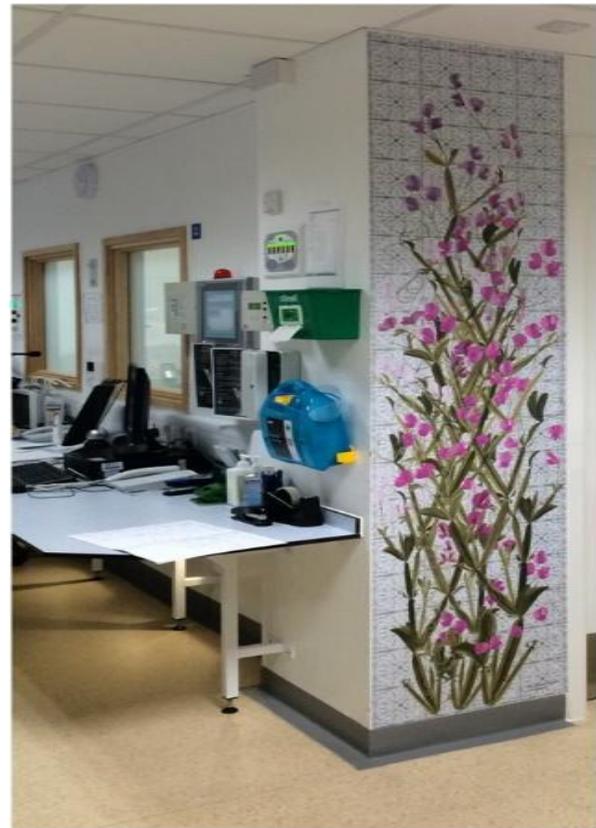


**Fig. 11.** Khoo Tech Puat Hospital, Singapore.

**Art and Technology.** Integration of biophilia can also be through visual art and technology.



**Fig. 12.** Art in a reception area is most soothing when it reflects regional sensibilities. Al Turner, DO, of Portland, Oregon, displayed photographs of a woodland scene on one wall.



**Fig. 13.** Artist Katy McIntyre Brown designs original botanical wallpapers for special units in healing facilities.

Nature represented through paintings, photographs, prints, television screens, eye glass displays, etc. can be introduced into the spaces of high stress, and in the facilities where it might be difficult to provide views or

gardens, but it may not be limited to visual context. Provision of nature simulations like sound of trees rustling, water falling and birds chirping can be alternatives in spaces such as rooms for therapies, imaging and other procedures.

## VII. THE WAY FORWARD

The growing amount of literature indicates that evidence-based biophilic design can have positive impacts catering to the emotional wellbeing, reducing the stress, and fostering better cultivating improvements in outcomes of health care facilities. This could be another direction medical and healthcare facilities may take to improving the quality of services provided along with the advancement in the medical technologies. The Design should seek to create an excellent habitat for people in the modern built environment as the biological organism that advances people's health, fitness and well-being. In a healthcare facility, patients and other users can be influenced by the experience of nature by both physical active and passive contacts such as horticulture therapy (Wichrowski *et al.* 2005), sitting and talking in a garden or by simply looking at nature through a window (Ulrich 1999).

The challenge of introducing Biophilia in our built environment as highlighted by Kellert *et al.* (2008, 2003); Kellert and Finnegan (2011); Browning *et al.* (2014) is to address the deficiencies of the contemporary building and landscapes practices by establishing a new structure for the satisfying experience of nature in the built environment. The designers should appreciate and appeal to benefits offered, both aesthetical and literal, to the healing environment by Biophilia, and this could be the way forward in a future of sustainable and green conscious designs. Hence through the collaboration of nature (Biophilian hypothesis) and human perception, the designer should create spaces that yield a better compatibility between the user and the built environment, a new dimension towards space design and the desired output/ performance of said space. This collaboration can be used in designs of healthcare facilities to provide a healthy environment and to manipulate and decrease the duration of patients stay, while at the same time also reducing the need for a person to go to a hospital in the first place.

There is an urgent need to focus on combining and incorporating the Biophilian hypothesis and biophilic elements in design of building especially the healthcare facilities to enhance the health, wellbeing and quality of life of the users on one hand, and improving the building performance and sustainability on the other.

These is a need to focus on "how do architect's design buildings for future change", "how do they avoid compromising culture, the environment and human comfort"; "how can the quality of built and unbuilt environment be improved", etc. are some of the questions that need to be asked and answered for a better building model for the future.

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