

The importance of BIOPHILIC DESIGN

Advancing our physical and mental well-being

By Heather Dubbeldam

The COVID-19 pandemic has dramatically increased the importance we place on healthy homes and workplaces, at least from the perspective of infection control. While measures such as air filtration, sanitation and physical barriers deal effectively with physical risks to health, much less has been done to address the mental toll the pandemic continues to exact on individuals and society as a whole.

There has been no more critical time in modern history for architects and interior designers to reflect on how their work can create environments that promote occupant health and wellbeing.



1. Biophilic design is a human-centred approach to design that utilizes natural materials and patterns to support the physiological well-being of building occupants.

On average, Canadians spend roughly 90% of their time indoors between home and office. While we have long aspired to create healthy indoor spaces, the pandemic has highlighted how critically important it is. Over the past year we have seen a mini-exodus from cities as people seek healthier environments, more space and a reconnection with nature. City parks have confirmed their importance for urban dwellers as oases of refuge that offer green spaces and fresh air. Residential architects have been busy making homes more livable and more conducive to remote working. The crisis has also laid bare the shortcomings of social housing that has largely ignored occupant wellbeing.

While corporations have often looked at the office as a real estate transaction, fitting as many people as possible into a space, they are now looking at the workplace from a relationship perspective. With the upcoming return to the office and with work practices upended, employers will need to create workplaces that are seen as both safe and enjoyable. Businesses at the forefront of workplace design are investing in biophilic design to improve employee wellbeing and productivity, and to attract and retain the best staff.

So how can architects and designers create environments – whether residences, workspaces or institutions – that promote positive physical and mental well-being? One approach is through the incorporation of biophilic design.

Biophilic design is often confused with biophilia or biomimicry; although they are related, they are not the same:

- Biomimicry is the design and production of materials, structures, and systems that are modelled on biological entities and processes – the mimicking of nature in man-made things.

- Biophilia, meaning love of nature, focuses on humanity's innate attraction to nature and natural processes. It proposes that we have a genetic connection to the natural world built up through millennia spent living close to or immersed in nature. It explains why we feel more relaxed in a park, hiking in the woods or spending time at a lake.

- Biophilia also contributes positively to our health; research shows that regular exposure to green space and natural elements is associated with a multitude of positive neurological and physiological outcomes, including a reduction in blood pressure, diabetes and cholesterol and improved quality of sleep.



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2. The Garden Circle House. A fully integrated approach to biophilic design was adopted to 'bring nature in'.

3. Connectivity to the outdoors or to natural elements is incorporated in every part of the home. Upon entry, a direct view to the backyard is provided through a tall, narrow window on axis.

These concepts are foundational to biophilic design, which utilizes natural materials, patterns, and sensory elements to maintain a connection to nature within the built environment. This is a human-centred approach to design, integrating natural principles to support the physiological well-being of building occupants. Incorporating 'direct' or 'indirect' elements of nature into the built environment has been demonstrated to reduce stress, while supporting cognitive function, increasing productivity, creativity and self-reported rates of well-being.

'Direct' elements of nature include views to the exterior, plant material, ample natural light, and access to fresh air; 'indirect' elements include a sensory experience of the natural world achieved through spatial strategies, forms, pattern or materials.

Biophilic design is not simply about organic forms and green walls, it is a series of design techniques that are integrated into the built environment in a more subtle, but equally meaningful way. Successful biophilic designs are inspired by the qualities and features of natural settings without being exact duplicates. The means by which this is achieved varies from spatial strategies to visual cues to forms and materials used in the design.

These strategies can be grouped into three categories:

NATURE IN THE SPACE

The presence of nature in a space, visual, sensory or auditory, in the form of plants, water, breezes, scents, light, shadows, and other natural elements.

NATURAL ANALOGUES

The representational presence of nature using natural materials, colours, patterns, and shapes incorporated into building design, facade ornamentation, or decor, including images of nature, simulated natural light and air, organized complexity, and biomorphic forms and patterns.

NATURE OF THE SPACE & PLACE

The incorporation of spatial elements commonly found in nature including:

Prospect: Unimpeded views.

Refuge: Places for withdrawal in which the individual is protected from behind and overhead.

Mystery: Partially obscured views or other sensory devices that entice the individual to travel deeper into the environment, or a mild sense of risk - like stepping stones over a shallow pond or a double height space.

The following case studies illustrate these aspects of biophilic design using examples from three of our firm's projects in different sectors - residential, institutional, and commercial - to demonstrate practical applications and interventions that are not elaborate or complicated, and are possible to integrate into almost any project.



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CASE STUDIES

GARDEN CIRCLE HOUSE

This is a two-storey new build, single-family dwelling located in midtown Toronto on a modest lot with limited outdoor space. The client requested a home that would 'bring nature in' so we adopted a fully integrated approach to biophilic design.

This included strategies from all three categories of biophilic design. Due to the scale of the home, 'direct experience of nature', with convenient access to the exterior, was easier to achieve than in a larger project. Connectivity to the outdoors or to natural elements is incorporated in every part of the home, and is emphasized through multiple physical, visual and multi-sensory means - sight, sound, smell, and touch. Upon entry, a direct view to the backyard is provided through a tall, narrow window on axis, while the whole of the kitchen and living area opens out onto the landscaped backyard through floor-to-ceiling sliding doors. A strategically located window in the dining room frames an existing pear tree, its foliage casting animated plays of light and shadow, while the scent of the pear blossoms in spring and the ripe fruit in autumn filter through the window when open.

Multiple green roofs can be seen from all bedrooms providing sensory delight with lush grasses, sweet plant smells and the soothing sounds of buzzing bees collecting pollen. In addition, the lap pool and water features in the backyard work together to create a relaxing effect both audibly and visually while helping to support natural cooling from breezes when the backyard doors are open.

'Indirect experience of nature' is achieved through the character and texture of natural materials emphasized throughout, including warm wood flooring, wood cabinetry, natural stone countertops, fireplace and tiles, and clay brick. On the exterior, brick in buff and warm grey shades, natural stone, mahogany windows and cedar cladding reflect the natural surroundings. A focal point of the interior is a curved central wood staircase with open risers and a solid mahogany balustrade that emulates natural organic forms and invites the hand to run along its sculptural contours.

Light pours down from a large operable skylight, providing illumination deep into the interior. In conjunction with the open riser stairs, the operable skylight functions as a highly effective means for passive ventilation, drawing the cooler air up and venting the warmer air out. Biomorphic forms and patterns were incorporated in the stair, light fixtures and wall coverings, which include natural imagery and symbols including billowing clouds, mountain peaks and the trunks of birch trees.

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CANADIAN CENTRE FOR RURAL CREATIVITY

The CCRC is a project on the boards, an arts centre to be located in the town of Blyth, Ontario celebrating the rural tradition of the performing and textile arts. The 33,000 sq.ft centre will be the first of its kind in Canada and will accommodate many different creative programs including fashion and creative textiles, performing arts studios, a media centre and fabrication lab, a multipurpose theatre and event space, a commercial kitchen and café, a gallery, and integration with outdoor event spaces and a community garden.

The design of the CCRC reinforces the connection between inside and outside for transparency to the community and visibility of the natural surroundings. Located in a rural setting, the design emphasizes the appreciation of the natural environment and the rich rural building traditions of the region. Staggered in plan, the building maximizes daylight and access to views; setbacks and cutouts in the massing allow for views to the exterior from many angles.

In addition, the building is organized around an interior central 'road' or 'spine' serving as a circulation zone that visually and physically connects the different areas and creative disciplines within the building. This central spine is a key element in the programming of the space and the integration of biophilic design principles.

The double-height volume with a mezzanine is a conduit for natural light from above. The lofty space is also topped with operable clerestory windows that allow for ample natural ventilation using stack effect. Views from the mezzanine level both to the exterior and interior spaces allow for prospect. A tall green wall at one end provides lush greenery and a source of oxygen and cooling to the central space, distributed by the HVAC system to other spaces in the centre. The mezzanine also leads out to an expansive green roof area allowing occupants on the upper-level direct access to a natural outdoor setting with vegetation and vantage points.

The rich tradition of building with wood in this region extends back more than a century. The new building respects this with its own "barn-like" vernacular structure featuring exposed wood posts and beams, an NLT ceiling, and wood siding. On the interior, natural variation in wood slatted walls is expressed to mimic natural processes. The building volumes are comprised of wood, brick and one using reclaimed wood cladding; the creative textile program occupies this volume and in reference, the cladding is 'woven' into pattern on the façade, expressing the program within. The theatre volume features large glass doors that open up to community gardens at the rear, inviting theatre goers' direct access to green space.

6. Staggered in plan, the building maximizes daylight and access to views; setbacks and cutouts in the massing allow for views to the exterior from many angles.



- Site plan**
- | | | |
|-------------------------|----------------|-----------|
| 1 Entrance | 4 Back exit | 6 Garden |
| 2 Outdoor event area | 5 Loading area | 7 Parking |
| 3 Proposed new building | | |

5. An interior central circulation 'road' or 'spine' in the CCRC serves as a key element in the programming of the space and the integration of biophilic design principles.

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DUBBELDAM BUILDING

Occupying a corner site on St. Clair West at the edge of Corso Italia, an under-utilized three-storey building was in decline for more than a decade. With our studio occupying the top floor of the building, this project offered an opportunity to demonstrate how modest interventions can go a long way to creating a building that promotes health and creativity by employing sustainable and biophilic design elements. In addition to our studio, we also operate a coworking space for creatives on the second floor. To round out the program, the ground floor is occupied by a creative agency and an indie coffee shop, and a residential unit is located in the raised basement.

7. The Dubbeldam Building demonstrates how modest interventions can improve the ability to promote occupant health.

8. New windows in enlarged openings yield a 60 percent increase in glass area giving views of the neighbourhood, and supporting creativity and productivity.

Suggestive of the creative inhabitants working within, the two public-facing elevations activate the streetscape with a bold and playful graphic presence; painted drop shadows surrounding the windows create a three-dimensional trompe l'oeil effect to passersby, giving the illusion of light and shadow cast by the sun. The 'shadows' are cast in different directions to represent the passing of the sun at different times of the day and year.

Entering the building, occupants and visitors are welcomed by a DIY green wall on the first landing. The custom Baltic birch pegboard not only provides a directory for the businesses in the building, but doubles as a green wall populated with lush plants in fragrant cedar boxes, welcome therapy especially during the cold winter months. Staff and other building occupants have adopted various sections of the wall and "tend garden" collectively. In addition, the underside of the entry stair is painted in bold tropical colours of fuchsia pink, deep red and terra cotta to add colour and energy in the main circulation space.





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9. Entering the building, one is welcomed by a Baltic birch pegboard wall which provides a directory for the businesses in the building, and doubles as a green wall populated with lush plants.

10. In the central stair a stepped Baltic birch stringer extends for a continuous run from basement to third floor, while curved Baltic birch slats rise from the second-floor stairwell to wrap the ceiling at the third-floor entry door.

A large part of the approach to wellness in this commercial project was natural daylighting and ventilation, and the use of wood of varying types and forms. The new windows in enlarged openings yield a 60 percent increase in glass area, bringing in plentiful natural daylighting and views of the neighbourhood tree canopy, supporting both creativity and productivity. An expansive corner window cut out of the north and east façades, surrounded by catalogues and material samples on wood shelves, allows for seemingly limitless views east down St. Clair Avenue, delivering the biophilic principles of both prospect and refuge. Ample natural ventilation is provided through strategically-placed operable windows and doors.

Consistent throughout the building is its natural Scandinavian-inspired material palette of light maple floors, warm textured Baltic birch and restored original Toronto brick, contrasting with darker accents such as charcoal-grey doors and furniture. Natural woods are used generously throughout the building in feature entry walls, signage, fixtures, millwork, furniture, and flooring. In the central stair, a stepped Baltic birch stringer extends to guard height for a continuous run from basement to third floor. Curved Baltic birch slats rise from the second-floor stairwell floor to frame a full height window before wrapping up the ceiling to the third-floor entry door.



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While we all can understand and appreciate the innate need of humans to connect with nature, and perhaps even understand its benefits to well-being, incorporating biophilic design approaches has not been a focus in discussions about healthy buildings and sustainability. In light of the ongoing health crisis, we need to refocus our collective design energies in producing environments that promote overall well-being.

What is important to take away from this article is that the interventions do not need to be elaborate or expensive so much as considered and applied. As professionals we have a responsibility to improve the lives of those who will inhabit or work in the buildings we design. If not us, who? If not now, when?

HEATHER DUBBELDAM, OAA, FRAIC, LEED AP IS PRINCIPAL OF DUBBELDAM ARCHITECTURE + DESIGN AND FOUNDER OF THENEXTGREEN.CA.