Timber Tonic

How Wood and Natural Materials Can Transform Healthcare Facility Design

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More and more, science is confirming common sense and the emerging concept of biophilia: that being exposed to nature, and natural, organic materials, not only calms our mind—it can contribute to a sense of health and well-being. There is no better place to apply this than healthcare architecture and design.

For most of human history, a connection to nature was a given, with our daily lives intimately tied to the cycles of the sun, the seasons, and the natural world around us. It's only recently that we began to earn a living, go shopping, enjoy endless entertainment, and even socialize without ever leaving home. While convenient, this separation from nature may be taking a toll on our health.

While no indoor environment can replace the extraordinary experience of the natural world, research is showing that incorporating nature into the built environment—whether in the form of sunlight and fresh ventilation, plants and greenery, or organic materials, such as wood—can improve occupant comfort, reduce stress, and potentially contribute to improved health indicators.[1]

The Biology of Biophilic Design

So, it makes sense that designers are increasingly looking for ways to incorporate more natural materials into buildings, especially healthcare facilities. Often referred to as biophilic design, it makes ample use of natural daylight, views of nature, and exposed wood to create a warm, natural aesthetic that supports a healthcare's healing objectives.

Timber construction and design can play an important role in biophilic design, whether it's as structural elements or interior finishes. Dr. David Fell, research leader at FPInnovations, has studied the positive impacts of incorporating wood into the design of buildings.

"The psycho-physiological reactions of human beings to wood are based on two major systems of reaction to stress, namely the autonomic nervous system and the endocrine system. One particular research project on the response of the autonomic nervous system to wood observed lower levels of blood pressure, heart rate in an environment where wood is present, compared with one where it is absent," according to Fell.[2]

He goes on to explain, "the main stress hormone that is of concern to us is cortisol. In two separate studies, cortisol levels were lower in people who had visual contact with wood in an indoor test environment."[3]

While it's early days and more research with larger sample sizes is needed, the results look promising. As Fell sees it, research is catching up to what architects seem to have known intuitively for decades.

BOLD BIOPHILIC DESIGN | Designers are increasingly seeing the biophilic benefits of wood in healthcare environments. Patients and visitors to the Surrey Memorial Hospital's emergency department are greeted by bold glulam timber columns, that give warmth to this large institutional space. [Photo courtesy of CEI Architecture and Parkin Architects | Photographer: Ed White Photographics]

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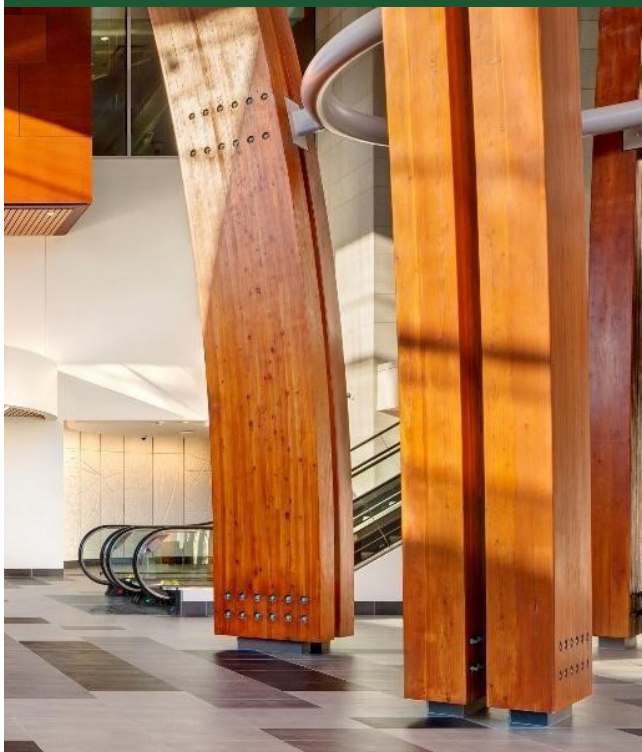
What is Biophilia?

"Since the earliest civilizations, nature served as humans' natural habitat, providing shelter, food, and remedies. Fast forward to modern days, the industrial and technological revolutions took over, reshaping the way humans interact with nature. The term 'biophilia' translates to 'the love of living things' in ancient Greek (philia = the love of / inclination towards). Although the term seems relatively new and is gradually trending in the fields of architecture and interior design, biophilia was first used by psychologist Erich Fromm in 1964, then popularized by biologist Edward O Wilson in the 1980's, when he detected how urbanization is leading to a disconnection with nature."

Excerpt from Dima Stouhi, Bringing the Outdoors Inside: The Benefits of Biophilia in Architecture and Interior Spaces, ArchDaily



"In my opinion, the empathetic architect has always been aware of the connection between wood and humanity. In surveys carried out before the biophilic design movement, architects and the occupants of buildings described, without exception, materials composed of wood as being warm, natural, and good for our health." [4]

The Rise of Biophilic Design in Healthcare

Advancements in technology and mass timber products are making it possible to incorporate more wood into healthcare facilities. This is translating into more welcoming and inviting designs for patients and the professionals who spend long hours in these environments.

Surrey Memorial Hospital

Such was the case when it came to a major renovation and addition at Surrey Memorial Hospital, the second largest hospital in British Columbia, Canada. With more than 93,000 patient visits per year, it's the busiest emergency department in the province.

The addition includes a new emergency department with separate spaces for adult and pediatric care, along with a tower that hosts the Neonatal Centre of Excellence and much-needed patient rooms for critical and intensive care units. Visitors are greeted by tree-like wood columns, each consisting of four thick glue-laminated timber (glulam) "branches" that extend from floor to ceiling and support a panelized atrium roof.

"The expansion looks fantastic. It was built based on the latest research that says wood can be calming and comforting, and that lots of daylight and views of green spaces can potentially help people recover faster," said Robert Bradley, energy conservation manager for Fraser Health.

A PICTURE OF HEALTH | As the research on biophilic benefits of wood continues to grow, one of British Columbia's busiest hospitals leads the way in offering patients a comforting, supportive, and healing environment. [Photos courtesy of CEI Architecture and Parkin Architects | Photographer: Ed White Photographics]

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NATURE'S PATH TO RECOVERY | Designed to blend harmoniously with the lakefront setting, the three-story Herrington Recovery Center combines natural materials with scenic views to create a tranquil recovery environment. [Photo courtesy TWP Architecture Ltd. | Photographer: Tom Davenport]

Herrington Recovery Center

More than 2,000 mi (3,200 km) east of Surrey, in Oconomowoc, Wisconsin, the Herrington Recovery Center, a treatment facility for alcohol and chemical dependence, includes an abundance of wood in its design, from soaring exposed glulam beams to an interior clad with natural cedar.

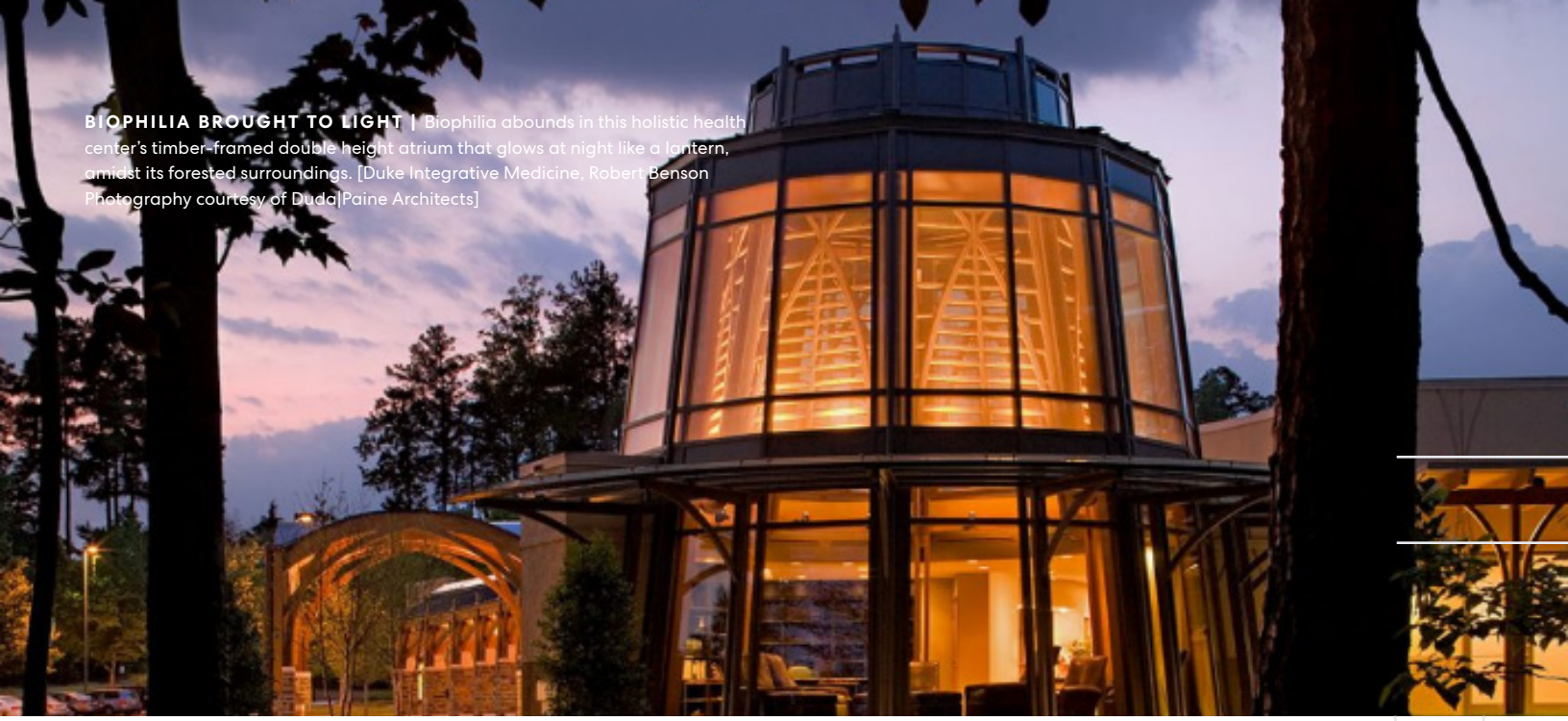
"Wood provided so many benefits in terms of creating a warm, healing environment."

From the very beginning, and for many reasons, we knew wood-frame construction was the best choice for this project," said architect John Curran, ALA, senior vice president for TWP Architecture who designed the facility. "It's amazing how well this project has been received—by patients, by the surrounding community and by the health care and design communities." Designed to blend harmoniously with the lakefront setting, the three-story structure combines natural materials with scenic views to create a tranquil recovery environment. In fact, one patient described his stay by saying, "There must have been some spiritual guidance when this building was being designed."

Stress Test: Is Wood Good for Your Health?

There is a growing body of research that is beginning to suggest wood may very well be good for our health and well-being when incorporated into our built environment. While it's early days and more research is needed, the results look promising.[5]

- In four different independent studies, the presence of wood was found to have an immediate effect of lowering sympathetic nervous response, akin to reducing stress and anxiety.[6]
- A study of stress levels in students found long-term exposure to wood interiors was correlated with an activation of the parasympathetic nervous system, which acts to reduce overall stress levels and promote healing.[7]
- A range of independent studies found that participants self-report a preference for wood interiors and believe that it promotes health and well-being.[8]



BIOPHILIA BROUGHT TO LIGHT | Biophilia abounds in this holistic health center's timber-framed double height atrium that glows at night like a lantern, amidst its forested surroundings. [Duke Integrative Medicine, Robert Benson Photography courtesy of Duda|Paine Architects]

Duke University Health Facilities

Program spaces for traditional and alternative medicine are united through a rich use of natural materials, such as wood and stone. Its radial configuration affords generous views of interior and exterior gardens and the surrounding forest, while bathing the interior in natural light.

"Whereas traditional clinical settings often evoke negative feelings of sterility and coolness, we created a warm, welcoming environment by interweaving the natural and the man-made," according to the project's architects, Duda|Paine Architects, a firm that has embraced the use of wood in healthcare facilities. "Our design strategy — 'human-centered healthcare design' – reduces stress through environmental design."

Such was also the case with the Duke University Student Wellness Center. Duda|Paine's design weaves together student health, nutrition, counseling, and psychological services under one roof. Wood is featured throughout, including a soaring gluam timber post-and-beam atrium along with salvaged-timber benches. A contemplative garden reinforces ties to nature and connects to a network of campus pathways. With a focus on architecture that promotes healing, Duda|Paine is continuing to push the boundaries of biophilic design in their latest project, Center for Health + Wellbeing in Winter Park, Florida.

GETTING CENTERED | Wood offers warmth to this understated, Zen-like student wellness center. [Duke Student Wellness, Robert Benson Photography courtesy of Duda|Paine Architects]

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Ronald McDonald House British Columbia & Yukon

While he's made a name for himself as an advocate for tall wood construction and design, Michael Green, founding principal of MGA | Michael Green Architecture, recently completed a thoroughly modern and contemporary two-story Ronald McDonald House that not only makes timber its primary structure, but reinvents the template for this home away from home for out of town families whose sick children are receiving critical care.

With more than 350 Ronald McDonald Houses across North America and growing, these facilities provide shared kitchen spaces, dining facilities, common areas, and private suites for families during an incredibly stressful time.

The project is an advanced application of mass timber construction, built of a hybrid cross-laminated timber (CLT) wall and high-performance light-wood floor system. The panelized construction enabled off-site prefabrication, with panels factory-cut to a precise size and fit. And because CLT can be left exposed, the floor-and-ceiling structure serves double duty, wrapping occupants in a warm aesthetic.

The award-winning design also tells a story about creating architecture for the ages, and the pivotal role mass timber can play. "I believe we need to build institutional buildings with their legacy in mind—buildings that should last hundreds of years," Green says. "The Ronald McDonald House is a great example of wood construction that is built to last. The exterior facade may be brick, but CLT is the vertical strength and light-wood frame is the horizontal. When we think of construction that is built to last, wood and mass timber can serve that role, as a long-lasting legacy material."

"As architects, we need to learn from and mimic nature in order to push the boundaries of what we can do with wood. We need to use technology to be in tune, rather than in conflict, with our natural world. We need to understand the story nature is telling us."

The exterior is designed to feel like a home and not a hotel. With an iron-spot brick facade punctuated by square-box dormers, it's a fresh take on more traditional residential motifs. Cedar cladding and wood window frames offer a warm contrast to the sleek, steel-grey masonry.

This is architecture with empathy, decidedly non-institutional in its feel, a place where dignity and playfulness live side by side. And from Green's perspective, there's no better place to look for inspiration than the natural world that surrounds us.

A HOME AWAY FROM HOME | Built with CLT and an ample use of wood throughout its interior, this home away from home for sick kids and their families is architecture with empathy, decidedly non-institutional in its feel. [Photos courtesy of MGA | Michael Green Architecture | Photographer: Ema Peter]

Sources

[1] Wood as a Restorative Material in Healthcare Environments, FP Innovations, 2015, p. 1-11, https://www.woodworks.org/wp-content/uploads/Wood-Restorative-Material-Healthcare-Environments.pdf

[2] Physiological effects in humans induced by the visual stimulation of room interiors with different wood quantities, The Japan Wood Research Society, 2006, https://link.springer.com/content/pdf/10.1007%2Fs10086-006-0812-5.pdf ; In this study subjects were 15 male students aged 19–28 years old. Three actual-size model rooms of 13m2 were used with wood ratios of 0%, 45% and 90%. In the 0% room, diastolic blood pressure decreased significantly, but the observed change in the autonomic nervous activity was relatively small. In the 45% room, a significant decrease in the diastolic blood pressure and a significant increase in pulse rate were observed. This room tended to have the highest scores in subjective "comfortable" feeling. The 90% room caused significant and large decreases in systolic blood pressure and diastolic blood pressure.

[3] Human stress responses in office-like environments with wood furniture, Michael David Burnard & Andreja Kutnar, 2019, https://www.tandfonline.com/doi/full/10.1080/09613218.2019.1660609; Although this experiment was moderate in scale, including only 61 subjects, the results indicate it is possible to use wood furniture as a passive environmental intervention to help office workers cope with stress. However, when selecting wood furniture, it is important to consider visual characteristics, amongst other aspects, and how they interact with other elements of the indoor environment (e.g. lighting).

Effects of redecoration of a hospital isolation room with natural materials on stress levels of denizens in cold season, Ohta H., Maruyama M., Tanabe Y., Hara T., Nishino Y., Tsujino Y., Morita E., Kobayashi S., Shido O., 2007, Two isolation rooms with almost bilaterally-symmetrical arrangements were used. One room (RD) was redecorated with wood paneling and Japanese paper, while the other (CN) was unchanged (with concrete walls). Seven healthy male subjects stayed in each room for over 24 hours in the cold season. The results indicate that, in the cold season, redecoration with natural materials improves the thermal environment of the room and contributes to maintaining core temperature of denizens at preferable levels. It also seems that redecoration of a room could attenuate stress levels of isolated subjects.

[4] Wood as a Restorative Material in Healthcare Environments, FP Innovations, 2015, p. 16-21, https://www.woodworks.org/wp-content/uploads/Wood-Restorative-Material-Healthcare-Environments.pdf

[5] Research to date is limited in scope and is represented by relatively small sample sizes.

[6] Wood as a Restorative Material in Healthcare Environments, FP Innovations, 2015, p. 17, https://www.woodworks.org/wp-content/uploads/Wood-Restorative-Material-Healthcare-Environments.pdf

[7] ibid.

[8] ibid., p.18