



Nature-Based Design: The New Green. Combine LEED metrics with essential biophilic elements, some argue, and you achieve a lasting sustainability, a built environment that uses less energy even as it energizes the people who use it. Adopting proven techniques for creating interiors that connect us with our natural instincts, designers can achieve spaces that help people feel and work better.

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Rosalyn Cama is president of Cama, Inc., an interior planning and design firm that is steeped in evidence-based design. When she speaks to A&D groups about the next challenge for “green” building design, she likes to tell the story of how she opened a national convention in New York with a telling experiment.

“In my world of healthcare design,” says Cama, “the goal first and foremost is to reduce stress. So, to an audience of some 700 designers I said, ‘Imagine a stressful time in your recent past. If you could escape anywhere in the world to help reduce your anxiety, where would you go?’ After giving them a moment to reflect, I asked them to think about the elements of that environment, the features that contribute to their calm, their sense of well-being.”

“Then, I asked them to raise their hand if the place they pictured was an indoor, built environment. Not a single hand went up. Every person in the audience had thought of outdoor spaces. Since then, over the past 13 years, I’ve repeated the experiment countless times, and fully 95 percent recall an outdoor space.”¹

These results are no surprise to Betty Hase, a professional colleague of Cama’s. Hase is the Advanced Knowledge and Applications Lead at Herman Miller. A long-time proponent of “biophilic” design—creating built environments that “incorporate ideas of habitat selection, environmental preferences, and the psychological and emotional ties between people and places”—Hase believes we’re on the verge of being able to build a strong economic and environmental case for nature-based design. According to her, mimicking within built environments the features of the natural habitat humans prefer is a logical next step for the green design movement.

“You can design a totally sustainable building that meets all the LEED standards but ignores the deep human need for contact with nature,” she says. “What’s really powerful is if you can do both—create energy-efficient spaces that also incorporate natural features that help people feel comfortable and inspired, really alive and engaged in the places where they work, learn, and heal. And that combats stress.”

A Natural Landscape

The concept of biophilic design emerged several decades ago in response to biologist E.O. Wilson’s book *Biophilia*. “Biophilia” literally means “love of life,” but Wilson and Yale professor Stephen Kellert expanded the idea to encompass basic human needs that evolved through—and are satisfied by—connection with the natural world.²

Related to this idea is the theory that because we evolved on the African savanna, that landscape remains the preferred natural habitat of human beings, regardless of culture or country. Though most of us now spend our days living and working (and increasingly playing) in man-made environments, we still seek key features of our ancestral landscape that aided survival and enhanced our well-being.

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Neurological Nourishment

Research increasingly shows that nature-based design has the potential to reduce stress in all kinds of built environments. A 2011 review in the *International Journal of Environmental Health Research* compiled findings from several different disciplines to develop 12 specific “evidence-based nature contact recommendations” for “creating healthful places.” Among these are:

- cultivate grounds for viewing
- maintain healing gardens
- welcome animals indoors
- light rooms with bright natural light
- provide a clear view of nature outside
- display nature photography and realistic nature art³

In addition to health benefits, there are indications that attention, learning, and cognitive function may be improved by nature-based design. Several studies have analyzed the impact of nature contact on what pioneering environmental psychologists Rachel and Stephen Kaplan first defined as “attentional recovery”⁴—“the ability to reactivate mental effort after a period of intense work.”⁵ Subsequent research by the Kaplans and others has proven that contact with nature, even just by viewing it through a window, improves cognitive functioning.⁶

For example, in a recent study of subjects who were “mentally fatigued” after completing a cognitively demanding task, those shown six minutes of “restorative images” (photographs of natural landscapes) had faster reaction times, more correct responses, and better overall memory recall than those who viewed photographs of urban images for the same amount of time.⁷ In a similar study of children diagnosed with ADHD, students tested after walking in a wooded area performed better on concentration tasks than those who had taken a walk in town.⁸

Meanwhile, new instruments for measuring brain activity provide another type of evidence that cognitive functioning is influenced in different ways by natural and built environments. Researchers using functional magnetic resonance imaging (fMRI) to look at brain activation patterns in subjects viewing photographs of natural or urban scenes found that very different parts of the brain were activated by the two types of images. In addition, measurements using an “Eye Position Detector System” found far fewer “eye fixations” while viewing natural as opposed to urban settings, suggesting that the former are less likely to burden the “inhibitory pathways in the brain.”⁹

In other words, when you look at an urban scene, your brain has to work harder to filter out nonessential information than it does when you’re looking at a natural landscape. The biophilic explanation for this effect posits that the human neurological system evolved to respond to the “fractal” geometry of nature—the complex shapes repeating at different scales that you can see in snowflakes, the veins of leaves, the branching of trees and rivers. Our brains respond to these

natural shapes as “background,” while the more simple, unscaled, cubist shapes of the built environment stand out and demand our attention. This is the basis of nature’s regenerative effect on us through what mathematician Nikos Salingaros calls “neurological nourishment.”¹⁰

Economic and Ecological Benefits

As researchers publish more hard data linking nature-based design with advantages like improved healing rates, better cognitive performance, and enhanced learning comprehension, the economic benefits of biophilic design become easier to quantify. In a comprehensive white paper on the subject published in 2012, environmental consulting firm Terrapin Bright Green argues that “incorporating nature into the built environment is not just a luxury, but a sound economic investment in health and productivity, based on well-researched neurological and physiological evidence.”¹¹

In an exercise that applied some of the proven effects of biophilic design to the economy of New York City, the authors found that “creating biophilic work environments for many of New York City’s office workers would result in over \$470 million in recouped productivity value,” while making sure that all students of the city’s public schools had sufficient natural light “could re-engage \$297 million in wasted taxpayer dollars and save \$247.5 million in lost parental wages resulting from missed school.”¹²

In his 2012 book, *Birthright: People and Nature in the Modern World*, Stephen Kellert discusses the impact nature-based design can have on worker morale and motivation. But the lamentable reality, he writes, is that “the average office worker in the United States today toils in a windowless setting . . . cut off from natural features or processes.”

These office settings are so sterile that they remind us of the barren cages of the old-style zoo, now ironically banned as “inhumane” to nonhuman animals. Yet modern office workers are expected to be alert, motivated, and productive in these featureless and sensory-deprived environments.¹³

In an interview, Kellert noted that low-impact design as exemplified by LEED standards often fails to address “the human need to connect with nature and place.” We give people “a computer with a nice screen saver and maybe a poster of a potted plant,” he told the interviewer, “and if it’s energy efficient, we call it ‘Gold.’”¹⁴

Kellert advocates a new standard, which he calls “restorative environmental design,” that combines LEED metrics and essential biophilic elements to achieve “true and lasting sustainability.” He maintains that no matter how energy efficient a building is, “if it’s a place that doesn’t breed satisfaction, enhance morale, or motivate people (and in fact alienates them) . . . when the cutting-edge technology that made it energy efficient is no longer cutting edge, and people don’t want to be there, they won’t sustain that environment.”¹⁵ Kellert concedes that there are times when

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biophilic objectives will conflict with energy-efficient design, “but you must try to have your cake and eat it too,” he says. “It’s tougher, but if you want sustainability, you must weigh these objectives and blend them.”¹⁶

Increasingly, design professionals concerned with sustainable building practices promote a more integrative design process in which people from a variety of disciplines collaborate to address “the interrelationships of all living and technical systems in the service of sustaining the health of all life,” as interior designer Linda Sorrento writes in a 2012 article in the *Journal of Interior Design*. By moving from a mechanistic view of “data-driven technical systems of conventional and green/high-performance design” to “the pattern-driven living systems of restorative and regenerative design,” these leaders in the fields of architecture and interior design believe they can achieve “a deeper shade of green,” with built environments that require less energy and foster “more human engagement, understanding, and capacity.”¹⁷

Where to Start

Hase says, in her experience, designers generally have good instincts when it comes to developing interior environments with nature in mind. She also notes, however, that much of their training not only dismisses these instincts but actively seeks to replace them with a focus on efficiency in planning. “We need to bring out what’s inherent in who we are—to create spaces that incorporate elements of the natural preferred habitat,” she tells the students who take her AIA continuing education course “Design Lessons from Nature.”

“It’s important to understand that it’s more about feeling than thinking when a person enters a built environment,” she says. “The challenge is to interpret and apply features in creative ways. You can get the effect of a water element without real water (and the chlorine smell and mold and mildew). The subconscious will ‘see’ a glossy, shimmering, blue surface and get the same good feeling our primitive ancestors did when they could see the shining surface of a pond or flowing river in the distance.”

She offers building owners and designers a few central concepts to think about when creating biophilic interiors.

1. Prospect and Refuge

British geographer Jay Appleton hypothesized that we experience landscapes in strategic, territorial terms inherited from our hunter/gatherer ancestors. His analysis of landscape paintings found that people preferred those exhibiting two key attributes: “prospect,” expansive, brightly lit, long-range views that would allow for spotting potential food sources or predators, and “refuge,” smaller, darker, and more enclosed areas that offer protection and concealment.

“Office designers have struggled for years to create places that provide openness and privacy at the same time,” Hase says, “something that nature has been

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doing forever.” She notes that in recent years work environments have become much more open in an effort to enhance visual connections and encourage collaboration. These workplaces provide “a lot of prospect,” with space plans that offer multiple views from most locations and multiple ways of moving through the environment. But Hase cautions that this must be balanced with refuge-like spaces that offer privacy and protection from interruption.

“It’s something that can be achieved with moveable screens, strategically placed artifacts, or a bit of overhead cover, like the canopy in a Resolve workstation,” she says. “But it’s essential to provide that choice if you don’t want a lot of stressed-out introverts at work.”

2. Fractal Patterns

Evidence is building that the irregular, self-similar geometries that occur virtually everywhere in nature have a significant role to play in creating built environments that contribute to human performance and well-being. As Lance Hosey, chief sustainability officer at the architecture firm RTKL and author of *The Shape of Green: Aesthetics, Ecology, and Design*, writes: “We respond so dramatically to this pattern that it can reduce stress levels by as much as 60 percent—just by being in our field of vision.”¹⁸

Hase suggests incorporating fractal shapes—particularly those that echo the patterns formed by the limbs, branches, and twigs of the acacia trees on the African savanna—wherever possible. Textile designs or architectural or furniture detailing that repeat similar shapes at different scales mimic the “difference within likeness” quality of nature that humans find simultaneously stimulating and restful.

3. Biodiversity

“If you just let nature happen, you get diversity,” Hase says. “And people are more comfortable, more engaged, more *alive*, in interiors that offer variety.” Environments that provide interesting and changing artifacts, unique architectural details, and graphic or video displays for people to “discover” as they move through the workplace can provide the stimulating qualities of mystery and surprise that are part of the natural environment.

Hase also points out that, in nature, most animals don’t spend all their waking hours in one spot, but roam their habitats to select different settings for different activities. “As it happens, human work is becoming more activity-based these days,” she says. “When you come into work, you’re not always going to one spot to do everything you need to do. When you go into your workplace, you’re going to look around and see what spot is available that gives you the best conditions to get that work done. It might be a coffee bar or a project room or a place where you can plug your tablet into a big screen to share some graphic content with a group of coworkers. But you need to have choices, just like in nature.”

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Every year new discoveries in the fields of neuroscience and endocrinology add to our knowledge of the role nature plays in human physiology and well-being. As Lance Hosey puts it, “A revolution in the science of design is already under way, and most people, including designers, aren’t even aware of it.”¹⁹

On the other hand, Betty Hase points out, with a little awareness of who we are and where we came from, designing with nature in mind can be instinctive. “To make a space that people will want to be in, create an environment that has elements of the natural preferred habitat. Make a workplace where people feel as calm and engaged as they do walking down a lovely nature trail, and you’ll get improved health, morale, performance.”

Notes

- ¹ Hase, Betty. This and all subsequent quotes are from a personal interview conducted on December 10, 2012.
- ² Kellert, Stephen and E.O. Wilson. *The Biophilia Hypothesis*. Island Press, 1993.
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- ⁴ Kaplan, R. and S. Kaplan *The Experience of Nature: A Psychological Perspective*. Cambridge University Press, 1989.
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- ⁶ Berman, Marc, *et al.* “The Cognitive Benefits of Interacting with Nature,” *Psychological Science*, 2008.
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- ¹¹ Terrapin Bright Green, LLC. “The Economics of Biophilia: Why Designing with Nature in Mind Makes Financial Sense,” 2012.
- ¹² *Ibid.*
- ¹³ Kellert, Stephen. *Birthright: People and Nature in the Modern World*. Yale University Press, 2012.
- ¹⁴ Ruiz, Fernando. “Biophilia Becomes a Design Standard,” *EcoHome Magazine*, July 26, 2012.
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- ¹⁷ Sorrento, Linda. “A Natural Balance: Interior Design, Humans, and Sustainability,” *Journal of Interior Design*, 2012.
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- ¹⁹ *Ibid.*

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