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Abstract | Article

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The human desire to gaze on something that is not man-made is widely acknowledged. But until recently it has not been scientifically analyzed in terms of either motivation or effect. Why do we find nature beautiful? Is the pleasure we take from it quantifiable? Can its beneficial effects be replicated in a room without a view? This research summary reviews some of the current research and probes into both the why's and how's of its impact on workplace design.

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The human desire to gaze on something that is not man-made is widely acknowledged. But until recently it has not been scientifically analyzed in terms of either motivation or effect. Why do we find nature beautiful? Is the pleasure we take from it quantifiable? Can its beneficial effects be replicated in a room without a view? This research summary reviews some of the current research and probes into both the why's and how's of its impact on workplace design.

We begin back in 1984 with sociobiologist E. O. Wilson, who posited an intriguing answer to the question of why natural views should have such a positive effect on the human mind and body with the publication of a book called Biophilia. Biologist Nicholas Humphrey posits that it is nature's unique combination of pattern and diversity that appeals to us and that the survival function of human appreciation for natural beauty is learning.

The workplace-design implications are summarized with a discussion of these five attributes that came out of the savanna research and how they can be applied:

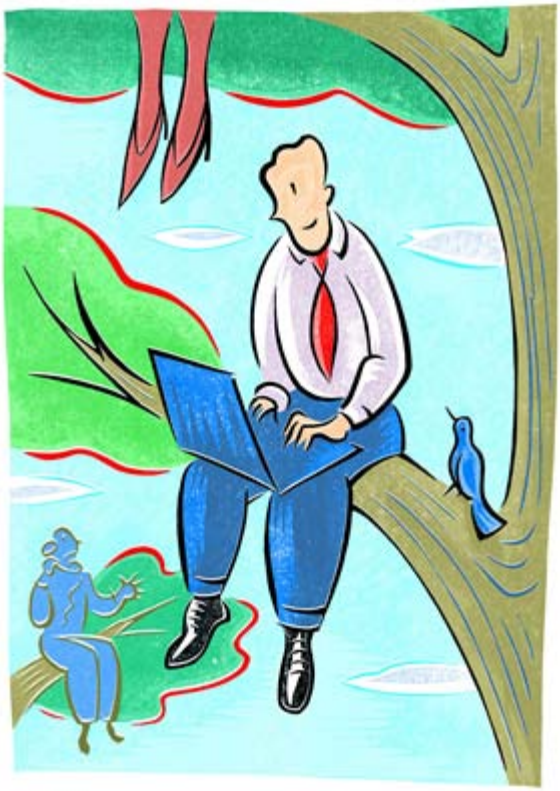
- ***Refuge and prospect***
- ***Attributes of the savanna***
- ***Mystery and fascination***
- ***Organic patterns***
- ***Natural light and views***
- ***Nature and well-being.***

In the early 1980s, Roger Ulrich (currently director of the Center for Health Systems and Design at the College of Architecture at Texas A&M University) published the results of a study that showed a significant correlation between a view to nature and human well-being. Analyzing hospital records for patients' recovery from a specific surgical procedure, Ulrich found that patients assigned to rooms with windows looking out on a natural scene "had shorter postoperative hospital stays, received fewer negative evaluative comments in nurses' notes, and took fewer potent analgesics" than patients in similar rooms with windows facing a brick-wall building.[1]

Subsequent studies by Ulrich and others linked natural views to relief of

stress, boredom, and anxiety as well as with improved productivity. Even viewing representations of natural scenes proved helpful. In one study, for example, Ulrich found that having intensive-care patients simply look at pictures of water and trees helped reduce anxiety and the need for pain medications.[2]

In another effort to quantify the impact on patient care, The Center for Health Design has been researching recently built or renovated facilities to determine the effects of design changes. The nonprofit group's focus is to demonstrate that "evidence-based design in hospitals and healthcare facilities can improve the quality of healthcare." Preliminary data indicate that a building's layout, furniture, and décor influence a patient's experience and affect the organization's bottom line. At Bronson Methodist Hospital in Kalamazoo, Mich., for example, renovations that included private rooms, an atrium garden, local artwork on the walls, and opening corridors to natural light have been directly linked to reducing infection rates by 10 percent, improving patient satisfaction to 95.4 percent, decreasing nursing turnover to below 12 percent, and increasing the hospital's market share by 6 percent.[3]



Researcher Lisa Heschong has found a correlation between views to the outside and improved performance among office workers. She and her team conducted two studies within the offices of the municipal utility district in Sacramento. The first study looked at 100 workers in a call center. A computer system continuously tracked their performance in terms of the time required to handle each call. The second study examined the performance of 200 office workers on a series of short cognitive assessment tests, taken at each individual's desktop computer.

Results showed that "a better view was the most consistent explanatory variable associated with improved office worker performance, in six out of eight outcomes considered. Views from a workstation were rated for both primary view (angular size of window view while looking at the desktop computer monitor) and break view (angular size of view from other seated vantage points in the cubicle). Both types of view were rated on a scale of 0 to 5, first based on size and secondarily by vegetation content. Workers in the call center were found to process calls 7 percent to 12 percent faster when they had the best possible view versus those with no view. Office workers were found to perform 10 percent to 25 percent better on tests of mental function and memory recall when they had the best possible view versus those with no view. Results from the questionnaire administered to participants in the desktop study supported the performance findings. There was a high correlation between workers' and surveyors' ratings of view. Those workers in the desktop study with the best views were the least likely to report negative health symptoms. Reports of increased fatigue were most strongly associated with a lack of view."[4]

In 1984, sociobiologist E. O. Wilson posited an intriguing answer to the question of why natural views should have such a positive effect on the human mind and body with the publication of a book called Biophilia. Wilson defines "biophilia" as "the tendency to focus on life and life-like processes." He hypothesizes that the evolution of the human brain in a natural setting built in powerful tendencies to pay attention to aspects of nature that at one time had significant consequences for survival and procreation.[5] "For human survival and mental health and fulfillment," Wilson says, "we need the natural setting in which the human mind almost certainly evolved and in which culture has developed over these millions of years of evolution."[6]

In other words, as Steven Pinker puts it in his book, How the Mind Works, "The brain strives to put its owner in circumstances like those that caused its ancestors to reproduce."[7] When it comes to what we need and want from the places where we live and work, it is all about survival—but not necessarily about the present.

The Savanna Hypothesis

The human brain evolved over the course of some 10 million years in individuals who lived primarily in nomadic, hunter-gatherer tribes. Ecologist Gordon Orians suggests that during this evolutionary process, presumed to have taken place in the savannas of tropical Africa, natural selection favored individuals who were motivated to explore and settle in environments likely to afford the necessities of life and to avoid environments with poorer resources or that posed higher risks.[8]

Subjects in one study who saw slides of different types of natural landscapes and rated how much they would like to live in or visit each consistently chose savanna-like environments over other types such as forest or desert landscapes—although none of the test participants had ever actually been in a tropical savanna. Orians and his colleague Judith Heerwagen have conducted studies that show that people even have a preference for tree shapes—a spreading, multilayered canopy of leaves and a trunk that branches close to the ground—like those found in "high-quality" savannas.[9]

Because of their critical role in the development of the modern human brain and psyche, environments like those that provided for the needs of our hunter-gatherer ancestors attract us. Their traits include abundant vegetation and wildlife; trees that offer protection from the sun and can be climbed to avoid predators; and long, unimpeded views.

"Aesthetic pleasure in landscape derives from the observer experiencing an environment favorable to the satisfaction of his biological needs," according to geographer Jay Appleton[10] His theory of "prospect and refuge" postulates that people prefer environments, natural or built, that offer both cover and a long-range view because the ability to see without being seen aided early humans in the satisfaction of their biological need to attain food without becoming food themselves. Settings that offer prospect and refuge remain aesthetically pleasing to the modern eye because they evoke the savanna landscapes, where open grasslands provided unimpeded views from tree groupings that provided cover and protection.

Cognitive Effects

Research suggests that biophilia plays a role not only in aesthetic preferences and in evoking vague feelings of foreboding or well-being in certain settings but also in our ability to function effectively in a given environment. The human brain evolved to respond to certain types of stimuli in a natural environment that provided an "order in complexity" very different from the informational barrage we are subjected to in today's artificial environments. As social ecologist Stephen Kellert puts it, "The dependence of the human psyche on highly varied and refined distinctions seems to be matched only by the extraordinary diversity, complexity, and vividness of the natural world as an extremely rich and textured system."[11]

Biologist Nicholas Humphrey posits that it is nature's unique combination of pattern and diversity that appeals to us and that the survival function of human appreciation for natural beauty is learning. Aesthetic preferences, Humphrey writes, "stem from a predisposition among animals and men to seek out experiences through which they may learn to classify the objects around them."[12] It was crucial that our hunter-gatherer ancestors be able to recognize "likeness within difference" (to understand that although they are of different sizes and coloration, all the berries on a bush are food) as well as "difference within likeness" (to distinguish between edible and poisonous varieties). This ability to classify, Humphrey says, enhanced survival by reducing the "thought load" on the brain to "expedite new learning and allow efficient extrapolation from one set of circumstances to another."[13]

Evolutionary psychologists Rachel and Steven Kaplan agree that natural settings "provide a context in which information and complexity can be managed effectively."[14] Their research has led them to distinguish two

types of attention: directed attention and "fascination," which is the type of attention evoked by landscapes with a hint of mystery and the promise of interesting and useful features that could be discovered if the observer were to explore the environment. The Kaplans argue that overuse of the faculty for directed attention (which often occurs in built environments, where a variety of more and less important stimuli vie for our attention) can result in fatigue characterized by irritability and distraction. On the other hand, the fascination that humans experience in natural settings can help people recover from this state.[15]

Other research seems to support this hypothesis. For instance, psychologist Terry Hartig recently conducted a series of laboratory and field-based experiments to investigate the role of natural settings in helping people recover from "normal psychological wear and tear." In one study, he asked participants to complete a sequence of mental tasks designed to exhaust their capacity for directed attention, then sent some participants to walk on a nature trail, others to walk in an urban area, and others to sit quietly while listening to music and reading magazines. After this period of rest, participants were asked to complete a proofreading task. The group who had relaxed in the nature preserve performed better and reported more positive emotions than their colleagues in the other two groups.[16]

New models for understanding the function of short-term memory in cognition and behavior indicate that the physical environment may be used as a memory aid. The results of experiments conducted by one group of researchers suggest that the brain avoids overburdening short-term memory by attaching information to visual "pointers" in the external world. Fixating on a pointer allows access to the contents of an item of memory, permitting what the researchers refer to as "just-in-time representation." The brain can "leave important information out in the world and acquire it just before it is needed in the cognitive program. This avoids the carrying cost of the information."[17]

Environmental psychologists Judith Heerwagen and James Wise believe that nature's "rhyming" diversity—the random repetition of patterns and forms at different levels of scale—provides extraordinary "opportunities to engage working memory and cognitive systems as one interacts with a setting."[18] They posit that man-made environments that replicate nature's depth of diversity in color, pattern, and form might have a positive effect on inhabitants' cognitive skills as well as their overall sense of well-being. Beginning in 1997, these two researchers consulted with Herman Miller to design and conduct a series of experiments to further investigate this theory.

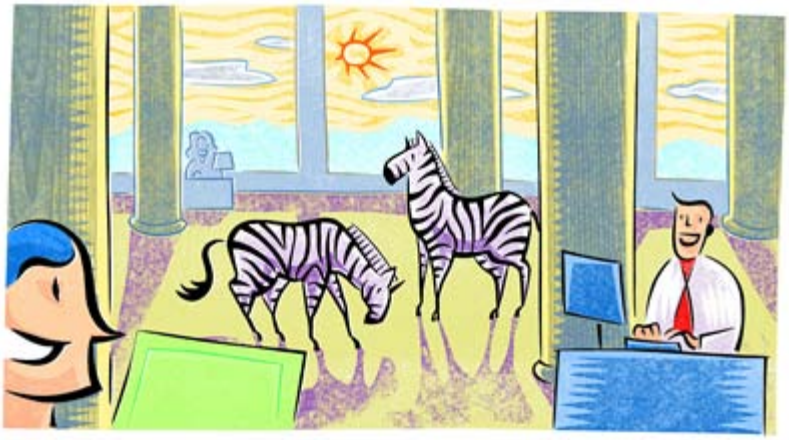
The Savanna Experiments

In "Project Savanna," Heerwagen and Wise worked with a team of Herman Miller employees to test the hypothesis that "interior environments designed to evoke the essential features and qualities of preferred natural settings will enhance the creative and cognitive performance of the people who work in them." The experiments they devised used three typical workstation cubicles—identical in every way except for the fabric covering their vertical surfaces. One station was done in plain gray, one was done in geometrically patterned fabric, and the third employed a digital image designed to convey the qualities of a savanna landscape. Test subjects hired through a temp agency sat in these workstations while performing a series of tasks designed to measure cognitive skills such as memory and creative problem solving. Each participant worked for half a day in each workstation.

Researchers found a positive correlation between the natural-image workstation and subjects' scores on creative problem-solving tests but did not find a significant correlation with performance on memory tests. Although more research is required to determine which attributes of the test image promoted creative thinking and whether another type of nature-inspired surface treatment might have a positive effect on short-term memory, the Project Savanna team concluded, "Creative problem solving and emotional functioning can be manipulated through the application of visual images to vertical surfaces of workstations."[19]

Other experts in the fields of architectural and interior design are expressing an interest in the implications of evolutionary psychology and cognitive science for creating buildings and space plans that support the way the human mind functions. In May 2003, the American Institute of Architects (AIA) announced the establishment of the Academy of Neuroscience for Architecture to investigate the neurological underpinnings of design, with the mission of understanding more precisely how "the environment, the structure we live in, affects our brain and our brain affects our behavior."[20]

John Eberhard, director of research planning for the AIA and a member of the advisory board of the Academy of Neuroscience for Architecture, estimates that it will take a decade of research to develop a factual database from which specific design principles may be drawn. In the meantime, researchers and designers offer some general guidelines for designing a workplace with the mind in mind.



Refuge and prospect. Workspaces can offer a sense of privacy and enclosure as well as a view to, and a connection with, the broader environment. Achieve a sense of refuge in individual workspaces that feature adjustable enclosures and fabric canopies and in architectural interiors that include dropped ceilings or soffits in some areas. Provide prospect with "open areas allowing a visual perspective around entrances and exits, coffee bars, libraries, business support centers, and other common areas."[21] Space plans that offer multiple views from most locations and multiple ways of moving through the space will appeal to unconscious needs for ease of environmental surveillance and escape.[22]

Attributes of the savanna. In addition to providing the long view and sense of protection typical of high-quality savannas, built environments might be designed to emulate other attributes of this preferred landscape. Sloped ceilings, trellises, and building overhangs supported by pillars can create symbolic tree canopies. Colors associated with productivity and harvest (greens for vegetation, blues for water sources) may be preferable to the browns and golds associated with the dormant[23]

season.

Mystery and fascination. Environments that provide interesting and changing artifacts, architectural details, or 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. Meandering (as opposed to linear) hallways or aisles can create enticing traffic patterns within the workplace that are not unlike the winding paths of a nature trail.[24] Compared to the linear approach that often characterizes furniture layouts and that can resemble row upon row of crops, consider a more organic plan that takes inspiration from oriental gardens.

Organic patterns. Elements of architecture or furniture detailing that repeat similar shapes at different scales may serve to mimic the "difference within likeness" quality of nature that humans find simultaneously stimulating and restful. Subtle changes in form, texture, brightness, and contrast can be achieved with various shades of the same color, a variety of textures (smooth to rough, shiny to matte), and lighting design that creates gradual changes in brightness and contrast.[25]

Natural light and views. Designing buildings and interiors that allow sunlight penetration into the workspace and a view of natural elements, such as trees and other foliage, have proven benefits for enhancing worker satisfaction and self-assessed productivity levels.[26]

As research into the importance of our connection to nature grows, so does the need to incorporate daylight and natural views, refuge and prospect, a sense of discovery, and other aspects of the savanna into built environments. Quantifying the significance of these elements—for improved worker productivity, health, and well-being—supports what people have known instinctively for a long time: Nothing beats a room (or an office) with a view.

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