



PART 1

CONTEXT

The standard for ecological design is neither efficiency nor productivity but health, beginning with that of the soil and extending upward through plants, animals, and people. It is impossible to impair health at any level without affecting it at other levels. The etymology of the word “health” reveals its connection to other words such as healing, wholeness, and holy. Ecological design is an art by which we aim to restore and maintain the wholeness of the entire fabric of life increasingly fragmented by specialization, scientific reductionism, and bureaucratic division.

—DAVID ORR

Design and Stewardship

LIVING BUILDINGS

What would ecological design mean for the typology of healthcare buildings? “In the century ahead we must chart a course that leads to restoration, healing, and wholeness” (Orr 2004). Bob Berkebile’s essay introduces the concept of living buildings—buildings that actually restore the ecosystems within which they are situated.

Architect Bob Berkebile and designer Jason McLennan (1999) define the future of architecture as a future of living buildings, operating on these six principles. Living buildings will:

1. Harvest water and energy needs on site
2. Be adapted specifically to site and climate and evolve as conditions change
3. Operate pollution free and generate no wastes that aren’t useful for some other process in the building or immediate environment
4. Promote the health and well-being of all the inhabitants, as a healthy ecosystem does
5. Comprise integrated systems that maximize efficiency and comfort
6. Be beautiful and inspire us to dream

This is not a future predicated on less, but rather one inspired by doing more—and doing better—with less. To move building design toward this vision, McLennan and the Cascadia Region Green Building Council (2006) developed the Living Building Challenge. Initiatives such as this will have a dramatic impact on the design of the built environment in the next decade.

Restoring Our Buildings, Restoring Our Health, Restoring the Earth

Bob Berkebile, FAIA

“The future belongs to those who give the next generation reason to hope.”

—PIERRE TEILHARD DE CHARDIN

The vital connection between human health and the built environment, between our human behavior and the health of the planet, has been studied and documented for decades. While still an architecture student more than forty years ago, I took on a research project at the famous Menninger Clinic, then located in Topeka, Kansas. During that semester, I studied how varying a patient’s physical environment can affect his or her mental, emotional, and physical well-being. The variables we used were simple—color, temperature, daylight, humidity, and acoustic levels. Nor were our measurements particularly sophisticated. Yet we were able to observe how patients responded to changes in color (red made them more agitated and “eye-ease” green, more calm) as well as the effects of light and temperature on their appetites. It was obvious to me even then that the environment we create for people can dramatically affect their health, heart rate—even their ability to feel good about themselves.

Thirty years later, I began to understand this connection differently and on a much broader scale. I was privileged to visit the South Pole in 1993 as part of a National Science Foundation team there to explore ways to make US facilities in Antarctica more sustainable. Scientists understand that our individual actions, our community patterns, what we design, build, and operate—all dramatically affect the planet’s well-being, which in turn affects our own well-being. In that amazing place, where scientists collect data on the ocean’s thermohaline circulation and other global phenomena, I gained a new awareness of hard science: it was no longer general, no longer merely theory.

WHAT’S THE ISSUE—AND THE OPPORTUNITY—BEFORE US?

In the last few decades, we’ve acquired a tremendous body of knowledge concerning the direct links between buildings and human health and productivity. In schools, better environments result in greater learning potential, a fact documented in studies from Alberta to Massachusetts to North Carolina to Brazil.

The Rocky Mountain Institute (RMI) reported on the power of daylighting to improve standardized test scores in California, Colorado, and Washington (Burns and Eubank 2002). In two school districts studied,

students in classrooms with the most daylighting showed scores 7 to 18 percent higher than those with the least. Strategic consulting firm Capital E has also cited benefits based on data compiled from thirty green schools nationwide (Kats 2005). Not only are these schools saving energy and water while reducing costs associated with waste and emissions, but studies demonstrate positive health or productivity impacts from improvements in air quality and related building-comfort conditions as well.

This connection between human health and the built environment goes even deeper. The Academy of Neuroscience for Architecture (ANFA) is now mapping the brain; recent research has identified a cortical region containing voxels, described by John Eberhard, former director of research for AIA, as collections of neurons that have the function of recognizing buildings. This part of the brain doesn't appear to exist for any other reason: researchers never find it active unless the body is reacting to its environment. Over time, we will be able to use this information to inform our designs and their impact on many variables of well-being that up until now have been deemed anecdotal or difficult to measure.

Similarly, the macroscopic view of earth from space and humanity's ongoing imprint on the planet is revealing our interdependence. Through sophisticated satellite imaging, infrared photography, and computer modeling, scientists are discerning changes on a global scale never previously imagined. This "large-pattern science" is showing us pollution levels, temperature swings, the fragility of the ozone layer, even the toxicity of the soil in extreme detail—all from miles and miles overhead. As a result, we are now receiving alarming reports about climate change and global warming as scientists precisely measure the amount of ice melt on the polar caps, the decline of thermohaline circulation, and the further degradation of our life-support systems.

RESTORING THE EARTH: WHAT'S POSSIBLE?

"The significant problems we face today cannot be solved by the same level of consciousness that created them."

—ALBERT EINSTEIN

We have come to a place where there is no longer any doubt that our actions as a society or as a collection of societies influence global economics, culture, and climate. A seemingly endless list of journal articles, television broadcasts, news stories, books, reports, environmental initiatives, and foundation programs bear witness to this obvious and inevitable trajectory. It appears that our ability to measure and track our own environmental demise has far outpaced our ability or will to understand it, let alone do anything about it. Despite this, we should remain encouraged by recent signs of increased interest among institutions, business, and government in understanding our impact on the health of the environment.

If we are to trust Einstein's maxim, our solutions must involve an opposing doctrine of connectivity, integration, and interdependence. It is a matter of changing not just the way we live, but the way we think and the way we work. It is not sufficient to use fewer raw materials and minimize emissions. A culture of change and a spirit of teamwork and interconnectedness that is far different from our current state of isolation and adversarial tendencies is required. This enlivened consciousness and understanding accelerates the potential for change.

Compelling new ideas, new technologies, and new models of integration are emerging that provide a glimpse into a more hopeful future. We know enough today; there is no reason to wait for the rest of the evidence, to wait until it's all absolutely scientifically proven. The pattern is strong enough to allow us to take these next steps and employ these new capabilities. Significant advances are already under way, with the rise of the US Green Building Council, AIA's Committee on the Environment, and the Healthy Building Network, as well as evolving benchmark tools such as Leadership in Energy and Environmental Design (LEED) and the Green Guide for Health Care.

In her revolutionary book *Biomimicry*, Janine Benyus explores the seemingly infinite realm of natural systems—evolving, adaptive, and sustainable—and how a growing number of innovators are capitalizing on this wisdom. The movement toward biomimetic architecture and high-performance design holds tremen-

dous promise for new products and methods of construction that emulate life's genius. Incredible new tools that offer better design efficiency, resourcing, and integration are also emerging. Building information modeling (BIM), for example, has the potential to reveal relationships between complex systems and accelerate toward a language and practice of sustainability. It's now a matter of using these tools to create integrated design options and evaluate material selection, system selection, and building performance, including environmental and health impacts.

WHAT'S NEXT, AND HOW CAN WE PROCEED?

"The best way to predict the future is to design it."

BUCKMINSTER FULLER

The promise of BIM and our willingness to learn from nature will help us move more quickly to healthy buildings. These are, in fact, integrated issues: on one level, it is about human health and our local environment, which includes buildings, neighborhoods, and communities; beyond that, it is about the larger environment: the planet. And each element can and should be part of the design definition.

For me, Fuller's early lessons resonate today more than ever—particularly his advice to young architecture students to practice "anticipatory design" for the future: "Architects, if they are really to be comprehensive, must assume the enormous task of thinking in terms always disciplined to the scale of the total world pattern of needs, its resource flows, its recirculatory and regenerative processes" (Fuller and Marks 1963). This moment in time represents the largest window of opportunity for a major shift in thinking in my lifetime. The immensity of these issues, of these needed changes, is manifest to most people.

But what will it take to make that shift? In part, it requires a convincing—and consistent—sense of urgency. In addition, we must offer up approaches that are clear, comprehensible, and attractive, so people will want to reach out for them.

It is critical that we begin to move beyond green buildings, even beyond the current generation of green building tools, and embrace the concept of living buildings or even restorative buildings. In BNIM's work for the David and Lucille Packard Foundation (Packard 2002), we defined the living building as having no net impact on people or the environment: it harvests all its own water and energy needs, is adapted specifically to site and climate, is built primarily of local materials, and generates zero wastes. The restorative building goes even further: it produces more energy than it consumes, purifies more water and air than it pollutes, and can actually restore a degraded environment through its very existence. We have the ability to design and build restorative buildings now—to create environments that are inspiring and uplifting and where people can gain, or regain, their health just by virtue of being in them.

We also have much more to learn. But we do know enough about sustainable architecture to move toward a regenerative future in our communities. Addressing this ultimate design challenge will require us to successfully realign human nature with Mother Nature, the built environment with natural environments. More than that, it will require of us a new way of thinking, of imagining something unimaginable not so long ago, of looking through new eyes to a world of buildings that restore.
