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NEW AND OLD: ARCHITECTURE'S FUTURE AT THE INTERSECTION OF INNOVATION AND ANCIENT WISDOM

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New and Old: Architecture's Future at the Intersection of Innovation and Ancient Wisdom

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DeeDee Birch examines entrusting our future to a higher standard of care.

In the face of a climate crisis that has caused some of the most volatile weather patterns in recorded history, the urgency and extent to which the building industry must transform is ever increasing. The 2023 Sixth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC) found that "human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1 degrees Celsius above 1850-1900 in 2011-2020."[1] The authors oscillate between warnings (pertaining to topics ranging from irreversible biodiversity loss to food insecurity, crumbling infrastructure and deteriorating human health conditions across the world) and calls for immediate action. Our most vulnerable global communities have already felt and borne the intensity of the crisis.

Burgeoning efforts to decarbonize our buildings will explode in the coming months and years. A small subset of forward-thinking firms has already begun to make high-impact systems and materials substitutions to lessen the effects of former solutions. The industry has seen timber framing and hemp insulation — both materials with low embodied carbon — replace traditional post-industrialization materials like steel framing and extruded polystyrene foam insulation. This method of design and specification, still performance-driven but more holistic in its understanding of energy and resources, will become critical and more widespread moving forward. As the IPCC report states, "for almost all basic materials — primary metals, building materials and chemicals — many low- to zero-GHG intensity production processes are at the pilot to near-commercial and in some cases

[1] *IPCC, Climate Change 2023 Synthesis Report, March 20, 2023, 4, https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_FullVolume.pdf.*

commercial stage but they are not yet established industrial practice."[2] The research around embodied carbon of building products is growing in breadth and specificity, and low embodied carbon products have already hit the marketplace; it is just a matter of widespread adoption and application.

As the industry races to decarbonize buildings, many firms are also considering modularity and material and building reuse to create a circular economy. Science has told us that mature ecosystems are more productive than new ones and that not only are forests carbon sinks but so too are grasslands and oceans; we must reevaluate the value and method of our extraction practices. All the tree-planting campaigns in the world cannot replicate the carbon sinks that existing established and diverse ecosystems function as today. The cradle-to-cradle framework in which building materials reenter our biological and technical nutrient cycles time and time again — instead of extracting new resources each time — will be pivotal in the widespread decarbonization of our buildings. Efforts and mandates to electrify the built environment and decouple it from dirty energy sources have even begun to trickle down even from the federal policy level.[3]

All of this comes, hopefully, just in time.

A substantial degree of responsibility for the climate crisis rests on the shoulders of the architecture, engineering and construction industries; the built environment produces 40% of global emissions and shapes the physical, mental and emotional lives of billions of people throughout the world. Those in the United States spend more than 90% of their lives indoors. We'll need more than decarbonization and electrification not only to halt but heal our warming planet.

The future of architecture delves deeper than decarbonization, electrification and adaptive reuse. Today's disaggregated and rapidly evolving industry, riddled with dozens of building and product certifications, must undergo a paradigm shift. And it is an exciting time for it to do so. The confluence of research and technological advancements across various industries has given designers unprecedented precision with which to design our world.

Human Health Innovations

Innovations in our understanding of biology, ecology, chemistry and medicine have led to remarkable changes in our understanding of human health and the impact the built environment has on collective well-being.

A significant area of innovation lies in the emergent field of green chemistry. The Toxic Substances Control Act of 1976 grandfathered in thousands of unevaluated chemicals already used to produce building products, consumer goods and food packaging. Most of these chemicals remain unregulated by the Environmental Protection Agency. As studies find many of these chemicals in human urine, blood, lungs and even newborn babies,[4] growing evidence shows their detrimental impacts on human health, ranging from increased risks of cancer to obesity, asthma, autoimmune diseases and neurological development issues.[5]

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[2] *IPCC, Climate Change 2023, 53.*

[3] *U.S. Department of Energy, "Biden-Harris Administration Announces Steps to Electrify and Cut Emissions from Federal Buildings," December 7, 2022, https://www.energy.gov/articles/biden-harris-administration-announces-steps-electrify-and-cut-emissions-federal-buildings.*

[4] *Environmental Working Group, Body Burden: The Pollution in Newborns, July 14, 2005, https://www.ewg.org/research/body-burden-pollution-newborns.*

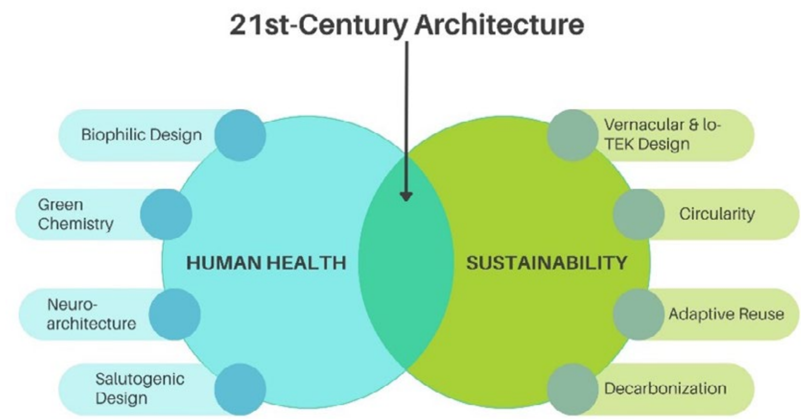
[5] *The Parsons Healthy Materials Lab, Material Health Design Frontiers: Prescriptions for Healthy Buildings (London: Lund Humphries Publishers Ltd, 2022), 122-133.*

Just a few of the thousands of chemicals of concern have been tested, proven dangerous and addressed in building product development. Manufacturers have long since eliminated the use of heavy metals like lead and radon, for example, and products without volatile organic compounds have hit the market in recent years. Efforts to address chemical toxicity continue to grow with scientific discovery. The conversation around persistent bioaccumulative and toxic chemicals has expanded in just the last couple of years, addressing mounting concerns over PFAs and other endocrine disrupters like BPA.

Green chemistry is the pursuit and development of new, healthier chemical compounds that either eliminate or radically reduce the use of toxic and hazardous substances in material goods. While green chemistry is a "philosophy that applies to all areas of chemistry," its impact on the products for the building industry will shift our conception of green building.[6] It will address all lifecycles of a chemical compound or product instead of considering the singular stage of occupant exposure, just as architects must do for buildings and the millions of products and materials that comprise them. Additionally, green chemistry should aid in the design and production of goods that make it easier to have buildings certified by even the most stringent sustainable building certifications, namely the Living Building Challenge.

Yet material safety and development remain a fraction of the information at practicing architects' disposal, and 21st-century architecture demands that practitioners move beyond material health alone.

In the 1970s, sociologist Aaron Antonovsky was developing a model of health he termed salutogenesis. Published initially in his 1979 text, Health, Stress and Coping, Antonovsky flipped the traditional, predominant pathogenetic model of medical treatment on its head. He suggested that instead of viewing



Author Diagram

human health as a binary of health or illness, humans all exist on a health ease/dis-ease continuum with myriad factors that consistently move people toward health or illness. He called for medical practitioners to examine the origins of health instead of illness and identify factors that moved people toward the health end of this continuum. Notably, he defined health as something beyond the mere absence of illness or disease, though Antonovsky focused a great deal on the role of mental, emotional and physical stress in human health outcomes. In his salutogenic model, stress factors accumulated until they manifested as an illness. Therefore, facilitating health meant actively designing for not only physical health but also mental and emotional health; the more one avoided those negative stress factors, the healthier they will be.

Antonovsky argued that people needed what he coined as a strong "sense of coherence" to exist on the health end of his health ease/dis-ease continuum. One's sense of coherence is comprised of three central components: (1) comprehensibility,

[6] *U.S. Environmental Protection Agency, Basics of Green Chemistry, last updated May 9, 2023, https://www.epa.gov/greenchemistry/basics-green-chemistry.*

in which the stimuli from one's internal and external environments are structured, predictable and explicable; (2) manageability, in which one has the proper resources available to meet the demands posed by stimuli; and (3) meaningfulness, in which one finds challenges worthy of investment and engagement (this is perhaps the most important component, as it refers essentially to one's meaning for life).[7] Antonovsky's work holds enormous implications for the design of the built environment. With a salutogenic design approach, occupant stress management becomes the foundation of any building program, and addressing the three components of a sense of coherence serves as a roadmap for salutogenic architecture. Comprehensibility has perhaps the most direct relationship with the built environment in that it demands one's physical environment invite clear courses of physical action and provide clarity. However, architecture can also support a sense of manageability and meaningfulness by providing physical and emotional support and integrating opportunities for connection and community into its design. While frameworks and approaches for salutogenic design are just beginning to take shape, they highlight the narrative potential of architecture and promise a new standard for healthy buildings. Aspects of this salutogenic model reappear in both biophilic design approaches and neuroarchitectural strategies, explored below.

Just as Antonovsky was developing his salutogenic model of health, several of his contemporaries were uncovering the value of the ancient human-nature connection in contemporary life. Roger Ulrich's landmark 1984 study demonstrated that views of natural settings improved the recovery time and process for postoperative patients; it concluded that nature has restorative effects on people.[8] In the same year, biologist E.O. Wilson popularized the biophilia hypothesis through the publication of his book Biophilia, which proposes that humans have an unmet evolutionary and genetically predetermined need to associate with the natural world. In 1989, Stephen Kaplan and Rachel Kaplan published a study that established and laid the foundation for Attention Restoration Theory, which posits that time in nature is cognitively restorative. A continuation and extension of all these ideas came in 1991 when Roger Ulrich proposed the Stress Reduction Theory, which echoes components of his 1984 postoperative patient study: Nature reduces stress and restores people's minds after mental fatigue.

Research surrounding human responses to nature throughout the latter half of the 20th century stressed the importance of understanding evolutionary biology in relation to the built environment; findings made clear that the human brain has not yet caught up to the rapid innovations and technological advancements of the first and second industrial revolutions. While we operate in a world powered by screens, spend our days moving through increasingly urbanized blocks of concrete and high-rises and dwell in standardized buildings fueled by mechanized HVAC systems, our brains are practically identical to those of our ancestors living on the savannah and they require the same foundational inputs: fresh air, natural light, exposure to other living plants and animals, tactile sensory information, seasonal and temporal awareness. Architecture firms must now confront what these findings mean for the world they design and construct.

The foundational studies and texts by Ulrich, Kaplan, Wilson and others inspired two biophilic design frameworks, pioneered first by scholar Stephen Kellert and later by the consulting firm

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[7] *Mittelmark, Sagy, et al., eds., The Handbook of Salutogenesis (Berlin: Springer, 2016), https://link.springer.com/book/10.1007/978-3-319-04600-6.*

[8] *Roger S. Ulrich, "View Through a Window May Influence Recovery from Surgery," Science 224 (May 1984), https://www.researchgate.net/publication/17043718_View_Through_a_Window_May_Influence_Recovery_from_Surgery.*

Terrapin Bright Green. Both frameworks identify the elements of the natural world people need and provide pathways for integrating those elements into the built environment in meaningful ways, ranging from designing with fractals to the integration of natural light and direct, tactile relationships with natural materials.

Similar acts of translation are occurring between scientific study and critical design theory in the realm of neuroscience. Until recently, 17th-century philosopher Rene Descartes' notion of dualism in which the body was merely a vessel for the mind remained relatively standard in neuroscientific thinking, even if slightly advanced since then; the human brain and body operated as entirely separate entities, with the body leveraging its five senses to feed information to the brain to process. However, contemporary research suggests instead that all cognition is a product of a deeply collaborative mind-body-environment paradigm. Instead of a linear connection between the body and the mind, there are a series of feedback loops that shape our experiences and identities — between our bodies, brains and environments. Furthermore, up to 90% of human cognitions are unconscious while only 10% of cognitions are conscious and paired with language. The 90% of nonconscious cognitions occur in part due to the vast number of human sensory tools at our disposal. Contrary to the prevailing conception of the five human senses, people have dozens of senses, ranging from proprioception and interoception (one's sense of their body in space and one's sense of their internal body and its parts, respectively) to thermoception and gustatory senses.

This new conception of human cognition, navigation and identity recognizes that people are embodied — that everyone experiences the world in a body that actively shapes one's understanding of the world as it moves through time and space. Our thoughts shape our experience of the built environment, and our physical experience of the built environment then shapes our thoughts in a never-ending cycle.

In her book "Welcome to Your World: How the Built Environment Shapes Our Lives," architecture critic and scholar Sarah Williams Goldhagen explains the built environment as "a living ecology of affordances," in which affordances are opportunities for action.[9] This is how people move through the world, scanning their physical environments for opportunities to act with constant nonconscious cognitions that include sensory impressions and emotions.

Neuroarchitecture also addresses the inexorable link between memory, language, identity and architecture. Language and metaphor help people make sense of the world. As the mind-body-environment paradigm suggests, language influences our experience of the built environment and vice versa. Every person serves as their own narrator in life, constructing storylines in real time and in retrospect. Collections of these storylines and experiences form memories, which become a foundational component of identity. Every memory embeds itself in a physical setting — it cannot exist without a temporal and spatial context. Therefore, architecture functions as a stage for people to play out their lives, and architects have the chance to curate that stage for the best possible outcomes.

Neuroarchitecture, in many ways, is synonymous with multisensory design, and humans are finicky creatures to satisfy when it comes to sensory input. Overstimulating spaces become cognitively draining while understimulating spaces can drive boredom and irritation. Furthermore, human sensory impressions are cross-modal in that the senses do not operate in isolation. Rather, they continuously influence each other. It will be up to design practitioners to research and develop target sensory goals for their projects based on program and context.

[9] Sarah Williams Goldhagen, *Welcome To Your World: How the Built Environment Shapes Our Lives (New York: Harper, 2017).*

All these areas of research and design theory — salutogenic design, biophilic design and neuroarchitecture — acknowledge that buildings prompt biochemical changes in occupants. As architectural design psychologist Jan Golembiewski writes in "The Handbook of Salutogenesis": "Architecture can be psychologically manipulative, for better or for worse."[10] Lighting conditions influence circadian rhythms, and building material colors and tactility can influence one's sense of thermal comfort and appetite. The Academy of Neuroscience for Architecture (ANFA) is a leading resource for neuroarchitecture, but as more robust frameworks for neuroarchitectural design emerge, practitioners have the opportunity to embrace an increasingly nuanced approach to creating spaces that reinforce positive affordances, self-identity and comfort from myriad sources.

All this research makes clear the opportunity for radically healthy buildings in the 21st century, as well as how much we inherited from our ancestors. We inherited instincts about safety, nourishment, happiness and community. The interdisciplinary approaches explored here, while giving practitioners such precision and an opportunity for intentionality, also point backward. In addition to sound instincts, we have also inherited a legacy of countless culturally and climate-specific approaches to creating habitat and shelter that unconsciously promoted these health outcomes and existed in symbiosis with surrounding natural systems. Practitioners can integrate every health-oriented solution into their current projects, and it will still not be enough because, ultimately, the only healthy built environment for people is one that can withstand our changing climate.

The Role of Vernacular Architecture and the Lo-TEK Movement

In 1964, the Museum of Modern Art (MoMA) featured Bernard Rudofsky's exhibition "Architecture Without Architects." The exhibit explored community-driven vernacular architecture from more than 60 countries and sparked a conversation that questioned the prevailing attitude toward buildings as "machines for living." In the years since, the conversations and texts about global vernacular architecture have continued, particularly as a response to the climate crisis. John May's "Buildings Without Architects: A Global Guide to Everyday Architecture" delineates the direct relationship between vernacular architecture and green building:

> Vernacular architecture, by its very nature, is built from local materials that are readily on hand and is thus defined by the geology and ecology of the region as well as by local climate conditions. Constructed by the community using traditional tools, these structures are highly practical, energy efficient, and blend with the landscape. These buildings carry many of the attributes that we are now seeking in 'green architecture' as we struggle to adapt our built environment to the demands and concerns of the climate change era.[11]

His examples range from the Caribbean chattel house, designed without nails for easy disassembly so the structure could move with its nomadic inhabitants, to Iranian desert towns that leveraged underground water supply systems, known as qanats, and ornate wind catchers so that occupants could survive in some of the most extreme desert conditions on the planet.[12] Both of

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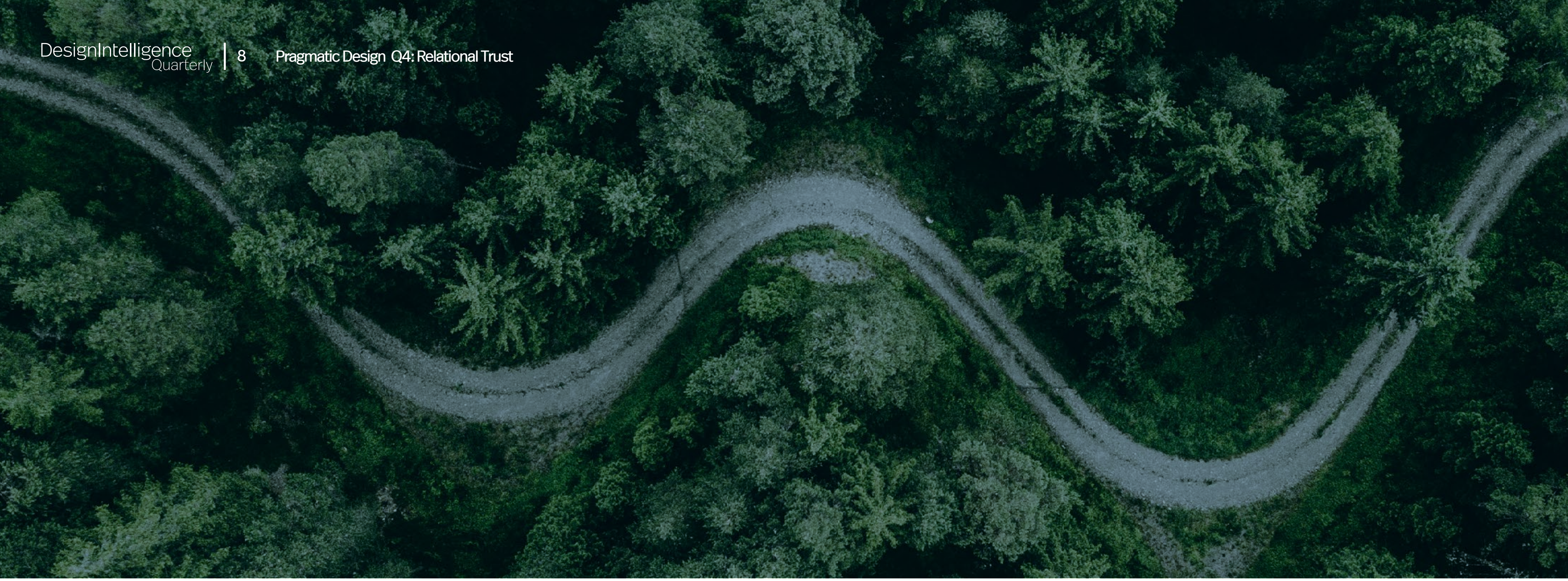
[10] *Mittelmark, Sagy, et al., The Handbook of Salutogenesis, 260.*

[11] *John May, Buildings Without Architects: A Global Guide to Everyday Architecture (New York: Rizzoli, 2010), 8.*

[12] *May, Buildings Without Architects, 13, 83.*



these structures offer contemporary architects lessons about designing for material circularity, adaptive reuse and extreme climatic conditions without dependence on mechanized systems.

The process of remembering and studying vernacular architecture has paved the way for the Lo-TEK movement (Traditional Ecological Knowledge). Julia Watson, a designer and professor at Harvard and Columbia, explains in "Lo-TEK: Design by Radical Indigenism" that Lo-TEK is "a design movement to rebuild an understanding of indigenous philosophy and vernacular architecture that generates sustainable, climate-resilient infrastructures."[13] Watson's examples of Lo-TEK design include the Waru Waru, or agricultural terraces, in Peru, which are made up of raised planting platforms and canals in the flood-prone area of the Lake Titicaca basin.[14] The raised planting areas prevent crops from washing away while the influxes of water fertilize the soil through the breakdown of silt, sediments, algae, plants and fish and animal residues permeating their crop systems.[15] Watson cites other examples like the living root bridges of the Khasi people in India. Their living infrastructure withstands some of the highest levels of rainfall on the planet and demands decades of planning and patience.[16] While operating at larger infrastructural scales, Watson's examples excel at many of the same challenges facing the architecture and design industry: using low embodied carbon materials, producing no waste and working in symbiosis with natural systems.

[13] *Julia Watson, Lo-TEK: Design by Radical Indigenism (Los Angeles: Taschen America, 2020), 20.*

[14] *Watson, Lo-TEK, 34.*

[15] *Watson, Lo-TEK, 39.*

[16] *Watson, Lo-TEK, 55.*

The climate crisis highlights humanity living beyond the boundaries of the systems that support all life on Earth. Human-driven development cannot continue to override and overextend the planet's ecological systems, neither can buildings continue to be standardized and mass-produced like machines, as they have been throughout the last two centuries. The architecture of today's context must reflect a realignment with natural systems; our buildings must facilitate living within our planetary boundaries through the inventive use of new structures, construction methods and readily available materials that do not harm human or ecological health.

Any examination of vernacular architecture inevitably concludes that cultural identity, spirituality and belief systems, and tradition inform vernacular architecture as much as locally abundant materials and climatic conditions. The fig trees used to create the living bridges, for example, are a cultural keystone species for the Khasi people.[17] Unlike most contemporary architecture, vernacular and Indigenous architecture function as physical representations of deeply held values and narratives. John May stresses that modern vernacular architecture already exists in the of form Earthship houses, which use both local natural materials and recycled synthetic materials, and ad hoc squatter settlements in countries such as Brazil and India.[18] However, neither of these examples provides insight into scaling the most compelling aspects of Indigenous and vernacular design — climatic and cultural specificity — to apply to large-scale projects. The question remains: How does one reconcile community-driven, ancient, culturally specific and spiritually embedded construction methods with today's secular, modern culture of convenience, comfort, profit-driven economics and individualism?

For current architecture firms to practice with the same degree of innate specificity of vernacular architecture, the design process must fundamentally shift. The term "place-based design" will take on new meanings as firms consider more deeply not only the local climatic conditions, ecological needs and readily available materials but also the value systems of the client and occupants in relation to the building program. Just as biophilic design, neuroarchitectural and salutogenic frameworks will play greater roles in the architectural design process, so too will areas of research like biomimicry, which studies and mimics nature's solutions to solve human-driven crises. The adoption of a design process that mimics and embraces the climate and cultural specificity of vernacular architecture provides firms with a unique opportunity to advance a vital broader cultural shift in our societies, one that reimagines our social hierarchies and embraces responsible stewardship instead of dominion over the natural world.

Contemporary Architecture Challenges

Current architecture firms face steep challenges as they evolve their practices to marry the past with the future. Buildings play a pivotal role in rebalancing the relationship between people and the natural world — a missing link in spurring meaningful action to combat climate change. Furthermore, the built environment must actively alleviate the strain currently placed on various global systems. Buildings should help localize food systems, improve human health outcomes and create viable habitats for biodiversity. Architects must embrace the integration of architecture with cultural and ecological identities and the unique energy and nutrient flows of specific places to create successful designs for them.

[17] *Watson, Lo-TEK, 55.*

[18] *May, Buildings Without Architects, 172-176.*

Climate change will also drive concurrent fundamental shifts in our political, economic and social systems. Designers practicing in today's context face not only the challenge of creating radically healthy and high-performing buildings but also to do so inside of economic and political systems that are each rapidly responding to the climate crisis in their own ways. Within the building industry, methods of manufacturing, the recalculation of the cost of environmental degradation, demolition and waste collection and management systems, all stand to alter the way those in the AEC industries design, purchase and construct their projects.

To build anything in the face of a destabilized climate and deteriorating human health is to leverage the most advanced research about ourselves and the natural world to satisfy our core, evolutionary needs. Buildings must nurture the ecosystems we belong to and rely on to breathe, eat and drink while still fulfilling our basic need for shelter. In today's context, design and construction demand ancient wisdom, local and reclaimed materials, an acknowledgment of our biology and an understanding of the role people play in broader ecosystems. Practitioners can echo and honor the wisdom of vernacular architecture armed with the specificity of modern-day science.

Firms must be prepared to adapt quickly, embrace a highly multidisciplinary approach and push for the most holistic, sustainable solutions with their clients and stakeholders. The future depends upon and has entrusted itself to architects realizing the potential of the built environment to support human and ecological needs.

> Architects must embrace the integration of architecture with cultural and ecological identities and the unique energy and nutrient flows of specific places to create successful designs for them.

DeeDee Birch, LFA, is an avid writer, researcher, consultant and passionate sustainability advocate with a focus on residential design and the intersections of the sustainability of the built environment and designing for human health. After earning a B.F.A. in sculpture and B.A. in English from Boston University in 2018, she completed her Master of Design in Sustainable Design from the Boston Architectural College in 2022. Most recently, DeeDee earned her Living Future Accreditation from the International Living Future Institute and the Healthier Materials & Sustainable Building Certificate from the New School's Healthy Materials Lab in 2023. She is deeply invested in how creativity can drive sustainability solutions, how complex global systems shape the lives of individuals and how to empower meaningful action in the pursuit of a happier, healthier and more equitable future. See more of her work at www.deedeebirch.com.