

# The World of Design Research

BY VERNON MAYS

Design research is being done today by universities, government agencies, corporations, and practices. We asked 11 leading design researchers about their work—its goals, applications, and impacts.

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**James Timberlake**  
**KieranTimberlake**

James Timberlake is a partner at KieranTimberlake and inaugural recipient of the Benjamin Latrobe Fellowship for architectural design research from the AIA College of Fellows. Gensler is working with his firm on the new US Embassy in London.

## Not many architects engage in serious research. Why is it important to your firm?

**James Timberlake:** Our firm culture began with research 26 years ago, and continued to emerge until it was formalized in 1999. Five years ago, when we became ISO 9001-2000 certified, we established research processes in our firm's management system. The essence of performance-based architecture is founded in research. Without the proper queries, data, metrics, and facts, science cannot inform art in meaningful ways. Architecture, after all, is both art and science, no?

## Would you call your research “scientific?”

**JT:** Yes. The research, whether applied or non-applied, covers a variety of topics, all of which are deeply informed by rigorous query. Many of our research initiatives are proprietary, but some in the public realm include the research and writing of Refabricating Architecture; the development of SmartWrap™; Loblolly House, and Cellophane House™; and the design and monitoring of several high-performance building envelopes. The new US Embassy in London embodies numerous research initiatives that involve a variety of systems, applications, and technologies.

## How will the outcome of your research benefit your clients?

**JT:** We believe that if we can improve building performance, encourage better social environments, and decrease the impact of our architecture on the environment, we will generate benefits not only for our clients, but for the advancement of architecture. Efforts such as our books and the fabrication of Loblolly House and Cellophane House are examples of applied results that have immediate measurable impact.



**Vivian Loftness**  
Carnegie Mellon University

Vivian Loftness is a researcher and educator in environmental design, advanced building systems, and design for productivity. She leads research on the intelligent workplace for the Advanced Building Systems Integration Consortium, a university-industry partnership.

**What is the thrust of your research? How do you select your topics?**

**Vivian Loftness:** We have projects underway in intelligent workplaces, high-performance building design, and sustainability. Architecture affects my decision to pursue any research. We focus on improving the design, construction, and operation of buildings for end users and the environment. We observe building performance, find gaps in the disciplines that could compromise performance, and identify where innovation can make a measurable difference.

**What are you working on now?**

**VL:** We're working on Building Investment Decision Support, an investment decision tool that helps identify the true costs and benefits of sustainable features and the life cycle justifications for high performance and green design innovations. It shows that profitable investments are possible through a range of cost benefits— from the “immediate dollars” of energy efficiency, waste management, and churn to the “long-term dollars” of improved indoor environmental quality, productivity, and health.

We also have quantitative before-and-after field studies underway in federal office buildings that link performance factors (such as health, productivity, and retention rates) to the quality of the physical environment. User satisfaction and performance studies reveal gaps between design intent and performance, such as the disconnect between thermal comfort standards set for 80 percent occupant satisfaction and the fact that only 40 percent of workers are happy. The thermostat cannot measure human perception. Lighting is another area where standards and reality don't always mesh. Paper-based reading levels are too high for computer-based work.



**Rachael McBrearty**  
Cisco

Rachael McBrearty is global creative director of Cisco's IBSG Innovations Practice, which designs next-generation customer experiences by using technology to connect customers to employees and enable real-time interactions throughout the customer journey.

**How would you characterize your research program at Cisco?**

**Rachael McBrearty:** It's about how we can bring technology to bear to advance business. We take a user-centered design approach, which considers the needs, limitations, and expectations of our retailers' customers. We look through the eyes of those customers, using design thinking to deliver the right balance of functional, emotional, and aesthetic experiences.

**Does that apply more to retail settings or websites?**

**RM:** It's across multiple channels. It's not that different than writing a story—like a hero's journey. Imagine setting out on an adventure to buy a new camera or get an outfit. We look at how the customer thinks about achieving that goal, how you facilitate it, whether they're shopping on their mobile phone, online, or in the store. We think about all the touch points that journey can take.

**What projects are you concentrating on now?**

**RM:** Two areas are showing positive business results. We're exploring the concept of a remote expert. It's about scaling your experts to interact with the customers live, in-store, through high-definition video, online through shared spaces and shared content, or through Twitter. It is about bringing the human touch into the experience. The other new area is interactive signage. We have a pilot in which we're personalizing signage, so you tap a loyalty card to the sign and it gives you targeted recommendations and offers. We want to see if that drives sales. It's a way to leverage the data retailers already have in their customer relationship management software.



**David Kirsh**  
University of California, San Diego

David Kirsh is a professor of cognitive science at UCSD. He sits on the board of the Academy of Neuroscience for Architecture (ANFA), which advances knowledge linking neuroscience research to an understanding of human responses to buildings.

### How do your research interests overlap with those of the Academy of Neuroscience for Architecture?

**David Kirsh:** Reducing cognitive complexity and maintaining control over the structure of the workplace are themes of ANFA's research and my own. Many of our questions focus on spatial cognition, such as effective design that results in simple navigation of complex buildings. Cues, layouts, or constraints within a space can compensate for neural deficits, but architectural attributes are complicated stimuli. We use virtual environments to study spatial cognition, with the results evaluated through electrophysiological neural reading devices. Some Academy members study how spatial and other design attributes affect activity in everyday life.

My work focuses on this, too. We studied office workers by video to understand the effects of desk designs and workflow patterns. Was the messy desk or the neat desk better? We studied people's behavior, interruptions, and the number of projects open on their desks at one time. That gave us a profile of the ways people relate to their desks.

### Are you studying environments other than the workplace?

**DK:** Smart kitchens are also under investigation. Take recipes, for example. Recipe books are inefficient, causing the cook to look at them repeatedly, which ought to be unnecessary given their lack of complexity. A smart kitchen is not just about production, but also about organization. It uses context-aware intelligence and artifacts, perhaps a frying pan with sensors that recognize when the butter is ready or else is too hot—or a knife that recognizes the difference between slicing and chopping and signals the cook if something is wrong.



**Jason Vollen**  
Center for Architecture Science and Ecology (CASE)

Jason Vollen is Associate Director of CASE, a research program co-hosted by Rensselaer Polytechnic Institute and Skidmore, Owings & Merrill. He focuses on such emerging technologies as energy-performative structural ceramics, environmental simulation, and digital fabrication.

### What are you seeking to achieve in your research program at CASE?

**Jason Vollen:** One of our goals is to accelerate the development and deployment of new technologies into the building sector. We're trying to position technologies to the marketplace faster. We're also focused on the building envelope, working to capture, transform, store, and redistribute the energy in and around the envelope.

### Do design professionals shape your agenda? Or is it driven by the marketplace?

**JV:** It varies. Often we work alongside large firms and develop our technologies in parallel with large building projects, meaning that the research is not sacrificed for the building or vice versa. We see that to be mutually beneficial, because if the pace of development means the new technology won't get applied on the first project, then it might get far enough along to be used on the second or third. It's a way to push the technology faster.

### Tell us about one of your current projects.

**JV:** They're all important, but one is the Integrated Concentrating Solar Façade, which is both a daylighting system and a power generator. It's taking 60 to 80 percent of the energy off the envelope through either high-quality heat or photovoltaics. This has been made possible by great advances in high-efficiency solar cell technologies, combined with viewing the façade as an energy generator. We can actually focus light, turn it into heat energy, and then move the heat away from the building.



**Jeremy Watson**  
Arup

Jeremy Watson is Arup's director of global research. A chartered engineer, he is also a visiting professor at the Universities of Southampton and Sussex, and chief scientific advisor for the UK Department for Communities and Local Government.

**Has research been a part of your firm culture from the beginning?**

**Jeremy Watson:** Yes, going back to the Sydney Opera House, I think Ove Arup was pushing the boundaries and researching new means of developing the engineering around innovative design. We feel that research and design are the two key elements that differentiate us—and one feeds the other.

**What research projects are you currently working on?**

**JW:** Our most important projects are in the area of sustainable planning and development, including methodologies for city infrastructure. We're looking at the interplay between the infrastructure that gets built in cities and what benefits can be gained in energy terms, both embodied and operational, and in convenience for citizens. There are frequently places where energy, for example, is lost in one system where it could benefit another.

**How has your research influenced your work?**

**JW:** It has internationalized our research links through Arup's research champions and partners. A key example is the formation of Institutes for Sustainability in London and Shanghai. What we've done in London is to leverage money from Europe to do retrofit of existing buildings for energy efficiency and to then transmit the information learned from doing that to small- to medium-sized enterprises. In Shanghai, with Tongji University, we have set up a sister institute. The goals are different, because Shanghai is a "new building" environment. We are doing joint projects that have been instrumental in releasing quite a bit of money—\$1.5 billion—for regional development.



**Dana Cuff**  
University of California, Los Angeles (UCLA)

Professor, author, and practitioner Dana Cuff is co-director of cityLAB, a UCLA think tank focusing on research and design demonstrations that promote new ideas about architecture in the city. Her work addresses affordable housing, the suburbs, and the politics of place.

**How does the City of Los Angeles support your research?**

**Dana Cuff:** LA is our backyard, so we use it as a lab. The post-suburban city is one of our research initiatives, which stems from cityLAB's location in Los Angeles, the mother of all suburbs. In 2009, we launched a design competition called "WPA 2.0" that addressed federal policy about how design might be part of bailout policies to improve America's infrastructure. At the end of the Great Depression, the government subsidized infrastructure projects that both created jobs and left a lasting design legacy. So "WPA 2.0" looked at how current federal spending on infrastructure could contribute more to local communities by investing in the design of bridges, roads, schools, water projects, and so on.

**Which projects of yours have implications for new paradigms in urban design?**

**DC:** The project we've been working on longest is "Backyard Homes," which looks at doubling R1 zoning density. Thanks to California legislation that enables second units to be built on single-family lots, new affordable backyard houses can be built. You could house a returning college student, older parents, a caregiver—or create a rental unit to help subsidize your mortgage. It's a more ecological use of land, and it doesn't change the character of the neighborhoods. CityLAB has developed a number of strategies for accomplishing this. It fundamentally shifts the way we think about urban growth, putting focus on the existing fabric rather than the periphery. Working with people in the city's Planning Department and with Daly Genik Architects, we have developed a prototype. So now we just need to build one of these units, either as a demonstration house, as a Habitat for Humanity backyard solution, or for a willing person with a backyard.



**Egon Terplan**  
San Francisco Planning + Urban  
Research Association (SPUR)

Egon Terplan is SPUR's regional planning director. His research combines planning and economics and addresses topics such as city/suburb competition for jobs, commute patterns and transit ridership, and local/regional collaboration on infrastructure.

**What is the thrust of your research program?**

**Egon Terplan:** Our research program touches on urban planning and governance issues. We pick topics that are both challenging to work on and are not being addressed effectively by others.

**What projects do you have in progress now?**

**ET:** One project, called The Resilient City, examines how we prepare for and respond to disasters such as earthquakes. It explores how to prevent the worst aspects of a major earthquake, as well as how to rebuild afterwards. Another project, The Future of Work, focuses on changes to the organization of the workplace and the extent to which future jobs will be clustered in dense, transit-served centers. We're exploring questions about how to retrofit the corporate campuses of Silicon Valley and how to shift more commuting onto sustainable modes of transit. Designers at Gensler are deeply involved in this project.

**What conclusions have you made as a result of your research?**

**ET:** We have the opportunity to make the Bay Area a model of sustainability and economic inclusion and do not have to wait for policy makers in Sacramento or Washington, DC, before we make progress regionally. Our research shows that there are cost-effective ways to reduce driving by shifting commuters towards transit and other modes and that there are sufficient infill sites to accommodate all future growth. We also have the ingredients for a competitive and diverse regional economy that provides sufficient employment for all who seek it.



**Anijo Mathew**  
Illinois Institute of Technology (IIT)

Anijo Mathew is an assistant professor at IIT's Institute of Design. He uses interactive design to study how information affects placemaking and how place affects information. In 2007, he was named New Researcher of the Year by the Architecture Research Centers Consortium.

**What influences your decision to pursue one topic or another?**

**Anijo Mathew:** My research is shaped by social evolution and the idea that people are starting to reconstruct notions of place through technology. The computer can turn data into physical and virtual feedback.

**How does technology work to shape place?**

**AM:** Placemaking is the notion that architecture shapes place, in the sense that people can come together and commune. Plazas, public spaces, and parks are an important aspect of urban space, rather than just buildings and streets. But now that information is so prominent in our lives, and we have moved to a transient point of view because of mobile devices, the idea of place becomes transient, too. Place can be shared with people who are not in the same physical location. So place is not just physical, it's also virtual. Using central points and the concept of zero-zero grids, it is possible to understand the personality of both physical and virtual space constructed by the people passing through. Through virtual connections, digital devices can track who has come to a place and from where, how long they stay, and where they're going.

**How are you applying these ideas?**

**AM:** We are working on developing protocols with IBM to use published data for mapping the visual construct of a city. Imagine walking around with a mobile device, seeing a building, checking out its history, who designed and occupied it, then peeling back layers and looking at mechanical systems or energy consumption or structural components—all the invisible stuff.



**Christine Barber**  
Gensler

Christine Barber is director of research at Gensler, where she oversees initiatives designed to deliver strategic insight to clients and provide a broader context for design direction. Recent projects focus on design and business performance, trends in global real estate portfolio management, and workplace mobility.

**What are the roots of Gensler’s research program?**

**Christine Barber:** It’s focused on solving the real questions and issues faced by our clients using the important combination of design and research as a way to add value to the client engagement. It’s also rooted in innovation. When it is informed by research, design becomes a vehicle for addressing problems in new and different ways that lead directly to innovative ideas and solutions.

**What kind of research is Gensler doing now?**

**CB:** Different design challenges require different approaches. Since the research program spans all of our practice areas and our delivery infrastructure, the simplest way to talk about what we’re doing is to describe the three main categories our research covers. Many projects fall into the category we call original research, which is focused on generating new knowledge. These projects often are grounded in linking design to human, building, or business performance. A second group of research projects involves the development of tools and frameworks that designers can apply in their work. Such tools allow us to quickly generate insights that can inform design and provide proof that the design strategy has met client goals. The third piece is trend research—it’s a way to anticipate how big shifts and changes are going to impact our clients’ businesses and what the implications might be for design solutions.

**Once the research is complete, how do you share the findings?**

**CB:** Learning is a vital component of the program. And once the research is complete, the research teams conduct educational sessions to reach designers across the firm. We also focus on sharing our research with clients through meetings, seminars, and conferences, and by publishing many of our findings in research reports and white papers. The true value of research is in sharing it with those who can apply the knowledge to its best benefit.



**Shari Tishman**  
Harvard University

Shari Tishman directs Project Zero, an interdisciplinary project at Harvard’s Graduate School of Education that examines how learning and teaching are shaped by globalization, digital technology, mind/brain research, and other forces.

**One of the key questions you address at Project Zero is how and where learning thrives. What have you learned about that?**

**Shari Tishman:** One of the ways that learning thrives is in settings that make thinking and learning visible. What’s really important to underscore is the emphasis on process, not product. It’s not just that the products of thoughts are displayed, but rather that we engage dynamic forms of representation that show your thinking as it evolves. We’re particularly interested in collaborative settings where people can look at the synergies between their ideas and others’ ideas and see how knowledge evolves as a shared, open-ended structure, rather than something that’s finite and objective. Learning environments that embody knowledge-developing ideas like this are particularly well suited to the 21st century.

**Can you describe a scenario that illustrates this idea?**

**ST:** A low-tech example would be a group of children at a museum having a conversation about a work of art. Maybe the kids are writing their thoughts on Post-its and putting them up on a wall and then moving them around as they talk. So what was a question now becomes part of an interpretation. They see the link between their ideas as they go along—making a visible representation that can be manipulated as they talk. Another of our projects emphasizes photographic documentation, perhaps taking pictures of people as they’re talking, and then reflecting on those pictures. Just by creating artifacts that can be text-based, visual, or sound-based—even tactile—we find they contribute to the building of understanding.”

Vernon Mays is an editor-at-large at *Architect* magazine.