

Robinson Sarah and Juhani Pallasmaa, eds., *Mind in Architecture: Neuroscience, Embodiment, and the Future of Design*. Cambridge: The MIT Press, 2015. 264 pp., 47 color ill., 24 b/w ill. Hardcover \$34.95 (978-0262028875)

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In 2003, at its annual conference in San Diego, the American Institute of Architects established a research group concerned with neuroscience and its likely effect on the profession. San Diego was an apt location, for it was not only the home of Louis Kahn's magnificent Salk Institute, but also of the University of California at San Diego, one of the world's premier centers for brain research. Eventually this group formed the Academy of Neuroscience for Architecture, which held its third international conference in September of 2016.

It is remarkable, and disconcerting, that few architects or architectural historians have been following these developments with more than passing interest. In 2015 a new book of edited conference papers appeared, entitled *Mind in Architecture*, which could change some minds. A number of the authors in the anthology were key figures in the organization of ANFA. Predictably, the tone of the essays is one of discovery and advocacy for a project that promises great things. As with many anthologies of this type, the essays often carry similar messages, but skillful editing has given the contents a structure and flow that might allow the book to function as a course text. More than just a primer for design professionals, this book is an essential introduction to research that may

produce a paradigm shift in both science and the humanities in the very near future.

The big idea that could move architects and academics, and perhaps cure some of the narcissism that pervades many disciplines, appears in the book's title: *embodiment*. Neuroscience has produced convincing evidence that the brain is so fundamentally connected to the body as a whole that substance dualism (Cartesian mind vs. body ontology) and computational theories of mind (cognition divorced from sensory-motor awareness) are no longer supportable as foundations for empirical inquiry, or indeed, for philosophy. According to the theory of "grounded cognition," the sensory-motor system does not "mediate" information from the outside world for the cognitive mind to use in its "phenomenological theatre." Instead, the cortex integrates two kinds of cognitive activity into a unified apprehension of both the physical world and its metaphysical qualities, much as Aristotle surmised centuries ago.

Juhani Pallasmaa, a Finnish architect and teacher well-known for his work on multiple sensory awareness and architecture as a craft, is one of the two editors of this volume; the other is the architect and counter-culture pedagogue, Sarah Robinson. The two organized a 2012 conference at Taliesin West, home of the Frank Lloyd Wright School of Architecture, which asked neuroscientists and scholars to reflect on the implications of this new research on the design professions. None of the participants were members of the dominant, Post-Structuralist elite who teach "theory" at leading architecture schools.

That fact ensured that the papers would be free of jargon. The only historians to speak were Harry Francis Mallgrave and Alberto Perez-Gomez—both scholars with unusual and diverse publications. The remaining authors included a philosopher (Mark L. Johnson), architects (John Paul Eberhard, Robinson, and Melissa Farling), a psychiatrist, a graphic designer, and several

neuroscientists. Though most had university appointments, there was ample evidence of professional experience in design among the presenters.

At the heart of the collection are two essays from *eminences grises* who underline both the pragmatic and the poetic aspects of buildings in their appeals for more collaboration between neuroscience and the design professions. John Paul Eberhard, the founder of ANFA and a former dean at Carnegie Mellon, connects the most sophisticated principles of proportion to the most basic graphic explorations of young children, arguing that brain science has much to teach about creativity and aesthetic judgment. Juhani Pallasmaa (also a former dean) writes passionately about embodied knowledge—the kinds of art practiced by craftspeople in traditional societies—and the disdain shown by many architects for things involving the senses and not the intellect. As he writes, “I believe that neuroscience can reveal and reinforce the fundamentally mental, embodied, and biological essence of profound architecture against current tendencies toward increasing materialism, intellectualization, and commodification.” (p. 52) In his many books and articles he has been a consistent advocate for the re-establishment of design practices that were jettisoned by the profession in the late twentieth century, and he clearly believes that the new biological sciences will support a correction in the trajectory of the design professions, away from egocentrism and the blind pursuit of novelty.

If these pieces form the nucleus of the book’s cellular structure, its walls are framed by two fascinating essays by Mallgrave and Perez-Gomez, whose previous contributions to the field were in the history of architectural theory during the Romantic and Enlightenment periods. Each offers an interpretation of the cultural context in which the sciences of the mind came to influence architecture, leading to the present moment in which architecture faces an existential crisis while neuroscience promises exciting discoveries about how

people perceive their environment. Both scholars are critical of their colleagues in design education, art history, and architectural practice.

Mallgrave has published two recent books that look directly at brain science and its potential impact on design. Drawing from this work, he reminds those architects who believe themselves to be conceptual artists that at no other time in history have building designers so blithely divorced themselves from the technical and social aspects of their profession. Here we first encounter the discovery of “mirror neurons” by Italian neuroscientists during the 1990s: the extraordinary brain cells that fire when monkeys look at the actions of other hominids. Rather than simply forming images of these activities in the visual cortex, cells in the cortex fire as if signaling the muscles and nerves to perform the actions that are going on in front of their eyes. Experiments on humans have confirmed this phenomenon in the brain as well (though not without skepticism). For Mallgrave such discoveries press architects to attend to their own emotions and sensory experience of the environment, and to follow the human sciences more closely in their approaches to design.

Alberto Perez-Gomez pursues a similar theme by sketching the Enlightenment philosophical armature that, he contends, led architecture to its current obsession with “architecture as a ‘sign’ whose meaning was articulated as the intellectual ‘judgment’ of exclusively visual qualities.” (p. 219) He succinctly presents a progression of post-Cartesian philosophical positions, citing Heidegger, Schelling, Husserl, Merleau-Ponty, and Nietzsche, that underpin the current debate about consciousness, mediated perception, and a computational mind. His gift for explication compresses some quite complex ideas into a compelling narrative that eventually arrives at what he calls “enactive cognition,” or embodiment. Invoking the work of Antonio Damasio, one of the most published neuroscientists in both scientific and popular literature, he

admonishes architects to become “attuned” to their bodies, the environment, and their own emotional responses to the physical world. “Once we understand, through recent cognitive science, that our consciousness does not end with our skulls, it becomes easy to grasp that the emotive character of the built environment matters immensely,” and hence he insists that the beauty imbued in buildings by architects cannot be cast aside in pursuit of abstruse semiotic constructs residing only their heads. (p. 226) He even goes on to recommend a return to hand drawing and other “revisions to long-held beliefs in architectural education.” (p. 229)

Philosophical implications of the new brain science figure prominently in several other essays, but none more forcefully than “The Embodied Meaning of Architecture” by Mark L. Johnson. In his work more than twenty years ago with George Lakoff, Johnson challenged the prevailing analytic view of meaning as “conceptual/propositional/linguistic” and proposed a theory that would ultimately connect to the discovery of grounded cognition. That theory, which he now extends to architecture, adheres to some propositions in the work of John Dewey and James J. Gibson, American thinkers previously relegated to the dustbin of history. “My hypothesis is that architectural structures are experienced by humans as both sense-giving and signifying,” he writes, (p. 40) expressing a view shared by Perez-Gomez, Mallgrave, Pallasmaa, and several other contributors. The fact that a pragmatist interested in art, Dewey, and a psychologist interested in the environment, Gibson, made similar observations in the 1920s and 1960s suggests that American challenges to continental philosophy were more credible than we generally assume. Johnson extends and enriches concepts of “a pervasive unifying quality” in experience (Dewey), and the “affordances” presented to an organism by its environment (Gibson) by looking at the conditions of balance, motion, containment, structure and space around

the human body, and comparing these things to buildings. That idea was of course a part of Heinrich Wofflin's pioneering work on empathy and emotion in art dating to the late nineteenth century, and extending into the twentieth in the work of Ernst Gombrich and Michael Baxandall. What is new is the forceful, and persuasive, case made by neuroscience that such externally-driven emotional states are linked to the mind's cognitive machinery.

Sarah Robinson uses the metaphor of "nested bodies" to explain similar connections between the sensory-motor system and the conscious mind, while Vittorio Gallase and Alessandro Gattara make a case for neuroaesthetics research in citing "four reasons why cognitive science matters to architecture." As an architect and educator Robinson sees her role as a kind of troubadour for the marvelous, world-shaking discoveries of neuroscience and psychology, and her essay sings, weaving its own nest of ideas and pathbreaking thinkers. Working together at the University of Parma, Gallase and Gattara have followed on the heels of their famous colleagues who worked with capuchin monkeys to measure mirror neuron activity during the early 1990s. Their current research features EEG scans of humans in office environments, and promises to flesh out hypotheses about pleasure and aesthetic sensibility in the brain.

Thomas Albright and Michael Arbib are also prominent neuroscientists working in a major research nexus—Southern California. Each presents a primer on recent research in their fields, tailored to the non-specialist reader with an interest in architecture. Albright focuses on visual perception and its mysteries, including illusions, color, motion, directionality, and geometric patterns. Like other contributors he brings in the work of humanistic scholars such as Ernst Gombrich and artists such as William Morris to illustrate his points about brain science. This isn't a dense, technical paper in a scientific journal, but it gently lays

out some important principles about visual stimuli and their processing in the visual cortex.

Arbib takes a more conservative stance in relating the work of his colleagues to what architects do on a daily basis. He begins with a good primer on how the brain functions. He, too, mentions Rizzolatti and the Parma studies on mirror neurons. He, too invokes embodiment and the work of the hands as presented by Robinson and Pallasmaa. He, too mentions Gibson's work on the environment. But, like most neuroscientists, he is tepidly cautious about any work that really illuminates what he calls "the neuroscience of the design process," and that is a disappointment to those who have spent careers studying architects, drawings, and the practice of architecture. Architectural historians have published case studies that might well tie into the work that scientists like Arbib do in their laboratories. But, as he makes abundantly clear, few of the 30,000 neuroscientists who attend annual conferences in the field have allied themselves with architects to study how design is done in the studio or on the computer. Vinod Goel of the University of Toronto has written extensively of his research on the cognitive process used architects and other designers, but his work is not cited. Arbib is "not sure there are many case studies in existence" and has not looked at them. His two examples of designers' thoughts on their craft include Peter Zumthor's cryptic comments about his wonderful baths for a hotel in Vals, Switzerland, and the experience of a choreographer in Melbourne, Australia making a dance for eight female dancers that is recorded in a book by Kate Stevens (2005).

Arbib is active in ANFA, and this essay is more than four years old, so there are far more instances of collaboration today than there were then, as was evident at the San Diego conference in 2016. What Arbib says about the gaping void in his awareness of humanistic scholarship should sound an alarm in the art

history and design communities, prompting historians to share their work with brain researchers. Dana Cuff's excellent case studies of practicing architects are decades old but still relevant, and there are many anthologies of research on drawing, model making, computer aided design, and the protocols followed by creative artists—one good example is *Thinking Drawing* (Routledge, 2008) edited by Marc Treib of the University of California at Berkeley. Today, as architectural practice is rapidly transitioning to mainly digital design platforms, there is a particular need to understand how the brain functions when interacting with screens rather than with paper drawings.

The remaining two essays, by Melissa Farling, FAIA, and Iain McGilchrist, have more specific and narrow purviews. Farling has worked extensively with environmental psychologists in identifying standards for schools and criminal justice facilities, a specialty that often recruits scientists. She focuses on the ways in which outcomes and user studies can be enhanced by neuroscience, and has worked as an ANFA fellow on such linkages. Uniquely among the contributors, she has put herself in the shoes of a brain scientist and “walked the walk.”

McGilchrist is something of an outlier in the group, as he is a practicing psychiatrist and professor of medicine who has nonetheless written on a wide range of subjects. His lively and provocative essay is nominally about attention and its mechanisms in the brain, but manages to cover a spectrum from Schubert's C Major Quintet to facial musculature in Augustan era Roman portrait sculpture. In a strangely unifying exploration of hemispheric specialization and ways of knowing, he ties several of the book's themes together: computational and symbolic reasoning, haptic and experiential connections between the brain and body, and the limitations of visual perception. He challenges architects to learn about the brain but not to forget that

experience of the environment is the most important laboratory available to any human.

Mind in Architecture is indeed about the future of design, and packs a lot of information about where the field is heading into its 257 pages. Neuroscience will undoubtedly continue to advance at a dizzying pace, regardless of whether architects, social scientists or humanists tag along. Like any science, its revelations can be quickly supplanted by new research, so outsiders must proceed cautiously in employing findings, even in closely related fields like sociology. Will “grounded cognition” or embodiment prove definitive when measured using a range of experimental methods and machines? If the authors in this book are correct, this new thought paradigm could upset the status quo in more disciplines than just architecture and visual art.