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Human Complexity
The Final Frontier

Harry Francis Mallgrave

We often take it for granted that architecture is a visual art. We think of it in visual terms. We design and evaluate our productions visually. We present our results to clients or design juries in a visual format. We publish our efforts on websites and in journals with graphic images. But do we experience a building or an urban environment exclusively in visual terms?

Figure 1. Library of Celsus, Ephesus, Turkey, completed 135 CE.

The perception of one's surroundings is, after all, a cross-modal or multisensory event. In entering a room our bodies as a whole unthinkingly experience a panorama of stimuli: the fit of a door handle, the ease of a tread/riser ratio, the tactile pressure and texture of a flooring material, the acoustic resonance of the space, the hand of a fabric, the smell of materials, the warmth of sunlight through a window, the sense of spatial relationships, or the flush of memories recalled. Good architects, of course, have always known the multiple dimensions of the built environment, even if we often reduce it to the cartoon of a visual art.

Western philosophy has for millennia constructed a similar two-dimensional images of ourselves. Only a few years ago it was commonplace to believe that we possess animal bodies and thinking minds, and there is scarcely a connection between the two. We passively survey the world with our retinal nerve cells, and these stimuli are then passed to the higher reaches of our brains, where they are converted to ideas—the gist of our mental existence. Presumably, we think with these ideas.

Of course there have been exceptions along the way. Baruch Spnoza, for example, argued that our animal spirits (emotions) could not be so neatly separated from our thinking activity. Martin Heidegger suggested that we cope with the things of the world not symbolically but pre-theoretically—that is, as "equipment" defined by its manipulability or "handiness" to our being.[1] Maurice Merleau-Ponty forcefully rejected "the age-old assumptions that put the body in the world and the seer in the body, or conversely, the world and the body in the seer as in a box."[2] Similary, the perceptual psychologist James Gibson defined a realm called "ecological psychology," which challenged the tenet that there was "a world of mental products distinct from the world of material products."[3] He called such a position "direct perception."

More recently the neurophenomenologist Evan Thompson, in drawing upon the insights of contemporary neuroscience, has proffered a more dynamic model of "radical embodiment," by which the nervous system,

body, and environment (including cultural) are interwoven developmental systems, in which nurture (culture) cannot be distinguished from our biological natures (genes). Culture is something already enfolded or "woven into the very fabric of each human mind from the beginning," a part of a larger environmental field that at the same time shapes our cognitive evolution.[4]

Thompson's model, which is indicative of a large body of theory that has grown on the back of the newer biological sciences, is however little known to architects. We still tend to think about design in conventional two-dimensional terms or with the traditional philosophical values of yesterday. But has this always been the case?

Early Theories of Empathy

Let us take the example of 19th-century philosophical theories and their relation to architectural practice. In his book The World as Will and Representation (1818), the Kantian philosopher Arthur Schopenhauer initiated a line of thinking that would have a profound effect on architectural practice. He believed that all of the arts had to be represented by ideas, and architecture, in particular, by the ideas of gravity, cohesion, rigidity, and hardness—what he termed the "bass notes" of nature. The materials that the architect employs are heavy and gravity (a vital energy, the "will" of nature) wants to pull them to the ground. The task of the architect therefore resides in representing this conflict—that is, in creating a building system (columns, beams, arches, vaults) that thwarts "these insatiable forces of their shortest path to their satisfaction."[5]

Although the theoretical underpinnings to such a view were idealistic, the architectural view that Schopenhauer presents is a highly material and animistic one: the active forces contained within materials held in a temporary condition of abeyance, a visual force-field as it were.

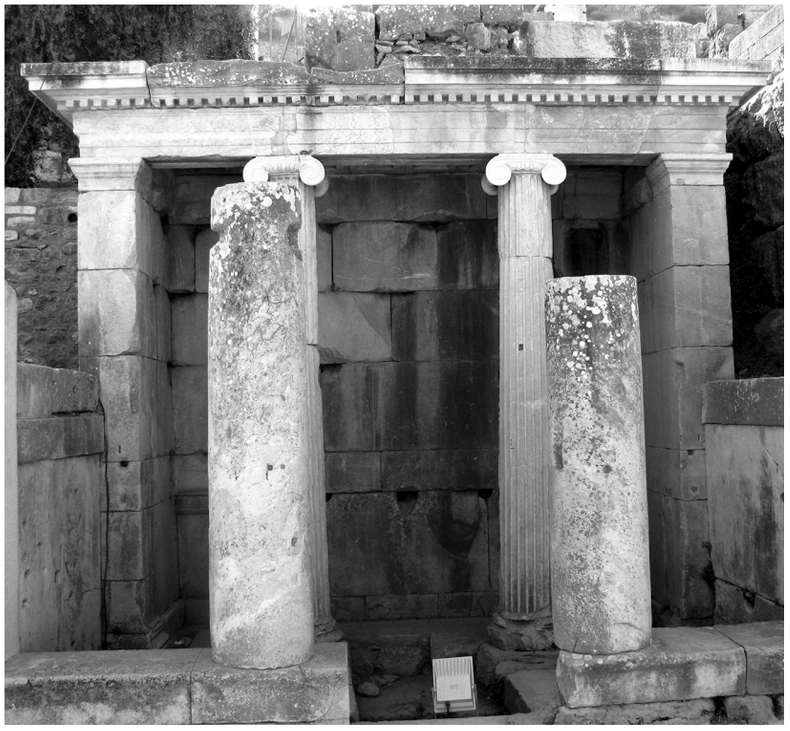

Figure 2. Ionic columns within a community well at Ephesus.

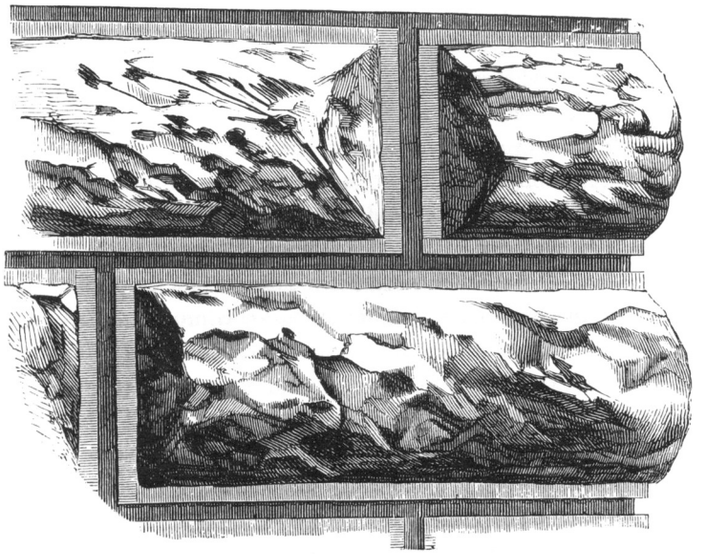

Figure 3. Rustication detail of the Dresden Art Gallery,

The architect Karl Friedrich Schinkel was much moved by Schopenhauer's ideas, as was his protégé Karl Bötticher, who over hundreds of pages referred to architecture as an "ideal organism" in which a "formless condition" of matter is "resolved into a dynamic expression."[6] Gottfried Semper, in his book *Style in the Tectonic and Technical Arts* (1860-63), took this animistic line of reasoning one step further. All architectural forms, he believed, are dynamic events. The triangular form of the Attic gable, for instance, exerts a downward pressure and activates the vertical expression of life inherent in the Doric column. The "supple and elastic strength" of an Ionic volute, again, mediates this transfer of forces (load) in a gentler way than its Doric counterpart: its particular form "offers resistance without violence."[7] (Figure 2 and 3) In one vivid passage describing the rusticated blocks he used on the Dresden Art Gallery, he spoke of how the lithic forces pounded into these blocks with a hammer and chisel remained preserved or contained within the stone as an energetic expression, and how this activity could be enhanced by directing the blows in a specific way and framing them with bands so as to endow the overall composition with a visual "beat"—an allegory to the idealist view of architecture as "frozen music."[8]

Semper's perspective, outlined a full 40 years after Schopenhauer's book appeared, was fully in line with contemporary psychological and aesthetic theories. His colleague at the ETH in Zurich, Friedrich Theodor Vischer, believed that architecture was a symbolic art, one in which the architect was charged with infusing matter with "buoyant life," through the linear and planar suspension of its various parts. Vertical lines, he argued, elevate the human spirit, while curved lines move more energetically than straight lines. Our bodies and brains respond to these forces with "vibrations and-who knows what—neural modifications" (his words) because we have a "pantheistic" urge to read our emotions into the forms of the perceptual world.[9] In a doctoral dissertation of 1873, his son Robert Vischer coined a word to describe this process—Einfühlung, literally "feeling into" the forms of the artistic

Figure 4. The Doric order of the Temple of Hephaestus, Athens, complete 415 BCE.

world.[10] Some 30 years later, after tens of thousands of pages were written on this theme, the term became translated into English as "empathy," an inadequate but nevertheless widely accepted term today.

Robert Vischer's term, nevertheless, captured an important point. When we perceive artistic form, our brains and bodies undergo an immediate and preconscious physiological and neurological response, through which we assign a valence or value to the event. We like or we don't like what we are experiencing. Emotion (defined simply as a response of an organism to a stimulus) is in fact embedded in the perception; emotion is the preconscious lens through which we perceive the world. The role of the architect or artist is to intensify this sensuous reaction, as Vischer noted, "every work of art reveals itself to us as a person harmoniously feeling himself into a kindred object, or as humanity objectifying itself in harmonious form."[11]

Space does not permit us to explore the many turn-of-the-century interpretations of this theme—which extend down to the early teachings of the Bauhaus—but two individuals who applied the theme of empathy to architecture should be noted. One was the art historian Heinrich Wölfflin, who opened his doctoral dissertation of 1886 with the question "How is it possible that architectural forms are able to elicit an emotion or a mood?"[12] His response is that we animate architectural forms simply because we have bodies. We experience buildings through our bodily organizations because the perception of form sympathetically works on our internal organs, leading to a psychological response. (Figure 4) In this regard, and alluding to Semper, Wölfflin insisted that a Doric column "bends its head down" in the exertion of assuming a load, while a lighter Ionic volute mitigates this effect because the heavy load is discharged into the volute, which visually acts as a flexible spring. He also extended this empathetic response to buildings as a whole. For instance, he preferred the more horizontal and wider forms of the Italian Gothic style over those of northern Gothic, because in the latter case, particularly with narrow medieval townhouses, the "squeezing together, pressing upward" of the forms created an uneasy feeling of tension.[13]

Wölfflin's contentions influenced German architectural practice at the time, but it also came to influence aesthetic theory more broadly. One person much impressed with the theory was the British writer Vernon Lee, who, when living in Florence, was interested in testing such theory empirically. Lee and her collaborator Clementina Anstruther-Thomson embarked on a series of experiments recording the physiological responses of people experiencing buildings. (Figure 5) In measuring the responses of people standing before Leon Battista Alberti's church of Santa Maria Novella, they noted that the tripartite organization of the facade prevented "the thorax from collapsing as much as usual during the act of expiration," how one's respiration seems to find an accord with the proportions of the building, how the overall reading of the facade forces a certain pressure on the feet and downward pressure of the head, a feeling that is offset by the upward springing lines of the arches and the resulting feeling of "harmonious completeness."[14] In retrospect, it seems remarkable how seriously people, even non-architects such as Lee, were thinking about architecture at this time.

Empathy and Mirror Neurons

A few years ago, in part because I had translated the writings of several of

Figure 5. Leon Battista Alberti, Facade of Santa Maria Novella, 1456-70.

Figure 6. Ludwig Mies van der Rohe, Neue Nationalgalerie, Berlin, 1968. Detail of the pin connection with the Richard Serra sculpture in the background.

the writers noted above, I was invited to a conference at the University of British Columbia on the theme of empathy. I expected the event to be devoted to historical and phenomenological considerations of the theme, and I was therefore both perplexed and surprised to find several prominent neuroscientists in attendance. It happened that the theme of empathy had suddenly come back into vogue with a vengeance, thanks to such neuroimaging technologies such as Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI). Scientists, with these new tools, were for the first time probing the neurological dynamics into how we "feel ourselves into" or emotionally relate to others.

These studies were prompted in part by another scientific discovery that had taken place in a neurological laboratory at the University of Parma in the early 1990s.[15] With the use of electrodes inserted into the brains of macaques, scientists were recording neurological patterns in specific areas of the brain while the monkeys were performing such tasks as grasping a peanut. While they found these patterns, they also found similar patterns of activity in monkeys who were not grasping the objects, but who were simply watching others perform the act. Neurological activation was found in two areas that instigate the movements involved, but not in the motor cortex, where we consciously execute the activity. In other words, in watching someone else perform an activity, whether it is swinging a golf club or a hammer, we simulate or prompt the same muscular movements in our own brains—an act scientists have called "embodied simulation."

Now let us connect these aspects of our being. If we watch someone we love hit their thumb with a hammer, we grimace in an empathetic response to their pain. If Phil Michelson mirrors the golf swing of his father (from the left side although he is right-handed), he becomes a highly proficient golfer at a precocious age. Together, both events suggest that we comprehend the world and learn new things through our neurological (preconscious) acts of simulation. We now know, for instance, that we see someone hitting their thumb with a hammer we map this event onto the area of our somatosensory cortex in which the nerve cells of the thumb are located. Children learn to ride a bicycle not by reading a manual but by watching an older sibling or friend at work.

Vittorio Gallese, one of the discoverers of mirror neurons, argues that the mirror-neuron system solves a great many other riddles, such how we form a sense of self, how we socially identify with others, have we come to have spatial awareness, and even how we have developed language.[16] In the last regard Gallese, together with the linguist George Lakoff, have suggested that language came about (very late in our evolutionary process) not through a process of symbolic abstraction (so-called reason) but rather through real-life encounters with the world—that is, through perceptual acts of simulating the gestures of others or in learning how objects are to be responded to, handled, or manipulated.[17]

There are many architectural implications to mirror systems, as several studies have shown. In one fMRI study in which scientists were recording the mirror activity of people watching others being touched by humans and by objects, they also found similar mirror activity when people observed two inanimate objects touching one another. In their concluding words: "Space around us is full of objects accidentally touching each other, that is, without any animate involvement. One could observe a pine cone falling on the garden bench in the park, or drips splashing on the leaf of a plant during a downpour. Models of embodied simulation posit that the same neural structures involved in our own body-related experiences contribute to the conceptualization of what we observe in the world."[18]

Now consider the fact that the architect "designs" a three-dimensional environment in which different materials touch one another. Architects shape whole forms into an overall composition and they detail materials joining one another—for instance, how a wall meets a ceiling or how in a column supports the load. One might argue that the intersection of this column and load is derived from rational or structural reasoning alone, but such an explanation does not explain the intense artistic effort that went into the creation of an Ionic capital or a connection for a Meisian building or Richard Serra sculpture. (Figure 6) Contemporary models of neuroscience suggest that we do simulate or animate these structural and material events, reaffirming what theorists of empathy noted more than a century ago (does not the Serra sculpture feel like a pin prick?). We embody the architectural experience literally by "feeling ourselves into" the design.

Embodied Design

There is still another dimension to this fact. In compiling another series of fMRI studies, David Freedberg and Vittorio Gallese have recently argued that we not only simulate these artistic events but we also simulate "the artist's creative gestures, such as vigorous modeling in clay or paint, fast brushwork and signs of the movement of the hand more generally."[19]

They make the case that in standing before a Jackson Pollak painting, for instance, we sense or feel the energy behind the force of paint being splashed on the surface.

But do we not read architecture in a similar way? In standing before the Medici Palace in Florence, for instance, do we not feel a sense of awe by these enormous blocks and (as Semper recorded) the force of the hammer and chisel that worked them? In approaching the Dominus Winery, do we not read the stacks of gabions as heavy because (as Wölfflin rightly surmised) we know the weight of stone? (Figures 7 & 8) Do not the curled titanium segments of a Frank Gehry pavilion, conversely, convey to us a sense of lightness and freedom? In visiting a Gothic cathedral, do we not simulate the delicacy of the mason's chisel on the stonework, those animating tactile values that John Ruskin insisted upon with his Lamp of Sacrifice? And is this not the reason why Herzog & De Meuron consistently modulate the exterior skins of their buildings, such as their use of weathered steel for the Caxia Forum or the perforated and indented metal panels used in the De Young Museum? Is it not because they intuitively understand that we indeed form an empathetic relationship with the materials of our built environment?

Architecture is beginning to enter a very interesting period—not because or parametric programs or the other technologies that presently stand at the disposal of the designer. It is because another new realm has been opened for architectural investigation and exploration—the breadth and depth of human complexity. For too many years we have ascribed to a journal of architectural theory that has promoted this craft as a formalist game intended to exploit highly conceptualized values that were really intended only to demonstrate the genius of the architect. Plato, for one, scoffed at such pretensions, at those who seek obscure and far-flung knowledge without first understanding their own human natures. He countered such vanity by citing the maxim that was carved at the entrance of the Temple of Apollo at Delphi—"Know Thyself."[20]

In this regard it might be useful to note the work of Ellen Dissanayake. This ethnologist has for years been on the trail of the origin of the artistic impulse by drawing upon evolutionary and anthropological evidence, and by citing the human predisposition for ritualistic play and ceremonial behaviors.[21] Her research into this predilection for making things "special," which she has consistently underscored, underwent a subtle but important change of direction around the beginning of this century, as new fields such as neuroaesthetics began to ponder similar issues. She rejected the early efforts of some neuroscientists to reduce artistic experience to formalist analysis and countered with the very Darwinian notion that human artistic impulses extend back to more primal and pre-Paleolithic stages of hominin evolution, that is, they arose before and during "human evolution as multi-media elaborations of rhythmic-modal capacities that by means of these elaborations gave emotional meaning and purpose to biologically vital activities."[22] Hence, the "rhythms and modes" associated with artistic activities are in fact emotional drives born of adaptations and enculturations, drives manifested in such things as social affiliation, making sense of our surroundings, acquiring competence in skills, and to the very special idea of "elaborating upon" something. It is only when the designer taps into these "cross-modal sensations of tactility and kinesis," as Dissanayake refers to the artistic process, that a work of art acquires the charm of being both creative and revelatory.

Figure 7. Herzog & de Meuron, Dominus Winery, 1997.

With all of our emphasis on methods and models in architectural practice, perhaps we have forgotten something of fundamental importance about this art. All good design is, in a cultural and personal sense, nothing more than what Tim Ingold refers to as a "variations" on our ingrained bodily skills.[23] And at this most primitive level, design is little more than

the embodied play of materials, colors, forms, spaces, patterns, sounds, and other sensory values. Thus the task of the architect, quite simply, is to design an environment that is creative and revelatory—revelatory not of some arcane idea or ideological principle but allowing us to experience or revel in our own vital activities. Richard Neutra some years ago cautioned the architect to forego "the pure aesthetics of a bygone brand of speculation" and embrace the "tools of sensory and cerebral stimulation professionally."[24] It is time for architects to take heed of this advice. We are the people for whom we design, and if we are beginning to gain some insights into the natures of our organisms, we should make use of them, in fact exploit what is it that allows people take pleasure in their built environments.

Notes

1. See Martin Heidegger, Being and Time (New York: Harper & Rowe, 1962), 97-98.
2. Merleau Ponty, The Visible and the Invisible, ed. Claude Lefort, trans. Alphonso Lingis (Evanston: Northwestern University Press, 1968), p. 138.
3. See James Gibson, The Ecological Approach to Visual Perception (Hillsdale: Lawrence Erbaum Associates, 1986).
4. Evan Thompson, Mind in Life: Biology, Phenomenology, and the Sciences of Mind (Cambridge, MA: Belknap Press, 2007), p. 411.
5. Arthur Schopenhauer, The World as Will and Representation, trans. E. F. J. Payne (New York: Dover Publications, 1969), p. 214.
6. Karl Bötticher, Die Tektonik der Hellenen (Potsdam: Ferdinand Riegel, 1852), vol.. 1, p. xiv.
7. Gottfried Semper, Style in the Technical and Tectonic Arts, trans. Harry F. Mallgrave and Michael Robinson (Los Angeles, Getty Publications, 2004), p. 783.
8. Ibid., p. 732.
9. Friedrich Theodor Vischer, "Kritik meiner Ästhetik," in Kritische Gänge (Stuttgart: Cotta, 1866), 5: 143.
10. Robert Vischer, "On the Optical Sense of Form: A Contribution to Aesthetics," in H. F. Mallgrave and E. Ikonomou (eds.), Empathy, Form, and Space (Santa Monica: Getty Center Publication Programs, 1994).
11. Ibid., p. 117.
12. Heinrich Wölfflin, "Prolegomena to a Psychology of Architecture," in Mallgrave and Ikonomou, Empathy, Form, and Space (note 11), p. 149.
13. Ibid., p. 169.
14. Vernon Lee and Clementina Anstruther-Thomson, "Beauty and Ugliness," in Beauty and Ugliness and Other Studies in Psychological Aesthetics (London: John Lane, The Bodley Head, 1912), pp. 187-89.
15. See Giacomo Rizzolatti, Leonardo Fogassi, and Vittorio Gallese, "Mirrors in the Mind," Scientific American, vol. 295, no. 5 (November 2006), pp. 54-61.
16. Vittorio Gallese, Christian Keysers, & Giacomo Rizzolatti, "A unifying view of the basis of social cognition," TRENDS in Cognitive Sciences, 8(9), (September 2004), pp. 386-403); Vittorio Gallese, "Mirror Neurons, Embodied Simulation, and the Neural Basis of Social Identification," Psychoanalytic Dialogues, 19 (2009), pp. 519-33; Vittorio Gallese, "Embodied simulation: From neurons to phenomenal experience," Phenomenology and the Cognitive Sciences, 4 (2005), pp. 23-48; Vittorio Gallese and Corrado Sinigaglia, "What is so special about embodied simulation?" Trends in Cognitive Sciences, article in press (2011), pp. 1-8.
17. Vittorio Gallese and George Lakoff, "The Brain's Concepts: The Role of the Sensory-Motor System in Conceptual Knowledge," Cognitive Neuropsychology, vol. 22, #3/4 (2005), pp. 455-79.
18. Sjoerd J. H. Ebisch et al, "The Sense of Touch: Embodied Simulation in a Visuotactile Mirroring Mechanism for Observed Animate or Inanimate Touch," Journal of Cognitive Neuroscience, vol. 20, #9 (2008), p. 1621.
19. David Freedberg and Vittorio Gallese, "Motion, Emotion and Empathy in Esthetic Experience," Trends in Cognitive Science, vol.11, #5 (2007), 199.
20. See especially Plato, Phaedrus, 229 & Philebus, 48.
21. Her most significant early work is Homo Aestheticus: Where Art Comes From and Why (Seattle: University of Washington Press, 1992).
22. Ellen Dissanayake, Art and Intimacy: How the Arts Began (Seattle: University of Washington Press, 2000), p. 145. See also my discussion of her theories in Architecture and Embodiement: The Implication of the New Sciences and Humanities for Design (Abingdon: Routledge, 2013), pp. 192-203.
23. See especially his introduction to Tim Ingold, The Perception of the Environment: Essays on livlihood, dwelling and skill (London: Routledge, 2000). 24.
24. Richard Neutra, Survival through Design (New York: Oxford University Press, 1954), p. 118 & 244.

Figure 8. Frank Gehry, Pritzker Pavilion, Chicago, 2004.

Image credits

1– 2. Photograph by author.
3. Gottfried Semper, *Der Stil in den technischen und tektonischen Künsten, oder pratische aesthetik,* vol. 2 (1860-63).
4. Photograph by author.
5. Photograph by Sarah Robinson.
6–8. Photograph by author.