

## **Architecture *from within*. An embodied perspective.**

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*We can see how, by adopting a dwelling perspective — that is by taking the animal-in-its-environment rather than the self-contained individual as our point of departure— it is possible to dissolve the orthodox dichotomies between evolution and history, and between biology and culture.*  
Tim Ingold, 2000, 186.

### **Introduction**

The present paper is meant to offer some epistemological, scientific and historic background on the potential relevance of neuroscience to the experience of architecture. This is going to be an exercise of perilous balance as, at difference with visual and performative arts and film, I do not have yet any empirical results from my lab to share. Let's begin by stating that neuroscience today offers a novel approach to the study of human social cognition and culture. I view this approach as a sort of 'cognitive archeology', as it enables to empirically investigate the behavioral and brain-body mechanisms that make our interactions with the world possible, to detect possible functional antecedents of our cognitive skills, and to measure the socio-cultural influence exerted through human cultural evolution onto the very same cognitive skills. With the sub-personal approach of neuroscience we can deconstruct or unpack some of the concepts we normally use when referring to intersubjectivity or to aesthetics, art and architecture, as well as when dealing with the experience we make of them.

As we speak, the still prevailing stance adopted by the vast majority of neuroscientists is almost entirely focused on the neo-phrenological enterprise of locating human high-cognitive functions like Theory of Mind, language or decision-making in some specific brain area. In contrast, since many years I advocate for neuroscience the investigation of the mechanisms subtending the *experience of our relationship with the world* (Gallese, 2011). This includes aesthetics and cultural artifacts, of which architecture is a prominent expression. I define this empirical approach as *experimental aesthetics*. By experimental aesthetics I imply the scientific investigation of the brain-body physiological correlates of the experience of particular outcomes of human symbolic expression, like what we now define 'art works' and architecture. Following the original notion of *aisthesis*, the notion 'aesthetics' is used here mainly in its bodily account, referring to the sensorimotor and affective connotation of our experience of perceptual objects (Gallese, 2017).

Of course, this approach only covers one of the many aspect characterizing the modern notion of aesthetics, as it refers to an early component of our perceptual experience of specific perceptual objects. Something likely happening before any explicit judgment is formulated (Freedberg and Gallese, 2007; Gallese, Freedberg, Umiltà, 2022). Neurophysiological and behavioral evidence shows that this early phase of aesthetic

experience is strikingly similar to that underlying our mundane perceptual experience of non artistic objects (Freedberg and Gallese, 2007; Gallese 2017). Thus, one of the tasks of experimental aesthetics is also to clarify how much different are the neurophysiological and bodily correlates of the experience of physical reality from those characterizing the experience of its symbolic representations. Let us briefly focus on why neuroscience is relevant to a better understanding of our experience of architecture.

### **Three reasons why neuroscience matters here**

Neuroscience is not meant to be an alternative to the humanities, but just a different methodological approach, partly aiming at the same explananda with a different epistemological attitude, a different level of description, and a different explanatory language. Neuroscience can contribute to address from the point of view of the brain-body some of the following questions: What does it mean to look at a Greek temple, a sky-scraper, to work or live within a specific urban planning or in particularly designed interiors, to use specifically designed objects, etc.?

The reasons why neuroscience is entitled in the first place to formulate such questions, and supposedly also to help answering them are the following, listed according to their decreasing broader implications (Gallese and Gattara, 2015). 1) The first reason deals with the relationship between perception and empathy. For many years aesthetics and cognitive science have shared a particular attitude towards the sense of vision when accounting for aesthetic experience and the perceptual representation of the world, respectively. Both approaches endorsed a sort of ‘visual imperialism’, or ‘oculocentrism’, neglecting the multimodal nature of vision. Such notion of vision doesn’t hold anymore (see below), as vision is intrinsically multimodal and synesthetic. The notion of empathy, recently explored by cognitive neuroscience, can reframe the problem of how art works and architecture are experienced, revitalizing and empirically validating old intuitions on the relationship between body, empathy and aesthetic experience.

2) The second reason deals with the intrinsic relational quality of the visual experience of any perceptual object. Be it a mountain, a stone, a temple, an office or a designed couch, the mechanisms enabling the experience of these different perceptual objects, no matter whether ‘natural’ or the expression of human creative activities, are basically similar, as all these qualify as the objects of different forms of *bodily relationality*. Indeed, neuroscience shows that any experience of any ‘possible world’ basically rests upon similar embodied simulation routines. The as-if mode of relation of embodied simulation appears to qualify not just our appreciation of cultural artifacts but all forms of intentional relation, including those characterizing our prosaic daily reality.

3) The third reason deals with architecture and its aesthetic quality. Embodied simulation can shed light on the aesthetic aspects of architecture, both from the point of view of its making and of its experience, by revealing the intimate intersubjective nature

of any creative act, where the physical object, the cultural artifact, becomes the mediator of an intersubjective relationship between creator and beholder. The experience of architecture, from the contemplation of the decorative element of a Greek temple, to the physical experience of living and working within a specific architectonic space, can be unpacked into their bodily grounding elements. Neuroscience can investigate what the sense of presence of any object is made of. This approach can, in principle, also contribute a fresher empirical take on the evolution of architectonic style and its cultural diversity, viewed as a particular case of symbolic expression, by looking for its bodily roots.

### **The multimodal nature of vision.**

Observing the world is more complex than the mere activation of the visual brain. Vision is multimodal: it encompasses the activation of motor, somatosensory and emotion-related brain networks. Any intentional relation we might entertain with the external world has an intrinsic pragmatic nature, hence it always bears a motor content. More than five decades of research have shown that motor neurons also respond to visual, tactile and auditory stimuli. The same motor circuits that control the motor behavior of individuals also map the space around them, the objects at hand in that very same space, and others' behaviors, thus defining and shaping in motor terms their representational content (for a review, see Rizzolatti, Fogassi and Gallese 2002).

These results change completely our understanding of the role of the cortical sensorimotor system and of body actions. The cortical sensorimotor system is not just a movement-machine, but integral part of our cognitive system (Gallese et al. 2009), because its neurofunctional architecture structures not only action execution but also action perception, imitation, and imagination, with different dynamic neural connections to other cortical areas. When the action is executed or imitated, the cortico-spinal pathway is activated, leading to the excitation of muscles and the ensuing movements. When the action is observed or imagined, its actual execution is inhibited. The cortical motor network is activated, though, not in all of its components and not with the same intensity, hence action is not produced, it is only simulated.

The primordial quality turning space, objects and behavior into intentional objects is their constitution as the objects of the motor intentionality that our body's motor potentialities express (Gallese and Sinigaglia 2010, 2011; Gallese 2014).

Different forms of mirroring mechanisms are involved with our capacity to directly apprehend the emotions and sensations of others, because of a shared representational bodily format. When perceiving others expressing disgust, fear, or experiencing touch or pain, the same brain areas are activated as when we subjectively experience the same emotions or sensations. We do not fully experience their qualitative content, which remains opaque to us, but its simulation enables us to experience the other as experiencing emotions or sensations we know from the inside, as it were.

## **Embodied simulation and the empathic body**

The discovery of mirror neurons 30 years ago ( for a recent review, see Bonini et al., 2022) gives us a new empirically founded notion of intersubjectivity connoted first and foremost as intercorporeality – the mutual resonance of intentionally meaningful sensorimotor behaviours. Our understanding of others as intentional agents does not exclusively depend on propositional competence, but also on the relational nature of the body. In many situations we can directly understand the meaning of other people’s basic actions, emotions and sensations thanks to the equivalence between what others do and experience and what we can do and experience (Gallese 2014; Gallese and Sinigaglia 2011).

Embodied simulation provides a unified theoretical framework for all of these phenomena. It proposes that our social interactions become meaningful by means of *reusing* our own mental states or processes in functionally attributing them to others. In this context simulation is conceived of as a non conscious, pre-reflective functional mechanism of the brain-body, whose function is to model objects, agents and events. This mechanism can be triggered during our interactions with others, being plastically modulated by contextual, cognitive and personal identity-related factors.

Embodied simulation is also triggered during the experience of spatiality around our body and during the contemplation of objects. The functional architecture of embodied simulation seems to constitute a basic characteristic of our brain, making possible our rich and diversified experiences of space, objects and other individuals, being at the basis of our capacity to empathize with them.

Altogether the results so far summarized suggest that empathy, or at the very least many of its bodily qualities, might be underpinned by embodied simulation mechanisms.

The sense we attribute to *our* lived experience of the world – hence including the experience of architecture- is grounded on the affective-laden relational quality of our bodily actions’ potentialities, enabled by the way they are mapped in our brains.

### **Empathy, embodied simulation and aesthetic experience: old ideas**

The idea that the body might play an important role in the aesthetic experience of art works and architecture is pretty old. In modern times the notion of empathy (*Einfühlung*) was originally introduced in aesthetics by the German philosopher Robert Vischer in 1873, thus well before its use in psychology. Vischer qualified *Einfühlung*, literally “feeling-in”, as the physical response generated by the observation of forms within paintings. Particular visual forms arouse particular responsive feelings, depending on the conformity of forms to the design and function of the muscles of the body, from those of the eyes to our limbs and to our bodily posture as a whole. Vischer clearly distinguished a passive notion of vision – *seeing* – from an active one – *looking*

at. According to Vischer, *looking* best characterizes our aesthetic experience when perceiving images, in general, and art works, in particular.

Aesthetic experience implies an empathic involvement encompassing a series of bodily reactions of the beholder. In his book *On the Optical Sense of Form* (1873) Vischer wrote: “We can often observe in ourselves the curious fact that a visual stimulus is experienced not so much with our eyes as with a different sense in another part of our body [...]. The whole body is involved; the entire physical being [*Leibmensch*] is moved. [...] Thus each emphatic sensation ultimately leads to a strengthening or a weakening of the general vital sensation [*allgemeine Vitalempfindung*]” (pp. 98-99).

Developing Vischer’s ideas, the art historian August Wölfflin (1886) speculated on the ways in which observation of specific architectural forms engage the beholder’s bodily responses. Shortly afterwards, Theodor Lipps discussed the relationship between space and geometry on the one hand, and aesthetic enjoyment on the other (1897, 1903).

The work of Vischer exerted an important influence over two other German scholars whose contributions are highly relevant for what I am discussing here: Adolf von Hildebrand and Aby Warburg. The German sculptor Hildebrand in 1893 published a book entitled *The Problem of Form in Figurative Art*. In this book Hildebrand proposed that our perception of the spatial characters of images is the result of a constructive sensorimotor process. Space, according to Hildebrand, does not constitute an a priori of experience, as suggested by Kant, but its product. Artistic images are effectual, that is, are the outcome of both the artist’s creative production and of the effects images produce on beholders. The aesthetic value of art works would reside in their potentiality to establish a link between the intentional creative acts of the artist and their reconstruction by the beholder. In such a way creation and artistic fruition are directly related. To understand an artistic image, according to Hildebrand, means to implicitly grasp its creative process.

A further interesting and very modern aspect of Hildebrand’s proposal concerns the relevance he assigns to the motor nature of experience. Through movement the available elements in space can be connected, objects can be carved out of their background and perceived as such. Through movement representations and meaning can be formed and articulated. Ultimately, according to Hildebrand sensible experience is possible and images acquire their meaning just because of the acting body.

The aesthetics of *Einfühlung* exerted a strong influence on another famous German scholar, Aby Warburg (see Gallese, 2012). From 1888 to 1889 Warburg studied in Florence at the Kunsthistorisches Institut, founded by the art historian August Schmarsow. As emphasized by Didi-Huberman (2002), Schmarsow (1853-1936) was determined to open art history to the contributions of anthropology, physiology and psychology and emphasized the role of body gestures in visual art, arguing that bodily empathy greatly contributes to the appreciation of visual arts. As Andrea Pinotti wrote, Schmarsow “...art historian and theoretician, centered his reflections, which exploited

both the results of the theories of empathy and the analyses of the formal character of art works, on the idea of the transcendental function of corporeality as a constellation of material a-priori, that is, on the idea of bodily organization as the condition of possibility of sensory experience” (2001, p. 91).

Warburg clearly learned this lesson as he conceived art history as a tool to shed light on the psychology of human expressive power. His famous notion of “pathemic form” (Pathosformel) of expression implies that a variety of bodily postures, gestures and actions can be constantly detected in art history, from Classic art to the Renaissance period, just because they embody in exemplar fashion the aesthetic act of empathy as one of the main creative sources of artistic style. According to Warburg, a theory of artistic style must be conceived as a “pragmatic science of expression” (*pragmatische Ausdruckskunde*).

Maurice Merleau-Ponty further highlighted the relationship between embodiment and aesthetic experience by suggesting the relevance for art appreciation of the felt bodily imitation of what is seen in the artwork (1962, 1968). Consistent with the role of *Einfühlung*, Merleau-Ponty also emphasized the importance of the artist’s implied actions for the aesthetic experience of the beholder, exemplifying it by referring to the paintings of Cézanne, when he famously stated that we cannot possibly imagine how a mind could paint (1968).

All these scholars believed that the feeling of physical involvement with a painting, sculpture, or architectural form, provokes a sense of imitating the motion or action seen or implied in the work, while enhancing our emotional responses to it. Thus, physical involvement constitutes a fundamental ingredient of our aesthetic experience of cultural artifacts.

### **Experimental aesthetics and architecture: few suggestions for a road map**

As seen above, August Wölfflin was one of the earliest proponents of the relationship between our bodily nature and our experience of architecture. According to Wölfflin if we were only visual creatures the aesthetic appreciation of art works and architecture would be precluded, because it is just because of our bodily nature allowing us to experience gravity, force and pressure that we can enjoy contemplating a doric temple or feel elevated when entering a gothic cathedral. The available empirical neuroscientific evidence seem to support this view.

This view can now be empirically tested, for example by recording the brain and bodily responses of volunteers perceptually experiencing and exploring virtual architectonic environments by means of their digital representation or by immersive virtual reality. Virtual caves or VR headsets today can reproduce with high accuracy three-dimensional and highly dimensioned digital versions of temples, squares, churches and buildings of which individuals can not only enjoy a vivid and realistic experience, but also a virtual exploration as if moving around and directing their gaze at

different details and spatial locations. This allows the recordings of brain signals and autonomic bodily responses in ideal conditions, minimizing movement-driven artifacts and signal noise.

Furthermore, I think that this experimental approach could also enable to empirically address important aspects of architectural history, like the evolution of architectonic style, charting its potential biological bodily roots. The same approach could also shed light on the plausibility of hypotheses about the supposed biomorphic and /or anthropomorphic origin of architectonic elements and decorations (see Onians, 1952; Scully, 1962; Rykwert, 1972; Hersey 1988; Robinson, 2011; Mallgrave 2013).

A second possible application of this approach to architecture deals with the relationship between architectural spaces and the way they are experienced by the people living and working in those spaces. The Finnish architect Juhana Pallasmaa (2005) has criticized the excessive 'oculocentrism' characterizing western culture, consisting in the cognitive privilege assigned to vision. With the invention of perspective the eye becomes at the same time the center of the perceptual world and of the subject perceiving it (2005, p. 16). According to Pallasmaa, the scopic regime instantiated by visual perspective exemplifies the disembodied nature of the Cartesian subject, whose solipsism segregates the mind from the body, the subject from the object and the I from the Thou. Such attitude deeply influenced contemporary architecture that according to Pallasmaa, by predominantly sticking to a pure formalist perspective, has lost contact with the people.

As the experience of the built environment and its affordances are shaped through the precognitive activation of bodily mechanisms, the role of embodied simulation in architectural experience becomes even more interesting if one considers emotions and sensations. A typical and recurring experience in everyday life is reacting with positive or negative feelings upon entering for the first time into a new architectural environment. However, as noted by Harry Mallgrave (2013), to date little neuroscientific research has been done on the emotional experience of architectural environments. As I will argue in my talk, 10 years later this still holds true.

The same applies to the haptic qualities of materials employed to design exterior and interior parts of architectonic spaces whose multimodal impact and liking could be easily measured.

The knowledge acquired through experimental aesthetics might provide new insights, just to mention the most obvious ones, for the future of design of office spaces or retail stores. Both are usually designed with strict and short deadlines by architectural firms usually specialized and routinized in this building typology.

It is worth highlighting that the proposed research agenda proves to be coherent with Schmarsow's notion of space "from within". According to Schmarsow "every spatial creation is first and foremost the enclosing of a subject".(...). Indeed the motor

system is also responsible for the phenomenal awareness of the body's relations with the environment.

It will be interesting also to study how daily actions or social interactions virtually presented within differently designed architectonic spaces can differently be experienced by beholders by investigating whether and how such different experiences correlate with different profiles of bodily and brain responses.

## **Conclusions**

Even if the notions of embodiment and empathy within the architectural field are much older than neuroscience itself, the latter is bringing new light to a topic otherwise almost dismissed or neglected by mainstream theory.

The theory of empathy began to have an impact within the contemporary architectural field. Architects and architectural scholars such as Juhani Pallasmaa, Steven Holl, Alberto Pérez-Gómez and Harry Mallgrave have revitalized and brought the topic of empathy back (see Robinson and Pallasmaa, 2015).

Architecture is among the fruits of the new way in which humans at a given time of their cultural evolution were able to relate with the external world. The material world was no more exclusively considered as a domain to exploit for the utilitarian satisfaction of biological needs. Material objects lost their unique status of tools to become symbols, public epiphanies able to make visible something absent, something that apparently is only present in the mind of the creator and of the beholder. Humans, thanks to the expression of their symbolic creativity, acquired the possibility to give shape to material objects, conferring them a meaning they intrinsically lack. Such meaning is the outcome of the creative actions of collectively building a temple or a cathedral, laying colors on a canvas or turning a marble block into a David or a Proserpina's Rape.

Today neuroscience can shed new light – from its own peculiar perspective and methodology – on the aesthetic quality of human nature and its natural creative inclination. This new research will help us understanding how and why art and architecture are among the most fundamental expression of our human nature.

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