



Sarah Robinson Intervista Vittorio Gallese

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This interview between Vittorio Gallese, cognitive neuroscientist and professor at the University of Parma as well as at the Institute of Experimental Aesthetics at the School of Advanced Studies at the University of London and Columbia University in New York and the architect Sarah Robinson was funded by the Dreihaus Foundation in Chicago, Illinois. We would like to acknowledge and thank them for their support. An abridged version of this interview is available at:

<https://www.youtube.com/watch?v=us8mMKUi1cc>

SR: Human perception is fundamental to experiencing the built environment. It's so obvious. Your work has changed very much how we think normally about human perception and your work on mirror neurons has led to this model you have developed, your perceptual model of embodied simulation. Can you tell us about your work?

VG: Yes. Let's say that the discovery of mirror neurons was the pinnacle of a line of research which made quite interesting discoveries before the actual discovery of mirror neurons. Basically, to squeeze it in a nutshell, what we revealed is that we don't see uniquely by using the so-called visual part of our brain, but vision is intrinsically - not just metaphorically, but even at the level of the brain - a multimodal enterprise. So, for example, when I look at a given object - sitting on this table - say it my mobile phone, as soon as I look to the mobile phone, even if I don't have any intention to grab it, my motor system is responding to the



object in a very similar way as when I'm about to stretch out my arm and grab the very same object. These motor neurons that we designated as canonical neurons basically translate the tridimensional shape of the object into the most suitable motor program required to interact with that object, even when we do not have any motor plan with that object. Which entails that as soon as I look to that object, that object manifests to me not just as a tridimensional icon but as the potential target of my pragmatic intentional relationship. So when I look at this object my motor brain bodily simulates what I could potentially do with that object.

Even more interesting for architecture is the way the brain maps space, particularly the space in the vicinity of our body. Research been done in Parma led by Giacomo Rizzolatti at the beginning of the 1980s revealed that the brains of primates, including humans, maps space in a variety of ways. One specific way to map space is to carve out to different regions in space. The first - what we designate as peripersonal space - is the space of our pragmatic interaction with the world, namely the space that can be reached by stretching out our arm. Whatever lies beyond that reachable point in space is designated as extrapersonal space. Peripersonal space is mapped by the motor system. We discovered neurons that guide our reaching and orienting movements in tridimensional space; but the very same neurons also respond to tactile stimuli applied to the very same body part - including the movement which are in control of - and with which we respond to visual stimuli, moving around the very same body part, or to events that produce sounds in the very same portion of space which surrounds the body part that this motor neuron controls. So this visual receptive field is not anchored to where I direct my gaze, is not related to the position of my eyes and therefore is not retinocentric, this visual receptive field is *body centered*. Indeed it moves along with the body part--as long as I move it the visual receptive field moves along as well.

And finally we discovered mirror neurons that control our goal directed motor acts - grasping, holding, placing - or communicative actions. It controls the execution of these motor acts but at the same time the very same neurons respond when we are the beholder, the witnesses of the very same motor actions being performed by others with whom we interact. The model of embodied simulation was an attempt to

provide a coherent theoretical framework that could explain this variety of phenomena that all share one common property: a part of our brain simulates what we would do with objects in space *in relation* to others. And this simulation is an integral part of our perception of objects, of space, and of others. In other words, by means of embodied simulation, we have a much more direct access to the world of objects, to the physical space in which our behavior takes place and our interactions with others. So that's why I don't like to link uniquely or exclusively the notion of embodied simulation with the notion of mirroring, with the mechanism of mirror neurons, because embodied simulation exceeds the functional properties of mirror neurons, because as I tried to explain, it applies also to our perception of tridimensional objects and to our perception of space. For all of these reasons this new model of perception I think has something to say in relation to the making and our perception of architecture and architectural space.

SR: So that's a vast change from the common considering of architecture as a primarily visual art, judged by its visual qualities.

VG: Yes, I think architecture makes no exception. In the very same way when we behold an artwork, whether it is a painting, a fresco or a tridimensional sculpture, we engage with those artworks not just with our visual system but also with our motor and tactile systems. This is something we haven't talked about yet, but we were the first to demonstrate that the notion of touch, the notion of contact, even when metaphorically employed activate those same brain regions. I can say, for example, that the bottom of this mobile phone is in contact with the surface of this table, when I see this object touching the other object, my tactile part of my brain kicks in, is activated, even if I do not attribute any tactile sensation to the surface of the table or to the mobile phone which rests upon it. The very notion of contact is mapped on our own somatosensory system. So the idea is that whenever I behold something which is the expression of human creativity, be it a painting, a sculpture, a movie, or an architectonical space I engage in this perception with a whole lot more than my visual system, basically I engage my emotional system, my tactile system, my motor system. So we are synaesthetes,



not just metaphorically when we read Mallarme, but we are synaesthetes 24 hours a day--our perception is intrinsically synaesthetic.

SR: So as architects we should be paying attention to tactile and emotional qualities, to the whole ensemble of senses because we are all synaesthetes. It seems that embodied simulation is also very much about the imagination.

VG: The relationship between embodied simulation and imagination is also very important and particularly so when we address topics related to aesthetic experience. For a long time we have done our best to draw a very defined and sharp line between reality and the imaginary world. For ages, the imaginary world has been considered as something other than the world of reality. Cognitive science and cognitive neuroscience have changed dramatically this point of view. Why? Because it has been shown that doing something is much more similar to imagining doing something than what previously thought. For example if I imagine to carry a bag full of bottles of mineral water up to the fourth floor step by step, at the end of this imaginary exercise my blood pressure will turn out to be increased, my heart rate will increase, my breathing rate will increase, so in a word my bodily condition is incredibly similar to my bodily condition when I don't imagine but I actually carry those bottles of water on the fourth floor going up the staircase. And similarly "seeing" and imagining "seeing" share a great deal of neural resources. Many of the brain areas that are involved when doing something or looking at something are also involved when we simply close our eyes and imagine doing something or imagine to see something. So imagination, creativity, and memory are all intertwined, very tightly interlinked and embodied simulation is a key element showing all these links from a functional point of view, from the point of view of the brain body system.

SR: Using your example, carrying the water bottles, as a person experiencing architecture, the steps, the level of the steps going up to an entrance, are going to be judged based on our experience of going up other steps, steps that we have experienced before rather than the actual





dimensions of their height. Are all these stored in our body memory?

VG: All this is stored in our procedural memory, which is a huge part of the so-called cognitive, or non-repressed unconscious. This is an extreme case showing you how closely linked is our body knowledge and our implicit body memory are relevant to affect the way we perceive the so-called external world. Perception is relational and relation I think is a keyword, is a real catch all word to explain the way we function in the world. Most of what we are doing is a relation to something else or to somebody else, be it a building, or a person, or an object, This relational quality calls very vehemently underlining clearly the fundamental pragmatic nature of this relation that we establish with the world, therefore the crucial importance of our motor behavior even in aspects of our behavior that we would not at first sight assign as a function of the motor part of our brain, namely vision. These things have been said many times in the past and I think Harry Mallgrave and his colleagues have been crucial in revealing the importance of this historical debate in aesthetics and in architecture emphasizing the relation between our perception of architectural space, our buildings, and our very bodily nature. And the first name that comes to mind is of course Wöllflin, who in his doctoral dissertation makes the claim that if we were just purely visual creature we would be deprived of the possibility to appreciate fully architectural space because this stems directly from our bodily nature, from our being subjects to the force of gravity and the like. So the elevation that I may perceive when I enter a gothic cathedral is not metaphorical, is not a post-hoc explanation that I cognitively produce but is the genuine outcome of bodily perception that those architects knew very well and were able to exploit to such a high degree in creating what they did.

SR: The process of making architecture is abstract. We listen to our clients, we digest the program, we have so many complex variables to consider, but it is all somehow removed from us necessarily because we have to go above and look down at our drawings. Even in the course our education, we architects learn about theory and history, but very little about making, very little about tactile things. The nature of architectu-

ral education is quite visual in itself and so it seems like we have gone to the opposite pole away from the spatial and emotional experience of the cathedral that you just mentioned. Yet so much of our experience of architecture is a full-bodied affair that we already possess in our cognitive unconscious. How could be differently approach our work, given how important the body is? Not in the abstracted sense of embodiment, but actually the bodily experience that makes us immediately love a space or be repulsed by it.

VG: The aesthetic evaluation of a given architectural space is just one element of a series of elements that make a place to live, to work, to entertain, to be educated, to kill time waiting for the next train or the next plane, and the like, much more complex than the simple aesthetic parameters a priori defined by the contemporary taste. I think it is much more complex because it will contain people and these people will bring along their idiosyncrasies, their preferences, their life histories, their own implicit memories, their way to navigate space, their way to interact with objects to move around, all these elements must be constitutive part of the creation, of the design of an architectural space. I've been always fascinated by the idea, the hypothesis, probably very difficult to prove, that many of the styles and architectural details - they shaped the history of architecture, particularly in classic times in Greece - were somehow inspired or derived from the observation of nature. Not the mere aesthetic contemplation of nature, but what nature in the daily practice of relation and interaction was suggested to humans. And in that respect this summer I was reading this beautiful book written by the Russian poet Osip Mandelstam. He travels in the 1930s in Armenia and in this book *Journey to Armenia* he writes that, "He first sensed the rudiments of architecture from pine cones and the demon of architecture and thereafter accompanied him all of his life." This is a clear perception that the nature where we live may inspire the homemade environment that architects build. The two are tightly coupled. We can have trees growing on buildings that are very popular now and may appeal to our aesthetic sense, but I think we can do much better both from an urbanistic point of view down to the level of how we design interiors, the way we choose materials, their tactile qualities are very important and, in-



deed, we are actively exploring the tactile component of our vision of a variety of images. Particularly we are interested in exploring the relation between touch and digital images. This is a very little explored field of investigation which nevertheless has a lot of literature from the past. So we are discovering that at both the factual as well as the metaphorical level, whenever touch contact comes into play, the tactile brain kicks in. If I read a sentence like a rough task my somatosensory cortex is activated, as it has been shown a few years ago with an fMRI experiment. Even more so, language is not at stake but what is at stake is my perception, my navigation of the environment surrounding me where I'm supposed to live my life.

SR: What would the consequence be if everything was smoothed. I mean much architecture in recent decades has not been sufficiently conscious of the importance of touch, the visual importance of touch also. In America many interiors are sheetrock, smooth gypsum board, in Italy there isn't anything smooth. Everything has got the touch of somebody before. Plaster has hand marks that made it. What would the implication be to the body-mind?

VG: Well, we can hypothesize that all these multimodal qualities of the environment where we live have a deep impact on the way we perceive our being in those environments and therefore effect the quality of our life, of our daily work activity, of our daily chores at home, of the quality of our relationships with the people with whom we share those environments. The good news is that all these hypothesis can be empirically investigated. And there is still very little empirical research that has been actually done although my feeling is that people are becoming more and more aware of the possibility that cognitive neuroscience is offering with the help of technology. We can now explore via virtual reality, which of course is still a very poor approximation of being physically present within a given architectural environment, but it definitely can approximate that experience, and therefore we can build virtual environments and characterize these different virtual environments in terms of their haptic qualities, the type of materials that have been employed, colors of those materials, the way the space has been

arranged and the like, we can vary all these variables and study their impact on the brain-body of distinct individuals. Probably we won't end up with the excellent optimal solution for all environments and to all people, because people are different, people have different tastes, so the same color or material that may work for some people in a given specific architectural environment might not work in a different environment for different people but we can study all these variables very proficiently empirically and I think the outcome of this empirical research can be useful to fuel the debate in architecture, to shape the architecture of the coming years.

SR: What you are essentially saying is that the body is this transcendental reality, not in a reductive sense in which everything is reduced to the body, we are not talking about reduction here, we are talking about a primary basis of something which for centuries was considered the bottom, the junk, the dirty matter. Matter was the bottom, spirit was the top. But what you are saying is that they are all condensed to one reality, one continuum.





VG: As you were speaking I couldn't refrain from visualizing this beautiful metaphor that you were using - the body is at the bottom, the spirit is on top. I mean this special metaphor would make no sense at all if we would be deprived of the force of gravity. It is only because our bodily nature enabling us to experiment the force of gravity that we may come up with such an idea. In a corner of the Universe where there is no such a thing as the force of gravity, up and down, top and bottom, would be meaningless.

SR: So you could say that architecture's most basic work, not to be reductionistic but in the most primitive sense, is housing the body and celebrating the force of gravity, because gravity is what is keeping us all here.

VG: I couldn't agree more. I want to be clear, because mine is meant to be a methodological reductionism. My key issue is experience, the experiential dimension of human life. In order to shed new light on the experiential dimension of human life we use this peeping hole which is a methodological reductionism. We temporarily try to reduce the experiential level at the level of the brain and body, at the level of neurons, at the interaction between brain areas, of functional connectivity and the like, but with the idea that through this journey we have through the brain-body we go back to the experiential level with our hands full of new results, of new notions, that better help us to understand where the linguistic concepts, the words that we use to designate those experiences come from. There is a clear genetic role to be played by cognitive neuroscience. I sometimes describe myself as a cognitive archeologist so I'm up to study where all these words and concepts that are historically determined, so we need history, we need philology, we need etymology, we need aesthetics, we need philosophy, but we also need cognitive neuroscience. Because cognitive neuroscience with its specific approach can help us better understand where all these concepts come from. Because we can actually study the cognitive modulation, we can study the idiosyncratic way in which we employ in a given ethnocultural context those concepts and words. But the basic truth is not mine, it's a quote from a book I love by Primo Levi, *The Drowned and the Saved*, when he

says that understanding means simplifying and in order to understand by simplifying other human species invented incredible tools like language, thought, and use of concepts. I think this is crucial, also in our conversation, because it shows that as I was saying before experience always exceeds the world that we learned to theorize about that experience. It is richer. So theories are an oversimplified incredibly powerful account of this magmatic mostly non-conscious multimodal experience of the world.

SR: You told us earlier how memory and imagination are integral to each other, can you elaborate on relationship?

VG: Yes, the old idea is that memory is something like an archive made of a variety of files and whenever we want to remember something or something comes back from memory we retrieve that file from that drawer. This is clearly false. Memory is an active and dynamic process which is re-created in the very moment when we recollect something. This is also clearly shows why memory quite often is so poor. We believe we remember clearly, but it can be shown that our memory is partial and imperfect. Memory and imagination are, again, two words that designate two apparently very distinct and different concepts that nevertheless share a lot. In both cases, we simulate something, recreating it in the very moment that we imagine it or remember it. A very good friend of mine, someone for whom I have an incredible estimation for her work, the novelist and essayist Siri Hustvedt, wrote in one of her essays that for a novelist writing a novel, writing about a fictional character, is something like remembering something that never happened. In this beautiful expression I think you have all the key elements that with a lot more boring words I was trying to tell you. The tightly coupled and intertwined nature of memory and imagination is made to a sort of degree of the very same fabric. And this fabric in my opinion, has a lot to do with embodied simulation.

SR: In architecture, which is static, buildings don't move, how does that affect our memory and imagination? How is movement implied?



VG: They don't move but we move constantly within those buildings. We move our eyes to explore visually those buildings or rooms or architectural environments, we walk around to explore them from the outside then we walk in, we sit, we lay, we stand up, we sit again, we move on escalators, so we are constantly animating those apparently static buildings with our movements and as we said earlier movement is always present even when we are standing still and beholding static objects. Movement is always implied, therefore it is very much the same in our relation to architecture.

SR: So movement is implied in the case of the cell phone sitting on the desk. We have certain associations with the cell phone and our body unconsciously moving to pick it up or we imagine it.

VG: And don't forget we constantly move our eyes to perceive that object. Even our static perception of a static object, it's also an example of a dynamic building and feeling-in being performed by the brain-body system because we tend to forget about that but 20% of our vision time is blanks, because we move our eyes constantly and during movement the image is not occupying the same position on the retina but, even more, we constantly blink and while blinking it's like having a curtain temporarily covering the stage on which the film or the theatrical piece goes on. We are totally unaware of those blanks brought in by eye movements and by our closing of our eyes with the blink reflex, so we constantly fill those gaps and we have the illusion that our perception is continuous and complete. It's never like that. Our perception is incomplete and our perception is the active outcome of the filling in produced by the working of the neurons sitting in our brain.

SR: Stasis is the exception rather than the rule. I mean everything is in movement-- even a building which apparently stands still.

VG: By all means.

SR: But to enter a room that is furnished has to be a completely

different experience, from the brain point of view, than entering one that is empty, that doesn't have any imprints of the body, or any sensitive imprint.

VG: Indeed, when you live for sometime in a very small environment in all of a sudden you move to a bigger house, or the opposite, you feel the difference quite powerfully and this effects your experience because your perception which has been for months or years scaled to a certain type of peripersonal space. So your navigation patterns in those smaller or bigger places have been somehow inscribed in your own implicit memories suddenly require a total recalibration because you have moved to a completely different environment which requires a novel strategy of relation in terms of your movements.

SR: So what you are saying is essentially that in living in a place, in spending time in a place, we are absorbing the place into our person.

VG: Definitely and at the same time we make that place another way of expressing who we are. There is a sort of symbiosis. We become a little more like the environment in which we live but ideally the environment in which we live slowly becomes more and more like ourselves. There has to be a mutual exchange and it's a reciprocal relationship, like in all the things we affect by means of relating to them.

SR: So keyword here is relation.

VG: Yes, if you allow me just one keyword I would say that. But qualifying it as bodily relation. That's where everything comes from in a very loose way.

SR: I think that's a fantastic bottom line.