

Mirroring, a liberated embodied simulation and aesthetic experience

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Being human not only means to experience physical reality, but also to conceive possible worlds, to surrender to imagination and to fictional realms. We live in relation with other people and objects present in our real world, but we also live in relation with people and objects that are part of the imaginary fictional worlds created by human symbolic expression, which in the course of our cultural history came to be identified as art. Both kinds of relationship are rooted in our brain-body system. Neuroscience has begun to investigate how our brain-body enables us to navigate in real and fictional worlds, constantly switching among them, in order to grasp the basis of the complex multimodality implied by these relationships.

Neuroscience sheds new light on the notion of visual perception: on the one hand it reveals how vision is multimodal, as it encompasses the activation of motor, somatosensory and emotion-related brain networks. On the other hand, motor neurons also respond to visual, tactile and auditory stimuli, besides controlling action. The same motor neurons that control our motor behaviour also map the space around us, the objects at hand in that very same space, and the actions of others, thus defining and shaping in motor terms their representational content.¹

The space surrounding our body—peripersonal space—whose limits are the limits of our outstretched arm, is defined by the motor potentialities of our body. Premotor neurons controlling the movements of the upper arm also respond to tactile stimuli applied to it, to visual stimuli moved within the arm's peripersonal space, or to auditory stimuli also originating from the same peripersonal space.²

Manipulable objects when observed are mapped by the motor brain as potential targets of the interactions we might entertain with them. Indeed, it has been shown that the very same neurons controlling the grasping and manipulation of objects also respond to their mere observation.³

¹ For a review see Vittorio Gallese, *The inner sense of action: agency and motor representations*. Exeter: Journal of Consciousness Studies 7, 2000, pp. 23–40. / Giacomo Rizzolatti, Leonardo Fogassi and Vittorio Gallese, *Neurophysiological mechanisms underlying the understanding and imitation of action*, London: Nature reviews neuroscience 2, 2001, pp. 661–670.

² Giacomo Rizzolatti et al., *Object representation in the ventral premotor cortex (area F5) of the monkey*, Maryland: Journal of Neurophysiology 78, 1997, pp. 2226–2230.

³ Akira Murata et al., *Object representation in the ventral premotor cortex (area F5) of the monkey*, Maryland: Journal of Neurophysiology 78, 1997, pp. 2226–2230. / Vassilis Raos, *Functional Properties of Grasping-Related*

Finally, mirror neurons, which are motor neurons originally discovered in the brain of macaques, are activated during the execution of an action and its observation when performed by someone else. In this way they map the actions of others on the observers' motor representation of the same actions.⁴ Most interestingly for our present discussion, the human brain is also endowed with a mechanism that directly maps the observed actions of others on the same neurons controlling their execution in the observer's brain. This is defined as a 'mirror mechanism'.⁵ The brain circuits that show evidence of the mirror mechanism, connect frontal and posterior parietal multimodal motor neurons, mapping the actions not only when controlling their performance, but also when imitating them, when perceiving them while being performed by someone else, and even when imagining performing them while being perfectly still. Similarly, it has been shown that experiencing an emotion or a sensation, observing it when experienced by others and imagining it are underpinned by the activation of partly identical brain circuits, although differently connected in these different phenomenal situations.

Embodied simulation theory provides a unified framework for all of these phenomena: it is conceived of as a non-conscious, pre-reflective functional mechanism of the brain-body, whose task 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. It seems to constitute a basic characteristic of our brain, underlying our rich and diversified experiences of space, objects and other individuals, which form the basis of our capacity to empathize with them.

These results altogether suggest that empathy, or at the very least many of its

Neurons in the Ventral Premotor Area F5 of the Macaque Monkey, Maryland: Journal of Neurophysiology 95, 2006, pp. 709–729.

⁴ Vittorio Gallese et al., *Action recognition in the premotor cortex*, Oxford: Brain 119, pp. 593–609. / Giacomo Rizzolatti, Leonardo Fogassi and Vittorio Gallese, *Functional Properties of Grasping-Related Neurons in the Ventral Premotor Area F5 of the Macaque Monkey*, Maryland: Journal of Neurophysiology 95, pp. 709–729.

⁵ For review see Vittorio Gallese, *Bodily Selves in Relation: Embodied simulation as second-person perspective on intersubjectivity*, London: Philosophical Transactions of the Royal Society of London B 369, 2014, 20130177. / Massimo Ammirati and Vittorio Gallese, *The Birth of Intersubjectivity. Psychodynamics, Neurobiology and the Self*, New York: W. W. Norton & Company, 2014.

bodily qualities, might be underpinned by embodied simulation.⁶ According to my proposal, empathy is the outcome of the natural tendency to experience our interpersonal relations first and foremost at the implicit level of intercorporeality, that is, at the level of the relation between our body and the body of others.

What is the relevance of embodied simulation to our understanding of aesthetic experience? Embodied simulation allows us to address human forms of creative symbolic expression in terms of social performativity. Indeed, the bio-cultural approach to the naturalization of art and aesthetics, heavily influenced by cultural anthropology, emphasizes the performative character of human creativity. In *The Perception of the Environment*, Tim Ingold wrote: “Hunters and gatherers of the past were painting and carving, but they were not ‘producing art’. [...] We must cease thinking of painting and carving as modalities of the production of art, and view art instead as one rather peculiar, and historically very specific objectification of the activities of painting and carving.”⁷

In a similar vein, Ellen Dissanayake wrote: “Art is not an ornamental and dispensable luxury, but intrinsic to our species. [...] Art as a behavioral complex is an inherited tendency to act in a certain way, given appropriate circumstances.”⁸

Embodied simulation is congruent with this approach and can be relevant to shed new light on aesthetic experience in at least two ways: First, because of the bodily feelings triggered by the content of man-made images portraying bodies by means of the embodied simulation they evoke. When looking at static or moving images portraying bodily actions, emotions and sensations, like when beholding a painting, a sculpture or watching a movie, embodied simulation generates the peculiar *seeing as* characterizing our aesthetic experience of the images we look at.⁹ Second, because of

⁶ Vittorio Gallese, *A neuroscientific grasp of concepts: From control to representation*, London: Philosophical Transactions of the Royal Society of London B. 369, 2003, pp. 1231–1240.

⁷ Tim Ingold, *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*, London: Routledge, 2000, p. 313.

⁸ Ellen Dissanayake, *Homo Aestheticus: Where Art Comes from and Why*, Seattle: University of Washington Press, p. 224.

⁹ David Freedberg and Vittorio Gallese, *Motion, emotion and motor representations*, Cambridge: Trends in Cognitive Sciences 11, 2007, pp. 197–203. / Vittorio Gallese and Cinzia Di Dio, *Neuraesthetics: The Body in Esthetic Experience*, In: The Encyclopedia of Human Behavior, vol. 2, ed. V. S. Ramachandran, Amsterdam: Elsevier Academic Press, pp. 687–693. / Vittorio Gallese, *Aby Warburg and the dialogue among aesthetics, biology and physiology*: Milano, Ph 2, 2012, pp. 48–62. / Vittorio Gallese and Alessandro Gattara, *Embodied simulation, Aesthetics and Architecture: An Experimental aesthetic approach*, in: Mind in Architecture: Neuroscience, Embodiment and the Future of Design, eds. S. Robinson and J. Pallasmaa, 2015, Boston: MIT Press, pp. 161–179.

the intimate relationship between the symbol-making gesture and its reception by beholders, in virtue of the motor representation that produces the image and, by means of simulation, enables its experience. Indeed, we have shown that when looking at a hand-written graphic sign, like alphabet letters or Chinese ideograms¹⁰, or when looking at abstract art works like those by Lucio Fontana¹¹ or Franz Kline¹², we unconsciously simulate the hand gestures that have produced them by means of the activation of our brain motor centres. We do not actually move, but our motor brain behaves as if we were drawing those images with our hand.

Embodied simulation, through its plasticity and modulation, might be also the vehicle of the projective qualities of our aesthetic experience, where our personality, cultural identity, the context, our mood and disposition, literally shape the way we relate to a given perceptual object, by means of the modulatory effect exerted on our simulation processes. Embodied simulation, if conceived of as the dynamic instantiation of our implicit memories, can relate perceptual objects and beholders with a specific, unique, and historically determined quality. This projective quality of embodied simulation complements its receptive features.

Neuroscience shows that the very same forms of sociality enabling symbolic and artistic expressions and their reception are, at their basis, a further exemplification of intersubjectivity conceived of as intercorporeality – the mutual resonance of intentionally meaningful sensorimotor behaviours. For example Marta Dell'Angelo's *Face to Face* (2006–2014)¹³ provides an exciting and thought-provoking artistic visualization of this mechanism of motor resonance and mutual attunement. Embodied simulation, as a new model of perception and cognition,¹⁴ reveals the constitutive relationship between the body and symbolic expression, because as we have just

/ Vittorio Gallese and Michele Guerra, *Lo Schermo Empatico. Cinema e Neuroscienze*, 2015, Milano: Raffaello Cortina Editore.

¹⁰ Katrin Heimann, Maria Alessandra Umiltà and Vittorio Gallese, *How the motor-cortex distinguishes among letters, unknown symbols and scibbles. A high density EGG study*: Amsterdam, *Neuropsychologia* 51, pp. 2833–2840.

¹¹ Alessandra Umiltà et al., *Abstract art and cortical motor activation : An EGG study*, 2012, Lausanne: *Frontiers in Human Neuroscience* 6, p. 311.

¹² Beatrice Sbriscia-Fioretto et al., *ERP modulation during observation of abstract paintings by Franz Kline*, Cambridge: *PLoS ONE* 8(10), e75241.

¹³ See [p. xy](#).

¹⁴ Vittorio Gallese, 2003 [fn 6], pp. 1231–1240. / Vittorio Gallese, *Before and below Theory of Mind: Embodied simulation and the neural correlates of social cognition*, London: *Philosophical Transactions of the Royal Society of London B* 262, 2007, pp. 659–669. / Vittorio Gallese, 2014 [fn 5], 20130177. / Vittorio Gallese and Corrado Sinigaglia, *What is so special with Embodied Simulation*, Cambridge: *Trends in Cognitive Sciences* 15 (11), pp. 512–519.

seen, our experience of man-made images—broadly speaking—can always be understood as a natural form of relational experience.

Let us now turn to the relationship between real and fictional realms. The results of empirical research reveal that the line between what we call reality and the imaginary and imagined realms of fiction is much less sharp and clear than one might think. However, there is a clear distinction between our experience of the real world and our experience of the worlds of fiction. Our relationship with fictional worlds is double-edged: on the one hand we pretend them to be true, while, on the other, we are fully aware they are not. Furthermore, our relation with fictional realms usually takes place in specific contextual conditions: when beholding a painting at an art museum, for example, several powerful ‘framing effects’ take place. First, we find ourselves in a context where the images hanging on the wall are supposedly art works. Second, once we let the image capture our attention, the frame surrounding it almost disappears, as we are fully absorbed by the image. Our appreciation of man-made images implies the inhabitancy of intermediate worlds where territory and map do overlap.

In spite of the fact that the body is at the core of our perceptions, of our understanding, and of our imagination, the relationship with fictional worlds is still mainly explained in purely cognitive terms, that is, following Coleridge, in terms of “suspension of disbelief.” This explanation, however, is at best partial. It has been proposed¹⁵ that embodied simulation can be relevant to our experience of fictional worlds because of the *feeling of body* they evoke by means of the potentiation of the mirroring mechanisms they activate. In such a way, embodied simulation generates the specific attitude informing our aesthetic experience. Such potentiation supposedly boosts the bodily memories and imaginative associations fictional content can awake in our minds, thus providing the idiosyncratic character of its appreciation.

How is such potentiation achieved? One important context-dependent aspect characterizing our relationship to fictional worlds deals with our distancing from the unrelated external world, which remains at the periphery of our attentional focus, very much like the frame surrounding the image we are beholding. According to my hypothesis, such distancing, like this temporary suspension of the active grip on our daily occupations, liberates new simulative energies. Our experience of fictional

¹⁵ Chappelle Wojciehowski and Vittorio Gallese, How stories make us feel. Towards an embodied narratology, California: California Italian Studies 2 (1), 2011, <http://escholarship.ucop.edu/uc/item/3jg726c2>.

worlds, besides being a suspension of disbelief, can thus be interpreted as a sort of “liberated embodied simulation”. When adopting such aesthetic attitude, our embodied simulation becomes liberated, that is, it is freed from the burden of modelling our actual presence in daily life¹⁶. Through an immersive state in which our attention is focused on the fictional world, we can fully deploy our simulative resources, letting our defensive guard against daily reality slip for a while.

Furthermore, when engaged with fictional worlds, the contextual bodily framing—our being still—additionally boosts our embodied simulation. Our being still simultaneously enables us to fully deploy our simulative resources at the service of the immersive relationship with the fictional world, thus generating an even greater feeling of body. Being forced to inaction, we are more open to feelings and emotions. The specific and particularly moving experience generated when immersed in fictional worlds is thus probably also driven by this sense of safe intimacy with a world we not only imagine, but also literally embody.

When we relate to fictional worlds, our attitude towards their content can be characterized as a sort of “neotenic look”, somehow similar to the way we were looking at the world during that early period of our development in which, because of our poor motor autonomy, our interactions with the world were mainly mediated by the embodied simulation of events, actions, and emotions animating our social landscape. Probably we learn to calibrate gestures and expressions and to match them with experiences of pleasure/displeasure observing them in others, thanks to embodied simulation and its plasticity.

When we relate to fictional worlds, like when contemplating art, our relative immobility is not anymore the consequence of the immaturity of our sensorimotor development, but the outcome of our deliberate decision. However, immobility, that is, a greater degree of motor inhibition, probably allows us to allocate more neural resources, intensifying the activation of bodily-formatted representations, and in so doing, making us adhere more intensely to what we are simulating. Perhaps it is no coincidence that some of the most vivid fictional experiences we entertain, as those occurring during our dreams, are paralleled by massive inhibition of the muscle tone in our body.

¹⁶ Vittorio Gallese, *Embodied simulation Theory: Imagination and Narrative*: Amsterdam, *Neuropsychologia* 13 (2), 2011, pp. 196–200. / Vittorio Gallese, 2012 [fn 9], pp. 48–62. / Chappelle Wojciehowski and Vittorio Gallese, 2011, <http://escholarship.ucop.edu/uc/item/3jg726c2>. / Vittorio Gallese and Michele Guerra, 2015 [fn 9].

During the aesthetic experience of fictional worlds, our experience is almost exclusively mediated by a simulative perception of the events, actions and emotions characterizing fictional content. For example, when watching a movie or reading a novel, we not only focus our attention, but our immobility enables us to fully deploy our embodied simulation resources and put them at the service of our immersive relationship with the story. This hypothesis can plausibly contribute to explain the difference between our “aesthetic attitude” towards fictional worlds and our ordinary consciousness of the prosaic reality of our daily life.

There is a final topic worth being addressed, although I’ll be able to do it very concisely here, for sake of brevity. Today we are experimenting with a new type of relation with the world, characterized by an unprecedented potential ontological instability. Indeed, objects, facts, words and individuals are as much real and present as the media and social networks represent them. The multiple sources and points of views through which our appreciation of reality is built ever more reduce factual truth to the weighted average of multiple different truths. In other words, at present for more and more people the way reality is represented by media and social networks has become the main validating criterion of reality.

Through media and social networks, by means of mobile phones, tablets and computers, we constantly alternate the experience of representations of reality and of its fictional narratives, which endlessly oscillate within the media flow. Journalistic reports on the war in Iraq alternate on the screen with feature movies on the same war, like Brian De Palma’s *Redacted*¹⁷, partly made of real footages of the same war. This contributes to multiply the sources alimending our sense of reality, destabilizing it. Our sense of what is real and really happening, is more and more fetishistically nourished by the digital fragments of a shared public virtual reality, which often appears to be counterfeited and/or manipulated. The growing autonomy of the digital world colonizes our imagination and at the same time externalizes our memories in an unprecedented way.

This scenario is apparently moving away from a bodily account of our relation to images. However, contemporary digital technologies, paradoxically, put the body back at the centre of the mediations by means of which we appreciate reality. New digital technologies dethrone language from its leading role in building our reality, putting a

¹⁷ Brian De Palma’s *Redacted* (2007) is a US American-Canadian war drama.

new form of non-linguistic bodily visibility at the centre of our life. Our body has substituted remote controls, as we currently control the playing of images by means of our fingers touching the screen of our tablets and smartphones. Our world experience becomes less language-centred and more sensuously embodied. Hence, as pointed out by Mark Hansen¹⁸, we move from semiosis to mimesis of reality.

I think that neuroscience might provide a new approach to the contemporary problem of the relation between reality and virtuality, by investigating the bodily impact of new digital communication technologies, shedding new light on the post-modern technological mechanosphere. In particular, the embodied simulation theory might specifically address the various modalities by means of which our body interfaces with reality and its virtual digital representations, providing new means for their comprehension. By means of embodied simulation the recent emphasis put on 'haptic vision'¹⁹ when discussing the new digital interfaces to images, can now be empirically addressed from the vantage point of the brain-body. This also opens the possibility for art and science to provide together new bases to understand our world, criticize it and, possibly, make it a better place to live.

¹⁸ Mark Hansen, *Embodying Technesis. Technology beyond Writing*, Michigan: Michigan University Press, 2000.

¹⁹ Laura U. Marks, *Touch; Sensuous Theory and Multisensory Media*, Minneapolis: University of Minnesota Press, 2002. / Vivian Sobchack, *The Address of the Eye: A Phenomenology of Film Experience*, Princeton, N.J.: Princeton University Press, 1992. / Vivian Sobchack, *Carnal Thoughts: Embodiment and Moving Image Culture*, Berkeley: University of California Press, 2004. / Jennifer Barker, *The Tactile Eye: Touch and the Cinematic Experience*, Oakland CA: University of California Press, 2009. / Giuliana Bruno, *Public Intimacy. Architecture and the Visual Arts*, Boston: MA, MIT Press, 2014.