EMBODYING MOVIES:

EMBODIED SIMULATION AND FILM STUDIES

Vittorio Gallese (University of Parma)

Michele Guerra (University of Parma)

1. INTRODUCTION

Film is an art, thus expressing one of the most distinctive features of what makes us human. Film is a possible target of investigation for cognitive neuroscience, and for a variety of very good reasons. First, because like all forms of art it exemplifies a mediated form of intersubjectivity where the film is the mediator between the film's creator and film's viewers.[1] Second, because watching a movie exemplifies a type of perception whose relationship with "natural" perception is still hotly debated. Third, because like other kinds of artistic expression, film enables us to study one of the many possible fictional worlds we inhabit, thus tapping into the crucial problem of the relationship between the "real" and the "virtual," between the prosaic world we inhabit in our daily occupations and the imaginary worlds of artistic fiction.

"How can cinema have so powerful a 'reality effect' when it is so manifestly unreal?" We would like to start by reinstating Steven Shaviro's[2] question against the background of the new take cognitive neuroscience proposes on embodiment and applying it to film studies. This "reality effect" represents one of the most challenging issues within the debate of film since its origins. Recent studies within cognitive film theory, visual psychology and neuroscience bring out strong evidence of a continuity between perceiving scenes in movies and in the world, as the dynamics of attention, spatial cognition and action are very similar in direct

experience and mediated experience. We can count on a huge literature on this topic.[3] Thanks to new technologies like fMRI, eye-tracking or other statistical analyses, we can widen the field of our cognitive approach to film theory,[4] also considering that usually neuroscientists base some of their experiments on filmed scenes.[5]

Since we are interested in tapping into such a debate from a motor perspective, our analysis will be based on Embodied Simulation (ES) theory[6]. ES has been proposed to constitute a basic functional mechanism of humans' brain, by means of which actions, emotions and sensations of others are mapped onto the observer's own sensory-motor and viscero-motor neural representations. Such theory was triggered by the discovery of mirror neurons in the macaque monkey brain.[7] Mirror neurons are motor neurons that typically discharge both when a motor act is executed and when it is observed being performed by someone else. The functional properties of mirror neurons (mirror mechanism, MM) characterize a parieto-premotor cortical network. Thus, observing an action causes in the observer the activation of the same neural mechanism that is triggered by executing that action oneself.

After two decades of research it is established that a similar MM is also present in the human brain[8]. The MM for actions in humans is somatotopically organized; the parieto-premotor cortical regions normally active when we execute mouth-, hand-, and foot-related acts are also activated when observing the same motor acts executed by others. Watching someone grasping a beer mug, biting an apple, or kicking a football activates the same cortical regions normally activated when actually executing the same actions. Further brain imaging studies showed that the MM also applies to emotions and sensations. Witnessing someone else expressing a given emotion like disgust or pain, or undergoing a given sensation like touch activates some of the viscero-motor (e.g., anterior insula) and sensory-motor (e.g.,

SII, ventral premotor cortex) brain areas activated when one experiences the same emotion or sensation, respectively.[9] Such shared activations ground an apparently external stimulus (someone else's emotion or sensation) in our personal experiential acquaintance with the same emotion or sensation.[10]

Summing up, according to ES theory our brain-body system re-uses part of its neural resources to map others' behavior. When witnessing actions performed by others, we simulate them by activating our own motor system. Similarly, by activating other cortical regions we re-use our affective and sensory-motor neural circuits to map the emotional and somato-sensory experiences of others. By means of ES we have a direct access to the world of others. The MM, though, constitutes only one instantiation of ES.

Object perception provides us with another example of ES in the action domain. Seeing a manipulable object selectively recruits the same motor resources typically employed during the planning and execution of actions targeting the same object. Several single neuron recording studies in monkeys and electrophysiological and brain imaging studies in humans demonstrated that neuronal populations in the premotor and posterior parietal cortex — canonical neurons — selectively activate both when grasping an object and merely perceiving it.[11] The sight of a manipulable object, such as a key (see below), evokes a motor activation in the observer's brain even in the absence of any overt motor behavior. Furthermore, when looking at an object the activation of grasping-related motor neural circuits can be affected by the same spatial constraints governing the execution of actual grasping actions. The power of an handled mug to afford a suitable grip has been shown to depend on its actual reachability, even when people do not act upon it, nor intend to do so.[12] Strikingly, spatial constraints affect the ES of one's own potential actions even when observing someone else who is about to act upon the object.[13] The perception of an object, through ES, can be nothing but a preliminary form of action, which

regardless of whether we actually interact with the object or not, gives it to us as something present-at-hand (*zu-handen*, in Heidegger's terms[14]). This suggests that ES constitutively shapes the content of perception, characterizing the perceived object in terms of motor acts it may afford — even in the absence of any effective movement.

A further instantiation of ES concerns the way the brain-body system maps the space surrounding our body, peri-personal space.[15] Posterior parietal and premotor neurons, both in humans and monkeys, integrate visual and auditory information about objects within peri-personal space by mapping it onto the motor programs required to interact with those objects within that space. As envisaged by Merleau-Ponty, "my body appears to me as an attitude directed towards a certain existing or possible task. And indeed its spatiality is not, like that of external objects or like that of 'spatial sensations', a spatiality of position, but a spatiality of situation."[16] The defining properties of peri-personal space consist in its being multisensory (i.e., based on the integration of visual, tactile, auditory and proprioceptive information), body-centered (encoded not in retinal, but in somatic coordinates), and motor in nature. Peri-personal space and its range can be construed, again quoting Merleau-Ponty, as "the varying range of our aims and our gestures."[17]

As in the case of object perception, the ES-based action dependence of peri-personal space does not involve the effective execution of movements, but it is revealed by the potentialities for action shaping the content of our perception of objects within reach even when we are not actually acting upon them.

As recently shown by the Italian philosopher Mauro Carbone,[18] Merleau-Ponty developed a theory of the perceiving body able to testify to the phenomenal truth of movement produced by the discontinuous images of cinema, by means of the movement projection performed by the observer. To paraphrase Merleau-Ponty, "If we now consider the film as a perceptual object, we can apply what we have just

said about perception in general to the perception of a film."[19] In the following sections we show the relevance of ES for film studies.

2. WAITING FOR ES

In the last twenty years we have been witnessing an increasing idea of continuity between the film and the viewer: we perceive the movie as well as we perceive the real world and both the movie and the world contact us primarily at an embodied level and then gradually at a "less wild" level of communication.[20] Biocultural film studies emphasize this kind of access to film, stressing how we can experience movies by means of a brain-body system evolved in a totally different environment.[21] As Deleuze said, "cinema not only puts movement in the image, it also puts movement in the mind […] I don't believe that linguistics and psychoanalysis offer a great deal to the cinema. On the contrary, the biology of the brain does."[22] We should thus get back to the brain-body to grasp our primordial contact with the film and test the plausibility of some film theories.

Deleuze made great use of brain metaphors, making sometimes difficult to understand the real meaning of terms like, for instance, "cinematic synapses".[23] Martha Blassnigg gave us a good description of the usage of these metaphors within a French culture inspired by Henri Bergson's *Matter and Memory*, noticing that the analogy between the screen and the brain was put forward by Edgar Morin too, many years before Deleuze — who never cites him in his two cinema books.[24] As Blassnigg writes, "Deleuze makes clear that the brain in a comparison with the screen is not to be understood as a purely cognitive faculty, and he foregrounds the importance of the involved emotive qualities."[25] In other words, Deleuze's brain metaphors mark the passage toward a physical approach to film studies that after

the publication of his cinema books put — more or less consciously — the Grand Theory rooted in semiotics and psychoanalysis in a difficult position, foreseeing the advent of a biocultural approach to cinema.

Bioculturalism actually seems to be the right way not only to challenge the Grand Theory, but also to update some insights from cognitive and phenomenological film studies, that have had the extraordinary merit of placing our brain-body system at the heart of film debate, even though demonstrating some resistances in considering the impact of cognitive neuroscience on such a debate. Nonetheless we would like to underline that we do not share the rigid condemnation of semiotics and psychoanalysis, nor of semiotic and psychoanalytic film theory; we know that the best contemporary semiotics and psychoanalysis — as well as the best semiotic and psychoanalitic film theory — are perfectly aware of the need to cope with the contribution of cognitive science and neuroscience.

According to Shaviro, the cinematic apparatus is a new mode of embodiment and "there is no structuring lack, no primordial division, but a continuity between the physiological and affective responses of my own body and the appearances and disappearances, the mutations and the perdurances, of the bodies and images on the screen."[26]

This continuity is strictly tied to the mode of presence of cinema, i.e., to the impression we are inside the diegetic world, we experience the movie from a sensory-motor perspective and we behave "as if" we were experiencing a real life situation. Indeed Shaviro stresses that such a continuity is mainly detectable at the physiological and affective level, heightening the relevance of our pre-cognitive approach to film, the physicality of such experience and the priority of film affect.[27] Many years after the publication of his book, Shaviro reinforced his positions: "what I was groping towards, bit unable to express fully, was the idea that the cognitive — far from being opposed to the visceral or bodily — grows out of the visceral and is

an elaboration of it."[28] The "as if" component of our film experience implies two intertwined sides: one rooted in our brain-body and the other developing through our cognitive processes. From this point of view, Ghazanfar and Shepherd's experiments with monkeys at the movies are very convincing.[29]

The interaction between the film as a lived body and its viewer[30] can go so far as to consider the movie as the crossroad of three different bodies: the body of the spectator, the body of the film, and the body of the filmmaker. MacDougall wrote that images we make are "in a sense mirrors of our bodies, replicating the whole of the body's activity, with its physical movements, its shifting attention, and its conflicting impulses toward order and disorder. [...] Corporeal images are not just the images of our bodies; they are also images of the body behind the camera and its relations with the world."[31] The debated idea according to which the movie could be considered like a lived body has been convincingly discussed in Sobchack's works, as she considers — referring to Umberto Eco — the "lived modes" of perceptual and sensory experience used by the cinema as "sign-vehicles of representation".[32] However, there is a huge number of scholars considering the film as a lived entity, mainly because it moves.[33] From our perspective, this kind of vitality is detectable as we think of the relationship between the movie and the viewer, since motion pictures, because of their own essence, entail a body able to decipher their movement by simulating it internally. Merleau-Ponty wrote that we can understand the movement only through the movement, that is, thanks to our own body "possibilités motrices".[34]

Filmmakers would be supposed to create, layer by layer, a living object sharing perceptual and cognitive structures with its viewer and they have to calibrate it according to a significantly different level of empathy. What is at stake is the embodied cognition of a new spatio-temporal dimension, and the only way to make it work is to establish a continuity between our embodied reality and our embodied

visions. The body becomes the starting point both for the filmmaker and for the viewer, recalling what Münsterberg suggested about the way our body adjusts itself in order to guarantee "the fullest possible impression."[35] As Grodal writes, basically Münsterberg "showed how the film experience might be described as a cued simulation of key mental and bodily functions,"[36] stressing how important our brain-body responses are in order to behave correctly in this new spatio-temporal dimension. Jan Patočka put it very similarly, when he said that "the original spatial perspective within which we locate ourselves receives its orientation from the possibilities of our corporeal activity."[37]

We posit that ES, considered within this perspective, plays a crucial role not only at the receptive level, but also at the creative one, and this is the reason why filmmakers are generally interested much more than scholars in this new field of research, since they become aware of the basis of their "filmic cognition," made mostly of gestures, actions, intentions and emotions inscribed in a space-time shaped by film style, camera movements and montage.

Psychological research on visual properties, visual space and film has demonstrated the existence of a strong continuity between perceptual experience in film and the real world, revealing the importance of the body in shaping the film space and in "spatializing" objects and characters.[38] We can posit that this is due to the fact that our brain serves primarily one purpose, moving us around, a crucial activity for our conceptual life too, if we agree with Turner saying that "the basic stories we know best are small stories of events in space," or that our "image schemas are skeletal patterns that recur in our sensory and motor experience," or again, referring to Eve Sweetser, that "the mind is a body moving through space."[39]

Although we mainly empathize with characters, it is self-evident, as Barker pointed out, that we respond to whole cinematic structures — textural, spatial and temporal — that resonate with our own textural, spatial and temporal structures.[40]

The PECMA flow (perception, emotion, cognition and motor action) put forward by Grodal refers basically to this kind of approach, grounding it on the general functional architecture of the brain.

3. ES AND ITS RELEVANCE FOR FILM STUDIES

Our point is that ES provides neurobiological grounding to this kind of interpersonal understanding involving the viewer's body, the film as a lived body and the filmmaker's body as well: this is why in making an experiment on film style we should also film the cameraman and his kinematics.[41] These kinds of relations are marked by our bodily involvement, to be considered at the implicit and pre-reflective level of intercorporeality ES conceives of.[42] This is the first contact, without which we cannot have any access to higher cognitive levels, making clear that the intersubjectivity movies enhance relies on internal non-linguistic representations, where the term representation "refers to a particular type of content, generated by the relations that our situated and interacting brain-body system instantiates with the world of others."[43]

ES sheds new light on many insights film theorists, psychologists and even physicians have put forward in XX century. Think of the early experiments made in 1920 by two French physicians, Edouard Touluse and Raoul Mourgue.[44] Their work, entitled "Les réactions respiratoires au cours de projections cinématographiques," aimed to show how stongly the movies affect the audience and how close the relationship between the movie and its viewer is. As Moussinac wrote five years after these experiments, "les docteurs Touluse and Mourgue établissent que, étant scientifiquement démontré que la perception du mouvement fait naître l'ébauche du mouvement correspondant, il se produirait à l'écran un phénomène du même genre

que la suggestion hypnotique pratiquée après avoir mis le sujet dans une attitude donnée."[45] Moussinac blends physiology and hypnosis but he suggests interpretations corroborated in recent years thanks to the discovery of MMs in humans.

The physical effect of film was brought out by Benjamin, who wrote about the tactile (*Taktisch*) quality of film,[46] and strongly condemned by Duhamel, who described in his 1930 *Scène de la vie future* film movement and rapidity as a means of impairing not only comprehension but also any form of participation[47] — and Benjamin will refer to him in his *The Work of Art in the Age of Technological Reproducibility*. The same effect characterized, to some extent naively, primitive and pre-narrative movies, in which the central role played by the human body within the frame elicited this kind of mirror effect. Such a matter will be also discussed in the works of Soviet filmmakers like Kuleshov, Pudovkin, Vertov and Eisenstein both in their films and writings, where by means of a process of trial and error they were committed in bridging film language and human brain processing. The physical effect will be incorporated in the transparency of classical Hollywood montage, that to some extent tried to externalize our cognitive processes, then challenged by the so-called modern cinema, aiming to break the sensory-motor relationship between the viewer and the movie by changing the normal "affordances" a movie entailed. Nowadays we see how new technologies try to enhance a multisensory relation based on new forms of immersion and physical involvement.

The central question is: How and at which level does the movie engage the viewer? Kracauer, perfectly in line with our assumption, would answer that the moving image engages the viewer "physiologically before he is in a position to respond intellectually" and it elicits "a 'resonance effect' provoking in the spectator such kinesthetic responses as muscular reflexes, motor impulses, or the like. In any case, objective movement acts as a physiological stimulus."[48] This is very close to

Michotte's concept of "mouvement incipient," by means of which "*je sens* ce que *l'autre fait*"[49] — that is roughly the Italian title of Rizzolatti and Sinigaglia's *Mirrors in the Brain*: *So quel che fai.*

The ES perspective may represent the basic link facilitating the convergence of high and low-level theories wished by Joseph and Barbara Anderson at the beginning of the "post-theory" era.[50] ES can better explain the activity of the viewer as a "cinesthetic subject,"[51] allowing us to cope with our subcognitive responses to film in a different and more elegant manner. ES can also shed new light on the "mode of presence" of cinema.[52] Since ES is characterized by the capacity to share meaning of actions, basic motor intentions, feelings and emotions, it is clear how relevant could be its role in the experience of many "action-packed" movies able to elicit subcognitive or cognitively impenetrable responses,[53] or in the studies on film immersion based on the perception of viewer's presence in the diegetic world or on self-location in a virtual world.[54]

ES updates and enhances simulation theories, by showing that the tracking process is shaped by motor programs and somato-sensory and interoceptive "representations" in bodily format activated in the observer.[55] ES generates the Feeling of the Body that constitutes "a crucial ingredient of our relationship with fictional narratives."[56] The Feeling of the Body consists of the activation within the observer of non-linguistic "representations" of the body-states associated with the observed actions, emotions, and sensations, as if he or she were performing a similar action or experiencing a similar emotion or sensation. The Feeling of the Body, according to this hypothesis, would enable a direct access to the world of others by means of the ES-mediated capacity to share the meaning of actions, basic motor intentions, feelings, and emotions with others, thus grounding our identification with and connectedness to others. Intersubjectivity should thus be viewed first and foremost as intercorporeality. Simulation appears more and more essential to the

understanding of how we represent ourselves through art, and MMs could be recognized as the first agents of this kind of embodied cognition.[57] Also simulation theories, conceived within the range of action of ES, play a role in our understanding of the nature of what we feel and we believe in aesthetic experience and obviously in film experience.

The embodied side of the "as if" response in relation to fiction relies on this kind of simulation and allows us to reconsider the debate on the impression of reality films elicit and on the real nature of our reactions.[58] Coleridge's well-known "willing suspension of disbelief," that has had a powerful afterlife in film studies, has gone through a big crisis in the period we are referring to: we read new proposals about the necessity for the viewer actively constructing disbelief in order to cope with what Richard Gerrig described as "anomalous suspense,"[59] or about the necessity of emphatically applying our disbeliefs in order to inhibit the default "realistic" answer of our perceptual system.[60] Some interesting contributions have tried to update such a concept, rethinking it within a Winnicottian perspective, or trying to give it a more scientific basis.[61] The central question is still the reality effect: why, being aware of our condition of spectators inside a dark movie theatre, are we victims of the anomalous suspense a movie elicits? And why do we experience the same feeling even when we see this movie for the second or third time? David Bordwell tries to answer such a question in a very intriguing way: "a great deal of what contributes to suspense in films derives from low-level, modular processes. They are cognitively impenetrable, and that creates a firewall between them and what we remember from previous viewing."[62] According to Bordwell, the resonance effect that, for instance, mirror neurons are able to create in the viewer would play a key role in this kind of pre-cognitive contact, and as we know movies are well suited to produce mirroring processes.[63] Bordwell's "firewall hypothesis" is in line with recent researches on the vestibular system in film, according to which "though it is

true that we can, to some extent, use our cognition to unwire our experience of a film (by using belief/disbelief mechanism, for instance), and switch to a mere intellectual (high order) experience, there are, however, limits to how much control we can exert over the low level sensory experience offered by a film."[64]

However, such classical theories as Radford's paradox of emotional response to fiction, or the so-called "pretend theory" and "thought theory" are challenged by the new insights cognitive neuroscience puts forward and particularly by ES. ES posits an on-line relation between the observer and the observed, anticipating, complementing and giving a neural basis to Currie's off-line running of our mental processes. His Simulation Hypothesis has had a huge impact on cognitive film studies, although it neglects the physical impact of film on the viewer. We are not alone in wishing for an intervention by Currie in this debate, maybe focusing on the contribution of MMs.[65] Currie says that one reason we can run our mental states off-line is to engage with fictional world,[66] but we have already observed how important it is to complement such an interpretation with a study of our bodily representation of this fictional world. Referring to our sensory-derived experience of the world, to the way we "manipulate" it with our brain, and to Sue Cataldi's work on embodiment, Rurtherford focuses on the meaningful relation the film viewer establishes with filmic environment and what such environment offers,[67] sharing actions and intentions.

All the literature on embodied, tactile, visceral, haptic and "full resonance-like" aspects of film is strongly animated by the idea that there is a true link between us and the movies, and — through ES — we can grasp the truth of this getting back to our brain-body system and the way it engages with the real world. Scholars like Shaviro, Sobchack, Barker, Marks and others can subscribe that "what we take to be true in a situation depends on our embodied understanding of the situation":[68] given the film as a situation, this is true for our "embodied visions" as well. The

reality status of film has its base here, via the affordances this fictional world offers to our brain-body and this is also the reason why neuroscientists like Damasio insist in comparing the movie to consciousness, affirming that whoever invented cinema might have thought, more or less consciously, of the function of the brain.[69]

Obviously ES does not deceive us, nor weaken the "as if" component; on the contrary it can to some extent strengthen such a component, over-riding both the suspension of disbelief and the dynamics of the so-called "segregation of the spaces." In other words, in aesthetic experience we are temporarily free from our real life occupations and we have the chance to liberate new energies to cope with a dimension paradoxically more vivid than reality. We can describe this attitude, more than as a suspension of disbelief, as a "liberated ES," keeping us at a safe distance from the film and at the same time increasing the intensity of our relation to it.[70] When watching a movie, our embodied simulation becomes *liberated* because it is freed from the burden of modeling our actual presence in daily life. We find ourselves situated at a *safe distance* from what is being narrated on the screen and this magnifies our receptivity. Through an immersive state in which our attention is entirely focused on the narrated filmic world, we can fully deploy our simulative resources, letting our defensive guard against daily reality slip for a while.

Another important element of liberated simulation consists in the fact that when we watch a movie, we do it almost completely still. While sitting in a movie theater our interactions with the world are almost exclusively mediated by a simulative perception of the events, actions, and emotions portrayed in the movie. A sort of emotional transfer takes place between actors and spectators that, being forced to inaction, are more open to feelings and emotions.[71] When watching a movie we not only entirely focus our attention on it, but our stillness simultaneously enables us to deploy fully our embodied simulation resources at the service of our

immersive relationship with the narrated characters.[72] Also this would be a good way to describe the difference between a mental state relying on our "aesthetic attitude" and another relying on "ordinary" consciousness.[73]

4. Sharing behaviors

Movies are basically action-based and action-packed. The movement normally implies a story developed in space and time and a goal to be reached. What we assume is that this kind of elementary structure contacts us at a pre-verbal level rooted in ES. In other words we must share attitudes and behaviors with what happens on the screen in order to enter that space. Both our beliefs and our ability to infer the meaning of the action we stare at depend on the "we-centric space"[74] enabled by the activation of the shared brain circuits characterizing ES. When we watch a movie we are compelled to privilege the space in front of us, moving in the direction our eyes look at.[75]

At its very beginning cinema embodied a form of modernity shaped by sensation and by a new ability to empathize with a virtual and self-moving environment. In the early phase of film, the body had a huge importance as a stimulus, and many movies within the so-called "cinema of attractions" were animated by the desire to address directly the audience by means of the body, emphasizing gestures, facial expressions, or recurring to some stylistic solutions such as for instance eye-contact. Referring to James Mark Baldwin's social psychology, Auerbach describes early cinema as the "very scene of corporeal self-objectification."[76]

The human body was an element of continuity capable of filling the emptiness of narrative structures and film style, and of making the viewer able to move through a new spatial dimension felt to be part of our peri-personal space, according to Lumière's main goal: placing the world within one's reach (*zu-handen*). As Singer puts it, cinema was grounded in "a *neurological* conception of modernity"[77], that is, in a strong tendency to sensationalism that we can also detect nowadays in many 3D or CGI (Computer Generated Imagery) movies.[78]

The main goal is to affect the viewer with a new kind of moving image, considering it within a sensory-motor perspective. In one of his early writings, referring to Lipps, Eisenstein wrote that "because emotional perception is achieved through the motor reproduction of the movements of the actor by the perceiver, this kind of reproduction can only be caused by movement that adheres to the methods that it normally adheres to in nature."[79] Eisenstein seems to be very close to the ES perspective, but he also sees that film art cannot stop at the body level: the filmmaker has to shift the affect from the body to the language (body) of film, transferring the principles of biomechanics from the actor's body to film's body, becoming a sort of "psycho-engineer" (*psicho-inžener*)[80] who considers the montage as the universal method for "vitalizing human qualities."[81]

Viewers' film experience can vary depending on the quality of film inputs: the acting represents a first stage of embodiment that allows the audience to be on-line not only in respect to its viewing processes, but also to action and tactility. The

acting body is the first form of embodiment, and film style arises from a negotiation with it. Film style could be the result of a fragmentation of our corporeal relation to the world (Soviet montage), a simulation of body's movements, displayed emotions and sensations within the movie as a "fully realized world"[82] (classical Hollywood film), or a neutralization of the action capable of immobilizing the character within his environment, contrasting the transparency of film language and offering a metareflection on film (modern cinema).

These cases, characterizing the abovementioned different phases of film history entail various sets of spectators' beliefs rooted in different cognitive and pre-cognitive domains. In the vast majority of cases the viewer feels the camera as her own body — capable of walking and making gestures —, and the movie as a sort of strange out-of-body experience: according to Barker, "when viewers and films share certain attitudes, tasks, or situations, they will move in similar ways."[83]

Sharing attitudes and behaviors means grasping the action potentiality of a movie, on which much part of its make-believe cues relies. ES could represent an interesting way of reconsidering the history of film style on a motor and enteroceptive basis, considering it both from the filmmaker's perspective and from the viewer's one. When a movie gives up its goal-orientation or its action potential, as in the case of 1960s new waves, we have to share other attitudes, wondering about director's hidden intentions and feeling a bit excluded from its environment. The degrees of ES could be an index useful to evaluate our cognition in film experience, and to test the "salience" of a film sequence[84] and the limits of our beliefs.

In the final part of our paper we analyze two important sequences of two very different movies: one from Hitchcock's *Notorious* (1946) and one from Antonioni's *Il grido* (1957), two good examples of identification and disidentification with character's actions, motor intentions, feelings and emotions. These two sequences

are characterized by the same stylistic solution – a false point-of-view (FPOV) shot – one that causes totally different embodied attitudes.

4.1. *Notorious:* **To Grasp or Not to Grasp**

According to Truffaut, "*Notorious* is the very quintessence of Hitchcock," while Krohn entitled the chapter on it "Writing with the camera."[85] From our perspective *Notorious* is a brilliant example of the classical period and a good model to test the value of an ES approach to film analysis. In the last part of *The Movement-Image*, Deleuze describes Hitchcock as the father of a new kind of image, the relation-image: "each image in its frame, by its frame, must exhibit a mental relation." This relation is to some extent encoded by the camera movement: "The characters can eat, perceive, experience, but they cannot testify the relations which determine them. These are merely the movements of the camera, and their movements towards the camera."[86] According to Deleuze, Hitchcock incorporates the viewer's responses into film style and language, and he is interested in triggering those responses by means of the camera behavior more than by means of the characters' psychology. In other words Hitchcock aims to contact the viewer at a pre-cognitive level exploiting the potentiality of camera movements, and promoting an embodied approach capable of enhancing the suspense effect: before sharing the experiences of the characters, the viewer shares the experiences of the camera.

The well-known sequence of the key in *Notorious* is usually mentioned for the extraordinary scene in which the camera, mounted on a crane, sees a wide-angle shot of the party and then glides in to an extreme close-up of the key clenched in Alicia's hand. Nonetheless we would like to recall here the preceding scene. Alicia is going to enter Sebastian's room to steal the key of the cellar: Hitchcock lets Alicia walk toward the camera waiting for her close-up on the room threshold. Alicia sees Sebastian's shadow reflected on his bathroom door. The keys are on his desk.

The camera gets close to the desk in order to grasp the keys. The viewer interprets this tracking shot as Alicia's POV shot. Hitchcock expresses very well the character's goal by simulating its accomplishment with a very common stylistic solution. The action potentiality of the camera is perfectly embodied by the tracking shot, sharing Alicia's motor intentions, feelings and emotion.

The viewer is almost ready to grasp the keys, as in a well-done grasping experiment, but Hitchcock decides to frustrate her potential — and almost accomplished — action by showing in the following shot Alicia still on the threshold. The woman, after having evaluated the risks of her action, decides to approach the desk and to grasp the keys: from a stylistic point of view, the structure of the scene is circular, it begins and ends in the same way, just observing Alicia walking in Sebastian's house.

In our opinion this sequence exemplifies how the tracking shot mimicks not only Alicia's potential approach to the keys, but also, by means of ES, the viewer's own potential approach, which turns into a grasping simulation the more the keys are made ready-to-hand, thus evoking the activation of the viewer's canonical neurons. Two distinct simulation processes can be envisaged. By embodying camera movements of the tracking shot, the viewer simulates approaching to the table. This

simulation brings the keys on the table within the observer's simulated peri-personal space, thus turning them into potentially graspable objects, thanks to the ensuing grasping simulation triggered by the activation of the viewer's canonical neurons. Once the viewer realize Alicia is still standing by the room threshold, suspense gets enhanced because it turns out that the previous tracking shot only simulated Alicia's intention to get the keys, and she still has to accomplish her goal at risk of being caught by Sebastian.

An ES-based analysis of Hitchcock's film style could implement the study of some of the most relevant techniques suitable for making the viewer part of the story. At the same time, such an approach is in line with recent attempts to describe Hitchcock's film narrative from an embodied perspective.[87]

4.2. *Il grido*: Thinking up a Movie by Staring at a Wall

Il grido represents a crucial point in Antonioni's filmography, since it anticipates the most recognizable and original stylistic solutions that the Italian director will employ in the tetralogy formed by *L'avventura*, *La notte*, *L'eclisse*, and *Il deserto rosso.* Aldo's floating off in the Po Valley landscape gives Antonioni a chance to reflect on the separation of human beings from reality, shaped by an interruption of their sensory-motor relationship. Aldo is not able to interact with the environment, nor with the other human beings, he is condemned to walk through a space-time he cannot share with anyone. Film style is strongly influenced by this kind of disembodied behavior, and Antonioni decides to contrast the myth of transparency making the viewer aware of the artificial dimension of the camera and heightening the discrepancy between film and reality. Antonioni discusses both the classical film transparency and the transparency of our conscious experience of the world.[88] Like Aldo who has no control over his environment, viewers feels they have no control over the fictitious world, and — as Grodal writes — "this elicits strong subjective feelings which also reflect that the

experience is disembodied":[89] the viewer experiences a lack of control of vision. As we can read in the film treatment, Aldo is not conscious of his body's behavior.[90]

Antonioni gets this effect by giving up the POV shot and the shot/reverse shot technique. On the one hand he aims to distort the visual relationship between the viewer and the object of her gaze; on the other hand he aims to refuse the reciprocity between individuals.[91] There is no space for action in Antonioni's world, as Zernik wrote "le monde est distant, comme 'à travers une vitre'."[92] This effect is very detectable if we analyze the sequence of the sugar refinery tower, that we find at the beginning and at the end of *Il grido*.

An extreme high angle shot shows us a worker calling Aldo, since Irma is looking for him. The worker stares at the camera and we interpret the shot as Aldo's POV shot. Suddenly Aldo bursts into the shot from the left side and makes the viewer aware that it is a FPOV shot — now an over-the-shoulder shot — revealing that there is another gaze regulating the relationship between the characters.

The same solution characterizes the following shots: Irma looks for Aldo, we see her from Aldo's FPOV shot — still believing in the POV shot — then the man enters the shot.

The following shot — organized in a chiastic structure — shows Irma who brings to Aldo his packed lunch. Aldo starts going downstairs, but the POV does not change, revealing the presence of a metaphysical gaze.

The same structure is repeated at the end of the movie, preparing for Aldo's death. The contact between Irma and Aldo seems to be impossible; Chatman observes that "Aldo's fall is rather the accidental consequence of a movement of yearning toward Irma, the only woman who could ever satisfy him."[93] Aldo's death could be the punishment for trying to get out from the entrapment Antonioni's camera has created. After Aldo's death, Antonioni gets back to the tower, offering for the last time his "absurd" POV shot.

The refusal of the POV shot and the absence of any reverse angle shot impair the viewer's ability to project herself on the movie, to share attitudes and behaviors with the characters, to empathize with the environment. Recalling what Deleuze wrote on Hitchcock, we can affirm that the camera much more than the characters determines the relations within the movie: we could easily describe Hitchcock's cinema as a cinema of affordance, while Antonioni builds cinematic walls between

the viewer and the movie, impairing movement and projection, and reflecting on the cinematic attitude to deny and at the same time to reproduce reality. According to Joseph Anderson's assumptions on "orientational relationships" in the movie, we can see how "the sense of these combinations of shots depends in large part upon the viewer's correct recognition of the physical orientation of the characters to each other and to their environment."[94]

To quote Chatman for the last time, we can verify this by realizing that Aldo "cannot move into dimension, into depth":[95] this idea of a "blocked vision" was expressed by Antonioni himself when he said that he thought up *Il grido* by staring at a wall.[96]

The scene we chose from *Il grido* again exemplifies the relationship between film style and embodiment, although, this time, from a negative point of view. By disengaging the camera from the character's body and by in so doing revealing a hidden dimension, the viewer is excluded from the diegetic world, becoming aware of the presence of a disembodied narrator. Summing up, while Hitchcock aims to fully exploit an embodied camera in order to violate viewers' expectation, thus enhancing film suspense, Antonioni, by using the very same film technique (FPOV shot), puts viewers in a similar existential situation as the film's characters. Aldo, in the same way as many other of Antonioni's characters is detached from a disembodied world, and viewers share his condition by experiencing an inactive and enstranged relationship with the camera.

5. CONCLUSIONS

ES provides a unitary account of basic forms of social cognition, showing that people re-use their own mental states or processes represented within a bodily

format in functionally attributing them to others. Because of a shared format of bodily representation, we map the actions of others onto our own motor representations, as well as others' emotions and sensations onto our own viscero-motor and sensory-motor representations. Movement, space, objects and action are crucial elements to be studied in order to see the film as a place of interaction and intersubjectivity. We propose that these elements are linked to the function of ES.

We believe ES can enrich the philosophical debate within film studies both at the receptive level and at the creative one, by shedding new light on at least three types of embodiment related to cinema: i) film style as embodiment; ii) acting style as embodiment; iii) viewer's responses to filmed bodies and objects as embodiment.

We suggest that ES is able to have an impact on different film styles, adding a new perspective in the history of film styles. The connection between the camera, the characters, the objects on the screen and the viewer has to be studied from all angles. The different gazes the camera eye can convey (e.g., POV shots, over-the-shoulder shots and FPOV shots) imply different levels of "resonance" in the viewer.

Finally we believe that our embodied perspective can inform a new empirical investigation of both the creative and the receptive aspects of film.[97]

NOTES

1. On the mediated experience both in film and media studies, see some works by Ruggero Eugeni from the perspective of contemporary semiotics: "A Semiotic Theory of Media Experience," http://ruggeroeugeni.files.wordpress.com/2010/12/asca_a_theory_of_semiotic_experience.pdf; "Neuroestetica ed esperienza mediale," in *Natura, comunicazione, neurofilosofie*, eds. Francesco Parisi, Maria Primo (Roma-Messina: Corisco), 233-42; *Semiotica dei media. Le forme dell'esperienza* (Roma: Carocci 2010).

2. Steven Shaviro, *The Cinematic Body* (Minneapolis: Minnesota University Press), 24-25.

3. See Joseph D. Anderson, *The Reality of Illusion: An Ecological Approach to Cognitive Film Theory* (Carbondale and Edwardsville: Southern Illinois University Press, 1996); James Cutting, "Perceiving Scenes in Film and in the World," in *Moving Image Theory: Ecological Considerations*, ed. Joseph D. Anderson and Barbara Fischer Anderson (Carbondale: Southern Illinois University Press, 2005), 9-27; Joseph Magliano and Jeffrey M. Zacks, "The Impact of Continuity Editing in Narrative Film on Event Segmentation," *Cognitive Science* (2011): 1-27; Jeffrey M. Zacks and Joseph Magliano, "Film, Narrative, and Cognitive Neuroscience," in *Art and the Senses*, ed. Francesca Bacci and David Melcher (New York: Oxford University Press, 2011): 435-54; Tim J. Smith, "The Attentional Theory of Continuity Editing,"

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4. For a review see Tim J. Smith, Daniel Levin, and James E. Cutting, "A Window on Reality: Perceiving Edited Moving Images," *Current Directions in Psychological Science* 21:2 (2012): 107-13.

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7. For a review, see Giacomo Rizzolatti and Corrado Sinigaglia, "The Functional Role of the Parieto-frontal Mirror Circuit: Interpretations and Misinterpretations," *Nature Review Neuroscience* 11 (2010): 264-74.

8. The possibility to firmly establish the existence of mirror neurons in the human brain on the basis of indirect evidence from brain imaging experiments has been challenged for many years — see for example, Greg Hickok, "Eight Problems for the Mirror Neuron Theory of Action Understanding in Monkeys and Humans," *Journal of Cognitive Neuroscience* 21 (2009): 1229-43; Agnes Lingnau, Benno Gesierich, and Alfonso Caramazza, "Asymmetric fMRI Adaptation Reveals No Evidence for Mirror Neurons in Humans," *Proceedings of the National Academy of Sciences U.S.A.* 106 (2009): 9925-30. The recent discovery of mirror neurons in the human brain — see R. Mukamel, A.D. Ekstrom, J. Kaplan, M. Iacoboni, and I. Fried, "Single-neuron Responses in Humans During Execution and Observation of Actions," *Current Biology* 20 (2010): 750-56 — has settled this issue, shifting the debate on what mirror neurons can explain. For a recent review of different views on this issue, see Giacomo Rizzolatti and Corrado Sinigaglia, "The Functional Role of the Parieto-frontal Mirror Circuit: Interpretations and Misinterpretations," *Nature Review Neuroscience* 11 (2010): 264-74; V. Gallese, M.A. Gernsbacher, C. Heyes, G. Hickock, and M. Iacoboni, "Mirror Neuron Forum," *Perspectives on Psychological Science* 6 (2011): 347-69.

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