First-Person Emotions: Affective Neuroscience and the Spectator's Self

Enrico Carocci, Università degli Studi Roma Tre

Abstract

The investigation of viewers' affective experience is one of the most complex and stimulating tasks for film scholars, and it has recently been addressed by analytic and continental strands of film theory. As neuroscience is well equipped to offer insights into cinematic emotional experience, a stimulating dialogue between film studies and neuroscience has been engaged. The present article proposes that an affective neuroscience approach may constitute a valuable framework for empirical investigations of the qualities of cinematic emotional experience. In particular, affective neuroscience provides important theoretical insights and empirical evidence for the study of the subjective dimension of emotional experience from a naturalistic point of view. Current psychocinematic research aims to investigate film experience by focusing on the connections between brain processes and mental events. The agenda of the psychocinematic theorists may be expanded by integrating third-person observations of neural activities with first-person methods that take into account the experience of mental phenomena. In this framework, brain studies on the experiential self are relevant for the investigation of the subjective character of the emotional experience of film.

Introduction

When we are in a movie theater, the flow of the narrative events becomes part of our own experience. What we see on the screen powerfully concerns and affects us; we are passionate and fascinated viewers. From the 1910s onward, one of the major tasks of film theory has been the attempt to explain cinema's emotional power. Over the decades, a variety of disciplines has been called upon, from psychology to philosophy and psychoanalysis, in order to suggest possible models of the spectator's mind and selfhood.[1]

[1] See David Bordwell, *Models of Mind in Explaining Film*, in Arthur P. Shimamura (ed.), *Psychocinematics. Exploring Cognition at the Movies*, Oxford University Press, Oxford-New York 2013, pp. 29-52.

In recent years, especially after the "naturalistic turn" in film theory, neuroscience has become an important reference discipline for both speculative and empirical research on the cinematic experience. The current empirical research program related to the viewer's aesthetic response to cinematic stimuli has been labelled "neurocinematics" or, from a broader perspective, "psychocinematics;"[2] the findings of this line of research offer insights for a neuropsychological understanding of the cinematic experience.

This paper emphasizes the relevance of affective neuroscience for both empirical and theoretical studies on the viewer's subjective experience.[3] I will refer particularly to Jaak Panksepp's and Georg Northoff's concepts of selfhood, which allow one to theorize the self as basically affective and embodied, and contribute to the investigation of first-person experience from a scientific perspective.

Consciousness and selfhood, traditionally prerogatives of philosophy and psychology, have recently become fields of investigation in neuroscience. Affective neuroscience specificities on these topics will be clarified in the next sections; I will specify how affect is theorized and in what respects it differs from emotion and feeling. In what follows, I will also briefly specify what I mean by "cinematic emotional experience."

First, the experience I am referring to is that of a canonical narrative film in a movie theater. Following Casetti, the "twentieth-century" theatrical film experience is shaped by the structure of "attendance,"[4] which minimizes the possibilities of actual interaction with the environment, and establishes an intense cognitive/affective relationship with a virtual universe. Neurocinematic research typically refers to this kind of experience, in which the mind-screen interactions are investigated without considering additional dimensions of experience.

Second, "experience" is here understood as *Erlebnis*, an essentially moment-to-moment dynamic in which the viewer's affective experience is framed and modulated by a double (narrative and sensory) cinematic flow. Martin Jay defines *Erlebnis* as "the prereflexively registered influx of stimuli from without or the upsurge of stimuli, either somatic or psychic, from within;" or as "sentient observation, which is generally prior to any reflection on its meaning. Philosophers sometimes call such experiences 'raw feels' or 'sensations.'"[5] The focus of my interest will be the bottom-up dynamic through which filmic stimuli catch the viewer's attention in a primary level of engagement.

[2] Uri Hasson *et al.*, "Neurocinematics: The Neuroscience of Film," in *Projections. The Journal for Movies and Mind*, no. 1, 2008, pp. 1-26; Arthur P. Shimamura, *Psychocinematics: Issues and Directions*, in Id. (ed.), *Psychocinematics. Exploring Cognition at the Movies*, cit., pp. 1-26.

[3] See Dominique Château (ed.), *Subjectivity: Filmic Representation and the Spectator's Experience*, Amsterdam University Press, Amsterdam 2011.

[4] Francesco Casetti, "Filmic Experience," in *Screen*, no. 50/1, 2009, p. 60.

[5] Martin Jay, *Songs of Experience: Reflections on the Debate over* Alltagsgeschichte, in Id., *Cultural Semantics*, University of Massachusetts Press, Amherst 1998, p. 44. See also Thomas Elsaesser, "Between *Erlebnis* and *Erfahrung*: Cinema Experience with Benjamin," in *Paragraph*, no. 3, 2009, pp. 292-312; Ruggero Eugeni, *Semiotica dei media. Le forme dell'esperienza*, Carocci, Roma 2010, pp. 25-56.

Third, as the emphasis in this paper is on an approach to affectivity in a broad sense, there will be no references to specific emotions. Even at the risk of a certain degree of abstraction, I will refer to a model of experiential selfhood which is relevant in order to theorize simulation in film experience. The theoretical frame of reference is Torben Grodal's "PECMA Flow" model, in which the viewer's experience is schematized as a flow of perceptions, emotions, cognitions, and motor actions. Even if the acronym places "emotion" in second position, it is essential to remember that "the emotion centers in the limbic system continuously interact with all mental processes: perceptual, associative, cognitive, and motor;" and this allows one to talk about "emotions" independently from phenomena "such as love and hate."[6] In Grodal's influential works, neuroscience plays a major role;[7] this makes it particularly suitable as a reference model of affective, as well as embodied, cinematic spectatorship.

A model of self will be discussed in order to address the issue of first-person experience. Phenomenology-inspired perspectives on spectatorship are of course useful references in this regard;[8] despite this, as will be seen, they will remain partly in the background. Phenomenology as a philosophical approach is typically focused on conscious experience; in contrast, Panksepp's research is focused on a radically affective and pre-propositional type of "core consciousness" (see below). In his perspective, affective *experience* arises from deep regions of the brain, the locus of the "periconscious" substrate of consciousness.

Affective Neuroscience and the Bodily Self

Neuroscientific approaches to emotion have been considerably developed over the last decades; currently, the expression "affective neuroscience" usually refers to a wide branch of research, and it is generally intended as "the cognitive neuroscience of human emotion."[9] However, in this paper "affective neuroscience" refers to a concept introduced in the 1990s by Jaak Panksepp.[10]

In Panksepp's view, the affective neuroscience approach differs from that of the "cognitive neuroscience of emotions" insofar as the latter tends to understand emotional experience as a "cortical readout" of unconscious bodily commotions.

[6] Torben Grodal, "The PECMA Flow: A General Model of Visual Aesthetics," in *Film Studies*, no. 8, 2006, p. 4.
[7] See especially Torben Grodal, *Embodied Visions: Evolution, Emotion, Culture, and Film*, Oxford University Press, Oxford-New York 2009.
[8] For an overview, see Elena del Río, *Film*, in Hans Rainer Sepp, Lester Embree (eds.), *Handbook of Phenomenological Aesthetics*, Springer, Dordrech-Heidelberg-London-New York 2010, pp. 111-117.
[9] Jorge Armony, Patrik Vuilleumier, *Introduction*, in Id. (eds.), *The Cambridge Handbook of Human Affective Neuroscience*, Cambridge University Press, New York 2013, p. 2.
[10] Jaak Panksepp, *Affective Neuroscience: The Foundation of Human and Animal Emotions*, Oxford University Press, New York 1998; Jaak Panksepp, Lucy Biven, *The Archaeology of Mind. Neuroevolutionary Origins of Human Emotions*, W.W. Norton & Co., New York-London 2012.

Cognitive neuroscience "envisions affects as inherently coupled to higher human cognitive functions;"[11] which means that humans can consciously "experience" emotions, while other animals can only "have" emotions.

Conversely, following the affective neuroscience perspective, emotional *feelings* arise from subcortical areas which are homologous in all mammals.[12] Therefore, animals do experience emotions, even though they are not "conscious" in a noetic way.[13]

In everyday human experiences, cognitions and affects are inevitably intertwined; nonetheless, an affective neuroscientific approach highlights how the latter motivate the former. Cognitions and affects reflect different features of brain organization: "Cognition involves the neocortical processing of information gleaned largely from environmental inputs via exteroceptive senses. Affects are not encoded as information. They are diffuse global *states* generated by deep subcortical brain structures, interacting with primitive viscerosomatic body (core self) representations."[14] Animal brain research studies are therefore pivotal in order to investigate the ancient foundations of human emotional experience.

Panksepp's studies on animal affective experience, conducted via electrical and chemical brain stimulation, allowed the identification of seven emotional and motivational systems, namely SEEKING, FEAR, RAGE, PANIC, LUST, CARE, and PLAY.[15] The arousal of those basic systems is necessary, even if not sufficient, for every conscious experience in humans; it also generates action tendencies and a core affective experience that is expressed, as already mentioned, in raw emotional feelings.

The affective neuroscience perspective highlights how an adequate comprehension of human emotional experience cannot disregard the basic mammalian emotion systems. Those primary emotional affects do not appear in pure form in humans; indeed, compared to that of other animals, the human brain displays more complex interactions between primary, secondary, and tertiary neocortical processes.[16]

Cognitive approaches to emotion have shaped most of the theoretical ac-

[11] Jaak Panksepp, *The Affective Brain and Core Consciousness*, cit., p. 52.

[12] A terminological clarification is necessary here. In Panksepp's vocabulary, "affect" and "emotion" are sometimes interchangeable terms, although in most cases the latter implies a cortical processing of primary affects. Instead, the use of the term "feeling" is crucial. It usually indicates a typically human "emotional consciousness," but, in Panksepp's view, "feeling" refers to a core "affective consciousness" shared by all mammalian species. This is the reason why primary feelings are frequently qualified as "raw:" they do not refer to a higher form of noetic consciousness, and yet they are the purely experiential, anoetic foundation of conscious experience.

[13] Marie Vandekerckove, Jaak Panksepp, "The Flow of Anoetic to Noetic and Autonoetic Consciousness," in *Consciousness and Cognition*, no. 18, 2009, pp. 1018-1028.

[14] Jaak Panksepp, *The Affective Brain and Core Consciousness*, in Michael Lewis, Jeannette M. Haviland-Jones, Lisa Feldman Barrett (eds.), *Handbook of Emotions*, 3rd ed., The Guilford Press, New York-London 2008, p. 48.

[15] Panksepp's capitalized nomenclature indicates that these systems correspond to "classes" of response, which involve action tendencies.

[16] In Panksepp's vocabulary, primary processes are distinct from secondary/learning and tertiary/thought processes. It is also important to specify that there is mutual integration, and not segregation, between the three levels.

counts of spectatorship after the "naturalistic turn." For example, in Plantinga's "cognitive-perceptual theory" (which, however, emphasizes the relevance of affects in cinematic experience) "emotion" is defined as "an intentional mental state [...] that is often *accompanied by* various sort of feelings, physiological arousal, and action tendencies."[17] In this respect, as mentioned above, Grodal's model is more deeply shaped by an "affective" approach to emotions: "emotions express the embodied brain's motivation system and affect even the most basic processes by which the brain tries to make sense out of the millions of pieces of light information that arrive through the eyes."[18] Cinematic experience, in this perspective, is imbued with intensities from the very first perceptual level (this is what Panksepp calls "sensory affects"), it is affectively colored at different levels, from simple perceptual salience to powerful narrative emotions.

For example, Grodal mentions the relevance of Panksepp's SEEKING system in processing narratives. The dopaminergic SEEKING system is related to approaching, anticipative, and explorative behaviours.[19] This system interacts with the other emotional systems; it motivates the impulse to affective engagement with the environment, and the search of the meaning of events. It is aroused rapidly and typically from novel stimuli to generate raw feelings of "'intense interest,' 'engaged curiosity,' and 'eager anticipation.'"[20] This is why it can be considered to be the affective foundation of interest and attention, which are higher cognitive processes instantiated in sub-cortical seeking activations.

When Grodal assumes that the SEEKING system supports the "serious mode" of processing basic narratives,[21] this would substantially accord with, for example, Tan's detailed psychological account, which is grounded on the consideration of "interest" as the fundamental emotion in cinematic attendance.[22] At the same time, Grodal's reference to Panksepp's approach permits one to reconceive Tan's basically disembodied cognitive perspective such that core embodied affects play a major role.[23] The seeking impulse, briefly, may be envisioned as the affective foundation of the spectator's fascinated attention.

Affective neuroscience insights underline the relevance of pre-propositional and pre-cognitive dimensions of feelings in human experience. The cross-species experiential level of affectivity features the qualities of human mental life that

[17] Carl Plantinga, *Moving Viewers. American Film and the Spectator's Experience*, University of California Press, Berkeley 2009, p. 54 (my emphasis).
[18] Torben Grodal, "The PECMA Flow: A General Model of Visual Aesthetics," cit., p. 4.
[19] See Jaak Panksepp, Lucy Biven, *The Archaeology of Mind. Neuroevolutionary Origins of Human Emotions*, cit., pp. 95-143.
[20] Jaak Panksepp, *Affective Neuroscience: The Foundation of Human and Animal Emotions*, cit., p. 149.
[21] Torben Grodal, *Embodied Visions: Evolution, Emotion, Culture, and Film*, cit., p. 180 (see also p. 125).
[22] Ed S. Tan, *Emotion and the Structure of Narrative Film: Film as an Emotion Machine*, Lawrence Erlbaum, Mahwah 1996.
[23] A different attitude emerges in Ed S. Tan, *The Empathic Animal Meets the Inquisitive Animal in the Cinema*, in Arthur P. Shimamura (ed.), *Psychocinematics. Exploring Cognition at the Movies*, cit., pp. 337-367.

Panksepp calls "e-qualia," i.e. "evolutionary," but also "emotional," qualia;[24] (this notion is related to the topic of subjective emotional experience, and recalls David Chalmers' "hard problem").[25]

But "who", or "where", is the subject of this unreflective and purely experiential primary consciousness? Panksepp relates it to an ancient form of first-person experience, and he identifies a fundamental level of selfhood which is directly affective and embodied, assuming that humans share with other mammals a core "affective consciousness."[26]

The foundation of conscious emotional experience can be located deep in the midbrain – in particular PAG, the periaqueductal grey area – and not in cortical areas. It is therefore possible to identify a cross-species affective, embodied and "periconscious" SELF (Simple Ego-type Life Form) arising from the interaction between basic emotional systems and brainstem representations of the body.[27] This "core self" is not cortical, since emotional experience does not imply the intervention of the neocortex (which plays an important role in regulating emotions, but not in generating feelings). Panksepp's bodily SELF resembles William James' physical self, and it is basically coextensive with Damasio's proto-self.[28] It is the "core" of consciousness although it is not conscious *per se*; and it indicates more a subjective "ego" than an objectified "self." Therefore, it cannot be excluded in the explanation of human experience, even if it refers to somewhat ineffable dimensions.[29]

Self-Relatedness and the Experiential Self

In a recent fMRI research study, Raz and colleagues showed how connections between functional brain networks during emotional experience of sadness can vary across experimental cinematic conditions.[30] It is a multi-layered analysis that investigates the cohesion of limbic, medial prefrontal cortex, and cognitive clusters; and it is a remarkable example of the complexity that "affective neurocin-

[24] See Jaak Panksepp, *The Periconscious Substrates of Consciousness: Affective States and the Evolutionary Origins of the Self*, in Shaun Gallagher, Jonathan Shear (eds.), *Models of the Self*, Imprint Academic, Thorverton 1999, pp. 113-130.
[25] David Chalmers, "Facing Up to the Problem of Consciousness," in *Journal of Consciousness Studies*, no. 3, 1995, pp. 200-219.
[26] Jaak Panksepp, "Affective Consciousness: Core Emotional Feelings in Animals and Humans," in *Consciousness and Cognition*, no. 14, 2005, pp. 30-80.
[27] Remember that capitalization does not indicate the conscious noetic self, but its evolutionary substrate. See Björn Merker, "Consciousness without a Cerebral Cortex," in *Behavioral and Brain Sciences*, no. 30, 2007, pp. 63-134.
[28] Antonio Damasio, *Self Comes to Mind: Constructing the Conscious Brain*, Pantheon-Random House, New York 2010.
[29] For example, the "chills" of music: see Jaak Panksepp, Günther Bernatzky, "Emotional Sounds and the Brain: The Neuro-affective Foundations of Music Appreciation," in *Behavioural Processes*, no. 60, 2002, pp. 133-155.
[30] Gal Raz *et al.*, "Portraying Emotions at their Unfolding: A Multilayered Approach for Probing Dynamics of Neural Networks," in *NeuroImage*, no. 60, 2012, pp. 1448-1461.

ematics" inquiries can achieve in accounting for the richness of film experience. The results of the experiments confirm the existence of interactions between a "lower" limbic network that processes primary emotions at a preattentive level, and "higher" cortical structures involved in self-referential processing.

This finding is consistent with Panksepp's perspective, since the activation of the core limbic group may correspond to the aforementioned PANIC system.[31] However, Panksepp's core self is only the first level of a multilayered selfhood; it is the foundation of experience, but a hypothesis is needed to connect the trans-species SELF to a more strictly "mental" self.

I assume that self-referential processing (SRP), by which core-self structures process environmental stimuli and relate them to organism concerns, may be a relevant issue for both theoretical and empirical studies on the cinematic experience. In what follows, a possible explanation of the viewer's immersed experience will be proposed.

Georg Northoff has recently suggested that the processing of self-referential stimuli is connected to, although not exhausted by, the activation of medial regions together referred to as cortical midline structures (CMS).[32] CMS are therefore supposed to be involved in first-person emotional experiences; this is a crucial issue, since neural processing in CMS is supposed to be involved in generating *mental* states.

In this regard, Northoff and Heinzel proposed "First-Person Neuroscience" as a method to investigate the links between neural and mental states in subjective emotional experiences, giving particular attention to neural processing in CMS. First-Person Neuroscience "uses methods for the systematic examination and evaluation of mental states by themselves and their contents as experienced in first-person perspective and links them with data about neuronal states as obtained in third-person perspective."[33] Phenomenology and introspective psychology are included as first-person methods.[34]

The authors recall an fMRI study on the experience of emotional pictures in which a parametric first-person and a categorical third-person approach were

[31] Moreover, in a review of current methodologies of "affective neurocinematics," Raz and colleagues note that evidence from lesion and animal research may integrate functional brain imaging methods. See Gal Raz, Boaz Hagin, Talma Hendler, *E-Motion Pictures of the Brain: Recursive Paths Between Affective Neurosciences and Film Studies*, in Arthur P. Shimamura (ed.), *Psychocinematics. Exploring Cognition at the Movies*, cit., p. 285.

[32] Georg Northoff, Felix Bermpohl, "Cortical Midline Structure and the Self," in *Trends in Cognitive Sciences*, no. 3, 2004, pp. 102-107; Georg Northoff, Pengmin Qin, Todd E. Feinberg, "Brain Imaging of the Self," in *Consciousness and Cognition*, no. 1, 2011, pp. 52-63.

[33] Georg Northoff, Alexander Heinzel, "First-Person Neuroscience: A New Methodological Approach for Linking Mental and Neuronal States," in *Philosophy, Ethics, and Humanities in Medicine*, no. 1/3, 2006, p. 4.

[34] Phenomenology and introspection as methodologies are discussed in Francisco J. Varela, "Neurophenomenology: a Methodological Remedy to the Hard Problem," in *Journal of Consciousness Studies*, no. 3, 1996, pp. 330-350.

compared.[35] What is interesting is that the results of the two approaches were different. In particular, "the first-person approach showed only regions in the cortical midline," which are supposed to be involved in the first-person experience of emotions; "more generally, these regions have been assumed to be involved in any type of first-person experience […] since they seem to preferentially process self-referential stimuli as distinguished from non-self-referential ones."[36] As this example suggests, First-Person Neuroscience is not limited to the observation of third-person neuronal states, but aims to identify the correlates of the meaning of experiencing a mental state (here: an emotion).

As previously mentioned, a major role is played by SRP by which core-self structures process environmental stimuli and relate them to organism concerns. In a meta-analysis of neuroimaging studies on self-related tasks (including the presentation of emotional pictures and movie clips) Northoff and colleagues have shown that while emotion processing takes place in subcortical regions, the activation of CMS reflects "the high degree of self-referentiality shared by all emotion rather than intrinsic emotion processing."[37] Moreover, since SRP is related to the environmental context and to meaningfulness, it intensifies the processing of emotional stimuli. It is also important to remember that neural processing in CMS is "supramodal," since it seems independent of the sensory modalities of the presentation of emotional stimuli. Namely, it is *per se* independent of perceptual processing.

This approach to selfhood is not inconsistent with Panksepp's model: it is therefore possible to assume a more global system consisting of the "subcortical-cortical midline system" (SCMS) that allows a more strictly "mental" and "experiential" core self from the bodily-sensory SELF to emerge.[38]

This experiential self could be understood as an integrative mechanism that enables SRP. As Panksepp and Northoff claim,

> *subcortical regions may determine the basic self-relatedness of the organism by coding the relation between different stimuli: interoceptive, exteroceptive, motor and emotional. This relation is expressed in affective and valuative terms. The resulting "sense of relatedness" may then be further elaborated in cortical midline regions in cognitive and temporal terms.*[39]

[35] Alexander Heinzel *et al.*, "How do we modulate our emotions? Parametric fMRI reveals cortical midline structures as regions specifically involved in the processing of emotional valence," in *Brain Research. Cognitive Brain Research*, no. 25, 2005, pp. 348-358.
[36] Georg Northoff, Alexander Heinzel, "First-Person Neuroscience: A New Methodological Approach for Linking Mental and Neuronal States," cit., p. 8.
[37] Georg Northoff *et al.*, "Self-referential processing in our brain – A meta-analysis of imaging studies on the self," in *NeuroImage*, no. 31, 2006, p. 448.
[38] Georg Northoff, Jaak Panksepp, "The Trans-Species Concept of the Self and the Subcortical-Cortical Midline System," in *Trends in Cognitive Sciences*, no. 7, 2008, pp. 259-264.
[39] Jaak Panksepp, Georg Northoff, "The Trans-Species Core SELF: The Emergence of Active Cultural and Neuro-Ecological Agents through Self-Related Processing within Subcortical-Cortical Midline Networks," in *Consciousness and Cognition*, no. 18, 2009, p. 207.

All of this is, of course, a fascinating hypothesis on the roots of selfhood; further cortical-subcortical investigations regarding SRP may strengthen or adjust it. The aforementioned Raz's neurocinematic experiment demonstrates that the interactions between limbic and medial prefrontal cortex may vary from film to film, and this may depend on dynamics of emotional regulation. However, this reminds us that selfhood is a continuum of stages and that "though it is a unity, it is not unitary:"[40] only further neurocinematics research can improve our knowledge of the dynamic interactions between components of self during film viewing.

Since cinematic attendance encourages an ego-centered experience, my claim is that taking SRP into account will allow for an improved understanding of "immersed simulation" as a default mode. The issue of simulation is broad and complex, and I will not attempt to summarize the debate here. Gallese's "embodied simulation" is particularly relevant for the study of the spectator's engagement,[41] as well as enactive approaches;[42] the affective neuroscience approach can add a different perspective, which is also centered on the body-action system but is less focused on perception.

Firstly, the so-called simulation theory of mind-reading requires the processing of external stimuli as self-referential. Indeed, as Northoff underlines, experiments on SRP in social domains reveal an involvement of CMS in both self- and other-referential-processing, and this strengthens the idea of a "resonance" of the others' mental states in one's own mental state.[43]

Secondly, and more basically, the core-SELF must be understood as a fundamental "I" which emerges from the interaction of primary-process sensory, homeostatic and emotional affects. Cinematic attendance is a form of mediated experience insofar as it heightens our receptivity, intensifies our emotional life and encourages simulation. It is immersive also because it produces strong emotions connected to ourselves. As Grodal states, "immersed" simulation may be considered as a default mode of experiencing narratives: "one might therefore hypothesize that the basic, default mode of experiencing others consists in a simulation in which emotions and action tendencies derived from the self, that is, first-person emotions, are activated."[44]

Emotions are intrinsically self-referential; and our experience of the self is always emotionally charged. A recent experiment showed that in subcortical regions the sense of self is closely related to emotional valence and intensity, while at

[40] Joseph LeDoux, *Synaptic Self*, Penguin Books, New York 2002, p. 31.
[41] See Vittorio Gallese, Michele Guerra, "Embodying Movies: Embodied Simulation and Film Studies," in *Cinema: Journal of Philosophy and the Moving Image*, no. 3, 2012, pp. 183-210.
[42] See Pia Tikka, *Cinema as Externalization of Consciousness*, in Robert Pepperell, Michael Punt (eds.), *Screen Consciousness. Cinema, Mind and World*, Rodopi, Amsterdam-New York 2006, pp. 139-62.
[43] Georg Northoff *et al.*, "Self-referential processing in our brain – A meta-analysis of imaging studies on the self," cit., p. 448.
[44] Torben Grodal, *Embodied Visions: Evolution, Emotion, Culture, and Film*, cit., p. 188.

a higher level we can easily make a distinction between the self and its emotions.[45] Only neuroscientific investigations may bring to light the functioning of subcortical regions from which our bodily self emerges, and this is why affective neurocinematics are uniquely equipped to investigate cinematic emotional experience.

Concluding Remarks

In an article on the relationships between neuroscience and continental film theory, Paul Elliott recalls the recent "experiential turn" in film theory and its new conceptualization of vision in the embodied spectatorship. Cinema, borrowing a formula from Elsaesser, is now regarded as an "immersive perceptual event."[46] Influential theories of spectatorship, which currently emphasize the embodied, affective and haptic dimensions of the viewer's experience, are involved in a paradigm shift occurring in both analytical and continental theories. The issue of experience has become pivotal, and it has been variously theorized, drawing on phenomenology, post-structuralism (or combinations of the two), critical theory, media theory, cognitive science, and neurophenomenology.[47]

In this paper, I suggested how affective neuroscience contributes to an understanding of immersed simulation by focusing on self-referential processing and the corresponding experiential self. More particularly, I assumed that affective neuroscience offers valuable insights into selfhood, in order to investigate the dynamics of first-person experience from a scientific perspective. The references to bodily-affective and mental-experiential self, of course, do not exhaust the relationships between neuroscientific and philosophical accounts on selfhood;[48] still, empirical investigations of the bodily-affective foundation of self seem particularly relevant in order to understand first-person experience.

Unlike neurocinematics experiments on visual perception,[49] affective neurocinematics do not show an immediate impact on the study of film style, nor do they seem suitable for providing tools for new models of film analysis. Their ob-

[45] Georg Northoff *et al.*, "Differential Parametric Modulation of Self-Relatedness and Emotions in Different Brain Regions," in *Human Brain Mapping*, no. 30, 2008, pp. 369-382.
[46] Paul Elliott, "The Eye, the Brain, the Screen: What Neuroscience Can Teach Film Theory," in *Excursions*, no. 1, 2010, pp. 1-16.
[47] See respectively Vivian Sobchack, *The Address of the Eye. A Phenomenology of Film Experience*, Princeton U.P., Princeton 1992; Steven Shaviro, *The Cinematic Body*, University of Minnesota Press, Minneapolis 1993; Laura U. Marks, *The Skin of the Film. Intercultural Cinema, Embodiment, and the Senses*, Duke U.P., Durham-London 2000; Miriam Hansen, *Cinema and Experience*, University of California Press, Berkeley 2012; Francesco Casetti, "Filmic Experience," cit.; Carl Plantinga, *Moving Viewers*, cit.; Adriano D'Aloia, *La vertigine e il volo. L'esperienza filmica fra estetica e neuroscienze cognitive*, Fondazione Ente dello Spettacolo, Roma 2013.
[48] See Shaun Gallagher, "Philosophical Conceptions of the Self: Implications for Cognitive Science," in *Trends in Cognitive Sciences*, no. 1, 2000, pp. 14-21.
[49] See Tim Smith, "The Attentional Theory of Cinematic Continuity," in *Projections*, no. 6, 2012, pp. 1-27.

ject is experience, and not the cinematic perceptual field. However, in its best examples, this line of research cannot be labeled as "uncinematic."[50] A major stake for affective neurocinematics is the consideration of "cinematic conditions," since they are focused on "'pure' emotion-related cinematic notions," considering their efficacy as "emotional cues."[51] In this respect affective neurocinematics, although still in their infancy, are of fundamental importance for the insights they offer in order to explain the qualities of our cinematic emotional experience.

[50] See Vittorio Gallese, Michele Guerra, "Film, corpo, cervello: prospettive naturalistiche per la teoria del film," in *Fata Morgana*, no. 20, 2013, pp. 77-91.
[51] Gal Raz *et al.*, *E-Motion Pictures of the Brain: Recursive Paths Between Affective Neurosciences and Film Studies*, cit., p. 285.