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Disrupted PECMA Flows

A Cognitive Approach to the Experience of Narrative Complexity in Film

Veerle Ros and Miklós Kiss

Abstract: Over the past two decades, Hollywood cinema has seen the proliferation of disruptive narrative techniques that were previously thought to be exclusive to the realms of (post)modern literature and art cinema. Most scholarly contributions on contemporary complex cinema have been classifications, attempting to position these films relative to the “classical” mode of narration. This article sidesteps these efforts at categorization and, by offering a cognitive approach to cinematic narrative complexity, aims to provide an overview of the mental processes that complex films elicit in their viewers. Using Torben Grodal’s PECMA flow model, we theorize how the experience of complexity arises out of a confrontation with plot devices that disrupt the embodied viewing process by breaching or subverting familiar narrative conventions. In conclusion, we suggest five different scenarios—all following from different PECMA flow disruptions—and describe how one of them can affect the experience of complex (post)classical cinema.

Keywords: cognitive approach, framing, narrative complexity, PECMA flow, puzzle film, reception

Over the past two decades, Hollywood cinema has seen the proliferation of disruptive, nonclassical narrative techniques such as radical nonlinearity and excessive embedding—devices that were previously thought to be more or less exclusive to the realms of (post)modern literature and art cinema. From the various types and degrees of nonlinearity in *Pulp Fiction* (Quentin Tarantino, 1994), *Edge of Tomorrow* (Doug Liman, 2014), and *Arrival* (Denis Villeneuve, 2016), through the multiply embedded story layers of *Inception* (Christopher Nolan, 2010) and *Source Code* (Duncan Jones, 2011), to the playful metalepses among such embedded layers in *Stranger Than Fiction* (Marc Forster, 2006) and *Reality* (Quentin Dupieux, 2014), mainstream cinema seems to have entered a new era of narrative experimentation.

Since this development seems to challenge traditional assumptions about the economic and goal-oriented nature of classical Hollywood narration *within*

its own mainstream branch, it is not surprising that it has drawn a great deal of scholarly interest.¹ While theorists such as David Bordwell and Kristin Thompson (2013: 53) assess the development as no more than the “complication” of what is essentially still a classical system of narration, Thomas Elsaesser and Warren Buckland (2002: 79) argue that the recent tendency may be indicative of a radical paradigm shift in narrative cinema. For them, “the ‘work’ of classical narrative . . . is becoming, it seems, the ‘play’-station of the post-post-classical. This, if true, would indeed demand the shift to a different paradigm.”²

Notwithstanding the academic recognition of the trend, most scholarly contributions on this topic have so far been attempts at narrative classification aimed at positioning these “puzzle” (Buckland 2009), “mind-game” (Elsaesser 2009), or “forking-path” (Bordwell 2002) films in various relations to the classical mode of film narration. Offering a cognitive approach, this article seeks to complement this growing scholarship by focusing on the following question: Why do viewers experience certain film narratives to be more complex than others? With the aim of providing a theoretical model of the underlying cognitive processes that give rise to viewers’ experiences, we adhere to the perspective of embodied cognition as set forth by film scholars such as Maarten Coëgnarts and Peter Kravanja (2015) and Torben Grodal (2009), building on the theoretical heritage of George Lakoff (1987) and Mark Johnson (1987) and drawing on insights from current embodied-cognitive approaches to narrative art (e.g., Caracciolo 2013; Gallese 2011; Gallese and Guerra 2012; Ward 2013; Wojciehowski and Gallese 2011).

This article aims to provide a cognitive definition of narrative complexity in contemporary cinema (see Kiss and Willemsen 2017). The purpose of such a definition is to establish a theoretical link between the textual and contextual properties of complex film narratives and the experiences of the viewer. It will use Grodal’s (2009) cognitive explanatory—“PECMA flow”—model of the viewing experience as a theoretical basis for this endeavor. While the model focuses on the universally shared aspects of the viewing process, it leaves room for considering the subjectivity of individual viewers by acknowledging how culturally acquired frames, scripts, and schemata play a fundamental role in interpretive processes. This neither universalist nor cultural-relativist, but bio-cultural approach (Boyd 2009; Grodal 2007) will allow us to explain how certain narrative strategies pose difficulties to the meaning-making faculties of most viewers without discounting the possibility of divergent interpretations.

We will expand on Grodal’s model by addressing the cultural and contextual influence of narrative conventions on the universal PECMA flow with regard to a complex cinematic experience. It is our presumption that disruptive narrative techniques that could potentially hinder meaning making and interpretation lose much of their confusing effect when they become recognized

parts of familiar conventions. Narrative conventions and their associated expectations provide viewers with easy pathways to understanding film plots, as they influence and simplify the interpretation process by highlighting what is important and what can be disregarded (Bordwell and Thompson 2004: 111). However, conventions may also be utilized and exploited in unexpected ways, a phenomenon that can provide surprising twists to otherwise familiar narratives. As such, they may serve to regulate—either balance or enhance—the potentially complicating effects of disruptive narrative techniques. New conventions are constantly evolving, as filmmakers are always looking for new ways to engage their audiences. For example, within the lasting trend of contemporary narrative complexity, techniques that were experienced as confusing in the 1990s have become conventional elements of today’s films in a process that can be described as a continual cycle of defamiliarization and familiarization. Given the existence in this process of both universally given and culturally and contextually fluctuating components, it is therefore not surprising that the very idea of what narrative complexity actually entails is perpetually shifting.

The goal of this article is to define narrative complexity from a cognitive perspective in a way that takes into account both the aspects of the aforementioned process: those that depend on developmentally predetermined—“hard-wired”—universal structures of the human brain and those that are influenced by culture and learning. Using the PECMA flow model as our basis, we will show how the experience of complexity arises out of a confrontation with unfamiliar, complicating plot devices that disrupt the embodied viewing process by breaching or subverting familiar narrative conventions. Furthermore, we will suggest five different scenarios—all following from different PECMA flow disruptions and leading to various degrees of mental challenge—and describe the experience of complex (post)classical cinema as a result of one of these scenarios. On the whole, this article aims to contribute to a more nuanced understanding of the cognitive dynamics that are at play when we are confronted with forms of cinematic storytelling that we consider to be “complex.”

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The PECMA Flow Model

Grodal (1997, 2009) suggests that the activity of film viewing can be explained as a cognitive processing stream, which he calls the “PECMA (perception, emotion, cognition and motor action) flow.” This model describes how the experience and comprehension of an audiovisual stimulus “relies on a processing flow that follows the brain’s general architecture, namely a flow from perception (ear and eye), via visual and acoustic brain structures, association areas,

and frontal brain structures to action (motor activation)” (2009: 146). For this ecological model, the PECMA flow is approximately the same flow that is triggered by and relied on in our day-to-day perception of, comprehension of, and interaction with the real world. According to Grodal, we understand films in more or less the same way as we understand our universally shared reality (beyond the obvious differences in real and mediated experiences); the only vital difference is the fact that our frontal cortex is capable of suppressing actual motor action in situations where the brain is aware of the fact that it is experiencing a representation. Grodal (2009: 150) argues that “in mental simulations such as film viewing, the modeling of actions in the premotor areas . . . does not lead to actual motor actions; the motor centers are only resonating, not executing.”

The human brain is top-down wired to quickly filter apparently important information (forms and movements) from the enormous amount of audiovisual data that it receives in a bottom-up manner through the eyes and ears (the perception stage). As for vision, the initial filtering process takes place in a part of the brain that is directly connected to the eyes (i.e., the visual cortex). Parts of this process are cognitively impenetrable and are therefore unaffected by acquired knowledge and acculturation, as is evidenced by our universal susceptibility to visual illusions. When it comes to the identification and emotional labeling of visual information, however, personal experience and cultural training play a significant role (2009: 147). The brain attempts to match incoming visual data to known schemata and images that are stored in adjacent association areas located in the temporal and parietal lobes (2009: 148). Each schema and image is stored with an emotional “tag” attached to them, which triggers an emotional response when incoming visual data can be matched to it (2009: 149). These tags trigger basic, deeply seated emotions (such as fear, anger, joy, and erotic desire) and determine the initial emotional valence that the brain attributes to the perceptual data. Emotions originate from the oldest, deepest parts of our brain, the limbic system (the old “mammalian” brain), several nearby areas in the brain stem (the “reptilian” part of the brain), and the cortical areas in front of the limbic system, affecting every stage of the PECMA flow (2009: 147).

Following the initial stage, the flow of perceptual information activates areas of the brain where association, the understanding of other minds, and the ordering of events in time take place (the cognition stage). These centers are located in the temporal and frontal lobes, the temporal-parietal junction, the hippocampus, and the amygdala, and are activated when the human brain tries to comprehend a narrative, make moral decisions, or foresee the outcome of an action (2009: 150). This stage of the PECMA flow is again heavily influenced and top-down governed by emotions and memories in a bidirectional process in which the deeper, animal parts of our brains work in tandem with

higher cognitive processes (which makes sense when we take into account how frequently emotions influence our ability to make logical decisions). This stage is where an individual's cultural background comes strongly into play. While emotions tend to have a core that is instinctive and unmediated by culture, the way in which and the extent to which we access or suppress our emotions, as well as how we manage our associations, our ethical choices, and our planning of complex actions, are all strongly determined by our individual cultural backgrounds and personal dispositions.

Finally, the information-processing flow ends at the motor cortex, the executive part of the brain that controls the premotor planning of actions and the actual motoric actions themselves (the motor action stage) (2009: 150). As noted earlier, actual actions need not take place in a situation in which we are aware that we are experiencing a mediated representation because the motor cortex is generally capable of repressing motor actions in case of simulated experiences.³ Grodal argues that, under natural conditions, audiovisual and narrative information is never free of relevance. Rather, the information that our brain selects (from the earliest stage of perception onward) always has a direct bearing on the intentionality of ourselves or that of another person. It is selected because it allows us to make choices, comprehend emotional states, and navigate spaces. Because of humans' forward-looking nature—an attitude that has been reinforced by our evolutionary history—every present perception and emotion already points toward possible future actions. Perception, in other words, is always goal-oriented and determined by context-specific affordances.

In practice, perception and motor action are inextricably linked; the cortical motor system on which these functions depend does not only control the activation of muscles, but it also simultaneously maps surrounding spaces, objects, and agents, and the various potential actions that these may afford (Gallese et al. 2009). This embodied action simulation is facilitated by a neural mechanism defined as the "mirror mechanism" (MM), which connects frontal and posterior multimodal motor neurons and functions in a way that is analogous to mirror neurons in macaques (Gallese 2017: 44). The mapping function provided by these neural networks activates when performing, planning, or imagining an action, but it also resonates when witnessing another human performing an action (Gallese 1998; Goldman 2006; Rizzolatti et al. 2001). In observed or imagined actions, "the motor system is activated, but not all of its components and not with the same intensity as when we move our body" (Gallese 2017: 44), resulting in the inhibition of actual motor action. In narrative fiction film, the characters on the screen present suitable targets for embodied action simulation, allowing viewers to immerse themselves in the fictional spaces they inhabit, the objects that these spaces contain, and the potential actions that they may afford.

While embodied action simulation is sufficient to explain the basic level of character immersion that takes place at the perception stage, in the cognition stage viewers utilize their understanding of other minds to elaborate the motivations and thoughts of the characters on the screen. Children develop the ability to construct mental models of other minds and understand subjective perspectives that differ from their own (i.e., the theory of mind) from age two onward (Leslie 1987). Evidence exists to suggest imaginative pretense play may form an important stepping stone in the development of this capacity (Leslie 1987; Lilliard 1993; Steen and Owens 2001; Vygotsky 1978). Conversely, our ability to appreciate and engage with fiction may be dependent on having a functional theory of mind (Grodal 2009: 154–155; Steen and Owens 2001).

Working as cognitive extensions of embodied simulations, models of fictional minds enable us to understand (or be puzzled by) the intentions, emotions, and actions of on-screen characters and, at times, experience them almost as if they were our own.

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Even though, while witnessing a mediated simulation, our action tendencies are inhibited by the awareness that we are experiencing a representation, they may still lead to instinctive, uncontrolled bodily responses such as the tensing of muscles, sweating, an increase in our pulse rate, or sexual arousal. This phenomenon can be explained by the fact that embodied simulation takes place early on in the perception stage, while reality-status attribution (in particular, disbelieving or framing something as a representation) requires additional cognitive effort (Grodal 2009: 154). This tension may be transformed into relaxation when a goal has been achieved, but our visual and auditory cortices will immediately begin seeking out the next goal or subgoal, and thereby effectively restart the entire PECMA flow (2009: 150–151).

Classical narrative films, when imitating our perception and experience of reality by featuring active human agents, following a more or less chronological representation of events, and adhering to a naturalistic representation of space facilitate an uninterrupted and seamless PECMA flow. Our brains have evolved to their current state through a process of natural selection; consequently, they are specialized in pursuing goals that have direct relevance to the survival of our species. These range from simple goals such as the search for nutrition and the evasion of predators to more complex goals such as the selection and courting of a sexual partner and the safeguarding of our offspring. When a film narrative mimetically features human agents who are engaged in the active pursuit of concrete goals, it allows for unproblematic (embodied) resonance, as it closely approaches the practical, day-to-day problem solving that our neural architecture has evolved to be able to facilitate. Even a realistic

but clearly fantastic horror film like *Aliens* (James Cameron, 1986) focuses on the very concrete main goal of the survival of the protagonists, a goal that can be subdivided into countless subgoals (such as “evade the predators,” “find shelter,” and “protect the child”). Its protagonists are humans whom we can easily empathize with, and its representations of time and space are highly conventional and natural (events are presented causally and in chronological order, and space is presented as coherent and continuous). The PECMA flow that we as viewers effectuate when watching such a film is seamless: from the available audiovisual information, we immediately single out those details that could be relevant to the main goal of the protagonists’ survival (e.g., a door, a gun); we identify subgoals that must be achieved in order to ensure such a favorable outcome; and we plan out motor actions and perhaps involuntarily tense our muscles or even increase our heart rate as if we were to get ready to perform these actions ourselves. If the mimetic mediation is convincing enough, only our later arising awareness of watching a representation and the lack of interactivity provided by the traditional form of film screening keep us from springing into action ourselves when, for example, an alien jumps at our supported characters. When a subgoal is met, our motor systems momentarily relax, only to start up again during the next PECMA cycle; we immediately reassess the new situation and begin to seek out new audiovisual details that may matter to the protagonists’ goals and subgoals. An intense, well-crafted sci-fi horror film like *Aliens* can be so effective in facilitating a seamless PECMA flow, that at its conclusion viewers may feel as if they have personally lived through the same stressful ordeals that the protagonists have faced. In the words of Roger Ebert (1986): “When I walked out of the theater, there were knots in my stomach from the film’s roller-coaster ride of violence.”

Narrative Complexity as Disruption of a Seamless PECMA Flow

Complexifying narrative strategies—such as the lasting withholding of crucial plot information, the excessively nonlinear presentation of time, a severe disruption of causality, or an abundant and metaleptic embedding of story layers—may hinder the natural, seamless flow of the PECMA model. When some information seems fitting to a plot but cannot be instantly found, understood, or tied to the relevant aspects of an unfolding narrative, the (PECMA) flow of cognition is hampered and, as a result, we remain indecisive on the mental action we (or the characters) should take until the confusion is resolved. For example, the withholding of a crucial piece of information, one that is essential in resolving the confusion of the plot, may cue us to keep searching for it among

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all the new information we receive. Likewise, an intensely fragmented representation of story time may force us to keep in mind events that were presented earlier and test them against newly received information in order to puzzle together a consistent timeline, thereby straining both our memory and cognition by an act of “mental rotation” in the chronological concatenation of events (Ghislotti 2009). As for complex narratives’ severely disrupted causality of story logic, it is mostly a consequence of an excessively nonlinear chronology and therefore requires the activation of similar cognitive competencies, such as recollection from memory and mental rearrangement. Every such complexification has the same effect of problematizing the meaning-making process and thereby stretching the cognition stage in the PECMA flow. In line with this functioning, Grodal distinguishes between embodied and transient meaning, and disembodied and permanent meaning.

Classical mainstream narrative films do everything they can to make the viewer’s embodiment (bodily access and immersion) into the diegetic world trouble-free by showing active human agents navigating through easy-to-comprehend, continuous spaces in a series of mostly chronologically or at least causally ordered events. As vast spatial or temporal leaps are clearly indicated to and easily able to be filled by the viewer (so as to form a coherent spatiotemporal unity), all stages of the sense-making PECMA process are unproblematic and direct: the viewer is well aware of the goals that are set, the objects or persons that are relevant to achieving these goals, and the actions that must be undertaken to accomplish them (Grodal 2009: 205, 208). The mediated stimulation of classical film narratives is transient; a viewer is not triggered or required to construct additional layers of symbolic, abstract, or metaphoric meanings in order to understand the concrete narrative situation. Although the viewer is still free to create such supplementary meanings, the fact that the concrete relevance of the narrative situation appears to be evident does not clearly encourage such behavior.⁴

By contrast, art films tend to include sequences that are designed to disrupt the PECMA flow, inspiring viewers to look for associations that transcend the level of (and make up the lack of) concrete goals and immersive actions. Presenting viewers with events, objects, characters, or narrative structures that cannot be readily understood, they arrest the PECMA flow at the point of cognition. When faced with simulated ambiguities, inconsistencies, or paradoxes, viewers cannot readily construct concrete meaning but instead have to rely on their association skills. In these “disembodied” cases, the mind calls upon abstract categories in its attempt to construct an intelligible reading of the narrative. These categories lead to the construction of higher and more permanent types of meaning (in the sense that they transcend the transient, immediate relevance of concrete goals and actions) (Grodal 2009: 210–216).

When encountering confusing paradoxes or pervasive counterintuitive elements that cannot be (immediately) resolved, we may become aware of the possibility that the information that a film is communicating to us could transcend the concrete relevance of goals, actions, and spaces, and, as a “solution,” we might immediately begin hypothesizing about how it may deal with different types of implicit or symptomatic meanings beyond referential and explicit meanings (Bordwell 1989: 8–9). According to Grodal, such scenarios may cause a viewing effect that is similar in nature to a “spiritual experience”: “paradoxes and counterintuitive events . . . arrest the PECMA flow and over-activate the association areas,” which may trigger “experiences of deep significance” (2009: 149–150). At the same time, we may also become more aware of the constructed nature of the artwork and begin to form hypotheses about the forces that brought into being such a peculiar experience. We aim at getting an indirect point of the artwork and look for ways to establish the possible relevance of what we are witnessing through associations and abstractions. How we do this exactly is highly dependent on the contextual knowledge that is readily available to us, our personal experience, our cultural training, and perhaps also our actual psychological and emotional disposition. All of these determine how this network of possible associations is structured and how it compensates for the disrupted neural flow.

Grodal links disruptions of the PECMA flow to a qualitative definition of art cinema by arguing that mainstream films tend to facilitate an unproblematic PECMA flow by focusing on concrete, transient meanings, while art films disrupt the PECMA flow in order to refer to more permanent, abstract levels of meaning (2009: 211–214). Amending this view, we would suggest that even the most straightforward crime plot relies on disruptions of the PECMA flow to create an attractive experience and enhance viewer engagement. As Meir Sternberg (2001: 117) has argued, narrative gaps form the driving force behind every narrative.⁵ He distinguishes three narrative “universals,” suspense, curiosity, and surprise, each of which relies on a different way of presenting informational gaps. Suspense relies on clearly marked missing information about the future (e.g., when we see a character racing to disarm a ticking bomb, but we do not know whether she will succeed). Curiosity relies on clearly marked missing information in the past (e.g., when we see how someone is murdered at the beginning of a film, but the identity of the killer is hidden). Surprise, finally, relies on unmarked missing information (usually also located in the past) that unexpectedly comes to light and drastically alters our understanding of the entire situation (2001: 117). Many contemporary complex films rely on a combination of all three effects (this cumulative effect might be one of the reasons behind these films’ true complexity beyond being simply complicated). For example, the narrative of *The Machinist* (Brad Anderson, 2004) creates curiosity by clearly marking missing information about a possible con-

spiracy against the protagonist, Trevor (Christian Bale); it creates suspense by conjuring up such questions as “Will Trevor succeed in solving the mystery?”; and, finally, it creates surprise by unexpectedly revealing the unmarked missing information that Trevor is guilty of killing a child and the child’s mother in a car accident. All this missing information pulls viewers into the narrative; the marked gaps invite the viewer to engage in a game of problem solving and hypothesis formation, while the unmarked gap allows the narrative to deliver its surprise twist ending. If missing (or misplaced) information is the driving force behind every narrative, it follows that disruptions of the PECMA flow are an integral part of how narratives function. However, it would not be unreasonable to assume that the more frequently and profoundly a film frustrates the PECMA flow—via techniques such as the lasting withholding of crucial plot information; the excessively fragmented presentation of time and space; the severe disruption of causality; and the abundant and metaleptic embedding of story layers—the more likely it is to be experienced as “complex.”

The Role of Narrative Conventions: Top-Down Governance of PECMA Flow through Cultural Training

Conventions and cultural training play a large role in governing the PECMA flow, especially in the cognition phase. We have hypothesized that disruptions of the PECMA flow may be caused by the use of techniques such as the lasting withholding of crucial plot information, the excessively fragmented presentation of time and space, the severe disruption of causality, and the abundant and metaleptic embedding of story layers. It is likely, however, that the *degree* to which such techniques are experienced as challenging or confusing is highly dependent not only on the extent to which they operate in the given narrative but also on the viewer’s familiarity with the cinematic conventions that are played upon. We know that disruptive techniques may, when used frequently by filmmakers, gradually become conventional. A technique like the marked flashback, for example, which may once have been experienced as disruptive, is now considered conventional. Bordwell (1985: 153) discusses the interaction of narrative conventions with a film’s internal narrative system in more detail. He posits that a film can establish its own intrinsic norms that may or may not deviate from familiar extrinsic norms (i.e., the paradigmatic, conventional, roughly standardized elements of a narrative mode). Deviations become prominent and foregrounded when they are clear exceptions to previously established (intrinsic or extrinsic) norms of presentation—in other words, when they go beyond the “unconventionally conventional” (Bordwell 2012). Conversely, when a film narrative deviates from its own internally established norms, this occurrence need not necessarily be experienced as disruptive, provided that the result still fits within a familiar set of extrinsic norms (Bordwell 1985: 151). The degree to which a technique is experienced as disrupt-

tive thus appears to depend on the viewer's familiarity with it from other films or media and the extent to which it breaches previously established norms. An uninterrupted PECMA flow can therefore not only be achieved through a film's close resemblance to and mimetic representation of our experience of the real world (Grodal 2009: 208), but it may additionally be facilitated through close adherence to familiar, conventionalized norms of representation, even if these are nonmimetic. Disruptive and nonmimetic cinematic techniques do not necessarily arrest the PECMA flow when they are part of a conventional form of cinematic language and representation that a viewer is familiar with. Grodal leaves room for this idea in his explanation of the PECMA flow. In his discussion of the precognitive phase of the perception stage, he mentions how previous experience may influence both the identification and the value that is attached to perceptual information:

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When it comes to the identification and emotional labeling of visual information and the development of associational networks, culture and personal experiences play a much greater part. The identification of course depends on previous experience, but so too, to a great extent, does the emotional valence attached to the information. (2009: 147–148)

In the subsequent discussion of the “top-down” cognitive processes that direct a viewer's perception and attention, cultural training plays an even greater role:

The procedure of matching input to stored memories and schemata may be described as a top-down procedure, insofar as matching presupposes previous learning, as does the evaluation of possible actions and the evaluation of a given protagonist's coping potential. The bottom-up flow is therefore supported and constrained both by the architecture of the brain and by previous learning. (2009: 152)

Cultural exposure and habituation do, in other words, have a significant impact on the PECMA-flow process. While the flow from perception to cognition and motor action depends on a number of hard-wired brain functions, it can be affected, directed, and constrained by previously acquired emotion and knowledge in the perception and most certainly in the cognition stages. Our instinctive emotional reaction to run at the sight of a predator may be inhibited by our knowledge that the cage that holds it is strong enough to keep it from harming us. Likewise, our brain's ability to learn and adapt allows us to acquire new cognitive schemata that help us to quickly make sense of structurally complex situations; for example, we may find it easy to navigate through a busy city district because we have traversed it (or other similarly

complex environments) many times before.⁶ In the same way, both mediated and real-life situations that are initially experienced as complex, frightening, or perplexing may quickly cease to be felt as such as a result of our familiarity with them.

In order to demonstrate how the disruptive quality we ascribe to certain cinematic techniques is also dependent on our familiarity with them (thus beyond the extent to which they disrupt an accurate representation of our everyday experience of reality), we need only look at the nonmimetic, “unnatural” modes in which classical film narratives represent reality. In classical Hollywood cinema, time is highly condensed, characters represent certain stereotypes or archetypes, good and evil are clearly delineated, and characters are rarely shown performing repetitive or unmotivated tasks that would not contribute to their characterization or propel the unfolding story further. Classical Hollywood narration should be seen not as an accurate or naturalistic representation of reality but rather as a highly conventionalized style of representation (Bordwell 1985: 156–166). Media- and film-literate viewers have been trained so extensively in its conventions that the style has taken on the quality of a “natural” representation of reality, allowing for an uncomplicated, embodied immersion in the diegetic world. As a result, only when this conventionalized mode of representation is disrupted by an unconventional variation is the PECMA flow hampered. The disruption of a familiar convention thus presents an even greater problematization of the narrative experience than a disrupted “natural” representation, as can be witnessed in art films that utilize “dead time” and show slow-paced, uneventful scenes to challenge or frustrate the viewer and risk their annoyance or boredom. An example would be the slowly paced, lengthy opening sequence of *The Turin Horse* (Béla Tarr, 2011), which shows a horse pulling a cart through a bare landscape more or less in real time. By failing to provide any narrative exposition, this exhaustingly long sequence deviates from the conventional function of an opening scene (an extrinsic norm) and challenges the attention span of its viewers. As a result, some viewers may delay their efforts at interpretation and simply enjoy the images for the aesthetic pleasures they offer, while others may attempt to match them with more subjective, lyrical, or abstract associations.

However, it should be noted that cinematic conventions are far from being arbitrary inventions. Any disruption of convention is therefore already part of a disrupted PECMA flow (where conventions are made for imitating real-world experiences). As Grodal argues, cinematic conventions evolved from formal techniques that have proved over time to be highly effective in engaging our cognition and emotion in predictable ways (2009: 31–35). Take, for example, the conventional technique of condensing time through narrative ellipses. When used in classical Hollywood narration, such ellipses serve primarily to cull superfluous information that is irrelevant to the presented story. Although

the technique disrupts the flow of time, the resulting presentation closely corresponds to the natural way we tell stories about past experiences in everyday conversations. Efficient everyday storytelling consists of the arrangement of memories in such a way that these become useful in guiding future actions. In order to achieve this, information that is of little or no relevance to the main “point” or end goal of a story is generally left out or glossed over. Classical Hollywood narration does the same: it presents us only with information that may be relevant to the story and the future actions of its protagonist(s), subordinating time and space to narrative causality (Bordwell 1985: 156–162). This means that, while the narrative ellipses in cinema may fail to correspond to our scientific understanding of time as a continuous flow, it corresponds closely to the way we experience, remember, and report it. When used in such conventional ways, narrative ellipses are unlikely to have a disruptive effect on the viewer’s embodied immersion. Ellipses can become disruptive, however, when used in unconventional ways—for example, when information that is of central importance to a story is left out while information that is less relevant is shown. While such a breach of convention may not cause any problems for one’s embodied immersion when it is temporarily hidden and thus undetected,⁷ in its open, confrontational, and lasting form it can have a profoundly disruptive effect.

To summarize, the degree to which viewers experience the storytelling of classical Hollywood cinema (or any other type of cinema for that matter) as cognitively problematic partly depends on their familiarity with its formalized conventions. These conventions are not arbitrary but have evolved out of techniques that have proven effective at manipulating and engaging our cognition and emotion in “accessible” ways (Anderson 1998: 10–12). They are accessible and reliable because they play upon evolutionary, hard-wired aspects of the human brain. In practice, for a narrative technique to pose problems for the PECMA flow, it is of less interest whether it corresponds to a “naturalistic” representation of reality than to the storytelling conventions that viewers have become familiar with. As such, we may hypothesize that the degree to which a cinematic technique is experienced as problematic and, consequently, the degree to which it increases the felt complexity of a film are dependent on both its adherence to narrative conventions and to the viewer’s familiarity with those conventions.

Experience versus Cognitive Processing

Described from a phenomenological perspective, narrative complexity is a label that we put on a unique type of experience that arises when our perceptual system is confronted with a narrative that features plot elements and/or plot arrangements that are somehow perplexing or fully confusing. From a cognitive viewpoint, such as that of Grodal, narrative complexity complicates

the viewer's embodiment in the immediate narrative situation and therefore requires a great(er) extent of cognitive investment on the part of the viewer to make sense and meaning out of it (e.g., it requires an actuation of problem-solving skills, or an assignment of a specific interpretive frame). These two definitions may overlap, but they are certainly not identical. The main problem with the cognitive approach is that it assumes that an experience of complexity arises naturally out of hindrances in the cognition phase. We may ask ourselves, however, to what extent a viewer is aware of the mental processes that take place in their interpretation of a film narrative. While Grodal's PECMA flow model convincingly shows how complications in a film narrative may lead to complications in the flow of our cognition, it disregards the question of how much of this flow, or how much of the disruption thereof, is consciously experienced by the viewer. This is problematic because, before a viewer can decide that a narrative is complex, they must first become conscious of the extent to which it strains their cognition.⁸

Although it is difficult (perhaps even impossible) to determine when the processing of narrative information becomes conscious and reflected, we may advance the following hypothesis: when the PECMA flow is disrupted, the viewer becomes strongly encouraged to rely on processes of subjective association, memory, and abstraction in order to determine the meaning, structure, and relevance of the narrative information at hand. While many of these subjective judgments may be habitual, unconscious, and automatic, viewers are sometimes faced with ambiguities that force them to choose between two equally viable alternatives—for example, when confronted with the choice between trusting a likeable but possibly unreliable homodiegetic narrator and trusting evidence that is incompatible with this narrator's narration. We may hypothesize that such ambiguities create multiple, equally viable yet ultimately incompatible interpretations, forcing a viewer to simultaneously entertain multiple hypotheses about the narrative's resolution. This, in turn, leads to an increased strain on the viewer's memory and attention, as each of these possible hypotheses must be continually checked against new information that may confirm or discredit it. If we define the conscious experience of narrative complexity as a mental state where the mind becomes aware of the strain that is being put on it by complications in the film plot, we may hypothesize that the more frequent or profound the complications in a film narrative are, the more these will challenge the viewer's cognition and require the viewer to actively direct their attention toward solving them, thus increasing their awareness of the interpretive activity that they are engaged in. The more aware the viewer is of the strain put on their cognition, the more likely they are to label this experience as complex. By these standards, we may determine the (degree of) narrative complexity of a film by looking at the extent to which

it includes complications that challenge the PECMA flow and that may cause a viewer to become aware of their own cognitive hindrance.

We now have constructed the necessary framework to formulate our working definition of the complex film plot. Using Grodal's PECMA flow model, we came to understand how formal-structural complications in a film can hamper viewers' embodied resonance and thereby hinder their comprehension, inviting them to rely on subjective association and higher-level reasoning in order to interpret and construct the relevance of the narrative at hand. We then argued that the repeated overactivation of association areas causes a strain on the viewers' cognition and that the greater this strain the more likely the viewers are to become aware of it and the more likely they are to label the experience as "complex." Now, we have all the necessary ingredients to formulate a combined structural, cognitive, and experiential definition of narrative complexity: a complex film plot utilizes one or more formally complicating techniques in ways that breach familiar conventions of cinematic storytelling, problematizing viewers' embodied immersion in the diegetic world, forcing them to utilize problem-solving skills, subjective association, and/or higher-level reasoning faculties in the construction of meaning, and straining their cognition to such an extent that they become aware of it.

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Forms of Complexity: From the Poetic to the Concrete

Now that we have formulated a definition of narrative complexity in cinema that draws a link between narrative techniques that disrupt the PECMA flow on the one hand and the experience of narrative complexity on the other, the next step should be to distinguish among the varying degrees and types of complexity that may occur. Cinematic representation can range from the exceedingly abstract to the highly concrete and "extensively obvious" (Bordwell et al. 1985: 1). Between those extremes lies a whole range of varying forms and degrees of both non-narrative and narrative complexity.

In this section, we expand on Grodal's model by sketching five hypothetical mental states, each following from disruptions of the PECMA flow and resulting in a differently felt sense of complexity for the viewer. In the early perception stage, visual and acoustic impulses are received by the eyes and ears. Following the initial recognition of forms and sounds in the visual and auditory cortices, the analyzed data is then matched to image schemata stored in

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the association cortex. At this point, we suggest that five different scenarios may occur, each corresponding to a specific type of cinema:⁹

- (1) The audiovisual information cannot be matched to familiar schemata (nonmimetic experimental cinema).
- (2) Matches are found, but the sequence of associations cannot be linked into a prototypical narrative (art cinema narration).
- (3) Matches are found, and the sequence of associations can be linked into a prototypical narrative (classical mainstream cinema).
- (4) Matches are found, but their resolution into a prototypical narrative is delayed, resulting in a temporary overactivation of association areas (puzzle films).
- (5) Matches are found, but their resolution into a prototypical narrative is delayed indefinitely, resulting in a sustained overactivation of association areas (impossible puzzle films).

(1) The audiovisual information cannot be matched to familiar schemata.

In this first scenario, the information supplied by the film resists initial attempts to be matched to concrete, embodied schemata, causing the mind to seek out increasingly abstract—and therefore increasingly disembodied—schemata to match it to. The disruption occurs at the point where the filtered perceptual input (shapes, colors, sounds, and movements) provided by the perception stage cannot be matched to concrete objects, spaces, and actions that are required to facilitate narrativization in the cognition stage. An example that could trigger such an experience would be *Black Ice* (Stan Brakhage, 1994), a film that refuses to supply its viewers with anything that could help them recuperate what is shown into any mimetic or iconic image (save, perhaps, for its title), let alone a concrete narrative. Although he recognizes its potential to “provide an intense perceptual pleasure” (Grodal 2009: 148), Grodal describes the viewer’s confrontation with such nonanthropomorphic moving images as somewhat challenging: “When watching a visual representation of phenomena without any centering anthropomorphic actants, we often ‘lose interest’” (1997: 89). On the other hand, Paul Taberham sees the engagement with experimental or avant-garde art as a “cognitive play with pattern” that

help[s] to cultivate and develop sensitivities that are generally under-rehearsed . . . , train the spectator to attend to their visual array and assess the graphic details without gauging their semantic content They may also exercise the viewer’s ability to make creative inferential leaps, or attend to the films with more patience stretching the spectator’s range of aesthetic sensitivities. (2014: 222, 225, 227)

Films that offer so little mimetic material to work with commonly cause viewers to give up their efforts at referential and explicit (that is, at narrative) meaning making and to exchange the natural, narrativizing viewing stance for a more experiential one. In this latter stance, their enjoyment may be found in the “adventure of perception” (Brakhage 1963: 25) of novel images and sounds rather than in the identification of familiar “anthropomorphic actants” or in the construction of a concrete story. This scenario corresponds to a category of film one could label as “nonmimetic experimental cinema.”

(2) Matches are found, but the sequence of associations cannot be linked into a prototypical narrative.

In the second scenario, information filtered through the visual and auditory cortices can be matched with image schemata that correspond to concrete objects, spaces, and actions. As the famous Kuleshov experiments demonstrated, viewers intuitively seek to connect sequences of shots into coherent narratives (Russell 2005). When a sequence of concrete objects and spaces is shown, the association cortex begins to form causal and spatial links among them in an attempt to link them into something resembling a coherent, prototypical narrative. In this scenario, however, such attempts are frustrated continually; shots of objects and events follow each other often with no discernible story logic, and spatial and temporal continuity is lacking or absent. Examples of this can be found in surrealist art cinema, such as the dreamlike, nonsensical montage in *Un Chien Andalou* (Luis Buñuel, 1929), the frustrated temporal and spatial logic of *Last Year at Marienbad* (Alain Resnais, 1961), and the surreal metalepses among the diegetic layers of *Meshes of the Afternoon* (Maya Deren, 1946). Films like these frustrate the PECMA flow not at the initial association stage of object recognition but rather at the more advanced stage of narrative construction. Narrativization may still be possible, but the results are often unclear because the forming narrative is incoherent and illogical. In its inability to construct coherent causal and spatial links, the association cortex is again forced to draw on increasingly abstract schemata to make sense of the experience—strategies we refer to elsewhere as “non-prototypical narrativizing efforts” (Kiss and Willemsen 2017: 161–162).¹⁰ Because of a lack of causal or spatial coherence among the elements of the film, the viewer is forced to draw on more abstract thematic, metaphoric, or symbolic associations. As such associations are increasingly distanced from the level of concrete spaces and actions, this kind of cinema often provides feelings of “deep meaning” that, according to Grodal, are comparable to “religious experiences or out-of-body experiences” (2009: 149).¹¹ This scenario is most commonly encountered in a category of film we label as “art cinema narration.”

(3) Matches are found, and the sequence of associations can be linked into a prototypical narrative.

In the third scenario, the information supplied by the film can be matched to familiar, concrete schemata, which can be linked together into a cohesive narrative with little effort. Since the search for matching schemata is satisfied at the level of concrete associations and since these can be linked into a conventional causal narrative featuring concrete actors, spaces, objects, and goals, there is no pressing need to leap to abstract (or “deeper”) levels of meaning in order to make sense of the experience. This scenario roughly corresponds with what one could call “classical mainstream cinema.”

It is worth noting that while many classical mainstream films include sequences that momentarily disrupt the PECMA flow, such potentially confusing moments generally fail to lead to any sense of complexity when the film swiftly supplies solutions to them. For example, *Hannah and Her Sisters* (Woody Allen, 1986) includes a scene in which the protagonist is told by his doctor that he has an inoperable brain tumor, only to reveal, moments later, that this event took place entirely in the protagonist’s imagination. From a formal perspective, this could be considered an example of *denarration* (Richardson 2001: 168), which is the denial or correction of previously narrated events. However, unlike the more profound and lasting cases of denarration that we find in art cinema (e.g., *Last Year at Marienbad* [Alain Resnais, 1961]), here the use of the technique is localized and its effects remain well contained. Although the moment may be experienced as a breach of previously established intrinsic norms, the unmarked gap in the narrative that it highlights is resolved at the same moment when it becomes apparent. Consequently, the effect here is one of surprise rather than one of confusion. Only when gaps or incongruities are foregrounded and sustained for longer stretches of a narrative may more profound experiences of complexity arise.¹²

(4) Matches are found, but their resolution into a prototypical narrative is delayed, resulting in a temporary overactivation of association areas.

The fourth scenario, which is omitted from Grodal’s account, is the possibility that although the PECMA flow is hampered, concrete, narrative meaning can still be recuperated with the investment of additional cognitive effort. In these cases, the viewer is supplied for most of the viewing process with sufficient information pertaining to agents, objects, and actions in a concrete diegetic world to make narrativization an effortless and unconscious process. However, disorienting aspects in a film’s story and/or storytelling, such as continuous jumps in the diegetic space and/or the narrative time, either breaches of the film’s established realism, or baffling and sustained metalepses can temporarily disrupt the PECMA flow and cause an overactivation of the association

areas as the mind races to find matching schemata that would somehow incorporate these deviations into the forming and otherwise coherent narrative. In this scenario, contrary to the conventions of classical mainstream cinema,¹³ the film does not offer its viewers swift, ready-made solutions to help bridge its “curiosity gaps” (Sternberg 2001) but forces them instead to be more creative and independent in their search for explanations. Notably, the caused confusion often does not remain limited exclusively either to the level of the story (e.g., a classical narrative in which a detective investigates a complex crime case) or to the level of storytelling (e.g., the case of François Ozon’s 2004 *5x2* and its consistently inverse narrative’s mere emotional complexity). An example of this would be *Memento* (Christopher Nolan, 2000), where the central question of the story (who is responsible for the murder of Leonard’s wife?) and the question raised by the film’s unusual formal composition (how to put the shuffled scenes together chronologically?) coincide. By presenting challenges through the telling of what would otherwise be a logical, conventional narrative and relating formal experiments to the central question of a story, such films highlight and foreground their deviant elements as puzzles for the viewer to solve.

The resulting mental process can be described as a heuristic matching of new information to available schemata. While this process starts from highly familiar, conventional and concrete schemata, each failed attempt to achieve a satisfactory match leads to subsequent attempts to match the information to schemata of increasing complexity and abstraction. In this scenario, however, that process is cut short, as several potential matches are found among the concrete schemata at the viewer’s disposal. Temporary ambiguity may arise regarding which of several schemata best matches the information that is presented, but as long as likely explanations for the incongruence are eventually offered (e.g., in a form of a twist) or can be constructed within the realm of the film’s full extent—of its concrete agents, objects, and actions—there is little reason for the heuristic matching process to move to “deeper” levels of abstract and disembodied meanings. In our example of *Memento*, the fragmented composition of the narrative is internally motivated and naturalized by the condition of its protagonist, who suffers from short-term memory loss. While unconventional and confusing in its structure, the film ensures that the viewer need not draw on abstract or lyrical associations to make sense of it.

Most importantly, the overactivation of the association areas in this scenario is only temporary. While the available information may initially match two or more conflicting hypothetical interpretations (each pertaining to the level of concrete agents, spaces, objects, and actions), additional information supplied by the narrative eventually closes this gap, leaving the viewer with only one interpretation that appears to be the correct one (in the sense that it accounts for most of the available information in the least contradictory

way). While a moment of disorientation may be experienced as cognitively taxing, resulting in a “felt” complexity (a mental confusion), it does not persist and therefore does not require the viewer to keep multiple, often conflicting, hypotheses in their mind indefinitely. Consequently, we would argue that in film narratives that provide clear-cut, concrete solutions to their disruptive moments, the extent of felt complexity experienced by the viewer should remain rather limited. The viewer may experience periods of profound confusion or doubt, but as each part of the narrative eventually fits together as a well-made puzzle, the ambiguity is resolved and the temporary sense of complexity (confusion) dissipates. Furthermore, as each of the (conflicting) interpretations pertains to the level of concrete narrative meanings, agents, and actions, the association process is never pushed into levels of abstract, disembodied meanings, and this prevents the viewer from experiencing the feelings of “deep significance” that could be triggered by a film that perpetually and definitely resists naturalization and narrativization. This scenario applies to most contemporary mainstream complex films that use disorienting or disruptive narrative strategies to create “curiosity gaps” but that eventually fill in these gaps to provide unexpected but fitting conclusions to their plots.¹⁴ An example of this kind of “puzzle” film would be *The Prestige* (Christopher Nolan, 2006), which challenges the PECMA flow with its unreliable, multilayered and nonlinear narrative, but eventually presents its viewer with a coherent, consistent (albeit fantastic) fabula. The film’s switch of genre (from period drama to science fiction) provides a twist (Tesla succeeded in teleportation) that solves the puzzle and allows for coherent resolution. Another example would be *The Machinist* (Brad Anderson, 2004), which presents its viewer with a seemingly inconsistent narrative, producing several conflicting moments that challenge the viewer’s PECMA flow, but eventually resolves these by revealing that all of the inconsistencies originate from the subjective and unreliable (internal) focalization of its protagonist. Again, the challenges that these inconsistencies pose to the viewer’s cognition should lead to a sense of complexity (confusion), but these feelings should dissipate once the narrative provides the viewer with a more likely, congruent account of events. Since some form of resolution is offered by most of even the more challenging contemporary mainstream films, this scenario corresponds to the vast majority of what we call mind-game or puzzle films.

(5) Matches are found, but their resolution into a prototypical narrative is delayed indefinitely, resulting in a sustained overactivation of association areas.

The fifth and final scenario is the most cognitively challenging one, for it leads to greater and more sustained states of mental confusion than either of the previous scenarios. On the one hand, in this scenario, the film presents its viewer with a sufficiently coherent setting, which features agents moving

through concrete spaces who perform concrete actions and strive toward concrete goals, and it allows for the viewer's embodied immersion. On its local, micro-narrative level,¹⁵ the film adheres to the rules and norms of classical filmic representation, and the elicited smooth PECMA flow is disrupted by incongruent moments in the narrative. Furthermore, similar to the fourth scenario, several concrete sets of schemata are found to match these apparently incoherent or illogical bits of information—each representing one alternative hypothetical explanation for the incongruence, which remains within the concrete narrative dimension. On the other hand, however, unlike the fourth scenario, none of these schemata eventually provide an undoubtedly satisfactory match; ambiguity is sustained, as is the resulting overactivation of the association areas. Sustained ambiguity crystallizes into paradox and perverted causality on the film's global, macro-narrative level: not only do they give us information that can be endlessly interpreted in two or more conflicting ways (each of these are valid in their own right but create an impossible paradox when confronted), these films also offer their viewers scenarios that on the whole cannot be equally true but that, at the same time, must be equally true in order for the local causality of the plot to function. The ending of *Lost Highway* (David Lynch, 1997), where the protagonist rings his own doorbell and answers his own call from inside, is a classic example, as is the impossible character and plot doubling of *Enemy* (Denis Villeneuve, 2013). On the one hand, providing a smooth narrative experience on their local, micro-narrative level, both films look and feel like a classical Hollywood movie. Yet, although their presented events initially seem connected in a causal and logical manner, their overall combination on the global, macro-narrative level does not allow for a cohesive and coherent story.

Films that balance the promise of naturalization and logical-rational resolution with PECMA-flow disruptions in a way that keeps viewers disoriented yet simultaneously invested in constructing a coherent narrative are rare. Such films, however, trigger a more profound and sustained experience of complexity than experimental or traditional puzzle films do. This phenomenon can be explained as follows: experimental films such as *Black Ice* or surrealist art cinema like *Last Year at Marienbad* provide their viewers with insufficient information to engage in embodied immersion and concrete narrativization, potentially triggering a “disembodied” viewing stance and allowing them to exchange their default efforts at hermeneutic recuperation for the creation of abstract thematic, metaphoric, or symbolic associations. By blatantly resisting attempts at straightforward modes of naturalization and rationalization, such films effectively tell their viewers to “give up” their attempts at embodied immersion and narrative meaning making. As the viewer accepts their inability to formulate a coherent, concrete, logical, and rational—classical narrative—interpretation, the overactivation comes to an end and gives room to other viewing

and intellectual pleasures. By contrast, films that offer their viewers sufficient hermeneutic “bait” (so that they engage in logical and rational narrativization) and grant them the possibility for embodied immersion in diegetic spaces and for identification with diegetic agents invite their viewers to actively partake in a construction of a coherent fictional world. When those attempts are then regularly thwarted by incongruent moments, when no solutions or corrections are offered to fill in the curiosity gaps created by these moments (unlike in the second scenario), and when instead new information only helps to solidify the incongruence into a paradox, the overactivation of the association areas is sustained. At the same time, the abundance of information pertaining to concrete spaces, agents, objects, and actions prevents the association process from climbing to higher levels of abstraction resulting in, to use Grodal’s metaphor, a sense of “higher meaning” (2009: 212). The paradoxes, emerging from a maintained yet radically problematized embodied immersion, become utterly mind-boggling in their diegetic manifestation. Consider, for example, the powerful sense of impossibility, if not “wrongness,” triggered by techniques such as character doubling in *Mulholland Drive* (David Lynch, 2001) or *Predestination* (Michael and Peter Spierig, 2014) or looping story worlds in *Triangle*

It is only in this scenario, where conventions provide a counterbalance to disruptive formal strategies, that we can speak of a sustained experience of complexity that corresponds to the category that we have previously referred to as “impossible puzzle films.”

(Christopher Smith, 2009) and *Timecrimes* (Nacho Vigalondo, 2007). By maintaining the possibility of embodied immersion while simultaneously hampering it, such films manage to deliver powerfully disturbing PECMA-flow-disrupting effects that can result in a profound and lingering sense of confusion or frustration. Only in this scenario, where conventions provide a counterbalance to disruptive formal strategies, can we speak of a sustained experience of complexity that corresponds to the category that we have previously referred to as “impossible puzzle films” (Kiss and Willemsen 2017).

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Notes

¹ Classical narration is the dominant, mimetic, mode of cinematic storytelling that imitates the chronological, causal, spatiotemporally realistic, and logical experience of reality (see, e.g., Bordwell 1985: 156–204; Bordwell et al. 1985).

² The disagreement among scholars is about whether contemporary complex films should be seen as a mere intensified—hyperclassical—variant of the tradition of classical narrative cinema (Bordwell 2006: 61, 63), or as an entirely new postclassical (Buckland 2009, 2014; Elsaesser 2009; Thanouli 2006) or even post-postclassical (Elsaesser and Buckland 2002) phenomenon with significantly novel strategies and viewing effects.

³ This is the case with film that is not (yet) interactive, unlike a video game that requires a concrete physical action response to its audiovisual stimuli. Storytelling in a virtual reality environment will probably alter this traditional divide as well as the PECMA flow model of cinematic experience (if such experiences will still be called “cinematic” at all).

⁴ Of all the viewers that watch an action blockbuster, only a select group of trained specialists tend to engage in sociological, cultural, or thematic readings; for most viewers, the concrete level of meaning provides sufficient relevance.

⁵ It must be noted that Grodal focuses on disruptions that cannot be resolved using information provided from within the narrative. Sternberg’s concept does, however, include such “permanently” unresolved gaps, as his analysis of a passage from the Old Testament illustrates (Sternberg 2001: 117–121).

⁶ Neuroscientific research might account for this ability. It has shown that the synaptic connections in our brains can change within the space of milliseconds and that entirely new networks may be constructed within the space of hours (Shaw and McEachern 2001: 6–10).

⁷ This is the reason why most of the unreliable narratives are not complex (i.e., cognitively challenging) at all: a steady presentation of misleading information in, for example, *Stage Fright* (Alfred Hitchcock, 1950) or *The Sixth Sense* (M. Night Shyamalan, 1999) is actually a vital condition for the operability of the unreliability; these films do not challenge the ongoing process of sense-making during the viewing, and therefore do not provide any complex, that is, confusing, experience beyond their surprise effect (see Kiss and Willemsen 2017: 52–56).

⁸ For a discussion of the distinction between conscious experience and unconscious cognitive processing, see Arthur Reber’s (1992) seminal article.

⁹ Although they interact cross-modally with all the other stages and their different neural subsystems, unsurprisingly the majority of disruptive narrative strategies discussed here primarily affect the cognition stage of the PECMA flow. Further research is needed to detail how perceptual or emotional disruptions may occur at the other stages of this bidirectional flow—a question that lies beyond the scope of this article (and, regarding the detailed revealing of the functioning of such cross-modal interaction among the stages, that of the explanatory competence of current neuroscience).

¹⁰ “In some art films, recurring dissonances, overall incoherency or problematic (or simply absent) narrative cues can send viewers on alternative tracks of meaning-making. Viewers may give up the construction of a prototypical narrative in favour of more poetic, lyrical, associative or aesthetic modes of apprehension. We describe this particular frame-switch as *non-prototypical narrativising efforts*, as they seem to depart from narrativisation (naturalisation by recourse to narrative schemas) as conceptualized by Monika Fludernik” (Kiss and Willemsen 2017: 161).

¹¹ Note that such a “feeling of deep ungraspable meaning need not correspond to deep, buried meaning in the film” (Grodal 2009: 149).

¹² For a detailed discussion of temporary and lasting cinematic cases of denarration and their various cognitive effects, see Kiss and Willemsen (2017: 72–80).

¹³ See endnote 2.

¹⁴ As for such “disorienting but solvable puzzles,” see Kiss and Willemsen (2017: 56–59).

¹⁵ Drawing on Bordwell’s umbrella term “narrative cohesion devices,” we understand “micro-narrative” strategies as “formal tactics that link passages at the local level—from scene to scene or from one group of scenes to another . . . usually serving to tighten up linear cause and effect” (Bordwell 2002: 95).

References

- Anderson, Joseph D. (1996) 1998. *The Reality of Illusion: An Ecological Approach to Cognitive Film Theory*. Carbondale: Southern Illinois University Press.
- Bordwell, David. 1985. *Narration in the Fiction Film*. Madison: Wisconsin University Press.
- Bordwell, David. 1989. *Making Meaning: Inference and Rhetoric in the Interpretation of Cinema*. Cambridge, MA: Harvard University Press.
- Bordwell, David. 2002. “Film Futures.” *SubStance* 31 (1): 88–104. doi:10.1353/sub.2002.0004.
- Bordwell, David. 2006. *The Way Hollywood Tells It*. Berkeley: University of California Press.
- Bordwell, David. 2012. “Tinker Tailor: A Guide for the Perplexed.” David Bordwell’s Website on Cinema, 23 January. <http://www.davidbordwell.net/blog/2012/01/23/tinker-tailor-a-guide-for-the-perplexed>.
- Bordwell, David, and Kristin Thompson. 2004. *Film Art: An Introduction*. 7th ed. New York: McGraw-Hill.
- Bordwell, David, and Kristin Thompson. 2013. *Christopher Nolan. A Labyrinth of Linkages*. Madison, WI: Irvington Way Institute Press.
- Bordwell, David, Janet Staiger, and Kristin Thompson. 1985. *The Classical Hollywood Cinema: Film Style and Mode of Production to 1960*. New York: Routledge.
- Boyd, Brian. 2009. *On the Origin of Stories: Evolution, Cognition, and Fiction*. Cambridge, MA: Belknap Press of Harvard University Press.
- Brakhage, Stan. 1963. *Metaphors on Vision*. Ed. P. Adams Sitney. New York: Anthology Film Archives.
- Buckland, Warren, ed. 2009. *Puzzle Films: Complex Storytelling in Contemporary Cinema*. Malden, MA: Wiley-Blackwell.
- Buckland, Warren, ed. 2014. *Hollywood Puzzle Films*. London: Routledge.
- Caracciolo, Marco. 2013. “Embodiment at the Crossroads: Some Open Questions between Literary Interpretation and Cognitive Science.” *Poetics Today* 34 (1–2): 233–253. doi:10.2307/23408448.
- Coëgnarts, Maarten, and Peter Kravanja, eds. 2015. *Embodied Cognition and Cinema*. Leuven: Leuven University Press.
- Damasio, Antonio. 1994. *Descartes’ Error: Emotions, Reason, and the Human Brain*. New York: Grosset.
- Damasio, Antonio. 1999. *The Feeling of What Happens: Body and Emotion in the Making of Consciousness*. New York: Harcourt, Brace & Co.
- Ebert, Roger. 1986. Review of *Aliens*, directed by James Cameron. RogerEbert.com, 18 July. <http://www.rogerebert.com/reviews/aliens-1986>.
- Elsaesser, Thomas. 2009. “The Mind-Game Film.” In Buckland 2009: 13–41.
- Elsaesser, Thomas, and Warren Buckland, eds. 2002. *Studying Contemporary American Film*. London: Arnold.

- Gallese, Vittorio. 1998. "Mirror Neurons: From Grasping to Language." Paper presented at the conference Toward a Science of Consciousness, Tucson, AZ, 27 April – 2 May.
- Gallese, Vittorio. 2011. "Embodied Simulation Theory: Imagination and Narrative." *Neuropsychanalysis* 13 (2): 196–200.
- Gallese, Vittorio. 2017. "Visions of the Body: Embodied Simulation and Aesthetic Experience." *Aisthesis* 1 (1): 41–50. doi:10.13128/Aisthesis-20902.
- Gallese, Vittorio, and Michele Guerra. 2012. "Embodying Movies: Embodied Simulation and Film Studies." *Cinema: Journal of Philosophy and the Moving Image* 3: 183–210.
- Gallese, Vittorio, Magali Rochat, Giuseppe Cossu, and Corrado Sinigaglia. 2009. "Motor Cognition and Its Role in the Phylogeny and Ontogeny of Intentional Understanding." *Developmental Psychology* 45 (1): 103–113.
- Ghislotti, Stefano. 2009. "Narrative Comprehension Made Difficult: Film Form and Mnemonic Devices in *Memento*." In Buckland 2009: 87–106.
- Goldman, Alvin L. 2006. *Simulating Minds: The Philosophy, Psychology, and Neuroscience of Mindreading*. New York: Oxford University Press.
- Grodal, Torben. 1997. *Moving Pictures: A New Theory of Film Genres, Feelings, and Cognition*. New York: Oxford University Press.
- Grodal, Torben. 2007. "Bio-culturalism: Evolution and Film." In *Narration and Spectatorship in Moving Images*, ed. Joseph D. Anderson and Barbara Fisher Anderson, 16–28. Newcastle: Cambridge Scholars Publishing.
- Grodal, Torben. 2009. *Embodied Visions: Evolution, Emotion, Culture, and Film*. Oxford: Oxford University Press.
- Johnson, Mark. 1987. *The Body in the Mind. The Bodily Basis of Meaning, Imagination, and Reason*. Chicago: University of Chicago Press.
- Kiss, Miklós, and Steven Willemsen. 2017. *Impossible Puzzle Films: A Cognitive Approach to Contemporary Complex Cinema*. Edinburgh: Edinburgh University Press.
- Lakoff, George. 1987. *Women, Fire, and Dangerous Things*. Chicago: University of Chicago Press.
- Leslie, Alan M. 1987. "Pretense and Representation: The Origin of Theory of Mind." *Psychological Review* 94 (4): 412–426.
- Lilliard, Angeline S. 1993. "Pretend Play Skills and the Child's Theory of Mind." *Child Development* 64 (2): 348–371.
- Reber, Arthur. 1992. "The Cognitive Unconscious: An Evolutionary Perspective." *Consciousness and Cognition* 1 (2): 93–133. doi:10.1016/1053-8100(92)90051-B.
- Richardson, Brian. 2001. "Denarration in Fiction: Erasing the Story in Beckett and Others." *Narrative* 9 (2): 168–175.
- Rizzolatti, Giacomo, Leonardo Fogassi, and Vittorio Gallese. 2001. "Neurophysiological Mechanisms Underlying the Understanding and Initiation of Action." *Nature Reviews Neuroscience* 2 (9): 661–670. doi:10.1038/35090060.
- Russell, Michael. 2005. "The Kuleshov Effect and the Death of the *Auteur*." *FORUM: University of Edinburgh Postgraduate Journal of Culture and the Arts* 1: 1–17.
- Shaw, Christopher A., and Jill C. McEachern, eds. 2001. *Toward a Theory of Neuroplasticity*. Philadelphia: Psychology Press.
- Steen, Francis F., and Stephanie A. Owens. 2001. "Evolution's Pedagogy: An Adaptationist Model of Pretense and Entertainment." *Journal of Cognition and Culture* 1 (4): 289–321.
- Sternberg, Meir. 2001. "How Narrativity Makes a Difference." *Narrative* 9 (2): 115–122.
- Taberham, Paul. 2014. "Avant-garde Film in an Evolutionary Context." In *Cognitive Media Theory*, ed. Ted Nannicelli and Paul Taberham, 214–231. New York: Routledge.

- Thanouli, Eleftheria. 2006. "Post-classical Narration: A New Paradigm in Contemporary Cinema." *New Review of Film and Television Studies* 4 (3): 183–196. doi:10.1080/17400300600981900.
- Vygotsky, Lev Semyonovich. 1978. *Mind in Society*. Cambridge: Harvard University Press.
- Ward, Mark. 2013. "Art in Noise: An Embodied Simulation Account of Cinematic Sound Design." Paper presented to the Society for Cognitive Studies of the Moving Image, Berlin University of the Arts, Germany.
- Wojciehowski, Hannah, and Vittorio Gallese. 2011. "How Stories Make Us Feel: Toward an Embodied Narratology." *California Italian Studies Journal* 2 (1). <http://escholarship.org/uc/item/3jg726c2>.
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