Points of Anchorage: Exo-centric Images and the Perceptual Relativity of Camera Movement

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This essay analyzes a unique filmmaking technique to highlight the fact that camera movement is fundamentally an optical illusion based on a misinterpretation of visual cues. The unique technique in question is what I have called the 'exo-centric image', namely an image produced by a camera attached to the body of an actor which, paradoxically, generates the impression of an immobile body in a moving world. Through an analysis of this peculiar technique, I make claims about the illusory nature of camera movement in general. In so doing, this essay concludes that the vocabulary we use to describe camera movement keeps us from seeing some of the more eccentric aspects of the effect we call camera movement.

INTRODUCTION

As a recent wave of scholarship has demonstrated, camera movement constitutes a rich, if elusive, topic.[1] As David Bordwell put it, 'camera movement has usually been considered too elusive to be analyzable'.[2] Part of the challenge stems from the fact that the vocabulary we typically use to describe camera movement refers to the realities of film production, and not to the 'phenomenon of camera movement on the screen as it is originally experienced and understood by us as viewers'.[3] This fact is best exemplified by edge cases — what Bordwell calls 'forbidden movements'[4] — where expectations about how a camera ought to move are subverted. Trick shots, digitally assisted camera movements and even animation confront us to the challenge of discussing camera movement with any precision. They also reveal the tenuous link between how a camera appears to move on screen and how it actually moved (or not) during production. Consider the opening 17–minute sequence of Alfonso Cuarón's *Gravity* (2013), which has been analysed by countless authors for its virtuosic display of camera movement and for the problems it raises as a result of its unique production context.[5] While some authors take up *Gravity*'s daring opening long take to question the use of the term 'camera' to discuss this special effects-driven assemblage,[6] others address the cognitive[7] or proprioceptive[8] empathy

between the movements displayed on screen and those felt by viewers. Instead, I want to focus on the final act of this sequence (00:13:34-00:16:08), when the heretofore unchained camera seemingly becomes fixed to the body of an astronaut spinning out of control in Earth's orbit. From the beginning of the sequence, the camera has been moving fluidly around the protagonists, Ryan Stone (Sandra Bullock) and Matt Kowalski (George Clooney), two astronauts working on a module of the International Space Station who get caught in a sudden shower of space debris which sends Stone careening into orbit. Around the 13–minute mark, the roving camera seemingly comes to a stop in front of Stone, keeping her locked in the frame even as she continues to spin out of control. In fact, although we know her to be moving rapidly, Stone appears fixed in the frame; it is the earth and the stars instead that we see rotating around her in this part of the sequence. While a lot has been written about the narrative functions of — and affective responses to — this particular shot, I want to emphasize the unusual body-camera-space relations on display in this image sequence. By extension, my goal in this essay is also to highlight the tenuous link between the appearance of camera movement and any notion about how (or if) the camera might have moved (or not) during production.

Of all the movements showcased in *Gravity*'s opening sequence, the one I am describing here is an example of a technique I have called the 'exo-centric' image.[9] Through a unique arrangement of body, camera, and space, this technique creates the illusion of immobilizing on screen the actor who was wearing the camera and moving with it during production. Whether in *Gravity* or in any of the myriad films that feature exo-centric images, the technique also reveals a deception at the heart of all camera movement, namely that our perception of movement on screen is any indication whatsoever of the actual movements a camera performed during production. Starting from Bordwell's hypothesis that, 'there must be perceptual cues which determine a 'camera-movement effect' onscreen *regardless of whether the camera moved in production or not*' [emphasis in the original],[10] this essay seeks to demonstrate the fundamentally illusory nature of camera movement, a fact that is obfuscated by the vocabulary we generally use to describe it. To do so, I approach camera movements from a phenomenological perspective, considering first and foremost the *appearance* of movement on screen as a signifier of movement. This descriptive approach aims to free us from the preconceptions tied to the vocabulary typically used in film studies to discuss the phenomenon we call 'camera movement'.

While my claims in this essay are meant to reflect on all forms of camera movement, my central example remains the exo-centric technique and the uncanny effect it has of immobilizing heretofore mobile bodies. Beginning by a description of the technique behind exo-centric images, I start by demonstrating the limitations of the language typically used to describe camera movement. I continue with an overview of different ways of describing movement, using frames of references that are either 'subjective' or 'objective'. Namely, I call upon Maurice Merleau-Ponty and James J. Gibson to highlight how our perception of

movement is affected by what we focus our attention on, as well as on whether the body is actively moving or passively being moved. Bordwell's notion of a 'perceived screen event' allows me to come back to camera movement with a description of the 'visual cues' that enable us to determine whether parts or the whole of an image are moving on screen. Finally, I come back to exo-centric images and, following Jordan Schonig's lead, analyse it in a way that 'alters the "normal circumstances" under which the visual effects of the moving camera can be seen', so as to shed light on what our vocabulary otherwise obfuscates.[11]

THE EXO-CENTRIC TECHNIQUE

Whether it appears in movies, television series, commercials, music videos, or extreme sports videos, the phenomenon I have called the 'exo-centric image' stands out for its characteristic way of representing body-space relations: the body appears frozen in the centre of the frame while the world around it is seen moving in its place. This unique effect has been used in films such *Requiem for a Dream* (Darren Aronofsky, 2000), *Mean Streets* (Martin Scorsese, 1973) and *The Hangover* (Todd Phillips, 2009) among countless others. Regardless of the narrative or aesthetic reasons why this effect might have been sought after in these films, I focus on the exo-centric image in this essay because of the reasons for which it succeeds in subverting our expectations as to how cameras appear to move on screen.[12]

An exo-centric image is produced when a camera is attached to the body of an actor who carries it with them as they move during a scene. Technically speaking, this effect can be broken down into three basic elements:

1. the camera must be *connected* to the body which it films;
2. the camera must be *carried by*, but *away from*, the body (in front or behind);
3. the camera must be *facing* the body that carries it.[13]

For example, as the above production still from *Requiem for a Dream* shows, during her famous hallway scene Jennifer Connelly wore a device called a 'Snorricam' which allowed her to move on set with the camera placed about an arm's length in front of her, looking back at her [fig. 1]. [14] Whether it is placed in front, behind, or anywhere around the actor's body, the camera keeps them centred in the frame as it moves in unison with them.[15] In other words, camera and body maintain their position *relative* to each other regardless of their displacements through space. This lack of 'relative movement' between camera and body is translated on screen by a body that becomes immobilized in the frame despite the movements we know them to have performed during production; the body becomes the camera's ground, or its point of anchorage. The result is a point of view that, paradoxically, is both *physically detached from the body* while also being *intimately tied to it*. We see this effect in all forms of the exo-centric image: from early attempts in *Kri Kri e il Tango* (anonymous,

1913) and *The Last Laugh* (Der Letzte Mann, F.W. Murnau, 1924), to more recent and formalized uses in *The Wolf of Wall Street* (Martin Scorsese, 2013), *The Muppets* (James Bobin, 2014), *The French Dispatch* (Wes Anderson, 2021), as well as in animated features such as *Frozen II* (Chris Buck and Jennifer Lee, 2019), *Mitchells vs the Machines* (Michael Rianda, 2021), and *Turning Red* (Domee Shi, 2022).

By depicting as motionless the body that moved with the camera during filming, the exo-centric image pushes us to recognize the inherent relativity of camera movement. It also highlights the shortcomings of the vocabulary we are taught to describe what we see on screen. Consider the movement the camera performed during the above-mentioned scene from *Requiem for a Dream*. Although we know full well that the camera moved backward during production as the actress wearing it was walking forward, it would be absurd to describe it as having dollied, tracked, or travelled backward. For one, this would obfuscate the passive nature of the camera's displacement. Consider Ryan Pierson's comment on the nature of what constitutes a moving camera or not:

> *If we were to say that every camera ever used on a film was a 'moving camera', on the grounds that the Earth underneath it was revolving around the sun, or if we were to say that no camera ever really 'moves' because it is always passively part of a dolly or a crane or a human body that's moving it, then the concept would become useless.*[16]

At the same time, a description of the camera's movement within profilmic space does not necessarily describe the effect that appears to us on screen. In the case of the exo-centric image, no profilmic account can satisfactorily describe the impression of an immovable body around which space seems to gravitate. To understand this strange reversal and the implication it has on our appreciation of camera movement, we must first understand the frames of

reference that allow us to make sense of the movement we perceive, on screen as much as in real life.

BODY-SPACE RELATIONS

According to David Bordwell, 'the very notion "camera" already situates us not before the cinema screen, but in a film studio, in production surroundings which include a mechanism called a *camera*'.[17] The same can be said for much of the language we have developed to discuss camera movement, which likewise is grounded in the displacements — whether real or imagined — of the device during production. 'The category "camera movement"', Patrick Keating writes, 'includes several techniques — most notably, pans, tilts, dollies, and cranes'.[18] Either these terms describe the tool used to perform a specific kind of movements (cranes are used to move the camera move vertically and dollies are most often used to move the camera in a straight line), or they refer to the particular kind of movement the camera performs (whether it pans left or right, or whether it tilts up or down). Importantly, none of these describes the effects of moving a camera, apart from the terms that metonymically name both the device and the movement for which it is known (e.g., crane, dolly, zoom, etc.).

Much like the way we might describe our own movements — or those of other bodies and objects in physical space — the vocabulary we use to describe camera movement assumes that space is fixed and that it is the subject (body or camera) that traverses it.[19] That being said, we must recognize that at least two distinct approaches can be used to describe the movements of a given entity in space. Those vary according to the point of reference upon which one anchors one's descriptions. For the sake of simplicity, I will call these 'subjective' and 'objective' frames of reference.[20]

Using what I am calling a 'subjective' frame of reference means taking the moving subject itself as the point of anchorage in one's description of their movements. For example, this could include describing someone as turning to their left or, in our case, saying that a camera pans right or tilts up. These descriptions are 'subjective' because they take the body of the subject as anchor; their point of reference is centred in the body. Such descriptions pay no mind to external factors that might affect or relativize how the individual (or the camera) is moving: a person sitting with their back to the direction that their train is moving might say that the vehicle turned (to their) right. Meanwhile, a bystander might describe the same movement as the train having banked left, as seen from their external perspective. This is what I am calling an 'objective' frame of reference, taking the individual who is moving — or being moved — as simply one among many other objects within a more expansive field of action. Using this approach is what allows sailors, among other examples, to give spatial cues that relate 'objectively' to their vessel (starboard, port, forward, aft, etc.), regardless of their own orientation at any particular moment. The individual that performs the movements remains the subject of the statement, but its status as a point of

anchorage is revoked in favour of more 'objective' points of anchorage.

A number of major issues keep me from suggesting this 'objective' model might reliably be used to describe the movements of a camera, at least as well as it can be used to describe the movements of objects in the real world. Firstly, the fact remains the vocabulary we have developed to speak of camera movement remains intimately tied to subjective referents. When we write of the camera panning left, tilting up, or tracking forward, we are in fact describing its movements from its own first-person perspective. Secondly, we cannot describe camera movement from an objective perspective precisely because our only access to camera movement — on screen, within a finished film — presents us exclusively with this subjective, first-person experience of movement. Note that this is different from suggesting that camera movement draws us into diegetic space, that it fosters empathy for or identification with the camera, or that it allows us to feel *at* the position of the camera, as Daniel Morgan has criticized of the notion of point of view.[21] On the contrary, my point is simply that, as viewers, we cannot observe a camera's movement from an external or third-person perspective. That is why I am advocating for an approach that is less reliant on the terminology used to describe the displacements of the camera in profilmic space than on 'the phenomenon of camera movement on the screen as it is originally experienced and understood by us as viewers'.[22] In turn, this shift brings us back to the question of the *appearance* of camera movement, and to the issue of our perception of movement in general.

POINTS OF ANCHORAGE

The question of our perception of movement is a large and complex one, having to do not only with the way we perceive our own subjective movements but also the way we come to understand the motion of objects in the world. James J. Gibson's questions are programmatic in this regard: 'How do we see the motion of an object? How do we see the stability of the environment? How do we perceive ourselves as moving in a stable environment?'.[23] These questions will bear on our appreciation of camera movement, but it is important to consider first how they are dealt with within our habitual modes of perception. Put simply, the answers Gibson gives to these questions have to do with whether parts or the whole of the retina are stimulated at any given time, suggesting objective motion or subjective movement respectively. This interpretation echoes that proposed by Jacques Paillard who, using the 'efference' model developed by Von Holst and Mittelstaedt, concludes that 'the movement of the retinal image resulting from the *controlled displacement of the eye* would be interpreted perceptually as a movement of the body in relation to a stable universe and not as a mobility of the external universe in relation to the body'.[24] In both cases of the movements of the body in its entirety and of those specific to the eye, subjective movement furnishes our perception with sufficient data (visual, but also kinesthetic, vestibular, etc.) to determine whether the movement the eye

records is due to its own displacement, to those of the body through space, or to those of objects external to the body.

While the field of psychophysiology offers illuminating answers to these questions, Maurice Merleau-Ponty' phenomenology of perception offers an equally stimulating explanation. It will also help us make our way back to the specific issue of movement in the cinema. Merleau-Ponty evokes a similar problem to that raised by Gibson when he describes how easy it is for our perception of movement to be altered by whatever we choose to focus our gaze on. Using as an example an individual sailing toward the coast, the philosopher recounts: 'It is the coast which slips by if we keep our eyes fixed on the rail, and the boat which glides along if we look at the coast'.[25] While an objective frame of reference might allow us to give a definitive answer as to what is moving and what is not, subjectively speaking, either one of these things may appear as though it is moving relative to the other. Movement, then, becomes a question of whether one chooses to focus on this or that part of the visual field, and of whether one allows oneself to attend to their perception of said movement. Several other examples of this relativity of movement in the eye of the subject can be found throughout *The phenomenology of perception*: 'The cloud floats over the steeple and the river flows under the bridge, if it is the cloud and the river that we are looking at. The steeple falls across the sky and the bridge slides over a static river if we are looking at the steeple or the bridge'.[26] Importantly, Merleau-Ponty's concern for the phenomenological description of appearances enjoins us not to see in these examples an immanent relativity of objects in motion, but rather a purely subjective relativity.[27] Indeed, Merleau-Ponty explains that '[w]hat makes part of the [visual] field count as an object in motion, and another as the background, is the way in which we establish our relations with them by the act of looking. […] *The relation between the moving object and its background passes through our body*'.[28]

Here, Merleau-Ponty's phenomenology meets Gibson's ecological approach to perception as both call upon an edge case to highlight the body's active role in allowing us to make sense of the movement we perceive. The example in question is that of 'passive or involuntary locomotion', as is the case when the body is moved in a vehicle, a context in which 'the kinesthetic component may almost wholly drop out'.[29] Deprived of the body's active contribution, our perception of movement becomes more susceptible to dupery, as Gibson details:

> It is worth noting that there are special cases of visual stimulation in which it does *become equivocal whether the visual scene is moving or whether the observer himself is moving. If one sits looking through the window of a stationary railway train at another train on the adjacent track, and if one of the trains begins to move slowly, the impression of moving self with stationary scene may give way to that of stationary self with moving scene, or vice versa.*[30]

For Merleau-Ponty, the interpretation of this illusion depends on the articulation of what, in our field of perception, acts as figure or ground. In the

case of inattention, the philosopher describes, 'I can at will see my own train or the train next to it in motion whether on the one hand I do nothing or on the other consider the illusions of motion'.[31] If, on the contrary, our consciousness is focused on a particular element, then the nature of the movement we perceive will arise from the relationship between what, at any given point, serves as figure and ground of our perception. As Merleau-Ponty concludes, citing an example by Kurt Koffka, 'when I am playing at cards in my compartment, I see the neighbouring train move off, even if it is really mine which is starting; when I look at the other train and try to pick out someone, then it is my own train which is set in motion'.[32] Koffka's conclusions about this example are unequivocal: 'The chief rule for these ambiguous cases is this: that the objects which form the (dynamic) centre of our visual world are at the same time our points of anchorage'.[33]

Since it is always a question of the relationship between the subject and their environment, the conclusions of Merleau-Ponty, Koffka, and Gibson highlight the role played by points of reference in our perception of movement. These conclusions also prove stimulating for our appreciation of camera movement. Consider a common, if perceptually ambiguous, example: a camera mounted on a moving vehicle, pointed at the characters sitting within it. In his analysis of such a shot in *Gerry* (Gus Van Sant, 2002), Antoine Gaudin asks whether what we are looking at is 'a camera movement relative to the background of the shot, or a fixed shot of the characters (with a moving setting)?'.[34] A similar question might come up when watching *Locke* (Steven Knight, 2013), where the entirety of the action takes place within a car as Ivan Locke (Tom Hardy) drives from Birmingham to London. As the camera is fixed on the car, pointed at Locke, it would seem absurd to say that it is moving at a constant rate of 100km/h, or thereabouts. While this movement falls into the background of our attention, it is possible to notice when the camera tracks laterally on the hood of the car, or 'dollies' in toward Locke. Why is that?

In the example of passive locomotion described by Merleau-Ponty, Gibson, and Koffka — but also Bordwell — our perception of what is moving and how depends on whether our attention is directed toward this or that element of the visual field. Unlike the *active locomotion* of walking — context in which movement provides 'a dense stream of information about objects' slants, their edges, their corners, their surfaces, their relations with other objects'[35] – the experience of *passive locomotion* in a train allows us to witness the fundamentally interpretative character of perception, which works by primary *anticipation* and secondary adaptation.[36] If a case of passive locomotion such as riding in a vehicle can give rise to such optical illusions, what of cinema and its equally passive spectatorial position?

RELATIVE MOVEMENT IN CINEMATIC SPACE(S)

Without the clues provided when the body moves of its own free will, perception is quick to fall prey to illusions. This makes the spectator's passive position all the more interesting for questioning the illusory nature of the 'perceived screen event' we call camera movement. 'Camera movement', Bordwell writes, 'presents us with a constricted but effective range of visual cues for subjective movement'.[37] With no recourse to an objective frame of reference as to the camera's actual movements within profilmic space, and without having access to the stimulations their bodies typically afford them in cases of active locomotion, viewers are left to interpret movement solely from the visual cues furnished by the camera's own subjective movements, be they active, passive or nonexistent.

As Gaudin and Schonig have demonstrated following Bordwell's lead, several additional conditions can affect our understanding of camera movement.[38] More specifically, Bordwell reminds us that the 'the profilmic-event model cannot specify *the perceived screen event* which we identify as camera movement' and that, on the contrary, '[t]here must be perceptual cues which determine a "camera-movement effect" onscreen *regardless of whether the camera moved in production or not* (since we recognize camera movement without necessarily making any inferences about production circumstances)'.[39] Here, Bordwell shifts the focus from the movements that the camera *might* have made during production to what we can actually attest to: the appearance of camera movement as we perceive it on screen. Pierson makes a similar argument by calling to our attention to the fact that the camera movement we see in *Gravity*'s opening shot were actually stitched together from 'thousands of digitally composited events'.[40] The same can be said for animated films in general, as Pierson demonstrates once more, since the impression of camera movement can easily be produced even when no camera was ever used during production. The exo-centric image also illustrates this perfectly, since all traces of the camera's displacement during filming are eliminated in the final image; a profilmic account cannot adequately describe the onscreen effect. In turn, this shift opens up a discussion regarding the nature of camera movement as an optical illusion.

Part of the challenge when viewing camera movement is understanding what elements of the phenomenon seen on screen pertain to the movements of the camera as opposed to the movements of surrounding elements. In other words, how do we come to determine that it is the camera that moves and not the other objects in the frame?[41] As opposed to Gibson's discussion of subjective movement and objective motion, however, we must also remember that camera movement offers only (second degree) visual cues of subjective movement, leaving up much to interpretation.[42]

To demonstrate the hermeneutic character of camera movement, consider Rudolf Arnheim's account of the fundamental distinction between the active

perception of a body in motion and the stimuli presented through camera movement to the immobile body of the spectator. To set the stage for the effect produced by camera movement, Arnheim chooses first to describe the visual impressions produced by the movements of one's head:

> If I turn my eyes or my head, the field of vision is altered. Perhaps a moment ago I was looking at the door; now I am looking at the bookcase; then at the dining-room table, then at the window. This panorama, however, does not pass before my eyes and give the impression that the various objects are moving. Instead I realize that the room is stationary as usual, but that the direction of my gaze is changing, and that that is why I see other parts of the motionless room.[43]

In accordance with Gibson's hypotheses, the contributions of the active body are what allow Arnheim to understand that the movement he sees is due to his own 'subjective movement' rather than the 'objective motion' of external objects. Arnheim insists, however, on the ambiguity that arises when this same movement is executed by a camera and projected on screen:

> If the camera was rotated while the picture was being shot, the bookcase, table, window, and door will proceed across the screen when the picture is projected; it is they which are moving. For since the camera is not a part of the spectator's body like his head and his eyes, he cannot tell that it has been turned. He can see the objects on the screen being displaced and at first is led to assume that they are in motion.[44]

Although counterintuitive at first glance, this conclusion stems from the fact that for Arnheim, the camera's position is 'presumed to be fixed. Hence if something moves in the picture *this motion is at first seen as a movement of the thing itself* and not as the result of a movement of the camera gliding past a stationary object'.[45] This 'relativity of movement in film', as Arnheim calls it, can even result in movements on screen that completely contradict those performed during production.[46] This is also what I am suggesting is demonstrated by exocentric images.

Even if we forego Arnheim's assumption that the camera is fixed until proven otherwise, the author's explanations perfectly exemplify Bordwell's conclusion that: 'For the camera movement effect to occur, monocular movement parallax must be read from the entire visual field. If only a part or item in the visual field yields that differential angular velocity across time, then camera movement will not be specified — only the movement of that object will be specified'.[47] In doing so, Arnheim also confronts us with the hermeneutic character of camera movement. To wit, perceiving the movement of the camera in the image asks of us to decipher purely visual cues, without the use of the kinesthetic stimuli that would usually allow us to perceive movement as either subjectively performed or objectively witnessed.

EXO-CENTRIC IMAGES AND THE
REVERSAL OF BODY-SPACE RELATIONS

Arnheim's inclination to describe a simple panoramic camera movement as depicting the displacement of all objects in space around a stationary camera is an inspiring springboard toward an analysis of the effect produced by exo-centric images. If, like Bordwell and Arnheim before him we choose to focus on the *appearance* of camera movement on screen rather than on any preconceived notions about *if* or *how* a camera moved during production, what 'camera movement effect' can we say is produced by the exo-centric technique?

Consider the exo-centric image featured in *Requiem for a Dream*. Although there have been scores of exo-centric images in films and moving image media in the decades since the film's release, it remains the paradigmatic example of this technique and of its strange reversal of body-camera-space relations. Among the three sequences in Aronofsky's film that use this technique, the best known one occurs halfway through (01:00:20-01:01:25), when Marion (Jennifer Connelly), leaves the apartment of her psychiatrist after exchanging sexual favours for drug money. The 'camera movement effect' used to convey the unsettling feeling of this scene has the side effect of leaving us with a deep uncertainty as to the (camera-)body-space relations presented on screen.[48] If we were to describe the movements of the camera 'objectively', as it took place on set, we could easily start by noting that it was attached in front of the body of the actress. We would then describe how, equipped with this device, Connelly walked down a lengthy corridor before turning right, calling the elevator, going down to the ground floor and exiting the building, all the while transporting the camera along with her. In this case of passive locomotion — where the camera was simply carried by the actress — should we say that the camera was moving backward in the corridor, that it turned left to get to the elevator, and so on? In the strictest technical sense, these descriptions would indeed be correct with regard to the displacements of the camera within profilmic space. However, several problems would come from this approach.

Firstly, such an attempt at describing the camera's movements 'objectively' would obfuscate the fact that the camera did not move autonomously; that it was subject to the movements of the actress. Secondly, and as a result of our own limited access to this movement, we must also ask ourselves how this unique camera-body-space relation *appears* on screen, regardless of the movements we imagine the camera to have performed during production. Limiting ourselves to the visual cues this exo-centric sequence affords us, what can we glean about the origin and nature of the movement depicted on screen?

The sequence starts with Marion in the centre of the image, a position from which she does not move during the entire scene. The first of the three shots contained in this one-minute sequence begins when the wall behind Marion starts to move around her, counterclockwise. The vanishing lines that pointed to the left of the screen disappear when the wall fills the frame, then reappear

Fig. 2:
Beginning and end of the 180° rotation. The wall identified in yellow moves around Marion. Screen grab, *Requiem for a Dream* (Darren Aronofsky, 2000)

to the right of the frame as the wall continues its rotation totalling 180° [fig. 2]. Once the rotation is complete, the camera faces Marion and the man's apartment; all three are aligned. As the sequence advances, the man's apartment recedes into the background while Marion remains motionless in the centre of the frame [fig. 3]. Her immutable position at the centre of the image is crystallized by the rotations of the world around her once she has reached the end of the corridor.

Already, we find that all the visual cues contained in the image convey the impression of a body in a state of (relative) immobility; in the eyes of the camera, Marion has not changed position since the beginning of the sequence. According to Bordwell's conclusions — indebted to Gibson's theories and shared by his successors, including Gaudin and Schonig — the appearance of a partial transformation of the environment suggests that only changing elements are in motion. In other words, as Arnheim similarly concluded, 'if something moves in the picture *this motion is at first seen as a movement of the thing itself* and not as the result of a movement of the camera gliding past a stationary object'.[49] Otherwise, everything that remains fixed in the image is presumed to have been motionless. By extension, and as Bordwell concludes, '[f]or the camera movement effect to occur, monocular movement parallax must be read from

the entire visual field'.[50] In the case of *Requiem for a Dream*, these cues suggest the immobility of the character's body and the movement of all other elements in space around her. This is the very impression that all examples of exo-centric images in narrative cinema evoke.

Although the *Requiem for a Dream* sequence continues with two changes in the camera's position (it moves behind Marion and then back in front of her), these descriptions are enough to draw some conclusions regarding the shift that occurs when leaving behind the presuppositions that come with the vocabulary of film analysis. Specifically, I have chosen to describe this exo-centric image as depicting a body perfectly fixed in the centre of an otherwise moving space. This interpretation is encouraged by the relative immobility of the body in the eyes of the camera. Echoing Arnheim's equally eccentric description of a panning camera which gives rise to the impression that space is moving around a stationary camera, my analysis of *Requiem for a Dream*'s exo-centric image highlights how ambiguous the 'camera movement effect' really is. Similarly, borrowing from Jordan Schonig's interpretation of the gestalt shift that occurs when seeing camera movements in altered viewing conditions, I suggest the approach I have proposed here, 'doesn't modify the image itself, but merely
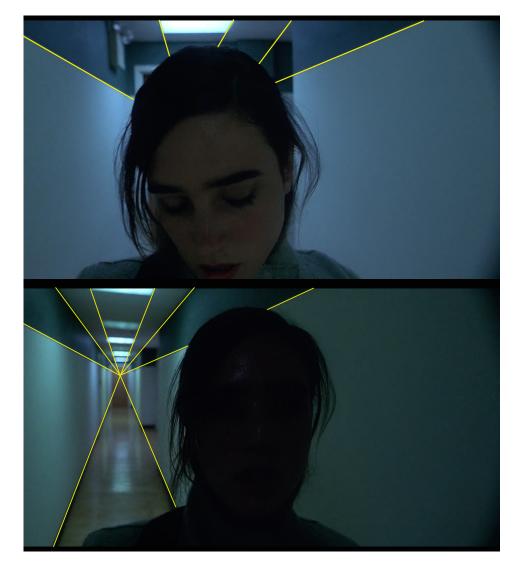

Fig. 3:
The vanishing point (identified by yellow lines) moves into depth as Marion remains fixed in the centre of the frame *Requiem for a Dream* (Darren Aronofsky, 2000)

alters the "normal circumstances" under which the visual effects of the moving camera can be seen'.[51]

CONCLUSION

By modifying a single aspect of our engagement with camera movement — rejecting the habitual, profilmic-focused vocabulary in favour of descriptions based purely on the appearance of visual cues — my goal in this essay has been to shed light on the inherent relativity of camera movement. We know that the camera did in fact move on set while filming *Requiem for a Dream*, but the absence of any *relative movement* between the camera and the actress who was carrying reflects another reality. A similar conclusion can be drawn from less unusual techniques for moving the camera. Even the seemingly simple example of a camera fixed onto the front of a moving car — as in the case of Locke described earlier — becomes ambiguous when we start questioning what the frame of reference should be for describing its movements. Ultimately, using a vocabulary anchored to the profilmic context keeps us from engaging more viscerally with the formal effects that camera movements produce on screen regardless — even *in spite* — of *if* or *how* the camera moved during production.

Thankfully, recent scholarship has shown that, now more than ever, camera movement is recognized as a complex phenomenon deserving of a more sustained theoretical engagement. Returning to the example with which we opened this essay, however, leaves us with further questions about the way camera movement might be analysed. The opening shot of *Gravity* is emblematic of a new production context that is transforming both the camera, and the things it is expected to do in narrative films: virtual production. In virtual production, camera, space, and all elements that compose the film (e.g., sets, lighting, actors, costumes, etc.) are transformed into digital data. The immateriality of the 'function' that the camera has become also allows it to cross space without any physical limits (volume, speed, course, etc.).[52] As there is no physical film set to speak of in some of these virtual productions, this context raises new questions as to the relevance of an analytical language based in descriptions of the movements of a camera in profilmic space. What is the nature of movement in this virtual cinema? What happens to the division between profilmic and scenographic spaces? How can we deduce the movements of the device in relation to space if they are now, ontologically speaking, one and the same thing?

Notes

[1] See Scott C. Richmond, *Cinema's Bodily Illusions* (Minneapolis: University of Minnesota Press, 2016); Ryan Pierson, *Figure and Force in Animation Aesthetics* (New York: Oxford University Press, 2019); Daniel Morgan, *The Lure of the Image: Epistemic Fantasies of the Moving Camera* (Oakland: University of California Press, 2021); Jordan Schonig, *The Shape of Motion: Cinema and the Aesthetics of Movement* (New York: Oxford University Press, 2021).

[2] David Bordwell, 'Camera Movement and Cinematic Space', *Ciné-Tracts*, 1 (1977), 19.

[3] Vivian Sobchack, 'Toward Inhabited Space: The Semiotic Structure of Camera Movement in the Cinema', *Semiotica*, 41 (1982), 317–335 (317).

[4] Bordwell, 24.

[5] Adriano D'Aloia, 'The Character's Body and the Viewer: Cinematic Empathy and Embodied Simulation in the Film Experience', in *Embodied Cognition and Cinema*, ed. by Maarten Coëgnarts and Peter Kravanja (Leuven: Leuven University Press, 2015), 187–199; Kristen Whissel, 'Parallax Effects: Epistemology, Affect and Digital 3d Cinema', *Journal of Visual Culture*, 15 (2016), 233–249; Ryan Pierson, 'Whole-Screen Metamorphosis and the Imagined Camera (Notes on Perspectival Movement in Animation)', *Animation*, 10 (2015), 6–21; Tom Gunning, '"Nothing Will Have Taken Place – except Place": The Unsettling Nature of Camera Movement', in *Screen Space Reconfigured*, ed. by Susanne Ø. Sæther and Synne T. Bull (Amsterdam: Amsterdam University Press, 2020), 263–281; Morgan, 17–19.

[6] Pierson, 17.

[7] D'Aloia.

[8] Richmond.

[9] Philippe Bédard, 'L'espace exo-centrique au cinéma', *Écranosphère*, 4 (2020), 7–23; Bédard, 'Going Beyond the Human Perspective: GoPro Cameras and (Non)Anthropocentric Ways of Seeing', in *Versatile Camcorders: Looking at the Gopro Movement*, ed. by Winfried Gerling and Florian Krautkrämer (Berlin: Kadmos, 2021), 45–61; Bédard, 'Un regard hors de soi : Étude des rapports entre corps, caméra et espace dans l'histoire des techniques de prise de vues au cinéma' (Ph. D. thesis, Université de Montréal, 2021).

[10] Bordwell, 21.

[11] Schonig, 121.

[12] For an in-depth study of the narrative functions of exo-centric images, see Bédard, 'Situating the Camera: Third-Person Images and the Question of Point of View in Narrative Cinema' (Master thesis, Concordia University, 2015). Note that while what I call here 'exo-centric images' can be found in almost any type of moving image media — as long as there are a body, a camera, and a space – I have limited my examples and sources to narrative films here simply for the sake of efficiency.

[13] Here too, we can find exceptions to this definition. The camera can be attached to a vehicle, an animal, or any other nonhuman body. For the sake of clarity and because there are more prevalent, I will focus on exo-centric images that feature the human body.

[14] Like Steadicam, Kodak, GoPro and so many other genericized trademarks, the name Snorricam is often used indiscriminately to describe 'a camera device used in filmmaking that is rigged to the body of the actor, facing the actor directly, so when they walk, they do not appear to move, but everything around them does'. <https://www.snorricam.com/home> [accessed 23 April 2022].

[15] Most films use the frontal arrangement, as seen in *Requiem for Dream*, *Mean Streets*, and *The Hangover*. Cameras mounted behind the actor in this exo-centric position would produce an over-the-shoulder perspective reminiscent of third-person points of view in video games, as showcased in *Seconds* (John Frankenheimer, 1966). Finally, still fewer films have used a rotating exo-centric perspective, with only *Angst* (Gerald Kargl, 1983) coming to mind. However, this orbiting exo-centric point of view is much more common in GoPro videos. See 'Situating the camera'.

[16] Pierson, 9.

[17] Bordwell, 20, emphasis in the original.

[18] Patrick Keating, *The Dynamic Frame: Camera Movement in Classical Hollywood* (New York: Columbia University Press, 2019).

[19] See Antoine Gaudin, *L'espace cinématographique: Esthétique et dramaturgie* (Paris: Armand Colin, 2015), 7–8.

[20] In navigational sciences, these would be called egocentric and exocentric, respectively. For a more sustained discussion of these concepts and their relation to camera movement, see 'Un regard hors de soi'.

[21] Morgan.

[22] Sobchack, 317.

[23] James J. Gibson, 'The Visual Perception of Objective Motion and Subjective Movement', *Psychological Review*, 101 (1994), 318–323 (318).

[24] Jacques Paillard, 'Les déterminants moteurs de l'organisation de l'espace', *Cahiers de psychologie*, 14 (1971), 261–316 (272), emphasis added. My translation of: 'le mouvement de l'image rétinienne résultant du déplacement commandé de l'œil serait interprété au plan perceptif comme un mouvement du corps par rapport à un univers stable et non comme une mobilité de l'univers extérieur par rapport au corps'.

[25] Maurice Merleau-Ponty, *The Phenomenology of Perception* (New York: Routledge, 2010), 324.

[26] Ibidem.

[27] Indeed, Merleau-Ponty issues a warning that 'to say that motion is a structural phenomenon is not to say that it is 'relative'. The very peculiar relationship which constitutes movement does not exist *between objects*', ibidem, 323–324. Nevertheless, I insist on calling 'relative' this perception of movement which imparts on this object or that the movement an individual perceives, according to whether they are focussing on this or that.

[28] Ibidem, 324, emphasis added. Another instructive example in this regard is Merleau-Ponty's description of a patient with paresis of the oculo-motor muscles: 'A subject whose oculo-motor muscles are paralysed sees objects moving to his left whenever he believes that he is turning his eyes towards the left', ibidem. 55. Convinced that they have moved their eye to the left, the patient's perception of their surrounding shifts to account for the expected movement; they attribute to the outside world the movement they want to accomplish themself.

[29] Gibson, 318.

[30] Ibidem, 319.

[31] Merleau-Ponty, 326. The illusory subjective movement will be proportionally inverse to that of the visual stimulus caused by the moving train in peripheral vision, so that a neighbouring train that 'retreats' (which goes in the opposite direction to that which one is facing) will give one the impression that they are moving forward.

[32] Ibidem.

[33] Kurt Koffka, 'Perception: An Introduction to the Gestalt-Theorie', *Psychological Bulletin*, 19 (1922), 531–383 (578).

[34] My translation of: 'S'agit-il d'un mouvement de caméra par rapport au fond du plan, ou bien d'un plan fixe sur les personnages (avec un décor mouvant) ?', Gaudin, 129.

[35] Bordwell, 22.

[36] Art historian Ernst Gombrich quotes J. R. Beloff to the effect that: 'Perception may be regarded as primarily the modification of an anticipation', to which Gombrich adds, still about perception: 'It is always an active process, conditioned by our expectations and adapted to situations'. Ernst H. Gombrich, *Art and Illusion: A Study in the Psychology of Pictorial Representation* (Princeton: Princeton University Press, 1961), 136.

[37] Bordwell, 21.

[38] Gaudin, 129; Schonig.

[39] Bordwell, 20–21, emphasis in the original.

[40] Pierson, 7.

[41] In a way, these questions are a continuation of those asked by Gibson, namely 'How do we see the motion of an object? How do we see the stability of the environment? How do we perceive ourselves as moving in a stable environment?', Gibson, 318.

[42] Indeed, as Sobchack cleverly articulates, 'we can see the film's seeing as the seeing of another who is like myself, but not myself'. Vivian Sobchack, *The Address of the Eye: Phenomenology of Film Experience* (Princeton: Pinceton University Press, 1992), 136.

[43] Rudolf Arnheim, *Film as Art* (Berkeley, Los Angeles and London: University of California Press, 1957), 30.

[44] Ibidem, 30–31, emphasis added.

[45] Ibidem, 32, emphasis added.

[46] Ibidem.

[47] Bordwell, 22.

[48] Keating would call these images 'semi-subjective', following Jean Mitry's use of the term. For an in-depth analysis of exo-centric image through the lens of the Mitry's semi-subjective point of view, see 'Situating the Camera'.

[49] Arnheim, 32, emphasis added.

[50] Bordwell, 22.

[51] Schonig, 121.

[52] See Mike Jones, 'Vanishing Point: Spatial Composition and the Virtual Camera', *Animation*, 2 (2007), 225–243.