The Poetics of Stereoscopic 3D Cinema:
Narrative, Attraction, and the Design of
Cinematic Space

by
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Abstract

This study examines the poetics of stereoscopic 3D cinema through the close reading of scenes drawn from four exemplary works of 3D cinema: *Dial M for Murder, Avatar, Hugo* and *Life of Pi*. The thesis identifies and analyzes the forms of creative decision-making that are used to construct a stereoscopic cinematic space within each of these films. These spaces are designed to support the needs of storytelling and narrative immersion. In addition, these creative decisions can also be used to support another type of viewing experience: the “cinema of attractions”. These moments of stereoscopic attraction can support narrative intent, but they can also provide a different form of engagement: cinematic spectacle and visual pleasure. The thesis details the application of stereoscopic visual design decisions in conjunction with the more standard cinematic techniques of composition, lighting, and an array of monocular two-dimensional depth cues.

**Keywords:** stereoscopic; 3D; cinema; narrative; cinema of attractions; spatiality
to those who never give up
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Chapter 1.

Introduction

1.1. History of 3D Cinema

3D photography is often considered a newer technology, but it has been systematically explored since the inventions of Charles Wheatstone in the 1830s. Wheatstone developed the basic principles of stereoscopic imagery at that time, and in 1838 designed and built a stereoscope (Zone, 2007, p7). The stereoscope is a device that helps the user see photographs in 3D. Each 3D photograph involves two images – left and right – the stereoscope allows each eye to view the corresponding photograph. There was enthusiasm around 3D and families would collect side-by-side photographs to view them through the stereoscope viewer. As the family passed the viewer around, one of them would read out the description for each photograph. These stereo images were very realistic, and permitted ordinary people to see exotic animals, or the great monuments of the world. Many tourist locations sold stereo images as souvenirs. These 3D experiences gave a sensation of real space and an immersive experience of places people would never have been able to see otherwise. 3D photography was a popular form of media for the time similar to home theatres of today. In the past people would collect these 3D photographs like the present collect DVDs or Blu-Ray discs. 3D is a pleasing experience that grasps a descriptive narrative as long as it is photographed properly and handled the rules of stereoscopic vision.

3D was also present in the early years of the motion picture. Ray Zone’s Stereoscopic Cinema and the Origins of 3-D Film’s book description identifies “the advent of stereoscopic film technology [an excitement for] both filmmakers and audiences, as a means of replicating all of the sounds, colors, movement, and dimensionality of life and nature for the first time” (Zone, 2007).
Zone describes four eras for 3D: The Novelty Period – 1838 to 1952, An Era of Convergence – 1952 to 1985, The Immersive Era – 1986 to Present, and Digital 3D Cinema – 2005 to Present. During the early "novelty period", 3D photographs became 3D moving images through the use of projectors “in different colours (most often red and cyan) filtered through coloured lenses [to] display stereoscopic visuality in cinema’s first decades” (Ross, 2015, p. 3). The "era of convergence" in the 1950s was the golden era for Hollywood’s 3D films. There were over fifty stereoscopic films” (Zone, 2007, p. 2) produced during this era. Some of the notable examples are House Of Wax (Toth, 1953), Creature from the Black Lagoon (Arnold, 1954) and Dial M for Murder (Hitchcock, 1954)
1. During the 1980s 3D entered an “era of immersion” and experimentation. As part of this aesthetic, stereoscopic films often exaggerated the use of the 3D effect – bring images well into the audience space2. A problem during this period of films was the overuse of lens separation to increase the stereoscopic effect. Unfortunately, the resulting visual disparity was often too large for viewers to fuse into one stereoscopic image, which often led to eyestrain and headaches. Throughout these eras of 3D cinema, there has continued a strong tradition of technological innovation. Zone seems to think that the immersive era continues in the new digital era. He further claims that stereoscopic cinema was the driver in the transition to digital theatrical exhibition (Zone, 2007, p. 4). The contemporary "digital era" is advancing rapidly as 3D hardware and digital image quality continue to develop. This generates exploration of the aesthetics and the poetics of the stereoscopic cinema image.

However, not all of these current innovative technologies are digital – some are optical, or even mechanical. For example, the technology of the earlier eras required cameras to be placed side-by-side in order to produce the left and right images. Since lenses needed be large to maintain proper optical quality, their size made it difficult to set the proper stereoscopic separation. The combination of the distance between cameras lenses and the proximity of subjects from the lenses make a difference in the resulting stereoscopic image. Today’s technology allows for two cameras to fit in a 3D

1 Sadly, Dial M for Murder was produced in 3D, but not released in that format until 1979 (Mitchell, 2004, p. 211).
2 As discussed later, the technical term for this intrusion in front of the screen into the space of the viewer is "negative space". This thesis uses both terms interchangeably.
“beam splitter” rig where they are setup with a mirror in between set at 45 degrees. One camera shoots straight through a mirror and the other shoots at the mirror and bounces to the same view (Block & McNally, 2013). This permits the two large cinema lenses to create overlapping stereoscopic images. With wider focal lengths and confined shot designs as lenses require little separation. Shooting over a long distance with telephoto focal lengths may allow lenses to sit side-by-side.

The central film in the recent 3D resurgence of the contemporary era was James Cameron’s Avatar (Cameron, 2009). Cameron's film benefited from a combination of engaging storyline and acting, strong use of traditional production values, and the creative use 3D design enhanced through innovative stereoscopic technology. Many critics questioned if a two and half hour movie could work in the 3D format. Cameron’s aim was to ensure that the 3D enhanced and didn’t detract from the cinematic experience. Many films in the contemporary era follow his lead, aiming for a relatively conservative form of stereopsis. It is common to keep the 3D visual parallax disparity low to avoid viewer discomfort, and to place the majority of the stereoscopic depth behind the screen plane and away from the audience. Most modern stereographers try to build generally pleasing 3D images that combine immersiveness of experience with comfortable viewing. It is interesting that this aesthetic reflects the goals and the visual design of the popular stereoscopic still images of the 19th century.

1.2. Understanding 3D Cinema

The design and the experience of contemporary stereoscopic cinema explore spatial connections between objects. Most of us can understand these connections by simply looking at them. Limbacher says “if we have two fairly normal eyes, ‘see’ in depth and there is no doubt that motion pictures in 3-D will add a naturalness to films, and also a sense of drama and involvement which has never been possible with conventional ‘flat’ films” (Limbacher, 1969, p. 191). Therefore we already know how we should be experiencing 3D depth. However, the creative use of 3D in cinema can bring viewers to the edge of their seats, pushing and extending the limitations of cinematic depth and space. The design of the stereoscopic presentation also determines how the picture captivates the audience. Does the stereoscopic image appear more natural in order to
immerse the audience within the narrative? Or, does the visual experience of the imagery act as a spectacle in its own right? A well-constructed stereo image of actors can build a sense of cinematic space that feels natural, adding to the sense of immersion within the story world.

The visual experience of stereopsis can be a key component in the creative toolbox of a filmmaker. “Because 3D is our natural way of seeing, it brings a feeling of realism to the audience. With 3D, we no longer have to rebuild the volume of objects in the scene we are looking at, because we get them directly from our visual system. By reducing the effort involved in the suspension of disbelief, we significantly increase the immersion experience” (Mendiburu, 2009, p. 3).

However, this goal of seamless narrative illusion is not a necessary attribute of stereoscopic cinema. An actor who leans forward so strongly that their 3D image invades the visual space of the audience will break the smooth illusion with a form of cinematic punctuation or intrusion. In some cases, this visual punctuation can be designed as a cinematic attraction in its own right. This range of choices between smooth narrative experience, "punctuated" narrative moment, and visual "attraction" is a key variable for understanding the full expressive capability of stereoscopic cinema.

1.3. Visual Experience in Cinema

Stereoscopic 3D is another tool in the cinematic toolbox. Many stereoscopic academics applaud the feature-length documentary, Pina (Wenders, 2010) for its excellence as a pioneer artistic work within the current 3D renaissance. Yet Pina generally follows the simplest 3D rules for the creation of a non-distracting stereo image. These guidelines include keeping shots relatively wide, camera motion slow and the amount of 3D depth tightly controlled. However, throughout the film, there are many scenes where the performers who were interviewed felt closer due to the stereoscopic design, thus immersing the viewer within their memories and recollections. “In applying stereoscopic depth to bodily portraiture, Pina does not construct an environment to move-into, but rather a voluminous surface that emits a tactile impression across unbridgeable space – like a conjured face emerging from the murky swirls of a crystal ball” (Gadassik, 2013, p. 178). This is an interesting concept as many films design
immersive worlds. *Pina* concentrates on the physical volume of characters rather than the space the characters are within. There are three significant spaces throughout the film: a large stage performance space, an intimate interview space, and a larger/wider location performance space. These sequences focus on the depicted depth of the character rather than the space around the character. The stage performance space allows the camera to shoot from multiple angles centering on the performers. The interview space is a close personable space; the character can share their feelings with their late mentor (named Pina). The location performance space allows for large-scale dance sequence that detaches from the bounds of a theatre. The film feels as if the viewer is moving with the performer.

*Avatar* (Cameron, 2009) was built on an entirely different scale – befitting its blockbuster status. In this film, Cameron creates an immersive world, an enchanting planet to explore, allowing for a powerful experience of filmic space and accompanying cinematic experience. “Once the moving images are brought to life, so to speak, the abundance of depth planes provokes an immersive effect through which the body is located within and in relation to, rather than at a fixed distance from, the content” (Ross, 2012, p. 383). From the moment the film begins, Avatar places the audience into a world with extended depth including indoor shots as they expand passed large windows in the background.

However, cinematic 3D experience does not need to be fully confined to the narrative domain. There is an older, and entirely different sense of cinema's relationship to audience. Tom Gunning, a cinema scholar points out that in the beginning of cinema history, the driving force was not story, but cinematic "attractions". Like vaudeville, or a circus sideshow, these early attractions didn't tell stories in any significant way. Instead they presented pure visual experience that affected the audience more simply and more directly. These attractions included exotic locations and interesting human activities. Often the attraction was the technology – the moving picture was a novelty and an attraction in its own right. Within a few years, cinema began to tell stories, and the cinema of narrative became the dominant form of production and exhibition. However, the 'cinema of attractions' still exists, with its own complex relationship with the 'cinema of narrative.' Gunning maintains “the cinema of attraction does not disappear with the
dominance of narrative, but rather goes underground, both into certain avant-garde practices and as a component of narrative films” (Gunning, 1990, p. 57). These two major cinematic directions can be seen in opposition, but Gunning reminds us that the cinema of attractions can be – and has been – harnessed in the service of the cinema of narrative. In a broader view of the world of the moving image, one can still see a more complete commitment to the cinema of attractions in certain art films, experimental documentaries (including feature length works such as Koyaanisqatsi (Reggio, 1982), Baraka (Fricke, 1992), or Samsara (Fricke, 2011)), and many of the examples of user-generated online cinematic "attractions" found on YouTube, Vimeo and related platforms. The visual experience of much of 3D cinema is intimately connected with the relationship of narrative and attraction within the stereoscopic design of the film scenes.

1.4. Spatiality within 3D

The Oxford English Dictionary defines spatiality as “having extension in space; occupying or taking up space; consisting of or characterized by space” (“Spatiality,” 2015). Conventional monoscopic filmmakers think about space through set design, staging, camera composition, and subject performance/movement. “2-D images are put into order with clear temporal relations and are aided by supportive mise-en-scène elements such as lighting and camera focus” (Ross, 2012, p. 385). With stereoscopy, “the frame is now a volume, that obeys spatial geometry rules. You were used to handling 2D projections; you will now practice with 3D transformations” (Mendiburu, 2009, p. 92). This leads to a more complex involvement with the staging, movement and performances.

There are temporal implications for this richer visual space. The stereoscopic environment becomes an important aspect of the image as “the narrative pace of 3D is forced into slowing down, by holding shots on-screen for a longer period of time” (Atkinson, 2011, p. 151). Ang Lee, who directed Life of Pi (Lee, 2012) explains, “Most modern films have about 2000 cuts in a two hour run time. Life of Pi has only 960.” Ang claims, those longer scenes allow viewers to immerse themselves in a scene rather than trying to take in a lot of information quickly (Hogg, 2013, para. 8).
In a formal sense, the stereographer needs to stage with three separate visual spaces in mind: the images experienced beyond the screen plane, the images experienced as at the screen plane, and the images experienced in front of the screen plane. Within the near space and the far space there are further gradations of stereoscopic distance from the viewer. This new set of depth variations can be used to build foreground, middle, and background volume within which the narrative elements can be staged. “Clearly, this new visual tool in the filmmaker’s palette does provide the potential to add another level of storytelling depth to a narrative” (Atkinson, 2011, p. 148). As scenes intensify so can the amount of depth into the audience space.

This potential richness of spatial gradation is a set of options – not a set of requirements. As mentioned above, Pina didn’t rely on a strong commitment to spatiality. The performers are typically placed in a rather non-spatialized world where most of the backdrops are dark curtains. This is close to what television producers call "a limbo set", one where the performers are lit and highly visible within a space that is dark and undifferentiated. The effect is similar in Pina, which “opts for a sculptural approach to the moving image that skims surface extensions and retractions, glides over textures” (Gadassik, 2013, p. 176).

Regardless of how the stereoscopic space is originally captured, it is still open to post-production depth manipulation. Discussing the foundations of 3D optics and stereoscopic image creation, Lipton notes that “the stereo worker can adjust the pair of images by laterally shifting one or both ... they can have various degrees of ‘forwardness,’ creating a spatial boundary that best suits the parallax content of the slide and setting the compositional elements behind the effective window” (Lipton, 1982, p. 125).

1.5. 3D and Narrative

Narrative is not the only path for 3D cinema to explore, but it is of critical – perhaps central – importance. The depiction of three-dimensional space is the foundation for the creation of the stereoscopic story world. Discovering the truly creative
capabilities for the expression of spatiality in 3D has always been a challenge. A film scholar named James L. Limbacher in 1969 wrote in his book *Four Aspects of the Film*:

“The dramatic possibilities of 3D have yet to be genuinely explored by film artists, who have been limited to throwing things out into the audience, making them more irritated than involved. When depth can be used to involve rather than to assault the viewer, it will be a most welcome addition to the art of film” (Limbacher, 1969, p. 191)

Nearly half a century later, blockbuster action flicks still tend to use 3D to assault the viewers. However, as more directors explore the creative aspects of the use of space, we can move beyond this simplistic sense of visceral assault. In the film *Hugo* (Scorsese, 2012), Scorsese found a subtler way to utilize a strong intrusion into the audience's visual space. “3D was exaggerated in places to enhance surrealism and for comic effect” (Pennington & Giardina, 2013, p. 191). When the clumsy station inspector is tripping over obstacles or conversation with his doberman, it’s difficult to not chuckle. Hitchcock relied on stereoscopic projection into audience space to provide narrative punctuation at key points in the plot. “In the case of *Dial M for Murder* (Hitchcock, 1954), these foreground effects... were saved to heighten the effect of dramatic moments in the plot such as the hand of the character played by Grace Kelly reaching out of the screen as the murderer attacks her, and the door key being passed out of the screen, which is an object of narrative significance within the plot” (Atkinson, 2011, p. 146).

### 1.6. Challenges involved with 3D

Mendiburu suggests that we are currently in a “renaissance of 3D cinema”. However, he lists three main sets of challenges: economic, technological and artistic (Mendiburu, 2009, p. 9-10). Economically, 3D movies cost more to generate. Additional time is invested for preplanning, design, as well as production. These films require doubling the complement of cameras to produce twice as many images. This places increased demands for extra hardware and associated costs for production, post-production, and exhibition. From the industry's perspective, there is some relief for this problem. Theatres charge a premium on 3D ticket prices, generating additional revenue to offset increased expenditures. Generally, 3D movie tickets cost 30% more than standard tickets. This strategy seems to be effective. Of the top ten grossing films all
time at the box office, nine of them were originally planned in 3D (Box Office Mojo, 2015). *Titanic* (Cameron, 1997) originally not in 3D – was later converted and re-released in 2012. The technology and know-how is continuously improving and becoming faster in many ways making the economic challenge easier to meet.

Technologically, stereo image creation has its limitations. “There is clearly much research to be undertaken and many challenges to overcome, particularly in relation to the convergence point anomaly and its related undesirable physiological side effects” (Atkinson, 2011, p. 153). 3D is sensitive at the vital point of audience participation: the stereoscopic perception of objects in visual – not actual – space. “The challenge in stereoscopic cinematography is to keep screen parallaxes as low as possible in order to offset the breakdown of accommodation/convergence and to avoid large parallax values of image points, which may result in excessive divergence” (Lipton, 1982, p. 191). A poorly designed 3D image can be difficult to watch, leading to eyestrain and even headache in some cases. “Because they are based on the two cameras' positions in space and on their angle, the corresponding images of reflections differ significantly. Thus they are creating deviations that cannot be fused by the viewers or are perceived as strangely vibrating, semi-transparent surfaces that lie on top of the objects depicted” (Flueckiger, 2012, p. 106). If the audience encounters the 3D image as impossible to fuse, they cannot enjoy the film.

Artistically, the challenge is for 3D cinema to fully explore the range of aesthetic options the technology makes possible. Most filmmakers and critics see the future in terms of supporting cinematic narrative – seeing stereopsis as a tool for creative storytelling. “Nobody goes to the theater to see technology. Audiences want to be told stories, and they will pay for enjoying them in the best visual experience possible. 3D can be part of that experience” (Mendiburu, 2009, p. 8). Since *Avatar* (Cameron, 2009), this question has been responded to with many films and articles that support 3D as a service for narrative.

However, there is also fertile ground for the exploration of 3D cinema as an attraction, and discovering its possibilities as a more purely visual experience in its own right. This exploration of visual attraction as amplified by the evocation of space that
stereopsis provides can also provide a more uniquely embodied experience for the viewer. “Moving away from rollercoaster attractions of kinesthetic experience, Pina investigates stereoscopy as a medium of anticipatory contact, spatial veiling, and ambiguous touch” (Gadassik, 2013, p. 176).

These contemporary challenges and goals have always been part of the world of stereoscopic cinema. Over forty years ago Limbacher claimed that “the possibilities of 3-D are endless and they will become a permanent part of all films sometime in the future. Of this there is no doubt” (Limbacher, 1969, p. 192). The recent momentum of the past several years has accelerated, and will continue to accelerate, our creative explorations of the stereoscopic cinema.

1.7. Outline of the Thesis

To most effectively explore the design and the experience of contemporary stereoscopic cinema, the thesis addresses the follow questions:

- What are the relevant poetics of cinema and cinematography?
- How are film techniques used to construct cinematic space?
- What is the role that stereoscopy can play in the design of cinema and the construction of cinematic space?
- How can stereoscopic design support cinematic narrative?
- How can stereoscopic design support other aspects of the cinematic experience?

The thesis examines stereoscopic 3D cinema for the purpose of explicating its poetics – the elements of creative design. The argument is developed in these stages:

- Chapter Two: “Perception of Depth” deconstructs and explains the concept of spatiality in terms of both traditional 2D visual depth cues and the technical parameters of stereoscopic imaging.
- Chapter Three: “Literature Review” summarizes relevant literature drawn from the areas of stereoscopy, cinema studies, narratology, and digital media theory.

- Chapter Four: “Methodology” documents the process of close reading used during the thesis’s detailed analysis of selected exemplary 3D works.

- Chapter Five: “Close Readings” consists of four close readings of selected exemplary works using critical analytical concepts drawn from Chapters Two and Three.

- Chapter Six: “Discussion” reviews and consolidates the critical understandings gained from the close readings in Chapter Five.

- Chapter Seven: “Conclusion” summarizes the findings on the poetics of stereoscopic 3D cinema.
Chapter 2.

Perception of Depth

2.1. Monoscopic Depth Cues (2D Cues)

The world is three-dimensional and there are many ways to achieve spatial presence in art. Perception researchers and film scholars have studied depth and distance in detail. This section collectively identifies a shared list of two-dimensional depth cues. The list of cues is a combination of the strongest and most common. They have been detailed for a better understanding of the experience of 2D depth cues (also recognized as monocular cues) and can be observed with just one eye.

2.1.1. Size

Size gradient is experienced when two objects of similar or same size are placed apart in space, one will appear proportionally smaller sized to the other when it is placed further away from the viewer in visual space (Bardel, 2001, p. 7). The perception of size and the perception of depth are so closely related that some effort is required to distinguish between them. Weintraub & Walker define this cue in three examples by presenting three of the same shapes at different scales on the same plane. First, if the shapes are considered by size “the largest appears to be the closet, and the smallest farthest away.” Second, if the shapes appear on the same plane, “they will appear to differ in size”. Third, if the shapes appear at different distances, “they may appear to be identical in size or at least more nearly the same size than is actually the case” (Weintraub & Walker, 1966, p. 23). The size gradient 2D cue is determined by the relative size of objects in space, size alone is a difficult cue to define 3D depth.
2.1.2. **Interposition/Occlusion**

Occlusion is viewed as partial overlap or interposition of objects when a near object partially obscures the view of a more distant object (Weintraub & Walker, 1966, p. 23). An example given by Bardel is a Windows based GUI, and he claims, “the only information communicated is that one object is clearly in front of another” (Bardel, 2001, p. 16). Although there is no depth information other than the relative depth between the objects, it is important to note that one object is closer than the other. In comparing interposition cue to the size cue, it is much easier to distinguish where each object layers in 3D space. “Thus, occlusion is, in a sense, the most basic depth cue; it is difficult to break the occlusion dependency rule and have a perceptually coherent scene” (Ware, 2004, p. 283).

2.1.3. **Colour**

Colour differences create their own overlapping planes on the 2D platform. The colour energy is principally determined by saturation level: highly saturated warm colours carry more aesthetic energy than do desaturated cold colours (Zettl, 2011, p. 73-74). Cool or pale colours tend to recede; filmmakers commonly use them for background planes such as setting (Zakia, 2013, p. 103). Similarly, because warm or saturated colours tend to come forward, such hues are often employed for costumes or other foreground elements (Bordwell & Thompson, 2013, p. 144).

2.1.4. **Brightness**

Brightness is considered a distance cue when two objects are lit by the same light source. Other things being equal, the brighter the object, the closer it appears (Dember, 1960, p. 171). Bardel explains it as objects or parts of objects that are more intense are seen as closer than those that are similar in intensity to the overall background. Multiple lights sources can adjust the viewer’s attention if the focus of brightness is on the object further away and closer object is not.
2.1.5. **Shading**

The distribution of light and shadow, properly used, can give a two-dimensional picture the appearance of depth (Dember, 1960, p. 171). Shading is comprised of attached and cast shadows. Objects are modeled with light and shadow appearing rounder. This is a result of two types of shadows. **Attached shadows** are the surfaces that face away from the light, or shadows cast by the contours of an object upon the object itself (Weintraub & Walker, 1966, p. 25). **Cast shadows** are the surfaces that have the light blocked. Of the two, attached shadows make objects themselves have depth and cast shadows provide distance information based on the object and surface it’s on. The greater the distance between the two objects, the more imprecise shadow is in communicating the relationship (Bardel, 2001, p. 7). Both types of shadows include shading as an important 2D depth cue.

2.1.6. **Texture Gradient**

Most natural surfaces, in fact, are characterized by gradients of texture density (Dember, 1960, p. 171). An example that’s easily followed is a brick road where the closest bricks are large and few. All similar sized features of the road are repeating and will change size the further away they become. As the distance increases, they will appear closer and closer (Zakia, 2013, p. 103). Uniformly textured surfaces result in texture gradients in which the texture elements become smaller with distance (Ware, 2004, p. 261). As the bricks continue into the distance, more come into view and are smaller but appear closer together.

2.1.7. **Linear Perspective**

Linear perspective refers to the fact that parallel lines converge as a function of distance in a two-dimensional geometrical representation of three-dimensional space (Weintraub & Walker, 1966, p. 27). Objects such as railroad tracks, which are parallel, appear to converge at the horizon as they become more distant from the observer. The ties that are in between the tracks also become shorter and shorter, “just as objects should as they become increasingly distant” (Dember, 1960, p. 173). The point of convergence is also known as the vanishing point is used in many 2D formats including
paintings adapted in the fifteenth century. Today, it is used as an essential technique for showing the experience of depth in photos as well as film.

2.1.8. Aerial Perspective

Aerial perspective is a depth cue used over long distance such as outdoor landscapes. Subjects closer to the viewer are sharper and have more saturated colour. A certain amount of moisture and dust is always in the atmosphere. “We therefore see objects that are close to us somewhat more sharply than those farther away” (Zettl, 2011, p. 163). Over longer distances, subjects become less clear and there's desaturation of colour. In most instances, the specification of blue is appropriate, but the more general rule would be the instruction to add proportional amounts of the hue of the ambient illumination (Weintraub & Walker, 1966, p. 27).

2.1.9. Movement Parallax

Movement parallax is when the camera slides horizontally and subjects that are at different distances of the scene move at different speeds. The close object seems to move faster because it also seems to move farther than the distant object in the same amount of time. The close object seems to move farther because of the size-distance relation (Weintraub & Walker, 1966, p. 21). This cue also gives depth to an object in close proximity as it shows more angles. Orbiting around an object provides more information of it's space. Such gradual revelations are often more dramatic than a long shot of the same scene (Zettl, 2011, p. 93).

2.1.10. Height in Plane

Relative height is a monocular depth cue. Objects that have vases below the horizon appear to be farther away when they are higher in the field of view; objects that have bases above the horizon appear to be farther away when they are lower in the field of view (Goldstein, 2013, p. 414). However, because the mobility of the camera causes the horizon line to shift constantly within a shot or from shot to shot, the height-in-plane distance cue is not always reliable (Zettl, 2011, p. 160).
2.1.11. Blurring

Focus can be considered a pictorial depth cue only if the object of fixation can be predicted (Ware, 2004, p. 266). Depth of field is a property of the photographic lens, affecting what planes of the image are in focus (Bordwell & Thompson, 2013, p. 174). Objects that are blurred in an image will appear as the background and objects in sharp focus will pop out, as there is selected focus. In real life, the eye adjusts to bring objects of interest into sharp focus. As a result, objects at different distances become blurred (Ware, 2004, p. 266).

2.1.12. Filled vs Unfilled Space

Fill vs. unfilled space is the perception of objects as seeming to stand out against a background. The technical term for this phenomenon is the figure-ground, relationship (Weintraub & Walker, 1966, p. 11). A figure is something object-like that is perceived as being in the foreground. The ground is whatever lies behind the figure (Ware, 2004, p. 196). A reversible figure-ground image can only notice one figure and one ground but not both at the same time.

2.2. Stereoscopic Depth Cues (3D Cues)

As two-dimensional depth cues provide a basis to experience depth and distance for a flat image, stereoscopic technology provides the perception of depth. A two-dimensional film illustrates the same image for both left and right eyes depicting depth indicated only by monocular depth cues. A stereoscopic 3D film, stereoscopic depth perception occurs as the left and right eyes receive different images (Goldstein, 2013, p. 235). Using two eyes, the requirement is viewing two images offset from each other and allowing the viewer to perceive each image individually with each eye. The list of stereoscopic depth cues (binocular cues) and terms are detailed for the understanding of how the technology works.
2.2.1. **Interaxial**

The interaxial is the single most important parameter in 3D cinematography (Mendiburu, 2009, p. 73). When 3D movies are captured with two cameras our natural binocular disparity is mimicked by the so-called interaxial disparity between the two cameras (Flueckiger, 2012, p. 103). The interaxial is the distance between the centers of two camera lenses when assembled in a stereo 3D apparatus. The standard interaxial distance is the equivalent of the distance between the human eyes, the average of which is approximately 63mm (referred to as the interocular distance) (Atkinson, 2011, p. 141). There is a distinct relationship between the cinematographic interaxial distance and the perception of depth. As we increase the interaxial, the sense of stereoscopic depth is increased. Conversely, as we decrease the interaxial, the sense of stereoscopic depth is lessened.

2.2.2. **Screen Parallax**

Parallax refers to the horizontal separation of the left and right images on a display. In technical terms, this would be achieved by using the ‘negative parallax’ of the screen space as opposed to the ‘positive parallax’ (Atkinson, 2011, p. 145). With **positive parallax**, the images are shifted right for the right eye and left for the left eye, which makes objects appear behind the screen also known as positive space; with **negative parallax**, the image is shifted left for the right eye and right for the left eye, which makes objects appear in front of the screen also known as negative or audience space. With **zero parallax**, the two images overlap and no shift appears at the screen plane – a similar effect as the current flat 2D films. Parallax is one of the fundamental techniques for stereoscopic cinema to work. It defines where an object is positioned in space (Flueckiger, 2012, p. 103). A lot of screen parallax isn’t necessary for considerable depth and too much screen parallax can cause eyestrain. A shot that has appropriate perspective cues will have a convincing “out of the screen” effect with very low values (Lipton, 1982, p. 101).
2.2.3. Convergence

If you want your 3D scene to be partially behind the screen, you will converge ‘two’ cameras (Mendiburu, 2009, p. 75). Parallel cameras will only capture and present objects in front of the screen. The inward rotation between the two camera lenses setup in a stereo 3D rig will define the screen plane between the closest and furthest object in depth. As the two produced images traverse, the objects within the shot move away from the viewer and behind the screen. “For various distances the eyes converge; the nearer the object the more the convergence” (Zakia, 2013, p. 102). Stereoscopic convergence of images for the left and right eyes requires binocular vision, and it is the only technique available for producing pleasurable stereopsis (Ross, 2012, p. 387).

2.2.4. Accommodation

All objects at any depth in a 3D film are focused on the screen plane by our eyes as that is where they are projected. When you look at an object in the real world, your eyes are converging and accommodating (or focusing), on a single point. When you look at a 3D image of an object floating in negative space, you are accommodating on the screen, but you are converging somewhere between yourself and the screen (Mendiburu, 2009, p. 22).

2.2.5. Convergence-Accommodation

Eyes normally focus and converge together in unison on objects moving closer and farther away in the real world, but because we accommodate for the screen plane in cinema our eyes force converge on objects appearing at different depths causing disunity. This decorrelation is not a natural function of our visual system, and our brain is actually forcing our eyes to do it (Mendiburu, 2009, p. 22). Only when screen parallaxes are zero will accommodation and convergence follow their normal pattern (Lipton, 1982, p. 220). Although we always focus on the screen we direct our glances to objects that are probably positioned in front of or behind the screen (Flueckiger, 2012, p. 104). This is one of the major limitations for comfortable stereoscopsis in the cinema. Many viewers who experience extended mismatch with convergence-accommodation can accumulate headaches.
2.2.6. Stereoscopic Anomalies

There are several 3D limitations and glitches that can occur. It could be anything from a capturing error to display inaccuracies. These limitations will not be focused on but are commonly known issues and are worth mentioning.

Stereoscopic 3D imagery requires binocular vision. Stereo blindness is a term to describe those who cannot fuse two images into one with depth due to eye complications. Mendiburu states that stereo blindness “is estimated to affect 3 to 15 percent of the population” (Mendiburu, 2009, p. 32).

The main stereographer faults include: edge violation, misalignment, retinal rivalry, and keystoning. Edge violation is the most common issue and it is when the composition cuts off a subject in negative space by the frame of the camera. This is important to note because negative space is often mentioned in the sections below. This fault is inconstant to depth logic, as the subject cannot be in front of the screen if the screen cuts it off, crippling the 3D effect. Misalignment is when the stereoscopic images are not aligned in vertical, rotational or zoom framing. Retinal rivalry occurs when the pair of images are not identical due to colour, focus or other artifact imperfections. Keystoning is when the camera rig operator has over increased the interaxial and convergence to the point that the object being captured is skewed.

The main display faults include: ghosting/crosstalk, psuedoscopic, and flickering. Ghosting or crosstalk appears during playback after the fusion of the stereoscopic images. With 3D glasses on, if parts of one image leak into the other it causes double vision or a softer picture. Many of the figures in the close readings section below are in anaglyph and are prone to ghosting or crosstalk. Psuedoscopic occurs when the stereo images have been swapped, which causes an inversion of depth. Flickering is caused by the viewer noticing the active shutter glasses as they blackout each eye.
Chapter 3.

Literature Review

3.1. Poetics

The Oxford English Dictionary defines poetics as “the aspect of literary criticism that deals with poetry; the branch of knowledge that deals with the techniques of poetry” and also tributes Aristotle’s “treatise on poetic art” (“Poetics,” 2015). In the fourth century, Aristotle brought us a study of storytelling and original ideas of uniting “plot”, “reversal of the situation” and “character” of classic Greek works. He uses a form of textual analysis, gathering information he gained from observing these works and presenting conclusions based on these observations. Although the word ‘poetry’ is used, Aristotle mentions “general conception modes of imitation” (Aristotle, 1951, p. 7) which applies to works today across many media such as drama, music, film and art.

David Bordwell explains the word poetics in Cinema of Poetics from the time of Aristotle. Translating the term as “derived from the Greek word poiesis, or active making”, Bordwell defines poetics as a domain that examines how works are constructed and designed. These works are “composed and contain functions, effects and uses.” Those who question, study or review “artifacts in any representational medium” in their construction or processes are examining the poetics of the works (Bordwell, 2007, p. 12).

Bordwell categorizes the term further as he describes an array of poetic types throughout art history including: “analytical, theoretical, historical, reason and generality, and alternative.” Analytical poetics focuses on the specific “devices” in a work or in the work as a whole. Theoretical poetics arrange the “conditions” in the works domain. Historical poetics is to recognize how works undertake “certain forms” in time. A poetics
of reason and generality accommodate the artist to promote “universal truths.” Alternative poetics is about the beauty in “unique forms” of the works (Bordwell, 2007, p. 12-13).

Bizzocchi and Tanebaum further uncover poetics as they state, “In order to fully understanding a medium is to have a deep understanding of how it functions in praxis” (Bizzocchi & Tanenbaum, 2011, para. 38). They also rely on a form of textual analysis – the detailed process of examining and re-examining the particular work to obtain understanding.

Samuel Henry Butcher, who translated and edited a version of Aristotle’s Poetics, writes, “Aristotle’s theory has regard to the pleasure not of the maker, but of the ‘spectator’ who contemplates the finished product” (Aristotle, 1951, p. 207). In other words, poetics are described as the design and construction of the work specific to the work and its domain.

3.2. Poetics of Cinema

Joseph V. Mascelli brings an overview of the original foundations of cinematic techniques in the art of filming motion pictures. The five C’s are: “Camera Angles, Continuity, Cutting, Close Up and Composition”. These five categories working together act as a service to the cinema of narrative. Camera angles, cutting and composition are of particular importance within 3D cinema as these variables shape the spatiality of the film. Herbert Zettl’s Sight, Sound, Motion: Applied Media Aesthetics aligns well with Mascelli’s concepts, outlining a similar set of major aesthetic imaging elements, depth cues and traditional cinema techniques.

Camera angles relates to the design, framing and function of film shots. “A carelessly picked camera angle may distract or confuse the audience by depicting the scene so that its meaning is difficult to comprehend” (Mascelli, 1998, p. 11). Overall there are three types of camera angles: “objective, subjective or point of view” (Mascelli, 1998, p. 13); Mascelli makes it clear that placement is determined by narrative significance stating “the best position for viewing the action occurring at that moment in
the narrative” (Mascelli, 1998, p. 51). As filmmakers focus on the camera position for the service of narrative, they are building the space within the story world. Mascelli states, “the cameraman must record a three-dimensional world on a two-dimensional film surface,” (Mascelli, 1998, p. 34) confirming that depth effect is related to the placement of the camera. He also lists some two-dimensional depth cues such as occlusion and perspective as well as classic cinema practices like lighting, camera and player movement, and use of short focal length lenses. Then he clearly tells us “the most effective method to record depth, however, is by choosing the proper camera angle” (Mascelli, 1998, p. 34). Zettl’s “forces within the screen” are a more technical guide to designing the scene frame by the camera angle. For instance, the cameraman can use horizontal lines to make the scene feel “calm” where tilting the camera and adjusting the horizontal line can “intensify the feeling” of anxiety and tension (Zettl, 2011, p. 104). Mascelli expresses camera angles as “the most important factor in producing illusion of scenic depth” (Mascelli, 1998, p. 34).

Mascelli also references spatial construction in his discussion of the operation of the "180 degree" rule to build a cinematic space that is not confusing for the audience. He reminds filmmakers that once the positions of subjects are established that they need to be consistent. If the character travels left leaving the frame, then they should appear in the next frame on the right side, traveling left to continue the motion. A new camera angle for the next frame may treat the space differently, but the characters actions should remain the same. Mascelli speaks of “action axis and screen direction ... by placing the camera anywhere within the 180-degree arc” (Mascelli, 1998, p. 109). The camera can be placed anywhere as long as it does not cross the line after selecting to frame from one the side of the subjects. The subjects screen direction should remain the same during the sequence. The filmmaker must follow the rules of the 180-degree arc otherwise it may look an “obvious mistake” (Mascelli, 1998, p. 110) and should be avoided unless it is deliberate.

Cutting is the role of the film editor, who is responsible for assembling the raw footage into the final product. The raw footage was once just moving images, but now includes sound and computer graphics. Action to action cutting relies on the other members of the film team to make sure the footage meets the requirements that are
“technical, aesthetic and have narrative” sync (Mascelli, 1998, p. 168). The editor sequences images in an order that make sense with each other to build the appropriate story world space. “It is possible to cut away at anything happening anywhere at any time” (Mascelli, 1998, p.161) but cutting on the action “so that the actual switch from one shot to another is masked by the action” (Mascelli, 1998, p. 157). Zettl’s “vectors” are recognized by on screen elements that specify the direction of the action. For example, perspective lines of a building, characters pointing, the specific direction of a characters gaze or action can direct the viewer’s attention (Zettl, 2011, p. 122). The goal of the film editor is to “make the audience care” so “each [selected] shot should make a point” (Mascelli, 1998, p.169). If done carefully, the viewer can be immersed in the film.

In Mascelli’s discussion of composition, he states “Good composition is arrangement of pictorial elements to form a unified harmonious whole” (Mascelli, 1998, p. 197). The combination of lines, forms, masses, and movement to unified frame balances help form the “center of interest” (Mascelli, 1998, p.214). The depiction of cinematic space is crucial, and he counsels filmmakers to “compose in depth for a three-dimensional screen appearance” (Mascelli, 1998, p. 244). He includes a list of 2D depth cues such as size, perspective, motion parallax, lighting, tonal values, colours and selective focusing to define stage depth. Zettl works similar ground, writing about the relationship between the camera, the subjects, the visual forces within the frame and the overall effect of the composition. Positioning the camera frames and staging the scene guides the manner in which the viewer experiences the shot. The organization of the frame also creates space within the image and allows the audience to mentally complete the visual information (Zettl, 2011, p.125-126). Eisenstein sees the versatility of cinematic composition to shape the exact nature of a given shot or a series of related shots within a sequence (Eisenstein, 1949, p. 40-41). He also stresses the potential power of composition with his concept of a single-shot montage-effect through compositional "conflict within the frame" [see figures 1-5 after p. 52 in his book Film Form: Essays in film theory] (Eisenstein, 1949, p. 54). For all of these film scholars, composition is the overall framing of visual cues within the film, which build the spatiality of the story world.
The critical poetic of stereoscopic cinema is the treatment of the z-axis. The x and y axes are the width and height of a frame, but the z-axis refers to the depth. In monocular cinema, the z-axis is within the flat surface of a screen. Cinematic techniques such as depth of field, focal length, camera motion, subject motion and camera position have been used to build compelling z-axis spatial presence within flat images. The large number of available 2D depth cues give the visual representation of the z-axis within the composition. Camera lenses support these 2D visual cues, adding optical “depth characteristics” such as foreshortening perspective (telephoto lenses), exaggerating perspective (wide angle lenses), or the amount of depth of field (focal length and aperture). These are powerful tools for the design of space even within monocular cinema: “Although the third dimension is illusionary, it proves to be aesthetically the most flexible screen dimension” (Zettl, 2011, p.173).

The stereoscopic experience can expand or compress film space even more dramatically. Zettl defines the z-axis dimension as seeing depth at the screen plane and beyond. In stereovision, he explains “the z-axis extends not only from the screen surface back toward the horizon but also through the screen toward the viewer” (Zettl, 2011, p. 157). Eisenstein sees the combination of the stereo-paired images as an optical phenomena whose task is consistent with the fundamental perceptual and aesthetic dynamic that underlies cinema itself – the combination\(^3\) of images (Eisenstein, 1949, p. 49-50).

3.3. Narrative, Attraction and Embodied Cinematic Experience

Narrative is a powerful cultural and psychological phenomenon. Polkinghorne examines the pervasive nature of narrative, citing Barthes who tells us "narrative is present at all times, in all places, in all societies" (Polkinghorne, 1988, p. 14). In *Film Art: An Introduction*, Bordwell and Thompson define the fundamentals of storytelling and

\(^3\) When discussing cinematic "combination", Eisenstein generally prefers the stronger terms "collision" or "conflict" to "combination", but when discussing both monocular persistence of vision and stereoscopic fusion, he uses the term "superimposition".
filmmaking narrative as a “chain of events in a cause-effect relationship occurring in time and space” (Bordwell & Thompson, 2013, p.73). They build upon this definition to describe the relationship of plot and story. The plot “guides the viewer in building up a sense of all the relevant events” and is presented to the audience by the discretion of the filmmaker. The story on the other hand, is “the chain of events in chronological order” or simply put, ‘what happens’. The same story can be presented in different ways – perhaps relying on standard time order, or perhaps inserting flashbacks into the story as told, shuffling the sense of time. Despite these temporal modifications to the plot, “we arrive at an understanding of the underlying story”. In the end, “the filmmakers have built the plot from the story, but viewers build the story from the plot” (Bordwell & Thompson, 2013, p.75). As viewers, connecting the dots by “identifying its events and linking them by cause and effect, time and space”, the filmmaker has “a huge array of choice for guiding the viewer’s experience of the film.” Causalities are most often driven by characters’ traits and motivations that “create causes and register effects” and they take place within the story time and effectively using the story space. Good storytelling in any medium uses the progress of interesting characters through a chain of connected events to draw us into the narrative experience. This allows us to engage in ”the willing suspension of disbelief” (Coleridge, 1891, p. 145) and our subsequent immersion within the narrative experience.

The narrative space is the stage within which a story unfolds. In traditional filmmaking, the frame is presented as a “flat array of colors and shapes.” – but the details of this flat array are very highly designed to create a story world that supports our understanding of plot, but also our connection to narrative environment, character development, and emotional intent. Throughout the history of the cinema, there are “many cues for guiding our attention and emphasizing elements in the frame.” Screen space, is a term that Bordwell and Thompson use for the space within the frame. The screen is flat, so the use of “mise-en-scène” organizes “two-dimensional” composition of “shapes, texture and patterns of light and dark” which give the audience “cues” to understand the “three-dimensionality of the scene.” The cues noted are “movement, colour differences, balance of distinct component and variations in size” (Bordwell & Thompson, 2013, p.146). The use of depth cues along with cinematic imaging decisions construct spatiality.
As powerful as narrative is in the experience and the history of cinema – it is not all there is to the medium. Eisenstein adapted the idea of "attractions" – theatrical moments that have a direct "effect on the attention and emotions of the audience". Eisenstein felt that such "attractions" had a definite role in the construction of cinematic montage sequences (Eisenstein & Taylor, 1998, p. 35). Gunning saw that this phenomenon of attraction was the dominant form in early cinema – which he labeled the "cinema of attractions". The "cinema of attractions" pre-dates the cinema of narrative, and attractions dominated the first stage of the medium. These attractions could be based on the content of the shot – an exotic landscape or an interesting event. They also could be based on the attraction of a new cinematic technique or an innovative cinematic technology. In fact, at the beginning "cinema itself was an attraction" (Gunning, 1990, p. 58) and the public went to exhibitions to see the “newest technological wonders”. Similar to Consumer Electronics Show (CES) today, guests are in awe over “inciting visual curiosity” and gain “pleasure through an exciting spectacles” (Gunning, 1990, p. 58). In the late 1800’s, cinema was a new technology and stood as a pure attraction. Gunning continues to explain the early films novelty was imagery of “close-ups, or trick films” (Gunning, 1990, p. 58) and they manipulated the existence of time and space. For instance, the "close-up" or "slow-motion" could be considered an early special effect because that sort of view is abnormal in actuality.

The ability to "show something" was a conception that “dominated cinema until about 1906-7” (Gunning, 1990, p. 57). As cinema grew and developed, storytelling became the dominant way of filmmaking and has been ever since. However, Gunning maintains that “the cinema of attractions does not disappear with the dominance of narrative, but rather goes underground, both into certain avant-garde practices and as a component of narrative films”. Hollywood filmmaking revolves around genres such as action, adventure, dramas, horror/thriller and comedy romance, which are mainly narrative. There is a hero, villain, and/or a love interest. Nearly all genres of film have all become a “synthesis of attractions and narrative” (Gunning, 1990, p.60). The example given by Gunning is “the chase film” from the early 1900s but let’s parallel that to the early 2000s film, *Catch me if you can* (Spielberg, 2002) nearly a century later. The basic story is that a successful con artist acquired himself millions of stolen funds, which also clinched the number one slot on an FBI agent’s capture list. While the narrative unfolds,
the audience is delivered an assortment of spectacles, or “wow” moments as the FBI agent is always one step behind the charming con artist.

Henry Jenkins writes about an attraction-like mediated moment he calls the “big wow”. Jenkins refers to the design of the presentations within vaudeville. He says that “vaudeville was not about telling stories … it was about the spectacular, fantastic, and the novel”. He clearly defines the big “wow” as the “moment of peak spectacle and maximum emotional impact” (Jenkins, 2007, p4). Like Gunning, Jenkins also refers to Eisenstein’s essay "Montage of Attractions," expressing that cinema might learn from the thrill of spectacle performances. Eisenstein points out that in the theatre, these "attractions" are “emotional shocks” which subject the spectator "to a sensual or psychological impact" (Eisenstein, 1974 p78).

Powerful cinematic moments, whether narrative-based, attraction-based, or both, can affect us in a visceral sense. Vivian Sobchak maintains that film is a fundamentally embodied experience. Her perspective is a phenomenological one, based on a viewer's observations of her own experience inside the media moment. A response to a sad film may cause crying, which triggers even deeper emotions for the viewer. Sobchack says that “more than any other medium of human communication, the moving picture makes itself sensuously and sensibly manifest as the expression of experience by experience” (Sobchack, 1991, p.3). The experience of the viewer is an embodied experience, and this embodied reaction reflects the experience as expressed within the film. Laura Marks agrees – in her book The Skin of the Film: Intercultural Cinema, Embodiment and the Senses. Marks argues for what she calls cinema's "haptic visuality", claiming that "vision itself can be tactile, as though one were touching a film with one's eyes" (Marks, 2000, p. xi). Miriam Ross maintains that stereoscopic cinema is even stronger in that direction. She claims that 3D can amplify the embodied cinematic experience: “3-D cinema asserts an uncontrollable, infinite depth in its image, producing a hyperhaptic visuality” (Ross, 2012, p. 334). The enhanced perception of depth through stereopsis rather than traditional mise-en-scène depth makes 3D a richer perceptual experience and therefore the phenomenological connections are more intense.
Stereoscopic films include all these domains of mediated design and experience. A 3D film can usefully be analyzed for its construction of narrative, and for its presentation of "attractions". An "attraction" can be the visual draw of the technology itself. Stereoscopy is still a relative novelty among our moving image alternatives. New stereoscopic and related technological advances such as high dynamic range (contrast), faster frame rates, and higher resolution imagery are attractions in and of themselves. At the same time, an "attraction" can be the attraction of content – such as a spear coming out of the screen into deep negative space and visually threatening the audience. The strongest of these attractions can have a pronounced embodied reaction – we may flinch as the spear is thrust towards us. But even the less dramatic use of 3D can and does enhance the richness of our phenomenological experience of the moving image.

3.4. Digital Media Theory

Lev Manovich examines a wide range of New Media forms and concepts relevant to this research: the general use of computers in media, the digital moving image, 3D computer graphics, and digital media space – among others. He summarizes key differences between old and new media, yet he also recognizes important connections that shared between these categories. He uses cinema as his preferred example when he identifies "principles [that] are not unique to new media and can be already found in older media technologies" (Manovich, 2001, p. 50). When describing the physical interface of a movie theatre (or viewing screen), he uses the metaphor of "a window opening up into a virtual 3D space" (Manovich, 2001, p. 73).

His two conceptions of "montage" are important for the understanding of traditional cinema and its relationship to the new digital cinema. He first describes traditional film editing or temporal montage, as the “technology for creating fake realities” (Manovich, 2001, p. 148) deceiving the viewer as it creates the illusion of space and time. Consistent with Eisenstein's original formulation, he extends the concept of "montage" and identifies two basic approaches for this construction of illusion. The first is temporal montage, which “separate realities from consecutive moments in time” (Manovich, 2001, p. 148). This form has been the dominant form of montage in traditional cinema. The second form he calls "spatial montage", as he extends
Eisenstein’s concept of “conflict within a shot” to include cinematic technique that explicitly combines more than one image element within a single shot. An example is a split screen and it has been used as early as 1903 in The Life of an American Fireman (1903) when “a dream appears over a man’s sleeping head” within the same frame (Manovich, 2001, p. 148). Manovich positions “spatial montage” as the opposite to the traditional, temporal sequential montage that staged a series of single and complete images within the frame of the screen. The simplest representation of spatial montage is: “two images at once, positioned side by side” (Manovich, 2001, p. 322). The examples of split screens in cinema range from the 1920’s through the “expanded cinema” of the 1960s (Manovich, 2001, p. 323) and into the 2000’s. Spatial montage allows the viewer to see multiple frames, spaces, or visual elements – at the same time. This allows – and often forces – the viewer to scan the shot and construct their own visual and thematic synthesis. These images are therefore “attention demanding” and are often hypermediated as the viewer becomes actively aware of the multiple acts of representation.

Jay David Bolter and Richard Grusin organize and discuss these concepts of remediation, immediacy and hypermediacy. They explain how “new media” is produced by the refashioning of “older media” (Bolter & Grusin, 1999, p. 14). Remediation occurs everywhere, as all media contain representations drawn from other media. “Introducing a new media technology does not mean simply inventing new hardware and software, but rather fashioning (or refashioning) such a network” (Bolter & Grusin, 1999, p. 19). For instance, television remediated film and radio by making elements from each and making something new. Similarly, photography remediated painting. Remediation can work in both directions. It can be the use of an older medium within a new medium. A character in a film watching a newscast would be an example of remediation, “as if the content of the older media could simply be poured into the new one” (Bolter & Grusin, 1999, p. 45). It can also work in the other direction: older media can incorporate concepts and dynamics from newer media. The increased use of split-screens in digital cinema in some ways reflects the multi-windowed universe of the computer desktop.

They use the same term (“remediation”) in a different way – the dynamics between two distinct user experiences: immediacy and hypermediacy. Immediacy is
when the viewer or user has lost awareness of the medium and is immersed within the content. While watching a film in the cinema, immediacy results from the viewer being captivated in the storytelling, and at the same time not thinking about the medium. In this case, film techniques such as special effects or intrusive editing could draw the viewer away from immediacy into a state of hypermediacy—an awareness of the mediation. Another example is sitting at a computer monitor using a software application on a specific task. Immediacy occurs when the user is not aware of the use of tools such as the mouse, the keyboard or menu commands. The rationale for the graphic user interface and its associated conventions is that “Immediacy is supposed to make this computer interface ‘natural’ rather than arbitrary” (Bolter & Grusin, 1999, p. 23). The more invisible and less intrusive these tools are for the user, the higher the level of immediacy that can be experienced.

Hypermediacy is the opposite of immediacy. Hypermediacy occurs when the user is consciously aware that she is engaged in or directly interacting with a mediated experience. “The logic of hypermediacy acknowledges multiple acts of representation and makes them visible” (Bolter & Grusin, 1999, p. 33). In cinema, the mystery film genre is hypermediated by design. The audience obtains clues, develops hypotheses and tries to solve the mystery. They know they are trying to “solve” this mediated puzzle, and they are aware they are in a mediated experience. This conscious act of puzzle solving and direct intellectual engagement is the point of the mystery film. This ongoing dynamic between immediacy and hypermediation can play an important role in 3D cinema, as the viewer oscillates between the immediacy of narrative, and the hypermediation of 3D cinematic “attractions” or “wow” moments.

Immersion and the dynamics of immediacy/hypermediacy have a complicated relationship. Janet Murray defines immersion as “the sensation of being surrounded by a completely other reality” (Murray, 1997, p. 98). She uses the metaphor of the physical experience of being submerged in water and how we seek the same feeling psychologically—“a mere flooding of the mind with sensation, the overflow of sensory stimulation experience” (Murray, 1997, p. 99). She maintains that we can find immersion within the immediacy of story, or through a more hypermediated “active creation of belief” (Murray, 1997, p. 110) within interactive media.
Laura Ermi and Frans Mäyrä look at games and identify three types of immersion: sensory, challenge-based and imaginative. Challenge-based immersion relies on the experience of a flow state built through the successful exercise of skill against the game's challenge. This immersion can be seen as a combination of or an oscillation between immediacy (success, reward, and "flow state") and hypermediacy (conscious decision-making). Ermi and Mäyrä’s other two types of immersion have a much stronger connection with the experience of 3D cinema. Imaginative immersion is their label for narrative immersion and Samuel Coleridge’s "suspension of disbelief". Theatrical 3D films share in this commitment to story immersion, and will try to use stereoscopic design to support narrative and story world. Sensory immersion is also relevant to the 3D cinema. Ermi and Mäyrä relate sensory immersion to the “audiovisual execution” (Ermi & Mäyrä, 2011, p. 7). The more sophisticated game platforms have higher states of image, sound, and even direct haptic experience. 3D cinema is also a richer state of visual experience, an experience so visually intense it can have even stronger haptic engagement than other films. As the cinema is a place where viewers can disconnect from the real world – surrounded by sound and a large dimensionally distributed imagery – they can become “entirely focused” within the “world and its stimuli” (Ermi & Mäyrä, 2011, p. 7) resulting in a sensory immersive state.

3.5. 3D Cinema Aesthetics

3.5.1. Negative and Positive Parallax

“2D filmmakers work only in terms of [screen] width and height, otherwise known as the x- and y-axis, working in 3D means they can also work with depth – or along the z-axis” (Pennington & Giardia, 2013, p. 15). The parallax between the left and right image develop the depth seen in the screen space through the z-axis of the frame. The convergence point is the screen plane itself. The visual 3D environment also includes "positive space" and "negative space". Positive space extends behind the screen away from the audience. In front of the screen or closer to the audience is referred to as negative space. This audience space is where viewers most strongly feels the 3D depth as objects come out or jump at them. The depth of the scene is dependent on the
configuration of screen parallax (along with a few other elements) and will effectively give volume or realism to the character. For instance, if there was a close up shot on a character’s face – as the cameras separate, the left and right images will have more information from each side of the face giving volume to the image. In 1982, Lipton illustrated how generating stereoscopic cinema can become extremely technical, measuring the cameras focal length and angle of convergence versus the distance to the subject (Lipton, 1982, p. 98). Perhaps there’s a simpler way to get the effect. Alain Derobe a French stereographer conceived the 3D term “natural depth” (Pennington & Giardia, 2013, p. 77). Instead of concentrating on the technical aspects of 3D like Lipton, he combines wide focal lengths with small camera interaxial and positions most of the cinematic space behind the screen plane in positive space. The stereo image is viewed live and adjusted on the fly to target the “nature depth” and construct the 3D effect to correspond to human vision to provide a realistic feeling depth. Wim Wenders who directed Pina (Wenders, 2011) replicated the technique by using wide focal lengths – “about 80% was shot on 10mm, about 20% on the 14mm” (Pennington & Giardia, 2013, p. 78). Wender’s attempted to achieve a “natural, pleasant feel” to closely “represent a human point of view … slow lateral movement was found to increase the depth perception and Wedners used this technique in preference to static camera positions” (Pennington & Giardia, 2013, p. 78). These techniques on natural depth with slow lateral movement are of many variations for creative cinematic space.

Negative and positive parallax create stereoscopic depth. According to Ang Lee, “It’s not like the depth you see in real life, but it’s not flat either – it’s its own thing” (Lee, 2013). Stereoscopic 3D cinema is not a new medium, but it’s still finding its way. Space and volume in 2D films can be created by several cuts, using close ups and wide shots to reveal the sense of depth. A 3D medium gives filmmakers more options for the depiction of space. Ang Lee explains by putting the main character in negative space and shooting over his shoulder: “the point of view becomes over the shoulder, and you envision yourself doing it” (Lee, 2013). What happens over several shots in 2D can be produced in one shot in 3D. Peter Jackson, Director of The Hobbit trilogy claims “that extra ability to control depth [allows the filmmaker to] devise ways in which it can become part of the storytelling”. The example he gives is “in Mirkwood, we really play on the fact that it’s a forest that’s kind of hallucinogenic almost – it draws you in – it makes
you part of that and you may never get out” (Jackson, 2011). The ability to aesthetically control negative and positive parallax to give that surreal experience will become part of the norm during 3D feature films.

3.5.2. Roundness

Trying to determine the size, speed and direction of objects in real life can be problematic unless there are depth cues in the surrounding area. A professional baseball player can often miss a fly ball because the backdrop is the sky with limited reference points. Similarly, in the stereoscopic world of 3D, roundness is more of a subjective perception rather than a quantifiable value. Images that have roundness look more natural to the viewer. It is supported by the 2D and 3D depth cues – there is no roundness knob that one would turn up to get more spatial volume. The combination of interaxial distance and convergence along with other cinematographic decisions that come together and create the volume of an object in the shot. As Mendiburu explains, the “roundness factor” is certainly a tool in the stereography’s “artistic palette”. The filmmaker has a great challenge in blending all these variables to create the appropriate impression of roundness. “Flattening the characters has an emotional impact and can be used as a statement of their inner feelings” (Mendiburu, 2009, p. 118). Although there are different situations that will have different results with individual audience members, roundness is an aesthetic quality. Lipton agrees, saying “actors quite clearly are not part of the background, but separate from it; they are rounded, not flat, and they look like the human beings we see everyday” (Lipton, 1982, p. 53). Flueckiger states that it is “equally important” to consider the “focal length of the camera lens” to affect roundness. “Lenses with long focal lengths compress the space in a scene” (Flueckiger, 2012, p. 104).

Different focal lengths have an influence on the weight of the scene. As with any cinematic poetic, these variables of roundness and depth can be used to their extreme, in order to distort the image where this fits the needs of the film.

The camera position mixed with framing or the mise-en-scène will develop the prominence of a subjects or characters. The lens choice is an important decision for the visual because it is interconnected with the distance of the subject for a given “on-screen size”, which is also “linked to the interaxial for a given 3D effect” (Mendiburu, 2009, p.
Generally, wide lenses are used with petite difference of interaxial to give a comfortable 3D image for a scene on a smaller set. It gives volume to the surroundings and a more natural representation of depth to multiple objects in the scene, where longer lenses would work differently. Atkinson states that “longer lenses are used to set depth and to accentuate distances between the characters” (Atkinson, 2011, p. 150). Viewers may experience a cardboard effect when longer lenses are used with multiple objects in the scene. The depth is intensified with the longer focal length give more perceived depth between subjects or characters. They then pop like cardboard cut-outs because the long lenses flatten the details. The subject may appear natural but they emerge at very distinct layered depths. Lipton settles that “these longer focal lengths and longer subject-to-camera distance” will affect the visual and the “interaxial setting can provide natural-appearing photography” (Lipton, 1982, p. 44).

The camera position and framing do indeed work together to illustrate the depth as Flueckiger says it’s “caused by an unfavourable ratio between object distance and interaxial disparity” (Flueckiger, 2012, p. 108). For example, the 3D will look more natural if a wider interaxial is used when the camera’s positioned farther away like on a sideline of a sporting event. Similarly, a small interaxial can be used for a close up but the camera should be positioned nearer equipped with wide lenses. The two wide lenses on the stereoscopic camera rig would wrap around the character more aiding to their roundness. Mendiburu speaks of “orthostereoscopy” being on of the most on-going “myths of stereography” where the two lenses have to be 2.5 inches [65mm] apart to “replicate the human interocular distance,” the averaged interocular distance (Mendiburu, 2009, p. 78).

The overall feel of the 3D in this show [Oz: The Great and Powerful] achieved natural volumes, with a handful of fun 3D moments reflecting Sam Raimi’s vision for the film. Our cinematographer, Peter Deming, selected a shorter lens palette than most films I have worked on, so achieving natural roundness was a relatively straightforward process because his subsequent framing choices significantly benefited 3D. I am as much a fan of beautiful bokeh as anyone else, but the process involved to get such bokeh tends to subtract from the ability to get good 3D, and I was happy that when we needed a close-up in this movie, our cameras actually got closer to the subject (Eric Deren as cited in Block and Mcnally, 2013, p. 186).
There are many variables involved including screen size, the position of the
viewer and the distance between their eyes. The perfect metrics on one screen may not
be the same on another. Individuals are a little different and may have wider or thinner
interocular. The audience member also has to be conscious of where they are seated in
the theatre. For example, sitting along the side of the theatre may warp the object from
being round to being elongated or stretched, as a ball to an egg. Likewise, sitting closer
or further from the screen will have individual roundness outcomes. Lipton observes that
“Most people have no trouble fusing images with a parallax of -65 mm, but those sitting
in the closest seats will have a harder time fusing the image than those father from the
screen, since angular measure of parallax is the significant factor” (Lipton, 1982, p. 200).

As technical roundness can be, it remains as a subjective perception and an
aesthetic of stereoscopic 3D cinema creative toolbox. Visual effects supervisor, Rob
Legato, talks about Martin Scorsese on the set of Hugo (Scorsese, 2011), “Marty would
talk about 3D on set more in terms of ‘I’m not feeling the depth’ or ‘I want more’ or ‘that’s
too much,’ which is more or less the language of stage direction... A director needs to
see 3D, feel it, master and embrace it live and on set in order for them to stamp their
personality on it... It’s about using 3D as part of the whole set of tools that will now take
filmmakers to the next level of movie making” (Pennington & Giardina, 2013, p. 191).
The balance between focal length, mise-en-scène, interaxial and convergence creates a
number of creative decisions for the volume of the subject. As long as filmmakers keep
this sensation within the comfort zone of 3D, it will be a pleasurable image to look at.

3.5.3. Editing Pace

The length of shots within series is called pacing, also referred to as the
“rhythmic potential” of an edited piece. “Every shot is of a certain length, with its series of
frames consuming a certain amount of time onscreen” (Bordwell & Thompson, 2013, p.
226). Pacing has been re-emphasized in the last several decades – with fast-paced
 commercials, TV shows and films. The editing style can be dramatically emphasized
which guides the viewers in their emotional response to the scene. Editors design the
pacing length however a lot depends on the visual information given in any one shot.
The viewer needs a chance to see or register what’s going on in one shot before going
to the next one. A wide shot may remain on screen longer than a visually interesting close up of the same piece as it provides more information to the viewer. Judging how shot lengths are implemented also relates strongly to the subject matter. Traditionally, an action sequence has a series of very short shots to convey a breathlessness or tension. The reverse is equally true to a sequence that is meant to be calmer. For these shots, the editing pace is slower—perhaps to establish a tender romance or build a fascinating reveal representing the mood of the subject matter. Mendiburu suggests that the “increased visual complexity” of 3D images require “extended reading time” and engage “a smoother, gentler editing style than 2D”. The viewer needs time to read the extra layer to visual information in stereoscopic imagery. Atkinson argues that the audience needs a moment to adjust for the “depth effect” as the “convergence point will shift” between shots. Each cut is a “constant readjustment of the eyes” which demands the “narrative pace of 3D” to slow down and hold “shots on-screen for a longer period of time” (Atkinson, 2011, p. 151). Bill Westenhofer, one of the Life of Pi Visual Effects Supervisors states “There are only 960 shots in the entire two hour runtime.” This averages to about 7.5 seconds before the next cut, which is much longer than most films. Another Visual Effects Supervisor for Life of Pi, Guillaume Rocheron, talks about the challenge of immersing the audience into the footage with the Director Ang Lee:

“Ang decided to use long takes. Very often these action sequences are intense sequences you have a lot of fast cuts. It’s fast paced. It’s hectic and puts the audience in a certain mood but you don’t really see what’s happening. Ang went the opposite way. If everything goes that fast in 3D out on the Ocean and with all that complexity it is going to be hard to watch. Ang slowed everything down so the audience has time to look at everything” (Guillaume Rocheron as cited in Hogg, 2013).

Bruce Block and Philip Mcnally in 3D Storytelling: How Stereoscopic 3D Works and How to Use It write “If the audience isn’t given a little extra time in 3D to find the subject, they can miss important visual information (Block and Mcnally, 2013, p. 186). As always, the pacing decisions also depend on the relationship between visual information and the director's intentions for mood and experience. In Life of Pi, there are many beautiful visuals that Ang Lee has chosen to leave on the screen longer length of time.
3.5.4. Deep Focus

Bordwell writes that deep focus was a “major stylistic option in the 1940s and 1950s” (Bordwell & Thompson, 2013, p. 174). Bazin strongly prefers deep-focus and its ability to support composition in depth – the layering of relevant imagery along the z-axis within a extended depiction of cinematic space. He prefers this approach over montage in part because it more closely approximates our everyday visual reality. In the early days of 3D, deep focus was believed necessary for the audience to examine the scene and long takes allows their eyes to wander the deep focus. There’s a functional connection between deep focus and slow editing pace that allows the viewers to explore the space within the screen. Bazin notes that when combined with slow-paced editing, composition in depth invites the viewer to closely examine the image in order to understand the story and experience the film (Bazin et al., 2005, p. 35-36). Bordwell claims with “deep focus creates another set of options for guiding our eye … sound, elements of mise-en-scène, framing and composition,” (Bordwell & Thompson, 2013, p. 175) which several aspects relate to screen space.

However, recent films such as Avatar often have shallow depth of field, which many “consider a big no-no in 3D” (Gardner, 2009, para. 13). A stereographic advisor named Brian Gardner said, “Coraline was really the first 3D movie to explore soft focus through shallow depth of field” (Gardner, 2009, para. 13). The Director of Photography for Coraline felt that the use of shallow focus was an “incredible artistic tool” and just because the 3D community frowned on shallow focus – he “likes to use all the colors in the crayon box” (Gardner, 2009, para. 19). About a third of the film had scenes with shallow depth of field, which was implemented in order to support the storytelling. Mendiburu also states that shallow depth of field vs. deep focus is currently an undecided issue, as “equally respectable 3D cinematographers are brilliantly making the case for each approach” (Mendiburu, 2009, p. 97). It does seem clear that either method can work in 3D, depending on the subject matter and the filmmaker’s overall aesthetic goals for a particular film.
3.5.5. Depth Budget

The blueprint to control depth artistically and provide visual attraction within the narrative is the depth budget, score, and/or script. Mendiburu says, “the depth budget refers to the overall 3D of a movie” (Mendiburu, 2009, p. 84). These depth budgets are visually represented on a line graph where the y-axis is the amount of depth and the x-axis is the film's timeline. Brian Gardner suggests that it is essential to have a plan showing “where every major element is in space, relative to each other, and to the screen” (Gardner, 2009, para. 6).

**Figure 3.5-1 Depth Script Example #1**

![Figure 3.5-1 Depth Script Example #1](https://library.creativecow.net/gardner_brian/magazine_3d_storytelling/1)

Figure 3.5-1 is an example of a depth script from Gardner’s article. It shows multiple lines on a graph that specifically assess the amount of sought after depth. Atkinson explains a horizontally plotted line graph where as there are larger gaps between lines, the more depth perceived by the audience within the scene (Atkinson, 2011, p. 146). It allows visual representation of the scale of depth through the whole film distributing “wow” moments appropriately. Flueckiger says “that the primary goal is to
match the depth cues to the narrative development and by saving the most intense moments for dramatic nodal points” (Flueckiger, 2012, p. 119).

The depth budget is used in the film’s preproduction stage to maintain continuity and control over the depiction of stereoscopic depth. The chart can get complex depending on the level of detail incorporated. The individual lines can represent different characters, or points of attention, what’s the closest subject to the audience and how far the background is. The amount between the two furthest lines indicates the amount of depth in the scene. This is tracked in part to verify that the amount of depth stays within a comfortable level. In figure 3.5-1, negative space is the yellow line that follows the character (red line) closely. The positive space is the darker blue line in front of the backdrop of the sky (light blue line). The solid black line indicates the screen plane. The distance between the yellow and the darker blue line is the amount of perceived space for the viewer. If the entire film is presented with lots of depth, it could be an issue with viewer’s ability to watch 3D for long periods. In addition, there are horizontal lines indicating the shot to shot cuts which show how much the depth changes from one scene to another. The difference can be a smooth curved line, which slowly adjusts depth to a strong jagged line, which may be attention-grabbing sequence. Pennington and Giardina relate it to a musical score “outlining the amount of 3D at particular points in a script to underscore mood and emotion and to help tell the story” (Pennington & Giardina, 2013, p. 15). Recognizing the mood of each shot will suggest how 3D should be involved similar to the sheet music.

During the pre-production of Coraline, the filmmakers came together to discuss how stereoscopic 3D would affect the story.
"The 3D for Coraline had to complement their story. It couldn't be allowed to distract from it, nor just make it more 'real'. It was important for the audience to be immersed into the fantasy of these story worlds – so, my view of the 3D planning for Coraline was that the 3D had to be crafted to be emotionally immersive for the audience. The image above [Figure 3.5-2] shows two snippets from the actual Depth Script used on Coraline 3D. I've put these side by side in the graph, for discussion purposes" (Gardner, 2009).

The difference between the "Other World and Real World" in figure 3.5-2 is that the plotted line spikes in the other world. This reveals that the intention of the film's overall 3D design is to make the real world flat – as if the viewer was watching a non-stereoscopic film. The reintroduction of the 3D in the other world creates more interesting visuals, but also signals that these scenes are from a world different from Coraline's normal one. Gardner claims that the "shallowness and lack of excitement" in the real world was directly related to the state of the protagonist emotions, feeling "boredom" and "her shallow life there" in the real world. The jagged peaks during the other world show more stimulating visuals perhaps indicating the protagonist's attraction to the "larger-than-life other world" (Gardner, 2009).
Another example of focusing on 3D and the creative aesthetics while in preproduction can be found with Pixar’s team at Disney. *Up* (Docter & Peterson, 2009) was the first Pixar film to be presented in Disney’s Digital 3D and they focused closely on how 3D could be implemented creatively. During an interview, Bill Kinder, the Director of Editorial and Post Production at Pixar discusses that these 3D decisions were intended to work alongside all the films elements to aid the narrative.

"The team here that does that work is attuned to seeing 3D as a tool to support the storytelling of the film. They think about it that way, just like the Director of Photography thinks about staging and composition and lighting on any film supporting the storytelling. When you look at it that way, it is possible to use 3D to supportive effect, but again you got to start with a great story and characters and an entertaining film“ (Bill Kinder as cited in Crofts, 2011).

The goal at Pixar was to find the sweet spot of a comfortable 3D and one that is rewarding and different for the audience. They did not want the audience thinking about the lighting, staging, camera focal length, and depth of field. All of these variables make a movie richer, but they do not need to be overly implemented to point of audience awareness of technique. At times a foregrounded "cinema of attraction" or "wow" moment can certainly be appropriate, but Pixar did not want to overdo this. Their goal was generally to have 3D work as a supporting enhancement throughout the entire film.

The Director of 3D Production Josh Hollander, and 3D Supervisor Bob Whitehill on *Up* (Docter & Peterson, 2009) explain how they were using 3D “to mirror the journey” of the main character Carl. As Carl explores in the narrative, the audience observes the world “through his eyes". The space would be compressed during the “low emotional moments”, and then pushing the depth “when there’s action and fun". An example they give is when the characters are close to the edge of a cliff, there’s an opportunity to use a lot of depth when “the camera pulls up and over” revealing the height of the cliff “enhancing the story, showing the parallels of danger” (Hollander & Whitehill, 2009). Another example is when Carl reaches South America – “the fog clears and he sees these gorgeous waterfalls” (Hollander & Whitehill, 2009). The camera cuts to Carl’s point of view, which invites the audience to join Carl in awe. "We can really blow out the depth and sort of mirror his experience with the audiences experience” (Hollander & Whitehill, 2009). These moments of narrative punctuation do verge on the experience of cinematic
attraction, but they aren't intended to overdo this experience of "wow". The film's ongoing goal was to engage the audience subconsciously within the spatial representation and at the same time not reveal the implementation of stereoscopic depth as a technology.
Chapter 4.

Methodology

4.1. Questions of Meaning and Why Close Reading

The authors of Researching Communications: A Practical Guide to Methods in Media and Cultural Analysis review questions of evidence and questions of meaning when working with any kind of textual source. Although they use the word “text”, it involves a wide array of “any cultural product whose meaning we are trying to puzzle out.” They recognize the role of “interpretation as ‘reading’ cultural text” (Deacon et al., 1999, p. 21). They define the term “textual analysis” as exploring the ways that “language is deployed, how images, sounds and statistics are organized and presented, and where relevant, how these various elements are combined” (Deacon et al., 1999, p. 21). In Introduction to Film Criticism the authors state, “In addition to searching for meaningful themes, the humanist critic looks for excellence in the deployment of aesthetic elements” (Bywater & Sobchack, 1989, p. 40). Deacon describes the techniques of textual analysis to be detailed, “close-grained work” and can be used to examine “small selections of material” rather than the entirety of the works.

Looy and Baetans write about “reading” and “close” in their book, Close Reading New Media. “Reading is always an act of dismemberment, of tearing open in search of hidden meanings. ‘Close’ as in ‘close reading’ has come to mean ‘in an attentive manner’ … When close reading the eyes of the reader are almost touching the words of the text. Nothing is to escape the attention of the meticulous scholar. Every small discontinuity, contradiction or aporia is identified and written down for further reference” (Looy & Baetans, 2003, p. 9-10). Bizzocchi and Tanenbaum also detail the term close reading in their article Well Read: Applying Close Reading Techniques to Gameplay.
Experiences, as a “detailed examination, deconstruction, and analysis of a media text” (Bizzocchi & Tanenbaum, 2011, para. 1). “

A User's Guide to German Cultural Studies explains “how to view a film” by closely looking at three possible topics: “narrative and dramatic development, historical and sociological content, and form and style” (Denham et al., 1997, p. 458-459). Each of these three approaches is detailed with a list of questions. The historical and sociological content topic explores relationships of the historical time period to relationship of sociological stereotypical questions. The form and style topic explores all forms of the film’s existence from the marketing of the film, to director and cinematic techniques.

The goal of the close readings in this thesis is the examination, deconstruction, and analysis of specific scenes drawn from critically acclaimed stereoscopic 3D films. The digital moving image is rich with visual data, which can be examined with great detail. A single film shot can be inspected from a variety of analytical lenses: camera position, focus, mise-en-scène, character action, screen direction, lighting, relationship to adjacent shots, and many others as well. In addition to these standard cinematic techniques, the analysis relies heavily on the design and effect of creative stereoscopic decision-making.

When observing any image, the mind automatically uses depth cues to understand the space within the image. A basic example is when objects occlude each other, or lay along linear perspectives. “The visual world is, of course, not composed simply of figures organized two-dimensionally on a plane surface. Visual space is three-dimensional. Objects have depth, and they are located, phenomenally as well as physically, at various distances from the individual” (Dember, 1960, p. 169). Although filmmakers are thinking about how the 3D technology is used for the benefit of the film, the use of 2D depth cues need to be consistent and support the 3D experience. Therefore, whatever decision is made in 3D should be reinforced by 2D depth cues.

The effect of the stereoscopic presentation determines how the picture captivates the audience. One of the aims is to discover if there is an impact on the imagery that relates to the cinema of attractions. Another is if the stereoscopic image appears with more naturalness, which relates to the cinema of narrative. The goal in this
investigation is two fold: to shed light on how the filmmaker used 3D as a creative variable as well as construct an analytical framework (see 4.4) to follow to aid in understanding these conclusions.

4.2. Poetics of 3D and Spatiality

To analyze the poetics of stereoscopic 3D cinema we need to focus on the creative decisions involved in the making of these films. The construction and shaping of stereoscopic space is central to this process. Stereoscopic storytelling is continuously transforming as new films change the way moments in sequences can be presented and punctuated with the use of the technology. Creative uses of 3D can bring viewers to the edge of their seats, entertaining the audience as well as drawing them into the story world. These 3D spaces can certainly support the needs of storytelling but can also support cinematic spectacle and visual pleasure. Since the dawn of cinema, 3D has been around but its history has been scarred with inadequate technology and lack of effective practice. To identify the creative potential of 3D, a close reading method of detailed analysis was applied.

The process of viewing the films was intensive, rigorous, and highly iterative, as necessary in any research based on close reading. The readings were completed in a series of organized stages. At every stage, a number of iterative viewings were conducted, each with a clear goal: identifying and understanding the key poetics for the creative and expressive use of 3D within the cinematic experience. The guide for each viewing was the analytical framework (see 4.4) that I developed in collaboration with Professor Bizzocchi. This framework formed a set of lenses to give the readings both focus and consistency. These lenses allowed for a higher degree of rigour and clarity during all phases of the research: observation, description/annotation, and analysis. The process was highly iterative, with three distinct stages, and multiple screenings of each film or scene at each of the three stages. As the stages proceeded, the screenings and notations became progressively more detailed. The list of screened films is provided in Table A – Film Screenings of the Appendix.
For the first stage, each of the selected films was screened several times in its entirety. During this round of complete viewings I noted for each film the times of interesting scenes and visually expressive moments. The second stage of screenings looked at each of these selected scenes in closer detail. This was repeated several times for each scene. During this second round of viewing, initial rough notes were taken for each scene being screened. These notes were reviewed, and a final set of scenes was selected for the third stage of screenings. As in the previous rounds, each of the scenes in this final group was viewed several times, and progressively more detailed notes were taken for each scene. In order to be absolutely clear about visual content and composition details, and to track any relevant motion effects, much of the viewing in this third and final round was done in slow motion or even in single frame advance mode. In order to judge parallax and clearly identify the use of positive space and negative (audience) space, this final set of readings also included the use of screen captures from an anaglyph version of the film.

After the first stage, I decided to concentrate on native 3D live action (often enhanced through CGI) rather than animated films. This was partly because of my strong interest in 3D cinematography and partly because live action is more conducive to identify the dialectic between the cinema of narrative and the cinema of attractions.

The notes and observations from the final stage of the screening were accurate in their depiction of what actually happened on screen. These notes and observations were treated as data, and formed the basis for the analysis and argumentation in sections 5 (Close Reading), 6 (Discussion), and 7 (Conclusions).

4.3. Anaglyph Readings

The rigorous approach includes the review of "anaglyph" renderings of the selected films (see 4.5). A pair of overlaying images is called a stereo image. There are several ways to view a stereo image, including simple cross-eyed viewing with the naked eye, or through a number of projection/viewing systems: including active, polarize and anaglyph. Anaglyph is the description for colour filtered stereo images. Anaglyph comes in a couple varieties including amber/blue, red/green, and red/cyan. Red/cyan is the
most popular and was the one used in this paper. The concept is the overlaying of two images that are each filtered by these colours and each eye can only see one image. Due to colour being the filter for the two images, accurate colour of the image is difficult to achieve. For instance, with red/cyan glasses – the reds and blues are hard to show correctly with red being the most problematic as cyan is a mix of blue and green.

The advantages for using anaglyph stereo images are based on the simplicity of this system. Because the binocular disparity is based purely on color, anaglyph images can be shown on any standard video monitor with no special 3D capabilities. It is the best format to view 3D on printed-paper. Anaglyph glasses are relatively cheap and easy to find.

However, there is an added advantage for anaglyph viewing as part of the close-reading process. The anaglyph images are red and cyan, which makes it easy to identify which areas of the scene have positive or negative parallax. Figure 4.3-1 shows how these differing parallax effects are rendered in anaglyph.

**Figure 4.3-1 Anaglyph Illustration of Disparity**

![Anaglyph Illustration of Disparity](image)

The “how it is captured” illustration shows a square in front and a triangle at the back with the circle converged on by the left and right cameras. The “how it looks
rendered” illustration shows the square with the red outline on the right side, and the cyan outline on the left side. This indicates that the square is in negative or audience space in front of the screen. The triangle has the red outline on the left side, and the cyan outline on the right side. This indicates that the square is in positive or the space behind the screen. The circle doesn’t have any outlines, so it is placed at the screen plane itself – within the boundary between negative space and positive space. Depending on the roundness factor, each tip of the circle would present minimal red/cyan outlining. The distance between the red and cyan is the amount of depth that the viewer experiences. The triangle is slightly further away from the circle than the ball, so the red/cyan disparity is larger. Typically if the disparities are too large, the audience may have difficulty fusing the images.

The selected samples for the close readings were viewed and analyzed on an efficient system that included a 3D Blu-ray optical disk player connected to an LG 55” passive 3D HDTV with a set of industry standard passive glasses. Then the samples were transferred to anaglyph for further conclusions and included in the paper.

### 4.4. Analytical Framework Lenses

This table summarizes the analytical lenses used in this study. This is a set of relevant technical/visual 3D parameters, standard cinematic imaging decision, and their outcomes and effects. These lenses are tools – specific concepts used to describe, analyze, and understand the relationship between traditional cinematic creative parameters, stereoscopic creative parameters, and their effects on the film story and experience.
### Table 4-1 Analytical Framework Lenses

<table>
<thead>
<tr>
<th>Cinematic Imaging Decisions</th>
<th>Technical/Visual 3D Parameters (Expressive)</th>
<th>Effect on Narrative</th>
<th>“Cinema of Attractions” and Sensory Experience</th>
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<tr>
<td></td>
<td>Lens convergence</td>
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<td></td>
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<tr>
<td></td>
<td>• Effective roundness</td>
<td>• Effect on story world</td>
<td>• &quot;Wow&quot; effect</td>
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<td></td>
<td>• Varying interaxial distance</td>
<td>• Effect on story &amp; plot</td>
<td>• Visual experience</td>
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<td></td>
<td>• 63mm (normal)</td>
<td>• Effect on character</td>
<td></td>
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<tr>
<td></td>
<td>• Dwarfism &amp; gigantism</td>
<td>• Effect on emotion</td>
<td></td>
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<tr>
<td></td>
<td>• Distance as 3D variable</td>
<td>• &quot;Realism&quot; parameter</td>
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<td></td>
<td>• Focal length</td>
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<td></td>
<td>• Depth of field</td>
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<tr>
<td>Composition</td>
<td>• Camera position &amp; framing</td>
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<td></td>
<td>• Subject distance(s) &amp; layout</td>
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<td></td>
<td>• Motion &amp; blocking</td>
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<td></td>
<td>• Lighting</td>
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<tr>
<td></td>
<td>2D depth cues</td>
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</table>

### 4.5. Exemplary 3D Works

The films chosen for the close readings are: *Dial M for Murder* (1954), *Avatar* (2009), *Hugo* (2011), and *Life of Pi* (2012). These films were selected because they incorporated interesting and effective examples of the role that stereoscopy can play in the design and experience of cinematic images. In addition, the creative quality of these films has been recognized through critical acclaim, measures of viewer popularity, industry awards and the reputations of their directors.

Rotten Tomatoes is a website devoted to collecting film reviews from all critics and fans alike. “To receive a Certified Fresh rating a movie must have a steady Tomatometer rating of 75% or better” (Rotten Tomatoes, 2015). *Dial M for Murder* scored 88%, *Avatar* scored 83%, *Hugo* scored 94% and *Life of Pi* scored 87% (Rotten Tomatoes, 2015).

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4 Framework adapted and extended from an initial set of analytical lenses developed by my Senior Supervisor, Jim Bizzocchi.
The Academy Awards: *Avatar* had nine nominations and won Best Art Direction, Best Cinematography, and Best Visual Effects. *Hugo* had eleven nominations and won Best Cinematography, Best Art Direction, Best Sound Mixing, Best Sound Editing, and Best Visual Effects. *Life of Pi* had eleven nominations and won Best Directing, Best original score, Best cinematography, and Best Visual Effects (IMDB, 2015).

The Golden Globes: *Avatar* had six nominations and won Best Director, Best Motion Picture, Best Original Score. *Hugo* had three nominations and won Best Director. *Life of Pi* had three nominations and won Best Original Score (IMDB, 2015).

The British Academy Film Awards: *Avatar* had seven nominations and won Best Production, and Design Best Special Visual Effects. *Hugo* had nine nominations and won Best Production, and Design Best Sound. *Life of Pi* had nine nominations and won Best Cinematography, and Best Special Visual Effects (IMDB, 2015).

As *Avatar*, *Hugo* and *Life of Pi*, each won Best Cinematography and Best Visual Effects at the Academy Awards (IMDB, 2015) it is difficult to debate that 3D wasn’t an important part at the films’ inception.

The directors of these films are Alfred Hitchcock, James Cameron, Martin Scorsese and Ang Lee. Each of these directors have been nominated for Best Director several times over their careers; Hitchcock won it once, Cameron won it twice, Scorsese won it once and Lee has won it twice. Both Hitchcock and Scorsese won the lifetime achievement award from the British Academy of Film and Television Arts (IMDB, 2015).

### 4.6. Close Reading Goals

The close readings refer to the terms and items in the analytical framework to analyze the films with high-level concepts. First, the spatiality vision in each of these films and how they influence the narrative or celebrate cinema of attractions. An evaluation of the treatment of space considered how the 3D and 2D depth cues work together and build the spatiality that supports the film’s vision. Any other interesting
subject relating to the spatiality, aesthetic or poetic towards the domain of stereoscopic 3D cinema was also noted.

The goal was to identify and analyze specific forms of creative decision-making used to construct a stereoscopic cinematic space within each of these films. The examination of these creative processes hope to reveal the design of the stereoscopic visual decisions of screen parallax and convergence with the more standard cinematic use of composition, lighting and an array of traditional monocular two-dimensional depth cues.
Chapter 5.

Close Readings


5.1.1. Narrative Context

The narrative of *Dial M for Murder* is that Tony (Ray Milland) is an ex-tennis pro who deceivingly tries to murder his unfaithful wife, Margot (Grace Kelly). Tony is motivated by his greed for Margot’s money, and he resorts to blackmail in order to get Swan (Anthony Dawson) to be the hired hit man. When Margot kills Swan in self-defense, Tony responds by trying to direct both the police inspector, Hubbard (John Williams), and Margot’s lover, Mark (Robert Cummings) off his trail by convincing them that Margot intentionally murdered Swan.

5.1.2. Scholarly Context

Many scholars briefly examine *Dial M for Murder* as a valued 3D film from the mid-century cinema. Atkinson argues that the “first example of a feature film to use the medium of 3D for storytelling purposes was Hitchcock’s *Dial M for Murder*”. As the film was an adaptation of a stage play, the film’s style and framing is similar to a “proscenium arch.” Instead of “using the techniques of throwing images out into the audience” like “other examples at the time”, objects such as lamps and vases were framed like “the flats on the wings of a theatre’s stage” (Atkinson, 2011, p. 146). Allison, Wilcox and Kazimi also write that *Dial M for Murder*, “is a prime example of an engaging and compelling story” and that the 3D effect “is much the same as watching a stage play” (Allison, et al., 2013, p. 154).
Another widespread opinion is that Hitchcock saves negative space “to heighten the effect of dramatic moments in the plot” and draws attention on “objects of narrative significance within the plot” (Atkinson, 2011, p. 146). Flueckiger indicates Hitchcock’s 3D style was using 3D during the “greatest tension” moments in the film. For example, as in the murder sequence, “in which the scissors in Grace Kelly’s hand extend far into the theatre” (Flueckiger, 2012, p. 120). Dial M for Murder is of the popular example of a film that “restrain[s] protrusion” (Higgins, 2012, p. 197) for the goal of using 3D aesthetically.

5.1.3. Treatment of Space

In Dial M for Murder (1954) Alfred Hitchcock builds a story world space that is generally tight and constrained. There are a handful of shots that are exterior and don’t have any significant influence on the film. They are more or less transitional shots showing the actors leaving the apartment, for example, to a dinner party or to the police station. This transition style lends itself to further comparisons with the aesthetics of a stage play; the effect of the transition is similar to when the lights go down allowing the actors to transition to the next set. Furthermore, here, as in a play, the thrust of the narrative takes place in a few main interior set pieces.

In fact, the film is mostly set within one room. To keep things interesting, the filmmaker was able to adjust camera angles and positions throughout the dialogue to keep certain angles for certain situations. Several conversations between actors involve a lot of blocking and set design. Multiple camera angles as well as movements mainly involve push-in motion and pans showing the fourth wall to utilize the full rectangular space of the room. Using bottles and lamps in the foreground and doorframes or windows as backdrops, the characters are placed within the space of the room and the depth is built in between.
An example of extreme angles to make the space more interesting.

Alfred Hitchcock is no stranger to storytelling in tight quarters. Both Rope (1948) and Lifeboat (1944) were successful suspense films and were mainly confined in small environments as he plays with film structure and technique. Although the constricted space may be a challenge to work with, it allows for more creative use of the stereoscopic technology as it's significance is demonstrating depth.

5.1.4. 2D and 3D Depth Cues

Hitchcock’s Dial M for Murder (1954) was an adaptation of a successful stage play by Frederick Knott. Given that most of the story world is inside an apartment, the confined space resembles a theatre performance. Nearly all the action happens in the apartment of the protagonist’s living room with only a few shots taking place on the street. The majority of the film is presented in positive space, where all of the depth appears behind the screen. This results in the object closest to the audience to appear on the screen plane, where the two cameras are converging. Even though a single set for the duration of an entire film can feel tight, the use of wider focal lengths helps the depth present more volume. The film consists of moderately deep focus allowing the viewer to scan the different layers of depth permitting observation of what’s on the desk, hanging on the wall, or sitting on the mantel in the background. Mariam Ross agrees “Dial M for Murder constantly shifts between scenes that maintain a type of deep focus throughout individual shots and scenes that place background action out of focus in order to highlight specific character action” (Ross, 2015, p. 30). Like other stage play
adaptations, they are limited to the spatiality of the story world and stress the importance on character and dialogue.

The filmmaker’s ability to frame the dialogue in an interesting way keeps the attention of the audience, which parallels with the entertaining dialogue. Over the shoulder dialogue shots are a challenge in 3D as the actors can cause frame violation errors, though they can be adjusted with floating windows. In *Dial M for Murder*, there are very few over the shoulder reverse angles shots, which allow the film to avoid this problem entirely.

Throughout the film, the camera movements around the set props add to the spatiality of the apartment as the motion parallax occurs. “Slow and slightly curved lateral movements gently support the impression of depth by adding motion parallax. It seems that Alfred Hitchcock was well aware of this effect by implementing many traveling shots in his first and only stereoscopic movie” (Flueckiger, 2012, p. 118). Additional 2D depth cues such as occlusion and rim lighting also increase the sensation of depth. Objects occluding others show which objects are in front or behind, and the strong rim lighting gives definition to objects separating them from each other.

Most of the film is in positive space with strong 2D depth cues making the frame like a window. The 3D effect enhances the visual frame modeling characters and giving the perception of depth within. Hitchcock avoids the uncomfortable hurling of 3D objects into the audience, which was popular at the time. Instead, this reliance on positive space makes an easy shift for new viewers of 3D and focuses on punctuating the key moments of the films narrative in negative space. Hitchcock is bold as a formalist and gives attention to every creative decision. The new technology was used for a purpose in *Dial M for Murder* rather than ambiguously. However, the credits at the beginning and end of the film were created with pronounced depth. This could have been intended for another purpose, such as preparing the audience for a film in 3D.

5.1.5. **Poetics of Stereoscopic Spatiality**

As specified above, the majority of the film is located in the living room and to expand the confined space, Hitchcock used multiple camera angles, showing all four
walls of the room. This happens subtly at the beginning and the end of the film. The audience gets a good sense of the story world and experiences more than an audience view of a stage play.

Figure 5.1-2 Dial M for Murder – 02:26

Margot and Mark converse about their affair.

For example, early on in the film, Margot (Grace Kelly) and Mark (Robert Cummings) are discussing their situation as they are trying to hide their affair. Several times throughout the sequence, the scene cuts from one side of the room to the other.

The two-dimensional depth cues are presented throughout the sequence, as Hitchcock is a master of composition. The blocking of the actors as the camera motions around and the way they interact with each other is carefully designed. The locations of all the set props are deliberate while the two characters have a dialogue. As they move around, so does the camera allowing the audience to explore the room as well as listen in on the conversation.
In figure 5.1-3, his arrangement of space is very structured where the objects are placed in several layers throughout the frame. For example, there is a table with a statue on the left, the stray hat on the right, and Margot poking around the doorframe. The doorframe alone serves as a great example of how a shot can be organized with 2D depth cues splitting the living and bedroom. She is in sharp focus and well lit, where the other objects are softer and darker. The focus is on Margot even though she is smaller than the statue or hat. With the addition of 3D, the audience can see the depth between these objects and how far Margot travels from one room to another identifying the space. The z-axis into the screen is very noticeable in this film because of the 3D. The doorframe occluding Margot for a short period of time also enhances the depth layers.

When the scene cuts back to the living room in figure 5.1-4, the angle behind the liquor bottles appears. The position of the camera is unusual because the bottles seem right against the wall in figure 5.1-2. Hitchcock’s creative decision for this shot is a statement to heighten the technique of 3D. In David Bordwell’s review of *Dial M for Murder*,...
*Murder*, he finds the drinks are shown in the foreground “with striking 3D saliency” (Bordwell, 2012, para. 41) As stated above, this is early on in the film and the bottles show on the screen plane or even slightly in negative space giving a stronger stereoscopic effect. The bottles are in the position to familiarize the 3D effect during the drama to the audience whether or not it was intended that way. At the same time these liquor bottles are a narrative prop as there are parallels between drinking alcohol and the state of the couples affair: a sinful act.

**Figure 5.1-4 Dial M for Murder – 06:28**

![Screen capture, *Dial M for Murder* © 1954, Warner Bros.](image)

Margot and Mark continue their discussion

As the conversation continues from the angle behind the bottles, the spatial representation of the room expands as all walls of the room have been explored and the set decorations fill in the extra volume. This approach expands the confined space of the stage and gives depth to the objects and the characters in it. "Characters can now make a circuit around the entire set" (Bordwell, 2012, para. 42). The camera positions in figure’s 5.1-2 and 5.1-4 are from the same scene, but Hitchcock reveals all sides of the room.
5.1.6. Stereoscopic and Cinematic Goals

*Dial M for Murder* (1954) has relatively few instances that are in strong negative space, and they are used for moments of tension and dramatic importance. These are all at the story's pinnacle events – essentially punctuating these significant moments: The first is when Tony (Ray Milland) is dialing home to Margot; there is a big emphasis on the ‘M’. The second is during the climax of murder scene, when Margot reaches out into the audience for help. The third is when there is a plot twist and Tony's scheme is revealed once the inspector finds the key. Each one of these scenes has importance and it is evident when they occur.

*Figure 5.1-5 Dial M for Murder – 42:44*

Close up of Tony’s finger “dialing M for murder”.

The first example is when Tony dials ‘M’ to call Margot to her death – not only is this the title of the film, it is the preliminary action to the murder itself. The frame, figure 5.1-5 is an extreme close up of his finger near the rotary phone faceplate. The realistic distance between the numbers printed on the phone and the front face is centimeters, but the filmmaker exaggerates this by pushing the depth to the extreme. To do this macro shot, Hitchcock had to build a giant phone and use a massive fake finger, which
in turn, was also used as marketing item (Bordwell, 2012, para. 9). The spatiality of this shot is strong and was designed for the audience to feel the distance that Tony’s character must go to start the chain of events to murder his wife. The second example is the murder scene, which includes a suspenseful lead up with Margot walking up to and answering the phone. In figure 5.1-6, the overlapping frames in the anaglyph image shows that the stereo rig’s two cameras has an interaxial greater than zero. By further analyzing the frames, the blue outline is on the right side and the red outline is on the left side, this indicates that the subject is behind the screen in positive space. The closer these outlines are together, the closer the subject is to the screen plane. The further these are away will show increased depth either away or toward the audience. The thin outlines suggest that Margot is close to the screen plane.

**Figure 5.1-6 Dial M for Murder – 43:15**

[Image of Margot on the phone, with a dark backdrop.

Margot is lit softly with the backdrop very dark. Cinematically, this feels very flat.

As the camera’s arcing motion takes a lengthy orbit around Margot in figure 5.1-6, the dark backdrop becomes lighter revealing the deepness of the room in figure 5.1-7 as the backdrops outlines are much thicker.
Figure 5.1-7 *Dial M for Murder* – 43:31

Margot’s silhouette in front of the brightly lit background.

This particular shot has shallow depth of field, which hints that the filmmaker intended the actor’s silhouette to pop out and be fixated point of attention even though it remains near the screen plane.
Swan’s distance from Margot is exaggerated by separating the two cameras further apart from each other.

As the intruder, Swan (Anthony Dawson), creeps up behind Margot, the reverse two-shot, figure 5.1-8 appears to have similar long depth between the two actors as the length of the room in figure 5.1-7.

Throughout this sequence, the 3D effect is gradual from shot to shot, where it begins flat to minimal depth in figure 5.1-6, and increased depths in figures 5.1-7 and 5.1-8. As the narrative presents more dramatic tension, the 3D scale increases. The final call for help includes Margot reaching toward the audience and her hand breaks the screen plane in figure 5.1-9.
After struggling with the intruder, Margot reaches back toward the audience for help.

In figure 5.1-9, the red outline is now on the right and the blue outline is on the left of Margot’s hand indicating that her hand is now in negative space. Swan’s left elbow is in positive space as the blue outline is on the right. The distance between the red and blue outlines is not too far apart keeping the two images fusible and the 3D experience considerably comfortable. The scene continues in negative space until the confrontation ends with Margot surviving and in turn kills Swan in self-defense.

When Swan falls to the floor after being stabbed in the back with the murder weapon, the camera positioning in figure 5.1-10 is flush with the floor. This gives a clear view of the scissors impacting Swan’s back and showing the full force of the instant death.
Swan falls to the floor, which thrusts the scissors into his back for the killing blow.

Hitchcock manipulated the camera position and set decorations to the advantage of expanding the smaller set of Margot’s living room.

The third instance where Hitchcock uses negative space to punctuate the moment is when Hubbard (John Williams) reveals the only flaw in Tony’s anecdote. As the narrative comes to a close, the audience believes that Tony is about to get away with all Margot’s money and that he is allowing the law to execute her as he thirsts to get revenge on her affair with Mark.
Police Inspector Hubbard uncovers the hidden key.

The key that Swan used to enter the apartment.
In figure 5.1-11, the camera position dollies toward the area of attention. As the camera moves in, the deep focus becomes shallow and the key in Hubbard’s hand comes out toward the audience. Higgins agrees that this is one of the few shots that “thrusts” toward the viewer (Higgins, 2012, p. 197). Figure 5.1-12 shows the key in isolation out in negative space.

5.1.7. Summary

The film consists of mostly positive space, which includes many 2D cues. *Dial M for Murder* utilizes occlusion and movement parallax more than most other films reviewed in this thesis. This is due to the small confined space the film was located in. Nearly all the 2D depth cues that can only be defined in a small space were apparent in the summary table (see Table 5-1). Strong rim lighting also proved as an important 2D depth cue for characters and subjects separation to the background. Although extreme high and low camera angles made the confined space feel bigger, the 2D cues were visually supported by 3D in giving depth behind the screen plane.
Table 5-1 *Dial M for Murder* 2D Cues

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*Dial M for Murder* was released at the end of the Golden Era for 3D and wasn’t recognized as a pinnacle of stereo filmmaking at the time. Instead it was caught up in the general deep decline of theatrical 3D that was taking place. As inadequate projection of the anaglyph and dual-strip polarized 3-D footage as well as uncomfortable glasses failed, the film was primarily released in 2D as the technology displaced with other competitive vivid formats – in particular the various widescreen technologies. This is unfortunate as there weren’t many serious dramas shot for 3D during the Golden Era. Several popular films used the technology to launch objects into the audience.

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5 The summary tables refer to the presence of 2D cues within the reviewed sequences. The three sequences or shots were selected based on their incorporation of interesting poetics for the design of cinematic space. The use of specific 2D spatial cues is summarized in the table. The summary tables are not intended to be interpreted formally as quantitative data. However, they are qualitative evidence of the relative frequency of each of the 2D cues.
showcasing one extreme of the effect. There were only a handful of films similar to *Dial M for Murder*, which elegantly used 3D as a creative tool in the filmmaker’s narrative toolbox.

Hitchcock’s attention to detail provides a strong example of 3D punctuation and demonstrates that a small confined space can feel large while respecting stereoscopic rules for comfortable viewing. Allowing the camera to explore the space while a character in dialogue keeps the viewer engaged to the surroundings as well as the conversation. Each character had their moment punctuated including the detective who solved the murder by revealing the key to the audience. With Hitchcock only emphasizing on a handful of negative space experiences that parallel the dramatic tension within the narrative he adeptly exhibited his understanding of stereoscopic 3D cinema focusing on dialogue, character and interactions.

### 5.2. *Avatar* (James Cameron, 2009)

#### 5.2.1. Narrative Context

On the distant world of Pandora, a human colony builds a camp to examine the planet’s natural resources as well as the planet’s native species called the Na’vi. The atmosphere on Pandora is poisonous to humans, so they developed genetically engineered Na’vi bodies called Avatars, which are controlled remotely via human minds. Jake Sully (Sam Worthington), – a paraplegic – is one of the humans who is equipped with an Avatar to allow for interactions with the Na’vi. Meanwhile, Colonel Miles Quaritch (Stephen Lang) plans to destroy anything in his path for the precious resource mineral unobtainium, Jake Sully finds himself stuck in between his relationship with Neytiri (Zoe Saldana) and the indigenous people of Pandora and his own human species.

#### 5.2.2. Scholarly Context

The producer of *Avatar*, Jon Landau proposes, “the aesthetic use of 3D should broadly mirror that of human vision” (Pennington & Giardina, 2012, p. 177).

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“Human eyes have to do two things in synchronicity with each other. They converge on an object of interest and focus on that object. As humans, we cannot separate out those two functions. In my opinion the best philosophy when creating 3D is to converge on our subject of focus so when it is projected in the theatre the subject of focus appears as if it is at the screen plane. By converging on a subject in focus we can cut between shots as quickly as we want because the audience eyes are always converging in one spot and their eyes are not jumping back and forth between convergence points” (Jon Landau as cited in Pennington & Giardina, 2012, p. 177)

James Cameron said “Watching a stereo movie is looking into an alternate reality through a window” (James Cameron as cited in Cohen, 2008). This quote implies that Cameron does not favour the placement of important action in the audience space in front of the screen. John Belton in Vol. 24 Issue 2 of Film History says if 3D “is ever to become a norm, it must cease calling attention to itself” (Belton, 2012, p. 194). Avatar keeps the 3D depth “behind the stereo window and limiting the emergence as much as possible” supporting Cameron’s weak use of objects in audience space.

Mariam Ross deciphers the 3D aesthetic in her paper titled Avatar and hyperhaptic visuality. She defines “hyperhaptic” as a quality of depth in 3D films that “include texture and the desire to touch and be touched by this texture.” As she examines several scenes in Avatar, she touches on topics such as editing pace, spatiality and depth of focus. She explains Cameron’s goal “to move his film away from the supposedly gimmicky effects created by this use of repeated negative parallax” by using negative parallax as a “gentle connection between audience … and characters in the film.” The glowing creatures similar to jelly fish “appear to float out towards the audience at the same time as they surround” the protagonist of Avatar. Although these objects are in negative space and out of focus, Ross doesn’t explore the shallow depth of field in detail admitting, “yet there is more work to be done in this relatively underdeveloped area of film studies” (Ross, 2012, p. 397).

Ron Burnett agrees that 3D style is closely tied to the filmmaker’s construction of the spatiality of the story world. He writes that 3D is “about depth, distance and a more profound sense of perspective” and that it “extends the Renaissance exploration of line, shape and colour”. He also touches on motion cap technology in Avatar and how it is a “synthesis of the real and imaginary.” He believes that these innovations enhance
spatiality, but “3D is in its early days as a medium for exploring the power of storytelling.” Burnett relates the narrative to the complex human ideas such as religion and immortality. As “Avatars are about substitution” we dream and enter our own world of the Na’vi (Burnett, 2010, para. 1-7).

5.2.3. Treatment of Space

James Cameron’s Avatar (2009) accelerated the trend of 3D and is one of the causes for more sophisticated stereoscopic 3D cinema. James Cameron co-developed a new generation stereo imaging camera called "The Fusion Camera System". This camera allows for more technical 3D depth control as it can adjust the camera’s interaxial, convergence, and focusing all at the same time. This camera system – dubbed as the Pace 3D rig – was also used for the films Hugo and Life of Pi reviewed later in this paper. The combination of computer graphics and high-end stereoscopic technology in Avatar benefitted the quality of immersion for the audience with a story world that has subjects in negative space as well as long depth.

The treatment for space in Avatar is clearly driving towards immersive environments for the viewers. Generally, the framing of shots includes a lot of noticeable layers and the use strong perspective 2D cues to make the film very deep. The main subjects or characters are often put to screen left or screen right with the vanishing point near the center of the frame as in figure 5.2-1.
As Jake Sully sits in a confined space, the camera angle always presents an extended backdrop.

Most interior shots depict an expanded space because windows open up and extend the view to the broader world, with objects in motion further in the distance. These carefully planned scenes have a lot of visual action taking place. For example, 5.2-2 is a screenshot from the control room full of presence. The camera travels from left to right creating motion parallax with all the objects in the scene. Although, the whole sequence is in positive space, it feels extended because the subjects closest to the camera are stereoscopically rounded and have a strong visual presence. A good example of this is the bowl-shaped computer monitor that is near the screen plane, yet its shape bulges toward the audience almost as if it was in negative space. The background walls are windows and through them are helicopters flying about. Cameron has constructed a world that’s rich with visual information for the viewer. Despite his relative dislike to the use of negative space, he does build a strong sense of complex narrative space through these other techniques (camera and subject motion, rich composition, extension of space through windows and monitors, and stereoscopic “roundness” of selected objects).
The transparent bowing computer monitor is one of several layers that extend outside the building where there are aircrafts traveling.

His spatiality differs significantly from Hitchcock’s Dial M for Murder (reviewed earlier). Avatar doesn’t contain many scenes staged within confined space. The most prominent exception is Cameron’s treatment of the personal life-support pods. We see this first at the beginning of the film when Jake Sully (Sam Worthington) is in one of these pods traveling to the planet. Although the space is confined and Jake is the center of the frame, Ross notes the use of stereoscopic roundness to express spatiality within tight quarters. She sees the depth within the extremities of his face such as cheeks, forehead and particularly the nose that protrude towards the audience and says there’s "a sense of volumetric depth that we could reach out to touch" (Ross, 2015, p. 26). Each time Jake enters the Avatar, he returns to a pod similar to this one.
Although Jake Sully is in a confined space, there is a shot inside the pod that displays a window, which is extending the z-axis.

5.2.4. **2D and 3D Cues**

During the opening sequence immediately after the shots inside the confined travelling pod, is the first of many indoor shots that extend the background. Figure 5.2-4 is a carefully designed shot and illustrates the visual aesthetics early in the film. This scene within what appears to be a warehouse has several strong 2D perspective cues to produce the perception of extended depth. The most notable is the linear perspective generating a vanishing point at the center of the frame. The composition of the two characters occluding the background also draws attention to the vanishing point, as it appears within the arms of the nurse. In figure 5.2-4, the nurse makes a circle with his arms highlighting the vanishing point and doesn’t occlude it. The depth of field is shallow, with the characters sharp and the background soft. The key light appears to be coming from above the pod enclosure giving brightness to Juke Sully who is strapped to the bed.
The fifth cut of the film expresses the amount of depth the audience will experience in this film.

As the camera tracks from left to right, we see strong movement parallax; the characters closest to the audience move faster than the distant characters at the back of the tunnel. The long room is also full of travel pods generating a texture gradient where it is difficult to count their number as they extend to the end of the warehouse.

For the construction of cinematic space, filmmakers used compositions that combine 3D and 2D cinema depth cues such as focusing and converging on the same subject. "Depth-of-field" is a 2D depth cue characteristic of a camera that can be used to enhance the composition of the image by drawing the viewer’s eyes. Accommodation is the eye’s power to focus on specific distances and convergence is the rotation of the eyes together centering on one object. Currently, stereoscopic displays have convergence-accommodation mismatch, which means, “the screen is always accommodated regardless where the convergence point is located” (Xing, 2013, p. 117). When a film displays shallow depth-of-field in 3D, the audience’s eyes are always accommodating or focusing on the screen plane and not the object out in negative.
space. It is a remediation of traditional filmmaking, and it has a different effect in stereoscopic film than in two-dimensional movies. As this primarily two-dimensional depth cue is used to direct the viewer to look at a specific object on the screen, it might not work as well in 3D where viewers may want to explore the scene a little more. “Due to the convergence-accommodation conflict, the shifting focus is much more absorbing and can thus be more obtrusive” (Flueckiger, 2012, p. 116) causing the audience to step out of the suspension of disbelief.

*Avatar*’s cinematographer Mauro Fiore, said:

"It’s really difficult to throw things out of focus and help guide the audience’s eye. Shallow depth-of-field is an interesting dilemma in 3D, because you need to see the depth to lend objects a dimensionality, but if you have too much depth-of-field and too much detail in the background, your eye wanders all over the screen, and you’re not sure what to look at. I had to find new ways to direct the audience’s eye to the right part of the frame, and we accomplished that through lighting and set dressing” (Mauro Fiore as cited in Ross, 2012, p. 396).

**Figure 5.2-5 Avatar – 13:30**


The floating mineral unobtainium is floating in negative space out of focus for a few
seconds before being racked focus to.

The first time this is presented in the film is when there is a rack focus from character to object in figure 5.2-5. The viewer might want to focus on the foreground object that is out of focus in audience space. Since it is out of focus, the viewer can become disorientated and even take a moment to realize what they are looking at. It almost looks like an unwanted artifact. However, if the blurred object is in positive space, it is less prominent and less distracting to the viewer.

Similarly, in figure 5.2-6 Neytiri (Zoe Saldana) and Jake Sully share an emotional moment where Barbra Flueckiger, suggests “dialogue alone would have provided a similar shift of attention if both characters had been in focus during this shot” (Flueckiger, 2012, p. 116). Instead, the filmmakers shift the focus from Neytiri to Jake and due to the convergence-accommodation conflict they also shift the convergence from each character to keep the viewers focus on the screen plane. When this occurs the entire depth zone of the scene adjusts. In the first image, the focus and convergence is on where Neytiri where she is on the screen plane, while Jake is in positive space. When the focus and convergence shifts to Jake, he is on the screen plane, but then Neytiri is in negative space. Her hands and wisp is also in negative space but are further towards the audience.

Figure 5.2-6 Avatar – 1:23:23 & 1:23:26

![Screen capture, Avatar © 2009, 20th Century Fox Home Entertainment.](image)

Example from Aesthetics of Stereoscopic Cinema (Flueckiger, 2012, p. 116)

This rack focus also presents a rack in depth due to the shifting convergence point. Some viewers may find this ‘depth rack’ a distraction, as there is an impression of
space shifting while the screen plane moves on the fly. If viewers follow the focus, it should make it a more comfortable viewing experience because it reminds us to not look at the objects in negative space which are it is out of focus. Although this supports the convergence-accommodation conflict somewhat as our eyes are constantly focused on the screen plane regardless of what part of the frame we are looking at, it undercuts the ability of 3D to have subjects placed at different spatial distances. Mediburu claims the creative shifting of screen plane (convergence) and focus (accommodation) is not a problem because: “as with any muscular activity, [limits in convergence and accommodation] decorrelation increases in efficiency and comfort with exercise” (Mendiburu, 2009, p. 22). If the scene had a bigger range of focus (at least the two characters and the wisp) as Flueckiger advocates, the perception of depth would not change and the dialogue would carry the attention even if the viewer wanted to continually look at the wisp in negative space comfortably. While Mendiburu states that “equally respectable 3D cinematographers are brilliantly making the case for each approach” (Mendiburu, 2009, p. 97) of using depth of field; Flueckiger says, “while shallow depth of field is an important part of the cinematic language, it still needs to be adjusted to stereoscopic 3D” (Flueckiger, 2012, p.112). They both seem to agree that further research and examples with shallow depth of field is required to understand how the aesthetic can be used for the cinema of attractions and in the service of narrative.

5.2.5. Flying through space

Throughout the narrative of the film it was suggested that Jake would learn to fly an ‘ikran’ which is a dragon-like creature. The flying sequences in Avatar are one of the many popular topics among those who watched the film. “The scene involving Jake capturing and taming one of these great beasts is one of the film’s great sequences” (Ebert, 2009, para. 7).

According to Table 10.1 in Goldstein’s Sensation and Perception textbook, the only 2D depth cues that have any effectiveness beyond 30 meters are occlusion, relative size, relative height and atmospheric perspective. Mendiburu agrees, telling us that “stereoscopic depth perception decreases until a maximum distance somewhere around 100 to 200 feet” and that monoscopic cues take over (Mendiburu, 2009, p. 26). Figure
5.2-7 shows this while Jake and Neytiri are discussing how to fly. It appears there are two stereoscopic “layers”: the characters that are focused and converged on, and the background.

**Figure 5.2-7 Avatar – 1:13:39**

In the background, there are relative size comparisons of other ikrans flying and floating islands (which occlude each other as well as the planets or moons). There is also atmospheric perspective: the objects further away are desaturated behind fog and the pinkish hue of the sunset. There are 2D cues in the foreground such as lighting and movement parallax. The characters in the foreground have some back lighting separating them from the backdrop. The camera is tracking from left to right making the foreground really separate from the background due to motion parallax. Spatially, there seem to be only two differentiated depth layers in the overall composition, but the foreground layer has a sense of internal depth within the characters space. Jake’s left arm appears further from the audience than his right knee and similarly with Neytiri’s knees pointing in different directions.
A critical component of the sense of a cinematic space is the navigation of that space as provided by the filmmaker. The ikran flights through Cameron’s Pandora are a good illustration of the power of cinematic navigation across a 3D space. As the sequence continues, the camera is locked on Jake and his ikran flying between the floating islands. It has a very similar feeling as figure 5.2-7 where Jake and his ikran are at the screen plane and everything else is in the background. Throughout the sequence “stylistic strategies gesture toward the attractional power of flight while preventing it from becoming just a visual thrill ride” (Ross, 2012, p. 219). The sequence does not feel like a simulation ride on rails as it cuts from shot to shot avoiding point-of-view angles. These are saved for the cockpit scenes that are framed with windows. To put an emphasis on the emotional connection that flight evokes, there are many reaction close-ups of Jake and Neytiri dancing the sky together during these sequences.

**Figure 5.2-8 Avatar – 1:13:00**


Jake on his ikran flying midst the floating islands. The ikran’s head pokes out into audience space.

The visuals are thrilling as the characters fly among the floating islands. It’s unfortunate that the 3D wasn’t embraced a little more. The editing pace was rather quick
and the use of audience space was minimal. A few punctuated events with the entire character in negative space could have been applied.

5.2.6. Frames within frames

_Avatar_ shows that filmmakers can avoid a clichéd use of 3D negative space, keep the focus on the screen plane and still maintain a strong sense of depth and spatiality. Cameron achieves this through a combination of careful composition, exploitation of the positive space beyond the screen, and the effective use of 2D depth cues. Things are kept interesting with the camera angles used. Many shots are inside cockpits exposing the world from within confined space. Although these spaces are confined, they are framed with windows, most notably within the human military vehicles. Figure 5.2-9 is near the end of the film when Colonel Miles Quaritch (Stephen Lang) and Neytiri have a one on one battle.

![Figure 5.2-9 Avatar – 2:26:05 & 2:26:15](image)

Colonel Miles Quaritch see’s Neytiri in his rearview mirror.

As Col. Quaritch peers into his rearview mirror making himself aware of his surroundings, he notices Neytiri coming from behind. The consistency of keeping the focus and convergence at the same location continues as Quaritch is at the screen plane. The shallow depth of field also continues, as Neytiri is moving closer but remains out of focus until the next shot. During sequences that include cockpit shots the driver tends to look strenuous and sweaty; their face is full of emotion, which commands the audience’s attention. Strong key lighting highlights the forehead and nose to help model the face. Similar to the first example where the “scene invites us to explore the face’s
dimensions as the head takes up most of the horizontal and vertical space in front of us” (Ross, 2012, p. 388)

**Figure 5.2-10 Avatar – 2:26:10**

![Avatar scene capture](image)


Focus remains on the Jake Sully on the screen and not outside the window.

*Throughout the film the monitors are all in 3D as well.

It is interesting to note that the monitors throughout *Avatar* were all also in 3D. The monitor frame acts as its own screen plane and the computer generated renders of characters, their bodies, and their vitals information appear either bowing in or out of the frame.

5.2.7. **Summary**

*Avatar* is a seminal film; its impressive special effects and visuals helped to lead the contemporary renaissance of 3D cinema. According to boxofficemojo.com, *Avatar* grossed over 2.7 billion dollars worldwide and won three Academy Awards, including Best Visual Effects (Box Office Mojo, 2015). The colourful story world of Pandora pulls viewers into the story as it immerses them by its vast space.

The primary 2D cues in the selected scenes of *Avatar* were mostly occlusion, movement parallax, and perspective. This is not surprising as each of these is a strong cue to depth and relative distance. Shallow depth of field was used strongly despite the 3D critic debate against it. Shallow depth of field can be effective as there is roundness on the point of attention occurs and there are fewer objects to explore the geometry of the scene.
The table below summarizes the different 2D cues used in the scenes analyzed.

Table 5-2 Avatar 2D Cues[^6]

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[^6]: The summary tables refer to the presence of 2D cues within the reviewed sequences. The three sequences or shots were selected based on their incorporation of interesting poetics for the design of cinematic space. The use of specific 2D spatial cues is summarized in the table. The summary tables are not intended to be interpreted formally as quantitative data. However, they are qualitative evidence of the relative frequency of each of the 2D cues.

Avatar’s story world is big. Many of the deep scenes are expressed with distance and perspective 2D cues. The 3D in these scenes appears to go very far into positive space. Avatar boasts shallow depth of field in many of its 3D shots; the filmmaker wanted to direct the attention of the viewer to the object in sharp focus. It is very pleasing visually in 2D and works well directing the audience to what they should look at. However, the majority of the featured objects in Avatar are placed in sharp focus at the screen plane. This undercuts Cameron’s ability to explore the visual expressivity of...
negative or positive stereoscopic space. With objects such as the precious resource ‘unobtainium’ and the floating creatures of Pandora earlier examined in figure 5.2-5 and 5.2-6 – they are out of focus when they are in negative space. When these objects are out of focus and close to the viewer in negative space it feels like a distraction rather than effective visual storytelling. As the camera racks focus to the object, it subsequently adjusts the location of that object’s 3D spatial positioning back to the screen plane. This can be noticeable when the object in negative space adjusts to the screen plane. Although Cameron’s proprietary technology (the Pace 3D Rig) allows for focus, convergence and interaxial adjustment at the same time, they do no necessarily need to be used in union.

Although conservative in its use of 3D convergent screen space and positioning, Avatar does use composition, motion, lighting, and 2D depth cues to create an interesting cinematic screen space and story world. Cameron’s drive to develop cinematic technology to unlock and modify the creative variables of 3D effects on set in real time was pioneered successfully. Avatar's success has created more interest in 3D among elite filmmakers such as Martin Scorsese, and Ang Lee. These filmmakers now have stronger technical and aesthetic tools at their disposal due to Cameron’s pioneering work in this film.

5.3. **Hugo** *(Martin Scorsese, 2011)*

5.3.1. **Narrative Context**

Set in the 1930s, a boy named Hugo (Asa Butterfield) lives in the walls of the Gare Montparnasse railway station. Hugo attained the ability to repair gadgets and clocks with his father before he was orphaned and was sent to his uncle to tend the station clocks. An elaborate automaton was left behind and all Hugo wants is to fix it in memory of his father. As he rummages for food and pilfers local shops avoiding the Station Inspector (Sacha Baron Cohen), he gets in trouble with the owner of a toyshop, George Méliès (Ben Kingsley). Under surveillance, Hugo continues his journey to unlock the mystery of the automaton in an adventure with George Méliès’s grand daughter,
Isabelle (Chloë Grace Moretz), with whom together discover much more than he expected.

5.3.2. Scholarly Context

Emmy Perryman suggests that Scorsese’s decision to shoot in 3D “can be viewed as an homage to Méliès” (Perryman, 2013, p.3). Like Méliès, Scoresese uses innovative technique to draw us in, and to advance his story. In her opinion, Scorsese is aware of this direction. “Hugo’s major theme is to celebrate cinema’s early history and the contributions of its pioneers.” Scorsese reminds us about the early days of film and how Méliès was able to make magic happen with the creative use of camera tricks and editing. Scoresese’s treatment of 3D within the train station’s “narrow crevices amid the gears of the enormous clocks” allows the audience to “feel the power to these Modern-age mechanisms”. The 3D also enhances the character’s traits including making Hugo seem “stronger and braver” and characters “faces are given a special intimacy.” At the same time, the inspiring film is a “broader message about the importance of motion pictures in people’s lives and of the medium’s power to stimulate human dreams and imagination” (Perryman, 2013, p. 4)

Barbera Klinger discusses positive and negative parallax and how “positive parallax appears to be the technology’s future, therefore indicating the “covert” use of negative parallax may become customary. Films such as Hugo that use negative space carefully actually increase the illusion of depth more “than positive parallax could alone.” Although “Scorsese employs negative parallax across a spectrum of possibilities”, she says, he “favours more subtle expressions and compartmentalizing overt expressions as comic relief”. For example, floating elements such as snow fill the theatre during “Hugo’s opening … a Paris of yore appears through a veil of snow falling gently into the audience’s space” and the Station Inspector and his Doberman’s “noses occasionally protrude from the screen.” The positive and negative parallax debate continues as negative parallax “is not a one-note phenomenon” anymore as it is a “flexible technique that can create diverse tones and emotional appeals to audiences” (Klinger, 2013, p. 194)
Aylish Wood explores the building of 3D space and views Hugo as a film that plays with the flexible variable of 3D depth. The adjustment of depth being “more or less exaggerated” maintains the attention of the audiences experience but also “introduces a range of relationalities.” The bold uses of stereoscopic volumes adjusting from shot to shot also builds the relationships “between Hugo and spatial configuration” he resides in thus relating the space to the narrative (Wood, 2013, p. 175).

Scott Higgins feels that “3D remains caught between novelty and norm”. While Hugo is an advocate for “depth-oriented aesthetic that can bind stereoscopic effects to character oriented narrative tasks, “the film can communicate a “sympathetic character to the audience” or alternatively point out “character aggression” via the space built between camera, character and objects. These techniques used in Hugo can highlight expression in a controlled manner but at the same time “seek expressive methods for handling the space behind the screen.” Indentifying qualities such as “roundness, recession and the modest bulge” may support the bond between 3D technology with the cinema of narrative (Higgins, 2012, p. 207).

5.3.3. Treatment of Space

The overall treatment of space in Hugo by Martin Scorsese is parsed into three special settings defined by scale. During the opening shot of the film, he shows all of them in what Ross calls “a spectacular stereoscopic ride complete with rollercoaster-like sensation” (Ross, 2015, p. 69). The camera starts far in the distance where the large open-world of the city Paris is pulsing full of life, then it motions towards the Gare Montparnasse railway station. As the camera travels into and through this complex, it reveals the defining space of the film – the internally self-contained story world of the station. Here the characters are defined and here they build their relationships. Finally, the camera continues through into the tighter space of the station’s hanging clock, revealing our protagonist, Hugo, living his secretive life within the highly confined spaces hidden within the mechanisms of the station.
The large open world, the city of Paris, where there are scenes of vast distances that are pulsing full of life.

There is a limited use of more standard cinematic spatial models: the bookstore, the cinema theatre, and Méliès’s home for example. However, the three spatial representations showcased in the opening sequences dominate the visual logic of this film: the city, the rich space of the station, and the paths and spaces hidden within. Each of the three serve distinct narrative functions. The short depictions of the wider world of the cityscape situates the film within the Paris of our imagination, but once this has been achieved, this sense of the broader city is not generally stressed. Instead, Martin Scosese focuses on the railway station space rather than the broader world of Paris – showcasing within this stage there are many different relationships happening between characters in the busy atmosphere. There are many people travelling from place to place, some that are in love and others enjoying the amenities of the local shops, all being observed by Hugo (Asa Butterfield). Hugo’s character is introduced as an orphan boy within the station walls who observes the world outside of his home.
The railway station is a contained sub-world, which is somewhat wide and open, but smaller than Paris and still a world within itself. This environment has boundaries and it is rich in characters.

Finally, the space within the walls and the clocks of Gare Montparnasse railway station reinforce Hugo’s life and personality. He is a fugitive who is fully comfortable only when he is hidden. Throughout the film, he often looks out into the station for the Station Inspector (Sacha Baron Cohen), who provies a sense of ever present danger – a persistent menace who may be only steps away. The tightness and knowledge of his space allows Hugo to feel secure but also makes the audience feel uncomfortable as it feels constricted. Demetri Portelli (the cameraman for the film) writes, the audience is “with Hugo in his claustrophobic situation and empathy can be felt and understood” (Demetri Portelli as cited in 3D storytelling, Block & Mcnally, 2013, p. 204). Later in the film when Hugo befriends Isabelle (Chloë Grace Moretz), they venture further outside of the station to locations such as the movies, the library and her home (the home of Georges Méliès).
Hugo (Asa Butterfield) in his own spaces, which are often smaller and claustrophobic as well as maze-like for his comfort and security.

When Hugo is in his environment travelling from clock to clock, objects move along the z-axis toward and away from the audience. Despite the constrained spatial environment, the scenes are constructed with multiple depth layers. Scorsese utilizes strong 2D cues to bring these objects out more toward the audience in audience space. Hugo tends to “look through these clocks to witness the activities and events around him” (Block & Mcnally, 2013, p. 203) and he often exhibits pleasure observing others. His motivation to unlock the secrets of his father’s automaton allows him to venture out into the station.

5.3.4. Stereoscopic and Cinematic Goals

The narrative tension within Hugo generally plays against a carefully defined space. Characters can expand into or be constrained by the various scales of the story world. For instance, the railway station includes characters that dislike Hugo, which forces Hugo to hide in small spaces. As an orphan, he doesn’t have a home; so living in
these tight spaces within the railway station explicates the character. The main cinematic imaging decisions for confined space include close ups and two-shots. These shots mainly frame the upper body or portraits of the characters, which give the most detail and at the same time avoid showing the surroundings. Throughout Hugo, these compositions were accompanied with having the majority of 3D space in front of the screen plane. This creates emotional narrative impact by bringing characters into audience view. For instance, the Station Inspector is introduced as a vigilant law enforcer with a keen eye for regulation. The character is expressed as a snoop who gets into the personal space of the everyday station patrons. As a creative decision, Scorsese positions the Station Inspector and his canine companion in negative space with strong 3D the majority of the time to “enhance surrealism and for comic effect” (Pennington & Giardina, 2013, p. 191).

In one of these attention-grabbing scenes the inspector interrogates the two main characters, Hugo and Isabelle about wandering the station alone. Here Scorsese follows Ross’s understanding of the impact of stereoscopic intrusion into audience space. “Through character placement in negative parallax, more direct in the way they solicit the audiences attention than they would be in flat versions” (Ross, 2015, p. 65). The shot is initially framed with the Station Inspector located at a comfortable distance from both Hugo and Isabelle. As they get questioned the inspector moves closer and closer to them – and to the viewer.

During the authoritarian monologue the anaglyph image in figure 5.3-4 overlaps with a slight offset, which reveals that the inspector begins in negative space near the plane of the screen. Then as he leans towards them looking off to screen left, the offset increases, moving his face even further into negative space, invading the personal space of the audience viewer in figure 5.3-5. VFX Supervisor and 2nd Unit Director Rob Legato said “If we do it over a long enough number of frames, the audience doesn't know it's being done, but they have a psychological response to it. It's like a new sort of dolly move” (Legato, 2012, para. 10).
The Station Inspector (Sacha Baron Cohen) is near the screen plane (left and right images are at a slight overlap).

This gradual but insistent change in depth creates a spatial presence that makes the audience feel as if they are being interrogated along with the two characters. As Klinger states, “It helps to create the Station Inspector’s character by mocking his strident personality” (Klinger, 2013, p. 426).

The number of apparent visual layers in the beginning of this shot is minimal – perhaps only two: the Station Inspector and the background. As the inspector leans in, his face becomes rounder and then seems to bulge forward into the audience’s space due to the lens distortion that occurs naturally when an object appears very close. This 2D effect is amplified through the Inspector’s extension forward into the negative space of the audience. This exaggerated image penetration stretches the 3D modeling from the point of his nose to the lobe of his ear, heightening the perception of spatiality and increasing the number of layers: nose, cheeks, ears then background. Consider how the roundness is affected here. When the inspector is more at the screen plane he appears natural, but as he leans in the 3D effect is overstated and his face becomes distorted,
stretching in the z-axis. This aggressive use of the 3D technique hypermediates the scene. It is what Gunning terms “the Cinema of Attractions”, in this case an exaggerated use of cinematic technology that calls attention to itself. Like many contemporary cinematic attractions, it also serves the cinema of narrative. The facial intrusion forcefully punctuates the experience of the scene, exposing the audience directly to the personality, power, and menace of the inspector. Scorsese cleverly integrates these creative visual decisions with the narrative’s audio. The distortion and invasiveness of the Station Inspector is one part; what he says is another:

“Seems like Maximilian doesn’t like the cut of your jib, little man. He is disturbed by your physiognomy. He is upset by your visage. Why would he not like your face?”

![Figure 5.3-5 Hugo – 44:39](image)

The Station Inspector (Sacha Baron Cohen) completes the monologue while pushing the boundary of comfortable personal space after stepping into and leaning toward the audience.

This pointed monologue describes a face, as the inspectors own face becomes dominant. Here picture and sound jointly reinforce both the core narrative and the punctuated moment of cinematic attraction.
There is strong spatiality with reverse shot of the Isabelle (Chloë Grace Moretz) and Hugo (Asa Butterfield) as all three characters including the Station Inspector (Sacha Baron Cohen) are lit very well and sharply focused.

Once this intrusive moment has done its work, things return to a less extreme state. The visual “attraction” fades, the spatiality returns to normal and the narrative tension subsides – Isabelle deftly defends Hugo as her simple-minded cousin from the country and the Station Inspector loses interest, and carries on with his duties.

Similarly, the scene where George Méliès (Ben Kingsley) has Hugo fix a toy mouse to convey trust between the two includes strong 3D effects and narrative relation. Méliès begins in a position of power over Hugo and looking down at him in figure 5.3-7.
Background elements are used to frame Méliès but do not look cluttered and distracting because they already much farther away and less visually prominent than the subject.

The characters are positioned in audience space and are quite round, making them seem more real and demanding of attention. Méliès appears powerful because of his forward prominence, strong lighting, and the way he is framed with a low camera angle. Hugo in figure 5.3-8, who is actually placed in positive space, seems less intimidating as his surroundings are flatter and duller giving him a position of weakness.

The actual depth of Hugo’s background is conveyed in 2D cues. The background is darker with less saturated colour and the people walk behind him in a hallway composed with a strong linear perspective. The 3D depth cues are not strong in this scene keeping the stereoscopic image flat for the viewer.
The 2D distance cues linear perspective, texture gradient as well as the strong rim lighting.

Figure 5.3-9 is a profile two-shot angled down the toy counter at the two characters. The strong 2D depth cues including perspective, size, colour, rim lighting, and depth of field combine with the 3D to create a powerful sense of depth and roundness. For example, a strong fill light creates sharp contrast and shadows on Méliès' face to increase roundness and the bright backlights define edges and separates subjects from background. A bold use of colour identifies foreground and background: warm gold colours in front and cold blues in back. Behind Hugo in figure 5.3-9, the background appears quite flat in 3D space, which is likely to match the spatiality of Méliès' background distance to prevent eyestrain while switching between the two close ups. The minimal separations of the stereo images gives Hugo this flatter look.
Two-shot mixed with some creative 3D framing with the centre in audience space and deep depth behind Hugo

There are also many layers of toys that frame the two, but Méliès’ framing is stronger with the group of toys surrounding him. The line of toys down the center acts as a barrier between the protagonist and the antagonist. Although the toys separate them, they both share this space as they both come from a world of loving toys: Méliès owns the toy store, and Hugo is a boy who is attracted to them.

The first toy in the line of toys is a figure balancing on a ball with one hand looking at mirror. The mirror of this toy is actually glass and transparent. Scorsese could have made a decision to make it not transparent and close this shared world of toys and really build a barrier between the two, but he plays with the spatiality, both in 3D and narrative. The scene concludes with an uneasy sort of truce between them in which Hugo is gaining Méliès's trust.

During the sequence where Hugo is having a dream about becoming the automaton the sense of spatiality is intensified, figure 5.3-10. As the dream progresses,
it starts with what seems to be two layers of depth: character and background. However, as Hugo discovers his body is making mechanical noises, the camera pulls back revealing smoke and more of the background. Hugo becomes lit differently with rim lighting making him pop out a little more. When the camera cuts back and the room is shown in a wide shot, the layers increase with a few props: column on the left, the table and smoke on the right. Then the scene is made tight by the set of gears releasing from all sides of the frame constricting the spatiality. There is depth and dimension constructed inside this limited space and when the 3D effect is increased, it parallels with the anxiety of Hugo serving the cinema of narrative.

**Figure 5.3-10 Hugo – 1:25:03 – 1:25:35**

SCREEN CAPTURE, Hugo © 2011, Paramount Home Entertainment.

Hugo has a nightmare where he becomes the automaton.

When Hugo awakes, he finds himself in his room with the automaton, figure 5.3-11. Hugo is placed in negative space but the rest of the room's spatiality is strongly shaped by 2D depth cues such as occlusion, lighting, and differential focus. The monochrome production makes it less vibrant; as the colours and motion of the dream sequence subside, so does Hugo’s anxiety. The use of occlusion creates two instances
of depth: the first, between Hugo and the set props surrounding him; the second, between Hugo and the other brightly lit character in the shot.

Figure 5.3.11 *Hugo* – 1:25:38


Hugo wakes up in his room with the automaton.

5.3.5. **Summary**

2D cues also play a large role as occlusion, rim lighting and depth of field are bold spatial techniques. Table 5-3 is a list of 2D depth cues that were noticed during the examples in *Hugo*. Overall, ten of the fourteen 2D depth cues were noticed in these scenes at least once indicating that the relationship between 2D and 3D cues exist in tandem.
He skillfully uses both 2D and 3D visual aesthetics to build his engaging cinematic story world. The broad and visually complex interiors of the Gare Montparnasse railway station create a rich stage where the characters have lots of space. The characters define their relationships within the space and play out their story arcs. The tighter and more constricted spaces hidden within the depths of the station provide a more protected and secret space where Hugo can live out his private life in relative isolation and safety. Scorsese’s understanding of composition and the many variables of cinematic image creation give these various spaces a constant sense of

7 The summary tables refer to the presence of 2D cues within the reviewed sequences. The three sequences or shots were selected based on their incorporation of interesting poetics for the design of cinematic space. The use of specific 2D spatial cues is summarized in the table. The summary tables are not intended to be interpreted formally as quantitative data. However, they are qualitative evidence of the relative frequency of each of the 2D cues.
visual interest and the ongoing ability to support character development and stage story development. He uses these 2D and 3D depth cues purposefully, modifying his strategy to the needs of the narrative in the moment. Sometimes he will carefully situate the characters within a rich storyspace, at other times he will attenuate our attention and focus on critical personality and story details.

There are several cases of character traits built with 3D in Hugo. The Station Inspector is carefully placed in 3D while in uncomfortable negative space to pull the character out of the screen and into the personal space of the audience. This seems to “signal character aggression, as when the station inspector’s hat brim and nose pierce the screen” (Higgins, 2012, p. 207). Although there is distortion of his face with his close proximity to the camera and extreme use of 3D, it works well alongside the narrative as the character is an inspector. Similarly, the gears closing in on Hugo during his dream sequence spatially crushes the character, and visually shares his nightmare with the audience.

Scorsese is also committed to exploring the specialized aesthetics of 3D storytelling on its own terms. Of the films reviewed, Hugo is the most aggressive to negative space activity. The film’s characters often move with intensity and narrative impact into the audience space. The interrogation by the Station Inspector and the transformation of Hugo into the automation both invoke the spirit of a stereoscopic cinema of attractions. Scorsese punctuates the narrative with moments that seize viewers with pure visual impact, and then brings them back to the pleasures of character and story.

5.4. Life of Pi (Ang Lee, 2012)

5.4.1. Narrative Context

Life of Pi (2012) starts with an older Pi (Irrfan Khan) recounting his childhood to an author (Rafe Spall) who is interested in writing his life story. Pi explains how he was born into a family that runs a zoo, which provided many childhood experiences that helped prepare him for his time on a lifeboat. When his father decides to sell the zoo for
a new start in Canada, disaster strikes the family while traveling by freighter over the Pacific Ocean. The ship sinks leaving a young teenager Pi as the lone human survivor along with a Bengal tiger who also found refuge aboard the lifeboat. The Bengal – an animal from the family zoo named Richard Parker – and Pi struggle to survive, as they must learn to survive together. They forge an unexpected connection that gives Pi a daily motivation to live. There are many interactions between the two as they spend months at sea.

5.4.2. Scholarly Context

Mariam Ross is one of the few scholars that performs an in depth 3D and spatiality analysis on *Life of Pi*, in 3D Cinema: Optical Illusions and Tactile Experiences. She describes, “sound, movement, and lighting all combined” are part of the “tense and vivid moments” in *Life of Pi*. However, she favours the use of “negative parallax space” as it plays on the “sensation of shock and trauma that can be induced in the viewers embodied interaction with the scene.” Throughout her analysis she clearly showcases 2D and 3D depth cues working together to “capture the development of Pi’s narrative more fully” (Ross, 2015, p. 129).

5.4.3. Treatment of Space

*Life of Pi* (2012) by Ang Lee is a visual masterpiece and it has many mesmerizing, vivid spatial scenes of the vast open ocean. “Lee uses 3D technology for the first time in this film, as a deliberate artistic choice rather than a commercial decision or a nod to visual fashion” (Times Higher Education, 2012, para. 6). There are many images in this story world that expand space from the bottom of the ocean to the edge of the universe with Pi and the lifeboat in between. In both day and night sequences, Ang Lee shows off the attraction of the visually beautiful content. Although the broad spatiality of this film evokes feelings of magic realism as Lee explores the limitlessness of the ocean or the sky in figure 5.4-1, the film also examines a tighter and constrained type of space. The majority of the film is captured on a 26-foot lifeboat with an adult Bengal tiger in figure 5.4-2. There is also a third type of spatial representation utilized in the “framing storytelling” space. The “frame story” has the older Pi sharing his life events
to a writer, where life and spatiality seems less extreme and more natural (exhibited in figure 5.4-3). As the sequences shift from the “frame story” space to Pi’s story world, the visual experience changes.

**Figure 5.4-1 Life of Pi – 58:06**


The camera is pulls back to a wide shot of Pi and the boat. With the horizon across the upper half of the shot, the sun and clouds are reflected on the surface of the ocean.

There is a strong contrast between the wide endless space of the ocean, and the constrained space of the boat on which the two castaways are trapped.
The beginning of this memorable relationship where Pi and training Richard Parker. There are several two shots and close ups that are exchanged and Ang Lee uses objects in strong negative space.
In the frame story world where Pi is conversing with a writer on his life. In this world there is minimal use of negative space keeping the characters at the screen plane.

5.4.4. Stereoscopic Transitions

There are many different kinds of transitions; the most common types of transitions are dissolves, fades and wipes. Ang Lee decides to do a more modern type of transition where there are mask dissolves when transitioning from the storytelling world into the story world. These types of transitions can initiate in the center of a frame and move outward toward the edges. They can shift in any direction, open or close any side, or do this all at once. Furthermore, they can start as one shape and form into another. They are customized to fit the form from the subjects in the frame. These types of transitions are an attraction as they hypermediate the experience. Mask dissolves (and the other forms of spatial montage such as split screens) are not very popular in 3D filmmaking. The traditional idea that the film should fill the screen with a single image is standard. “Spatial montage represents an alternative to traditional cinematic temporal montage, replacing its traditional sequential mode with a spatial one (Manovich, 2001, p.322). Adding multiple layers of different settings looks out of place and Manovich says
it works “against the technology.” Since the content is already in 3D, the goal of these forms of spatial montage is to illicit even more of a ‘wow’ reaction from the audience.

In the “frame story” world of Life of Pi, Lee is conservative with 3D keeping most of the direction at a comfortable depth near the screen plane. When transitioning into the story world, he selects interesting subjects to come in at different times of the mask dissolve, which creates an intriguing composite. For example, figure 5.4-4 shows a “magic realist” string of connecting images to gradually transition from the “frame story” world to Pi’s core story world.

**Figure 5.4-4 Life of Pi –35:43 – 35:54**

![Screen capture, Life of Pi © 2012, 20th Century Fox Home Entertainment.](image)

A mask dissolves transition from frame story at the park to story world departure of the freighter.

Pi (Irrfan Khan) and the writer (Rafe Spall) are sitting on the bench. As Pi starts to describe the journey over the deepest part of the ocean, the scene cuts to an overview map of the location. In the second frame of figure 5.4-4, the bench with the two characters remains when the map is revealed. As the camera pushes into the backdrop map, the rest of the previous shot slowly dissolves to make the third frame. During this
time, the floating text over the map creates motion parallax and when the camera moves in, the distance of the text to the map changes in the fourth frame.

The 3D in combination with the masked transitions gives a strong effect of traveling through space – the view pushes into the darkest part of the map and then into blackness. At the time when the transition completes, Pi’s voice trembles when he begins to explain how he ended up on a lifeboat.

5.4.5. Split-screens and Layers

Another stimulating notion for spatiality is the creative use of split-screens, which are rarely explored in 3D. A split screen is a rectangular partition (or partitions) of the screen, sometimes cutting in half, sometimes in other arrangements of embedded or arrayed rectilinear images. Ang Lee has a history of experimenting with split screens in the motion picture, *Hulk*, (Lee, 2003) by bringing multi-paneled, comic book-esque pages to life. During the sequence in figure 5.4-5, young Pi (Suraj Sharma) is reading the survival guide out loud.

There are several spatial layers to the split screen in 3D that really bring the audience into the world. This is not a traditional split screen since there are no hard-edged rectangular frames. The frames are built with only cutouts of subjects occluding the other frames, which are super imposed over the montage sequence.
Young Pi (Suraj Sharma) is reading the survival guide out loud during a sequence of masked split screens. *Notice the floating window that allows screen left Pi to be in negative space without causing a frame violation.

The scene begins with a wide shot of Pi looking down at the survival guide as he reads aloud. Then, a cutout close up of Pi fades in to overlay the left of the frame, which becomes the foreground. The wide shot dissolves to a point of view close up of the survival guide and acts as a secondary layer covering the original wide shot. The survival guide (secondary layer) wipes screen right to screen left revealing another wide shot of Pi in the ocean.

The spacing of each split screen is unique but always consistent with a real world depth logic. The portrait shot of Pi on screen left is nearest to the audience and the survival guide in behind is occluded by the portrait shot and appears at the screen plane. The third layer in the background is situated in behind both the portrait as well as the survival guide and has the most depth into positive space. As the montage of Pi continues, there are multiple cross fades for each detailed action placed at screen right.
The sequence differs from traditional split screen technique – it doesn’t rely on rectangles; instead Ang Lee uses masks based on subject shape such as a split with the edge of the manual. When the manual fades away, the split-screen becomes only two layers: the mask shape of Pi and the montage of Pi in behind. The sequence is both visually interesting and it keeps the viewer involved in Pi’s will to endure by showing his point of view and a montage of his struggle to survive. Here Ang Lee is clearly showing off the fusion of two distinct visual techniques: the split screen and the use of content-driven shape masks. Not only is this an aesthetically pleasing scene, but it also serves as character development by showing the skills that Pi utilizes to still be alive at this point of the film.

5.4.6. Occlusion and Framing

Generally, the characters inhabit the positive space past the screen, as though the viewer is looking though a window at them. Much of the film is located in the middle of the ocean, which means the ocean in negative space does not work, but smaller entities such as the “spray from waves” splashing into “negative parallax space” do (Ross, 2015, p. 129). The scene with the jumping fish is at a point in the movie when the main characters are drained and feeling defeated. To emphasize the next rising action, the jumping fish start leaping towards the screen; they leap into audience space to enhance the spectacle of this sequence. The scene also changes the film frame’s aspect ratio and goes from filling the 16x9 screen to a format that is wider, with black bars appearing above and below the picture. The change occurs during the end of a sequence and may not be noticed in the theatre. “By Dynamically controlling the Stereo Window, we can manipulate the perception and emotional intensity of a story moments” (Gardner, 2011, p. 10). This changes the spatiality in a different way – the viewer’s attention is intensified as it replicates the natural field of vision and encloses the action. However, if the viewer notices this change, it could cause them to suspend their disbelief; as the screen ratio changes, they are reminded that they are watching a screen, and thus brought back into the temporal world of the theatre rather than the fictional world of the film.
The action in the scene involves flying fish that rocket through the path of the lifeboat holding young Pi and the Tiger. The key question is why did the aspect ratio change for this single scene? It appears that it was for the purpose of expressing a stronger stereoscopic effect. Ang Lee subtly compresses the spatial representation so that the figures going into audience space are exaggerated as they break or occlude the frame. Stereoscopic imagery is supported by use of size, occlusion and motion in this sequence. As the fish come toward the audience they get bigger and occlude each other. The subject can only go so far into audience space before it becomes uncomfortable for the viewer. If the subjects break the edge of the frame while in audience space, it will cause a window violation error (the object is in front of the screen, it shouldn’t get cut off by the edge). However, if the screen was manipulated and smaller they will appear on top of the frame and the subject’s parts will overlay the black bars. “This means that there is greater space above and below the frame for the fish to extend into negative parallax space” (Ross, 2015, p. 129-130). This technique avoids the window violation entirely (instead of getting cut off, they are on top).

Figure 5.4-6 Life of Pi – 1:15:11

Screen capture, Life of Pi © 2012, 20th Century Fox Home Entertainment.

The wings flap outside of the picture over the letterbox black bars.
For instance, in figure 5.4-6, the subject flying into audience space pushes the screen toward the audience and continues forward with the wings flapping out of the frame, which occludes the black bar above the picture. Then, the center of attention goes on the tuna, which is the peak action in the stereo effect, the culmination of which occurs when the big tuna splashes into the audience's lap outside of the frame. Miriam Ross also analyzed this sequence stating, "some of the most viscerally intense [scenes] are those in which the fish appear to tear into the auditorium" (Ross, 2015, p. 130)

Figure 5.4-7 *Life of Pi* – 1:15:13 & 1:15:15
The belly and tail of the tuna is occluding the bottom frame of the film.

Ang Lee uses the technique of adjusting the aspect ratio to push stereoscopic elements creating a more immersive experience. “The discovery of dynamic floating windows suddenly opened this whole range of possibilities for 3D storytelling. It gave us the ability to get rid of all the window violations, and give us a tool for dynamically controlling how we use depth in a scene” (Gardner, 2009, para. 54). The performance of this simple technique was subtle, but it was enough to enhance the experience. Although the main depth cue is occlusion, the backlighting from the sunlight also helps the characters pop out from the background. The 3D is not particularly strong with the tuna in negative space, but because the tuna is on top of the frame, it signifies the importance of the tuna.

As the sequence continues, the big tuna accidently gets caught on the lifeboat. Then, there is a battle between Pi and the Bengal in figure 5.4-8. This is where Pi first realizes his animal instincts and how he can achieve dominance over Richard Parker, which is vital to his survival.

Figure 5.4-8 Life of Pi – 1:15:44
Pi intimidates Richard Parker with his makeshift spear appearing in negative space.

Unfortunately, the technique of occluding the frame wasn’t used again. The spear is clearly exaggerated during this tense moment while they battle. This recalls the classic 3D trope from the 1950’s cinema by poking the audience who are at the Tigers point-of-view. Because the technique was used only for the tuna, it presents an argument that Ang Lee wanted to keep the significance on the tuna. However, if Pi were to be cut-out and masked over the letterbox black bars, the sequence would intensify Pi’s strength and willpower to survive.

5.4.7. Motion Parallax and Magic Realist Traversal of Space

During a dream sequence, Pi travels through space and time in memory of the tragic event the occurred.

Throughout the film, there are often moments of a complete commitment to the cinema of attraction – Life of Pi loves to show off by exhibiting beautiful compositions
and vivid colors, but also by foregrounding the use of striking cinematic technologies. The dream sequence of young Pi replays the events that occurred earlier in the film in a very abstract way. As the camera starts to move forward deep into the ocean, it reveals animals swimming within. As they pass, the scene goes deeper through the z-axis and the darkness of the ocean becomes abstract showcasing glances of galactic substances among bubbles in figure 5.4-9. As the camera continues, the abstract imagery forms objects such as flowers as well as Pi’s mother’s face. Then, the dream comes to a close when Pi tries to understand the freight ship is on the sea floor, illustrating how deep his emotions go. Ang Lee uses this 3D vortex to remind the audience why Pi is fighting to survive.

5.4.8. Summary

Table 5-4 shows how 2D depth cues are utilized throughout the film to depict space. During the transitions from storytelling work into story world, most of the depth cues are created as the object or characters are cut out and shift around. One object might dissolve out before another character slides in. Utilizing motion and occlusion gives strong 2D cues of where these layers are positioned in space. Similarly, during the split-screen montage, objects and characters create the split frame, which are not traditional rectangular frames. Each object acts as its own layer and frame as it occludes the one underneath. Furthermore, occlusion occurs in the flying fish scene when the tuna occludes the film frame. By having the belly of the tuna flip over the letterbox black bars makes the fish appear outside of the film. The film itself is vividly colourful – Ang Lee takes advantage of 3D depth technology to showcase the natural beauty and size of the ocean, which also serves as a massive backdrop to emphasize how lost Pi and Richard Parker are.
Yann Martel's *Life of Pi* is an amazing narrative and was thought as un-filmable. Ang Lee solved this problem in part by using technology to create visuals unlike other Hollywood films. Planning the film with the z-axis in mind increased the presentation of spatial representation in both close quarters on a lifeboat and expressing the vastness of the ocean. Lee said: "I want to learn and become one of the trailblazers in discovering the language of 3D filmmaking" (Ang Lee as cited in Kemp, 2013). His bold actions with 3D enhance the story world, which shows his intentions to take this technology to the

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8 The summary tables refer to the presence of 2D cues within the reviewed sequences. The three sequences or shots were selected based on their incorporation of interesting poetics for the design of cinematic space. The use of specific 2D spatial cues is summarized in the table. The summary tables are not intended to be interpreted formally as quantitative data. However, they are qualitative evidence of the relative frequency of each of the 2D cues.
next level. With modern mask dissolve transitions and playful use of split screens, his creative decision-making goes beyond many other filmmakers.

3D enhances the story world as it became much more visual than the frame story world. Within the story world, character would reach into the audience and animals would pop into negative space – the scene felt more spatially fulfilling than their counterparts in the frame story world. The tuna broke the frame and splashed into negative space and for a moment it brought the ocean into the theatre. Ang Lee took a risk creating this film with many innovating new ways to explore 3D. To use the type of transitions he used as well as split-screen scenarios to visually enhance the narrative shows that Lee is a leading pioneer in what 3D filmmaking is all about.
Chapter 6.

Discussion

6.1. Construction of Space

Visual artists such as filmmakers, photographers, and painters construct the space and the spatiality of their story world. Filmmakers have more to work with than photographers and painters, as film is a time-based medium. Films include a sequence of images and/or motion, which allows exploration of space using tools. 2D spatiality cues in traditional cinema are normally occlusion, texture gradient, perspective, depth of field and other monoscopic cues. As more films are adopting the 3D technology, stereographic image-makers use 3D cues to express depth and build the film’s sense of spatiality. Parallax and convergence are the two foundational binocular cues for stereopsis. Parallax is the overall disparity or offset between the two images. Convergence is the area where the left and right images overlap perfectly, with no offset at this part of the image. These technical decisions create the two important stereoscopic perceptual phenomena for the viewer. The parallax determines how strong the stereoscopic effect will be. The convergence decision determines which parts of the image are at the screen plane (the convergence point), which parts are in the audience space in front of the screen (negative space), and which parts are in the space beyond the screen (positive space).

The 2D cues and the 3D cues complement each other in the construction of story world space and the experience of spatiality for 3D films. The close reading analysis of selected scenes from Dial M for Murder (Hitchcock, 1954), Avatar (Cameron, 2009), Hugo (Scorsese, 2011) and Life of Pi (Lee, 2012) demonstrate examples of 2D cues and 3D working together to create spatiality. The overall treatment of space among these films range along a range from the small space of a single room in Dial M for Murder, to
the enormous space of the Pacific Ocean and the even wider cosmos in *Life of Pi*. Within these different spatial representations, the use of stereoscopic imagery produces the perception of depth that has physiological and emotional effects. These effects support the narrative and story, but the images can also give a pure visual attraction or evoke a response of how did they do that effect (cinema of attractions). Additionally, each film has specific results of how they used 3D as a creative variable either supporting the narrative directly or as visual attraction in its own right.

### 6.2. Scale of Spatiality

The close readings reveal that stereoscopic depth can be applied effectively across a wide range of story world sizes – from confined and tight spaces to extremely large and expansive spaces.

**Relatively Small Cinematic Space**
- *Dial M for Murder*’s living room
- *Avatar*’s traveling pod
- *Hugo*’s tunnels within the walls of the train station
- *Life of Pi*’s life boat

**Medium Sized Cinematic Space**
- *Avatar*’s indoor scenes
- *Hugo*’s hallways throughout the train station
- *Life of Pi*’s frame story space

**Large Cinematic Space**
- *Dial M for Murder*’s streets
- *Avatar*’s arrival warehouse
- Hugo’s train station
- Life of Pi’s island

**Even Larger Cinematic “World” Space**

- Avatar’s Pandora
- Hugo’s Paris
- Life of Pi’s ocean and sky

Table 6-1 below summarizes the range of spatiality and relative size of the cinematic spaces portrayed in the scenes reviewed during the close readings. As with our other tables, this summary is not intended to be read as quantitative data, but is rather a qualitative overview demonstrating the wide range of spatial scales that were represented in the films.

**Table 6-1 Range of Spatiality**

<table>
<thead>
<tr>
<th></th>
<th>Small Scale</th>
<th>Medium Scale</th>
<th>Large Scale</th>
<th>World Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dial M for Murder</td>
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<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Avatar</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Hugo</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Life of Pi</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

This indicates the flexibility 3D has for the development of spatiality and story world. 3D is not limited to any particular scale – small, medium, or large – but can work on any setting. The shorthand use of specific category labels should not undercut the versatility of this process. The spatial spectrum in this study has a number of in-between examples, as each film used the cinematic space and 3D spatiality in ways appropriate to the needs of cinematic story and the overall visual experience. Dial M for Murder’s overall space is small and confined as it is mostly within the walls of one room. Avatar’s space is appealing as the computer generated story world boasts its medium to large space. This is after the characters enter Avatar’s story world via a small fitted pod, further demonstrating the possibility of space and scale juxtaposition in 3D film. Hugo
has scenes in smaller confined spaces which Hugo occupies, but the film generally stays within the area of the train station and beyond, which is medium to large space. *Life of Pi* seemed to adapt all types of spatiality – the film uses the full range of spatial expression: the small, constricted space of the life raft, the more standard spatiality of the framing interview scenes, the larger spaces of the floating island or the sinking ship, the vast ocean dwarfing the lifeboat and its struggles, and even the vaster cosmos surrounding all.

### 6.3. Functions of Spatiality

A smaller cinematic space makes it easier to explore character. *Dial M for Murder*’s tight space setting focuses on character development and how Tony convinces Swan to murder Margot. Similarly, the confined spaces within the walls of *Hugo*’s train station centers on Hugo’s personal safe zone where no one can easily get to him. In *Life of Pi*, Pi is trapped on the small life raft feeling vulnerable with a tiger onboard. These constrained spaces are an appropriate setting to increase our understanding of the various characters and amplify the emotional intensity of the storytelling.

The medium spaces of *Hugo* and *Life of Pi* are where characters build relationships as they interact with each other. The Station Inspector roams the train station in search of orphaned children but also has interest in the lady who sells flowers. Pi and the writer express personal thoughts as they converse in the frame story.

The large spaces allow for scenes with an extended sense depth supported by conventional 2D cues and can pull the audience into the story world. In *Avatar*, the flying sequence involves action as the characters take a thrilling ride through the floating islands of Pandora. *Life of Pi* illustrates Pi’s experiences as he dreams an abstract vision that travels to the ocean floor.

The world-scale spaces are often aerial shots showing an awe-inspiring story world. In *Avatar, Hugo* and *Life of Pi*, these scenes are aesthetically inspiring – increasing the visual pleasure of the cinematic experience.
The 3D treatment of these spaces can create stereoscopic spatiality in front of or behind the screen, or both. The films differed significantly in this regard. *Dial M for Murder* and *Avatar* generally limited their use of negative space compared to *Hugo* and *Life of Pi*, which were more amplified. However, *Dial M for Murder* did join *Hugo* and *Life of Pi* in utilizing a selected exaggeration of the negative space for the service of narrative. Overall, the filmmakers used screen depth to develop a variety of spaces among their story worlds.

6.4. 3D Cues in Conjunction with 2D Cues

The films all used 2D spatial cues and 3D spatial cues in combination to build cinematic space. The specific choices and combinations varied according to the needs of each story and the individual styles of the filmmakers.

Though the space of *Dial M for Murder* is on the smaller end of the spatiality range, 2D and 3D spatial cues visually fill out this fairly tight space. 2D cues such as size, colour, brightness, cast shadow, occlusion, movement parallax, lighting, motion and depth of field were all observed in the analysis of *Dial M for Murder*. The camera movements throughout the living room increased the depth perception of objects that occluded each other. The parallax between the left and right images presented distance between subjects and set props. The convergence variations generally kept the film in positive space behind the screen plane. The wider focal lengths present a larger depth of field, which allows the viewer to explore the space. Close-ups, on the other hand, usually resulted in a shallower depth of field, isolating the subject in the frame.

Many of *Avatar*’s deep scenes are expressed with distance and perspective cues. The film projects immersive environments for the viewers with surrounding elements in audience space such as tree leaves, vines and floating wisps. 2D cues such as size, colour, brightness, attached shadow, linear perspective, occlusion, movement parallax, height in plane, aerial perspective, lighting, motion and depth of field were all observed in the analysis of *Avatar*. The scenes had a strong sense of depth and extension into space. Most of the indoor shots have many windows, which added another layer of depth. Despite a moderately shallow depth of field, the combination of
mise-en-scène, composition, and 2D depth cues makes the awareness of positive space very strong.

*Hugo’s* space within the walls focuses on the lead character’s familiarity with his space. As he travels through vents and small corridors, the audience feels constricted and uncomfortable. Elements such as smoke and dust float out into the audience space. In addition, mechanical pulleys, gears and switches push forward as Hugo goes from clock to clock. Outside of this space, the train station reveals itself as medium to large. 2D cues such as size, colour, brightness, cast shadow, texture gradient, linear perspective, occlusion, movement parallax, lighting, motion and depth of field were all observed in the analysis of *Hugo*. There is considerable non-obtrusive negative space throughout the film supported with lighting, colour, occlusion, perspective and depth of field. Unlike *Avatar*, the point of interest seemed to appear in negative space the majority of the film. The characters are modeled just in front of the screen plane in center frame, which offers a comfortable stereoscopic experience. Classic lighting techniques aided the perception of depth while characters bulged out of the screen in sharp focus.

The latter two thirds of *Life of Pi* features Pi on a boat with a tiger. Although the raft’s space is confined, there are many distant shots of the boat in the middle of the ocean expressing the detachment that Pi is experiencing. There are many visually mesmerizing shots of the sun, clouds and the cosmos presenting vivid colours of the sky and stars. Many of these shots make it difficult to determine where the ocean ends and sky begins, similarly to where the screen plane lies in 3D. 2D cues such as size, colour, brightness, occlusion, movement parallax, aerial perspective, lighting, and motion were all observed in the analysis of *Life of Pi*. Utilizing motion and occlusion gives strong 2D cues of where these layers are positioned in 3D space. Similar to *Dial M for Murder*, the lead characters were often positioned at the screen plane. With *Life of Pi*’s backdrop being the ocean, the aerial perspective enhances the positive space creating several layers up to the screen plane. The film utilizes negative space often through the use of interesting layering of subject cut-outs as well as adjusting the stereo window.
Table 6-2 Overall 2D cues among all films

<table>
<thead>
<tr>
<th></th>
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<th>Hugo</th>
<th>Life of Pi</th>
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<tbody>
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<td>✓+</td>
<td>✓</td>
</tr>
<tr>
<td>Attached shadow</td>
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<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Cast shadow</td>
<td>✓+</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Texture gradient</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Linear perspective</td>
<td></td>
<td>☐</td>
<td>✓+</td>
<td>☐</td>
</tr>
<tr>
<td>Occlusion</td>
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<td>✓+</td>
<td>✓+</td>
<td>✓+</td>
</tr>
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<td>Movement parallax</td>
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<td>✓+</td>
<td>☐</td>
<td>✓+</td>
</tr>
<tr>
<td>Height in plane</td>
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<td>✓</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Aerial perspective</td>
<td></td>
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<tr>
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<td>✓+</td>
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</tr>
<tr>
<td>Motion</td>
<td>✓+</td>
<td>✓+</td>
<td>✓+</td>
<td>✓+</td>
</tr>
<tr>
<td>Shallow depth of field</td>
<td></td>
<td>✓+</td>
<td>✓</td>
<td>☐</td>
</tr>
</tbody>
</table>

Note – This table is a summary of the 2D depth cue observations and tables from the close reading analyses in Chapter 5. Like them, this table is not intended to be read as quantitative data, but rather as qualitative evidence of the relative frequency of the individual cues.

Table 6-2 refers to the 2D depth cues in the sample scenes of the films reviewed in the close readings chapter. 2D and 3D cues reinforce each other and they are used purposely to build the space the filmmakers want. Within smaller spaces, the main 2D cues are size, occlusion, movement parallax, lighting, motion and depth of field. As we observe larger spaces, texture gradient, linear perspective, height in plane, and aerial perspective take effect. In both spaces, positive and negative space can be used as a variable dialing up and down the intensity. Each film example has different apparent 3D depth. Both *Dial M for Murder* and *Avatar* kept negative space to a minimum, but
Avatar’s positive space was amplified by a strong use of 2D perspective cues within a set design that was extended into the z-axis. Life of Pi’s outdoor scenes also used distance and perspective cues effectively. Dial M for Murder’s indoor scenes still achieved depth between subjects within the frame by a different set of 2D cues. In Hugo, when the attention is in front of the screen, other cues such as lighting are used to help round the characters and model them into the audience space.

6.5. Narrative and Attraction

Throughout the analysis we have seen a number of creative decisions made in support of film narrative. However, the design of stereoscopic cinema is not solely dedicated to the development of story: there is also pleasure in the pure visual experience of stereoscopy on its own terms. This brings us once again to Tom Gunning’s concept of the "cinema of attractions". Gunning makes several points about these "attractions". Not all cinematic experience is purely narrative, some filmic pleasures are enjoyed for their own attraction. This does not mean attraction and narrative are necessarily mutually exclusive. An attraction can provide its own intrinsic interest, and at the same time it can also serve the needs of the narrative. Bolter and Grusin as well as Lev Manovich claim we can oscillate between the pleasures of immediacy (associated with "suspension of disbelief" and narrative immersion) on the one hand and hypermediation (associated with the conscious awareness of a cinematic attraction) on the other. A 3D film is often a hypermediated experience as it shows off cinematic effects and technical advancements for the purpose of entertainment. When subjects are placed out in negative space or deep within positive space, 3D can call attention to itself resulting in the loss of suspension of disbelief. However, we naturally see in three dimensions so immediacy and narrative immersion is still possible. The path to narrative immersion within 3D is to use spatiality as a supportive tool to storytelling. 3D can also bring its own additional visual or embodied appeal to the experience. Film viewers can and do oscillate between the pleasures of immediacy and hypermediation as they experience both narrative immersion and the appreciation of stereoscopy as a cinematic attraction.
6.6. Secondary Stereoscopic Design Implications

The poetics of 3D are built upon the design and experience of cinematic space. In addition to this ongoing broad design challenge, the close reading analysis of the selected subject films revealed three subordinate sub-themes:

- Negative space as punctuation to narrative
- Negative space and shallow depth of field
- Spatial montage in 3D

6.6.1. Negative Space Punctuation

A dynamic relationship between negative space, narrative development, and cinematic attraction was common across three of the four films. *Dial M for Murder*, *Hugo*, and *Life of Pi* had some sort of cinema attraction during significant narrative moments. Each film used negative space differently — but all of them showed the ability of stereoscopic presentation to walk a thin line between negative space as a visual punctuation of narrative plot, and as a cinematic attraction in its own right.

Alfred Hitchcock’s 3D in *Dial M for Murder* generally relies on positive space and saves negative space for narrative punctuation and cinema of attractions. There are three key moments of the film that are in negative space. First, when Tony was dialing Margot both his finger and the rotary dial were in negative space. Secondly, during the murder, Margot reaches backwards into the audience — which appears to be a call for help from the audience — before she discovers a pair of scissors. Thirdly, when Hubbard reveals the key uncovering Tony’s plan. Hitchcock uses close-ups or medium close-ups during these moments of punctuation, which are all essential moments in the plot.

Martin Scorsese’s willingness to have characters move into the audience space gives the experience of pushing the bounds of the personal space of the viewer. First, when the Station Inspector interrogates Hugo and Isabelle. The creative use of 3D visuals during the narrative’s audio was distorting the face of the Station Inspector while he verbally announced the words “physiognomy”, “visage” and “face”. As he spoke these
words, his nose continued to poke further into audience space. The second occurrence is when the 3D effect is psychologically attached to the character. While Hugo is having a nightmare, he dreams that he is becoming the automaton. As the dream continues, the negative space is increased as the set collapses with gears right before Hugo wakes up.

Ang Lee was perhaps the boldest designer of cinematic space – exploiting the extremely tight space of the lifeboat and the massively large ocean and cosmos. His strong use of positive and negative space boosts the perception of depth in order to wow the audience. He also pays tribute to the relatively standard historical use of negative space by showcasing Pi’s makeshift spear in negative space. Then, even more daring, Ang Lee utilizes a modern technique of 3D by adjusting the aspect ratio (stereo window) for objects in negative space to appear projected over the frame of the film. Although this effect appeared once throughout the film, it was during a key narrative point. The flying fish explode into negative space as they come across the lifeboat’s path – signifying the importance of solving the food problem. He further hypermediates this already hypermediated visual tradition. Ang Lee takes risk creating this film with many innovating aesthetics to explore 3D imagery – such as split screens and spatial montage – that other popular filmmakers haven’t yet encouraged.

These films all show the use of stereoscopic visual design in the service of story through the punctuation of plot intensity at specific key moments. They also demonstrate how the strongest of these punctuations can go beyond the basic needs of cinematic narrative and provide the visual pleasure of cinematic attraction in its own right.

6.6.2. Shallow Depth of Field in Avatar

Some traditional stereographers maintain that the 3D composition requires complete depth of field. I do not agree that 3D necessarily requires deep focus, however, I did see a problem with the way shallow focus was implemented in Avatar. The film followed a traditional technique in cinema by using shallow depth of field to direct the viewers’ attention. Subsequently, due to the convergence-accommodation conflict where our eyes are constantly focused on the screen plane regardless of what part of the frame we are looking at, James Cameron designed Avatar to lock the camera focus and the
stereoscopic convergence (the screen plane) on the same part of the subject in order to give a more comfortable 3D experience.

As *Avatar’s* shallow depth of field keeps the subject at the screen plane sharp, subjects in positive or negative space are soft. Although a soft positive space doesn’t draw attention to itself, a soft negative space does. When an object is spatially placed in audience space, it is distracting by drawing attention to itself even though it is not in focus. Interestingly, when there is a rack focus from one object to another, the z-axis spatiality adjusts. When the rack focus (along with the convergence) occurs to the object that is in negative space, the object moves back to the screen plane.

*Avatar’s* depth of field is often shallow, which doesn’t always allow the viewer to explore the composition of the spatiality. Although, the audience feels and sees the depth surrounding the point of attention, the commitment to combining focus and convergence together creates a contradiction in 3D with shallow depth of field. 3D filmmaking involves subjects at different spatial distances along the z-axis. It doesn’t mean that the film has to go to completely deep focus. However, having several points of interest in focus within comfortable 3D depth can be and has been achieved. *Avatar’s* compositions and set design do present a world that is spatially deep, but when objects are soft in positive or negative space, they can appear less visually significant.

### 6.6.3. 3D Spatial Montage in *Life of Pi*

*Life of Pi* is unique among the reviewed films in its use of what Manovich calls "spatial montage". Ang Lee successfully uses masked transitions as a different approach to the construction of cinematic space and as a transitional device to move from one shot to the next. This technique is used in the film during the important transitions from the frame story to the story world rather than normal sequences. As the transitions select interesting subjects to cut in and out at different times of the dissolve, it also builds a completely different model for creating a hybrid cinematic space within the frame. With each masked subject on a different z-axis, this rare technique expresses visual interest on its own terms as it creates original and aesthetically pleasing forms of layered composition.
During the split screen montage, Ang Lee is clearly showing off the fusion of several distinct visual techniques: the split screen, the use of content-driven shape masks, and a hypermediated commitment to compositional layers. With Pi narrating over the layered images, the audience has the freedom to view Pi reading the safety guidebook or the comical montage behind. Ang Lee is able to carry off the adaptation of traditional temporal montage into the spatial montage aesthetic made easier through digital technologies.
Chapter 7.

Conclusion

The foundation of this argument is the key concepts drawn from the relevant literature of cinema studies, stereoscopy, narratology, digital media theory and phenomenology. Selected 3D cinematic works (as identified in the academic literature, professional journals, and the popular press) were explored thoroughly. The thesis identifies the relevant concepts for 2D and 3D spatiality, and explicates the implications for their creative and expressive use within the medium.

The addition of stereoscopic imaging to the design of cinematic experience puts a powerful set of new visual tools in the hands of filmmakers. Traditionally filmmakers have relied on location choice, set design, lighting, composition, and a wide range of 2D depth cues to create a sense of space and spatiality appropriate to the needs of the film. 3D imaging adds the ability to give the viewer the sense of binocular depth they get in everyday life. The poetics of 3D imaging allow for the creative manipulation of the amount of depth perceived (through parallax disparity) and the relative distance of objects and people along the depth axis of the theatre (through convergence and the allocation of negative space and positive space). These poetics are the drivers for the construction of the stereoscopic cinematic space, but they are most effective when properly combined with the set of existing two-dimensional visual poetics of space and depth.

This combined set of 2D and 3D visual tools is versatile, and can be adapted across a wide range of cinematic spaces. The specifics of the visually created film space will vary, depending on the filmmaker's goals for narrative effect and visual experience within a given film or scene. These visuals create a more embodied cinematic experience, as the enhanced spatiality triggers a sensory experience that places the
viewer directly within the space of the story. Finally, this enhanced sense of space and embodied self not only supports storytelling, but can also go beyond the confines of narrative and suspension of disbelief into the more visceral worlds of cinematic attraction and visual hypermediation.

In order to achieve these findings, I employed a rigorous approach that included repeated viewing, note-taking, and analysis across various 3D formats: theatrical exhibition, Blu-Ray Discs, and anaglyph screen captures. This task has been challenging, but extremely rewarding. The topics discussed and studied share both the boundaries and the synergies of spatiality, the ‘Cinema of Narrative’ and the ‘Cinema of Attractions’ within this domain.

This thesis has concentrated on the visual design of stereoscopic cinema. Sound technology is a non-visual spatial element that is outside the scope of this study. However, like the visual 2D cues, sound design shapes the sense of space in both traditional and stereoscopic cinema presentation. The relationship between spatiality, sound and the design of stereoscopic space is an important area for future work on the poetics of 3D cinema.

There are hopes that this thesis may be useful as a guideline for other film scholars examining the network of relevant design relationships, including stereoscopy, spatiality, cinematic construction, narrative, and viewer engagement. The overall goal was always to advance the scholarship and the practical understanding of the making of 3D cinematic experience. My future ambitions will be to concentrate further on the understanding of the poetics of 3D cinema and then develop my personal techniques and style in the context of an original 3D film of my own.
References


Klinger, B. (2013). *Beyond cheap thrills: 3D cinema today, the parallax debates and the “Pop-Out”*. Public, 24, 47, 186-199.


Appendix

Table A – Film Screenings

<table>
<thead>
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<th>Preliminary Screenings</th>
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