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Olivia Franziska Luz December 3, 2013

Early Practices in Digital Cinematography:
The Techniques and Technologies of the Digital Intermediate
and Digital Motion Picture Cameras

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Abstract

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By Olivia Franziska Luz

At the turn of the twenty-first century, recently developed digital technologies posed new challenges for cinematographers. The technologies most relevant to early changes in cinematography are the digital intermediate and digital cameras. The introduction of the digital intermediate will be explored through the film, *O Brother Where Art Thou?*, which was shot by Roger Deakins and showcases how Kodak's Cineon scanner and color correction suite was used to affect the look and feel of an entire film. Then, digital cameras will be explored as a progression to understand how the technology developed in the films *The Celebration, 28 Days Later,* and *Slumdog Millionaire*, all shot by Anthony Dod Mantle. Both Deakins and Dod Mantle are key to better understanding how these technologies can be used to create an aesthetic that was removed from the look and feel of celluloid film. Despite these films not adhereing to the standard Hollywood conventions of cinematography, their lower resolutions did not affect audience's positive perceptions of the film. The technologies and techniques were utilized on each film to create a new aesthetic with its own definition of image quality, influenced by the digital tools used, instead of trying to mimic the look and feel of celluloid film. This thesis examines these early examples of innovation in the realm of digital filmmaking, a trend that has slowed today.

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Introduction

Cinematography is the marriage between the technical side and artistic nature of filmmaking—cinematographers must be technicians but also control the visual expression of a film. The cinematographer has always been one of the driving forces behind the feel of a film and how the story is told. And the cinematographer must understand all steps in the workflow from production to exhibition in order to create the final product desired by the director and producers. Thus, the cinematographer must also constantly learn new technologies as more tools are created and shifts in industry practices occur.

At the turn of the twenty-first century, recently developed digital technologies posed a new challenge for cinematographers. How would cinematographers develop fresh storytelling techniques with these technologies and how would they incorporate them into their production practices and workflow? Digital technologies started to infiltrate the motion picture industry, and cinematographers began to discuss how this would change their roles in the filmmaking process and affect their production and post-production workflows. Digital was no longer simply a forecast for the future: the future had arrived. Starting out as purely experimental, many of these technologies were able to develop and become fully practical, soon transitioning to become primary technologies of the motion picture industry. For the purpose of this thesis the discussion will be limited to how digital operates within the film industry.

In 2000, most feature films were still shot on photochemical celluloid stock, distributed in film canisters, and projected on 35mm projectors. However, the art and practices of cinematography were about to undergo the most significant and prolific changes since the introduction of color cinematography. On the front-end of filmmaking, changes would occur in

production practices through the introduction of different digital camera technologies; on the back-end, new tools and technologies would affect how films would be processed and color corrected. Each of these changes in aspects of both production and post-production would go on to spur a digital overhaul of the industry in everything from how a film is shot to how the film is distributed and projected.

A Notable Early Use of the Digital Intermediate

While the entire film industry has been affected by the transition to digital, the introduction of the digital intermediate and digital camera are the two technologies that most specifically affect the role and work of the cinematographer. Chapter one will examine the first use of Kodak's Cineon scanner and the creation of the digital intermediate to color grade an entire film on *O Brother Where Art Thou?*. This film was the catalyst for the digital intermediate to become a standard part of the production workflow in just less than five years after it was used on *O Brother* in 2000. Understanding how the digital intermediate came to prominence requires an examination of Roger Deakins, the cinematographer on *O Brother*, who was one of the first cinematographers to experiment with technology in order to change the *whole* look of a film from how it was originally shot. Deakins' use of the digital intermediate introduced the technology to the feature film industry as a technology that could give cinematographers and filmmakers more opportunities in developing and manipulating their final product. The tools dramatically extended "image manipulation capabilities for color correction, digital filtering, and lighting" (Clark "Mission Statement"). The digital intermediate helped Deakins develop a new workflow in production that was influenced by the technical changes and manipulations that would occur in post-production.

Since its release in 2000, *O Brother* sparked a debate among cinematographers on the use of the digital intermediate, most recognizably in the cinematography trade magazine, *American Cinematographer.* This debate led to an interesting discourse between cinematographers on how digital technologies affected their roles, their artistry, and the overall future direction of the film industry. One of the key figures in this debate was cinematographer John Bailey, who continued to deliberate on digital technologies throughout much of the first decade of the 21st century. Cinematographers debated the digital intermediate more than any other digital technology because it influenced how much control they had over their final image, changing what they created in the production phase and reworked their role in the artistic process of finishing a film. Once it became cost effective, it was easier for producers and studios to implement the use of the digital intermediate because they usually fully controlled the post-production process. This was the opposite to the introduction of digital camera technologies. Cinematographers were more able to resist the implementation of digital cameras, since it required a complete revision of the production workflow that many crews were unfamiliar with. The digital intermediate simply expanded capabilities in post-production that did not necessarily require the cinematographer's presence. Only in recent years, since the digital motion picture cameras have reached a professional standard comparable to celluloid film, have studios begun mandating their use as a full replacement of celluloid technologies.

Although the digital intermediate started off as an expensive technology, as the technology improved and became more widely used, costs decreased, allowing it to become a norm in post-production, replacing the practice of color timing[1] the actual film negative. Now, more than a decade later, while the technology of digital scanning and correction software has

[1] Color timing is the photochemical process of altering and enhancing the color of a motion picture in a photographic laboratory.

greatly improved, the basic techniques of a digital intermediate have not changed. However, the use of a digital intermediate drove the need to eliminate the scanning portion of the workflow by instead starting the whole process with a digital image produced from digital recording technology—helping in the rise, improvement, and acceptance of the digital motion picture camera. Additionally, on the output side of the digital intermediate, films are no longer being scanned back onto film, rather remaining in digital format for exhibition. Corrections no longer need to be exported back to film for release printing—films are now often shot digitally in production and then exhibited as digital files with digital projectors. The Cineon scanner prompted the practice of the digital intermediate in order to digitally color correct and manipulate films, allowing digital to become the standard technology in the various aspects of the industry. Yet, the scanner also promoted its own end. The digital intermediate drove the acceptance of the digital camera by pushing camera manufacturers to create professional digital motion picture cameras that would eliminate the scanning steps in the digital intermediate workflow.

The Early Progression of Digital Cameras

Digital cameras entered the industry as consumer grade technologies and over the course of a decade matured to professional grade technologies. Early on, the digital motion picture camera was accepted by cinematographers with hesitation and often only implemented through economic constraints on productions that could not afford to shoot celluloid. Due to the complexity in the technology, the digital camera took longer to develop into a professional tool by various manufacturers and thus must be examined as a progression. While the techniques of the digital intermediate have remained relatively the same as they were when used on *O Brother*, digital camera technologies have greatly changed and developed over time, from a relatively

cheap consumer grade technology to a high-cost product created for professional motion picture production. To assess how the digital camera and digital recording formats advanced, chapter two will examine three films, all shot by the same cinematographer, Anthony Dod Mantle. The first film discussed will be *The Celebration* (1998), which was shot on consumer handheld digital cameras, far from the image quality standard of the professional industry. The camera's small size produced a unique camera movement that placed viewers inside of the story action. *The Celebration* was part of the film movement, Dogme 95, and went on to gain much critical acclaim despite having a lower image resolution and home-video look. It was one of the first films to find success in its digital cinematography and allowed Dod Mantle to begin developing a new style in cinematography that larger film cameras had not allowed. Audiences perceived the distinctive and lower resolution look of the digital images, and still enjoyed the film. *The Celebration* jumpstarted Dod Mantle's career and eventually got him noticed by director, Danny Boyle. The two have since collaborated together numerous times, including on the other two feature films discussed in chapter two, *28 Days Later* (2002) and *Slumdog Millionaire* (2008). *28 Days Later* used the Canon XL1 and the MiniDV format, to produce a gritty feel that reminded viewers of documentary or surveillance footage, making the post-apocalyptic story of the film feel all the more real. The last film, *Slumdog Millionaire* is the most polished of the three and showcased images closer to the quality of celluloid film images while still preserving its own digital aesthetic through the movement, camera angles, and coloration. While a somewhat abstract concept, image quality will be used in this thesis to describe the amount of degradation in an image noting that the degraded look of digital and celluloid technologies is different. High quality parallels a low amount of degradation in the image.

An examination of the production practices and workflows of these three films reveal how Dod Mantle developed a new aesthetic through digital cinematography, and how the technologies were operating in the industry early on. Dod Mantle's films often used an array of new techniques and camera technologies. So, each technology and how it affected his cinematographic process will be examined, including the difficulties each afforded him. An analysis of each of these three films will reveal how the digital motion picture camera eventually became an accepted and now standard image acquisition technology. Dod Mantle employed digital technologies early on, far before their results were comparable to the image quality of photochemical film, which often resulted in his films having degraded resolutions and poor dynamic range[2]. However, Dod Mantle's work was still acclaimed because he was able to create a feel to his films unlike other films at the time, taking the audience where the camera had rarely ventured before, using the unique qualities of smaller digital cameras to create distinctive and boundless camera movements and unusual shot compositions.

Though Dod Mantle took full advantage of the strengths and weaknesses of the various digital cameras to create unique aesthetics, camera movements, and ways of storytelling, he was often initially influenced by budget restraints that gave him no other choice than shooting digital. The film industry often straddles between art and industry. With economic limitations affecting the choices of filmmakers, choices in technology are never truly revealed to be artistic or economic. The true reason why many of these digital technologies were implemented is difficult to know, so instead this thesis will focus on how the technologies affected the production techniques and the final outcomes of their films.

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[2] Dynamic range refers to the ratio between the darkest (shadows) part of the image and the brightest (highlights) part of the image; overall range of luminance

The Relationship between Technology and Techniques

When examining changes in production practice, one must keep in mind the relationship between technology and production techniques. Historians and film theorists have often conflated the terms "technology" and "technique". For the purpose of this thesis, the distinction between the two terms should be clarified to better examine how they relate to one other. In his essay, "Toward a Theory of the History of Representational Technologies", Rick Altman focuses his entire first section on just this distinction between technique and technology and how the two influence one another. Altman writes, "one of the prime movers of technological development lies in the interest of automatizing (i.e. reducing the production time of) those techniques which have become consecrated by tradition" followed by various examples of how visual artists have achieved this; for example, the development of directional microphones in the 1930s after constant attempts to limit and concentrate the range of existing mikes in cinema (Altman 5). He then continues, "just as technology often automatizes an accepted technique, so new techniques often appear in reaction to—indeed in compensation for—the introduction of the technologies," such as when directors of the 1950s would split the wide Cinemascope screen into two or three sections to create a composition more familiar to that of the 1:1.33 frame from before (Altman 5). How can we place digital technologies within these arguments? While digital technologies were created to automatize accepted techniques of filmmaking, the works of Deakins and Dod Mantle show how digital technologies have gone on to introduce new steps and mediations in the techniques in the production practices, expanding the workflow. Chapters one and two will analyze the relationship between how technologies affect techniques of filmmaking and how various old and new techniques have influenced digital adoption and technology advancements.

This thesis will begin by examining the digital intermediate because it primed the industry to manufacture and then accept higher-grade motion picture cameras. Both the technologies and techniques of filmmaking will be best examined through articles in the cinematography trade magazine, *American Cinematographer,* which exhibit discussions of these film's images by their actual creators: the cinematographers. These articles give much insight into how Deakins and Dod Mantle created their films and also how to gauge cinematographers' reactions to, attitudes about, and influences on digital technologies. The magazine continues today to be an outlet for creative discussion between cinematographers on aspects of the art, practices, and technologies of filmmaking. Examining the discourse in the magazine best reveals the causes for anxiety by various cinematographers and how they worked and now continue to work through these anxieties as the industry transitions to a permanent digital state.

A New Digitally Influenced Aesthetic

While many cinematographers and filmmakers were most concerned with the negative impact on image quality from digital technologies, Deakins and Dod Mantle took advantage of these technologies to develop new techniques of filmmaking and form their own uniquely stylized films through the digital tools in favor of their narratives. These digital technologies allowed the cinematographers to create their own standards of image quality, questioning the relationship between image quality and what defines renowned cinematographic achievements. Straying from the conventions and practices of the Hollywood motion picture industry, the films examined in the following chapters do not show perfect, high-quality images, but instead images that are often degraded by lower image resolution, high degrees of noise, and/or poor dynamic range. This created an aesthetic that was foreign to the celluloid film feel that most audiences were used to. Though many cinematographers were hesitant toward or against any form of

digital in the cinema, these two cinematographers found themselves in circumstances that allowed them to uniquely tell their stories and broaden their artistic visions by using tools that allowed techniques beyond those of celluloid technologies. Deakins and Dod Mantle utilized the strengths of the tools in favor of the story to soften their weaknesses, creating films with a unique look that audiences enjoyed. Both were not afraid to highlight the limitations of their technologies to compensate for the lower quality. These events in the first decade of the development and implementation of cinematographic digital technologies are important to examine to better understand how filmmakers can work to continue to develop a digital aesthetic today.

Chapter 1

The Digital Intermediate as Used by Roger Deakins

From Digital Answer-Print to Digital Intermediate

Before filmmakers started shooting films digitally, they first began scanning films digitally for use in post-production. Traditionally, films had to be color corrected in the process of making answer-prints[3] from their original negatives to give the film a smooth and continuous look and feel. In the 1990s, experiments began with scanning film into digital form to create digital answer-prints—a process that would later be named the digital intermediate. Roger Deakins was one of the first cinematographers to explore this process. He utilized the digital intermediate tools to create an image quality on *O Brother Where Art Thou?* that would have been impossible with conventional color timing methods. The digital intermediate has now become a standard part of the post-production workflow, but this may not have happened had Deakins not taken the risk of using this new technology at the turn of the 21st century. The film and its new use of the digital intermediate triggered many different reactions which can be examined through the multiple articles in *American Cinematographer.* These articles showcase debates that allow a greater insight into how the digital intermediate became a normal practice in the industry and how the digital revolution affected cinematographers and cinematography early on. While the digital intermediate was initially an expensive technology, once the costs were lowered by increased demand and the technologies scanning abilities improved, it quickly became a standard in the workflow. Though the early scanning technology lacked the ability to maintain many of the quantitative standards of cinematography, such as image resolution, color preservation, contrast ratios, and sharpness levels, Deakins was able to use it to his advantage by

[3] The first version of a motion picture after all post-production has been executed

creating with it a better subjectivity to the time and feel the film's script desired. *O Brother* was a pioneer in the realm of digital technology and continues to be viewed as a revolutionary cinematography achievement.

Roger Deakins

The choice to use the digital intermediate on *O Brother* was entirely that of the cinematographer, Roger Deakins, whose background should be examined to better understand why he might have taken the risk of using this new technology. Deakins found an interest in photography at a young age because of his love for observing life and the ability to capture what he saw with his camera. He found an opportunity to move from photography to filmmaking when he heard about the new government sponsored National Film School opening outside of London. After graduating, Deakins began by shooting commercials and rock concerts, and then eventually found opportunities to shoot documentaries. His first significant documentary work was shooting the war in Rhodesia for the African National Congress, followed by a project filming a crew aboard a ship on the World Yacht Race (Rogers 71). Thus, Deakins' foundations lie in documentary filmmaking, which is a film form that often drops the conventions and standards of narrative filmmaking in favor of better telling a story. Due to his start with shooting documentary, Deakins has continued to operate on the films he shoots today, an unusual practice for many cinematographers. Early on in his narrative film career, Deakins worked with the same crew, such as his gaffer John Higgins, which allowed him to focus on his relationship with the director and how he will operate the camera (Rogers 75).

Deakins has always taken an unconventional approach to filmmaking stemming from his documentary background, and in 2000 he continued this trend by experimenting with Kodak's Cineon. The use of the Cineon on *O Brother Where Art Thou?* set the stage to rethink how

digital scanning technologies could be used for color timing and manipulating colors on a film, instead of just for visual effects purposes. The practices that Deakins began on *O Brother* influenced how the technology would go on to be used by other filmmakers and how the digital intermediate would develop to become a permanent part of the post-production workflow.

Kodak's Cineon

One of the earliest forms of digital infiltration into the generation of the cinematic image began at the Eastman Kodak Company in the area of post-production technologies, when Kodak introduced its Cineon System in 1993. The system was unique in that it scanned images into a DPX file format that captured much greater image information and better quality than the previous scanning technology, the video-based telecine. The digital data was able to obtain better dynamic tonal range and color depth of the film being scanned (Curtis). The scanner used a CCD sensor, which is a light-sensitive chip similar to those used in video cameras. The sensor is divided into 4096 individual sensing elements that sense red, blue, or green. Kodak matched the color sensitivity in the sensors to the dyes in their motion picture negative films. Each frame could be processed in three seconds, taking up about 40 million bytes of information (Davidson). Initially, the technology was intended to progress visual effects through digital compositing (Prince 73).

However, the software that was developed to work on the digitally scanned images could be used for adjustments much simpler than visual effects. Filmmakers could simply "sharpen or blur images and resize", do "scene salvages" or removing unwanted objects in the frame, and filter elements of the image. One could perform such operations manually on a few key frames and then the computer would "interpolate the changes to all intervening frames [in order to] produce a smooth sequence" (Davidson). While the Cineon scanner and its software was used in

1993 on films such as *Cemetery Club* and *Fire in the Sky,* these films only used it for small fixes and not to its maximum potential. It was not until 2000 that the system became a commercial success and began to be seen as a technology that could be used to manipulate every single frame of a live action film. This technology would go on to be named the digital intermediate, and within a few years it became a consistently used technology on almost all major feature films. It is important to note that Cineon system was a closed system, and not open architecture, in that it scanned best with Kodak film stocks and then transferred the films back onto Kodak film at the end of the workflow. Perhaps, this is a reason the Cineon did not last much longer into the 21st century, and was later outdone by other scanning technologies.

Films like Jon Shear's *Urbania* and Gary Ross' *Pleasantville* are often the films recognized to have first taken advantage of this new technique of digital image manipulation (Fisher 37). *Urbania* was shot in super 16mm, for economic but also aesthetic reasons. Shear chose super 16mm to give the film a "sooty color and grainy look appropriate to the film's somewhat surreal quality," but then took advantage of the Cineon to digitally process the film and blow it up to 35mm film for projection (Thomas). Ross' *Pleasantville* used the technology to add color to specific parts of the black and white world created for its viewers. The manipulation of the images in *Pleasantville* is obvious to the viewer, thus producing a similar effect to how digital visual effects were used by filmmakers and observed by audiences.

O Brother Where Art Thou?

However, the film that best showed early on how the Cineon technology and digital intermediate would go on to be used in the industry was *O Brother Where Art Thou?,* which continues to be the film most frequently referenced when discussing the early digital intermediate. *O Brother* is an important film to discuss because it used the scanning and digital

technologies to change the coloration and look of the film—not for gimmicks like those used in *Pleasantville* that were more noticeable to viewers, or technological format reasons like in *Urbania.* Instead, on *O Brother*, the techniques used created an aesthetic look that would better support the story of the film. Such use of the tools found in the Cineon suite were more applicable to most motion picture films, making it an important influence on how the digital intermediate would go on to be used by filmmakers.

After seeing the results of *Pleasantville* and *Urbania,* the digital scanning and manipulation technology piqued the interest of filmmakers Joel and Ethan Coen and their cinematographer Roger Deakins, leading them to take on the risk of this new technology to change the look and color of *O Brother*. The film's script is loosely based on Homer's *The Odyssey* and takes place in the Deep South during the 1930s. Three convicts, led by Ulysses (George Clooney), escape from a chain gang, to return to Ulysses' home to retrieve loot stashed there from his last bank heist. On their journey, they encounter many strange characters, such as three seductive sirens, a Cyclops Bible salesman, and a blind prophet. The Coen brothers envisioned a dustbowl look to the film that was very dry and reflected back on the sepia tones found in early photography. The dry feel of the film would also contrast the looming and eventual flood from a new dam, which why the trio is rushing back to Ulysses home before it is put underwater. Deakins, one of the industry's most acclaimed cinematographers, had collaborated with the Coen brothers four times before and thus the three already had a well-established working relationship. Over half the film would take place in exteriors, so the Coen brothers opted to shoot on-location in Mississippi for its "unique delta landscapes" (Fisher 33). However, Deakins had shot in the south during the summer and foresaw the issue that the

location of Mississippi would be filled with lush green foliage—opposite of the Coen brothers' dustbowl era vision.

Thus, tests began early on in pre-production to find a process that would transform the look and the feel of the film. Deakins shot test footage of the verdant trees at Griffith Park in Los Angeles. He stuck to convention at first by attempting to use various photochemical processes at the Deluxe Laboratory. These included bleach-bypassing or silver retention processes, specifically Deluxe's ACE process that allows a specific percentage of the silver to be retained. However, Deakins needed a more selective process, he wanted to desaturate the greens without losing the colors in the other parts of the image, such as the blue skies. So, Deakins decided to try digital scanning and color processing options. While the Coen brothers enjoy having tactile control over their films, still editing in traditional flatbed consoles at the time, they agreed to experiment with the digital technology in response to Deakins dissatisfaction with traditional photochemical processes. Deakins chose to work with the same company that did the scanning and recording on *Pleasantville*, Cinesite, specifically working with the senior colorist, Julius Friede, who had also done the coloring of *Urbania.* Cinesite was also the first company to use Kodak's Cineon (Davidson). Friede and Deakins worked together to manipulate the saturation of the images, transforming the green found in the trees into dry browns and yellows (see Figure 1). Afterwards, Cinesite recorded the digital file back onto the same 35mm Eastman EXR color intermediate film that was then processed by the lab, Deluxe (Fisher 39). Cinesite proved to Deakins that this technology allowed for control over the colors in the image beyond those of photochemical processes and, accompanied with a good price quote, the production elected to finish *O Brother* with a digital intermediate.

Figure 1

The original image shot by Deakins on-location

A more golden image after manipulation in the DI suite *(O Brother Where Art Thou)*

As a cinematographer, one must make many technical and technological choices to figure out how to best tell the story. Scanning the film with a Cineon resulted in a loss of image resolution. However, Deakins has stood by his decision that it was the best option at the time to enhance the script and story of *O Brother*. Similarly, Deakins convinced the Coen brothers to shoot their first widescreen format motion picture (2.40:1 aspect ratio) because of the "importance of landscapes and the epic nature of the story" (Fisher 40). Deakins also chose to shoot the film on Super 35mm film stock with spherical lenses instead of anamorphic lenses which are traditionally used to get a wide aspect ratio. In his interview with *American Cinematographer*, Deakins reveals the reasoning behind his technological choices, stating, "the

spherical lenses have the effect of pulling the audience closer to the characters; it's more intimate [than anamorphic]. To my mind, the feeling of depth recorded on Super 35 would augment the picture-book quality of the story" (Fisher 40). The use of spherical lenses on a wider film stock was an aesthetic choice by Deakins to better tell the Coen brothers' story. Thus, Deakins' choices in film stock and lenses lead to a different kind of image quality than a film shot anamorphically on 35mm. Deakins demonstrates on *O Brother* that a film that strays from the quantitative conventions of cinematography can be successful if it qualitatively supports aspects of the film story, not only through his choice of using a digital intermediate but the techniques and lenses he chose to utilize as well.

Color Becomes a Character

The initial choice to use the digital intermediate was influenced by the Coen brothers desire to have a dustbowl look to the film, but Deakins used the tools available to him by the Cineon for much more. He was able to negate the destructive aspects of the Cineon scanning (loss in image resolution and quality) by using its unique capabilities elsewhere to add additional visual layers into the storytelling. The best example of this is discussed by Deakins in a special features segment on the film's DVD, "Painting with Pixels," which is completely devoted to showcasing the innovative processing techniques used by Deakins and the digital intermediate. Deakins discusses how the scene with the sirens is broken up into two sections, the first being when George Clooney and his cohorts meet the sirens, and the second being after they wake up from their hangovers and find that one of their companions has disappeared. Deakins wanted the first part to have a "saturated look" in which they "separated the greens from the trees, making it a very rich kind of golden color" (see Figure 2). The look of this scene supports the heightened feelings of the characters as the sirens bewitch them. The second part of the scene, returns us to

the film's reality, exhibiting the more dusty and faded look we find in the majority of *O Brother* (see Figure 3).

Figure 2

The Sirens begin to seduce George Clooney's character *(O Brother Where Art Thou)*

Figure 3

Clooney's character wakes up after being bewitched *(O Brother Where Art Thou)*

This scene is merely one example of how Deakins was able to create subtleties in color and saturation, which allowed him to better convey the psychology of his characters and the reality they are functioning in. Critics and audiences positively received the color of O Brother. *Variety* film critic, Todd McCarthy, called the "slightly washed out and burnished hues" a "constant delight." He also described the film as a "modest technical marvel" which indicates that Deakins was able to use the tools of the digital intermediate subtley but successfully, without alienating audiences by overusing the digital effects (McCarthy).

The coloration of the film was so unique and visually stimulating that it becomes another character in the film. The "Painting with Pixels" DVD featurette shows clips of an interview with Randy Starr (VP of Business Development at Cinesite at the time) who states that, "as a character, [the color] lets you feel the period of time, it lets you feel the heat in the air…something the filmmaker could not capture in camera" revealing the added choices that the digital intermediate offers. Color correction is no longer fixing and matching colors from shot to shot, but instead using the tools of color correction to add layers to the story. Audiences will notice the unique color of the film, noting the golden color palette that is a strong motif through the entire film. This coloring is only removed in the key event of the film: the flood. The dry look that permeates the entire film is immediately contrasted when water takes over the screen as the dam floods the town. The following shots are very monochromatic and show subdued hues of blue, in direct opposition to the dry yellow look of the rest of the film (see Figure 4). Despite the digital intermediate offering new creative choices, many cinematographers were against the technologies and techniques of the digital intermediate. Many felt the technology came with too many negative side effects to make up for its creative tools, sparking a debate that would play out in the pages of *American Cinematographer* in the next decade.

Figure 4

Shades of blue take over the screen after the flooding of the town (*O Brother Where Art Thou*)

American Cinematographer: The Future of Filmmaking

The most immediate and relevant reactions to changes in technologies are often found within trade magazines, such as *American Cinematographer*, the monthly magazine distributed by the American Society of Cinematographers, which showcases new technologies and often cinematographers' reactions to them. In examining numerous articles in *American Cinematographer*, one can better understand how cinematographers felt about and reacted to digital technologies, specifically the digital intermediate. Discussions of digital technologies can be found in many monthly issues throughout the 1990s and on, but the most relevant are a series of articles on "The Future of Filmmaking" that were published in the September 2000 issue of *American Cinematographer*. This issue was created to examine the current and future state of the film industry on the brink of digital transformation and to survey member's feelings on these transitions. The various articles sought out the opinions of members from all parts of the industry: cinematographers, directors, producers, equipment manufacturers, film preservationists, and so on. However, the reactions of the cinematographers are most essential to the purpose of this discussion.

The majority of the interviewed cinematographers discuss digital video and HD camcorders. Their comments reveal why many cinematographers were anti-digital or video for many years to come. Cinematographers were quick to revolt against manufacturers who were pushing technologies whose quality standards were far from those of celluloid films. Many seem personally attacked by the insulting claims that one of the benefits of these digital cameras were that you did not need to light—reducing the importance of their role. However, it is interesting to note that, in the lengthy article that showcases the opinions of 26 esteemed cinematographers from all sides of the industry, only one cinematographer mentions the digital intermediate or digital scanning processes: Roger Deakins. He calls the technology "an extension of cinematography" that "[enables] us to create a look that supported the mood of the story" while noting that "it's not the right technique for telling every story" ("Future of Filmmaking" 79). The other cinematographers' failure to mention this tool exposes that the digital intermediate and its later influence was perhaps the digital technology cinematographers did not see coming in 2000. It was not until a few years later, when the use of the digital became a standard step in film processing, that cinematographers began to openly showcase anxiety over the new technology.

The DI Dilemma Begins

Not until the 2008 June edition of *American Cinematographer* was there a real outcry against the digital intermediate. The timing of the publication of cinematographer John Bailey's article, "The DI Dilemma, or: Why I Still Love Celluloid," paralleled the time when digital camera technologies were beginning to be seen on more productions than ever before. The article was a direct response to a recent story on National Public Radio's morning news program in which reporter Susan Stamberg interviewed Stefan Sonnenfeld, an eminent colorist and founder of one of the largest color correction companies, Company 3. The report described the digital

colorist as the "Da Vinci of movies," someone who can "correct all the mistakes and flaws of original photography" or "the raw film" (Bailey 92). Bailey's horrified reaction to the report came from the failure of Stamberg to quote or reference a single cinematographer, the main force behind creating the visual images of a film. Was the digital intermediate in accompaniment with other digital technologies slowly making the role of the cinematographer obsolete? Already the language in the report ("raw") suggests that the film shot in production is an unfinished product waiting to be molded into something presentable. Who will do this molding? Bailey acknowledges that Roger Deakins demonstrated the potential of the digital intermediate on *O Brother*, and that "for awhile, it appeared cinematographers had a second palette". However, he attributes the downfall of the digital suite to when the other members of production realized they too could "paint" (Bailey 93).

Yet, this sort of politics is something that cinematographers and any creative force on a production have always had to deal with. Who has the final say over the finished product? Who gets final cut? Now, who gets to choose the final look of the film? The final look of a film is something that was not emphasized until digital processing was introduced. Certainly, there is more risk involved today with what will come of one's final image, but with this risk comes the ability to be more creative than ever before in storytelling. For Deakins, "every shot [he] has ever made has been a compromise in some way," revealing that filmmaking has always been an art of give and take, no cinematographer will ever shoot and finish a film without the influence and input of other people or circumstances (Deakins 80).

A more pertinent issue in Bailey's article, however, is image resolution and quality. It is important to not conflate the terms resolution and quality. Quality refers to the amount of degradation present in an image, while resolution is the amount of detail that an image can hold,

which can be physically measured. In digital it refers to the size of a pixel, in celluloid film it refers to the area for exposure used in a film emulsion. Thus, resolution is a contributing factor to the level quality in an image. Bailey puts forth his own standards for achieving the least degraded or highest quality image starting in production. He believes quality is highest with anamorphic 35mm—perhaps a subtle dig at Deakins' choice to shoot Super 35mm with spherical lenses on *O Brother* and many of his other films. He calls Super 35mm the "poor man's anamorphic," because anamorphic 35mm still has a higher resolution frame. If one shoots on 35mm film, using a standard spherical lens to achieve an aspect ratio of 2.40:1, they will only utilize about 50% of the frame's area (see Figure 5).

Figure 5

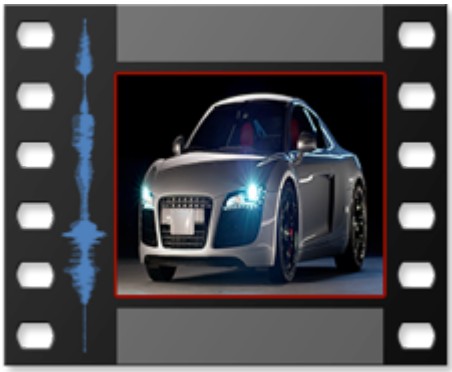
35mm Widescreen without Anamorphic

Anamorphic Widescreen

However, if one uses an anamorphic lens to stretch the image horizontally, they will use the entire frame area, thus improving image quality by enhancing vertical resolution and reducing grain. The other option, which Deakins practices often, is to shoot on Super 35mm film (which is a wider frame on the film strip) with spherical lenses. When using spherical lenses, the usable area of the film frame increases from 184 mm^2 on standard 35mm stock to 259 mm^2 on Super 35mm stock (see Figure 6).

Figure 6

Super 35mm Widescreen without Anamorphic



Anamorphic Widescreen

Image graphics from Figure 5 and 6 taken from Red.com, "Understanding Anamorphic Lenses"

Anamorphic widescreen is still the best resolution, using 367 mm^2 of the available frame to create an exposure. Bailey chooses the anamorphic lenses for aesthetic reasons as well, noting that selective depth of field is easier in anamorphic and "helps guide the viewer's eye to the chosen action" (Bailey 92). Perhaps Bailey's argument oversimplifies what contributes to image quality. Is image resolution really the best test for image quality in cinematography or are other factors involved?

Roger Deakins On Image Quality

In the October edition of *American Cinematographer* in 2008, Deakins somewhat responds to Bailey and the outcries against the digital intermediate with his article, "The DI, Luddites, and other Musings". Deakins' article, opposed to Bailey's, struggles with finding a definition of quality—how can we define quality when films have always been so stylistically different depending on the filmmakers and even more the technology available to them? What is the best way to create an image? Deakins writes, "with all our modern inventions and innovations, there are few films that manage to achieve the "quality" of *Citizen Kane*, though there are many that have far less grain and considerably higher resolution," suggesting there are

not single standards or rules that one can stand by to define quality of an image (Deakins 80). Bailey asserted in his article, "given the higher resolution of the anamorphic frame, I have found it problematic to down-rez or degrade it to a 2K[4] or even a 4K[5] DI. There are those in the digital world who will dispute this, but I trust my eyes" (Bailey 92). However, Deakins directly addresses this claim when he states, "I would not for a moment suggest that a Super 35mm image scanned at 4K or even 6K would approach the resolution of an anamorphic image produced photochemically today" (Deakins 80). Is a film great because of the technology on which it is shot? Or are the choices made by the cinematographer in shot conception, frame composition, and camera movement what make a film's cinematography successful? Deakins mentions multiple films, shot on different technologies with varying styles, that are heralded for their cinematographic achievements. He attributes these achievements to the "meticulous execution" of the filmmakers' choices by the camera operator. Essentially, Deakins discredits Bailey's argument in that it reduces to anamorphic being the most superior form of technology that a cinematographer can use—which is simply false given the many films shot by talented cinematographers on other technologies. Films shot on mediums other than an anamorphic should not be regarded as anything less, merely *different.* Most cinematographers will agree that one should always choose whatever technology *best* tells the story.

Deakins suggests that the DI "holds no threat to the filmmaker, only opportunities," pushing that the DI is simply another new technology for cinematographers to take full advantage of (Deakins 80). Many filmmakers refer back to the films of the 1960s and 1970s, with a sort of nostalgia for their "look" and heavy celluloid film aesthetic. However, filmmakers

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[4] 2K refers to an image resolution 2,000 pixels (horizontally) and is often equated to HD television resolution which is actually (1920 by 1080 pixels).

[5] Similarly, 4K refers to an image resolution of 4,000 pixels and is currently the standard for ultra high definition and used as the dominant movie projection standard.

are always making artistic choices to try and create "looks" beyond the premise of picture quality. An excellent example of this is *O Brother,* in which the stylized look that the Coen Brothers wanted was the nostalgia of an antique postcard, or photography with heavy sepia tones. This sort of aesthetic experimentation is interesting because the Coen brothers are using a new digital technology to create a cinematic style the returns the historical look of a time far before the digital. They used the digital intermediate to create images that were not necessarily of the *highest* quality but pointed to a quality of something in the past, in the era of their story world.

New Production Practices?

In 2009, the discussion on the digital intermediate's relationship the cinematographer continued in the article, "Cinematographers, Colorists, and the DI" which shows the transcript of an interview with John Bailey and colorist Stefan Sonnenfeld. After initial resistance to the digital intermediate, Bailey went on to collaborate with Sonnenfeld on his latest film, *He's Just Not That Into You* (2009). In the process, both Sonnenfeld and Bailey went on to develop "a better understanding of the other's perspective on a umber of complex issues related to digital post" (Silberg, and Pizzello 78). The interview facilitates a discussion on the pros and cons of using a digital intermediate and finishing films digitally. Sonnenfeld is clear that he has no intention of taking over the cinematographer's creative process but instead believes that his "work complements theirs" (Silberg, and Pizzello 78). While Bailey seems to be more comfortable with the idea of the digital intermediate than he was in his last article, he still stresses issues that stem from the technology, such as cinematographers not getting paid for their time working with the digital intermediate or how actors are now writing into their contract demands on how the digital intermediate should be used. One of the most interesting issues he is

finding is with how some cinematographers are now shooting their photochemical footage due to an increasing fall back on the digital intermediate. Bailey tells of color timers in photochemical labs who are concerned with how uneven work looks and finding too much variance in the negative density of the film to color time it. Thus, the only solution is to take the negative to the digital intermediate to make a decent answer print—eliminating the possibility of striking an interpositive[6] (IP) off the negative in order to archive one's film (Silberg, and Pizzello 78).

So, Bailey now seems concerned with the changes in production practices in which the digital intermediate becomes the crutch for an uneven negative. Is the digital intermediate leading to an entire transformation and perhaps degradation in production practices in the art of cinematography? Technologies have always changed and developed, but with digital, the basic techniques of filmmaking are changing and shifting. The unlimited "fixing" one can do in the digital intermediate suite, from power windows to digital lighting to airbrushing actors, has conceivably sparked a change in the basic techniques of filmmaking. The infamous statement, "I can just fix it in post" has many cinematographers more than aggravated in fear of a desecration of the techniques of their art form. A tool initially invented to help cinematographers improve their image in the name of story telling is now often viewed as a back up for mistakes made on set. Filmmakers need to take the advice of Roger Deakins, "The closer the photographed image is to the filmmaker's intent, the more control the DI suite avails the cinematographer" (Deakins 80). But, more importantly, how do these changes in production practices affect how a film can be archived and stored later on, if one no longer has the option to use their negative to make an interpositive. These changes have led to a call for new technologies for long-term film storage as interpositives are used less and less.

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[6] An interpositive is a negative of the original film negative which produces a positive and is used for printing masters from the original negative film

After its introduction, the digital intermediate quickly became a part of the post-production workflow because it expanded on all the tools that photochemical manipulation already offered. Studios or producers easily implemented the use of the digital intermediate, but cinematographers were still able to choose their acquisition technology. John Bailey pitted the digital intermediate against celluloid film, without realizing that the digital camera should be his focus. There were many disputes over the digital intermediate because early on it was more of an immediate threat to cinematographers than the digital camera. However, today, the digital intermediate is slowly becoming obsolescent as digital cameras give cinematographers more tools in camera to create certain looks (Curtis). Image manipulation can happen much more immediately, often day to day in video villages, rather than waiting until the end and final edit to color correct a whole film at once. The digital intermediate opened the door for more digital technologies to be implemented into the production workflow in which the digital camera would be the ultimate end of celluloid motion picture cameras.

Chapter 2

The Digital Camera in the Films of Anthony Dod Mantle

Digital Cameras Enter the Market

At the same time that the digital intermediate was changing the post-production workflow, digital cameras began to be utilized on motion pictures, immediately altering production workflows. While the underlying practices and techniques of the digital intermediate remained the same after its introduction into the industry, the digital camera went through many changes and developments, starting off as a low-grade consumer technology and then going on to be developed for motion picture filming. In the early 1990s, research laboratories for major camera manufacturers were working on developing a high definition digital camera that would capture images using an electronic image sensor. Before any of these cameras became capable of shooting close to the quality of celluloid film, they were released as home-video products for general consumers. Filmmakers began to experiment with these very basic but curious technologies. This pushed motion picture camera manufacturers to continue developing more advanced professional grade digital cameras. This chapter will provide an examination of how digital recording technologies entered the industry and developed over time to become a technology accepted by filmmakers, as well as critics and audiences. The production practices that surrounded successful early uses of digital technologies reveal why cameras that were inferior in standards of image quality were able to produce cinematography that has been widely

Early uses of digital cameras will be examined through the work of now renowned cinematographer, Anthony Dod Mantle, who has shot many films digitally over the course of his career and helped make the digital camera a respectable tool for cinematography. Various digital

camera models will be examined as they were used on three films by Dod Mantle. These films encapsulate Dod Mantle's vision and style as a cinematographer and showcase some of his most successful works through his innovation with digital camera technologies, while also showing the progression of the camera technology in one decade. *The Celebration* (1998) was one of the first films to gain international success and attention for its novel digital camerawork with the Sony PC3. This film got Dod Mantle noticed by Danny Boyle, leading to the duo's first feature film collaboration in *28 Days Later* (2002), which showcases a unique example of how the shortcomings of the digital medium found in the MiniDV format can be utilized to enhance the content of a film. Lastly, *Slumdog Millionaire* (2008), Dod Mantle's most popular and recognized film to date, showcases the digital camera the SI-2K Mini, which was developed for professional cinema and allowed Dod Mantle to refine his skills refined his skills to produce a series of stunning visual images.

Anthony Dod Mantle

The foundation of Dod Mantle's cinematography is a revitalization of how to best tell a story through the use of new tools and practices. Dod Mantle employs digital technologies to progress his cinematographic vision and uses camera movements and angles to reveal things about characters and the film's story, otherwise not possible with celluloid technologies. He does not merely use digital tools and technologies to replace the techniques of celluloid filmmaking—instead he utilizes digital technology to construct a unique visual style and movement in his films. Dod Mantle continually adopts new technologies, but always with the film content as his first priority, which is why he continues to create successful films. Dod Mantle focuses his cinematography on the qualitative aspects of film images, rather than the quantitative conventions that many cinematographers define as image standards today. Despite his uses of

digital technologies resulting in degraded images with lower resolution and dynamic range, Dod Mantle is still able to create a high visual quality to his films through how he manipulates the audience via his choices in camera movement and shot composition.

Dod Mantle's background should be examined to better understand how he was able to create successful films with inferior digital technologies. After working for just two decades, Dod Mantle has had the career that most cinematographers would hope for in the span of a lifetime. He has always pushed the limits of cinematography—Dod Mantle was one of the first cinematographers to utilize consumer grade digital video (DV) cameras to shoot motion pictures in the mid 1990s. Yet, this trend in Dod Mantle's career began for economic reasons rather than aesthetic or artistic intentions. He did not want to shoot the first few major films of his career digitally and reportedly hated shooting HD. However, his productions could not afford anything else in Denmark, the country and industry in which Dod Mantle began working. Even in 2006, Dod Mantle revealed his concerns on high definition (HD) video cameras, stating in an interview with *American Cinematographer*, "I consider HD to be a brutal medium, in particular when depicting human skin. It's very hard to work with as opposed to film, which is like velvet. So I used traditional methods to create a diffusion and softness that HD seriously lacks" revealing how the digital technologies affected the techniques of Dod Mantle's cinematography (B. 106). Even almost a decade after shooting his first digital film, Dod Mantle was still frustrated with the limitations of digital technologies in comparison to celluloid film. The economic restraints of Dod Mantle's early films forced him to adopt digital technologies before other cinematographers. However, he embraced this restriction to expand in other areas of his filmmaking, such as the aesthetic and stylistic choices in the look and movement of the film that only digital cameras could afford him.

While initially Dod Mantle's use of digital video cameras stemmed from economic constraints, digital filmmaking and HD cameras have gone on to define Dod Mantle's career. He has since chosen to continue experimenting in the continuously and rapidly growing arena of digital technologies. Not only has he employed new technologies and techniques, he is also not afraid to create untraditional visual images through unique camera movement, angles, and shot compositions, all of which come together to create a unique quality to his work that is heralded by many today. Dod Mantle boldly adopted digital technologies early on, creating a raw and dynamic style that he has refined today, while continuing to innovate with up-and-coming technologies on every production. The key facet of Dod Mantle's career has been digital cameras, which he has utilized in his films to create a unique feel and subjective style. Dod Mantle's risk-seeking mentality as a filmmaker has pushed him to forgo the technological and aesthetic constraints of the conventions in the industry to create his own successful style of cinematography.

As with many other cinematographers, Dod Mantle started with an interest in still photography after taking a photography course in Denmark. In the 1970s, Dod Mantle was in his early twenties and decided to take a camera and travel the world, most importantly to India, which heavily influenced his visual interests. Dod Mantle then returned to his birthplace of England and went on to graduate from the London College of Printing in 1984. In 1985 he moved to Denmark to attend the National Film School of Denmark until 1989 (Ellis 189). He began his career as a director of photography shooting documentaries on 16mm film. After realizing he wanted to shoot films more artistically than what documentaries called for, Dod Mantle began working on Danish features (Ellis 191).

In the 1990s, Dod Mantle became involved in one of the most influential film movements of the decade: Dogme 95. Dogme 95 was founded in 1995 by a group of Danish filmmakers, who wanted to create a return to storytelling in cinema. The directors Lars von Trier, Thomas Vinterberg, Soren Kragh-Jacobsen, and Kristian Levring came together to create the Dogme 95 Manifesto, which contained "The Vow of Chastity" or a set of ten rules "designed to liberate the cinema from its bondage to illusionist dramaturgy and bourgeois romanticism" (Cook 569). These ten commandments were "indisputable" and are as follows:

1. Shooting must be done on location; props must not be brought in
2. The sound and images must never be produced separately
3. The camera must be handheld
4. The film must be in color. Special lighting is not acceptable.
5. Optical work and filters are forbidden
6. The film must not contain superficial action or violence
7. The film must take place in the here and now
8. Genre movies are not acceptable
9. The film format must be Academy 35 mm (later amended to include digital formats)
10. The director must not be credited

(Corliss)

Even though the commandments were designed to liberate the cinema, they put incredible constraints on the filmmakers, which forced them to be more innovative and creative in shooting their films. The Dogme 95 movement gives much insight to how Dod Mantle was influenced early on in his career, revealing the groundwork of his cinematographic vision. Working under the restrictions of the Dogme 95 movement made Dod Mantle what he is today, a

flexible and risk taking filmmaker, able to work through the many constrictions that different films, locations, and plots put on him. For Dod Mantle, Dogme 95 was "not necessarily something new" and he described the movement as "a revival. A renaissance. A refocusing on the story. The nakedness and simplicity of Dogme has put us back in touch with the essentials of filmmaking" (Corliss). The Dogme 95 movement produced *The Celebration,* Dod Mantle's first internationally popular film of his career.

The Celebration

"It wasn't so much the film, not even the look…
it was the camera operating, the movement of the camera"
– Director Danny Boyle on *The Celebration* (*Side by Side*)

Films of the early digital era meant a complete rethinking of the technical side of filmmaking (*Side by Side)*. New digital technologies were going to change not only the physical medium of films, but also *how* films were shot and *how* films looked, the practices and aesthetics. *The Celebration (Festen)* was at the start of this rethinking. In 1998, director and founding member of the Dogme 95 movement, Thomas Vinterberg, released the first official Dogme 95 film, *The Celebration*, shot by Dod Mantle. The film follows an emotional but somewhat satirical story about the complexities of a wealthy family that are revealed during the family's reunion. The story begins as a classic family drama, but takes an unexpected turn when the son, Christian (played by Ulrich Thomsen), gives a toast to his father for his 60th birthday and strays from the typical flattery, instead accusing his father of child abuse. As he exposes these

traumatic events, he suggests that they pushed his sister to suicide a few months earlier. The reactions of the family and their guests are initially comical, followed by disbelief, shock, and discomfort. The film gained international box-office success and critical acclaim; at the Cannes Film Festival it won the esteemed Jury Prize and was nominated for the Palme d'Or. Film critic Geoffrey Macnab called *The Celebration* a "dazzling film of rupture" but more importantly pointed out that Vinterberg may be "telling a traditional story but uses shock tactics to do so" (Macnab). While the plot of *The Celebration* is incredibly fascinating, many of its plot points follow that of a typical art-house drama. However, Vinterberg suggests that the "camera is the catalyst that transforms" the film through the unique cinematic style created by Dod Mantle's use of handheld digital cameras (Macnab). Through Dod Mantle's camera techniques, Vinterberg was able to break from convention while still telling a somewhat classically structured narrative.

Critical reception of the film was positive and solidified the intention of the Dogme 95 movement, showing it was more than a marketing gimmick to get viewers into the theaters. Film scholar Arne Lunde described the film as having a "new kind of guerilla-style [and] anti-Hollywood cinema aesthetic" (Lunde 22). Dod Mantle made technological choices that supported the narrative such as employing camera angles with perspectival distortions to mirror the issues in the Danish bourgeoisie, leading to a "stylistic, neo-expressionist excess" (Lunde 22). While *The Celebration* was not initially intended to be a film that pioneered digital filmmaking, Dod Mantle's cinematography became the most successful and noticeable part of the film. Audiences perceived the distinctive look of *The Celebration*, but more importantly they perceived how the camera highlighted a well-written script and intriguing story. Film critic Maria Mackinney described the film as "aesthetically minimal, almost unforgiving" in an interview with Vinterberg but goes on to say, "the form and the content complement each other

in this film, there's this starkness and then you allow the atmosphere to be, at times, almost ugly." While the plot is quite cruel and cynical, Vinterberg states it is "sometimes ugly, although I think it's very beautiful," in which the beauty of the film stems from how Dod Mantle's camerawork takes the viewer into the atmosphere; we are allowed into the story (Mackinney 56).

Sony PC3

Dod Mantle shot *The Celebration* on the Sony PC3, a consumer-grade HD digital video camera that he discovered while simply shooting for fun at a soccer match. He was drawn to the camera for the sense of immediacy found in the movement of the images (*Side by Side*). While the raw look of HD cameras is now somewhat associated with the Dogme 95 movement, it was not at all required by the manifesto. More importantly, digital was not the preferred choice of director Thomas Vinterberg, who in an interview revealed, "shooting on video was a compromise I didn't like. I'm still angry about it" (Macnab). Vinterberg reveals his true allegiance to the Dogme 95 movement declaring, "it would have been far more Dogme-like to have shot the film in the medium in which it was to be shown, which is 35mm" since the film was shot years before the use of digital projection (Macnab). The budget of the film was under one million dollars, and with the script requiring a cast of almost 50 actors, Vinterberg had to choose the less preferred medium, making a technological sacrifice in favor of the story. The small Sony cameras worked within the budget of the film.

Dod Mantle wanted to take full advantage of the unique offerings of these cameras, so he decided to use them to "be a protagonist in the *Celebration*," allowing the camera to be a part of the dramatic action, putting the audience directly into the space of each scene (*Side by Side*). At many points throughout the film, characters even bump into the camera as Dod Mantle was "very good at becoming part of the atmosphere…[crawling] around between the guests" (Macnab).

Vinterberg and Dod Mantle followed all the rules of the Dogme 95 "Vow of Chastity," including keeping the camera hand-held for the entire duration of the film, which was possible because of the Sony PC3's small size, giving flexibility to Dod Mantle in how he shot the action of the film. Dod Mantle describes the process of using the Sony PC3 as one of revelation and discovery, expressing that "with that camera, I suddenly saw these moves, these possible movements that I didn't know in my cinema...and that became my donation to *The Celebration*" (*Side by Side*) (See Figure 7). The rules of the Dogme 95 manifesto and the technological constrictions that the Sony PC3 camera placed on Dod Mantle, in turn became a donation to his career, jumpstarting him toward becoming an inventive cinematographer and digital technology pioneer.

Figure 7

Anthony Dod Mantle shooting *The Celebration* with the Sony PC3 (*Side by Side)*

While Dod Mantle's camerawork is sometimes chaotic in *The Celebration*, it mirrors the narrative state of the characters as their family begins to fall apart. The digital form of the film does not overwhelm the content of the narrative. Dod Mantle is careful not to allow his jarring camera movement and angles to work against the actors, but instead highlights their superb performances and key moments in the incredibly well written script. As seen in Figure 8, the Sony PC3 allowed Dod Mantle to rapidly move the camera and create inventive angles, all

within the same shot. As the brother and sister greet each other on the stairs, the positioning of the camera makes the spectator feel as if they are in space, spying down on the action as it happens in the film's reality.

Figure 8

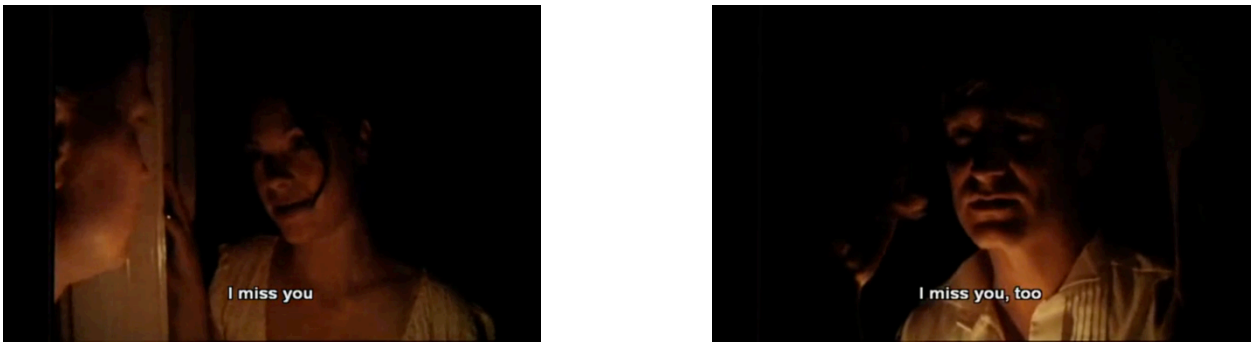
Flexibility of camera movement in *The Celebration*

The shots in Figure 8 also showcase the stylistic choice of canted angles, which have gone on to be a recurring choice in Dod Mantle's cinematography in later films. Many cinematographers reserve the use of canted angles for specific instances and peaks in action, yet Dod Mantle threads them throughout his films as a motif. Although these angles are not commonly found in classical cinematography, they are more acceptable in *The Celebration* because they mimic more real life perspectives. The camera becomes a voyeur in this film, giving the viewer compositions that they may have seen from their own perspective if they were in the space of the film. Additionally, perhaps the overuse off kilter compositions is employed to suggest an unbalance to the audience that will later be echoed in the plot of the film.

Dogme 95 also restricts any form of "special lighting," meaning lighting that is not naturally present in the setting and scene. Vinterberg and Dod Mantle were able to use this restriction to support their narrative by matching "the darkest mood [to] the darkest time of day" (Macnab). The digital camera was helpful in that it can 'see into the dark' much better than a

celluloid film camera, allowing scenes with little to no light. For example, in Figure 9, the scene is lit entirely by a single flame, a natural but usually quite weak light source that is used for many of the scenes of the film. In this scene, Christian has just fainted and the film cuts to a haunting scene in which he sees his dead sister, only by the flame of a lighter. The flame illuminates enough of the frame for the audience to see the action, but creates a look and feel that is dramatic and dark, reflecting the narrative action that is occurring in this shot and many of the other dimly lit scenes. The flickering light bounces off the actors' faces, creating an ethereal feel to support the narrative.

Figure 9



Scene lit by a single flame in *The Celebration*

Creation of Image Quality with Low-Grade Images

Although *The Celebration* was shot on high definition digital video, when it was blown up for exhibition on 35mm the resulting image was more pixelated and had a low image resolution. The aesthetic quality of the image did not remind audiences of typical feature film images, but was instead indicative of news or documentary footage. Yet, many critics discussed successful camerawork of the film. How did Dod Mantle thus create image quality in his film, despite creating a film that fell outside the conventional standards of cinematography? Dod Mantle gives light to this in an interview in the documentary *Side by Side*, in which he states,

"the combination of the movement and the activity and the emotion, the emotional movement of that camera would probably define that film's visual language, apart from the actors and the writing and the great script" (*Side by Side*). The camera invites the audience to become a character in the story, and heightens the emotional tension found in the script. Dod Mantle favored the subjective aspect of his cinematography rather than focusing on the objective camera standards of most motion pictures.

Vinterberg's film was an important film for the start of the digital era because it showed that digital filmmaking could be successful with audiences if the form supported the content of the story. Four years after the release of *The Celebration*, Dod Mantle would rethink his work and pair the consumer digital camera with a higher budget film and extensive lighting set-ups to create the zombie thriller, *28 Days Later*.

28 Days Later

After seeing his work on *The Celebration*, director Danny Boyle approached Dod Mantle on working together "digitally". Boyle was interested in working with new technologies and using these technologies to allow him to do things he could not achieve with the conventional modes of celluloid filmmaking. At that point in his career, Boyle had been shooting all of his features on celluloid, and most recently had shot *The Beach* (2000). However, the large crew of a big budget Hollywood feature "didn't suit [him] at all" and he felt as though the film was "too much away from [him]" (*Side by Side*). Boyle wanted a medium that would allow him more intimacy with the films he shot, which he felt digital would have the potential to do. So Boyle, Dod Mantle, and writer Alex Garland, created the script for the film *28 Days Later* (2000) and chose to shoot the entire film on consumer grade cameras. This choice led to many strains in

production practices affecting how Dod Mantle would create images. The technology's affects on Dod Mantle's cinematography techniques are best examined through the *American Cinematographer* article on the film, "All the Rage," by Douglas Bankston.

28 Days Later (2002) is a post-apocalyptic film that begins with three animal-rights activists breaking into a research facility to release the chimpanzees from captivity. A frantic scientist attempts to stop them, warning them that the chimps have been infected with a highly contagious virus that puts them into a zombie like rage. Despite this, one of the activists goes ahead and releases a chimpanzee that then attacks her, immediately turning her into a rage-filled zombie, at which time the screen goes black. After a few seconds the words '28 days later' appear. The film then begins with the main story, which follows a bicycle messenger, Jim (Cillian Murphy) who awakens from a coma in a hospital to find that the entire building is abandoned. So he leaves and wanders the streets of London, which are eerily deserted. Jim soon comes into contact with some of the "infected" that begin to attack him but, luckily, a pair of uninfected survivors rescues him. Jim meets up with other uninfected humans, but along the way a few of these survivors get infected and the others must quickly kill them to avoid their own infection. Eventually, Jim is left with just two female survivors, the tough-minded Selena (Naomie Harris) and the young Hannah (Megan Burns). The three find a group of soldiers who have been broadcasting a radio signal. These soldiers have fortified a country mansion to attempt to start over and resume living civilized lives. However, things at the mansion take a dark turn and Jim is pushed to not only protect himself and his female counterparts from the zombies, but from the soldiers as well.

The MiniDV Format

Dod Mantle and Boyle had worked on two British TV movies before shooting *28 Days Later,* which allowed them to build a strong director-cinematographer relationship. Having worked together recently, the two had enough trust in one another as filmmakers to successfully take the risk of experimenting with digital technologies. Garland's script called for much on-location shooting in London as a means to fully convince viewers of the destruction in this apocalyptic story. Thus, in *28 Days Later*, Dod Mantle and Boyle began looking at different camera formats that were present in the digital market, more so than focusing on the actual camera bodies. Dod Mantle and Boyle chose to shoot the film in the MiniDV format, despite it being on the lower end of digital camera technologies available at the time of shooting. The format was chosen for its gritty look that was similar to the various videos audiences come into contact with in their everyday lives. The camera they chose to shoot on was the Canon XL1, which was the best choice for the project because its small size allowed the camera to be set up quickly and easily maneuvered (Bankston 83). Dod Mantle did much of the preproduction work and tests at the Moving Picture Company in London, to ensure that, when the film was put through post-production and printed on 35mm for exhibition, the image projected would be acceptable to audiences. Dod Mantle had to make a few adjustments to the camera to ensure he would have the best quality image possible for the post-production house. Using Optex adapters, Dod Mantle was able to affix the Canon EC (6-40mm) and Canon EJ (50-150mm) prime lenses to the camera bodies. Additionally, instead of using the Canon XL1's black-and-white viewfinder, Dod Mantle used nine inch color monitors to precisely control his image composition (Bankston 84).

One of the most striking sequences of the film is when Jim walks around a deserted London, past famous landmarks such as Big Ben and Piccadilly Circus (See Figure 10). These shots were done on-location by halting all traffic at 4 A.M. and would not have been possible with an expensive and large celluloid film camera. To quickly shoot these scenes, the production purchased multiple cheap Canon XL1 cameras to set up many shots at once. The cameras were so user friendly that Dod Mantle just had to set up and frame the shots, and then the cameras were operated by six to eight other crew members, including Dod Mantle's longtime gaffer Thomas Neivelt as well as producer Andrew MacDonald.

Figure 10

Jim walks towards Big Ben

Jim walks around the empty Piccadilly Circus (*28 Days Later*)

However, Dod Mantle describes the process as "hell" because, as they were shooting, the rising sun caused causing Dod Mantle to have to Walkie changing T-Stops to each operator of a

camera that were each at a different angle to the sun (Bankston 83). So, while the small size and low cost of the technology allowed Dod Mantle to set up many shots, this burdened him as a cinematographer in that he now had many more cameras to control and higher risk of failure because the MiniDV images had to be carefully exposed without having the light blow out the images.

As Dod Mantle broke out of the conventions pushed on him in the Dogme 95 films, he also continued to break the conventions of cinematography when it came to acquisition technologies, optical choices, and the resulting images he created. Dod Mantle had freed himself from the Dogme 95 system, but continued to innovate with digital technologies that created images far from the usual conventions of image quality and classical filmmaking. In *28 Days Later,* the digital technologies allowed Dod Mantle to experiment with new techniques of filmmaking. However, Dod Mantle found many new limitations and difficulties were placed on him by the technology of the MiniDV format and Canon XL1. Because *28 Days Later* would have a wide release in theaters around the world, the digital image had to be carefully crafted since the format could easily ruin the image when shown in exhibition because blowing up a low-resolution image for projection could end in a low quality image. So, Dod Mantle had to meticulously employ the cameras to create a the highest resolution these cameras were capable of.

Digital cameras pick up light entirely differently than celluloid film. They usually require much less light, meaning that too much light can push the highlights too far and ruin the image. Additionally, to decrease the depth of field and to record as much information on the tape as possible, Dod Mantle underexposed by one or two stops. For lighting, Dod Mantle notes that he used as many lights as he would have shooting on celluloid, but that the lights themselves were

smaller because he was working at a faster exposure speed (Bankston 88). The narrative story put an additional difficult strain on Dod Mantle in terms of lighting. Because society has mostly fallen apart in the film, there would have been no electricity and thus no practical light, calling for the cinematographer to be very strategic in creating sources of light, especially at night. Most of the night exterior scenes were "photographed using day-for-night processes to eliminate any city-light illumination" (Bankston 86). The actors had to be carefully lit, because the contrast in the digital formats tended to make lights look artificial. Dod Mantle often lit actors with large HMIs through silks to illuminate them for the day-for-night scenes without giving too much contrast.

Dod Mantle also had to carefully compose his images to avoid hard contrast lines in the backgrounds of scenes. *28 Days Later* has many wide shots, especially in the sequences depicting the expansiveness of the destruction in London. These sequences are some of the most impactful and subtly horrifying parts of the film because of how jarring it is to see one of the largest and most iconic cities in the world completely empty. In these wide shots, Dod Mantle had to carefully direct the audience's attention, because the "backgrounds in wide shots have a tendency to become a pixelated mess". He created shots with clean lines that direct the eye and colors that highlight the important action (See Figure 11) (Bankston 86).

Figure 11

In this wide shot, Jim is only a small teal speck at the top of the screen (*28 Days Later*)

Aesthetics of the MiniDV Format

While the camera caused many difficulties in Dod Mantle's production practices, the Canon XL1 was chosen for more than just logistical and practical reasons. Boyle and Dod Mantle chose the MiniDV format for the aesthetic reasons that it produced a harsh and gritty image that matched the violence of the script and the urban setting. Dod Mantle overcame all of the technical challenges of shooting on the MiniDV format to create visuals that stunningly and hauntingly captured the story. Instead of trying to create images reminiscent of celluloid film, Dod Mantle often pushed the digital image, further degrading it through various unconventional filters, such as a washing-machine lid and burnt and deformed plastic (Bankston 87). Such filters gave the image a morphed and unique optical look and feel that highlighted frightening parts of the plot. Dod Mantle was using the weaknesses of the digital image to his advantage, to better develop the brutal and slightly distorted look of his film. Instead of trying to hide the shortcomings of digital film, he enhanced and heightened them.

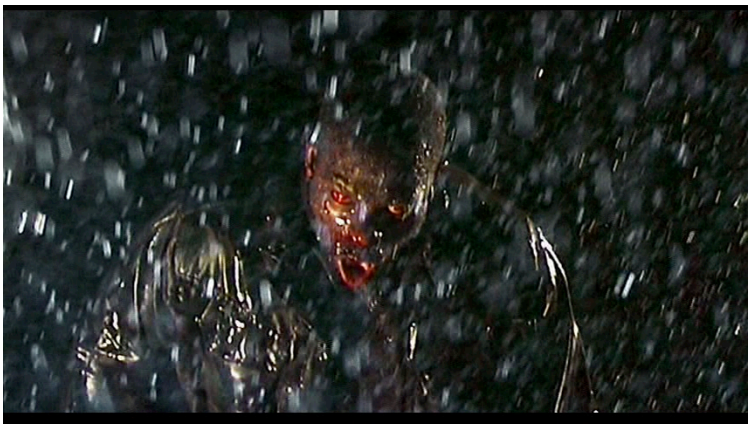
The climactic scenes of the film occur mostly outside in the pouring rain as day turns to night, when Jim, Selena, and Hannah are trying to escape the mansion. They are running not only from the raging zombies hidden by the darkness of night but also the soldiers who have revealed their true intentions of taking advantage of the women. In these scenes, how the rain exposes on the digital image adds to the frightening and violent action of the scenes and creates a stunning and unique texture to the image (Figure 12).

Figure 12

Rain creates a unique visual texture as Jim defends himself from the soldiers (*28 Days Later*)

Unlike his work on *The Celebration*, Dod Mantle kept the camera movement to a minimum in *28 Days Later*, especially in the finale scenes. He felt it would have been "fatal if [he'd] moved the camera around too much" because the story was already saturated with brutality and the camera movement did not need to add any more "fear and disaffection". To keep the camera from being entirely static, Dod Mantle instead often used a dolly to retain mobility in the presence of the characters while providing a more "nonchalant" and smooth camera. The cinematography still reveals its cinematographer in the unconventional and often canted angles that Dod Mantle chooses. These unique and unbalanced camera angles found in many of Dod Mantle's films, never seem out of place because they match the narrative action occurring within them. Dod Mantle also made the technical choice of using a fast shutter to enhance the movements of the infected to better distinguish them from the uninfected (Figure 13). This shutter makes their movement more surreal and frenzied compared to the uninfected; the faster speed makes them look superhuman (Bankston 89).

Figure 13



The horror of the zombies is elevated by the lighting and fast shutter speed (*28 Days Later*)

While the images in *28 Days Later* have a lower resolution and limited dynamic range, often losing information in the dark and light areas of the picture, Dod Mantle manages to produce some incredibly stunning shots that only add to the terror of the film. In a review in the industry trade press, *Variety,* film critic Derek Elley writes that Dogme vet Anthony Dod Mantle lenses an "eerily beautiful stillness to the scenes of Jim walking through the streets" in the orange dawn (Elley 28). However, he ends his review by stating that "Boyle and d.p. Dod Mantle build no real case for shooting digitally rather on 35mm" and the "pic's look is grim" (Elley 29). However, this grimness that digital provides seems to have been Boyle's exact intention. If you have the budget and funds to shoot something on film, why use the lesser digital video technologies? Boyle has responded that the "aesthetic of digital video mimics the way we receive information in the 21st century," where audiences are used to seeing pixelated, grainy, and lower quality digital images in their everyday lives, whether it be through their cell phones or computers (Daly 5). The look of *28 Days Later* is reminiscent of that lower-quality feel; it creates a subconscious connection, often lacking in traditional films, between the images found in the reality of the audience and the reality of the film. Boyle and Dod Mantle use the harshness

and low quality images of digital to intensify this connection and remind viewers of images they have seen in their everyday lives, making the story and the aspect of zombies in rage all the more scary and real. The Canon XL1 and MiniDV Format provided the filmmakers many challenges on *28 Days Later*. However, they did not stop experimenting with the technology and a few years later collaborated to shoot their most visually powerful digital film to date, *Slumdog Millionaire*.

Slumdog Millionaire

Decades after his first trip to India as a young photographer, Dod Mantle would return to to shoot Danny Boyle's *Slumdog Millionaire* (2008) which would go on to be the greatest cinematographic achievement of his career up to that point. According to Danny Boyle, Dod Mantle once told him that working in the digital format was great, but that he would never get an Oscar (*Side by Side*). However, in 2008 Boyle and Dod Mantle made *Slumdog Millionaire*, a film that pushed digital technology to the next level with an exceptional style and vision that perfectly matched its story and setting. The film became the new benchmark in technical innovation in digital filmmaking and, at the 2009 Academy Awards, Dod Mantle took home the Oscar for Best Cinematography on *Slumdog Millionaire.* This was the first time a cinematographer had won the award for a film that was shot using mostly digital technologies. Dod Mantle's win marked a turning point in cinematography, and digital technologies were finally taken seriously as a medium for motion picture recording technologies. Since Dod Mantle's win, many more cinematographers have received the award for their work on films shot with digital technologies.

Slumdog Millionaire is adapted from the novel *Q & A* by Vikas Swarup and begins in medias res on the set of India's *Who Wants to be a Millionaire?* The story follows Jamal Malik, who, after he has gotten to the final round of the gameshow, is being interrogated by the police for possibly cheating on the show. Jamal recounts how he was able to answer every question on the program correctly, ending up one question away from winning the jackpot prize. Jamal's interrogation is intercut with scenes from throughout Jamal's life. These scenes depict Jamal's youth, his coming of age, and how he landed on the program. The film follows him through childhood, adventuring through the slums of Mumbai with his brother Salim, and, eventually, his encounters with the love of his life, Latika. The viewer is taken through various stories as we watch Jamal grow and drift apart from his brother and lose contact with Latika. The narrative of the film is temporally and spatially disjointed, depicting many different points in Jamal's life as well as various settings around India. The story called for the filmmakers to often shoot on-location. Thus, Dod Mantle and Boyle knew that they would need cameras that allowed mobility in shooting in the hot and crowded streets of India—a task for which digital is best suited. The article, "Rags to Riches," in the December 2008 publication of *American Cinematographer*, gives insight into the meticulous pre-production and creative work in the production of *Slumdog Millionaire*. This article, written by Stephanie Argy, will be referenced throughout the discussion of Dod Mantle's camerawork on the film to understand how he created new techniques in filmmaking in conjunction with using new technologies.

SI-2K Mini

Boyle really wanted to "throw viewers into India in order to convey what its really like to be there," so he and Dod Mantle set out to find a small digital camera that could easily maneuver on-location through India's chaotic environment. Dod Mantle knew he would not be able to use

the MiniDV format that he had used on *28 Days Later* because of its consumer grade and the difficulties it had caused him on that set. It lacked the latitude needed to hold the highlights and a chip that could record the heavy contrast present in the slums. He would be unable to artificially light many of the locations, so he needed a camera that could handle and control what the natural light presented. Most important to Dod Mantle was the flexibility and size of the camera. For the scenes depicting Jamal as a young child, Dod Mantle wanted to get on the children's level and follow them as they ran through the winding maze of the slums. He found that Silicon Imaging's SI-2K Mini, a newer and higher professional grade digital camera, offered with some modification what he would need for the shoot (Argy 45).

Figure 14

Anthony Dod Mantle and Danny Boyle shooting on the SI-2K Mini on *Slumdog Millionaire*

(Courtesy of Ari Presler)

The relatively new SI-2K mini provided the mobility and flexibility required of the camera systems. *Slumdog Millionaire'*s technical supervisor, Stefan Ciupek, worked with the camera facility Wolfgang Damm and Pille Filmgeräteverleih in Germany to modify the SI-2K mini to fit the production's needs. To allow the camera operators greater presence within the action, Ciupek devised thin camera suitcases that could be slid into custom-made backpacks,

allowing the camera operators to work fully handheld. He created four packs, housing all of the acquisition equipment, in which the camera would record straight to a hard drive via an Apple MacBook Pro running under windows. Each case also included all batteries needed for the camera, laptop, and accessories, as well as a screen on the top of the cases so one could operate the control software and the Mac without needing to open the case. The screens doubled as image monitors for both the operators and Boyle. The heat was so intense on location that these packs had to be loaded hourly with dry ice, using up to 45 pounds of dry ice per day (Argy 46). These camera packs and their separation from their recording systems allowed them to be placed in various places and positions, opening up a multitude of angles that would have been difficult to achieve with bulky celluloid cameras. Figure 15 shows a shot in which the camera jumps with the characters off the roof of a shanty, capturing an intriguing and unique camera angle in the process, throwing the audience into the world of the characters.

Figure 15

The SI-2K Mini allows for unique camera movements and angles (*Slumdog Millionaire*)

The SI-2K Mini has a lens mount that can operate with a variety of lenses. Dod Mantle used this to his advantage, changing between a multitude of lengths and lens manufacturers from 9.5mm and 12mm Zeiss Distagons, a 5.9mm Angenieux, a Cooke 9-50mm zoom, to a 200mm Canon lens. The universal lens mount of the SI-2K Mini allowed Dod Mantle to choose lenses

specifically for each scene and location, using the strengths of each lens to support his needs. Certain scenes required the crew to be "especially discreet" in shooting on-location. This called for a set of extremely small Linos C-mount lenses that allowed the shooting of objects or even textures "very close to the lens to enhance a feeling of sharpness, quality, and depth" while also enhancing "a feeling of sneaking a view at someone running by" (Argy 52). Each lens allowed Dod Mantle to achieve an image that supported a specific part of the narrative.

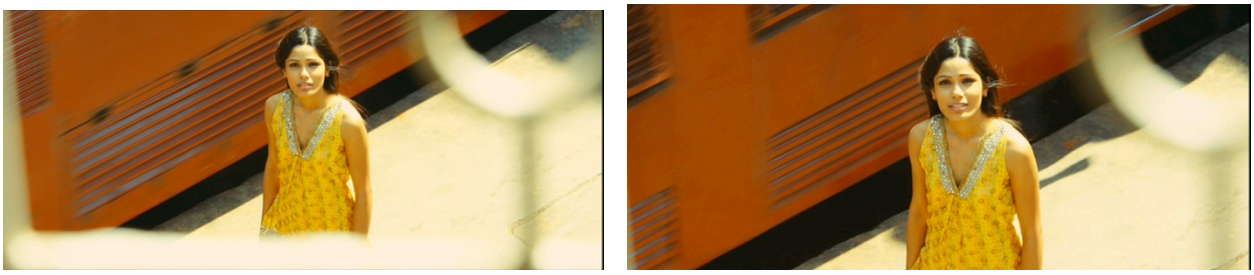
Canon EOS-D1 Mark III

Dod Mantle added another digital camera into the mix to create special memory shots that are found throughout the film. He began experimenting with the Canon EOS-D1 Mark III to keep a lower profile in some settings. The camera is a still photography camera and has the ability to shoot bursts of up to 30 RAW[7] images per second. However, Dod Mantle notes that, depending on the use of menus in the camera and the size of the files, most of these bursts only reached about 11 frames per second. Dod Mantle found that people were "much more relaxed around a stills camera" which allowed him to shoot in locations where it would have been a challenge to get a film permit, such as the inside of the Taj Mahal. When the image bursts from the Canon EOS-D1 were strung together, they created a unique motion that, according to Boyle, "looked like a vivid memory" (Argy 58). A shot repeatedly used throughout the film is an image of a grown up Latika in a bright yellow dress when Jamal finds her at the train station (Figure 16). This shot operates to subjectively show when Jamal is thinking of Latika and the Canon EOS-D1 Mark III gives it a different look and feel than the other images of the film, closer to that of a memory. Such experimentation with different technologies and techniques is not

[7] RAW is a type of digital image file that is unprocessed in order to save the most data from the image sensor with minimum loss of information. RAW is similar to a celluloid film negative in that the file format has all the information needed to create an image but is not directly usable.

always welcomed on such a large film set, but Dod Mantle says that working with "an 'open-minded' director like Boyle sparks those kinds of ideas" (Argy 58).

Figure 16



Canon EOS-D1 Mark III Shots of Latika (Freida Pinto) in *Slumdog Millionaire*

Difficulties of Working With New Digital Technologies

After shooting *28 Days Later*, both Dod Mantle and Boyle were more familiar with the difficulties that digital provided. While improvements in technology between the two productions eased many of these issues, Dod Mantle found that one of the most difficult parts of his shoot was that his crew, mostly composed of local Indian camera people, was not yet fluent in the language of digital. Dod Mantle notes that many of the crewmembers in his departments were "interested in learning the modern technology" but when it came down to it, everyone around him "knew the language of celluloid." So, for second unit shoots, Dod Mantle often felt more comfortable sending out crews with a 35mm camera rather than "issuing them the digital gear with all its potential complications" (Argy 54). Even so, more than 60 percent of the film was captured digitally, although initially the cinematographer and director duo planned to shoot only 25 percent of the film digitally and the rest on 3-perf Super 35mm. However, Boyle was not only pleased with the performance of the SI-2K Mini, but also pleased with how the camera affected the look and feel of the film. Because of the potential problems of shooting on-location in India, whether they be politically, technically, or weather related, Dod Mantle and Boyle often

chose to shoot in a similar set up as on *28 Days Later*, with multiple cameras and operators running at the same time. Except for Telfer Barnes (Dod Mantle's long time 1st AC) and Thomas Nievel (Dod Mantle's closest collaborator and gaffer), most of Dod Mantle's local operators had not been introduced to digital motion picture acquistion technologies (Argy 58). Dod Mantle felt he was "taking unusual technology to a land with a very different filmmaking tradition" so he often had weekly meetings with the camera department to smooth out any technical and collaborative issues between the four or five operators working with him (Argy 56). Since the technologies that Dod Mantle was using were so new, he had to consistently direct his crew to ensure positive collaboration on a set where many different schools of thought were being introduced between not only those familiar with digital and those familiar with celluloid, but also the local Indian crew and the non-Indian crew.

Changes in Technique Create a Unique Cinematographic Style

Boyle and Dod Mantle chose to attach a gyroscopic stabilizer (gyro) to the base of the handheld unit to decrease vibrations and increase stability, keeping the small and easily movable camera from producing camera images that were too hectic. According to Dod Mantle, the addition of a gyro resulted in a unique camera movement "somewhere between handheld and immaculate Steadicam," allowing the fast and swiping movements found in handheld cinematography while still preserving the smoothness of steadicam shots (Argy 48). The gyro acts as a sort of brake for the camera so Dod Mantle can move it quickly but also abruptly stop it without getting any sort of reverb in the image. This created a distinctive camera movement throughout the film that defines many of the shots. The camera is often quick, darting through the action, but simultaneously smooth to avoid disorienting the viewer. Just as in *The Celebration*, these camera movements are only as good as the editing, and editor Chris Dickens

seamlessly weaved the shots together, not allowing their high degree of movement to become exhausting to the viewer (McCarthy 21).

With the portable camera suitcases and backpack systems, Ciupek and Dod Mantle were able to allow the operators much freedom so that they could speedily follow the actors and keep up with the quick action within many of the film's scenes. They were able to manipulate the digital technologies to accomplish things that would be almost impossible with celluloid film cameras. However, this mobility of the camera often pushed Dod Mantle's skills as a camera operator. One of the primary scenes in the film depicts Jamal as a child running through his slum in Mumbai. Dod Mantle immersed himself in the action, following as the actors ran between crowds of people and the narrow passages of the slums. He describes filming these shots as shooting semi-blind, as the bright sunlight often kept him from seeing the image on the screen while he ran to keep up with the actors (Figure 17). These scenes were some of the most successful and memorable scenes of the film; audiences found them mesmerizing. In Todd McCarthy's review of *Slumdog Millionaire* in *Variety*, he describes Dod Mantle's camera as "often on the prowl or on the run and it sometimes dashes through jammed streets and shantytown alleys at the speed of the sprinting kids themselves" (McCarthy 21). He also writes that the images are "stunning sans arty posturing," revealing that Dod Mantle is able to create a unique and artistic aesthetic without alienating the audience by making the cinematography feel too contrived.

Figure 17

Young Jamal and his brother run through the slum, glares of sunlight often take over the frame

(*Slumdog Millionaire*)

When it came to shooting interior scenes, Dod Mantle and his gaffer, Neivelt, returned to the techniques they had developed while working in the Dogme 95 movement. Neivelt often bounced 6K HMI lights into mirrors and reflector boards. This allowed not only the actors, but also Dod Mantle to move freely through the space without ruining any of the lighting, techniques that both Dod Mantle and Neivel honed in their Danish filmmaking days. The camera is thus able to move throughout the space, straying from the traditional methods of filmmaking in which the camera does not cross the 180 degree mark. Though Dod Mantle has broken from the Dogme 95 movement, it continues to influence how he makes his films. While the conventions placed by the manifesto often limited its filmmakers, Dod Mantle still used these limitations to develop skills that made him an easily adaptable and risk taking filmmaker.

On *The Celebration* and *28 Days Later*, the cameras created a product in which the digital qualities of the films were obvious to audiences. With *Slumdog Millionaire*, Dod Mantle solidified the digital medium as a serious acquisition technology. He refined his techniques to create a digital film that displayed stunning images while still having a different aesthetic than celluloid films, but without sacrificing as much of the image to low dynamic range and poor resolution as his previous digital films displayed. Despite *Slumdog Millionaire's* imperfect noise levels and color contrasts compared to something shot on 35mm photochemically, Dod Mantle

successfully created his own digital image quality standards that were recognized when he won the Oscar for best cinematography. *Slumdog Millionaire* successfully surpassed his standards of image quality in his previous digital films while still showcasing Dod Mantle's stylistic and innovative cinematography.

Digital Becomes an Accepted Medium

These three films shot by Dod Mantle, show not only the progression of digital camera technologies, but the changing production techniques concerning digital filmmaking. The digital camera entered the market as something for the average consumer, far from the standards of professional filmmaking. However, the technologies improved rapidly to meet the needs and conventions of the motion picture industry. In just one decade after *The Celebration* was shot on consumer grade cameras, professional digital cameras had advanced to offer filmmakers 2K resolution, greater dynamic range, and more immediate and direct control over their final image than celluloid ever offered. In 2008, digital cameras were no longer viewed as gimmicky recording mediums but as a full substitution for celluloid film cameras that could even overcome some of the shortcomings of the 35mm format. Digital cameras, such as the various 4K RED cameras and the Arri Alexa have been released and widely used on many feature film productions. In the past five years, the industry has transitioned to shooting the majority of feature films on digital cameras that no longer have the difficulties or limitations with which Dod Mantle had to deal with. However, these limitations helped Dod Mantle uncover many different digital production practices that remain part of the digital workflow.

It is interesting to note that the introduction of the digital camera displays an inverse relationship from celluloid film technologies. Celluloid began as a highly specialized technology, requiring much training and professional gear with a low degree of accessibility.

Only in the mid twentieth century, multiple decades after the technology became prominent for visual recording, did celluloid film recording become an accessible form (Super 8mm) for consumers to use in their day-to-day lives. Digital cameras have displayed the opposite development, beginning as simplistic and low-grade consumer cameras that were introduced into the industry on films like *The Celebration*, after which manufacturers began to try and create higher quality cameras more suited for professional productions. Professional grade motion picture digital cameras were thus manufactured to fit the needs of large-scale productions, allowing cinematographers more flexibility and control over their technology that often required specialized practices in celluloid filming. The digital camera has always been and continues to be a technology accessible to the consumer, which has opened up the realms of filmmaking. Even consumer grade cameras have improved to offer amateur users visuals closer to those of professional motion pictures, yet these images still lack many of the quantitative measurements of quality, such as 2K or 4K resolution, strong dynamic range, and highly complex color profiles. The introduction of digital has now developed to lowering the barriers to using professional or close to professional motion picture cameras, but while also influencing the end of celluloid image acquisition.

Conclusion

The Cinematographers and their Technologies

Each chapter examines its respective technology through the lens of the cinematographer using it, because both Deakins and Dod Mantle were key to introducing digital changes into the industry with their risky choices in utilizing these new technologies. While their styles and aesthetics are quite different, one can find many similarities in the backgrounds and production practices of both cinematographers that allowed them to be successful with new and underdeveloped digital technologies. Even as both the digital intermediate and digital camera became standard parts of the industry, these four films remain as distinctive instances in which the technologies were utilized for their unique capabilities, at times in their weaknesses. Although these films showed early on how digital tools could be used to extend the possibilities of cinematography, the growth of a digital aesthetic has not continued to develop. Many of the practices of Deakins and Dod Mantle, in which audiences were aware of the digital influence on the films they were watching, have now been abandoned in favor of recreating celluloid images with digital technologies. Further examination of their similar foundations and circumstances can reveal why these films and cinematographers are such outliers in the implementation of digital technology and creating a digital aesthetic that celluloid could not achieve.

Both Deakins and Dod Mantle began their careers as cinematographers shooting documentary films, which requires a certain flexibility in one's workflow. Documentary filmmaking also creates cinematographers who are more willing to take risks with new technology, because of the strains and limitations that often arise in on-location documentary shooting. Coming from documentary foundations, both cinematographers also operate, meaning

they physically operate the cameras themselves when possible, while many cinematographers pass this work onto camera operators. This is important to how the cinematographers work, allowing them to adopt unfamiliar technologies. When using new technology, they need only to adjust their own workflow instead of passing on to a camera operator the technical changes that digital introduces. These foundations and characteristics of each cinematographer helped them change the form of their films to better support the content, going against quality conventions of classical cinematography to create innovative visuals that were successful with audiences.

Additionally, on both *O Brother Where Art Thou?*, *28 Days Later,* and *Slumdog Millionaire*, the directors and cinematographers had strong and well established working relationships from collaborations on previous films. This sort of trust between the director and cinematographer is very important to trying new technologies that often neither had used before. Having the faith of the Coen Brothers, Deakins was able to process *O Brother* using technologies that had previously not been used to change the colors of an entire feature film. The Coen Brothers also often innovated with color, so these techniques continued this trend in their films. Similarly, Dod Mantle and Danny Boyle shot two films together before *28 Days Later*, which influenced Dod Mantle's freedom and Boyle's confidence in him making the right digital technology choices for the story of the film. For both Deakins and Dod Mantle, their directors trusted them to make the best technical and technological choices for their films, allowing them to fully collaborate in the creation and manipulation of the content in production and post-production.

All four of the films were also privileged in that they started with very novel scripts that told classic stories, but in unconventional ways, pushing the filmmakers to match the ingenious scripts with their cinematography. For example, *O Brother Where Art Thou?* is based on one of

the oldest stories in time (the Odyssey) but revitalizes the narrative by placing it out of context into the depression era. Comparably, *Slumdog Millionaire*, is a typical coming-of-age narrative of discovery and disillusionment, but its nonlinear script bounces between different environments and phases in the main character's life.

The combination of the factors above provided each cinematographer with the circumstances that allowed them to experiment and create films outside of the standard conventions of filmmaking. Though their uses of digital technologies and practices influenced the infiltration of digital in the film industry, these films have not gone on to influence *how* these tools would continue to be used, only that they are now the standard. Each of the four films were highly regarded for their innovative uses of digital, however they only convinced the rest of the industry to adopt the technologies instead of adopting the new techniques. Most filmmakers continue to use digital tools to replace the techniques of celluloid filmmaking, instead of expanding the practices in production and post-production to create films unlike any that audiences have seen before. Thus, these films by Deakins and Dod Mantle are not representative of how digital has continued to be implemented in the film industry. Deakins used the digital intermediate to create surreal feel to his film that was reminiscent of the depression era, thus allowing the lower resolution caused by the scanning process to parallel an aged photograph. Today the digital intermediate is used mostly for color and tone matching between shots and scenes. Dod Mantle used the small size of the digital cameras to move and place the camera in ways that viewers had never seen it before. Today the digital camera is used with movements and compositions similar to those of classical Hollywood filmmaking. Deakins and Dod Mantle were pushed to be more inventive in order to compensate for the limitations of their technologies. Now, such inventiveness is more difficult to find in other filmmakers, since digital

technologies have improved to the standards of quality found in celluloid, and no longer have the weaknesses the two cinematographers had to deal with in their films.

Digital Production Practices

In these four early instances of digital adoption, the cinematographers were restricted by the immaturity of their technologies, forcing them to be detailed in their techniques and pioneer new ways of capturing images or manipulating images later on. However, today the changes in production practices, stemming from digital technologies, often create an environment devoid of technical innovation. Digital is instead now used to streamline the techniques once used in celluloid filmmaking.

When using a digital intermediate in post-production, the cinematographer should pay careful attention to their practices in the image acquisition stage, whether they are shooting on celluloid or digital. To work with the image successfully in post-production, the cinematographer must record images with the most information possible (highest resolution, greatest dynamic range, and flexible color profiles) in order to have a high degree of flexibility in how they manipulate them later. Yet, many filmmakers instead focus on using the capabilities of post-production to fix problems created in production, rather than enhancing the images to support their narrative.

Regarding digital cameras, these technologies change the pace on set. Due to the nature of celluloid filmmaking, there was always a unique rhythm in production. With celluloid, cinematographers could shoot at most ten minutes of film at a time before having to pause to switch the film magazine. These natural pauses allowed the crew and the talent to regroup and refocus their efforts. On digital mediums, cinematographers have much more elasticity in how long they can shoot; at times they do not even have to stop rolling the camera between takes.

While initially this can seem liberating for cinematographers, it can make the production practices less careful and more relaxed.

Deakins and Dod Mantle successfully helped push the parameters of image quality through their use of digital tools and practices. However, standards of image quality have continued to be lowered despite improvements in the technologies, causing the acceptance of practices in filmmaking that were not as detailed and thorough as celluloid required. The meticulous filmmaking that Deakins and Dod Mantle showed on their films has not continued with digital today. Today digital technologies have improved to make initial image acquisition less demanding, causing a shift in focus to other aspects of story creation and often producing films of all genres with more visual effects. This digital environment is opposite of what Deakins and Dod Mantle had to face, in which their technologies were so undeveloped that the filmmakers had to employ them more creatively. The improvements in digital technologies are making it a medium that requires less from the filmmakers to produce a relatively high quality visual image. The tools of the digital intermediate are now becoming a technology available to consumers, and costs of higher-grade cameras continue to drop. Cameras and color correction softwares that are now available at relatively low costs blur the lines between amateur and professional, creating a new genre of filmmaker in between.

Implications for Young Filmmakers

Digital technologies have now decreased the barriers to creating professional looking images. However, this creates a proliferation in the amount of films created by non-professionals, thus increasing the barriers to entry into the professional motion picture industry. I can now shoot a short film on a DSLR such as the Canon 5D Mark III, which boasts HD resolution and relatively strong dynamic range, with changeable lenses that mock the look of

professional film lenses. Thereafter, I can use color correction software on my personal computer to manipulate images in post-production much like what was used initially by the digital intermediate. In the past, the technologies and techniques of celluloid distinguished amateur and professional filmmakers, since 16mm and 35mm cameras and stocks were not as easily accessed by consumers. Now, with the abundance of high-grade digital technologies, this is a bit harder to distinguish—making it a difficult environment for a young filmmaker, like myself, to cross over into the professional part of the industry.

Though the early uses of the digital intermediate and digital cameras provided cinematographers with exciting and groundbreaking experiences, they have ultimately led to the takeover of digital technologies on all ends of the film industry. This digital transition has led to the end of celluloid cinematography, due to the economic strains put on film manufacturers and processing labs from decreased demands in their products and services. As digital camera technologies continue to improve and offer filmmakers all of the latitude, image quality, and aesthetic feel of celluloid, celluloid is quickly becoming obsolete. Due to the economic hardships in the industry and decreased use of film stock and processing services, celluloid is slowly fading out of existence. Thus, digital is no longer a choice; it is quickly becoming the only option. The original and material stocks that film has been shot on for most of its technological lifespan are disappearing. This removes a tool for the cinematographer, imposing the use digital technology by completely removing the alternative of celluloid. This removal of choice impacts the artistry of cinematography, forcing the cinematographer to end the techniques and workflow that accompany celluloid filmmaking.

This loss of the opportunity of shooting with celluloid affects me directly as a young, aspiring cinematographer. Although the films of Deakins and Dod Mantle showed that digital

can be used very creatively, I strongly believe that their foundations in celluloid tools and practices allowed them to cultivate their talents and then translate them to digital. The nature of celluloid filmmaking forced more meticulous and slower paced production practices that the cinematographers transferred to their digital production practices. I am very passionate about cinematography and very disappointed in the decreasing opportunity I will have with learning and shooting on celluloid film. As an artist, I feel cheated of a medium that is crucial to understanding my art form and history. Are we already so far into the digital age that we have forgotten a time when our films were analog and material? For the first century of film, motion pictures were shot, edited, and exhibited on celluloid. Now, as we enter into the second decade of the twenty-first century, film is forgetting its own original medium. The entire early history of film showcases production practices and technologies that are now becoming obsolete and forgotten.

Final Conclusions

This early use of the digital intermediate and primary progression of digital cameras from consumer grade to professional level equipment showcases two cinematographers who used digital tools and techniques to create films that had an aesthetic different from that of celluloid films. While the image quality did not meet the quantitative standards that the industry had set over time, the technology supported the content of each film. In the four films examined, the digital influences and technologies were obvious to most viewers; even if they were unaware of the technical nature of what was different, they sensed a different feel to the images they were viewing. The digital intermediate began the process of finding a digital aesthetic by affording filmmakers the foundational concepts for creating a digital look, removed from the aesthetic of film by expanding post-production manipulation capabilities. The digital cameras began as

small and inexpensive technologies that begged for experimentation in camera movement and shot compositions.

The events and films described in the previous chapters are just two key occurrences at the start of a rapid transition to digital technologies in the motion picture industry that would go on to render celluloid technologies almost entirely obsolete in just a little over a decade. I believe these films are important to discuss because they opened the door for digital technologies and influenced the adoption of these technologies. Deakins and Dod Mantle both redefined acceptable image quality by creating cinematographic achievements that had lower resolution and weaker dynamic ranges than most celluloid films being shot at the time. Audiences were still able to enjoy their films because they used these weaknesses in favor of the narratives they were telling. They were certain to not use digital as a gimmick but instead to support their stories.

Though initially rejected by many filmmakers, both the digital intermediate and digital cameras have today become the standard technologies in the industry and changed the production workflow that had remained relatively the same for almost a century. Each of these technologies went on to be used in conjunction with one another. The digital intermediate and the digital camera technologies mutually supported each other's rise to prominence and standardization by minimizing workflows. The digital intermediate added in the step of scanning the film to digital in which information from the negative was often lost, which drove the development of digital cameras that could capture high resolution and dynamic images. Filming with a digital medium removed the step in post-production of scanning and digitizing the film, while still allowing filmmakers to manipulate the colors of their images in the digital intermediate suite. The changes through first the standardization of the use of the digital

intermediate in post production and then the proliferation of digital cameras in production pushed the transition to an entirely digital exhibition workflow. Projection then began to transition to digital 2K and 4K systems, and films were no longer sent to theaters via film rolls but as files on hard drives.

It is important to note that the films described in the previous sections are extremely rare events in the adoption of digital technologies. They serve as excellent examples of how cinematographers used the weaknesses of early digital technologies to their advantage, but were able to do so because of a specific set of conditions stemming from their backgrounds and circumstances in creating these films. The cinematographers each used their tools to dramatize their narratives. For Deakins, the manipulation of the color of the film allowed it to become a character in the story, while Dod Mantle utilized the small size of digital cameras to infiltrate the story world and allow the camera to become its own protagonist. Both cinematographers were able to create films with a style removed from the celluloid film aesthetic that were still successful with audiences. Deakins and Dod Mantle proved through their early adoption of digital technologies that instead of focusing on the objective form of filmmaking, filmmakers can utilize new technologies to give priority to a film's subjectivity and expanding the techniques of cinematography to tell stories in new ways for audiences.

The rise of digital has not continued to develop its own aesthetic as Deakins and Dod Mantle so innovatively crafted. While digital technologies are now the more commonly used technologies in the industry, digital cameras and the digital intermediate continue to try and match or recreate the look and feel of celluloid film. Instead of utilizing the tools of the digital intermediate to develop a new film aesthetic, the techniques are often used to transform digital images into images with a more celluloid feel, for example by adding in noise. Though digital

cameras are much more mobile than their celluloid counterparts, practices in shooting and camera movement have not greatly changed. Digital technologies have improved so much that even most cinematographers can no longer tell the difference between what was shot digitally or on celluloid, since so many filmmakers continue to use digital to match the look of celluloid (Clark). So, what does the future of digital filmmaking hold? Will digital one day find its own aesthetic, freed from the aesthetics of celluloid that filmmaking has been bound to for the first one hundred years of its use? Or will we continue to try and match the look of celluloid, almost in a mockery of its disappearance?

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