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A Critical Assessment of the Animator's Artistic Ownership over Motion Captured Performances

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Declaration

I hereby declare that this dissertation is my own work. It is submitted for the degree of Master of Arts in the field of Digital Animation at the University of the Witwatersrand, Johannesburg. It has not been previously submitted for any degree or examination at any other university.

Emmanuel Sarfo-Boansi

8 August 2014

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Introduction: The Convergence

Never before in the history of filmmaking has there been such a convergence of live-action performance and character animation as has been seen in recent times with the advent of motion capture technology. The technology (also often referred to as performance capture) transmits a live performance of a human being onto a digital 3D character by having specialized cameras acquire data from markers worn by the performer. The technology has had an enormous impact on the entertainment industry, and has brought the worlds of live-action and digitally animated filmmaking ever closer together.

By doing so, it has bridged "the differences between the live-action actor and the key-frame animator" (Jones, Oliff 178). In computer generated (CG) animation, a 'key-frame' character animator is the equivalent of a hand-drawn or a stop-motion character animator, responsible for animating characters and creating their performances. 'Key-framing' or 'hand-keying' refers to the process by means of which the character animator creates 'key' poses of a digital character in the computer. The computer then interpolates between these poses, i.e. creates the frames in between them, which are further manipulated by the animator, to create the illusion of believable movement. After the animator has laboured over as many key-frames as possible, he or she creates not only the illusion of believable movement, but a performance for the CG character.

However, the convergence between the actor and the key-frame animator engendered by motion capture technology has not always been an easy one; in fact it has been largely controversial. The blurring of lines between live-action performance and animated performance as a result of the motion capture process has had a profound impact on both live-action and fully animated films. It has forced practitioners as well as observers of the two entertainment forms to re-examine their understanding of 'performance' within the respective storytelling modes and to come to terms with how a performance is understood and perceived when motion capture blends the two worlds

together. It has forced us to re-evaluate our understanding of what constitutes an 'animated' performance and what qualifies as an actor's performance 'authentically' recorded and preserved onscreen.

The primary aesthetic thrust behind motion capture's increased prominence in the filmmaking world has been the desire to create CG animated performances that are as *realistic* as possible (Jones, Oliff 178). This has been particularly evident in live-action films that are reliant on visual effects to create fantastical characters that have great narrative importance within directors' visions for their films. The other important function of motion capture technology that live-action directors have embraced is the fact that it gives them a more tactile tool to engage in a more direct and intimate fashion with the visual effects aspects of the films they endeavour to make. It has allowed them to approach these parts of their films in much the same way that they would approach a live-action shoot – allowing them to treat the animation as though they were filming 'real' enacted situations. These reasons have caused the realms of animation and live-action to be intertwined in a way that they have never been before. Of the numerous controversies that have arisen out of this convergence, many of them come to a particular problem: the question of who has artistic authorship or ownership of animated performances generated with the aid of motion capture technology; the performers, or the character animators?

The pursuit of realism in these CG performances certainly tends to foreground the work done by the motion captured actors to bring the photo-realistic characters desired by directors to life. In much of the controversy that has surrounded motion capture, the overarching concern in mainstream discourse has been that of just how much of a motion captured actor's performance is being preserved on-screen and how much of it is being digitally manipulated. Some directors of films employing motion capture have been adamant about the fact that their actors are the sole creators and drivers of the performances of their CG counterparts. James Cameron, director of the 2009 science-fiction epic *Avatar*, was particularly vocal about this in the aftermath of the roaring success of his film. He voiced dismay at the fact that his actors were not given more

recognition by the Academy of Motion Picture Arts and Sciences and other prestigious film societies for their motion captured performances. He insisted that the motion capture process is an "actor-driven" one (Abramowitz).

Indeed, in order to get a realistic performance out of a photo-realistic CG character (particularly one that is human-like) that is to be integrated into the world of a live-action film, it makes sense to have that performance be informed by a 'real life' performance as much as possible. Motion capture, with its ability to efficiently transpose an actor's recorded performance onto a digital character, suits this purpose perfectly. This is why it has increasingly become the standard method for helping to create realistic CG characters (especially humanoid ones) in non-animated films, as well as a few notable 'animated' ones such as *The Polar Express* (Robert Zemeckis, 2004) and *The Adventures of Tintin: The Secret of the Unicorn* (Steven Spielberg, 2011).[1] It allows the motion captured actor to, as Cameron would say, *drive* the CG performance. This process has proven to be the more desired approach to achieving the realism desired by directors as opposed to the 'traditional' key-framing approach. If CG characters in a live-action film are to *appear* as realistic as possible, it is imperative that they *move* and *perform* as realistically as possible. With this pursuit of realism so heavily dependent on the actor being at the heart of these CG performances, what effect does this have on the creative freedoms of character animators who are tasked with augmenting the motion captured performances in order to ensure that they fit naturally within a live-action film?

This brings to light an old tension in animation which dates back to periods during what many consider to have been the first 'golden age' of American hand-drawn animation (typically considered to have lasted from around 1928 roughly through to the 1960s), particularly at the Disney animation studio. Whenever animated human characters were required to perform as realistically as possible, the use of live-action footage of performers was a logical tool to use as reference. This pursuit of animated performances with as much naturalism or 'verisimilitude' as possible, with the at times heavy reliance on live-action footage to create the performances, had many animators

feeling as though they were creatively "nailed to floor"(Thomas, Johnston 331). What the motion capture process seems to have done is further intensified this artistic tension and caused the performative skill of actors to encroach even more on the artistic and performative ownership of character animators over realistically animated characters.

This tension has been intensified on a number of fronts. Other than the seeming reduction of key-frame character animators' performative autonomy, motion capture has significantly overshadowed the technical skill of these artists who are able to create compelling, believable and (to an extent) realistic animated performances, particularly in humanoid characters.[2] Motion capture offers, at least at first glance, an easier and more efficient way to achieve realistic animated results, as opposed to the considerable investments of time required to achieve similar results by hand-crafting performances from scratch by means of the purely key-framing technique. It is then no surprise that within the CG animation industry motion capture technology has historically been met with a noticeable level of resistance from many key-frame animators who have regarded it as a threat to their craft. How *exactly* does motion capture, in its affinity with realism, impact on the artistic ownership of character animators? What are the conditions that influence the effect that it has?

On the face of it, it would seem as though motion capture's employment in live-action visual effects has almost decimated the character animator's artistic contribution to and ownership of digital performances. However, as more and more animators have become exposed to working with motion capture in recent times, the common misconception once held by them (often shared by those uninvolved in the animation industry) that the motion capture process is simply a cheap, predominantly automated, and easy way to achieve realistic animated results, with little contribution from character animators, has diminished. Many of them have come to realize that they are essential players in motion capture being used successfully (Kelly).

This has happened in tandem with the application and implementation of motion capture within production pipelines becoming more sophisticated. Part of the reason for this increased sophistication has been because those within the entertainment industry have steadily come to realize that in order to use the technology effectively, the skill of animators is crucial to getting the best results out of it. Because of this motion capture is now seen less by animators simply as 'Satan's Rotoscope' (Cope), a term given to it by 'purist' character animators in reference to the 2D process (developed by animator Max Fleischer in 1915, which he then patented in 1917 [Kitagawa 5]) of manually tracing over frames of live-action footage in order to rapidly produce 'realistic' hand-drawn animation (Menache 3-4). The continuing cinematic success that motion capture has enjoyed over the past decade and more, as a result of the more thoughtful and strategic employment of it by filmmakers, has come to force character animators to accept that it is to be a mainstay in the entertainment industry, and a process that a large number of them will inevitably have to engage with at some point in their careers (Kelly 41).

Despite this, there are still conflicting views from many in the animation industry regarding just how it is that the use of motion capture to produce realistic animation affects the artistic roles of character animators. Has it eroded their artistic authority over realistic digital performances? There is a school of thought that it is simply an aid for animators that helps them reach an already highly realistic result in a very efficient way, from which point they can use their artistic license to push the performance further and exaggerate the realism to better suit the CG character and the particular aesthetic desired by a director (Kelly 42).[3] In other words they see it as "just a tool" for them to achieve realistic results while still being able to artistically express *themselves* and maintain a degree of artistic ownership over the CG performances. However, there are others who feel that the motion capture process, though acknowledging that captured performances still require the skill and trained eye of an animator to augment them successfully, is a somewhat restrictive one and allows for limited room for animators to creatively contribute to CG performances (Sadool, qtd. in Vasquez, "Jalil Sadool"). Once again, this echoes the sentiments of many animators during the 'classical' days of Disney hand-drawn animation regarding the use of live-action footage. Thus

there is still a level of contention and uncertainty regarding how exactly motion capture's ability to produce realistic results impacts on character animators,[4] and consequently how much artistic autonomy the technology affords them.

It is with this in mind that an examination is necessary of exactly how it is that motion capture's employment to achieve these results has impacted on the artistic and performative liberties of CG character animators. In particular, it is important to address the question of whether or not the traditional ideal of the character animator having artistic ownership over the performances he or she creates, the ideal of the animator being an 'actor' or a performer, is still feasible within the realm of live-action visual effects when it employs motion capture technology. In a medium which demands absolute realism from any fantastical photo-realistic CG characters that are to inhabit the same cinematic space as their live-action counterparts, is it possible for the notion of a character animator being the artistic 'author' of these characters' performances to exist? These are questions that need to be answered, and the goal of this paper is to try and provide those answers.

Before we begin to do so, it is useful to be aware of some of the limits that frame how this study attempts to answer these questions, as well as some of the key aspects of the approach that will be taken. Regarding the approach, many of these problems will be examined specifically from the perspective of character animators as 'performers' in their own rite, their specific role in films involving animation, and within the context of how their discipline has evolved as a performing art. It should be noted, though, that this is not done so with the presumption that the character animator is the sole creative authority in films involving animation. It is, however, useful to take an approach based on the character animator's perspective in order to examine how the implementation of motion capture impacts on the creative dynamics in the character animator's relationships between the director, as well as the motion captured actors. More importantly, by taking such an approach we may perhaps gain some new insights into the performative problems surrounding motion capture that differ from those derived from how mainstream discourse has tended to examine the technology's impact on the

film world, which has largely centred on how it can compromise an actor's performance in terms of how it is recorded, and its final presentation on screen.

It should also be understood from the outset that this paper does not attempt to embark on a complete historical survey of the development of animation in all its innumerable guises and examine how they all impact on motion capture. Rather, a few key areas that are the most pertinent to the questions and controversies outlined above will be looked at in detail in order to examine these problems.

Thus the first chapter of this study, which forms the historical foundation for this paper's investigation, examines how the ideal of the animator being an 'actor' took shape and how the performativity of character animation functions within animated film's aesthetic traditions by focusing largely on mainstream American hand-drawn animation. There are certainly other forms of animation that deserve to be looked at in relation to motion capture. Stop-motion animation, for instance could easily be examined in this context because, of the older forms of animation, it was the one that was the most commonly utilized as a live-action special effects technique (as CG animation and motion capture are being used today), having been pioneered by the likes of Willis O'Brien with his work on the original *King Kong* (Merian C. Cooper, Ernest B. Schoedsack, 1933) and further developed by Ray Harryhausen and his extensive work on numerous fantasy/adventure films. However, mainstream theatrical hand-drawn animation is the most relevant form of animation for this study's purposes as it was here that the ideal of the character animator conducting his or her craft akin to the way an actor would was arguably the most pronounced and celebrated. Moreover, as we've seen, it was also within this context, (again, particularly at the Disney studio) that this very ideal began to be encroached upon by the close use of live-action reference and/or rotoscoping; making this a highly suitable and relevant precedent to be closely analysed in relation to the problems posed by motion capture.

Chapter 2 turns attention to how performance has historically functioned in live-action film to suit the aesthetics of 'realism' in the medium. Rather than attempt to consolidate *all* of the considerable film theory pertaining to these subjects, this is done primarily in relation to how performance functions in animated film, which helps to provide some insight into the aesthetic discrepancies, as well as how that feeds into the performative discrepancies, between animated and live-action film. This forms a good base for examining how it is that motion capture brings the worlds of animated and live-action film together, and understanding the aesthetic and performative problems that often arise when this happens.

Chapter 3 then focuses on motion capture itself, charting how it has come into prominence in mainstream cinema and become such a prevalent process in the animation and visual effects industries. This is done by looking at some of the earliest uses of the technology leading up to some of the most significant technological breakthroughs made with it, its failures and successes, seeing how it has evolved to become an increasingly sophisticated and robust filmmaking process, examining how and why it is that filmmakers have come to embrace it, and, in the process, gain an understanding of the significant effect the technology has had on character animators working in live-action visual effects.

Lastly, in Chapter 4 case studies will be made of the Na'vi characters in Cameron's *Avatar*, and the troll characters in Peter Jackson's *The Hobbit: An Unexpected Journey* (2012). These two examples have been selected because they are both relatively recent, high profile, and important productions in terms of their implementation of motion capture. As we shall see, they also represent intriguingly different examples of how it is that motion capture can be used successfully and, crucially, represent different ways for how it is that motion capture as an animation process impacts on the artistic and performative liberties of character animators. From the evidence of these case studies, the investigation concludes by assessing the answers and insights we will have found and gained through these analyses. It considers the implications this has regarding how it is that acting and performance is viewed in a day and age where so much of

conventional and established filmmaking processes are heavily impacted on by ever-progressing digital technologies.

Chapter 1

Traditional Animation Performance and the Animator's Autonomy

> *I'm not one of those people who draws compulsively. I don't draw unless I have to. I actually don't really enjoy it. I got my kicks at the [Disney] studio from putting a performance on the screen.* – Milt Kahl (qtd. in Canemaker 134)

The fact that a character animator crafts the performance of an animated character may not necessarily come as a surprise to anyone who has at least a basic understanding of animation. Animation is a medium that, particularly in the case of large scale productions intended for theatrical distribution or television, involves multiple artists skilled in various disciplines that come together and collaborate to create a motion picture in which every frame of everything onscreen often has to be entirely fabricated. When these frames are played back in sequence and in real-time, they create the illusion of movement. This is, at least fundamentally, true of animation in all its various forms; whether it be hand-drawn animation, stop-motion/puppet animation, sand animation, and even CG animation (where if not *all* the frames are necessarily hand-crafted, the vast majority of them certainly are). The people involved in these productions, operating under the artistic and creative supervision of a film's director, include artists responsible for aspects of production such as storyboarding, art design, layout, the animation of effects, props or, indeed, of characters. In the case of character animation, when the animators responsible for it create the frames of footage, they create not only the illusion of movement, but animated character performances.

This seems obvious enough. It makes sense that the character animator is the necessary conduit through which animated performances are created, whether it is done so through drawing, through the manipulation of digital or physical puppets, or any other means. But what about the concept of the animator considering him- or herself as a

performer? That is something that surely comes across as odd to casual onlookers of animated film. Indeed, the most obvious aspect of animation, and the one that is normally focused on in mainstream discourse and by those who perhaps only have a superficial understanding of the art form, is the skill and technique involved in drawing or manipulating countless frames of images of fabricated characters in order to create the illusion that they are 'alive' (Bird vi – vii). At first glance, it would seem that the craft is only about this technical skill, and being able to effectively convey the illusion of movement with inanimate drawings or digital or physical puppets.

This is why the above remark made by Milt Kahl, considering that he was a hand-drawn animator, would likely seem somewhat surprising to passing fans of animation. It seems even more surprising considering that Kahl was one of the most celebrated of Disney's renowned 'Nine Old Men', the elite group of animators at the Disney studio during the height of the first 'golden age' of Hollywood hand-drawn animation. More surprising still, particularly to practitioners of character animation, is the fact that, of all of the 'Nine', Kahl is widely considered to have been the very best draftsman. Animators both old and contemporary frequently laud Kahl's immense drawing skill.[1] Yet here we observe his feelings of ambivalence towards the actual act of drawing to create a performance, and his greater satisfaction from the act of "putting a performance on the screen". In the same interview from which the quote is taken, after Kahl made that remark, the interviewer followed by asking "So you're really more of a performer, than a draftsman? Is that how you consider yourself?" Kahl answered, "Right. Yes, I do" (in Deja, "Getting to Know"). As surprising as that comment may seem to some, it nonetheless gives insight into and confirms what many character animators are all too aware of: that the essence of character animation is ultimately about performance and approaching the crafting of an animated performance through many of the same fundamental processes that an actor would.

Along with the general public, established performance theory has typically ignored animation's credentials as a performing art.[2] The lack of recognition by most non-practitioners and non-scholars of animation that the animator engages in performance

has tended to irk some animation practitioners, such as renowned animation (and in recent years, live-action) director Brad Bird (*The Incredibles*, 2004; *Mission: Impossible – Ghost Protocol*, 2011). He has bemoaned the fact that mainstream discourse typically overlooks this crucial aspect of animated film.

> What is typically lost in discussions about animation is the fact that when you watch an animated film, the performance you're seeing is one the *animator* is giving to you. If an animated character makes you laugh or cry, feel fear, anger, empathy, or a million other emotions, it is largely due to the work of these often unsung artists, who invest a lot of themselves in the creation of these indelible moments.
>
> If the public could watch the faces of the best animators when caught up in the act of drawing an emotional scene, they would see artists as fully invested *in the moment* as the best live actors. (Bird vi)

Although the understanding of animation as a performing art is at the forefront of the minds of most professional animators, many of them only come to realize this when they begin to reach a point of relative sophistication in their craft, and begin to look past the technical aspects of the art form. Richard Williams, another animation legend,[3] illustrates this well with the following anecdote from one of the famous animation master-classes he once held.

> The movie actor, Scott Wilson sat through my three-day San Francisco masterclass. To my surprise he came up at the end and said, 'Of course you realise, Dick, that *this whole thing* has been about acting.'
>
> I said, 'What?' and Scott said, 'These are the *exact* equivalent methods, exercises and analyses we do in our acting workshops.'
>
> So acting is intrinsically part of the whole. (Williams 9)

Yet how is it that an artist who just seems to draw or manipulate countless images at a painstakingly slow rate can be engaging in any kind of performance, any kind of acting, at all? How is it that this notion came to be? If we are to understand how it is that motion capture affects this ideal, it is essential that it is thoroughly examined and understood, and in order to do so, it is necessary to go to the 'source' of this ideal: fully animated film.

First, we need to consider the drawn or hand-crafted aspects of animation, which provide the first insights into the issue of the character animator's artistic ownership within animated film's aesthetic traditions. Animation, in all its forms, is predominantly a graphic medium, where everything tends to be constructed in an ostentatious manner, usually drawing attention to its constructedness. By its graphic nature, Paul Wells notes, the medium has an inherent tendency towards the stylization of 'real' life rather than the direct mimicry of it (24-25).[4] This stylization is usually present in the representation of everything that appears onscreen, including the animated performances, which are normally geared towards some degree of exaggeration, and expressing the "graphic outcome" of creating a character (Wells 105). Donald Crafton also insists that animated performances and their graphically constructed spaces normally work in an aesthetic unity, whereby the level of stylization in one complements and matches that of the other (7-8). Therefore, because in much of fully animated film the animator usually operates in an already graphic space, the stylization inherent in it already privileges the animator's subjectivity, artistic autonomy and ownership at the purely visual and graphic level.

To examine how it is that the notion of the animator as an 'actor with a pencil', began to develop, it is necessary to turn our attention to how character animation developed through the mainstream American hand-drawn animation studios. This is necessary because, as mentioned earlier, of all the many stylistic and aesthetic directions that animation has taken, it was in this particular context that the notion of the animator being an 'actor' began to take shape in earnest and became the most strongly idealized.[5]

This is largely because these studios, such as the Warner Brothers studio, the Fleischer Brothers, and, of course Disney, were the most concerned with progressing animation towards being "both an industry and an art form", and therefore concerned themselves with "entertainment values" (Wells 14, 22-23). In so doing, these studios focused on animated characters being entertainers and performers, and character animators played a vital role in delivering their performances.

The style of the early cartoons made by these studios, roughly from 1910 through to the early '30s, was overwhelmingly aligned to the aesthetic codes of comic strip cartoons (Wells 14-17). The overall aesthetic impression of this style was one of flatness, contributed to by its "high-contrast black-and-white palette, simplified forms, rounded characters, and inconspicuous backgrounds" (Crafton 147). Animated performances in this mode reflected this graphic simplicity.

Iconic characters featured in these shorts, such as Otto Messmer's Felix the Cat, the Fleischers' KoKo the Clown and Betty Boop, and Walt Disney's Mickey Mouse all exhibited performances that were less about depth of character personality, and more about the enactment of gags that exhibited animation's ability to do the irrational or impossible. Animators crafted their characters' personalities and performances in such a way that they became "essentially expressions of the possibility of drawing itself" (Wells 105). Crafton describes animated performances in this mode as 'figurative'. Figuratively animated characters were represented as "recognizable 'types', marshalling a small range of instantly identifiable facial and body expressions", whose acting was "skin deep". They were "comedians without any depth or subtlety of personality" (Crafton 23-28). The performances of these characters echoed those of actors in silent film acting, and were "often modelled explicitly on vaudevillian comics and speciality acts" (Wells 105). This is an important point of which to take note. It shows that although animators certainly modelled their animated performances according to the then-simplistic aesthetics of their medium, they also "kept one eye on the forms of narrative and visual exposition and on the performance styles that were being practiced in the mainstream" (Crafton 35). It reveals that animators, even in these early days,

viewed animation as a form of performance (albeit a crude and novelistic one), and not only as the act of presenting facile moving drawings.

However, it was not until the hand-drawn animated medium started to develop in ways that required what Crafton calls 'embodied' performances that the notion of a character animator truly being an 'actor' began to take shape. Crafton describes 'embodied' performance as "the philosophy and practice of creating imaginatively realized beings with individuality, depth, and internal complexity" (36). This is where the Disney studio becomes particularly important, as it was the artists operating within its walls, at the command of Walt Disney himself, that spearheaded the move away from characters simply "moving around on the screen and doing funny things. [Walt] wanted the audience to care about what happened to the characters, and believe in them as real beings, not just as a bunch of funny drawings" (Wilfred Jackson qtd. in Crafton 37). This move towards greater character complexity began in the mid-'30s and happened in tandem with the overall drive towards the more naturalistic construction and rendering of animated worlds that was happening at the Disney studio, and to varying degrees at other major studios (Crafton 150). The chief motivation for this move towards what many would call 'realism' was Walt Disney's desire to turn animation into a commercially viable medium not only in the short form, but the long form as well (Wells 22-24).

It was believed that in order to sustain genuine audience engagement throughout the length of an animated feature film, the high levels of stylization and graphic simplicity that had allowed animated shorts up until the early 1930s to be appreciated and enjoyed as novel forms of entertainment would not be suitable in the feature format. In order for audiences to be fully immersed in an animated film's narrative, they would need to relate more to what was happening onscreen at a deeper level than they had been doing with the shorts. Thus, Walt believed that animated characters and the narratives they operated in required a greater degree of complexity. This meant that a greater degree of so-called 'realism' was required in the representation of animated

characters and consequently in the spaces that they inhabited; something more aligned to the photographic representation in live-action film (Wells 37-38).

On that note, it is perhaps at this point necessary to engage with the concept of 'realism' within the context of animation in relation to the other cinematic arts. 'Realism' is a complicated and elusive term in general, and the visual arts often prove to be a tricky space in which to locate any definitive, concrete description of the term that can be universally applied to the numerous manifestations of the visual arts. This is why it tends to be best to locate any definition or use of the term within the context of the discourse in which it is being used. Thus, as Wells puts it, 'realism' is a "necessarily subjective" and "relative" term (Wells 24). So when speaking of the look that came to characterize the Disney feature animation aesthetic since the studio's production of *Snow White and the Seven Dwarfs* (David Hand, 1937), Wells describes it as being "hyper-realistic" in relation to other forms of animation that either approached or deviated from this style. He describes it in this way because, of all the other hand-drawn animation styles, it is this one that most "echoes the 'realism' of the live-action film" (Wells 25-26).

This definition is useful and workable specifically within the context of animation. However, Wells has stated that any definition of 'realism' is relative. Thus when placing the aesthetic of Disney films and others that have emulated that style to some degree or another against the photographic realism of live-action film and visual effects, as is partly being done in this paper's investigation, using the term 'hyper-realism' to define the 'Disney style' becomes less viable. For this reason it is perhaps better to describe the Disney feature aesthetic using the term 'naturalism' within the framework of this research. It is a term that perhaps better takes into account that these films are fundamentally separated from live-action 'realism' because they are *drawings*; representations of reality in the form of lines and colour. Therefore no matter how plausible their movements may seem, they never try to directly mimic photographic realism and trick the audience into believing they are photographed images of real life. As Michael Barrier notes, they are always distinguishable from live-action by at least

some “leavening of caricature” even in their most naturalistic forms. In his words, “Even though cartoons can be believable, they can probably never be *as* believable as live-action film. No matter how caught up in a cartoon an audience may be, it must be aware that it is watching photographs of drawings rather than photographs of real people” (Barrier, *Hollywood Cartoons* 4). This is true of CG cartoons as well, but in different, more deliberate ways. But more will be said of this later in this chapter.

What is important to recognize for the moment is that the ‘embodied’ mode of animated performance emphasized animated beings that were more believable and compelling, which was crucial for the overall drive towards animated ‘naturalism’. This demanded a greater level of sophistication and skill in the drafting and execution of the cartoon characters and their physical actions, in order for the performances to be believable on their own terms, as opposed to being a “bunch of funny drawings”. All of this resulted in what would evolve into “a new breed of artisan, the ‘character animator’, whose job it was not only to draw but also to articulate the acting basis for the performances within the increasingly industrialized process [of animated filmmaking]” (Crafton 39).

However, naturalistic acting could not be conveyed if “the animators could not reproduce such natural forces as gravity and motion in a convincing three-dimensional space” (Crafton 150). Hence the ‘Twelve Principles of Animation’ began to take shape and became increasingly refined. These Principles were a set of rules, techniques, and solutions that were developed over time through a combination of analysis of live-action footage, general observation of nature, trial and error, and just pure experimentation. Frank Thomas and Ollie Johnston, two of the ‘Nine Old Men’ probably even more famed than Kahl, wrote in their seminal book on the art of Disney animation, *The Illusion of Life* that these techniques gradually became isolated and refined over time to aid in the creation of both more dynamic ‘cartoony’ animation, and highly naturalistic animation (Thomas, Johnston 34-69). For example, the well-known ‘Squash and Stretch’ principle refers to the compression and decompression, or contraction and extension, of the shapes of organic beings or objects in nature as they move and are affected by natural physics (Thomas, Johnston 47-51). Though this technique is the

most pronounced in its often highly exaggerated use in 'cartoony' animation (which has created the misconception that it does not occur in nature), it is also essential to conveying naturalistic weight and physics, and the most skilled of animators are very aware of how to use it in more understated ways in order to convey this naturalism.[6]

However, it was the particular study of acting theory and technique that created the modern conception within the animation industry that the character animator is a *serious* actor and entertainer (Thomas, Johnston 473-483). This resulted in animators thinking so deeply and personally about their characters and how to craft their performances that they began to "incarnate their nascent characters, [finding] the right movements and expressions, and then [getting] that interiority to emerge in their drawings" (Crafton 44-45). This is something that Thomas and Johnston spoke and wrote of very seriously. In *The Illusion of Life*, they discussed how the craft being practiced at the Disney studio during its 'golden age' emphasized animating characters with as much unique and individuated personality as possible by means of the animators thinking as deeply about the characters as possible. By seriously engaging in acting theory and technique, they were able to understand what it was that made a character performance authentic and compelling. They discussed how, during the production of the early Disney animated features, many of the studio's animators "enrolled in acting classes, seeking a greater understanding of the principles of the theatre" (Thomas, Johnston 474). This became more and more necessary as animators needed to portray increasingly complex individuals, with very specific personalities, that needed to elicit greater degrees of empathy from the audience.

Animating characters with empathy, or what Thomas and Johnston often referred to as "pathos", is what would make audiences care deeply about the on-screen characters and empathize with them (475). As Ed Hooks explains, "Empathy is the magic key to acting…The basic theatrical transaction is between the actor and the audience, and the thing that holds it all together is emotion. Humans empathize with emotion…The goal of the animator is to expose emotion through the illusion of movement onscreen" (Hooks 15-16). Thus in the same way that live-action actors began informing the characters

they portrayed with as much personal investment of emotion as possible in order for their character portrayals to be more empathetic, character animators began to understand that the more they emulated this approach, the more likely they were to achieve the same results with their animated performances.

This evolving conception of animated acting and the character animator's role in it "had a specific theoretical underpinning in the lectures and writing of Konstantin Stanislavsky" (Crafton 37). Stanislavsky's teachings and theories have come to form a large part of any form of acting that intends to appear compelling and believable within the portrayal of a fictional narrative, whether onstage or onscreen. James Naremore writes: "Nearly all forms of actor training in the United States today" – and arguably much of the Westernised world – "are approximately Stanislavskian, whether or not he is recognized as a source" (2). The basis of Stanislavsky's theories, known commonly as "the Method" or "Method Acting", emphasize "studying and 'living' the role [of a character], incarnating the character by living it oneself" (Crafton 38). In Stanislavsky's own words, "An actor is under the obligation to live his part inwardly, and then to give to his experience an external embodiment" (qtd. in Crafton 38). By "living the part", an actor would feel the character's emotions more deeply, resulting in a more 'truthful' portrayal. In essence, the actor was required to *become* the character. Similarly, character animators employing Stanislavskian technique came to try and 'live' their drawn characters as "much as human actors, through study, rehearsal, and introspection, [and] get into their roles" (Crafton 45). Thus in most animated films emanating from the model that Disney established with his feature films, though the animators are not physically present on screen, they "are still present , though they are participating as embodied characters within the narrative" (Crafton 45).

This process of embodiment, 'incarnation', and personal ownership of performance is what Stanislavsky referred to as the creation of an "inner life" for a character. By projecting this "inner life" into a portrayed character, the performance would be derived from a deeply internal source within the actor, thus legitimizing and authenticating his or her external actions. The character animator essentially becomes a

Stanislavskian actor in that "it is a necessary requirement of the animator to project his/her 'inner life' into the narrational consequences of character construction and development" (Wells 105). By doing this, the process of character animation becomes most concerned with "investing the animated characters with experience" by means of the animator's 'inner life' (Wells 105).

These methodologies may seem excessively romantic at first, and perhaps even somewhat self-indulgent. However, because of the fact that animation is fundamentally a graphic medium, it tends to lend itself to broad acting, or the type of acting that "actors disparagingly call 'results'" (Hooks 2), meaning emphasis only on the exteriority of a performance with little regard for its interiority. Without Stanislavskian-like internal motivation, animated performances would have remained in this vein, lacking emotional depth and nuance, and being little more than facile moving drawings.

The projection of the character animator's "inner life" into an animated performance is also linked to the animator's innate artistic ownership at the purely visual and graphic level of animated film, and circumvents us back to this particular concern. A large part of this "inner life" concept in acting involves "the use of personal 'sense memories' to inform moments of narrational action" as well as "the overt concern with matching inner feeling to outer expression" (Wells 105). As is the case with live actors, this inherently gives the animator artistic ownership in that the performance becomes his/her own unique interpretation, in the same way that a drawing or a sculpture is automatically the personal interpretation of the artist. Therefore, the art of character animation incorporates artistic ownership and embodiment both at the level of performance, and at the purely visual and graphic level. The animator makes a strong, unique statement both in terms of the performance itself, and in the graphic representation of that performance.

With regard to artistic embodiment at the graphic level, this is the way that it has been understood within the graphic arts for centuries. The emphasis on the notion of an art

work being the manifestation of an artist's individual virtuosity and unique creativity dates back to the earliest days of the Renaissance. It was particularly in this period where an art work's "sense of wonder" stressed "its intellectual aspects", and its "abstract creative features [were] allied with the intellectual aura associated with the written word" (Risatti 116). The foregrounding of the artist's individual 'genius' and, in particular, personal and emotional embodiment in his or her work reached arguably its highest point during the period of Abstract Expressionism, characterized by the prominence of the American vanguard painters, where the focus centred not only on the virtuosity of the artist, but on how the work was a direct expression of the artist's emotional and personal being (Rosenberg 23-39).

Natalie Dekel has focused intently on the direct relationship between the personal, emotional being of the artist, and how it is expressed in his or her work. She has examined the way every characteristic of any piece of art, including personal or independent animation, is the direct embodiment of a particular aspect of the artist's self. Very much in the Abstract Expressionist vein, Dekel discusses how every element of the physical surface of an art work represents an aspect of the artist's emotional state while creating the work, how his or her lived experiences deeply inform artistic processes and choices, and what the personal motivations were at the time of applying either line or colour in a particular way. Referring to colours, for instance, Dekel insists that they are "more than just signs on paper, they are about how much we can tell about the existence of the person behind them, the person who created them, the artist" (176). Dekel's focus on the "artist as the nucleus of the creative work" emphasizes how artists "embody or express their identity, and their artistic sense, in the process of making art" by virtue of the belief that their work is inseparable from their identities (168).

This exaltation of artistic subjectivity and the artistic 'self' emerging in every element of an artwork clearly has strong ties to Modernist discourse, and at first glance would seem somewhat removed from the highly industrialized procedures of commercial animation. Indeed, many intellectuals and animation scholars, including Paul Wells, feel that the commercial feature animation model has sacrificed much of the potential for

individual artistic expression, particularly in the Modernist sense.[7] However, fully animated film, in whatever form, still remains one in which artists typically create stylized worlds and caricatured beings, regardless of the degree to which the level of stylization may vary. Therefore, the medium still remains one in which artists are privileged to make graphic, personal, and expressive statements and maintain artistic ownership over their work.

This is one of the main areas where motion capture tends to become a particularly controversial topic in relation to fully animated film because, by the technology's very nature, it undermines the stylized representation of movement that 'full' animation (even in its most naturalistic forms) usually prioritizes to some degree or another. Throughout the development of hand-drawn feature animation within the mainstream, the drives towards naturalism never strove to be *exactly* like live-action film (Crafton 2), and always kept its constructedness apparent to some degree or another. Invoking Barrier's sentiments once more, in the case of hand-drawn animation, one could never truly convince audiences that what they were looking at were photographs of real people. Thus the notion of complete, indisputable photo-realism could never truly (or feasibly) be achieved through the medium. Partly because of this, Disney always sought to take advantage of animation's ability to stylize, make graphic statements, and do the impossible while making it look and feel as plausible as possible through naturalistic movement and consequently believable and engaging performances. Disney "always insisted that his artists preserve at least a small gap of implausibility to keep animatography distinct from cinematography" (Crafton 2).

Thus regardless of how closely animated performances approached 'reality', they still retained their graphic identity. The graphic aesthetics of animation as a medium of artistic expression still govern the naturalism of these performances. So even though the Stanislavskian approach to acting benefitted animators by helping them authenticate the physical movements and gestures of their animated characters by making them seem genuine, it was still up to the artists' graphic and stylistic sensibilities to make sure that the way these more naturalistic poses and actions were

displayed remained squarely within a graphic, representational space. Hence one of animation's core ideals emphasizes clarity of expression, and readability of silhouette (Thomas, Johnston 53, 325-326). Therefore, from all of these observations, one could say that the aesthetic traditions of fully animated film have always *protected* both the artistic and performative autonomy of animators. The visual nature of the medium has always *allowed* animators to maintain at least some degree of artistic ownership over the performances they craft.

This remained the case even during the somewhat more artistically contentious periods at the Disney studio, when live-action footage of human performers was heavily utilized in order to reach greater levels of naturalism more efficiently. While the Fleischer brothers used live-action footage far more literally through the rotoscoping process, the Disney studio used it differently. There it served multiple purposes, and its benefits were seized upon in varying degrees from as early as the days of the production of *Snow White* in the mid-'30s (Thomas, Johnston 319-321). As previously noted, it helped animators improve their understanding of real physics and locomotion. However, it also served to inform specific animated performances to varying degrees. On one level, particularly in some of its earliest uses, it was used somewhat loosely as a method of work shopping performances, particularly in the cases where Disney hired "professional actors to perform the parts before film cameras as inspiration" (Crafton 45).

In these cases, the goal with the use of the footage was purely to observe how certain professional actors would interpret the way an animated character should perform a certain scene or sequence within a narrative. Naturally, professional actors offered unique and inspirational acting ideas that animators were given free range to observe and utilize whatever most benefitted the animated performances, always being mindful of the fact that their goal was to create compelling performances that still remained stylized. According to Thomas and Johnston, live-action was first used almost exclusively as source material which could be mined at the animators' discretion (319-320). These first forays into employing live action footage in this way resulted in some

rich animated performances filled with entertainment value. The success of these early experiments resulted in the process being used more by animators as a way of quickly brainstorming ideas. Although the filming of professional actors was common, other artists at the studio, from the animators to the story artists "who had a special talent for acting" filmed footage of each other that may have served to inform the animated performances (Thomas, Johnston 319-320).

There were also the instances, particularly in the post-World War II period, where footage was shot and used more specifically to offer detailed blueprints for performances as well as a way of meticulously planning out the direction and flow of scenes before the animators began work on them. Crucially, it was also used as reference for animated movement that was intended to feel more 'realistic'. This was usually the case when films were to feature highly naturalistically drafted (or "straight") human characters. Perhaps more importantly, the largest motivation for this highly structured and controlled method of implementing live-action footage was to lower the costs of producing animated features. The first Disney feature to implement this approach was *Cinderella* (1950), the studio's first post-World War II feature. The film, Susan Ohmer writes, was first shot entirely in live-action, with actors cast to perform the roles of every human character in the film in "full costume and make-up" (238). In these cases animators were mandated by studio management to adhere to the live-action footage very closely, with much of the acting and staging choices for scenes having already been pre-planned and approved (Thomas, Johnston 331). Use of the footage in this way had the tendency to make animators feel creatively constrained by it, and "it could dominate the animator" or "stifle imagination" (Thomas, Johnston 319).

However, the Disney studio's animators never lost sight of the fact that these films needed to remain 'animated'. So in their earliest experiments using the footage almost completely literally, when they saw that the direct copy of it created eerie results with animation lacking "the illusion of life", they realized that they needed to adapt and interpret what they were seeing. This needed to be done in order to make sure that the high levels of 'realism' engendered by the live action footage never undermined the fact

that the films were to remain graphic and caricatured. Thus the footage was always "redrawn in animatable shapes", with the human actors' movements being "reinterpreted into the world of [the animator's] designs and shapes and forms" (Thomas, Johnston 323). This was, again, consonant with Walt Disney's desire to keep the look of animated films distinct from live-action, and the animators' approach to using live-action footage was with this directive or philosophy (depending on how one sees it) in mind. There was always a degree of caricature maintained in the designs of the "straight" human characters, and therefore their movements and gestures retained a level of stylization in the animators' interpretations.

This was particularly true in the instances where live-action was used less as merely a cost-cutting tool and more as a useful and efficient aid to the animators, as was the case in the Disney films of the '60s and '70s. By this time the animators became more adept in using the footage in more measured ways. In the words of Thomas and Johnston, "As long as we remembered to use the photostats [of live-action footage] only as a reference in making our own statement of what should be in the scene, our animation was never tight or restricted". The animators would remain the performative and artistic authorities (under the supervision of their directors) by deciding what of the actors' performances would be preserved to some degree and what would be discarded or reinvented. What would appear on the screen would be a "simple, strong, direct statement that [had] clarity and vitality" (Thomas, Johnston 323).

This idea of an artist's own projected visual statement is, again, no less than what is at the heart of fully animated film, and what keeps it in the domain of the graphic representational arts. It is an ideal which has been imparted into CG cartoons, now the dominant form of mainstream feature animated film. One could argue that this is possibly the most crucial element that separates mainstream animation in its contemporary guise from full live-action 'realism' in that, unlike hand-drawn animation, 3D digital animation is capable of creating both the stylization of animated cartoons, as well as mimicking live-action's photo-reality. While it is true that the creation of entirely convincing, realistic CG humans remains, in some respects, a daunting challenge for the

medium,[8] creating realistic characters that are at least humanoid, as well as any type of creature (fantastical or not), is well within the medium's capabilities in the present day, especially with the employment of motion capture. Thus studios intending to create CG animated features are normally very conscious of devising aesthetic treatments for their films that keep them firmly within the realm of 'cartoons',[9] therefore emphasizing artistic interpretation and stylization to some degree or another. Thus despite the fact that 3D digital animated performances are not hand-drawn, and are rather created through the manipulation of digital puppets, they still operate within the same tradition of animators making both graphic and performative statements.

The CG cartoon, in the same way as the hand-drawn one (or other older forms of animation), still prioritizes the artistic autonomy of animators and still allows them to be actors that embody themselves in their hand-crafted performances, something which evidently surprised celebrated former Disney hand-drawn animator Glen Keane during the making of Disney's *Tangled* (2010). Keane directed the character animation in the film, and upon seeing its completed animation, he was surprised by how much of an animator's artistic ownership could be maintained in the CG medium. "I thought that computer animation was a much colder, removed art form. And I realized as I was watching the movie, that I could recognize who the animator was behind every shot, by the touch of the animation, the timing, the way the face was shaped, everything – just like hand-drawn" (Keane, qtd. in Desowitz).

Chapter 2

Performance in Relation to the Aesthetics of Live-Action Film

Before we can further this investigation into motion capture technology's impact on character animators in live-action visual effects, it is necessary to understand the aesthetic conventions and traditions of 'realistic' narrative live-action film in the mainstream. We need to understand what defines its 'realism', and, crucially, how it is that performance operates within this space to both supplement and embody the goal of realistic representation. For the purposes of this investigation, this will be done specifically from the context of how it differs from performance in animated film. In the same way that animated performance cannot be discussed in separation from the medium's aesthetic traditions, the same holds true for live-action performance.

The 'reality' of live-action film, in all its innumerable guises, has fundamentally always been characterized by its indexicality. An index, as defined in American logician Charles Pierce's system of signs, "is a sign which is based on a real bond existing between the object and the sign which represents it" (Armes 11). Signs falling into this category are things like footprints and sundials (Armes 11), or fingerprints, shadows, and photographs (Abbott 98). Film is indexical because, at its most basic level, it is a series of photographs taken of our physical world played back to create the illusion of motion. Photographs are representative of a "real bond" in that they are created when "rays of light inscribe an object's image onto photosensitive paper at a particular moment" in time (Mulvey qtd. in Abbott 98). By an object's image being "inscribed" by light, the photograph's "real bond" becomes a physical one. A photograph itself is a physical trace of the elements of our physical world, and is a sign which has been "produced by the thing it represents" (Mulvey qtd. in Abbott 98).

This is the trait that has always defined the 'reality' of live-action film, even in the days when it could not entirely reproduce exact simulacra (namely colour) of our perceptual

world. To those who experienced early photography and film, it did not matter that images were black and white. They still had "indexical weight"[1] because they were physical records of an object's existence. "Generations of filmgoers," Robert Stam notes, "found black-and-white more 'realistic', for example, even though 'reality' itself comes in colour" (224). Lev Manovich, in his discussions of how new media challenges film's indexicality, notes that all live-action films, regardless of the various techniques used by filmmakers or how they may vary stylistically, all essentially function around this fundamental characteristic; "on unmodified photographic recordings of real events that took place in real, physical space"(294). Thus live-action cinema, Manovich states, "is the art of the index; it is the attempt to make art out of a footprint" (295).[2]

Of all the varied aesthetic and stylistic directions that film theorists and filmmakers have historically felt or argued to be the most artistically valid ways to make "art out of a footprint", the "realist" direction proposed by Siegfried Kracauer and particularly André Bazin is the one in which mainstream narrative cinema's codes of representation and storytelling are most closely aligned. Kracauer and Bazin stressed film's "vocation for realism" and vouched for its capacity to realistically portray fictional narratives (Stam 224). They argued for "a movement *toward* realism in the form of clear and believable stories told in transparent language" (Stam 225).

The aesthetic conventions and traditions of mainstream, or 'dominant', cinema fall in line with what Bazin termed "classical cinema", which "evokes certain practices of editing, camerawork, and sound that serve the reconstitution of a fictional world characterised by internal coherence, plausible causality, psychological realism, and the appearance of seamless spatial and temporal continuity" (Stam 225). It is by these codes that the mainstream movie-going public have come to accept filmic narrative depictions as 'realistic'. Stam relates that, for Bazin, "the classical realist film was 'transparent' in the sense that it attempted to efface all traces of 'the work of the film', making it pass for 'natural'" (225). This form, which Noël Burch called the "Institutional Mode of Representation", is "a product of the bourgeois dream of a perfect simulacrum of the perceptual world. By effacing all the signs of their production, 'dominant' cinema [has]

persuaded spectators to take constructed effects as transparent renderings of the real" (Stam 225). All of these codes of representation may also apply to narrative films which are based to some extent or another on historical fact or true stories, which are still subjectively constructed for entertainment purposes.

This 'realist' direction is in large part derived from the storytelling strategies of traditional theatre and literature, particularly those of the nineteenth century, which saw the birth of the "classical realist text". The 'realist' strategies that were established in theatre and literature emerged out of the nineteenth century "movement in the figurative and representational arts dedicated to the observation and accurate representation of the contemporary world" (Stam 223). Both forms of storytelling had historically focused on the creation of self-sustaining diegetic worlds. In the nineteenth century the drive towards a realistic portrayal of narratives became more pronounced, with both narratives and the characters within them being created in ways that reflected the 'real world' and people's experience of it in more believable ways (Stam 223). The "classical realist live-action film" has largely continued this movement by employing and adapting the strategies of these older storytelling art forms. In terms of the visual representation of a narrative, the theatre served as the basis upon which narrative film would create its own aesthetic language, building on and adapting from it to increase the sense of "transparency" to which filmmakers operating in this mode seemed to feel live-action's indexicality leant itself. As Tom Gunning writes, "film clearly took the legitimate theatre as its model" (233).

The aesthetic direction for hand-drawn animated films that Walt Disney pushed for was intended to largely mimic live-action film's trajectory and embodied most aspects of the filmic ideals proposed in Bazin's notion of "classical cinema". When Paul Wells speaks of Disneyesque 'hyper-realistic' animation's aspirations "to the creation of a realistic image system which echoes the 'realism' of live-action film", he refers not only to the 'accurate' representation of reality inherent in live-action film, but also to the conventions used to construct a linear and cohesive narrative (25-26). Crucially though, unlike narrative live-action films, animated cinema, even the type pushed for by Disney,

typically "foregrounds its artificial character, openly admitting that its images are mere representations. Its visual language is more aligned to the graphic than the photographic" (Manovich 298). This was seen in the previous chapter, which means that the perception of animated worlds and particularly animated performances by viewers has fundamental differences to the way in which live-action performances are.

However, before we can engage with the differences, it is necessary to recognize the similarities, which Crafton spends a lot of time addressing. He emphasizes one of the foundational principles of all theatrical performance geared towards serving a narrative, whether it be onstage or onscreen.

> Indeed, according to traditional theories of stage acting, dramatic irony is the basis of performance, since the actors, while performing, are not themselves but a believed-in character. . . . Experiencing a temporary forgetfulness, spectators may imagine, contradictorily though without great confusion or anxiety, that they're watching characters and not actors whose bodies just disappear. It's as though viewers are in two places simultaneously, within the fiction and outside of it. (Crafton 19)

All acted performances are, in essence, founded upon the viewer understanding the separation between the performers as real people in their own rite, and the "believed-in" characters that they are portraying. Actors have always "traditionally been regarded as entities separate from the beings which they perform, which are characters" (Crafton 59). Crafton argues that animated performances are understood in something of a similar fashion, because viewers also understand the characters onscreen to be separate from the characters' true nature off screen. But in this case, the onscreen characters have no lived physical being outside of the screened performances; they only ever have 'life' once they are onscreen. They are entirely fabricated in a self-evident fashion, and audiences are fully aware of this, yet they still accept them as 'real persons', just as they do with actors in their character portrayals. This is part of what Crafton refers to as "the

most profound irony" of animated performance. Animated characters defy most traditional theories of performance which stipulate the necessity of a 'living being' to deliver a performance, and yet people still experience them not only as performers but as 'real' characters (Crafton 18-23). Thus Crafton insists that the manner in which we perceive animated and 'live' human performance is largely similar primarily because of the "total experience" – and acceptance – "of performance as an ironic doubling of bodies" (59).

This "dramatic irony" of performance is, essentially, related to the overarching notion of the 'suspension of disbelief', which is critical to audience engagement with all forms of narrative cinema and entertainment. From the earliest days of cinema, there has always been an awareness on the part of the viewer that the performances and the narratives being viewed onscreen are constructed events. Gunning calls the experience that early cinema-goers had of the films they viewed as the "I know very well . . . but all the same" sensation. According to Gunning, in early films "the realism of the film image [was] at the service of a dramatically unfolding spectator experience, vacillating between belief and incredulity" (qtd. in Crafton 50). The then-obvious artifice of the fictional 'worlds' represented on the film screen, despite their photographically 'realistic' representation, was something viewers were always aware of, yet they were still willing to engage with and take joy in film's "illusionistic capabilities". This "unfolding spectator experience" is still present, though less dramatically, in modern film viewing, even when virtually all the "signs of their production have been effaced" and they almost perfectly exhibit the characteristics that define Bazin's notion of "classical cinema". Crafton insists that when viewers engage with a narrative film they enter a frame of mind where they are willing to engage with the onscreen narratives and accept what they know to be 'fake' as 'real'. As viewers participating in a filmic or theatrical experience', "we change our anticipation and belief systems when we cross the border of the cinema world, whether that world is animated or not" (Crafton 51). Thus the effectiveness of the portrayal of any narrative is ultimately dependent on an audience's 'belief system' and their willingness to be absorbed in what they are seeing.[3]

Therefore, Crafton states, "On-screen performers [animated or not] thus exploit the viewers' ability to hold contradictory attitudes, their capacity to immerse themselves in the character, the action, and the story while also keeping their distance" (6). He goes further and says the experience of "Performance in animation, since it highlights 'the transgression of borders' . . . may apply not only to the shifting spaces of cartoons but to ['live'] acting as well" (Crafton 51). Thus for performers "in the realm of movies whether they are linked to a flesh-and-blood body is irrelevant; all have equal ontological status" (Crafton 77). They have similar potential to be believed in as 'real', 'live' and 'present'.

Crafton's assertions work to validate animated performance on the same grounds as any other type of performance. However, it is now crucially important to attend to the differences between the two, as they directly inform the subject of the way a digitally created character existing in a live-action film is potentially perceived or 'believed in' by audiences. Although with live or filmed performances the viewer is aware of the separation between the performer and the character, the fact that there is a real, physical, living person portraying the character immediately reduces the sense of dramatic irony in the performance and the narrative. Crafton himself acknowledges this, though in understated ways, in the discrepancies in how dramatic irony manifests itself in animated performance as opposed to live-action performance. This is most evidenced when he writes that viewers grant animated characters "*proximal liveness*", meaning, "The beings come close to being real, but since [our] belief in their living status is not complete [as we are always aware that they are manufactured beings], they just miss the mark" (Crafton 52). He alludes to the fact that live performance does have more potential to be accepted as 'real' by writing that Disney's push towards 'embodied' animated performance was in order to "reduce the live-real gap of proximal liveness" and "make it easier for viewers to experience [animated characters] as individualized actors and participate in world-making as they would in ordinary [live-action] cinema" (Crafton 82-83). Much of the history of 'realistic' 'live' acting, concurrent with the visual construction of 'realist' narratives, has thus been geared towards reducing 'dramatic irony' as much as possible, and making it easier for audiences to suspend disbelief. Actors in 'classical realist' narratives have developed their performance techniques to

heighten the illusion that they do not merely represent their characters, but that they *are* their characters.

Naremore dates this evolution in acting technique to the movement from a "presentational" to a "representational" aesthetic in traditional theatre. This started to happen when "the proscenium, or 'picture frame' arrangement became the dominant form of Western theatrical architecture some time in the late seventeenth century" (28). The "relatively 'presentational' theatre of Shakespeare and the Elizabethans" was more limited and sparse, and stages were not elaborately constructed and arranged to suggest complete verisimilitude with the settings of the stories being performed (Naremore 28). The style of acting in this form of theatre was far more extroverted, and was characterised by direct address of audiences. In "presentational" theatre an actor would deliver performances "with full rhetorical force, remaining in character but looking at the audience like an orator" (Naremore 36).

Naremore notes that elements from this style of acting, particularly direct address, still exist in certain forms of theatre, film, and television in the modern era (particularly "vaudeville-inspired comedy" and "radical or modernist cinema" [36]). However, the "representational" aesthetic replaced this form of acting as it increasingly prioritized a more naturalistic representation of a narrative. As the proscenium theatre employed far more elaborately constructed sets and stage arrangements to create a greater sense of verisimilitude, acting became less and less about direct address of audiences (Naremore 28). It focused more on naturalistic representation, and performers increasingly started to act as if the audience was not there, as though an invisible "fourth wall" existed between the actor and spectator (Naremore 28, 36). For instance, actors began to adopt three-quarter or profile stances in order to sustain the illusion that they were not performing for an audience, while still making sure that their actions and gestures were visible to the spectators beyond this 'fourth wall'. Acting had become a matter of "acting sideways" (Naremore 37). By the nineteenth century, "representational" acting strategies geared towards realism became increasingly sophisticated. For example, Naremore notes that "the chief mark of realistic, psychological drama from the late

nineteenth century onward has been the tendency of the actors to turn away, moving out of the strong or shared positions, facing each other on the diagonal so as to make the stage seem less 'rhetorical' and more 'natural'" (37).

Increasingly, "representational" theatre as a whole had become devoted to creating and sustaining an illusion of realistic representation. When narrative live-action cinema adopted the strategies of the proscenium stage in the first part of the twentieth century, it would gradually take the aesthetic of the theatre much further and increase the sense that the filmed performances were 'real' and had actually taken place in 'real life', and that the camera just happened to be there to film them. The medium would eventually create a sense of "transparency" in a way that the theatre could not.

The earliest forays into storytelling in the medium of film, though, adhered far more literally to the representational strategies of the proscenium stage. Cameras were almost always positioned at a distance from the actors, "so that figures on the screen approximated proscenium scale and the spectator seemed to occupy an orchestra seat". Actors in these films essentially acted as though they were onstage, making their physical gestures overtly visible (Naremore 38). One of the filmmakers often credited with initiating the creation of a visual language for cinema that would better connote realism and more varied visual exposition was the American director D.W. Griffith. Operating from 1908 through to the beginning of the 1930s,[4] Griffith is regarded as being one of the first to have "a basic awareness that the unit of film-making is not (as in the theatre) the scene, but the individual shot. He saw that a scene must be broken down into shots for it to have its full effect. He made exciting use of his camera and found new ways of editing shots together to make a sequence" (Armes 98-99). Griffith and subsequent filmmakers emphasized bringing the camera closer to the actors, making heavy use of medium shots and tighter "framings of faces and details". Filmmakers also began to rely heavily on the "shot/reverse shot combination", and the result of all these methods aided immensely in "facilitating a change toward psychological realism" (Naremore 38-39).

With more varied and artful cinematography now having been established, it was no longer necessary for actors to perform in ways that made their gestures overtly visible to people in all parts of a theatre audience, as directors would construct their camera-work in ways that placed emphasis on only the actions that were necessary for the shots and, by extension, for the story. In Naremore's words, "The camera was no longer simply an audience; it had become a kind of narrator" (39). The eventual coming of sound and colour to the cinema would also greatly enhance the sense of dramatic and realistic representation. "[T]he 'talkies'", in particular, "ultimately provided everything else that was necessary to 'transparent', fully representational performances" (Naremore 39).

While this was happening, Stanislavsky's acting theories (which he began developing around the turn of the twentieth century) became increasingly employed both onstage and especially onscreen. This aided in the overall enterprise of live-action filmmakers in making their work appear as "transparent" as possible. Although the representational acting strategies of the proscenium stage offered a sense of naturalism, before Stanislavsky's teachings became popular actors still, in essence, "struck poses and 'showed' the audience that they were experiencing emotion, rather than experiencing the emotion itself" (Hooks 4). Performers may no longer have been addressing audiences directly with "full rhetorical force", but their acting still had a fundamental 'stagy' quality to it, geared towards overt exterior representation. Hooks notes that for a period in the nineteenth century, this was in part influenced by the work of Francois Delsarte, who "developed a system of acting theory based on poses and physical signs." According to Hooks, "actors practicing the Delsarte System said to the audience, in effect, 'I'm not really feeling anything, but if I were, it would look like this'" (4).

Delsarte's teachings would certainly not be appropriate for the aesthetic goals of 'dominant' cinema, and "Stanislavsky's work", as Hooks puts it, "totally blew the Delsarte System out of the water" (4). Stanislavsky was after all, as Naremore calls him, "the great exponent of naturalism", and as narrative film continued its drive towards realistic representation, his theories became a cornerstone for all acting geared in this

direction. “All varieties of teaching derived from [Stanislavsky’s] work try to inculcate spontaneity, improvisation, and low-key psychological introspection; they devalue anything that looks stagy” (Naremore 2). Stanislavskian acting technique, by making exterior actions appear authentic through internal motivation, aids a great deal in ensuring that when actors are communicating the necessary points of a story they appear to be doing so in a natural, effortless fashion.

This necessity of the communication of narrative imperatives is a crucial point to take note of. “Clearly all films”, Naremore tells us, “depend on a form of communication whereby meanings are *acted out*” (2). Thus the fundamental goal of all acting is to ‘communicate meanings’ and make the necessary motions and expressions visible in order to aid in storytelling. This means that actors are, fundamentally, always performing in something of an ostentatious, theatrical manner. Naremore says as much, stating that even “At its most sophisticated, acting in the theatre or movies is an art devoted to the systematic ostentatious depiction of character” (23), and that even the most naturalistic performances “involve a degree of ostensiveness” (17). What Stanislavsky’s teachings helped to do was make sure that it did not seem as though the persons onscreen were ‘acting’ in the conventional theatrical sense. His and the later work of his followers V. I. Pudovkin and Lee Strasberg ensured a much more naturalistic, and understated form of characterization that made actors’ “communication of meaning” appear as if it was being done in a way that did not seem forced or self-conscious.

Animators working in the ‘embodied’ mode of performance, as has been discussed, learned and continue to approach their work in this manner. However, there is a difference, however nuanced or miniscule, in the purpose of this. Animated film, to reiterate, typically does not conceal its essential artifice, and always prioritizes stylization and caricature. Thus the reason animators have come to approach their work in this way is geared more towards making it easier for audiences to identify with the on-screen beings they know have been fabricated, as opposed to making audiences believe that the animated performances actually took place in ‘real life’ and happened to

be caught on film. The typical narrative live-action film, on the other hand, never foregrounds any sense of artifice. The entire emphasis is to use the medium's indexical qualities, its ability to show traces of life as we perceive it, and make it seem as though the narratives and acted performances we see onscreen took place 'for real', without subjective and artistic interference, and just happened to be caught on film. As Manovich observes, the typical live-action film "works hard to erase any traces of its own production process, including any indication that the images we see have been constructed rather than simply recorded. . . . It pretends to be a simple recording of an already existing reality – both to the viewer and to itself" (298-299). Hence Stanislavskian theory, with its foundation being so heavily concerned with more 'honest' character portrayals and 'truth', found affinity with this emphasis on 'transparency' and 'reality' (albeit a constructed one) being caught on film.

The lack of importance of silhouette in live-action film, for instance, illustrates well how its aesthetic goals involving performance are far removed from those of animated film and emphasizes the sense of unmediated reality being presented. As a point of difference from some of the earlier more 'stagy' qualities of even the representational proscenium stage (and incidentally animated performances), actors employed Stanislavskian technique to reduce the importance of self-consciously creating readable silhouettes. Aesthetically, as seen in the previous chapter, the necessity of clear silhouettes suits animation's drives towards 'graphic outcomes', which continues to be the case even in some of the more naturalistically animated CG films of today. In much of narrative live-action cinema, this is of scant (if any) concern, as Angie Jones and Jamie Oliff elaborate:

> Live-action directors rarely think about silhouette when they shoot actors. The silhouette should be there if the actor is doing his job. In contrast, the animator is *always* concerned with silhouette. Without a strong silhouette, the performance will be hard to read. A strong silhouette can read from far away or up close. A live-action actor is rarely thinking about his silhouette or whether his pose is reading well. He has

> to believe the movement will be honest if he is honestly acting as the character, and he never looks back to see whether it is. (Jones, Oliff 181)

This devaluing of silhouette is closely related to the emphasis in dramatic live-action films on actors being able to deliver compelling performances while at times doing very little with their bodies. Naremore observes that "the dramatic film has always fostered a neutral, 'invisible' form of acting" and that the "actual work of people who appear in movies or television seems to involve a compromise between 'obviousness' and 'doing nothing'" (17, 34). This often requires actors to be skilled at "doing nothing extremely well", especially when it comes to subtly communicating narrative imperatives that are meant to appear understated and often barely perceptible. This is another fundamentally Stanislavskian ideal, one he termed the "gestureless moment". According to Pudovkin, "Stanislavsky felt that an actor striving towards truth should be able to avoid the element of *portraying* his feelings to the audience" in an overt manner, and in 'realistic' filmmaking, particularly in the use of close-up shots, an actor's "extreme paucity of gesture, often literal immobility, is absolutely indispensable in it" (qtd. in Naremore 39-40). Not only is this essential to the understated communication of important narrative information, it is crucial to the manifestation of a sense of naturalism.[5]

This element of withholding information and restraining bodily motion has, ever since Disney started pushing for more naturalistic and 'embodied' animation, long been a source of intrigue for character animators aiming for naturalistic animated performance. Indeed, Milt Kahl once recognized the difficulty in animated performance of attaining a "gestureless moment". "The hardest thing to do in animation", he said, "is nothing" (qtd. in Deja, "Getting to Know"). Partly because of the technical challenge this presents,[6] this is why much of animation tends to be more inclined towards broader gesturing and more dynamic motion. When character animators first ventured more deeply into embodied animated acting, through observation of the Stanislavskian acting that was permeating Hollywood, they began to recognize certain things that live actors

did that they felt would not necessarily suit animation's concerns with graphic representation.

Picking up on the degree of subtlety often practiced by film actors as opposed to animators, Kahl once observed that "an actress or an actor can make a complete expression and mood change with a little motion of the eye . . . [In animation] what you have to do is to display it to the audience. I always try to make it goddamn clear that people see what [I'm] trying to do". He went on to discuss how changes of mood or expression in animated performances need to be far more strongly contrasted and very clear to suit the medium's graphic imperatives. ". . . if a character is reading a book, say, and something over here makes a noise, something startles him . . . I'd try to get a very complacent and maybe amused expression, so you'd have something to change to. So you'd make the change strongly . . . you see the change of expression, and it reads to you. . . . You've got to have it in a place where the audience can see it" (qtd. in Canemaker 165). These sentiments again confirm that while the 'embodied' animation practiced during the first 'golden age' of animation was moving closer towards naturalistic representation, the concern with clarity, 'readability', and, above all, graphic representation overrode any potential for performances to become *too* subtle and realistic. The animators' prioritization with keeping a healthy distance from live-action photographic realism thus extended to the degree of naturalistic acting they felt was necessary in animated film.

However, the trend with modern animation of the more naturalistic kind, especially in CG animated film, seems to be to more closely emulate the kind of "low-key ostensiveness" typical of dramatic live-action film, with the goal of increasing 'believability'. Some of the most recent films to come out of DreamWorks Animation, for example, such as *How to Train Your Dragon* (2010) and *Rise of the Guardians* (2012) are indicative of this trend, which feature human characters performing in very subtle and understated ways during more low-key, emotionally driven moments in the narratives. They seem to personify some of Hooks' sentiments regarding contemporary animated performance needing to be even more sophisticated than that which was practiced by

'the old guys' through proper study of acting theory. He stresses that the days of the Nine Old Men were "simpler days, and what worked then is increasingly insufficient now" (Hooks 3-4). Animators of today often embrace the challenge of trying to attain the kind of subtle performances that live-actors often give; trying to give animated performance as much range as that which characterizes live-action performance.[7] Although Kahl's statement about achieving a "gestureless moment" in animation still remains a huge challenge just on a purely technical level, even in CG animation,[8] the most skilled of modern animators are able to execute it effectively.

However, where mainstream feature animation is concerned, even when character animators come close to achieving this kind of subtlety they *still* do so with the intention to keep the movement (or lack of movement) caricatured and deliberately stylized in order for it to 'read'.[9] Moreover, keeping the animation stylized eases the burden on how realistic the motion would need to be. It is highly unlikely that such a degree of subtlety and nuance would be attempted by animators *without* the intention to stylize it, because that would make the performance appear far too realistic for characters that are usually intended to be stylized. When that degree of realism is required, it is normally intended for live-action film requiring photorealistic human-like digital characters, and in those cases it becomes far more logical and practical to have an actor drive such performances. As will be seen in the next chapter, this is normally where motion capture becomes a necessary tool.

For now, though, it should be recognized that the emphasis on understatement is part and parcel of the broader repertoire of filmmaking techniques used by realist live-action actors and directors geared towards eliminating any sense of stylization and stressing "the aura of reality 'captured' on film" (Manovich 299). Arguably the most fundamental and valued component of the process of filming performance is that of being able to physically work with actors onset as they author performances in a real space, in 'real time', and having them react to other actors, their environment and their situations 'in the moment'. This helps enormously in creating a sense of 'realism', as the performers' responses become far more organic and more plausibly motivated.

The 'real time' aspect is a crucial point to note in the context of the discussion of motion capture's usefulness in live-action filmmaking, as it is a feature that is certainly not inherent in the conventional creation of animated performance. As Jones and Oliff state, "Actors are always in real time and animators are never in real time" (182). Hooks writes that, "Live actors work in the present moment; animators do not have a present moment. (Or if they do, it's one hell of a long moment)" (qtd. in Jones, Oliff 181). He further elaborates on the differences between animated performance and live-action performance when it comes to operating 'in the moment'.

> Actors work within the fleeting moment, moving from action to action, emotion to emotion, never looking back, never focusing on the emotion itself. A good animator must go through a similar process of motivating her characters on a moment-to-moment basis, but she then must keep re-creating that same moment over and over and over again, sometimes for weeks on end, while she captures it on the page or computer screen. Actors learn that once a moment is gone, it's gone for good, but animators have to pitch camp at the intersection of movement and emotion. (Hooks 5)

Closely related to this hallowed ability to create performances 'in the moment' is the element of improvisation. It is something which has roots in the theatre, but it arguably serves the goals of live-action filmmaking even more effectively. When actors are forced to improvise, then it becomes apparent just how much they have embodied their characters, and can greatly enhance the feeling of naturalism in a film's unfolding events and give the work a refreshingly spontaneous quality. Naremore illustrates this well by writing that "because naturalistic filmmakers are enamoured of what William Gillette called 'the illusion of the first time' they also encourage a good deal of improvisation, trying to create situations where actors will be forced to fumble along, or where one player will do something unexpected, forcing the others to react spontaneously." There are some directors who have even encouraged "their casts to develop scenes as the

cameras roll, and players sometimes transform mistakes into clever bits of business, just as they do on stage" (Naremore 44-45).

The fact that there is an opportunity for live-action performances to be worked with in this way, despite the otherwise highly constructed and 'controlled' nature of the filmmaking process,[10] means there is an organic quality that can always be mined by directors.[11] This is possible from the simplest cases of two characters interacting with one another, to more elaborate situations where multiple characters can react off of one another and create the sense of an organic 'ensemble'. This ability to 'feel one's way through a shoot', finding and working off of things which are unexpected, gives directors a great degree of flexibility, and ultimately allows for greater levels of naturalism in the representation of the performances.

Thus the goal of filmmakers, when they wish to integrate realistic CG characters into a 'realist' live-action film, is to replicate these same conditions and effects. They wish to create the same sense that real physical beings have simply been captured unawares on film behaving naturally, in a manner that feels unscripted and even spontaneous. Naturally, they are inclined to use the same methods they would in ordinary filmmaking circumstances and this is where motion capture becomes a particularly desirable method to achieve these results.

Chapter 3

The Evolution of Motion Capture in the Cinema

Motion capture technology's rise to prominence within mainstream live-action cinema (particularly in the genres of science fiction and fantasy) is largely linked to the increased employment of CG visual effects in live-action films featuring characters, environments, or other fantastical elements that are either extremely difficult or simply impossible to film via conventional means. The requirements of creating something non-existent that appears utterly convincing onscreen meant that computer generated imagery, as the demand for it in live-action cinema began to increase, had to mimic the photo-realistic properties of film. If CG visual effects were to exist within the conventions of narrative live-action cinema geared towards 'transparent' reality, there could be no cues to the artificiality of the digital synthetic image.

Manovich notes that much of the history of all computer graphics development has revolved around the simulation of photographic realism, placing emphasis on the attainment of two primary goals: for CG elements to seem as though they physically exist in the 'real' world, and, consequently, to appear as though they have been filmed by a real camera in the same way that any other real life existents would be (191-192). Stacey Abbott has noted how the increased demand for CG elements in live-action films of the science-fiction genre pushed the art form of CG visual effects to perfect the creation of this illusion, to the point where audiences now cannot detect any signs of artifice in synthetic digital imagery (91-95). In the early and mid-1990s, CG visual effects had started to prove that it could meet these demands. The new medium managed to convincingly create the illusion that entirely digital characters and elements were filmed on set, had corporeality and coexisted in the same physical world as live actors. Films like James Cameron's *Terminator 2: Judgement Day* (1991) and Steven Spielberg's *Jurassic Park* (1993), were among the first and most important live-action films that exhibited in emphatic fashion that synthetic digital creations could indeed

inhabit live-action worlds and not diminish or 'spoil' the illusionistic nature of realist live-action film through revealing any digital 'artefacts' (Manovich 201).

Another essential requirement in the successful integration of CG elements within a live-action world is that of the digital creations needing to *move* in as realistic a manner as possible in order for the integration to be seamless and unnoticeable. Unlike animated films, the constructed-ness of the digital images can never be allowed to surface, thus if the synthetic elements *appear* realistic, it is imperative that they *move* realistically.[1] Thus CG live-action visual effects called for skilled animators who were capable of making non-existent objects or characters move in a truly hyper-realistic manner that made them seem as though they truly fitted into the 'real world' of live-action film.

This immediately calls attention to a fundamental difference in the requirements of animators operating within live-action aesthetics, as opposed to those operating within the aesthetics of 'cartoons'. As has been seen, the requirements of animators in fully animated film are geared towards a more graphic aesthetic as the medium does not attempt to disguise its fundamental constructedness. However, because the typical narrative live-action film focuses on absolutely transparent realism, in essence, the animation in live-action visual effects cannot look as though it has actually been animated.

In the earlier stages of CG technology's use in the cinema, it was proven that the creation of realistic movements in certain CG elements could indeed be automated via the running of computer simulations (with extensive human manipulation) that could accurately mimic real-life phenomena such as water, fire, dust, explosions etc. However, the creation of realistic movement in synthetic characters was not truly automatable. One could never really automate the realistic movements of digitally created beings that were meant to not only seem to have corporeality, but also sentience, via simply tweaking computer algorithms or parameters. The illusion that these characters were

indeed real and sentient required that they not only moved realistically, but they *performed* realistically; a requirement that no mathematical algorithms could ever meet acceptably. These movements thus needed to be created by hand, via key-frame animation and the animator's skill in creating the crucial 'illusion of life'. Because of this, the live-action space was one that still required the artistic and technical skill of character animators.

One could reasonably contend that this was purely out of necessity, as it was the only possible way to create the illusion of digital characters being in the same physical space as live-actors. In a medium which is meant to be characterized by its 'reality', the artistic skill or expression of animators is not meant to be celebrated; it is meant to serve the purpose of filmic realism. Nevertheless, the medium of live-action visual effects still allowed animators to operate in a manner akin to the way animators work in fully animated film – that is, being the driving force of animated performances. The situation would be different, however, when it came to the creation of realistic digital *humanoid* characters, and this is where motion capture technology becomes of particular significance.

Of motion capture technology's many advantages, the most fundamental and important is that of the creation of realistic movement in a digital, usually human-like, character. The technology offers a form of automated animation of human-like characters, and it is because of this that it rose to prominence in the world of live-action cinema. Effects-heavy films of the 1990s predominantly featured digital characters that were not at all human (or if they did, the characters' greatest resemblance to human proportions lay in that they were bipedal beings, such as Jar-Jar Binks or Yoda in George Lucas's *Star Wars Episode I: The Phantom Menace* [1999]). At the turn of the century, however, there became an increased demand for fantastical human-like characters in live-action films that would appear completely realistic and convincing alongside live actors, and feature prominently in the films' narratives. It was from this point on that motion capture was revealed to be a highly effective means to achieve these desired results. Its immense potential was realized and showcased for the first time, and in emphatic fashion, with

the performance of a character that has now surely attained status as a cinematic icon: Gollum, in Peter Jackson's *The Lord of the Rings* trilogy (2001-2003). From this point onwards, the motion capture phenomenon would take mainstream cinema by storm.

Because of the fact that motion capture technology only began to take on programmatic significance in mainstream cinema at around this time, when CG animation (particularly of the visual effects variety) in the cinema had already reached a point of relative maturity and sophistication, there is still a perception that the technology is a recent creation, a type of late offspring of CG animation.[2] However, as is usually the case with almost anything that attains popularity in the mainstream, motion capture technology has been in existence for much longer than the time of its debut in the 'limelight' suggests.

It is now a well-worn observation that motion capture technology "in the entertainment field is the descendent of rotoscoping" (Menache 3). Some, like Barrier, even refer to it as merely "a sophisticated form of rotoscoping" (Barrier, "Monster House"). However, rotoscoping mapped realistic human movement onto 2-dimensional, hand-drawn characters (the Fleischers' Ko-Ko the Clown regarded as being the first to have been created in this way in 1915 [Kitagawa 4-5]). Alberto Menache notes that "the advent of 3D animation brought about the birth of a new, 3D way of rotoscoping. Hence, motion capture" was created (4). As was the case with much of 3D digital imaging technologies, Midori Kitagawa observes that the first forays into the research and development of motion capture began in the 1970s "in pursuit of medical and military applications" (6). However, while every other aspect of CG technology continued to advance steadily and take incremental, but significant steps forward in the entertainment arts throughout the '70s and early '80s, motion capture technology remained crude and stagnant, only having a presence "in the form of research projects" at tertiary education institutions in the USA (Menache 4). The technology would only start taking its most significant developmental steps into the realms of entertainment in the mid-'80s, when "the CGI industry discovered the technology's potentials" (Kitagawa 6).

The 1985 television commercial entitled 'Brilliance' for the National Canned Food Information Council, which aired for the first time during the January 1985 Super Bowl, is widely considered to be the first successful application of a form of motion capture in any entertainment format. The commercial featured a shiny female robot made out of chrome acting as the spokesperson for the Council. The character, commonly referred to as "Sexy Robot" by those who saw the commercial in the '80s, was created by Robert Abel and Associates, utilizing a somewhat 'low-tech' method of motion capture. Using black magic markers, they placed black dots on eighteen major joints of a female model performing the actions of the robot on a swivel stool. Her actions were photographed from multiple angles, with the images then being imported into computers. From this point, a series of applications and algorithms deriving from the information provided by the photographs were created, which then drove the animation of the digital character (Menache 4-6).

The first intended use of motion capture in the cinema, however, would prove to be a failure. The technology was intended to be employed in the 1990 film *Total Recall*, in a sequence where Arnold Schwarzenegger's character was pursued through an airport X-Ray machine by security guards. Motion capture technology was to be used to create the skeletons that would appear on the X-Ray machine representing the characters as they went through it. The motion capture system employed was of a more conventional 'high-tech' guise, in which retro-reflective markers were placed on the actors and were captured using optical motion capture equipment and motion capture cameras. Unfortunately for the filmmakers, miscommunication, misunderstanding of what was possible with the technology, and seeming incompetence on the part of the motion capture equipment manufacturers in terms of post-processing the captured data, meant that no usable data was available to be used on the film (Menache 53-55).

This failure foreshadowed much of the difficulty that motion capture had in being utilized on a wide scale in the film industry during the '90s. The technology's much-vaunted promise of being able to feasibly create realistic 3D motion at a lesser cost than through key-frame animation was constantly offset by the plethora of problems

associated with it: the high cost of the technology itself; lack of true expertise in terms of how to effectively employ it for feature films; miscommunication of the necessary technical and logistical requirements; misinformation about the degree of automation it afforded, and consequently a disillusionment regarding how much manual labour was required in order for captured results to be presentable; and a lack of understanding about what types of situations the technology should be used for both in practical and aesthetic terms (Menache 48-50). As a result, the technology would exist only on the margins of the film industry throughout the 1990s.[3]

While CG animation was becoming increasingly sophisticated and key-frame animators became more practiced in the skill of creating sufficiently realistic motion that could seamlessly fit in with the aesthetics of live-action film, motion capture technology remained useful in only limited ways in live-action filmmaking. Where it was employed successfully, it was done so for things like the creation of digital stunts that were impossible for any human performer to do, whereby the capture data provided a solid base from which to push and exaggerate actions, as was the case in a high-octane air-chase sequence in Joel Schumacher's *Batman and Robin* (1997). Other instances were for the simulation of large crowd scenes like those seen in James Cameron's 1997 epic *Titanic* (which also employed heavy key-framing to successfully augment the capture data) (Menache 49-50, 53). However, the technology was certainly never relied upon to create a lead character actually *acting* alongside human actors – until Gollum, of course.

This was the first time that motion capture technology was entrusted to aid in the creation of a major character in a live-action film. The character was initially intended to be an entirely CG key-frame animated character. This was because the other potential options – make-up/prosthetics applied to an actor with subsequent digital enhancements, or animatronic puppetry – were rejected by director Jackson as he felt they would both produce inadequate results and be too restrictive to the filming process, especially considering the range of actions Gollum needed to perform. Make-up and prosthetics, for instance, can take a great deal of time to apply to performers and do not always achieve the desired aesthetic results.[4] "Gollum was so emaciated and

twisted," Jackson relates, "walking on all fours, scrambling up and down cliff faces – it just wasn't conceivable that we could have done that with a human. So we made the big decision early on to create Gollum as a CG character, using a combination of animation techniques" (qtd. in Fordham, "Middle-earth" 74). The actor Andy Serkis was initially only meant to provide the character's vocal performance (Abbott 103). In the end, though, Gollum would end up being created through a "combination of techniques" which would employ Serkis to greater degrees than Jackson had ever intended, and among those techniques, motion capture would play a significant role.

The key to Gollum's creation was the necessity for an unequivocally realistic, nuanced, emotionally driven and intense performance that could convincingly coexist with those of live actors, and the filmmakers went to great lengths to achieve this. Realizing that Serkis could give so much more to the character of the wretched, mutated Hobbit than just a voice, Jackson decided that Serkis should be present on set with the actors as they performed their scenes, adorned in a white one-piece suit, playing the part of Gollum alongside them (Abbott 103-104). Takes with Serkis in-shot performing and interacting alongside the other live-actors were highly convincing, eliciting organic and naturalistic performances from all the actors (Fordham, "Middle-earth" 89-90). Serkis's performances were then superimposed over with the digital Gollum via CG rotoscoping (Abbott 104). The animators at Weta Digital (the visual effects studio largely responsible for the special effects in the *Lord of the Rings* films) "crafted the performance of the final digital character by combining Serkis' natural body movements with key-frame animation" (Fordham, "Middle-earth" 79). Serkis himself would then be digitally painted out of these shots, leaving only a digital, key-frame animated Gollum that largely matched Serkis's performance (Abbott 104).

There were also instances in which Serkis's performances were captured in a motion capture volume where numerous specialized cameras digitized the information derived from retro-reflective markers on a customised one-piece suit worn by the actor (Fordham, "Middle-earth" 90). The capture data was then transferred to a roughly rendered version of Gollum that could be viewed in real-time by Jackson. He could

direct Serkis's performances 'in the moment' and quickly review low-resolution versions of the resultant digital performances and rework them accordingly, a process Jackson could easily adapt to (Christophers 55). This exemplifies the observation made by Jones and Oliff that, "The process of recording the mo-cap data is one that the live-action director can relate to better than a traditional animation pipeline. . . . By using mo-cap, the director has interaction with the performer and can make several takes within 'the moment'" (179). This is opposed to a traditional animation workflow where days or weeks can pass before a shot can be animated to a point where a judgement can be made about whether or not the performance is working. The labour-intensiveness of such a process is exacerbated by the enormous investments of time required to manufacture the necessary realistic motion required for a photo-realistic digital human-like character to be integrated into a live-action world.

The motion capture process did, however, have its shortcomings. Facial motion capture was not possible at the time of the production of the *Lord of the Rings* films, so Gollum's facial performance had to be entirely key-framed by animators (Joe Letteri, qtd. in "Avatar: Weta Digital"), with their work being heavily based on the recorded performances of Serkis. Much of Serkis's overall performance also needed to be interpreted to better fit the physiology of Gollum, because although the character did have broadly human proportions, they were still different enough that Serkis' motions could never be directly transmitted onto the character on a literal, 'one-to-one' basis. As a result, Weta's animators were still required to use a considerable amount of key-frame animation to enhance Gollum's overall motion captured performance. It was particularly in the instances where Gollum was to perform in highly physical ways or perform actions beyond the capabilities of any human performer, where extensive key-frame animation was required (Randy Cook, qtd. in Fordham, "Middle-earth" 92). Thus animators were still a crucial part of the success of Gollum's performance, even if *their* roles as 'performers' in the traditional animation sense were altered in favour of Serkis being the 'author' of the performance.

The steps taken by the filmmakers and their use of motion capture technology ensured that a realistic digital humanoid character that not only needed to look and move realistically, but deliver a compelling performance could indeed be integrated into a live-action film without disrupting the aesthetics of the medium. Most profoundly, once one strips away all the technical aspects of the process, this was achieved by fundamentally approaching the creation of the character with the same methodologies that are used to record any performance in live-action cinema. Gollum, a synthetic character, was created through the use of a skilled live performer driving the character's performance, working and being filmed in much the same way as he would in ordinary circumstances. As great as the implications this would have on the filmmaking industry in terms of revealing a new range of characters that could be portrayed in live-action film, it would have deeply profound implications on the role of character animators as 'performers' working in live-action visual effects. Nevertheless, as Jones and Oliff put it, the creation of Gollum in *The Lord of the Rings* films "started a frenzy among live-action directors who have crossed into animated and visual effects films" (178).

Though one of the next most significant milestones in the development of motion capture in the cinema would not necessarily take place within the realm of live-action visual effects, it would still have massive implications for that form of filmmaking. Robert Zemeckis found himself seizing upon, as well as drastically advancing, the capabilities of motion capture in filmmaking with his 2004 'animated' film *The Polar Express*. He essentially used motion capture as a way to create his film using live-action methodologies, while also drastically expanding on them. Unlike Gollum, the characters in *The Polar Express* would be created exclusively through the use of motion capture. It as also the first major production that employed both body and facial capture together (Menache 70-72). The main limitation regarding the facial capture, though, was that the nature of its marker-based process meant that no form of the digital character's facial performance could be viewed and assessed in real-time (Duncan, Fitzpatrick 232).

However, this did not encumber Zemeckis, because he focused his energies specifically on crafting the performances themselves, 'in the moment', and achieving the best

possible performances without having to be encumbered by the usual practical and logistical realities of standard live-action production. Only once the shoots on the motion capture stage were completed, and Zemeckis was happy with the artistic merit of the performances, would the shots then be designed and framed around the rough digital versions of the actors' captured performances, by means of a virtual camera system called 'Wheels' (Menache 71). This is an aspect of the motion capture filmmaking process that Zemeckis took full advantage of and gleefully revelled in. Operating in this way, he and his collaborators could move or position the cameras as they would on a live-action shoot, and at times even in ways physically impossible for a real gravity-bound camera (Fordham, "Dream" 132, 125). The process also allowed for sets to be redressed and lighting set-ups changed all "with an ease and flexibility that had been previously unthinkable" (Freedman 42).[5]

But the element of maintaining an actor's 'realistic' performance always remained crucial to Zemeckis, highlighted by his desire to invest a great deal of time working with the actors to craft the performances as meticulously as possible. He always sought to maintain what many feel to be "the most irreplaceable elements of recorded cinema (actors and performance)" (Freedman 42). This element on its own had a particularly controversial impact on the animators working on the film.

All the performances of the digital characters were intended to be driven solely by the actors. Unlike Gollum, these characters were intended to appear as utterly convincing realistic *humans*, meaning that the actors' performances were intended to be translated literally and directly onto their CG counterparts, especially now that facial capture was possible. According to Bill Tessier, one of the animators who worked on the film, the mandate to the animators was strictly to preserve the performances of the actors, something which became a "sticking point" for them (qtd. in Vasquez, "Bill Tessier"). As is the nature of all motion captured performances, the capture data on this film still required the work of animators to augment it and bring it to a presentable state, because it is always rough and incomplete. However, according to Tessier, the data recorded was not meant to be used loosely as reference by the animators; it was meant

to be the template for them to preserve every aspect of the actors' performances, down to the most minute details, without any embellishment (qtd. in Vasquez, "Bill Tessier").

As much as this approach may have irked animators, Zemeckis's efforts continued to open the eyes of filmmakers to what was possible with motion capture technology, and many of them would later use and adapt the film's techniques for their own cinematic endeavours. One of the lessons learnt from *The Polar Express*, though, was that creating an entirely convincing, realistic digital human character still remained a challenge in digital filmmaking, and the film became a prime example of the "Uncanny Valley" effect. The basic definition of this effect, originally theorized by Japanese robotics professor Masahiro Mori in relation to the field of robotics, is that the more closely something synthetic is deliberately modelled to be a realistic human being, the higher our expectations become of it to *be* human. Thus any inaccuracies in the mimicking of human characteristics, either of appearance or of motion, create an eerie, unsettling effect in the viewer, rendering the synthetic being disturbing or 'creepy' (Mori).[6] This was largely the source of the criticism of *The Polar Express's* visuals.

A precedent for this already existed in the form of *Final Fantasy: The Spirits Within* (Hironobu Sakaguchi, 2001), the other entirely motion captured feature film that preceded *The Polar Express*, and in that instance motion capture was also recognized as a factor in the creation of the pronounced "Uncanny Valley" effect that came to characterise the film. There too, the characters were modelled hyper-realistically, intended to be indistinguishable from real human actors, both in appearance and movement. The film fell notably short of the mark, resulting in a highly eerie quality in the characters' movements, and was strongly criticized for it (Plantec). Unfortunately for Zemeckis and his *Polar Express*, these same problems also became strongly associated with the film. Nevertheless, as the film's visual effects supervisor Jerome Chen notes, the techniques used to make the film had far greater implications than its visual appeal (Menache 71).

Filmmakers continued to push this ability as far as possible. Peter Jackson, in his 2005 remake of *King Kong*, expanded on the methodologies he had employed to create Gollum, except that now it was possible to do facial capture. The production used a marker-based approach to drive the performance of the titular giant ape character, with Andy Serkis enacting the character. This in itself is important to consider. It is arguable that, a decade earlier, such a character would almost certainly have been created exclusively with key-frame animation. But the need to have the digital silverback gorilla perform in intimate, emotionally charged scenes with actress Naomi Watts' character, Ann Darrow, seemed to provoke Jackson to use a more traditional live-action approach to creating the performances. Serkis, although his character was of enormous proportions, performed his scenes together with Watts on a green screen stage from an elevated platform in order to provide the necessary eye-line for Watts, as well as to create the necessary onscreen chemistry between the two characters (Fordham, "Return" 49, 123). Because of the inability to do on set motion capture, Serkis re-performed his scenes on a motion-capture stage, with both his face and his body being captured simultaneously (Serkis qtd. in ABC News). Action scenes of Kong, however, such as his fight with two tyrannosaurs, "relied extensively on key-frame animation" (Fordham, "Return" 75).

Jackson's and his team's prior work on Gollum, though, would not be the only instance where motion capture would be employed to circumvent the limitations of traditional make-up and prosthetics in the 2000s. For Gore Verbinski's two *Pirates of the Caribbean* sequels, *Dead Man's Chest* (2006) and *At World's End* (2007), make-up and prosthetics had also been foregone in favour of creating the octopus-headed, crab-clawed villain Davy Jones and his marine-mutated crew of The Flying Dutchman digitally, using on set motion capture to drive the performances of the characters. John Knoll, the films' visual effects supervisor, relates the reasons for doing so.

> We wanted to be able to do things that would be very difficult or impossible to do with make-up or prosthetic appliances. We didn't want creatures that looked as if they could have been played by guys in suits; so

> some had holes through them or other aspects that couldn't have fitted to a performer. But we also wanted to treat the CG characters like any other part of the movie. We felt very strongly that we'd get better results by having world class actors author performances on set. An actor could work with the director to deliver a performance, the camera operator would have somebody to frame up on, the director of photography would have someone to light, the editor would have a performance to cut – and the visual effects would have no stylistic difference from the rest of the movie. (qtd. in Fordham, "Beneath" 68).

Knoll's comments are salient to the entire discussion of motion capture's usefulness in live-action filmmaking. They are a testament to our discussions concerning the value of maintaining the most organic qualities of filming performances when creating digital characters for a live-action film, in order to create a sense of naturalism. His comment about the value gained from having actors drive the performances was validated in emphatic fashion by the tour-de-force of a performance delivered by Bill Nighy, the actor who portrayed Davy Jones via motion capture. His performance was so rich, commanding and nuanced that it apparently exceeded the way Jones had been imagined by the films' animators.[7]

What made the on set motion capture process possible was a system developed by the visual effects technicians called "iMocap". Fundamentally, it differs from a conventional motion capture set-up in that it does not rely on large numbers of motion capture cameras surrounding a performer to capture movement. Rather, it uses a select number of specialized cameras that "procedurally track actors' movements", providing adequate capture data to drive the fundamental bodily motions of the digital characters (Fordham, "Beneath" 68). Facial motion capture, though, did not feature in this process, leaving the faces of Jones and his crew to be entirely key-framed by the animators. However, this was done by adhering to the reference footage shot of the actors, particularly Nighy, as they performed onset. The animators were tasked with ensuring

that Nighy's performance was preserved in its entirety, while accounting for the physiological discrepancies between the actor and his digital character.

The efforts of the filmmakers on the *Pirates of the Caribbean* sequels precluded a larger shift in mainstream live-action cinema to use motion capture to alter an actor's physical appearance in ways impossible or ineffective through traditional make-up, rather than only to make animated characters seem like they were 'real' performers. While this was done in far more extravagant ways in Verbinski's *Pirates* films, it was done in somewhat more downplayed ways in some of the latter films of the 2000s. Films like *The Curious Case of Benjamin Button* (David Fincher, 2008) and *TRON: Legacy* (Joseph Kosinski, 2010) took the concept of 'digital make-up' through the use of motion capture to new levels, in each case using the technology to age actors either older or younger, respectively. While Zemeckis continued the pursuit of creating realistic humans in animated films that would cross the "Uncanny Valley" with *Beowulf* (2007) and *A Christmas Carol* (2009), the "Valley" needed to be crossed in live-action film in order for 'digital make-up' to appear convincing.

With *Benjamin Button*, this needed to be done in order to create different versions of actor Brad Pitt in various stages of old age. The task was accomplished by having stand-in actors perform the roles where Pitt's titular character was in his elderly forms, and then motion capturing Pitt's own facial performance in separate sessions as he sat in a chair surrounded by cameras in a motion capture volume. With the capture data having been successfully transferred onto the aged digital versions of Pitt's head, those heads were then tracked onto the bodies of the on set stand-in performers (Duncan, "Legacy" 34). The difficulty of this task was somewhat eased by the fact that Pitt's imagined elderly appearances left some room for interpretation, in a sense killing with one stone the two separate birds of creating a convincingly realistic performance, and avoiding the dreaded "Uncanny Valley" effect (Duncan, "Legacy").

An "inversed" version of the same task was required on Kosinski's *TRON: Legacy*, where Jeff Bridges needed to appear younger in order to portray a 35-year-old version of himself that would appear as the film's main villain, Clu (Duncan, "Legacy" 30). To do this, the filmmakers also employed facial capture of Bridges enacting the character. However, as opposed to the approach used on *Benjamin Button*, the capture was done on set among the other actors as performances were filmed, and Bridges wore a helmet with four cameras attached to it to capture his facial performance. This is something that director Kosinski insisted on, and was motivated by the importance of maintaining traditional methodologies of recording live-action performances, and retaining the organic results of the process (Duncan, "Legacy" 34). However, Kosinski also recognized the role played by the animators to make sure that while the digital manifestation of Bridges retained the essence of the actor's performance, it was also consistent with the younger appearance of the character. Kosinski astutely recognized that, "When you age . . . not only does your look change, but your mannerisms change as well. To make sure the Clu performance represented Jeff at 35 years old, the animators would sometimes have to tweak some of his expressions. It was a very difficult thing to do, transferring Jeff's performance to this 35-year-old digital character" (qtd. in Duncan, "Legacy" 41).

There are certainly other relevant examples of films that pushed and showcased motion capture's capabilities that could easily be discussed at length. One might just as easily discuss *Happy Feet* (George Miller, 2006), as it was the first animated feature involving motion capture in its production to win (albeit controversially) an Academy Award for Best Animated Feature.[8] Cameron's *Avatar* is also an obvious case of major breakthroughs having been made with the technology, but that will be discussed in detail in the next chapter. Spielberg's *The Adventures of Tinitin* used the same approach used in *Avatar* but employed it to create a film that was marketed as an animated one. Rupert Wyatt's *Rise of the Planet of the Apes* (2011) was the first film to employ a full, 'true' motion capture set-up on set, complete with body and facial capture. Nevertheless, the examples that have been detailed in this chapter illustrate the overall trajectory of how it is that motion capture has profoundly impacted on mainstream cinema, allowing filmmakers to create digital characters in much the same way that they would in more conventional live-action filmmaking circumstances. What has also

become apparent, though, is how drastically this has impacted on the roles of animators working with captured performances. Now, it is necessary to see whether or not the notion of the animator as a 'performer' is feasible in this new paradigm of digital character creation.

Chapter 4

Case Studies

4.1 The Na'vi in *Avatar* (James Cameron, 2009)

Like other motion capture efforts before his, one of Cameron's principle motivations for using the technology for *Avatar* was to create realistic fantastical humanoid characters without having to contend with the practical and aesthetic limitations of make-up and prosthetics. In this case, the characters that needed to be created were the alien Na'vi, who were central to the film's narrative. In the film, they are a race of humanoid people that inhabit a distant moon called Pandora. They are ten feet tall and characterized by their long, lean and slender bodies, blue skin, long tails, animal-like ears, large cat-like yellow eyes, and broad lion-like noses. Cameron knew at the outset "that the alien Na'vi, as he envisioned them, were far too outlandish to be portrayed by actors in suits or prosthetic make-up" (Duncan, Fitzpatrick 15).

Though the characters would have to be created digitally, Cameron's intention had always been to have actors portray the characters. This, he felt, would be a better approach to achieving the type of realistic, nuanced, emotionally driven, human-based performances that would be needed from the Na'vi characters if they were to exist within a live-action film, as opposed to conventional key-frame animation methods. As has been discussed, these methods are not *inherently* suited to the aesthetics of live-action film. For *Avatar* it needed to seem as though the on-screen beings were actually real *people*, despite their fantastical appearances, that had been filmed on camera. Audiences would need to feel and *believe* they were empathizing and engaging with beings that actually existed, not 'animated' characters. As with all live-action films featuring the integration of CG characters, the sense of 'dramatic irony' apparent in the digital characters would need to be the same as that experienced with live-actors, not as it is with characters in animated films – meaning that it needed to be reduced to an absolute minimum. Thus it was imperative that live *actors*, not animators, drive the CG performances, and physically and emotionally embody the onscreen characters.

In order to facilitate this happening, Cameron and his team of technicians and artists would make significant technological advancements to the existing apparatus and methods of digital filmmaking. The development and use of a virtual-camera, for instance, was one of the great advancements made by them. This piece of technology, as well as Cameron's employment of it in the motion capture volume where the film's virtual production took place, would expand even more on bringing a live-action methodology to the digital realm, which Zemeckis had begun to do on *The Polar Express*. Having taken years to develop, the virtual camera system allowed Cameron to see the low-resolution versions of his performers' CG counterparts within their equally low-resolution virtual environments in real-time as the actors performed in the capture volume. "Through the virtual camera and real-time performance capture," Jody Duncan and Lisa Fitzpatrick write, "Cameron would be able to direct all-CG shots – which would make up a large percentage of the shots in *Avatar* – just as he would live-action shots, with his CG characters and locations right there in his camera's eye". He was able to design his shots and camerawork during the shoot, framing up on actors as they performed (Duncan, Fitzpatrick 44-47). This was one of the chief differences from what Zemeckis had done on *The Polar Express*, where he only designed his shots and camerawork long after the motion capture shoot (Menache 72-73).

The strides made in the development of the facial capture technology were critical to making this virtual production pipeline possible, and where our investigation is concerned this particular advancement is of crucial significance. Although *The Polar Express* and *King Kong* had shown that facial capture could indeed be employed to create realistic, accurate and nuanced digital facial performances, the methods used to acquire the data in those films had significant limitations. Among others, as previously noted, one of the main ones was that the marker-based approach did not allow for real-time viewing of the facial performance on the CG character, a crucial requirement for the virtual production's live-action approach to be successful (Duncan, Fitzpatrick 232). To make this possible, the filmmakers opted not to use the marker-based method and employ an image-based technique instead, which was far more production-friendly.

To do this the filmmakers devised helmets, called 'Headcams', that had small cameras attached to them, positioned directly in front of the actors' faces, capturing their facial performances independently of those of their bodies, but still in conjunction with them. The actors' faces were painted with dots that broadly represented their major facial muscle groups, and from those dots the cameras on the helmets extracted the necessary information to provide raw facial capture data (Duncan, "Seduction" 83). That raw data would then drive a lot of the fundamental facial animation of the CG Na'vi and avatar characters (Na'vi-looking beings grown from the DNA of humans and Na'vi that are controlled by the original human's consciousness). With this system, the actors' fundamental eye and mouth movements could also be extrapolated in real-time from the single head camera. The ability to view roughly rendered digital facial performances in real-time was due to the fact that the image-based approach derived slightly limited, though still highly valuable, levels of data, because it was being extrapolated from the two-dimensional field of view of the head camera.[1] This provided the filmmakers with an unprecedented level of control with regards to being able to preserve the actors' full performances, while still allowing the virtual production process to run smoothly and efficiently. The system has since become a commonly used technique for deriving facial capture data simultaneously with body capture in an efficient manner, particularly in subsequent films that Weta Digital (also the lead visual effects studio involved with *Avatar*) has been involved in creating realistic digital characters for.[2]

Despite this enormous level of control, it would be disingenuous to think that the overall process becomes an entirely automated one. As with all motion capture endeavours, there are significant reasons why capture data cannot completely drive the final CG performances, and *Avatar* proved to be no different in that regard, despite its significant advancements. As Richard Baneham, one of *Avatar's* animation directors, says, regardless of how sophisticated a motion capture system is in its ability to track an actor's movements, "ultimately, at the end of the day, [from the motion capture shoot] you get a *data set*. From that data set you don't get a performance – what you have to do is give it to an animator or a motion editor" (qtd. in Speaking of Animation, "Podcast:

Avatar"). "Cameron's fantasy at the outset," Duncan and Fitzpatrick write, "had been that the facial capture process would be automatic, completely hands-off from the animators. He didn't want the animators embellishing or interpreting the actors' performances. . . . But that degree of automation proved impossible. The head-rig data could not drive the rigged models one hundred percent" (241).

The raw facial capture data, in part because of the need to have a streamlined virtual-production process, could only provide the fundamental information of what an actor's face was doing. What it did not do, according to Andy Jones, another one of the film's animation directors, was provide the subtle, incredibly intricate, and at times barely perceptible details, nuances and idiosyncrasies of an actor's facial performance. Thus "where the animator becomes important", Jones says, "is in being able to recognize and add the details that are missing from the facial capture – a quiver of a lip, a slight movement of one eyebrow" (qtd. in Duncan, "Seduction" 135).

Then of course there is the factor, just like with any other motion capture project, of the physical discrepancies between the actor and his or her CG counterpart. Though the alien Na'vi and the avatars would eventually have their faces modelled to more closely resemble their human actors in order for their performances to better translate to the characters, they were still different enough that performances could not be transferred literally, on a 'one-to-one basis'. Cameron himself came to acknowledge this: "[Jake Sully, the film's main protagonist] had a broad leonine nose, a protruding muzzle, oversized eyes, and other features that were different enough from [Sam Worthington's, the actor who portrayed Sully] face that the expressions did not translate perfectly, no matter how much data was captured" (Duncan, Fitzpatrick 241-242).

Although this challenge would also be present to a very small degree with regard to the Na'vi's and avatars' bodily performances, it was to a far lesser extent compared to the challenges presented when preserving the actors' facial performances, "which would demand [the animators'] most intense and meticulous attention" (Duncan, Fitzpatrick

240). The work of the animators extended beyond adding details missing in the facial capture data, which in itself was an arduous endeavour. What was also required of them, in a similar way to what was done with Davy Jones, was largely to *interpret* an actor's facial performance, its emotional intent, and what he or she was trying to communicate, in order to ensure that it was being transferred, intact, onto the digital character. There would always need to be an interpretation of the actor's performance to match the physical attributes of the CG counterpart, regardless of how much data was captured. Thus "Cameron had to adjust his perception of the process as time went on, and embrace the role of the animator" (Duncan, Fitzpatrick 242).

The process of interpreting the actors' facial performances and preserving them was an extremely intensive artistic and analytical process for the animators. In order to do this, as well as add the fine nuances missing in the facial capture, the animators came to rely heavily on the copious amounts of HD (high definition) reference footage of the actors that was shot on the motion capture stage. From that footage, which displayed multiple views and angles of the actors as they performed, the animators would be able to see exactly what was missing in the facial capture data and recreate it in CG via key-framing (Duncan, Fitzpatrick 240-241). Crucially, the animators would have to thoroughly analyse the footage in order to understand exactly *how* it was that the actors' muscles were firing, their relationship to each other as they were being engaged, and what order they were engaging in to convey the emotions the actors were communicating (qtd. in Speaking of Animation, "Podcast: Avatar"). They needed to understand the actors' facial performances at a "neuromuscular level" (Duncan, Fitzpatrick 234). From that point, the animators would then need to apply this understanding to fit the structural differences in the CG characters, a task which, according to Baneham, was a tremendously laborious undertaking (qtd. in Speaking of Animation, "Podcast: Avatar"). Because of this the HD reference footage became an indispensable tool. As Baneham puts it, "We lived or died by our HD reference" (qtd. in Duncan, "Seduction" 135).

The other more obvious physical discrepancies that had to be accounted for were the ears and tails of the Na'vi and avatar characters, which clearly could not be performed

by the actors. The movements of those elements were thus entirely key-frame animated. They were used as extra emotive appendages which, Cameron was quick to acknowledge, added a lot to the final CG performances, further emphasizing the emotions conveyed by the actors (Duncan, "Seduction" 138).

Despite the recognition by Cameron that animators would still have to play a major role in bringing his characters to life, their authorship over the actual performances appears to have been non-existent. The interpretive process was never allowed to become one where performances were *re*interpreted to the point where they ceased to be the actor's own and become the animator's. It was never a case of, according to Baneham, the animators "thinking they could do something better" and "making their own shots" (qtd. in Speaking of Animation, "Podcast: Avatar"). The mandate for the animators' use of the capture data in this case was to make sure the actors' performances were preserved in their entirety in the CG characters.

The filmmakers felt that such an approach, as a consequence of the sense of realism it engendered, would also result in digital performances that had the kind of subtlety typical of live-action narrative film, which they felt they would not achieve via pure key-frame animation.[3] A good illustration of this is a scene in *Avatar's* first act where Jake Sully, in his alien avatar form, is taken to the dwelling of the Omaticaya clan by Neytiri and a host of other Na'vi. Once there, he is interrogated by the clan's patriarch and matriarch (Neytiri's parents), who contemplate whether or not to kill him, as they know he is one of the colonists from earth. When Sully assures them that he is not a scientist, to show them that he is open to learning the ways of the Na'vi people (in order to serve his broader goal of infiltrating the clan), the matriarch, called Moat, asks him, with an intimidating air, what exactly he is. Sully's previously easy-going manner becomes slightly more serious as he says "I was a marine". Observing that the term 'marine' is not understood by these non-humans, Sully attempts to elaborate further by speaking in terms they might better understand: "A warrior of the . . . jar-head . . . clan".

The manner in which Worthington performed this, and the way it comes across in the CG character, in many ways exemplifies Kahl's statements about the subtlety of a live-actor's performative goals as compared to those of an animator, which were discussed in chapter 2. Worthington's delivery of the words shows a struggle to find appropriate terminology that will be understood by his Na'vi captors. The struggle to do so in a manner that sounds sincere is also apparent. The distinctly 'tribal' or 'primitive' words seem awkward on the tongue of this man who comes from a 'civilized' world, but he attempts to disguise how ridiculous he feels when saying them by trying to keep a straight face. Sully's mask of sincerity breaks for a brief instant when he uses the absurd term "jar-head clan". Here he stumbles in his inward struggle to maintain an air of sincerity and it is revealed on his face, but only in the most subtle, almost barely perceptible way, and only for the shortest space of time. Only the slight and momentary furrowing of Sully's brows, the tiniest twitch in his left cheek, the subtlest darting of his eyes, the quick blink, and the slightest backward movement of his head reveal how ridiculous Sully feels what he has just said is. This brief instant seems to reveal a thought process going something along the lines of, "The *'what'* clan?" Sully then quickly recovers his mask of sincerity, proceeding with his goal of infiltrating the clan.

This type of subtlety and "low–key ostensiveness" works perfectly within the aesthetic framework of live-action motion pictures that Cameron was determined to keep his film within, regardless of the fact that over two thirds of it would be computer-generated. Yes, one could argue that an animator could potentially create the same sort of subtext and nuance solely through key-framing, but only after working on it for a considerably long time.[4] The point is that the process required to do so, where an animator embodies the character only by proxy, not 'in the moment', not in real time, and not in physical space, violates the live-action methodologies of recording and presenting performance that is so prized by live-action directors. Cameron sought to maintain what many directors feel to be the most essential and prized quality of live-action film: recording acted performances. For the aesthetics Cameron desired for his film, it is entirely justifiable that actors be the sole authors of the onscreen performances – with a considerable helping hand provided by the animators.

4.2 The Trolls of *The Hobbit: An Unexpected Journey* (Peter Jackson, 2012)

The manner in which the three mountain trolls in Peter Jackson's *The Hobbit: An Unexpected Journey* (the first in a three-part adaptation of J.R.R. Tolkien's children's novel *The Hobbit*) were realized, however, presents an interesting counter-point to *Avatar* regarding the dynamics governing artistic ownership over motion captured performances. The trolls appear in the film on an evening when the protagonist Hobbit Bilbo Baggins (played by Martin Freeman), and the company of thirteen Dwarves he is travelling with stop to camp and rest for the night in a forest clearing. As they set up camp the trolls, unbeknownst to the characters or the audience, manage to enter the camp and steal two of the company's ponies. The trolls make off with them, intending to make the animals their supper. When the Dwarves Fili and Kili realize what has happened, they get Bilbo to sneak into where the trolls are preparing their meal, and free the ponies.

Successful versions of troll characters had already been created previously, and showcased onscreen in all of Jackson's *The Lord of the Rings* films a decade earlier, so there was both a precedent and an existing template for how to create them. The physical attributes of the trolls appearing in *The Hobbit* were much the same as those that appeared in Jackson's previous Tolkien novel adaptations. They are large, roughly ten-feet tall, thickly skinned, vaguely human-like, and somewhat grotesque-looking. They are also lumbering, brutish, and slightly bestial characters. Moreover, the trolls that appear in *An Unexpected Journey* are intended to be those that were seen only briefly in the first *Lord of the Rings* adaptation, *The Fellowship of the Ring* (2001), as characters that had been turned to stone.

The variants of trolls that were seen throughout *The Lord of the Rings* films displayed limited personalities. They always appeared as either dim-witted behemoths or fierce beasts employed to do combat and all manner of 'heavy lifting' by the evil forces of Middle Earth. However, the trolls that appeared in *The Hobbit* needed to be intelligent beings that exhibited far more individuated personalities than those that had been seen in other films. They were still intended to be oversized brutes of the same genealogy of

those that viewers of Jackson's Tolkien adaptations are familiar with, but they needed to be brutes with character. Crucially, unlike the other trolls seen in Jackson's films who only ever grunted and roared, these trolls needed to deliver dialogue and converse with Bilbo and the Dwarves. In short, they needed to be sophisticated performers.

With all the advancements in motion capture technology that had been made over the past decade, particularly those pushed forward by Cameron's *Avatar*, it is unlikely that there would have been much debate in Jackson's mind as to whether or not to create these characters via the employment of the technology.[5] It was not, however, the first time that trolls would be brought to the screen with the aid of motion capture. The technology had helped to provide some of the base motion for the trolls in *The Lord of the Rings* films, with many layers of key-frame animation applied to them to create the requisite sense of weight and mass (David Clayton, qtd. in "Creature Animation"; Fordham, "Journey's End" 93,). In those cases motion capture tended to serve a more functional purpose, much like it had in most of the films where it had been used in the previous decade. So-called 'hero shots' of trolls that actually required them to perform in somewhat more compelling fashion alongside live-actors tended to be handled with pure key-frame animation.[6]

However, for the kind of sophisticated performances required of the trolls in *An Unexpected Journey*, motion capture would be used much more consciously as an acting and performance tool as opposed to one that merely provides realistic motion. The motion capture set-up used on this film was fundamentally the same as that which was created for *Avatar*. The performers acting out the parts of the trolls wore standard motion capture suits adorned with markers and donned the same types of facial capture helmets that Cameron's actors had done for his film (Duncan, "Back Again" 97). Because the scene featuring the trolls would see them interact and converse with Bilbo and the Dwarves at the same time, a method was developed for Jackson to be able to see the performances of both groups of characters integrated together in his camera view as he filmed them.

Martin Freeman and the rest of the Dwarf actors performed their part of the scene on a forest stage set in the Wellington, New Zealand-based studio where much of the film's live-action elements were shot. On that set, long sticks topped with tennis balls were operated for the sake of the actors having correct eye-lines that corresponded to the trolls' scale (Seymour, "The Hobbit"). In a motion capture volume adjacent to the stage set, the troll actors enacted the scene at the same time that it was being shot on the live-action set. As Duncan writes, "That motion capture drove the animation of the low-rez trolls that were scaled up and composited into Peter Jackson's video tap so that he could see the trolls and the dwarves acting together in the scene" (Duncan, "Back Again" 103). According to Eric Saindon, one of the film's visual effects supervisors, this technique was a tremendous boon for Jackson on a cinematographic level: "The trolls were so much bigger than the dwarves, it was very useful for Peter to be able to see them with the dwarf actors, so he could get his framing right and make sure that everything was flowing together" (qtd. in Duncan, "Back Again" 103). According to the film's animation supervisor David Clayton, it also allowed Jackson to be able to choreograph and rehearse the trolls' movements as he would any other live-action ensemble performance (qtd. in "Creature Animation").

However, because of the nature of the vast physical discrepancies between the trolls and the actors who were playing them, the translation of the actors' performances presented different challenges from those that existed with the creation of the Na'vi or even Gollum. While bringing these characters to life with the aid of motion capture was certainly invaluable to Jackson as a live-action filmmaker, the overall process had both technical and artistic differences to other more literal actor-to-digital character translations seen in films employing motion capture.

Firstly, whereas the Na'vi and avatar characters had been made to look as closely humanoid as possible, while retaining their distinctive alien characteristics, the trolls in *The Hobbit* do not appear altogether much more anthropomorphised than their 'cousins' seen in the previous films. Although these trolls were redesigned from the ground up to look more compelling and even somewhat more appealing (in their own

strange way) than the stone versions of them that appeared in *The Lord of the Rings* (Duncan, "Back Again" 103), they are still unmistakably of the same family as those that had been seen before. Their faces had been structured somewhat differently in order for them to seem more intelligible, as well as to facilitate the delivery of dialogue, but they still exhibit the same broadly designed proportions and loose basis in human anatomy. Their eyes are disproportionately small compared to their massive heads, and they are spaced widely apart, almost to the very sides of their heads, because of the broad bridges of their large noses. Their large and compact bodies are hunched over, with broad shoulders and muscular arms that are slightly larger and longer than their somewhat portly legs.

The nature of the trolls' enlarged bodily proportions alone ensured that the performances of the actors needed to be *re*interpreted drastically in order to sell the scale and mass of the creatures (Clayton qtd. in "Creature Animation"). Whereas the enlarged size Na'vi in *Avatar* is explained by the lighter gravity of their planet, and could thus be animated accordingly, the trolls exist in a world that is intended to be governed by earthbound physics, so their size truly does make them giants, meaning that their physical performances needed to be appropriately reinterpreted.

The actors portraying the trolls seem to have done their level best to work their bodies in ways that approximated the stature and gait of the trolls. Indeed, production stills of them in the motion capture volume as they performed the scene seem to prove this (see Figure 1 for an example). In these photographs, they are shown spacing their feet widely apart, bending their knees slightly, keeping their arms ever-so slightly distanced from their torsos so as to mimic the trolls' hefty arms and larger upper bodies. The stills also show them bending forward to approximate the creatures' naturally hunched bodies.

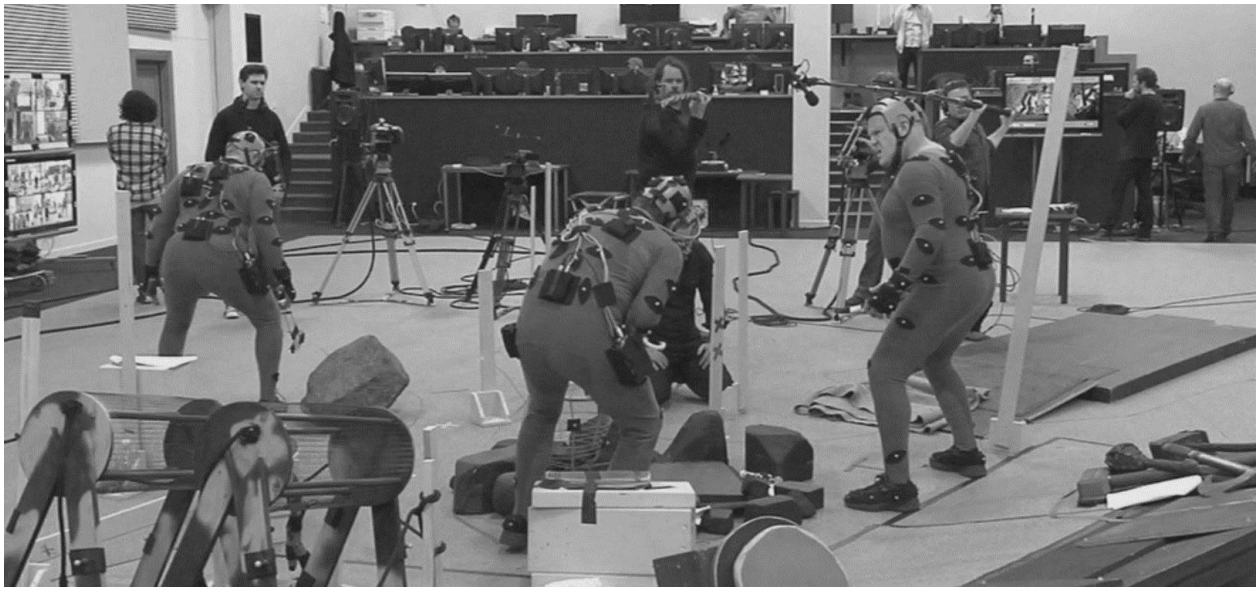

Figure 1 (Seymour, "The Hobbit").

Despite these efforts to make their movements feel authentic to the trolls' physiques, transferring the actors' movements in a purely literal manner to the digital trolls would not have produced the level of realism required of these fantasy characters who were expected to exist within the aesthetics of a live-action film. Despite the fact that Jackson was able to work with the actors and organically get takes of the performances he was satisfied with, Clayton says

> . . . from there, when we applied those motions to the trolls and started really getting into the details it became apparent that, yes, we need to slow it down a lot, [and] maybe some of the performances just aren't right. If a troll's jumping up and down, for example, on the day [of the motion capture shoot] you've got a man jumping up and down, and it's got a certain weight and physics to it, [but if] you apply that to a troll, it's just way, way too fast, and the more you slow it down, the more it gets a bit wishy-washy. (qtd. in "Creature Animation")

A good illustration of this is a shot where one of the Dwarves slices at a troll's leg with his sword. The troll squeals in pain as he clutches his injured leg, jumping up and down momentarily, before being hacked again in the same leg, causing him to stumble and fall backwards. Clayton relates how this shot was handled: "We just key-framed it from scratch, basically; using the performance that Peter selected just like a blocking pass, in a way" (qtd. in "Creature Animation").

The trolls' facial performances also required significant amounts of invented key-frame animation, because their facial characteristics were so vastly removed from those of the human performers. With the Na'vi, the close resemblance between them and the human actors meant that while a level of interpretation was required of the performances, it still happened at a far more subliminal and less perceptible level than that required of the trolls. The distance that needed to be travelled to translate the actors' performances to the trolls, who were designed with such exaggerated features, was far greater than that which needed to be travelled for the Na'vi. Moreover, in the case of *Avatar* the animators were strictly mandated to never deviate from the performances given by the actors; for Cameron there was no room for embellishments or reinventions of the performances where it was not *absolutely* necessary. However, because of the trolls' exaggerated features, and also, by all accounts, a presumably less strict instruction to preserve *everything* done by the actors, Clayton relates that there was also a lot more room to be able to stylize the trolls' performances.

The film also shows the trolls performing with a definite comedic quality, which seems to have afforded additional opportunities for the animators to push and stylize performances, taking advantage of the trolls' exaggerated physical attributes. This is sometimes obviously apparent; for example one troll's eyes at times become uncontrollably defocused and slide around to peer in opposite directions before refocusing again on what the troll is looking at. While their performances still needed to be compelling, they aren't as subtle or underplayed as those of the Na'vi. When the trolls talk to each other or any of the other characters, they often do so in broad and physical ways, moving overtly in the direction of the characters they are addressing; in many

cases interacting with them physically in some way or another. The manner of both their bodily and facial expressions is often exaggerated, simplistic and easy to read; one is never left in any doubt about what they are feeling or trying to communicate. There was also reinterpretation required of the trolls' lip-sync. Like the animation of the trolls' bodies, the speed of the actors' delivery of dialogue, which was very quick at times, also needed to be meticulously adjusted and reinterpreted via key-frame animation in order to match the enlarged proportions of the characters (Clayton, qtd. in "Creature Animation").

What we observe from all this is of critical importance to the discussion of animator ownership over CG performances in live-action films. Everything about the trolls' performative and physical characteristics seems to illustrate that a greater degree of artistic license and autonomy was afforded to the animators in the creation of the creatures' performances. The requirement of the trolls to seem as real as possible, to seem as though they were real existing beings performing alongside real people as opposed to ostensibly animated characters, did not necessarily mean that a direct translation of the actors' performances would achieve the best results. Clayton's remarks that the motion captured performances at times "just weren't right" and that the captured data would at times operate as little more than a "blocking pass" cannot be taken lightly. They reveal that an actor helping to create a digital character's performance does not automatically equate to an appropriately realistic performance, once the CG character's proportions become significantly removed from human proportions.

The necessity for the trolls' performances to correspond to their physiology and broad, exaggerated facial appearances in order to appear realistic ensured that a substantial degree of animator artistic license was indeed necessary. As a result, Clayton says that of all the CG characters that appeared in *The Hobbit*, the trolls were the most representative of "a real blend of two worlds – mo-cap and key-frame animation" (qtd. in "Creature Animation"). The requirement to make 'fantasy' appear 'real' depended a great deal on the animators' artistic and performative artistry.

The creation of the trolls in *The Hobbit* employed the same fundamental means of creating digital performances as those used for the Na'vi in *Avatar*. In both films, the filmmakers acquired the largest amount of data that can, at present, possibly be captured of a performer's face and body while still being able to maintain a streamlined, organic production. However, the results and the artistic dynamics concerning performative ownership were vastly different. Even with these large amounts of data, the trolls required *performative* artistry from *both* the actors and the animators, without breaking the illusion that there were real, intelligent, sentient 'persons' on the screen. The process needed to be more artistically collaborative in order to sustain the illusion of realism and yet the 'reality' of the trolls was arguably no different to that of the Na'vi. The characters were still engaging as believable beings in a live-action world, and the suspension of disbelief was never broken.

Conclusion: The Motion Capture Collaborative

Crafton has written that, "In the age of artificial intelligence and the convergence of humans and computers in the arts, entertainment, and everyday life, it's increasingly likely that performativity will become a crucial issue" (94). His words could not be more pertinent to the subject of the continuing employment of motion capture in mainstream cinema. What the technology has done has placed more scrutiny on the subject of performativity in both live-action and animated film than ever before. Film critics, fans, and scholars may not always be aware of it, but one of the most critical aspects in the controversy, anxiety, intrigue, and at times hysteria surrounding motion capture technology has to do with the shifting dynamic between the screen actor as a performer and the animator as a performer. When people in mainstream film discourse question how much of an actor's performance is being presented onscreen when they see a digital character brought to life with the aid of motion capture, they are unaware that what they are really asking is "whose *performance* is it: the actor's or the animator's?" What they are asking goes far deeper than just the element of how much so-called 'digital make-up' has been applied to an actor in order for them to portray a fantastical character.[1]

Despite the apparent tensions, from the evidence of the case studies, and even from the films that have been used in this paper to chart motion capture's rise to prominence, it is apparent that the motion capture process is, ultimately, a highly collaborative one between the animator and the actor. Granted, outside of the lead animators and animation supervisors, the majority of animators who do the 'grunt work' of interpreting the captured performances rarely cross paths with the actors.[2] However, the skills of both sets of artists are required to see the digital performances come to life onscreen, and that in itself is inherently collaborative. As this investigation has shown, the nature of this collaboration can shift in wide and varied directions. Examples such as *Avatar* exhibit a definite lopsided version of this collaboration. In these instances the actor becomes the sole author of the performance, and the animator simply supports it, making sure that the actor's work is preserved in its entirety, while trying to account for

the physiological discrepancies between the human performer and the digital one. The example of *Avatar* in particular also reveals just how much of an animator's artistic ownership over a performance is heavily governed by a director's vision of what the digital performances should be and consequently how he/she mandates the captured performances to be used and interpreted. Examples such as the trolls in *The Hobbit*, on the other hand, give us an example where the actor's performance is both complimented and enhanced by the animator's artistic *re*interpretation of what was done by the actor; taking it into new and interesting directions. In this instance, the actor provides a loose basis for the animator to push and stylize the performance, and build a new one that becomes an amalgam of actor and animator performativity. Another critical factor should have also become apparent in the analyses of the trolls and the Na'vi: that the more a realistically rendered fantastical character deviates from human proportions, the less possible it is to adhere to the motion captured performance of a human. Thus the less human-like the CG character is, the amount of artistic freedom afforded to the animator consequently increases, and the motion capture process becomes an even more collaborative one.

The element of collaboration in animated performance is not unique to motion captured performances. Indeed, it has been happening in fully animated film ever since actors started providing live-action reference to animators (even if it was at times contentious) and, particularly, started lending their voices to 'cartoons'. The role of voice actors has always been taken into account to varying degrees by animators. The manner in which vocal performances are delivered have always had an impact on how animators craft the animated performances. Kahl was often quick to acknowledge how inspired he was by the highly compelling vocal performance given by Geraldine Page when she voiced the villainess Medusa in Disney's *The Rescuers* (1977). He spoke glowingly of just how much the "over-the-top" nature of the actress's vocal performance informed the way he crafted Medusa's performance, as her animated characterisation needed to correspond to Page's engrossing delivery. "She forces you to 'plus' things!", Kahl exclaimed of Page (qtd. in Canemaker 159). Contemporary animators continue to pick and choose intriguing quirks and characteristics of voice actors and their delivery of performances that they feel would help 'plus' the animated performance.

Reference of actors' physical performances as they voice animated characters is also used occasionally. Dreamworks Animation, for instance, often employs what they call a 'lipstick cam' to record voice actors as they voice their characters, in order to provide an extra source of potentially valuable reference for animators to mine at their own discretion (Willis qtd. in Vasquez, "Jacob Gardner and Ben Willis"). For *Rango* (2011), director Gore Verbinski had his actors, albeit loosely and crudely, act out the entire film together, whereby he loosely filmed their performances, which also provided a source for animators to use largely as they pleased.[3]

Of course, the distinction in animated film is that animators are, normally, at liberty to decide what elements of an actor's vocal performance (or occasional and additional physical performance) *they* feel would enhance the animated acting. The manner in which motion captured performances, which are intended to be absolutely realistic, are brought to the screen does not always allow animators such performative freedom to pick and choose as they please. Indeed, in most cases this is not desired by live-action directors. What the example of the trolls in *The Hobbit* shows us, though, is that there is room for both the animator and the actor to contribute meaningfully to a photorealistic digital humanoid character's actual performance. There can indeed be a blend between the animator's own sense of performativity and the actor's skill in physically embodying a character that results in a highly compelling digital fantastical character that does not break the illusion of realism or disrupt the aesthetics of live-action film. It might then be said that the motion capture process, to take a cue from Crafton's terminology, can allow for a type of *dual embodiment* to occur in a single screened digital performance, where the animator and actor embody the character together. The nature of this 'dual embodiment' is perhaps even more pronounced than that which also occurs, to an extent, when an actor provides the voice for an animated character.

So perhaps the notion of a character animator being the *sole* author of the performance of a realistic, live-action digital character created with the aid of motion capture is not feasible. However, that does not necessarily mean that the animator cannot make a

meaningful artistic contribution to the character's performance. Therefore the notion that motion capture, when it is used in this way, completely erodes the animator's artistic and performative autonomy is far from absolute.

Yacov Freedman has written of how attempts in mainstream film discourse by academics, practitioners, and film organisations like the Academy of Motion Picture Arts and Sciences to "place" motion capture into the ossified categorizations of the cinematic arts that have been in existence for the past century are futile. Freedman argues that the technology and its wide and varied applications fundamentally defy "the old, standby distinctions of animation versus live-action and technology versus artistry", and that we need to recognize the technology "as an entirely new form of filmmaking" (48). The relationship that we have examined between the animator's performativity and that of the actor's when motion capture is employed as a means to create a performance is both indicative and symptomatic of this larger redefining of the cinematic arts that the technology has begun to engender. Because of the fact that a single motion captured performance can represent the artistic and performative skill of both the animator and the actor simultaneously, film aficionados, practitioners, and academics are now also tasked with changing the way that they perceive onscreen performances brought to life with the aid of this technology. The manner in which credit is attributed to performances created in this revolutionary way must change, and it must be recognized that the acting skill exhibited in a single motion captured performance may be attributed to more than just one performer.

Notes

Introduction

1. Both Zemeckis's and Spielberg's films, through their innovative employment of motion capture both practically and aesthetically, drew contention for not having been created through the 'traditional' method of completely hand-animating performances. Both films were, nonetheless, categorised as 'animated' in the sense that they were all entirely digital, with no live-action elements existing within them. Yacov Freedman, in his article detailing the plethora of controversies surrounding motion capture, has gone into further detail concerning how it is that motion capture defies traditional categorizations and media of filmmaking.
2. Certainly, animators have proven themselves capable of creating 'realistic' humanoid performances. But, as is discussed later in this paper, it is usually done with a degree of exaggeration, moving the animation away from *absolute* realism.
3. Former DreamWorks animator David Hubert says this tends to be the case specifically in animation for gaming (qtd. in Vasquez, "Creatures Interview"). Shawn Kelly, lead animator at prominent visual effects studio Industrial Light and Magic, insists that motion capture is never anything more than a "tool" for animators regardless of whether it is being used in games, feature animation, or visual effects.
4. David Lam, lead animator at leading game developer Naughtydog, says that in all the different manifestations of the animation industry, whether in games, feature animation, or visual effects, there is still a "mystery" surrounding motion capture, and how animators should approach their use of it. This, Lam says, is largely because different studios and different animators have vastly different approaches to using the technology (qtd. in Vasquez, "David Lam").

Chapter 1: Traditional Animation Performance and the Animator's Autonomy

1. John Canemaker has written in some detail about the admiration for Kahl because of his remarkable skill. "Praise for Kahl's drawing ability by his admirers tends towards hyperbole. 'He's my favourite draftsman, probably of all time,' marvels animator Andreas Deja, who has long studied Kahl's work. Kahl's colleague Ollie Johnston once compared Kahl's drawings to Michelangelo's. 'I've never seen a finer draftsman,' he says" (126).
2. Donald Crafton has written that, "Strangely, performance studies and film acting studies alike have avoided the great and puzzling lacuna that is animation performance" (4). This is not altogether surprising, as most performance theory, as

Crafton outlines, is based on the fundamental element of a real, flesh and blood, living being delivering a performance with its own body (20).

3. Williams is famous for having directed and animated countless animated commercials in London, England from the 1960's through to the 1980's with the studio he founded, Richard Williams Animation. He is a three-time Academy Award-winning animation director, and attained great fame for having directed the animation in the Robert Zemeckis-directed and Steven Spielberg-produced *Who Framed Roger Rabbit* (1988).
4. Speaking of animation's relationship to live-action 'realism', Wells speaks of animation's stylization by writing that "animation immediately extricates itself from [the debates of the 'reality' of filmmaking] by already being a medium which is informed by self-evident principles of construction. Animation does not share the same method and approach of the live-action film. Rather, it prioritises its capacity to *resist* 'realism' as a mode of representation and uses its various techniques to create numerous styles which are fundamentally *about* realism" (24-25).
5. Certainly, stop-motion puppet animation's own focus on the performative nature of character animation should also be recognized. In fact, as CG character animation shares stop-motion puppet animation's fundamental trait of being a form of puppetry in 3-dimensional space (albeit a digital one), one could reasonably contend that discussions surrounding CG animation and its relationship to older forms of animation should always involve puppet animation. Aardman Animations co-founder Peter Lord has even described CG animation as the "young and glamorous sibling" of stop-motion or what he refers to as "model animation" (9). However, to reiterate what was said in this paper's introduction, for the purposes of this investigation it is more prudent to focus specifically on the historical development of theatrical hand-drawn character animation, as this approach best helps us to understand the aesthetic and performative problems created by motion capture.
6. There are other principles that assisted in conveying dynamism or naturalism that could certainly be discussed at length, but are not the focus of this study. The principle of 'Anticipation', for example, describes the movement of an object or being in one direction, often to gather energy, before it moves off in another. 'Follow Through and Overlapping Action' describes the movement of either extra appendages, hair, or secondary body parts that move at their own pace, but follow and are affected by the movement of the main body-part. They continue moving after the main body has come to a complete stop (Thomas, Johnston 47-53).
7. To confirm this, Crafton writes that the view held by many academics and intellectuals is that "Disney's philosophical transformations [of the animated film] were steps in the wrong direction and that the modifications of cartoon space introduced in the 1930s caused something of animation's verve, jazzy spontaneity, and ludic surrealism to be lost" (149). There are instances in Wells' writing that reveal a disappointment in the wide-scale industrialization of animation and the move towards naturalistic representation spearheaded by Disney. "Disney's concentration on innovations in the apparatus to facilitate the animated film

ultimately had the consequence . . . of undermining the distinctive aspects of animation itself . . . Simultaneously, the *ideological* freedoms of animated films displaying both graphic and narrational anarchy gave way to the overtly moral confrontations within *realistic* scenarios" (23). "This feeling" Crafton writes, "that something was sacrificed in the rapid development [of animation] is a minority view among fans, but it's the opinion many academics hold" (149).

8. In saying this, it should be noted that there have been some successful creations of realistic digital humans in the cinema, such as the elderly versions of Brad Pitt in his portrayal of the titular character in *The Curious Case of Benjamin Button* (2008) (discussed in chapter 3) which were almost universally found to be convincing. The character Clu (also discussed in chapter 3), a younger version of the actor Jeff Bridges in *TRON: Legacy* (2010) was also, for the most part, a convincing creation. In general, creating still images of entirely convincing, photo-realistic digital humans is already somewhat commonplace. Making those characters move and perform entirely convincingly, though, remains a daunting task.
9. The Pixar Animation Studio, for example, has always been particularly adamant about this aesthetic direction. John Lasseter, one of the founding members of Pixar and the current Chief Creative Officer of both Pixar and Disney feature animation, has stressed that, "Typically, in what we do, the worlds we create are very caricatured. We're not trying to do realism" (qtd. in Simpson).

Chapter 2: Performance in Relation to the Aesthetics of Live-Action Film

1. This term has been adapted here from Freedman's use of it in his article, where he writes that motion capture allows directors to maintain the "indexical weight and 'truth' of recorded cinema" while allowing them to experience the advantages of digital filmmaking (48).
2. Most forms of stop-motion animation (particularly puppet/model animation) differ from other forms of animation in that, unlike the others, they share live-action film's defining trait of indexicality. The key difference with stop-motion is in how indexicality is treated as opposed to its use in typical live-action film. Live-action treats its inherent indexicality to lend credence to the presentation events that actually occurred in the real world (whether staged or not). In that form of filmmaking, to take a cue from Paul Wells' discussions about realism in animation, indexicality is used to emphasize realism as a mode of representation. Stop-motion animation rather uses the indexical referent of objects and puppets existing in the real, physical world to create the illusion of living beings that do *not* in fact exist, or events that did not occur, and have rather been constructed and fabricated.
3. Other areas of film theory have engaged with the subject of the spectator's 'belief' system. Stam notes that an element of the "psychoanalytically inflected" branch of film theory concerned with filmic 'realism' advocates that, "If the spectator is the site of a psychic process of largely unconscious origin, the issue of verisimilitude pales in importance next to spectatorial desire and the 'will to believe'" (225-226).

4. According to Roy Armes, Griffith initially entered the film industry in 1907, but he only began directing in 1908 (97-98).
5. As is the case in much of Naremore's text, he draws attention to the excessively "romantic idealism" of Stanislavsky's teachings and the different varieties derived from them by his followers. Of this hallowed "gestureless moment", for instance, Naremore says that the "antirealist" and modernist Bertolt Brecht "would have argued that actors are always and everywhere 'portraying,' and that they ought to be forthright about the process" (40). Naremore also critiques Pudovkin's advocating of the "gestureless moment", stating that he "writes as if 'truth' could be seen shining through faces, forgetting that the muscular arrangement of the eyes and the mouth are themselves a form of gesture, even when the actor is 'living the part'" (40). Nevertheless, as he also usually does throughout his text with other examples, Naremore acknowledges that this Stanislavskian ideal is useful and evident in mainstream films when he writes that "Pudovkin is right when he describes typical film acting as a relatively passive phenomenon" (40).
6. The reason for this technical difficulty stems from the considerable skill and control required to keep the numerous drawings 'alive' when the character is intended to be doing very little with his/her body. Redrawing numerous images where the character makes no big 'change' of expression or bodily movement has always been a challenge in hand-drawn animation.
7. DreamWorks animator Jalil Sadool, for example, has discussed scenes where actors communicate thought processes without lines of dialogue and do so with the use of the most subtle gesturing. He has suggested that animators need to be aware of such acting strategies while crafting their animated performances (qtd. in Vasquez, "Jalil Sadool"). Ted Ty, also a DreamWorks animator, discusses the emotionally compelling performance of Jessica Chastain in *Zero Dark Thirty* (Katheryn Bigelow, 2012), saying that animators should aspire to create performances of the same kind of quality exhibited by the actress (qtd. in Vasquez, "Ted Ty")
8. The challenge is lessened in CG animation because the medium does not use drawings to create 'the illusion of life', thus removing the necessary draftsmanship and ability to control subtle changes from one drawing to another to execute such an effect. Because of the fact that the CG medium lends itself to more of a focus on the execution of movement, it makes it possible to spend more time downplaying motion as much as possible, and being more subtle with the representation of it.
9. Ben Willis and Jacob Gardner, also DreamWorks animators, discuss how they use extensive filmed footage of themselves performing as reference for the performances they animate. They say that they often adhere quite literally to their reference in the initial stages of blocking their shots, in order to get the right level of naturalistic and believable movement, as well as the necessary subtlety and emotional content for their shots. Once they have achieved all this, they then work to push the performances, stylizing them in the necessary ways for them to exist in the graphic aesthetics of animated film (qtd. in Vasquez, "Jacob Gardener and Ben Willis").

10. The live-action filmmaking process becomes a highly 'controlled' one by virtue of all of its physical and practical realities such as lighting set-ups, camera placements, blocking and staging of performances, set construction, set-dressing, etc.
11. This notwithstanding that while directors might be able to mine actors' organically delivered performances, the post-production processes involved in filmmaking that mould the performances into the final incarnation of the film can have a drastic impact on the way these performances appear or function within the context of a movie. Visual effects are an obvious example of this happening (particularly in the present day, especially with processes such as motion capture). But a process like editing, one of the defining elements of film itself, can drastically alter an actor's intentions with his or her performances, with entirely new meanings or emotional beats being able to be constructed in the editing room. For instance, a director may sometimes direct an actor to perform in a certain way, with the actor not fully understanding the reasoning behind the direction they have been given, or what place the performance will have in the film. Only when the film has been edited does the performance's place within the narrative then become clear. In film theory, this type of phenomenon is commonly known as the 'Kuleshov effect' (Naremore 24-25).

Chapter 3: The Evolution of Motion Capture in the Cinema

1. Manovich noted this by stating that one of the goals for the "simulation of 'real scenes'" by means of computers involves the realistic representation of an object's "pattern of movement" (Manovich 192).
2. For example, Jones and Oliff reflect this perception when they write (in a book published in 2007) that "A new technology called *motion capture* has been introduced to the world of computer-generated animation", inferring the beginning of the technology's rise to prominence in the early 2000s (178).
3. It was, however, during this time used the most extensively within the video gaming industry, where the demands on its application were less rigorous, as Menache notes: "Video game characters were extremely low detail, and the motion data didn't need to be very clean. Most characters didn't even need to stay firmly on the ground" (48).
4. Jody Duncan and Lisa Fitzpatrick write in some detail about the limitations of make-up and prosthetics. "The time-consuming, endurance-testing nature of covering an actor in prosthetics," they write, "is the stuff of movie lore" (Duncan, Fitzpatrick 13). Not only can the process be exceedingly lengthy and tiresome for performers, but the applied effects can potentially place actors under considerable physical duress. They can also be limited in that make-up effects or prosthetic appliances can only be designed to a certain degree of fantasy or outlandishness before they become impractical (Duncan, Fitzpatrick 13-14).
5. Zemeckis enjoyed the process so much that motion capture has since become his preferred method of filmmaking. Steve Starkey, the producer of both *The Polar Express* and *Beowulf*, has gone as far as to say that Zemeckis has made a "life commitment to this form of cinema" (Cohen). Menache even claims to have heard

Zemeckis say, during the production of *The Polar Express*, "that he would never shoot a live-action movie again" (70).

6. In addition to being something that CG animation practitioners are always wary of, Mori's theory of the "Uncanny Valley" has since been expanded upon extensively in CG animation studies, with considerable attention having been given to it. Many researchers have investigated the theory's validity or applied it as a method of critiquing or evaluating the aesthetics of animation. Kelly Christophers, for example, used it as a foundational principle in her research of motion capture's effectiveness in achieving realistic animation, and in the process cited various instances of researchers who have engaged with the theory in different ways.
7. Hal Hickel, the animation supervisor for the two films, relates the incredible value brought to Jones' portrayal by Nighy. "We started work on Davy Jones quite a while before they cast the part. To be honest, the way I imagined the character was initially a bit limited. I saw him as a terrific, mean villain, with a lot of gravitas, but I assumed he'd be very stoic and stone-faced. Bill Nighy brought so much to the character – weird humour, tons of odd eccentricities – more, I think, than any of us had imagined" (qtd. in Fordham, "Beneath" 78).
8. In the process, the film caused a stir in the animation industry, with studios like Pixar voicing displeasure in the fact that a film that was not entirely key-frame animated and utilized motion capture was able to win an Oscar for Best Animated Film. Yacov Freedman has also examined this controversy in more detail (38-39).

Chapter 4: Case Studies

1. This is opposed to the marker-based method that Cameron and his team had foregone, which derives more accurate and higher levels of data due to the markers being captured in three-dimensional space by multiple motion capture cameras (Letteri, qtd. in "Avatar: Weta Digital"). But because of these high levels of data, the performances cannot be viewed in real-time. In addition, the close proximity that the motion capture cameras need to be to the actors in order to capture the movements of the markers also places significant limits on the size that the motion capture volume should be (Duncan, Fitzpatrick 232). Thus Cameron and his collaborators were content with using the image-based approach instead, and decided to expend their efforts on building highly robust facial animation puppets (or 'rigs') of the CG characters, which could be used to retain the fine nuances of the actors' performances (Duncan, "Seduction" 83).
2. Other previously mentioned films like *Rise of the Planet of the Apes*, *The Adventures of Tintin: The Secret of the Unicorn*, and *The Hobbit: An Unexpected Journey*, *Dawn of the Planet of the Apes* (Matt Reeves, 2014), are some examples of where Weta Digital has utilized the system extensively, and in some cases expanded on it to achieve varying results. As alluded to earlier, *Rise of the Planet of the Apes* was a significant step forward in that it was the first production to take the systems developed on *Avatar* outside of the motion capture volume and successfully implement them on set or on location while principle photography for the film took place.
3. Jon Landau, the producer of *Avatar*, stated the reasons why the filmmakers felt this was so: "Our goal in using performance capture was not to replace the actor with our computer animated character, but to *preserve* the actor – because what a great actor does and what a great animator does are antithetical to each other. A great actor

withholds information. Dustin Hoffman can sit there and do nothing in *All the President's Men*, and you are riveted. But no animator would *ever* animate a character to just sit there and do nothing" (qtd. in Duncan, "Seduction" 70-72). Contentious as the comments may perhaps be for professional animators, they nonetheless illustrate the objectives of *Avatar's* filmmakers.

4. Lam has made comments along these lines. He acknowledges that it is possible for animators to fabricate ultra-realistic motion via key-frame animation, but because the process would take an impractically long time, he insists that animators need to embrace motion capture as a tool (qtd. in Vasquez, "David Lam").
5. Senior visual effects supervisor for *An Unexpected Journey* Joe Letteri also says that ever since motion capture was used to create Gollum, Weta Digital, the visual effects facility responsible for the visual effects of *The Lord of the Rings* films and *The Hobbit*, the technology has been the logical and preferred choice for the facility to use to create digital characters whenever possible (qtd. in "fxguidetv").
6. One such occasion was in *The Lord of the Rings: The Return of the King* (2003) where a heavily armoured warrior troll engaged in hand-to-hand combat with Aragorn, one of the film's main protagonists. All of the close-up shots in this sequence were handled entirely with key-frame animation (Fordham, "Journey's End" 131).

Conclusion

1. The term 'digital make-up' is used here in reference to Andy Serkis's frequent assertions that the process of an actor portraying a digital character via motion capture should be viewed as "digital costume and make-up" (qtd. in ABC News). The term is now frequently used in mainstream discourse pertaining to motion capture.
2. A prime example of this was Richard Baneham's role on *Avatar*. Of the film's three animation directors, he was the only one present in the motion capture volume during the motion capture shoots (Baneham qtd. in Speaking of Animation, "Podcast: Avatar").
3. Hal Hickel also supervised the animation on the film, and he says that the footage shot of the actors "wasn't really intended as a blueprint or a roadmap for the performances for the animators to work from, but it was a resource that they could mine for bits of business" (qtd. in "ILM's Hal Hickel"). Verbinski's chief motivation for using the process of filming his actors was also to avoid the often sterile process of getting voice performances for animated characters via actors reading lines (often solitarily) in sound booths. He felt he would get more organic and natural vocal performances if the actors performed together as they were being filmed (Hickel, qtd. in "ILM's Hal Hickel").

Works Cited

Abbott, Stacey. "Final Frontiers: Computer-Generated Imagery and the Science Fiction Film". *Science Fiction Studies* 33.1 (2006): 89 – 108. Print.

ABC News. "The Hobbit's Gollum: Andy Serkis Interview Focuses on Being a Performance Capture Specialist." Online video clip. *YouTube*. YouTube, 17 Dec, 2012. Web. 16 Oct. 2013.

Abromowitz, Rachel. "'Avatar's' Animated Acting." *LA Times*. n.p. 18 Feb. 2010. Web. 11 Oct. 2013.

Armes, Roy. *Film and Reality: An Historical Survey*. Harmondsworth: Penguin, 1974. Print.

"Avatar: Weta Digital." Podcast. *Fxguide*. n.p. 9 Jan. 2010. Web. 29 Oct. 2013.

Barrier, Michael. *Hollywood Cartoons: American Animation in its Golden Age.* New York; Oxford: Oxford University Press, 2003. Print.

---. "Monster House: What's in a Name?" *Michael Barrier*. n.p. 8 Sept. 2006. Web. 19 Nov. 2013.

Bird, Brad. Foreword. *Acting for Animators - A Complete Guide to Performance Animation*. By Ed Hooks. Portsmouth, NH: Heinemann, 2000. vi-vii. Print.

Benjamin, Walter. “The Work of Art in the Age of Mechanical Reproduction.” *Illuminations.* Ed. Hannah Arendt. New York: Schocken Books, 2007. 211-343. Print

Canemaker, John. *Walt Disney’s Nine Old Men and the Art of Animation*. New York: Disney Editions, 2001. Print.

Christophers, Kelly. “Realism in CGI Character Performance: A Comparative Study of the Evolution of Key-Framed Animation and Motion Capture Systems at Weta Digital Studios”. MA Research Report. University of the Witwatersrand, 2011. Print.

Cohen, David S. “Academy Struggles to Define Animation.” *Variety.com*. n.p. 6 Nov. 2007. Web. 3 Feb. 2014.

Cope, Ken. "A Brief History of Motion Capture for Computer Character Animation". Character Motion Systems. By David Sturman. SIGGRAPH 94:Course 9, 1997. Print.

Crafton, Donald. *Shadow of a Mouse: Performance, Belief, and World-Making in Animation*. Berkeley: University of California Press, 2013. Print.

“Creature Animation: Gollum, Goblins and 48 fps.” Podcast. *Fxguide.* n.p. 17 Dec. 2012. Web. 28 Oct. 2013.

Deja, Andreas. “Getting to Know Milt Kahl.” Online video clip. *Deja View*. Blogger, 22 Aug. 2013. Web. 25 Aug. 2013.

Dekel, Natalie. "The Silence of the Paper: Embodiment of 'Artistic Personality' in the Process of Art – Making." *The International Journal of the Arts in Society* 4.4 (2009): 167 – 177. Print.

Desowitz, Bill. "Glen Keane Talks 'Tangled.'" *Animation World Network*. n.p. 28 Oct. 2010. Web. 5 Jan. 2014.

Duncan, Jody. "Legacy System." *Cinefex* Jan, 2011: 28-57. Print.

---. "The Seduction of Reality." *Cinefex* Jan. 2010: 68-146. Print.

---. "There and Back Again." *Cinefex* Jan. 2013: 84-116. Print.

Duncan, Jody and Fitzpatrick, Lisa. *The Making of Avatar*. New York, NY: Abrams, 2010. Print.

Fordham, Joe. "Beneath the Barnacles." *Cinefex* Oct. 2006: 66-89. Print.

---. "A Dream of Christmas." *Cinefex* Jan. 2005: 112-170. Print.

---. "Journey's End." *Cinefex* Jan. 2004: 67-142. Print.

---. "Middle-earth Strikes Back." *Cinefex* Jan. 2003: 71-142. Print.

---. “Return of the King.” *Cinefex* Jan. 2006: 42-81, 123. Print.

Freedman, Yacov. “Is It Real . . . or Is It Motion Capture? The Battle to Redefine Animation in the Age of Digital Performance.” *The Velvet Light Trap* No. 69 (2012): 38-49. Print.

“fxguidetv #163: The Hobbit: An Unexpected Journey.” Online Video Clip. *Fxguide*. n.p. 17 Dec. 2012. Web. 30 Jan. 2014.

Gunning, Tom. “The Cinema of Attraction: Early Film, Its Spectator, and the Avant-Garde.” *Film and Theory: An Anthology.* Ed. Robert Stam and Toby Miller. Malden, Massachusetts: Blackwell, 2000. 229-235. Print.

Hooks, Ed. *Acting for Animators - A Complete Guide to Performance Animation*. Portsmouth, NH: Heinemann, 2000. Print.

“ILM’s Hal Hickel on *Rango.*” Podcast. *Fxguide*. n.p. 8 Mar. 2011. Web. 24 Oct. 2013.

Jones, Angie and Oliff, Jamie. *Thinking Animation: Bridging the Gap between 2D and CG*. Boston, MA: Thomson Course Technology, 2007. Print.

Kelly, Shawn, et al. “Motion Capture.” *Animation Tips and Tricks – Volume 2*. AnimationMentor.com, 2009. 41-43. Web. 15 Sept 2011.

Kitagawa, Midori and Windsor, Brian. *MoCap for Artists: Workflow and Techniques for Motion Capture.* Amsterdam; Boston : Elsevier/Focal Press, 2008. Print.

Lord, Peter. Foreword. *A Century of Stop Motion Animation*. By Ray Harryhausen and Tony Dalton. New York : Watson-Guptill Publications, 2008. 9. Print.

Mann, Camille. "Did Andy Serkis Deserve an Oscar Nomination?" *CBS News.* n.p. 24 Jan. 2012. Web. 11 Oct. 2013.

Manovich, Lev. *The Language of New Media*. Cambridge, Massachusetts: MIT Press, 2001. Print.

Menache, Alberto. *Understanding Motion Capture for Computer Animation*. Burlington, MA: Morgan Kauffman, 2011. Print.

Mori, Masahiro. "The Uncanny Valley." 1970. Trans. Karl F. MacDorman and Norri Kageki. *IEEE Spectrum*. IEEE, 12 Jun. 2012. Web. 3 Feb. 2014.

Naremore, James. *Acting in the Cinema*. Berkley: University of California Press, 1988. Print.

Ohmer, Susan. "'That Rags to Riches Stuff': Disney's Cinderella and the Cultural Space of Animation." *Film History* 5.2 (1993): 231 – 249. Print.

Park, John Edgar. "Behind the Scenes on 'Final Fantasy: The Spirits Within". *Animation World Network*. n.p. 10 Sept. 2001. Web. 22 Feb. 2014.

Plantec, Peter. "Crossing the Great Uncanny Valley". *Animation World Network*. n.p. 19 Dec. 2007. Web. 22 Feb. 2014.

Risatti, Howard. *A Theory of Craft: Function and Aesthetic Expression.* Chapel Hill: University of North Carolina Press, 2007. Print.

Rosenberg, Harold. *The Tradition of the New.* 2nd Edition. Chicago: The University of Chicago Press, 1982. Print .

Simpson, David. "Awards Season Roundtable Series: Animation." Online video clip. *Hollywood Reporter*. n.p. 16 Dec. 2011. Web. 2 Feb. 2012.

Seymour, Mike. "The Hobbit: Weta Returns to Middle Earth." *Fxguide*. N.p. 14 Dec 2012. Web. 23 Feb. 2013.

Speaking of Animation. "Podcast: Avatar with Richard Baneham!" Podcast. *Speaking of Animation*. n.p. 3 Mar. 2010. Web. 13 Sept. 2012.

Stam, Robert. "The Question of Realism: Introduction." *Film and Theory: An Anthology.* Ed. Robert Stam and Toby Miller. Malden, Massachusetts: Blackwell, 2000. 223-228. Print.

Thomas, Frank and Johnston, Ollie. *The Illusion of Life: Disney Animation*. 1981. Michigan: Hyperion, 1995. Print.

Vasquez, Larry. "Creatures Interview with Animators Cameron Fielding and David Hubert." Podcast. *iAnimate*. n.p. 16 May 2013. Web. 22 May 2013.

---. "Interview with Animator Ted Ty." Podcast. *iAnimate*. n.p. 12 Feb. 2014. Web. 25 Mar. 2014.

---. "Interview with DreamWorks Animator Bill Tessier." Podcast. *iAnimate*. n.p. 26 Apr. 2013. Web. 30 Apr. 2013.

---. "Interview with DreamWorks Animators Jacob Gardner and Ben Willis." Podcast. *iAnimate*. n.p. 30 Jan. 2013. Web. 5 Feb. 2013.

---. "Interview with DreamWorks and Weta Animator Jalil Sadool." Podcast. *iAnimate*. n.p. 13 Sept 2013. Web. 15 Sept 2013.

---. "Interview with Naughtydog Lead Cinematic Animator David Lam." Podcast. *iAnimate*. n.p. 27 June 2013. Web. 30 June 2013.

Wells, Paul. *Understanding Animation*. London: Routledge, 1998. Print.

Williams, Richard. *The Animator's Survival Kit*. London: Faber and Faber, 2001. Print.