

THE UNIVERSAL STORY: COMING-OF-AGE IN CONTEMPORARY ANIMATION

by

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ABSTRACT

Cycles is a 3D animated short film about a father who struggles to keep up with his daughter as she races through life. Whereas most coming-of-age films focus solely on the journey of the adolescent, *Cycles* subverts the expectations of the genre by exploring the impact growing up has on both the parent and child in tandem. As a film, *Cycles* relies on the careful and deliberate use of tropes, informed character and environment design, and established cinematic devices to support the story's theme of accepting change. Though my personal experience inspired this film, it evolved into a contemporary and universal example of the coming-of-age genre through iteration and thorough research. While viewing *Cycles*, the audience is invited to reflect upon their own experiences with maturation, growth, and familial conflict.

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CHAPTER 1: INTRODUCTION

Coming-of-age stories are prolific across a wide range of cultures. They deal with the inevitability of personal change, growth, and facing the unknowns of adulthood. Much like the act of “crossing the threshold” delineated in Joseph Campbell’s “The Hero’s Journey”, adolescence involves stepping into a new world as an independent entity for the first time (71). While these stories often focus on the individual undergoing change, they rarely discuss the impact their journey has on the world they leave behind. *Cycles* focuses on this moment of metamorphosis and extrapolates upon the emotional struggle that often accompanies it. Through this, *Cycles* incites a dialog that invites a mutual understanding of two inexorably linked struggles; the guardian “letting go” and the child craving independence. Through animation, both perspectives are presented in a way that is enjoyable, approachable, and easily accessible.

Coming-of-age stories usually focus on children and teenagers (Millard, 1). This staple of the coming-of-age genre is a result and a perpetuator of the individualism that pervades Western society. For that reason, it is a cultural concept worthy of challenging and exploring. By including the father’s perspective more heavily in *Cycles*, he acts as a co-protagonist in a genre where he would otherwise be a secondary or tertiary character. This choice challenges the core focus of the traditional coming-of-age, and through this exploration, new meaning can be drawn from the form. Additionally, through these subversions, *Cycles* provides a more comprehensive look at the further-reaching implications of the coming-of-age genre by examining the impact it has on the adults that facilitate the journey.

Movies such as Dreamwork's *How to Train Your Dragon*, Studio Ghibli's *Kiki's Delivery Service*, and Disney's *Turning Red* all explore the tumultuous transition between childhood and adulthood. When it came to *Cycles*, I selected short-form 3D animation as the medium because the brevity of the format reinforces the concept that children mature very quickly, and the flexibility of 3D animation allows for complete creative control. All fictive settings within this film are meticulously hand-crafted to guide the eye and provide varying levels of dynamism that would be impossible in live action. All sets are intentionally staged to best frame the characters, the action, and the intent of the scene. Stylizing the characters allows for broader appeal and, consequently, access to a wider audience. The acting, expressions, and movement of the characters are uninhibited by physical limitation, allowing impossible action and exaggeration.

What follows is a detailed account of *Cycles*' conception chronicling my creative decisions, research, production processes, personal motivations, and technical breakthroughs while crafting this work.

Context and Limitations

To understand "*Cycles*", it is important to note both the culture in which the narrative takes place as well as the culture of the director. Generational dynamics vary throughout the world. Though *Cycles* seeks to reach a wide and diverse audience, my personal experiences as a white, middle-class American female heavily influenced the way the film portrays the relationships and dynamics of the characters. These include but are not limited to: "The Overprotective Dad", "The Overprotected Kid", "All Girls Want Bad Boys", and "The Bad Boy" as outlined by tvtropes.org. Altogether, the researcher's unique viewpoint, experiences, and exposure to these narrative

stereotypes informed and influenced all creative decisions that comprise the foundation of the production.

While the tropes used in this work are explored further in a later chapter, their use within the film is intentional and measured. Both their implementation and their subversion provide additional context to the culture of the setting and add depth to the story's characters. Consequently, the international cultural reach of this film is lessened as many of the details are Americentric. An imperative decision made early in production that "universality" not be conflated with "genericism"; if all visual markers of time, place, and culture are stripped from the work, discussing the inherently cultural phenomenon that is "coming-of-age" would be impossible.

CHAPTER 2: CONTEXTUALIZING *Cycles*

Coming of Age: The In-Between

To discuss *Cycles* as it relates to the coming-of-age genre, it is necessary to define “coming-of-age”. Establishing the limitations for what is and is not a coming-of-age narrative has been a point of contention for literary scholars for decades. Kenneth Millard, author of *Coming of Age in Contemporary American Fiction*, collects and analyzes variety of definitions from critically acclaimed authors from over the last century. While all of them agree the narrative of a coming-of-age story brings about a maturation, they differ regarding how specifically that maturation must take place (Millard, Introduction).

Cycles takes the audience on a journey through the adolescence of the daughter. However, unlike contemporary examples of the genre, our conflict does not stem from the barriers she encounters on her way to adulthood. Instead, *Cycles* asks the audience to walk alongside the father and experience the turmoil he endures while desperately trying to keep her safe. Because *Cycles* offers this unique dual perspective, the director firmly believes it is a nontraditional example of the coming-of-age genre.

Many argue the archetypical coming-of-age narrative hinges on the tumultuous time of adolescence, and many examples in animation adhere to this stipulation (Millard, 4). Disney’s *The Lion King*, Miyazaki’s *Spirited Away*, and DreamWorks’ *How to Train Your Dragon* all feature protagonists between the ages of thirteen and nineteen. While this is a fine definition to use while

discussing the genre, it is limiting. While the daughter's journey could be used as an example of this convention, it is more pertinent to discuss coming-of-age as a "loss of innocence" and time of "understanding his or her place in history" (Millard, 11).

As one matures, their place in relation to society, their family, and the world shifts. In that sense, it is possible to undergo a coming-of-age multiple times throughout one's life. Though the daughter is coming into her own as an adult, finding her footing as an independent agent and seeking her own future through pursuing the horizon and personal relationships, the father is tasked with reassessing his position in the world and his relationship with his daughter. In both cases, the challenges that these characters face are the result of the natural progression of time; they are unavoidable, forcing them to adapt, mature, and cross a threshold into a new phase of life.

This returns to the assertion that the coming-of-age genre does not need to be limited to featuring only adolescents. Certainly, adolescence is the most universal metamorphosis, but it isn't the only metamorphosis we experience throughout a lifetime. In that way, *Cycles* serves as a coming-of-age narrative in two parts; the first sees the daughter embark upon the traditional venture of personal emancipation while the second follows the father as he comes to terms with his next phase of life.

Because these two narratives happen simultaneously and target separate phases of life, *Cycles* reaches a wider audience than it would have if the story only focused on the daughter. By presenting these two transitions side-by-side, *Cycles* reminds the viewer that no great period of transition happens in a vacuum and that one "can come of age" at any age.

Similar Works

“Father and Daughter”

No film exists without context. Every piece, whether feature or short, eventually finds its way into the canon of cinema. Whenever an artist embarks on a new project, the dreaded question inevitably arises; has this been done before?

When preproduction began on *Cycles*, it was important that it brought something new to the world’s library of animated shorts. To know where a film will sit in the context of other works, you must first be an active consumer of similar media. As soon as research began, so did the hunt for *Cycles*’ predecessor. This meant scouring digital libraries for films with similar runtimes, themes, and narratives. Throughout this process, it became apparent that while there are plenty of coming-of-age films in the genre that deal with a variety of similar themes and narrative devices, such as “Borrowed Time” by Andrew Coats and Lou Hamou-Lhadj, there was only one that came exceedingly close to *Cycles*: the 2000 Academy Award winning short *Father and Daughter* directed by Michaël Dudok de Wit.

In *Father and Daughter*, a young girl and her father ride their bicycles to the seaside. The father takes her further up the shore, leaving her there while he embarks on a journey without her. The remainder of the film is a masterfully edited montage of the daughter’s life as she continually bikes back to the place where she was abandoned, hoping her father would return. It is a melancholy film, stylized with sepia and ink, but it is impossible to deny the surface-level similarities between *Father and Daughter* and *Cycles*.

Both films offer unique angle on how the relationship between a father and daughter can develop over time, and both use the bicycle to take the audience on the journey, but the greatest difference between *Father and Daughter* and *Cycles* are the core themes of their narratives and the perspective they want to emphasize. In fact, as similar as the two films are, they are narratively, thematically, and cinematically opposites.

In *Father and Daughter*, there is no active cultivation of a relationship. The film instead explores the absence of that critical father-daughter relationship and the lingering effect this absence has on the daughter. It is a film about a lack of closure, lingering love, and loss. While *Cycles* also focuses on a father-daughter relationship and the desire to revisit a moment in the past, the father is an active participant in the journey.

Stylistically, *Cycles* and *Father and Daughter* are extremely distinct. *Father and Daughter* opts for an ink-on-sepia style, evoking a sense of nostalgia and simplicity that pairs well with the themes of longing and loss that de Wit explores. *Cycles*, on the other hand, is bursting with color. The seasons fly by, time changes, and the audience is taken along through the vivid greens of new beginnings and the ochre oranges of change. These bold color choices support the idea that maturation, growth, and progress are natural and should be welcomed.

Cinematically, both films heavily use directionality to reinforce their narratives. As discussed in *Dynamism: In the Cinematography* (19), *Cycles* constantly moves the characters from left to right to support the idea that the narrative follows the linear flow of time. The only breaks in this movement are during moments of conflict or when the father begins to walk back towards a past he cannot revisit. Conversely, most of *Father and Daughter* is played from right to

left. She struggles against the natural flow of time to revisit the moment of bereavement, fighting against wind and hilly terrain only to finally reach the place where it all began. In this way, both films handle the same subject in radically different ways. How does one deal with the passage of time? Do they fight against the natural order of things in the pursuit of closure or happiness, or do they accept that they must move forward to find contentment?

By drawing parallels between the elements used in *Cycles* and *Father and Daughter*, it becomes clear that *Cycles* uses directionality and screen direction appropriately. Both Michaël Dudok de Wit and I chose to highlight the same cinematic elements to tell their stories but utilized them in starkly different ways to produce different effects and different films

CHAPTER 3: MEANINGFUL CREATIVE DECISIONS

Set Dressing and Environment

“[Changes in location] are often abrupt, sudden, and radical, so that a new place is coterminous with a significantly new sense of self.”

-Kenneth Millard, *Coming of Age in Contemporary American Fiction*

When I chose to tell this story through short-form 3D animation, the medium came with the expectation of highly intentional set dressing and environment management. One of the most powerful tools at a 3D filmmakers’ disposal is the pure flexibility of the world. In *Into the Spiderverse* by Sony Pictures Entertainment, they “bent all the rules to exaggerate perspective and customize each shot for graphic and emotional intent” (Bret St. Clair, Sony Pictures). The set creation in *Cycles* follows a similar theory.

For a film that focuses on personal growth and evolving relationships, I chose an oak-hickory forest to best visualize *Cycles*’ theme of change. Common throughout most of North America, oak-hickory forests shed their leaves in winter, bloom green in the spring, and fade to beautiful gold-oranges in the autumn. This provides clear visual cues to the audience about how much time is passing on-screen while allowing the setting to reinforce the themes of the narrative.

Cycles begins in autumn. The leaves have lost their verdant greens and now paint the sky with vibrant golds and reds, letting the audience know that our characters are about to embark on a transformative journey (Scheltema). As the film continues, we follow the daughter and the father through the rest of fall, a brief winter, and then into a beautifully bright spring. The greens, oversaturated to evoke a stronger feeling of joy and freedom, paint the forest floor and the canopy.



Figure 1 Single frame render of Cycles shot 41 by Christina Christie

The climax of the film takes place in a moment divided by spring and winter. The father, finally caught up with his daughter, stands backed by bare trees and melting snow. The daughter, now an adult, stands against the foliage of a burgeoning new year. As they confront one another, the audience sees the stark contrast between winter and spring, between old and new, between stagnation and growth, all culminating in the moment the camera reveals the clearing in its entirety. In the same way spring meets winter in the center of the field, so do the conflicting goals of the

father and daughter. In that moment, the father is faced with a choice; resign himself to clinging to the past and live in winter, or to step forward and accept the change that comes with spring.

As the story and setting developed, the next step was stylizing the oak-hickory forest. With infinite options, “The Skillful Huntsman” by Khang Le served as a strong inspiration when it came to stylizing the environment. Le plays heavily with atmospheric perspective in his work. His simplification of tonal values within deep vegetation allows the background to maintain its sense of depth and detail without detracting from the foreground (Le, Skillful Huntsman). Throughout *Cycles*, atmospheric perspective adds depth to all shots and harmonizes the highly saturated background, midground, and foreground.

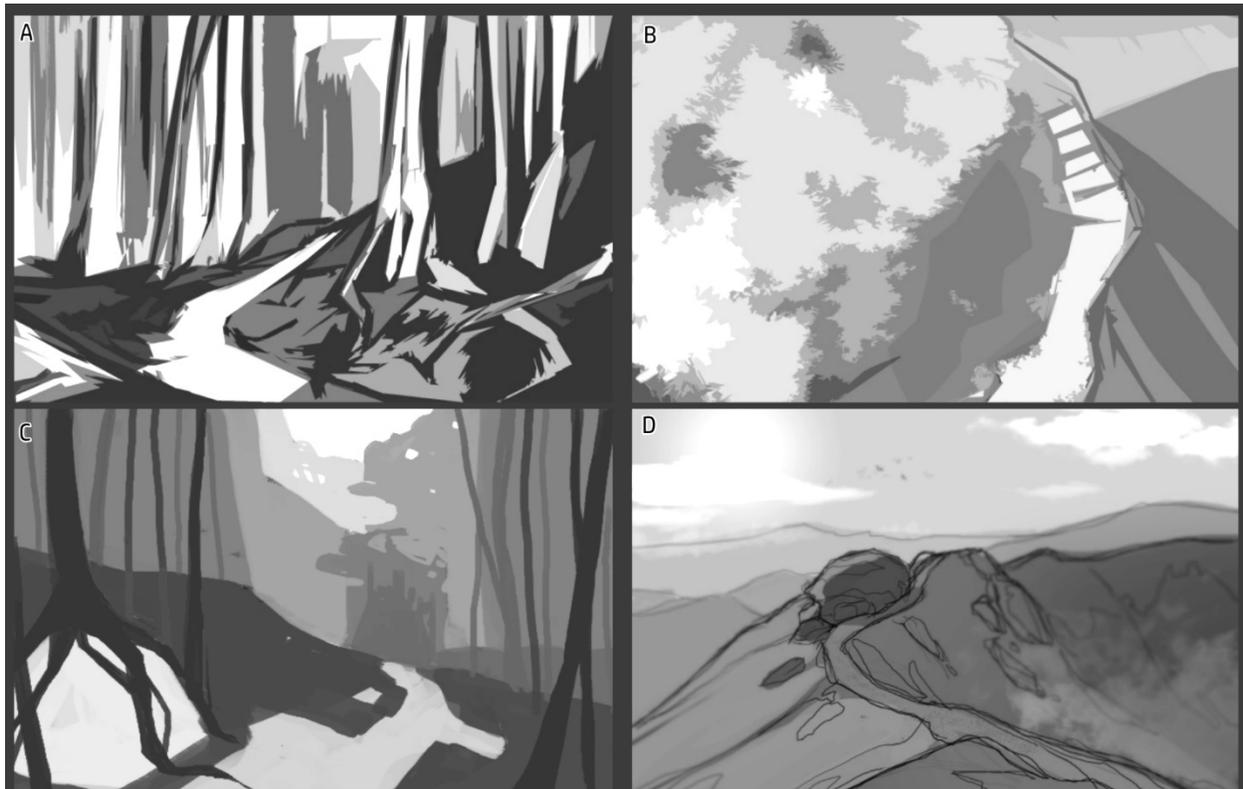


Figure 2 Grayscale landscape studies by Christina Christie

The mountains in the background greatly contribute to the feeling of scale and depth in *Cycles*. They rise high above the action of the film, dominating the skyline and punctuating the feeling of open space, freedom, and possibility. The gentle curves of the sweeping peaks worked as a great compositional element that helped break up the frame, and the cool grays and whites provided visual interest without drawing attention away from the more saturated subject matter.

In sum, the setting of *Cycles* is one that helps tell the story. The color-changing trees support the themes of growth while also allowing the film to visually express the compression of time, and the vast mountains inspire a feeling of freedom, possibility, and independence.

Characters

When working in the coming-of-age genre, characters are the primary focus. They bring life to the narrative, allowing the viewer to connect with the story by resonating with the audience through appeal and acting.

Appeal stands as one of the twelve basic principles of animation presented by Ollie Johnston and Frank Thomas in their renowned guidebook “The Illusion of Life”. Where an actor on screen may rely on charm and a handsome jawline, the artist must create an animated character’s appeal. Many factors contribute to a character’s appeal, but none are so critical as design.

In early production, all three of the characters were caricatures of their roles. The father began as the “Overprotective Dad”, the daughter as the “Plucky Girl”, and the boyfriend as the “Jerk with a Heart of Gold” (tvtropes.org). Generalizing their purpose in the story was the first step towards making meaningful design choices that would better link their appearance to their

intention. In this way, the initial designs for these characters stemmed purely from the tropes that they embody.

Storytellers often try to avoid tropes while writing stories because tropes are often conflated with cliché. As Jenny Cruise, New York Times Bestselling author puts it, “tropes... can guide you towards the story you know you need in the moment”. In the case of *Cycles*, I used tropes to guide me toward the design the characters needed in the moment.

Once the artist understands character’s purpose in the story, the next step is to visually conceptualize that purpose. What does a “father” look like? How should the boyfriend, who is both an antagonistic force to the father and a promise of freedom for the daughter, reinforce and subvert these two contradictory impressions? Are these presuppositions constant between cultures, and if not, how does one circumvent the subjective misinterpretation of a character’s design?

Fortunately, the concept of shape language offers guidelines for answering these questions. Chis Solarski, author of “Drawing Basics and Video Game Art”, offers a contemporary translation of the classical anatomical and illustrative methods that inform the basis of the psychology of shape language (176). By analyzing shapes, forms, and figures, we gain a better understanding of how to utilize those same elements in our own designs. These elements allow the artist to guide the subconscious mind of the viewer and grant them a more nuanced understanding of the artist’s intent.

To put things more concisely, shape language is a product of centuries of cumulative observation. The shapes we see in everyday life are evocative of immediate, instinctual responses; the spines on the cactus are sharp, pointy, and triangular, and most things in nature that fit this pattern are dangerous. Likewise, square things, such as houses and boxes, are stable and reliable.

If we apply this concept to the world, one could argue that there are dozens of unique and increasingly complex shapes that inspire a litany of feelings. To keep the concept practical, Solarski narrows it down to three main forms: the circle, the square, and the triangle. These shapes can be used on their own or combined with each other to create an endless array of designs (Solarski, 198). In *Cycles*, all three main characters highlight variations of these major shapes.

The father, George, has a square and sturdy stature. The square is often reserved for level-headed heroes or reliable supporting characters. As the father acts against the daughter's growth but simultaneously has good intentions, his design reflects a broad and comforting persona that leans more masculine than cute. To elevate the depth of his character, the square elements of his silhouette were broken up with circular eyes and a beard that helps round out his otherwise angular features. Balancing those the stern steadiness of his shape language with the paternal softness afforded by his eyes, beard, and hat was a constant struggle given his imposing figure, but after many iterations I found balance in his design (figure3).

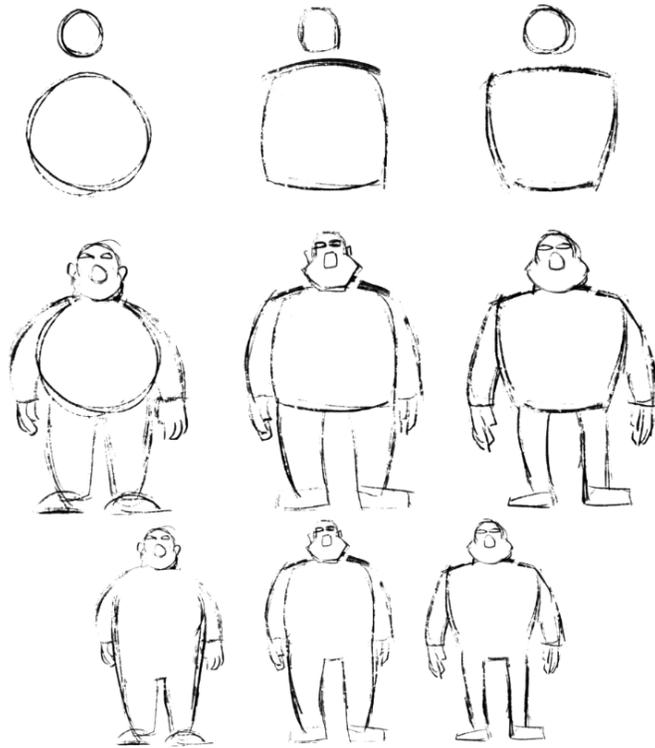


Figure 3 Shape studies of the father by Christina Christie

In contrast to the father, the daughter presents as round, bubbly, and feminine. Everything about her design, both young and old, exudes friendly and approachable. There are no sharp edges on her face, and even the hems of her sleeves, jacket, and shirt are round to inspire the feeling of fluidity and youth. This serves to contrast her moments of high-intensity and stubbornness; even when she is angry or determined, she still maintains her appeal.

The boyfriend is comprised of rounded triangles. His face is more angular than the father face or the daughter's face, and that same triangular shape repeats in the lapel of his jacket, the handkerchief he wears, and the sharp points of his gelled-back hair. Compared to the bright pinks and golds of Tessa, Mitchell rolls in wearing blacks and reds. Everything about him, from his robust leather jacket to his loud and gleaming motorbike, tell the audience that he is a titular "bad

boy”. He is dangerous, he lives life on the edge, but avoids feeling “evil” thanks to the phrasing of his actions and mannerisms. This makes him easily recognizable as the trope he portrays while still endearing him to the audience, more firmly establishing him as a love interest rather than an antagonist.

One may ask why the characters of *Cycles* are human at all. Animation is a limitless medium, allowing the artist to tell their story with whatever characters they can imagine. This sort of freedom is one of the greatest boons of the form, and arguably designing the cast underutilized such a freedom.

Anthropomorphizing animals or objects and placing them at the center of human narratives is an excellent way to palatably repackage difficult themes (Collington, 144-159). Disney’s *Zootopia*, an animated film focused on the ramifications of widespread discrimination, used anthropomorphic animals to replace the contentious and controversial elements of real-world discrimination with the universal dichotomy of predator and prey. In this way, *Zootopia* benefits from these designs on several fronts; the difficult subject matter is made more easily digestible thanks to the distance provided by the animal-centric world. Additionally, the quirks of the animals are thoroughly utilized throughout the film to make certain story beats possible. This is an effective and thorough utilization of non-human character design that strengthens the story and universalizes the themes.

In the case of *Cycles*, keeping the characters human allows the audience to better resonate with the narrative. Stylizing those humans adds a slight degree of separation from reality that prevents the story and the acting from feeling uncanny while allowing the artist to cultivate each character’s appeal.

Story

From Personal to Universal

When creating a story, it is difficult for the filmmaker to completely divorce themselves from their own firsthand experiences. *Cycles* is no exception, stemming from the moment the director had to tell her own loving parents that it was time to stop seeing her as a child and start treating her as an adult. The specifics of that event are unique to the individual. To take every moment of that conversation and translate it to screen would be uncomfortably personal and alienating to at least a portion of the prospective audience. However, coming-of-age is a universal experience.

How does one begin to translate a personal story into a narrative that will resonate with a wide audience? For *Cycles*, the process began with a re-analysis of the original pitch. Long before production began, *Cycles* was a far more bittersweet film. It focused heavily on the consequences of being too stubborn to let the love in your life grow. The father's journey was the only journey the audience saw on-screen. While it was the first iteration of film the director wanted to produce, the reel's first viewers offered a different perspective; it felt terribly, terribly unfair. It placed all the blame on the decaying relationship between the father and the daughter on the parent without addressing that the daughter was culpable, too. Many of these first viewers were parents themselves, which was a demographic that had not been consulted before. These new viewers had all gone through adolescence at an earlier point in life, but unlike younger viewers who resonated more closely with the daughter, these viewers saw their experiences mirrored in the father.

This realization fundamentally changed how I wrote *Cycles*. My assumptions about parenthood did not inform the narrative nearly as accurately as hearing the firsthand experiences of individuals who had seen their children mature. Understanding this discrepancy opened the door to research that would prove integral to universalizing the narrative.

The act of creating an animated film is a research project guided by never-ending questions. These questions can be as broad as “*what do I want to say with this narrative?*” or as focused as “*what kind of necklaces did women wear in this culture around 1920?*”. Every query has one thing in common; it inspires investigation. Animation requires that all this thinking be done well in advance of production. It is a long, arduous process that constantly requires the artist to reflect on why they make the choices they make, prompting a deep understanding of the motivations behind their visuals and narrative (Spicer, 5-9).

In *Cycles*, the need to broaden the perspective of the film led to the broadening of research methods. Without the ability to step into the shoes of a father watching his daughter grow up, how does one expect to properly depict the demographic? With a limited number of personal acquaintances to speak to about their experiences, my focus turned toward the world of psychology.

After their children leave home, many parents face what is colloquially known as “empty-nest” stage of parenting. It’s often associated with a sadness that stems from the absence of the child. In many cases, fathers experience empty-nest syndrome differently than mothers. This difference is rarely explored in-depth, but through the research of Justyna Teresa Ruskowska, a Doctor of Philosophy from Nottingham Trent University, I found a variety of perspectives and interpretations of this stage of fatherhood.

In *Cycles*, I selected a father-daughter relationship over a mother-daughter relationship because of the assumption that the departure of the child from home impacts the father in a less noticeable way than it does the mother. The expectation that men maintain a stalwart exterior, unburdened by intense emotion, aligns with society's idea of masculinity (Ruszkowska, 84). However, in many cases, this expectation leads to the "empty-nest" phase being more intense for the father because the father dedicates less time to anticipating and adapting to the change (Ruszkowska, 71). This idea of repression and subsequent volatility made the exchange between the father and daughter in *Cycles* more compelling, as did the opportunity to represent the more emotional side of fatherhood.

In fact, many fathers feel as though they are excluded or minimized in their children's transition from living at home to moving on into the world (Ruszkowska, 87). In the Western world, mothers are expected to be more involved in the upbringing of their children and their husbands are relegated to supporting them through the empty-nest phase as opposed to being given the space to experience their own emotions. With *Cycles*, the focus is given to the father's struggle to invite conversation and reflection in viewers who have not had the chance to fully accept or process the maturation of their children.

Likewise, the research for the father led to a more in-depth understanding of the daughter's character. In the words of Kenneth Millard, "finding a place in society is coterminous with finding a satisfactory relationship with the father" (Millard, 15). *Cycles* gives the daughter the agency to define this relationship.

By gathering perspectives from peers, acquaintances, friends, and online sources, *Cycles*

became a nontraditional coming-of-age-narrative that represents a more relatable and universal experience.

Stereotype: Use and Subversion

The idea of utilizing stereotype is a contentious one. Some, such as Kumari Devarajan of National Public Radio, believe that stereotypes, even positive stereotypes, negatively impact the peoples they depict (Kumari, *'Strong' Black Woman? 'Smart' Asian Man? The Downside to Positive Stereotypes*). This is a reasonable observation; making assumptions about a diverse group of people based off their physical appearance is “a slippery slope to the bad stuff.” (Kumari). However, when working with short-form media it is imperative that the audience connects with and understands the characters on screen as quickly as possible to allow themselves to be immersed in the piece well before it reaches its conclusion. For this reason, the careful use of stereotype, trope, and cliché was integral to *Cycles*' production.

When discussing stereotype in conjunction with cliché, it is important to differentiate the two. By definition, a “trope” is “*a convention or device that establishes a predictable or stereotypical representation of a character, setting, or scenario in a creative work*” (“trope”, def. 3a) where as a “stereotype” is “*a simplified and standardized conception or image invested with special meaning and held in common by members of a group*” (“stereotype”, def. 1). These terms may seem interchangeable, but while they are similar, tropes stem from stereotypes that have a history of use in a particular genre of media. Cliches, which are often regarded as something to be avoided by authors and filmmakers alike, are simply overused tropes.

Stereotypes, tropes, and cliches permeate our collective consciousness through the

litany of media we consume and establish themselves firmly as the tools by which we digest a narrative. For *Cycles*, the challenge was not avoiding using tropes but choosing which tropes to use and how to implement them effectively without being cliché.

At its core, *Cycles* explores the relationship between a father and his daughter. It is a story of agency, autonomy, and compromise. It was important that this evolving relationship and the daughter's demand for independence be depicted in a nondestructive way. Over the past thirty years, the role of the "young girl" or "daughter" in media has evolved alongside feminism, and so have the associated tropes. In the 90's, Linda Williams tackled this subject in her work "*Gender, Genre, and Excess*" wherein she discussed how women are primarily used as wives, lovers, mothers, and delicate daughters. When the woman is not an object of the protagonist's desire, she is nothing more than a passive entity meant to receive the action of the more active male protagonist. Even in "weepies", contemporarily known as "chick-flicks", women are solely meant to be the conduit for emotion or melodrama, not fully realized characters (Williams, 4). This library of tropes and trends can be seen in countless pieces of cinema, most obviously in Hallmark's copious library of holiday films.

In a film where the daughter strives for independence only to pursue a future with her boyfriend, one must ask if this is a healthy maturation of character or an unfortunately common case of a woman being defined by her relationship to men. To better understand the way tropes were applied to the cast of *Cycles*, it is important to consider the steppingstones between the 90's and now.

During the early 2000's and 2010's, a growing number of animated television shows sought to push back against the narrow library of stereotypes afforded to female characters in

media. This manifested as a trope now known as The Flawless Token (tvtropes.org). Characters that fall into the “flawless token” trope are always a lone girl thrown into a cast of boys. These flawless tokens are perfectly capable and beyond reproach. By definition, “they will be much smarter and have more common sense than average... and if the show is a comedy full of idiots... the token is almost always the straight man” (tvtropes.org, *Flawless Token*). This trope is widely used throughout modern-day Western animation; Gwen from *Ben 10*, Sandy Cheeks from *SpongeBob*, and Smurfette from the *Smurfs* are all notable examples.

The daughter in *Cycles* strikes a middle ground between the domestic ideals of women in media from the 90’s and the powerhouse perfection of the 2010’s. She is not the feminist “girl power” stereotype, nor is she the lovesick schoolgirl who only cares about her boyfriend. She is a maturing woman. Her goal is not to break away from her father and family entirely. She does not see the love from her father and reply, “I do not need you because I do not need men”; she looks towards him as an equal and asks for him to respect her autonomy. In this way, *Cycles* draws the audience into this relationship by relying on well-established tropes at the outset; we have the “Overprotective Dad” and the “Rebellious Daughter” (tvtropes.org). This alone informs the potential conflict, allowing the viewer to settle into the narrative without needing much context. When the boyfriend enters from screen right with his leather jacket, slicked-back hair, and dangerous, red motorcycle, the audience knows the daughter is “Dating What Daddy Hates” (tvtropes.org). All of this sets the foundation for the story without any dialog, allowing the visuals to shine through and offering the climax of the film the time and space it needs to be impactful.

The daughter is also very traditionally feminine. She has a youthful face, an athletic

hourglass figure, and maintains several of the round facets present in her younger design. Many critics such as Dr. Lisa Wade have identified a persistent problem with the infantilization of women in animation (Power, Mickey Mouse, and the Infantilization of Women). Though animation provides infinite possibilities when it comes to design, the daughter in *Cycles* is still traditionally feminine. Why?

The answer is simple: the daughter's wishes must be taken seriously regardless of her feminine appearance. While adding additional "masculine" features such as a sharper jawline or broader shoulders may have played more heavily into her athleticism or stubborn nature, these parts of her personality do not need to be represented visually to support her journey or the boundaries she sets throughout the film.

All in all, using stereotype was critical to the production of *Cycles*. In my opinion, stereotype is a necessity when creating any story. It is the careful manipulation and subversion of these stereotypes that adds depth and novelty to a narrative.

Dynamism

In the Cinematography

"Because the eye tends to read a picture from left to right, physical movement in this direction seems psychologically natural, whereas movement from right to left often seems inexplicably tense and uncomfortable."

-Louis Giannetti, Understanding Movies

In film, the directionality of character movement can have a profound impact on the audience's perception of the narrative (Egizii et. al, *Which Way Did He Go? Directionality of Film Character and Camera Movement*). Like all tools of cinema, directionality must be used purposefully and intelligently to support the narrative. The proper integration of this device on *Cycles* had a profound impact on audience response, though it took improper integration to understand why.

Cycles takes the viewer on a journey through time. The daughter grows up, the father ages, and the relationship between them matures. While in the storyboard phase, which is often used as a first pass at layout/camerawork, the flow of the film, the characters on screen, and the action moved from right to left. The test audiences enjoyed the story, but most felt something was "off." There was something hiding in the edit that kept *Cycles* from connecting with the audience. At first, I revised the story. Then I started cutting, shortening, or lengthening shots in the hopes the issue would resolve itself. Still, the unease persisted.

It was not until an advisor mentioned that it felt like the characters were "going the wrong way" that the culprit revealed itself. Horizontally flipping the film changed the direction of the action; now the film was one continuous journey from left to right. Suddenly, the viewer's reception was more positive. But why?

Fortunately, many others have posed the same question. Cleveland State University conducted a study in 2012 that sought to understand how directionality affects audience's perception. The study applied a more consistent and scientific perspective to film. Through it, they were able to empirically prove what Gianetti outlined in *Understanding Movies*; the audience feels

more comfortable with left-to-right motion. In the West, we read and visualize time from left to right, so it follows that left to right motion feels most natural to us.



Figure 4 Single frame render of shot 18 by Christina Christie

In the cinematography of *Cycles*, the idea of left-to-right directionality served as the cornerstone of every shot. The daughter, wanting to grow and mature and progress, always leads the charge towards the right side of screen. The idea of returning to the left from the right is impossible in the context of time flowing forward, and the idea of going against this flow feels wrong on a subconscious level. In the moments where the camera tracks back to follow the father towards the past, the audience sympathizes with George. He is engaged in the futile struggle of fighting against time, wanting to preserve things as they were.

There are only a handful beats in *Cycles* where the camera pauses. They represent moments of great potential. At the very beginning, when the daughter is young, the passage of time has not yet begun. The viewer eases into the moment through a slow dolly in with a slight tilt to gently introduce the audience to the story. The camera stills, highlighting the wholesome moment, and then things get moving. From that moment on, the viewer is taken on a journey down the mountain path through time.



Figure 5 Single frame render of Cycles shot 1 by Christina Christie

The second moment of potential exists when the father and daughter have reached the conclusion of their argument. The camera stills, letting the audience take in the magnitude of the moment. The father has the potential to move forward towards his daughter or back towards an unattainable past.

There are two shots in *Cycles* where the camera moves from right to left, and they are the two shots that reflect the emotional struggle of the father. When the father finally catches up with

his daughter and holds her in his arms, pulling her back towards home and returning her to her youth, we see the camera track them backwards. This trend continues in the following shot as he begins to walk back the way they came, and only stops when the daughter digs her heels in and refuses. In these shots, the viewer is shown the father's wishful perspective. He wants his little girl back, and he struggles to see her as an adult.

Likewise, deciding the character's position on screen used a similar principle. The daughter, always leading her father to the right side of screen, stays screen right for almost the entire film. The only exceptions to this rule are when her father sees her as a child during the climax of the film. As he realizes she has grown up, she shifts to the right side once more. Using this device strengthened the daughter's association with growth and maturation while simultaneously reinforcing the father's association with stagnation and stubbornness.

All shots in *Cycles* utilize the directionality of the camera and the character's position on screen to emphasize the dichotomy of progress and regression, bolstering the themes of the film by using the audience's subconscious comfort with left-to-right movement to support the idea that progress is natural.

In the Acting

In the words of Chris Webster, “[in bringing a] script to life, the performance becomes all-important” (Webster 306). For *Cycles*, the medium of animation elevates mundane action like running, jumping, and riding a bike, into something more visually interesting, appealing, and meaningful. This is because animation allows the animator precise and ongoing control of the

character's performance dynamics; that is, the timing, phrasing, and pacing of the action (Webster 306).

By manipulating timing, the animator can emphasize key poses and expressions that may otherwise be fleeting or appear unnatural in live action. This idea of timing is intrinsically linked to the use of squash and stretch, the “most important” of the twelve principles Frank Thomas and Ollie Johnston proposed in “The Illusion of Life” (Thomas, Johnston 48). Through this method, the elongation or compression of the body's volumes adds to the fluidity and strength of the action (Thomas, Johnston 37). Though this method was uncovered during early explorations into the medium such as Walt Disney's “Steamboat Willie” and Disney's first feature release “Snow White”, it persists as one of the most heavily utilized principles of animation today.

In *Cycles*, timing and squash and stretch are paired to better characterize the actors on screen and add to the visual fluidity of their motion. For the father, his steps are heavier than his daughter's. He moves more slowly, with more weight, and his limbs, while constrained to a traditional biped's range of motion, hold less tension than a physical body. While never approaching the level of fluidity present in “rubber hose” animation, the exaggerated follow-through of the father's arms and legs adds to his goofy, fatherly charm. In contrasting his acting and motion with his large and imposing design, the father is presented to the viewer as less intimidating and therefore a more appealing protagonist.

Of all the characters in *Cycles*, the young daughter uses squash and stretch most liberally. She is bouncy, energetic, and always on the move. From a technical perspective, much of *Cycles* requires both the cameras and the characters to move through an environment at a high speed. To simulate the limitations of a traditional camera's shutter speed, I combined squash and stretch with motion blur to allow the daughter

high fluidity. Both her momentum and directionality are highlighted to further the film's idea that change happens "in the blink of an eye."

The boyfriend, on the other hand, is more rigid. His intentionally antagonistic design is meant to utilize the audience's presuppositions to fuel the assumption that he is "bad boy". Much like how the father's motion contrasts with his design, so does the boyfriend's. His acting is precise, measured, and snappy to make it clear that while he appears to be rough and tumble, he is more responsible and in-control than his design implies. This adds additional character depth without offering him any dedicated screen time and allows the transition to the proposal scene to be more believable to the audience.

Furthermore, the "phrasing" of the performance, or how different actions in the same sequence relate to one another, directly impacts the mood of a shot (Webster, 306). This is the difference between a small, short, subtle wave and an overblown, full-body wave; while they are the same action, the way in which every piece of the action is parsed out and placed in the context of the adjacent animation gives the acting new meaning and better characterizes the cast.

Animation is the only medium which allows the artist to present the performance they envision uncompromised and ensures that both the personality and the emotions of the characters on screen are identifiable through acting alone (Larson). In a short film without dialog, everything the audience knows about the characters must be done through their body language and expressions. Every character will run, smile, laugh, and cry differently; deciding these differences and directing the phrasing of the animation is key in establishing the personality of the characters and solidifying how they will react to the events of the story.

CHAPTER 4: MEANINGFUL TECHNICAL DECISIONS

Motion Capture and Key

As *Cycles* is a sizable production featuring four separate character rigs, considerable complex prop interaction, and intricate acting, much of the final year of production was dedicated to animation. To streamline this process and aid in meeting tight production deadlines, I considered motion capture as a supplementary animation technique.

In choosing to include motion capture as a method of animation, it is important to consider the impact motion capture has on the final “feel” of the animation. Keyframe animation is often considered more “artistic” as it preserves the artist’s original intent. It offers the animator the ability to bend the laws of physics, motion, and anatomy to manipulate the audience’s perception of the persistence of vision, creating something that feels correct to the eye without the restrictions of the physical world. In the words of Tsai-Yun Mou, “traditional keyframe method has better support for [the animators] to express their creativity” (Mou, *Keyframe or Motion Capture? Reflections on Education of Character Animation*). For this reason, a critical defense of *Cycles* existing as an animated short revolves around the heavy use of the keyframe method.

This then posed a new challenge; would it be possible to elevate motion capture data to the same level of expression as its keyframed counterpart? If possible, motion capture would remain a viable supplementary animation method. Otherwise, it could not be used on threat of compromising the charm of the medium and working against the purpose of the thesis.

Various attempts at retrofitting a fully articulated film rig and replicating artful, expressive motion through modified motion capture are documented below. While exceptionally useful in theory, motion capture was not integrated into the pipeline until late in production. This resulted in several complications that slowed integration considerably.

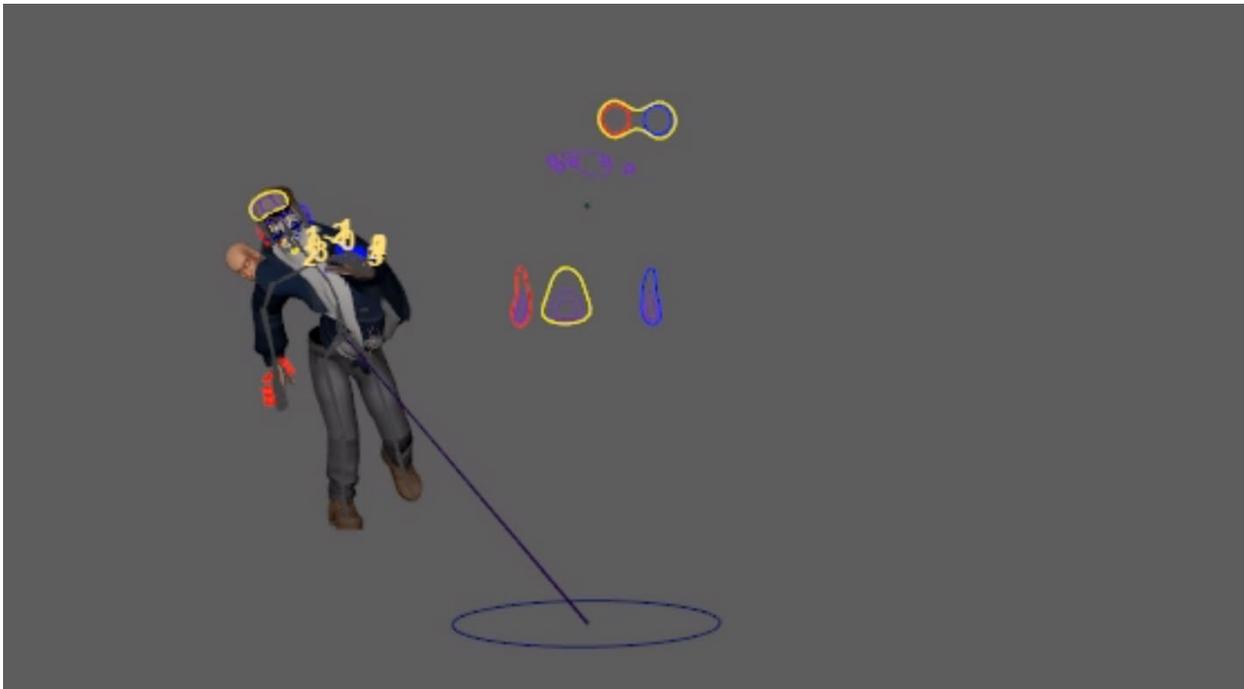


Figure 6 Screenshot of MOCAP technical issues by Christina Christie

First and foremost, the full, film-ready rig could not be easily mapped to the humanIK skeletonⁱ provided by Maya and Motion Builder. This is because the motion capture pipeline has been optimized for games, and game rigs are often required to be “lighter” or less complex than film rigs to meet the requirements of real-time rendering. For this reason, ribbon splines, which are often used to create stretch and bend in film rigs, are not supported. For the father’s rig, ribbon splines were critical to the function of the head and neck and could not be removed¹. This

disconnection between the high-flexibility film rig and the capabilities of the standard motion capture rig began an investigation into how to combine the two. There was little to no documentation on how to begin to retrofit a film-ready rig into a mocap pipeline, so I had to build a unique pipeline for *Cycles*.

While the trial-and-error process was long, the solution involved the creation of two unique rigs. The first was the film-ready rig. It contained all joints and elements required for fully articulated animation as well as a series of driver joints that corresponded with the standard humanIK skeleton. This version of the rig was incompatible with Motion Builder. The second was a stripped-down version of the film rig that contained nothing but the standard humanIK skeleton. The stripped-down rig could take data from motion capture footage directly in Motion Builder, allowing the animation to be cleaned up natively in the program. Once the data was cleaned up, it could then be transferred to the film-ready rig in Maya. The film-ready rig was equipped with a series of driver joints, or joints that controlled the main facets of the body, and the motion capture data could be mapped to these driver joints without causing conflicts with the original skeleton. This allowed the motion capture data to drive the animation without interfering with the pre-existing face, body, or hand rigs.

Preparing the rig is only half the process; finding actors, directing the performance, and capturing the data is its own undertaking. Fortunately, the production was able to utilize the largest motion capture studio on the East Coast. With assistance from Florida's Interactive Entertainment Academy and the varied talents of the University of Central Florida's acting students, the mocap process began.

Generally, motion capture is used in interactive media to create a library of motion that the game developers or animators can call upon, modify, and blend. This data is meant to function under a variety of conditions, coded to activate or de-activate in response to triggers in the digital environment. For *Cycles*, there was no coding or motion library. This required the actors imagine the set of *Cycles* and perform using proxies and blank space. Coupled with the specific requirements of the individual shots, the actors must be directed around an invisible world to ensure they won't collide or clip with major set pieces in digital space. This was yet another obstacle impeding mocap integration.

During the first capture session, the actors had not worked in motion capture before, and the filmmaker was inexperienced in directing live-action actors. Because of this, most of the capture data lacked the kind of exaggeration and energy required for an animated production. This data was still used to test the pipeline, which supported all imported data, all high-articulation rig elements, all XGen groom, and iteration without issue.

With a functional pipeline, the only question that remained was whether motion capture would enhance or hinder the look of the final film. When shown to test audiences comprised of animation professionals, many identified the animation as motion capture data without being prompted due to its realistic weight and fluidity. Others believed it still fell within the style of motion for the film given how the clean-up provided additional exaggeration. Viewers who did not have a background in animation enjoyed the test shot but did note that it felt distinct from the rest of the key-framed film. The early audiences had mixed opinions, but in the end motion-capture was not used in *Cycles*' production for two reasons:

The process of capturing the data is labor-intensive and time consuming. I initially considered motion capture because it seemed a promising way to speed up the animation process, but getting to the studio, finding the right actors, and directing those actors effectively takes a lot of time to master. During production, these were not skills the filmmaker possessed nor wished to focus on. Secondly, key-frame animation provides the animator precise and absolute control over the character's performances and, as Tsai- Yun Mou found in his paper, allows the animator to express their creativity more freely in phrasing animation (Mou, 11). While motion capture is an excellent tool in a digital artist's arsenal, the style of *Cycles* lends itself to the traditional key-frame method. Using motion capture in conjunction with the filmmakers' limited experience would have likely made the animation feel too generic for the production.



Figure 7 Screenshot of successful MOCAP by Christina Christie

Simulation

Hair



Figure 8 Single frame render of Cycles shot 4 by Christina Christie

One of the most impactful technical decisions in *Cycles* was the choice to use simulated hair grooms. During pre-production, the film had a more stylized look. The characters leaned further away from realism, and the hair was going to be modeled, rigged, and animated using traditional modeling methods and keyframe animation. However, as research continued and the style of the film evolved, so did the look of the hair.

The idea of using hair “grooms”, or hair comprised of densely generated hand-styled polygons, stemmed from their popular use in feature films such as *Luca*, *Onward*, and *Frozen*. This style of hair is very true-to-life both in look and in motion. With a film so dependent on momentum, the lifelike secondary animation on the hair would enhance the feeling of the

character's speed as they move through the environment and further the feelings of freedom and independence for the daughter.

To create this kind of hair, I needed to use specialized technology. While there are many hair simulation plugins and software available, the tool selected for *Cycles* was Maya's XGen. Its purpose is to generate, shape, and simulate hair grooms. At the onset of production, the filmmaker knew very little about the tool; fortunately, there were plenty of resources to fill in knowledge gaps.

Michael Cauchi, visual effects artist at Moving Picture Company Episodic, authored and shared his article "A Beginner's Guide to XGen" which was critical in setting up the framework for groom and simulation. While the article was not comprehensive, it was enough to begin the process and outlined the many technical pitfalls artists who are new to digital hair grooming may encounter. It also introduced the concept of modifiers, or procedural code to define the hair's texture, as well as the use of guides to create the overall shape.

Unfortunately, XGen proved to be a constant technical challenge. As a plugin, XGen is extremely sensitive to file pathing, parenting and name changes, and texture mapping. Learning and managing these intricacies was as time-consuming as creating the grooms themselves.

While XGen was a considerable investment, the results were stunning. When coupled with Redshift's native hair shader, the grooms captured the light in the same way hair would in the real world. Rim lights popped with a gorgeous golden glow and immensely enhanced the production value of the film. This new look motivated revisions in other areas of the film to match the quality, including the textures and vegetation.

The final benefit of XGen came in its ability to simulate the motion of the hair. With the characters constantly moving, getting the secondary action of the hair correct and consistent was an important aspect of selling the speed and energy of the montage and the subtle stillness of the climax. If the hair had been sculpted, dynamic joint chains or hand-keyed animation would need to be used. With a groom, it is as simple as attaching one of Maya's native nHair systems to the groom and adjusting the dynamic properties appropriately. Granted, when working with simulation, adjusting the dynamic properties can be just as intensive as hand-animating; some shots in *Cycles* show more successful hair simulation than others, though most of the motion does add to the film.



Figure 9 Screenshot of in-progress hair simulation by Christina Christie

When choosing to use XGen, it was important that the addition of the millions of hair polygons would not slow down render time. Early in production, time tests were run with the two rendering engines being considered for *Cycles*. The first was Pixar's Renderman, and the

second was Maxon's Redshift. In the end, Redshift was over 600% faster than Renderman after introducing XGen into the scene, rendering a frame in 2:48 as opposed to Renderman's 12:14. The look was nearly identical, but Redshift, being a GPU-based rendering engine, handled the increase in poly density much more efficiently.

The implementation of XGen had far reaching ramifications for *Cycles*. It bolstered the production quality of the film by challenging the visuals to be more high-fidelity, played a major role in deciding the rendering engine, and greatly lessened the amount of time required to complete secondary animation. As technically demanding as the plugin was to integrate, the way the results play with light and motion add to the film in a way that sculpted hair could not.

Cloth

Cloth simulation is the practice of utilizing physics to replicate real-world fabric. When done correctly, cloth simulation adds a layer of fidelity and fluidity to animation that enhances the visuals of the film without distracting from the animation. When done incorrectly, the result is a messy, glitchy disaster. For *Cycles*, cloth simulation was one of the two largest technical undertakings considered for production.

When working with cloth simulation, there are three separate elements to consider: the base animation, the dynamic properties of the simulation, and rendering the cloth. All three of these must be executed correctly and in sequence to avoid any undesirable visual artifacts such as clipping, pinching, or crushing.

Large studios usually animate the character's body without any clothing. This allows the animators to focus on the kinematics of the body without worrying about how cloth might interact with the motion. In the pipeline of cloth simulation, the animation on the body must be complete before final cloth simulation begins for the shot. This is because the clothing must be driven by the base body, meaning the base body must be exported as a cache to be included in a dynamics systemⁱⁱ as a collider. From there, the animation is used less as the final product and more as a guide for the simulation's motion.

After the animation is complete, the clothing must be created. While this can be done with a variety of tools and software suitesⁱⁱⁱ, Marvelous Designer was the tool researched for *Cycles*. Marvelous Designer is one of the industry's premiere tools for 3D cloth artists, allowing the user to create garments using real-world measurements in digital space (marvelousdesigner.com). It also hosts a robust simulation tool, designed to handle high-density calculations in an isolated environment. This allows Marvelous Designer to handle all simulation and then export the clothing cache back out to Maya for rendering in the user's engine of choice.

Rendering the simulation poses few unique challenges. While the process of applying shaders and textures to the simulated cloth is the same as it is for all standard 3D objects, interpenetration and clipping can proliferate unless the material is double-sided. In producing *Cycles*, I found that the export settings of the simulation are critical at this stage. Miscalculations in scale, poly density, and file type can be costly mistakes.

Despite all the research allocated towards cloth simulation, most of the film features sculpted and rigged clothing. This is because that while simulated clothing creates realistic, fluid movement, the parameters of simulation lead it to be more volatile and less predictable than the

alternative. This makes cloth simulation and the associated troubleshooting extremely time-consuming. In the final film, the only shots that utilize Marvelous Designer's cloth simulation are the shots where she throws off her graduate gown because creating the required fluidity in the cloth using a sculpt and rig would have been extremely difficult. As I designed most of the clothing in *Cycles* to be form-fitting, the lack of full cloth simulation does not noticeably detract from the overall look of the film.

Building an Organic Environment in Houdini

When developing a project that will have limited resources, the adage “work smarter, not harder” stays at the forefront of production (qtd. Allen F. Morgenstern). To best tell the story of *Cycles*, the characters had to visibly move through time. After selecting the gradual change of seasons to visually represent the passage of time, it became clear that *Cycles* would take place outside. This necessitated the creation of an organic world.

3D modeling is split into two schools. The first, organic modeling, focuses on creating living beings and creatures. The second, hard-surface modeling, focuses on man-made objects (Pluralsight, Hard Surface V.S. Organic Models). In the case of *Cycles*, the entirety of the film takes place in an organic oak-hickory forest. No forest is complete without trees, and *Cycles* would need a lot of them.

While hard-surface and organic modeling are widely considered to be the two types of model that an artist can create, actually creating the models can be done in a variety of ways. While traditional methods such as box-modeling and sculpting allow the artist complete control over every detail of the mesh, they also only create one model at a time. Faced with the need to populate

an entire woodland, creating a single tree at a time wouldn't be enough. How does one create an entire forest while still maintaining a style and artistic vision?

The answer is guided procedural modeling. In procedural modeling, the user creates a series of “nodes” that take unique input and produce a unique output in a way very similar to standard coding (Benes 1). Because of its high yield, adaptability, and versatility, procedural modeling is “one of the most powerful techniques for authorizing a vast variety of computer models” (Benes 1). SideFX's Houdini is the industry's premiere procedural modeling software, and that was where the creation of *Cycles*' forests began.

Procedural modeling has been used to create plants since the method's inception (Benes, 2). Using something called “L-Systems”, branches, leaves, and in some cases even cells can be told to branch off one another at unique angles and proliferate according to the user's input. These L-Systems are the basis for Houdini's pre-packaged tree generation nodes and served as the foundation for the tree generator used in *Cycles*.

Originally, research explored the creation of non-photorealistic trees. This meant the treetops would not react realistically to light but instead respond to hand-curated normals. By using non-photorealistic rendering in conjunction with non-photorealistic trees, the goal was to allow the artist complete control over the color of the leaves, the shadows, and the translucency of the foliage in a way that presented a more highly stylized and artistic render. However, as research continued, it became apparent that the rendering engine used for *Cycles* only supported non-photorealistic rendering if the tree shader was hand coded using Open Shading Language. While I heavily considered using OSL, it was ultimately abandoned because the film's style had become more realistic with the integration of xGen and procedural textures.

The method used to create *Cycles' Forest* is a combination of Houdini's native foliage generation tool and the techniques of other artists who have utilized, modified, and reworked the tool's structure (Kris, LucenDev). The result is a hybrid of the two, allowing for the generation of an endless array of user-guided foliage that can be made more or less stylized as per the artist's preference. While I used only used this tool to create more realistic looking trees in the end, the tool itself provided a multitude of ways to shape the treetops, crowns, leaf density, and overall uniformity using a handful of intuitive parameters. Without this tool, creating the setting during the allotted production process would have been nearly impossible.



Figure 10 Screenshot of photorealistic (PBR) and non-photorealistic (NPR) trees by Christina Christie

Similarly, I used Houdini to create the mountains visible in the background using procedural methods. Houdini provides a robust suite for terrain generation, and the artist was able to set and manage a small selection of parameters to achieve the desired look. This included

a high level of erosion, a clearing for the action to take place, and a low impact polycount. To create this effect, a combination of heightmaps, masks, and optimization nodes were used to create the final base mesh (Geven, *Learning Heightfields*). I created the low-resolution's normal maps by baking the results of Houdini's erosion simulation onto the low-poly mesh using Substance Painter, resulting in a low-impact but high-value production model.

CHAPTER 5: CONCLUSION

Cycles is a story about a father who struggles to keep up with his daughter as she races through life. At its core, the film focuses on coming to terms with change. Some chase it, looking for new opportunities or independence. Others struggle against it, desperate to maintain their comfortable status-quo. When these desires collide, there is conflict. Through that conflict, there is growth.

Coming-of-age stories are so abundant because what it means to come-of-age changes from generation to generation. *Cycles* began as a glimpse into my personal experiences but grew into a universal story through feedback and extensive research. Through the limitless possibilities afforded by 3D animation and the ever-evolving technology of the medium, I was able to translate my uncompromised vision from concept to screen and craft a visual narrative that resonates with a wide, inter-generational audience. This film stands as a contemporary but nontraditional example of the coming-of-age genre.

REFERENCES:

- Benes, B., et al. “Guided Procedural Modeling.” *Perdue University*, EUROGRAPHICS, 2011, pp. 1–3.
- Bret St. Clair. “*SPIDERMAN: INTO THE SPIDERVERSE: Building New York City*” *YouTube ImageworksVFX*, 10 Apr. 2019, <https://youtu.be/vH-LpARZurY>
- Campbell, Joseph, and Phil Cousineau. *The Hero's Journey: Joseph Campbell on His Life and Work*. New World Library, 2014.
- Campbell, Joseph. “Chapter I: Departure.” *The Hero With a Thousand Faces*, Princeton University Press, Princeton, NJ, 2004, pp. 71–78.
- Cauchi, Michael. “Beginners Guide to: XGen Pipeline for Beginners.” *Mikecauchiart*, Michael Cauchi Art, 28 Aug. 2018, www.mikecauchiart.com/single-post/2017/08/29/Beginners-guide-to-XGen-pipeline-for-beginners .
- Coats, Andrew and Lou Hamou-Lhadj, directors. *Borrowed Time*. *YouTube*, Quorum Films, 2015, <https://youtu.be/4G5cXMrV0B4>. Accessed 20 Mar. 2021.
- Cruise, Jenny. “Tropes, a Defense Of.” *Argh Ink*, 21 Dec. 2020, <https://arghink.com/2020/12/tropes-a-defense-of/>.
- Dudok de Wit, Michael, director. *Father and Daughter*. *Youtube*, Pensare Films, 29 Mar. 2017, <https://www.youtube.com/watch?v=CDprY-6IMG4>.

Originally premiered in 2000

Egizii, Matthew L., et al. “Which Way Did He Go? Directionality of Film Character and Camera Movement and Subsequent Spectator Interpretation.” *Cleveland State University*, 2012.

“Flawless Token.” *TV Tropes*, <https://tvtropes.org/pmwiki/pmwiki.php/Main/FlawlessToken>.

Geven, Jonne, director. *Learning Heightfields Pt 1: Heightfields?* *YouTube*, 20 Jan. 2018, <https://youtu.be/9k6noRP5n5k>. Accessed 8 Mar. 2022.

Giannetti, Louis D. “Movement.” *Understanding Movies*, Pearson, Boston, 2014, pp. 93–123.

Sobel, Josh, director. *Expressive Facial Rigging*, FRigging Awesome Studios, 2015, <https://friggingawesome.gumroad.com/>.

Kris, director. *Tutorial: Stylized Trees with Houdini and Unreal Engine*. *Youtube*, LucenDev, 29 Dec. 2019, https://www.youtube.com/watch?v=w985uZBzU_I. Accessed 8 Mar. 2022.

Utilized all parts of tutorial.

Larson, Eric. “The Phrasing of Action and Dialog in an Animated Film.”, animationmeat.com.

“Hard Surface V.S. Organic Models.”, *Pluralsight*, Pluralsight, 7 Nov. 2019,

<https://www.pluralsight.com/blog/film-games/whats-the-difference-between-hard-surface-and-organic-models>.

L, Alberto. “SIMPLE BUN HAIR XGEN GROOM FULL PROCESS EASY WORKFLOW (PREV).” *YouTube*, CGI Tutorials and Resources, 19 Mar. 2020, <https://youtu.be/QB4vAE5FQdY>

Le, Khang, et al. *The Skillful Huntsman*. Design Studio, 2008.

Collington, Mark. “Chapter 4: The End of Modernism and the Metanarrative .” *Animation in Context: A Practical Guide to Theory and Making* , Bloomsbury Visual Arts, London, 2017, pp. 144–159.

Millard, Kenneth. “Introduction.” *Coming of Age in Contemporary American Fiction*, Edinburgh University Press, Edinburgh, 2007, pp. 1–14.

Ruszkowska, Justyna Teresa. “Constructions of Fatherhood during the 'Transition to the Empty Nest' Stage of Parenting.” *Nottingham Trent University*, Nottingham Trent University, 2009.

Solarski, Chris. “Character Design.” *Drawing Basics and Video Game Art*, Watson-Guptill, New York, NY, 2012, pp. 188–200.

Spicer, Malory, and Maria Palazzi. “Digital Animation as a Method of Inquiry.” *The Ohio State University*, 2015.

“Stereotype, *N. (1)*.” Random House Webster’s Unabridged Dictionary, <https://www.dictionary.com/browse/stereotype>.

Thomas, Frank, and Ollie Johnston. *The Illusion of Life. Disney Animation*. Disney, 1995.

“Trope, *N.* (3*b*).” Random House Webster’s Unabridged Dictionary,

<https://www.dictionary.com/browse/trope>.

Wade, Lisa. “Power, Mickey Mouse, and the Infantilization of Women - Sociological Images.”

Sociological Images Power Mickey Mouse and the Infantilization of Women Comments,

The Society Pages, 8 Aug. 2013,

<https://thesocietypages.org/socimages/2013/08/08/power-mickey-mouse-and-the-infantilization-of-women/>.

Webster, Chris. “Performance Dynamics.” *Action Analysis for Animators*, Focal Press,

Amsterdam; London, 2012, pp. 306–306.

“What are XGen Descriptions?” *Autodesk Support & Learning*, Autodesk, 29 July 2019,

<https://knowledge.autodesk.com/support/maya/learn-explore/caas/CloudHelp/cloudhelp/2015/ENU/Maya/files/GUID-E90F6106-DF5B-4D8E-AE7B-65CBC2FDB13D-htm.html#:~:text=XGen%20Descriptions%20store%20settings%20for,by%20and%20organized%20in%20Collections>.

Williams, Linda. “Film Bodies: Gender, Genre, and Excess.” *Film Quarterly*, vol. 44, no. 4,

University of California Press, 1991, pp. 2–13, <https://doi.org/10.2307/1212758>.

“XGen Modifiers.” *Autodesk Support & Learning*, Autodesk, 29 July 2019,

knowledge.autodesk.com/support/maya/learn-

explore/caas/CloudHelp/cloudhelp/2019/ENU/Maya-CharEffEnvBuild/files/GUID-C1383446-2EA4-4E53-9FF3-5712EB720174-htm.html.

ⁱ Josh Sobel's "Expressive Facial Rigging" lectures were used extensively to create the high-flexibility rigs.

ⁱⁱ "Dynamic system" refers to the system of interrelated nodes required to create dynamic animation. This usually involves a nucleus solver to emulate the physics of the world, a dynamic object, such as cloth, and a collider, or the object the dynamic object interacts with.