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Until 2004, Walt Disney Studios' primary form of animation, called cel-style animation, consisted of hand-drawn images photographed at 12–24 frames a second. Since the studio officially announced that cel-style animation would be shut down in favour of CGI feature films (Druitt), computer technologies have become a central mode of animation in the Walt Disney Studios context. Films that were released shortly after this transition, such as Pixar's *WALL-E* (Andrew Stanton, 2008) and Walt Disney Animation's *Tangled* (Byron Howard and Nathan Greno, 2010), represent a departure from traditional animation. *WALL-E* and *Tangled* draw from the central principles of conventional Disney cel-style animation both narratively and stylistically, but their nature as computer-generated products allows for enhancements to the narratives that could not have been done to the same extent with hand-drawn animation. These enhancements are largely dependent on texture mapping, a technological innovation that visually depicts characterization and exposition when combined with traditional techniques like shape language, squash and stretch, and "rhythm, tilt, and twist." In *WALL-E* and *Tangled*, texture mapping is essential to both the style and narrative development of the films. This paper will argue that the narratives of these films are dependent on their digital production, despite containing prominent lingering codes and conventions of cel-style animation.

Cel-style animation, patented by Earl Hurd in 1914, includes the use of painted or printed moving elements placed on transparent celluloid frames over a static background. Walt Disney adopted this process when he founded Laugh-O-Gram Studio in the early 1920s and later Disney Studios in 1926. Disney subsequently became a pioneer of animation, using conventions such as shape language to communicate a mood through elements including line thickness and edge sharpness. Decades later, computer animation built on the cel-style of the previous generation to transform the landscape of animation. In a 1987 article entitled "Principles of Traditional Animation Applied to 3D Computer Animation," Pixar CEO John Lasseter offered an internal look at how computer-generated animation intentionally builds on the foundations of cel-style animation. The first computer-animation experiments that

took place in the 1960s and 1970s had a similar sleek and shiny look that lacked texture. As a result, animators developed texture mapping and furthered the principles of shape language by generating emotional and expositional depth through the use of shapes and lines, albeit now in a more detailed manner than ever before. Texture mapping is a graphic technique in which surface texture and detail are added to a 3D, computer-generated model ("Texture mapping"). Advances in texture-mapping technology have resulted in an almost photorealistic look and feel in contemporary computer-generated animation. Pixar Studios in particular has been a pioneer in texture-mapping technologies. RenderMan, the modelling and rendering software they produce, has become the industry standard for texture mapping photorealistic images and visual effects (Haswell 4). These technological innovations initiated a shift that has occurred in Pixar texture mapping toward an "organic aesthetic"—one that does not necessarily negate real-world textural referents but rather prioritizes expression over photorealism (1). Just as cel-style animation introduced storytelling techniques through shape, computer-generated animation introduces storytelling through texture.

Texture is a central tool for narrative and character expression in Pixar's *WALL-E*. The first few aerial shots of the tangible environment of the Earth, organically resembling an enormous landfill, tell the story of human-induced destruction in a matter of seconds. As the juxtaposition of the cheery song "Put On Your Sunday Clothes" fades away, an aerial shot closer to the ground reveals WALL-E navigating his way through the piles of landfill that are detailed to a level of precision that 2D cel-style animation would not be capable (see figure 1). After discarded newspapers and abandoned advertisements explain more precisely why humans no longer inhabit Earth, WALL-E, filled with the items he has accumulated, enters his home. This scene characterizes WALL-E through his

Figure 1. Aerial shot from *WALL-E* (2008)

interactions with human objects that are obviously foreign but pleasurable to him; this scene also encourages the audience to look at WALL-E through close-ups and longer takes. Although he does not speak, WALL-E is able to provide the audience with a deep exposition of his history through the textures of rust, dents, and grooves on his figure. This level of detail is generated through displacement shaders in the texture-mapping process (Haswell 5), a process that allows the animators to insinuate decades of existence into a harsh environment. According to Haswell, these textural imperfections are reminiscent of a 2D animation aesthetic. The roughness of *WALL-E*'s texture opposes the sleek, "perfect" look commonly associated with 3D computer-generated animation and more accurately resembles the "imperfect," expressive aesthetic of cel-style animation, which demonstrates a human presence in the creation (5). The textural techniques of *WALL-E*, although achieved through digital means, are founded on 2D animation principles. However, the level of precise detailing that texture mapping provides could not be achieved through cel-style animation (see figure 2).

This crossroads of hyperrealist (using tangible, real-world textures) and expressionist (using the texture to tell a story) representation exhibited in *WALL-E* is defined by Pat Power as "the magical-realist approach" (126). Functionality and texture are indexical and rooted in real-world referents, but the digital nature of the medium allows for versatility and expression. This approach is reminiscent of what Susan Buchan calls a cinematic "world," which "allows

Figure 2. The Trash City (*WALL-E*, 2008)

us to experience spaces and haptically to possess material objects that, in our physical world, are inanimate, but through the 'special powers' of animation, are endowed with a semblance of life" (102). In the same way that stop motion creates an uncanny feeling through the animation of tactile and material referents, the expressive use of hyperreal texture in *WALL-E* exhibits a limbo between pure reality and pure fantasy that accounts for its magical-realist approach. Although some degree of realism has long been an important principle in Disney's traditional cel-style animation, the hyperrealism required to achieve the magic-realist effect that is central to the emotional resonance and overall narrative in *WALL-E* is possible only because of advances in texture mapping and computer-generated animation.

Tangled, another computer-generated (CG) animated film, also draws from traditional Disney animation principles. Narratively, the film follows Disney tradition by appropriating and translating a classic fairy tale into an appealing story for a contemporary demographic. Stylistically, the film's look and feel are based on the "Disney aesthetic" as described by Frank Thomas and Ollie Johnston in *The Illusion of Life: Disney Animation* (Carter 3). These aesthetic principles include "shape language," which forms the aesthetic in *Tangled* through a fusion of *Pinocchio*'s thick lines and *Cinderella*'s lyrical shapes; "rhythm, tilt, and twist," which are elements of pose design that help generate the illusion of life to counteract the stiff appearance of CG animation; and stylized uses of squash and stretch motion (Carter 3–15). The film's original director, Glen Keane, even used a graphic tablet to draw over CG animators' work in order to provide notes on how to refine their animation to ensure it resonated with the traditional Disney aesthetic (Carter 3). The foundational use of traditional animation techniques, however, does not mean that *Tangled* could be transferred to a cel-style animated piece with the narrative intact. Two factors account for the narrative's dependence on CG animation: the film's irreverent postmodern approach and Rapunzel's incredibly detailed hair.

From the very first *Tangled* trailer released in June 2010, it was apparent that Disney was framing the film in a way that emphasized its high-flying nature, treating the fairy-tale style of the narrative in an almost parodic way reminiscent of a film like *Shrek* (Andrew Adamson and Vicky Jenson, 2001; see figure 3). The trailer employed a Dreamworks-esque style of modernizing the animated film by pairing Pink's "I'm Trouble" with exaggerated, cartoon-style scenes that do not appear in the theatrical release. Even the promotional posters for *Tangled* mimicked Dreamworks' postmodern, parodic approach by picturing the protagonists with raised eyebrows and knowing looks that promised adventure and comedy (see figure 4). In the film itself, contemporary dialogue such as "I'm not freaking out, you're

Figure 3. *Shrek* poster. Internet Movie Poster Awards, 31 March 2011, http://www.impawards.com/2001/shrek_ver3.html.

Figure 4. *Tangled* poster. Internet Movie Poster Awards, 29 July 2010, http://www.impawards.com/2010/tangled.html.

freaking out" may have come across as awkward and inappropriate in the more nostalgically based style of cel animation. Though the lighthearted, irreverent tone that was highlighted throughout the film's marketing campaign might have been possible in a traditional cel-style animated movie, the cutting-edge technology of computer-generated animation provided a more natural fit.

Additionally, the narrative of *Tangled* relies on CG animation because texture mapping was necessary for the animation of Rapunzel's hair in the film. *Tangled* is adapted from the fairy tale "Rapunzel," and impossibly long hair is an iconographic image associated with that story. In the creation of the film, Rapunzel's hair was elevated from its largely iconographic nature to be treated as its own autonomous character with a central function in the narrative. The character supervisor who worked on Rapunzel, Jesus Canal, stated as much in *The Art of Tangled*:

> [The hair] is actually a character—another character to animate. The way you usually do hair, it's a second pass, or an afterthought. Animators don't have to worry about it. But in this case, Rapunzel's hair—oh, boy—they need to animate it, and we have to interact with that. We have to create a new workflow, and an animator and a more technical person have to work together. (Kurtti 66)

The character of Rapunzel's hair in *Tangled* demands a level of malleability and texture that only computer technology can provide. The hair is an extension of Rapunzel—she uses it as a rope to tie up Flynn Rider and to climb down from her tower, she uses it as a lasso to pick up things and fight enemies, and she even uses it to form a path where she walks. Glen Keane meant for Rapunzel's hair not just to become a physical extension of Rapunzel but an emotional one as well:

> Ultimately,it'sgoing to be amazing watching Rapunzel run down the stairs with seventy-five feet of hair following behind her. Just mesmerizing—all this hair shimmering, every little strand. I mean, millions of hairs moving on there. That's something you can't do in hand-drawn animation. Though I still have to remember that Ollie's comment, 'What's she thinking?' is really the thing that people care about. That's what's going to count. (Kurtti 66)

One example of this characterization occurs when Rapunzel and Flynn enter the kingdom. Initially, her hair poses restrictions on her mobility in the busy streets. Rapunzel and Flynn then decide to enlist the help of young village girls to elaborately braid her hair to keep it off the ground. Her newfound mobility, which allows her to explore the town and dance in the streets, parallels Rapunzel's newfound freedom. It is only when Rapunzel returns to the tower and is once again trapped that Gothel undoes her braided hair. Rapunzel's hair in *Tangled* functions as a reflection of her thoughts and emotions, which is emphasized when the freedom of her hair affects the freedom of Rapunzel herself. The elaborate texturing and animation of individual strands of hair serve to highlight the importance of this crucial narrative element. Such a degree of versatility and detail are not possible in cel-style animation, in which hair cannot be feasibly animated as anything more than a single-coloured, single-textured element. Central narrative elements and catalysts, such as Gothel's envy of Rapunzel's hair or Flynn's sacrificial act of cutting the magical hair when he is injured, would have less emotional impact if the character-

ization of the hair had not been strongly developed through textural storytelling. In order to give Rapunzel's hair the characterization it deserves, *Tangled* relies on the level of detail that can be achieved only through computer-generated animation.

The ways in which *WALL-E* and *Tangled* employ traditional techniques of cel-style animation make it clear that computer-generated animation is not simply a subversion of or a detour from 2D animation but rather an evolution of it. That being said, CGI animation opens the door for narratives that could not be executed to their full capacity within the constraints of cel-style animation. Through the technology of texture mapping, *WALL-E* provides visual exposition for environment and characterizations, while *Tangled* turns hair into a detailed and autonomous character. Both films demonstrate that Walt Disney Animation's transition to exclusively CGI does not mean the end of animation's artistry or tradition; rather, by building from a core foundation of traditional animation principles, these films expand the narrative and character-focused capabilities of animation, bringing forward new stories that the world would never have seen if the studio had remained tied to the nostalgic technologies of cel-style animation.

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