The Visual Effects of ParaNorman:
## *New Tools And Stereo Stop Motion*

Digital ghosts, zombie transformations, spectral creatures, set extensions, digital background crowds…all things you wouldn't expect in a film whose core is one of the oldest forms of animation, stop motion. These are all part of the role of Visual Effects on ParaNorman. Tools of all kinds are used to create something that's thought of as handcrafted and now the computer has become just another one of those tools.

The goal for visual effects in the world of stop motion involves blending and matching our digital enhancements to the stylized look and handmade feel of the real puppets and sets. When adding effects like lightning, boiling clouds and spectral energy, we first always begin with testing traditional materials on stage. Then we use those images to inspire us to create an effect that not only compliments and enhances, but also extends its impact and performance beyond what's physically possible.

Angry Aggie is a character created as a real stop motion puppet, and then enhanced with a digital dress, tesla coil-like energy, and a yoke of spectral plasma surrounding her. The dress was based on actual physical designs of shredded paper and cloth, and her hair based on handmade, blown ink artwork. A high level of 3D puppet matchmove tracking was needed to critically lock all these elements onto the puppet, and extensive layering in Nuke was used to integrate everything together. Separate lighting passes of the environment were shot so we could sync the interactive lighting with her emotions. As Norman confronts Aggie in the remains a of destroyed void, we matchmoved Norman as well so that the Houdini based spectral energy Aggie emitted could collide and wrap around him.
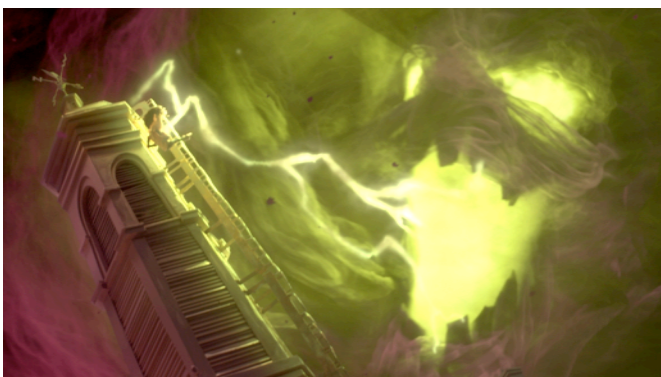
Another incarnation of Aggie was as the Witch Face in the sky. The boiling clouds were based on practical tests of bridal veil material. The look and translucent quality of this material was replicated using Houdini and then sculpted and animated into the terrifying face of the giant witch. Additional 2D animated lightning bolts were added as she torments the townspeople and knocks Norman off the tower.

Norman has a special gift that allows him to see ghosts. His grandmother, uncle and Bub the Dog are ghosts that, like Aggie, were created as real puppets and later enhanced digitally to create their spectral appearance. This involved 2D and 3D tracking, and particle systems in Nuke and Houdini to achieve the balance of chromatic aberrations, floating motes and spectral veil material seen swirling around them.

The same process was applied to the full digitally created ghosts that appear as Norman walks to school. Each ghosts was designed to evoke a different time period of the town. The shot of Norman walking down the street greeting them was nearly 48 seconds long. The process of stop motion animation requires that every frame is shot individually as the real Norman puppet is moved. The length of this shot required over 1100 frames, several weeks of setup, animation and months of post digital work. The shot ends with a digital set extension that adds the streets, downtown and hills on the horizon.

One of the challenges given to visual effects on this film was to increase the scope of the stop motion world using digital set extensions. As real buildings and set dressing were being created for stage, visual effects artists were photographing, scanning, modeling and texturing digital versions to ensure we could seamlessly extend the environments. Once we made the world larger, it was then our task to populate it with digital background characters. Some shots contained hundreds of angry townspeople rioting in the streets, while the largest crowd shot contained over 4000 CG extras. A system of body shapes, costumes, accessories and motion libraries had to be planned out in advance to optimize the workload.
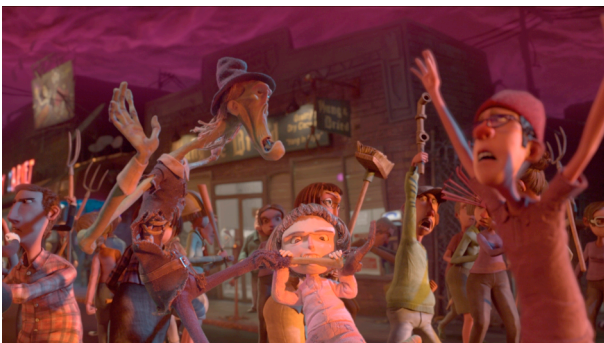
In the climax of the film, the zombies are freed of their curse and transform into their ghostly alter egos before dissolving away. To achieve this effect, it was critical that visual effects capture and recreate the puppets for every frame of each zombie/ghost pass shot. Using multiple cameras and software to resolve 3D meshes ensured we could match geometry to make the zombie crack and break away, revealing the ghost within, which then unravels into veil material that floats away on the wind. Particle systems and dynamics using Houdini combined with Nuke achieved the final effect.

On ParaNorman, we used the most advanced techniques to support one of the oldest forms of animation. At LAIKA, we're dedicated to preserving a way of artistic and visual storytelling that we feel the audience appreciates due to the tactile quality of miniatures and puppets. We're also innovating and taking advantage of new tools and technologies to ensure we can continue bringing this handcrafted style to the public. In an industry filled with flawlessness, we've embraced how the subtle flaws of a handmade object make it beautiful, unique and something to be treasured.