Magical Menage

Several London-based visual effects studios create the digital cast and more in the latest Narnia adventure

By Barbara Robertson

The beautiful but often-dangerous world of Narnia has offered the Pevensie children adventure, happiness, and heartache during each visit to the enchanted land. In the third visit, which plays out in the feature film *The Chronicles of Narnia: The Voyage of the Dawn Treader*, two of the children—Lucy and Edmund—along with a cousin, meet up with Prince Caspian as they sail aboard the ship "Dawn Treader" to the edge of the world. En route, they happen across all sorts of creatures and characters, from the iconic Aslan to the comical Dufflepuds—brought to cinematic life by computer graphics. VIDEO

Indeed, water plays a major part in this latest film, based on the book series by CS Lewis (for a detailed look at the creation of the various forms of digital water, including the Naiad water creatures, see "Swimming in Effects," in the January/February 2011 issue of *Computer Graphics World*). Yet, as always, the fantastical world of Narnia is graced (and plagued) by a myriad of digital inhabitants. VIDEO

Mousing Around VIDEO

The Moving Picture Company (MPC) handled more than half of the total VFX shots in the movie, including integrating "The Dawn Treader" into the CG water, a sea battle, and other water-related shots. MPC also had its hands full creating some of the Narnian creatures.

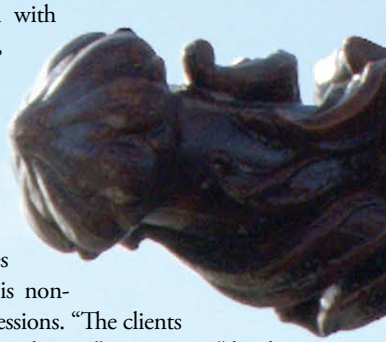
MPC had created Reepicheep for Prince Caspian, the previous film, but he's aged now for this movie, and the artists had ideas about how to improve the popular character. "Not often do you get the chance to directly change the way you did a creature the first time around," says Ben Jones, character lead. "We knew we could do better."

For example, animators working on the previous Reepicheep had struggled with particularly mouse-like poses. To help the *Dawn Treader* animators hit those key poses, modelers and riggers built the musculature and bones to squash and stretch, and form different shapes. "There's a specific shape mice make whereby they arch their back and their hindquarter is in a curving arc," Jones says. "We made sure that came naturally."

The team also made a less mouse-like change. Reepicheep has aged, his performance is more subtle, and he acts straight to camera. Previously, the animators had trouble with eye lines because the character's eyes were set far apart, more on the sides of his face than the front—as with a real rodent. In this film, though, his eyes moved forward. "That made his face more expressive," Jones says.

During postproduction, a change in voice actors to Simon Pegg necessitated changes in the character's facial animation rig. "Because the tools are muscle-based, we could react without too much trouble," says Adam Valdez, visual effects supervisor for MPC's shots. "We've put a lot of energy into making our rigs fast and flexible for the animators so we can turn around changes quickly."

For Reepicheep's fur, MPC upgraded the overall groom of the hair and fur system developed for *10,000 BC* (see "Making History," March 2008), and improved the interaction with water and blowing wind. In addition, a new lighting pipeline and updated shaders that take advantage of image-based rather than point-based lighting improved his look.



Dragon Drama

In the film, Reepicheep shares scenes with Eustace, a 60-foot dragon who is non-speaking and relies solely on facial expressions. "The clients were keen that the boy [Eustace] was the dragon," Jones says, "that he was trapped inside and couldn't speak. That was tricky, really. Quite a tough thing to do. We had to look at the actor's facial expressions and translate them into the dragon. We took reference photos and modeled the shapes separately."

To build the dragon, MPC started by cyber-scanning a maquette created by KNB in Los Angeles, and then moved the data into Pixologic's ZBrush. Because the director wanted to relate the design back to Will Poulter, who

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Making Magic

Narnia is a magical world, and helping to create a fairy-tale environment was The Senate, where a team of approximately 40 artists worked on 250 shots using Autodesk's Maya, Mental Images' Mental Ray, Apple's Shake, and The Foundry's Nuke.

"The bulk of our work was in creating environments and extending environments," says Richard Higham, visual effects supervisor.

One such environment was a magical library in which a magician emerges from a wall of books and tosses a fantastic map across the floor. "The magician was live action," Higham says. "We took a cyber-scan of him for the reveal shot, cleaned up the scan, rigged it, motion-tracked the actor in the plate, and then projected the clean background from a certain frame."

So, when you first see the background, it looks normal, and then as the camera tracks in, a shape distorts the background. "It doesn't shift in the way your eyes expect," Higham explains. "After that, we brought in reflections from glass jars on the shelf and distortions, all from the 3D shading network. We had a projection pass and created a refracting shading network that we applied to the model of the magician. Then we hit the render button, and whatever happened, happened."

Once fully into the room, the magician extends his arm and makes a throwing motion. A map unrolls in the air, floats a bit, and settles onto the floor—a 3D map created at The Senate. "Imagine looking at Google Maps and that you can drag a scene until you get what you're looking for," Higham says. "It's like a holographic map." But, it doesn't look like a hologram, at least not like today's holograms. The team created a textured, animated border for the map with 15 homages to previous films. The camera flies over digital ocean and through digital clouds, all created with Maya fluids, until it approaches the dark island created at MPC, a pre-rendered element that The Senate composited into the fluid simulations.

Because the children travel to an island that The Senate created in miniature for the map, the studio also created a full-sized version. "We received footage of people in little rowing boats approaching the island, so we created an establishing wide-angle shot using matte paintings and full-CG renders of the backgrounds," Higham says.

The Senate also sent a star shooting down from the sky, formed a shape through particles emitted from geometry, and resolved it into a woman with a residual glow created in compositing. The artists modeled King's College Chapel in Cambridge and the environment surrounding it for an 800-frame shot in the opening. And, the crew created other environments.

"We're known for our invisible effects, but this film allowed us to dabble with magical stuff and be creative with environments—extravagant, ornate, exotic, jungle woodlands," Higham says. "In that sense, it's been a really good project for us." *–Barbara Robertson* **VIDEO**

played him in boy form, MPC incorporated the actor's signature shapes into the dragon's facial design. To soften the dragon's look, they gave him crocodile skin with a leathery feel, rather than a scaly, hard surface. "The boy inside fully inhabited this creature," Valdez says. "But, he hadn't become a monster."

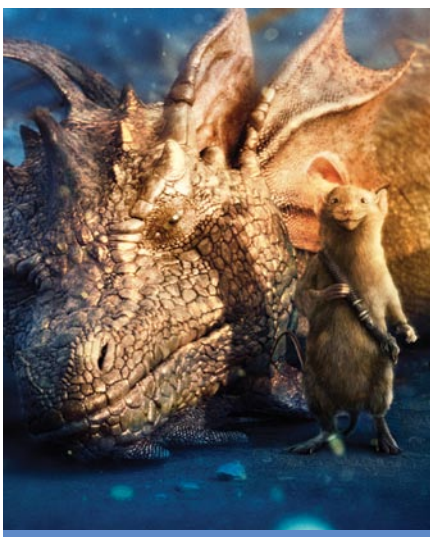
Because the boy transforms when he steals a piece of treasure, the MPC artists also added gold flakes to his skin to give him a gold patina. "We wanted to give the idea that the curse of the treasure is part of his body," Valdez says.

In addition to tricky facial expressions, the dragon has legs, arms, and wings. It flies in most of the shots, sometimes while carrying a character in its arms. And in some shots, Reepicheep rides atop its head. "The animators went through lots of testing cycles," Jones says. "His wings are behind his arms, dangling in front. It was critical to do those animation tests to figure out how he could fly."

A combination of blend shapes, muscle shapes, and cloth shapes made it possible for the creature to distort without looking rubbery. "The hardest thing was giving him believable skin and muscle deformation," Valdez says. "We wanted a surface area that preserved the deformation so that his wings felt like they were catching and filling with air."

All Hands on Deck

The sea serpent was the largest of MPC's creatures, the strangest, and, in some ways, the most difficult. "It has little hand feelers all over it," Jones says. "It was a nightmare to rig." The animation tools the team developed, however, helped the animators deal with that complexity more easily.



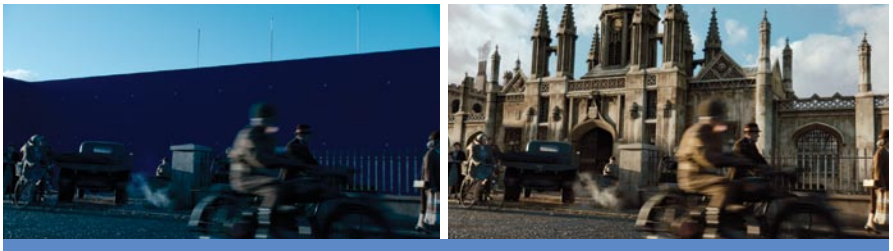
Eustace, a 60-foot dragon, and the tiny, furry Reepicheep share several shots despite their differences, thanks to animators at MPC.

At left, Framestore re-enacted Aslan the lion, and at right, MPC sent Reepicheep the mouse scampering across the screen again for *Dawn Treader*, the third film in the *Narnia* franchise. In each case, the studios needed to take advantage of what they had learned on previous films without losing the familiar personality and appearance of each character.

"We gave the animators values so they could choose the rate of change and how randomly and how fast [the feelers] move, and the tools would generate the motion automatically," Jones says.

In a key sequence during the battle, the creature wraps around the boat three times. For this, the technical animators used cloth simulation and other in-house tools to handle the collisions between the surfaces and create the correct amount of friction to look believable.

"We had snake animation tools that allowed us to keep a fixed length and get side-winding snake motion," Jones says. "We have a curve down the center, and animators could interactively choose which points are in world space and which connect to an object. So the tail could whip around the ship and lock on, and the head could move away independently."



Artists at The Senate modeled King's College Chapel in Cambridge for an 800-frame shot in the opening, and composited it into bluescreen footage (above, left) to create the final image (above, right).

Aslan and the Dufflepuds VIDEO

Framestore had created Aslan for Prince Caspian, and when asked to reprise the character's role for *Dawn Treader*, the artists there learned their job was to duplicate what they had done before. "We're never quite happy to roll out the same thing again," says Jonathan Fawkner, visual effects supervisor. "So we dusted him down and ported him to a new fur system we have here, which made him easier to light and composite. We basically cleaned him up, and I think he looks quite different."

In addition, for the previous film, the studio gave the lion a requested golden fantasy look. For this one, everyone wanted him to look slightly more realistic, so the crew re-designed the shaders and re-groomed him. "The re-designed shaders help him respond to CG lights more in the way the artists expected," Fawkner says.

The crew made a few other changes as well based on particular shot requirements. When Eustace, still in dragon form, meets Aslan on a beach, for example, the lion paws at the ground. "He tears the skin from the dragon and releases Eustace from the curse, so we needed a close-up on the paws," Fawkner says. "It was quite tricky because no one realizes how stupid a lion's feet look in close-up. We had to create a cross between the lion's foot, which is a massive sort of paddle with furry lumps for toes, and a kitten's paw, which is familiar to people."

During shots in which Aslan's mane needed to blow in the wind, the character artists displaced guide hairs using a fluid-simulation system. "It was a balancing act," Fawkner says. "Occasionally, it looked like he was underwater, but it gave a nice effect when we balanced everything right."

The Dufflepuds, however, were completely new. Put under a spell by a magician who owns an island, they are smaller than normal-sized humans and have only one leg. "The natural thing would have been to make them with CG to give them freedom of movement and the capacity to do the most impossible things," Fawkner says. "But there were 16 Dufflepuds and 250 individual performances. That was more than we could afford." So instead, the crew shot the upper torso and heads of 16 actors jumping in one spot in front of a bluescreen.

"But, after we shot these characters jumping, [production] decided the sequence was for comic effect, and we needed to have them jump higher and higher and spin all over the place," Fawkner recalls. So, the Framestore artists retimed their performances to give them more of an arc, and allow the CG leg to jump higher. They matched those re-timed performances to the previs animation until they found four or five similar takes for each Dufflepud. They body-tracked the performers and rigged 16 individual one-legged CG characters modeled using cyber-scans of the actors. Then, they attached the legs to the bluescreen elements.

"We had a rig that allowed the animators to pivot the 2D object in [Z space] and move it up and down, but that's all, so it was quite tricky from the animator's point of view to get it to work quite right," Fawkner says. Because the crew from the "Dawn Treader" filled the bluescreen plate into which Framestore needed to insert the Dufflepuds, to make the small characters visible, the animators had them jump higher than the crowd and into pools of light.

"We stuck a lot of environments into the shots as well, including 3D trees with leaves blowing in the wind, anything we could do to keep it from looking like a Teletubbies set," Fawkner says. "We needed to pull out the stops to put a realistic spin on it."

In the book, CS Lewis is able to describe in words the odd characters and unusual sites that make *Narnia* so enchanting. In *Dawn Treader*, like in the previous *Narnia* movies, modelers and animators had to use their well-honed CG skills, to do the same. And the results were, well, magical. ■

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