Industrial Light & Magic

By Claudia Kienzle

While ILM received 2005 Oscar® nominations for "Best Visual Effects in a Motion Picture" for *War of the Worlds* and *Chronicles of Narnia: the Lion, the Witch, and the Wardrobe*, this prominent visual effects company has proven itself a winner through its history of ground-breaking visual effects work.

For over a decade, ILM has had a hand in virtually every major, visual-effects-intensive blockbuster movie to hit the big screen. Steven Spielberg's *War of the Worlds* and Disney's *Chronicles of Narnia* both raise the benchmark for visual effects by intensifying the impact and realism of their extraordinary visual effects scenes.

ILM created effects magic for both films concurrently, with its artists switching between the *Narnia* world of fantasy and mythological creatures and the *War of the Worlds* destructive attack by alien invaders. The two biggest effects shots—the Bridge Scene in *War of the Worlds* and Coronation Hall in *Chronicles of Narnia*—both involved mixing hundreds of layers of CG and live action elements while striving for seamless realism.

ILM artists say they could not have completed these challenging, complex visual effects sequences with such riveting results in the tight timeframes they were given without the Discreet® Inferno® visual effects compositing solution and Autodesk® Maya® 3D animation software.

The Bridge Scene

In the Bridge Scene, Ray Ferrier (Tom Cruise) and his two children escape in a van as aliens attack and destroy the city around them. Heat rays, emitted from alien tripods above, hit the Earth and blow up a bridge overpass carrying cars, trucks, and people. The vehicles, including an 18-wheeler, come "raining down" from the bridge onto the street below and many buildings and people are vaporized.

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"While this sequence starts out with the original film plate, it progresses to the point where the viewer is seeing miniatures from our model shop standing next to 3D-generated and true-scale, live-action buildings. The CG buildings were based on 3D geometry with photorealistic building facades projected onto them," says Grady Cofer, Inferno supervisor at ILM.

"The real challenge to this compositing was that these 3D and live action buildings and vehicles had to fit together seamlessly and credibly, while maintaining the proper 3D perspective as you pass by them," Cofer adds. "The ability to manipulate 2D objects within a 3D space is something that the Inferno does especially well. And it's a capability that we use to full advantage here at ILM."

The Heat Rays

ILM's SABRE department, named after the light saber swords made famous by *Star Wars*, is based upon Discreet Inferno, Discreet® Flame®, and Autodesk® Burn™ technology. There are nine Inferno systems and three Flame systems, as well as a large "proc pool" devoted to Burn background render processing. Burn played a critical role in helping the SABRE artists meet extremely tight deadlines on these films because the creative work could continue on the Inferno systems after they'd "kicked off" renders to Burn.

"Being able to try many creative approaches quickly and have immediate feedback was a tremendous plus for conceptual effects like the heat rays. We tested many ideas—electrical bolts, pulse beams, laser lights—but we settled on a unique effect that looked like searing, glowing, greenish 3D plasma," says Cofer.

The heat rays were created in the Inferno Action module using a particle generator that the artists used to "spray" particles along pre-determined paths. This sprite-based particle emission was then treated with glows and a greenish hue for a very innovative, organic look.

Creating Creatures

The climax of *The Chronicles of Narnia* features an immense, ornate hall which is the setting for the King's coronation. Lining both sides of the main aisle are hundreds of creatures, both real and mythical, who watch as Aslan the lion, the children, and others walk by. The crowd is a sea of fascinating characters, such as half-man-half-horse, half-man-half-goat, and unicorns, which are made believable by how well the live action human upper bodies moved in relation to the CG animals' lower extremities.

"This scene was daunting because we were responsible for creating over 30 different types of creatures within six months—far less time than special effects houses are typically given—and accomplish this without sacrificing any quality," says Jeff White, creature TD (technical director) for ILM.

"Using Maya to its fullest extent, we devised innovative ways to streamline the rigging process. Although we had to create unicorns, centaurs, fauns, and other diverse mythical creatures, we determined that there were many similarities to their forms," says White. "We boiled all of the mythical creatures down to four basic categories—bipeds, quadrupeds, horse, and human, and then used those basic riggings as a springboard to generate all the creatures needed for the show," White adds. For example, a faun combined a human upper body with goat legs; however, they found that using the base rigging for 3D horse legs expedited the process without sacrificing quality. The base rigging or skeletal structure for the horse could also be modified to become a boar.

"Maya offers us a comprehensive toolkit to create rigs and deformations to really marry the live action and CG body elements together," says White. "Also, tools such as Maya Hair and Fur were exceptional for creating hundreds of horse tails and minotaur tails quickly."

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Occasionally, the ILM animators exhausted the features in Maya and needed something more. "So our software people used the Maya API (application program interface) to extend the program to handle whatever task we needed to accomplish—for example, we wrote iSkin, a Maya plug-in, for skinning deformations," says White. "With Maya, we're always able to find really creative solutions to very complicated problems to get our creatures to look, move, and deform properly."

The Coronation Scene

"The biggest challenge in compositing the Coronation Scene was creating mythical creatures that had live action human upper bodies and CG creature lower bodies," says Kevin May, senior Inferno artist in the ILM SABRE department.

"Where the human part meets the CG part, there were a lot of integration and layering problems. For example, the human muscle flexed but the CG cloth over it did not. Or a belt worn by the centaur was married directly to the live action plate of the upper body but not the lower CG animal part," May adds. "So I used a lot of Inferno deformation tools and extended bicubics to get those to match up perfectly, and the complexity of doing that for a whole crowd of mythical creatures was quite extensive."

Another challenge was that some of the creatures were supposed to look very tall, so when they were shot, they stood on green screen platforms. But when these platforms were keyed out, they found that parts of the Coronation Hall floor had been obscured in the live plate. They used Inferno tools, such as rotoscoping, paint, and projected textures onto a bicubic surface, to fill in the missing portions of floor.

"Altogether, there were several hundred layers to composite, and we had the Inferno systems going day and night. We could finesse details—like the way CG cloth moved in relation to the character wearing it—without having to redo the entire shot," says May. "We broke up extensive shots into logical groups of layers, and started compositing from the background and working forward. The Inferno system's ability to give us immediate creative feedback, and having Burn handle all the rendering as a background process, was a huge benefit on visual effects shots as demanding as this."

Cofer agrees: "I don't think it's a stretch to say we couldn't have done these visual effects sequences without Inferno and Burn. There are many tools out there that let you stack up 50 rendered elements, but there's something else that Inferno has—it's providing for an artist's touch and that's what really matters. And it does so with flexibility and speed, and a user interface which is 'pitch perfect' in my opinion. It's the perfect tool."

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