© Paramount Pictures, *Aeon Flux*. Image courtesy of The Orphanage.

# The Orphanage

*By Audrey Doyle*

At this leading visual effects company, artists spend more time creating art, thanks to the high-end tools in Autodesk Maya and Autodesk 3ds Max software products.

At The Orphanage, technology takes a back seat to artistry. "I consider visual effects to be moving surrealism," says Jonathan Harman, a CG supervisor at the company. "Just as Dali didn't spend all his time thinking about how the chemicals were mixed to make the paint he used, we don't want to spend all our time thinking about the software we're using."

"If we're using good software," he adds, "our artists will spend less time thinking about the technology and they'll spend more time being artists."

To achieve such artistic freedom, The Orphanage, a leading visual effects, production, and technology company based in San Francisco and Los Angeles, has integrated Autodesk® Maya® software and Autodesk® 3ds Max® software into every stage of its pipeline, from modeling to rigging to animation to rendering. "It's about direct manipulation. We want our artists to drive the creative process directly and not have to move through layers of abstraction and complexity to achieve their creative visions," says Dan McNamara, vice president of technology. "Maya and 3ds Max allow our artists to do that."

According to Harman, the artists have been achieving this goal with Maya and 3ds Max for several years, using Maya for modeling and creature work, and 3ds Max for shading, texturing, lighting, and rendering on projects ranging from feature films to television commercials to music videos. During that time, however, programmers at The Orphanage also had to bolster their production pipeline with proprietary tools designed to enable the software to interoperate.

Now that both Maya and 3ds Max are part of the Autodesk Media and Entertainment portfolio, the artists are looking forward to smoother interoperability between the two powerhouse packages. "We used to feel that having Maya and 3ds Max in our pipeline was both a strength and a weakness—a strength because each package has very strong features that

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complement each other and a weakness because getting data from one package to the other was an issue that required some heavy lifting on our part," Harman says.

"Today, we're using the FBX file format to transfer data between Maya and 3ds Max, and we're looking forward to having even more synergy and interoperability between the two packages in the future," he continues "This will turn what used to be a weakness into a very important strength."

Over the years, artists at The Orphanage have relied on the varied and robust tools in Maya and 3ds Max to create stunning digital effects for a multitude of projects. Most recently, the company created effects for the movies *Harry Potter and the Goblet of Fire* and *Aeon Flux*, and it is currently working on effects for *The Host* and *Superman Returns*. As the team explains, each of these projects has presented CG challenges that they have been able to overcome, thanks to certain features and capabilities in Maya and 3ds Max. In *Harry Potter*, for instance, one of the team's responsibilities was to create effects for the scenes comprising Dumbledore's pensieve. According to the story, a wizard can remove a thought from his mind and place it in a pensieve, which is a magical object that stores memories. This leaves the wizard with a clear, fresh mind to concentrate on more pressing matters.

At one point in the film, Harry falls into Dumbledore's pensieve and ends up in one of the elder wizard's memories of a trial that took place sometime before. The artists used Maya to model the environment—an elaborately detailed trial chamber measuring eight stories high and weighing in at 3 million polygons. "Maya is great when it comes to handling huge, very detailed and dense models like this one," McNamara says. In addition to the size of the model, another challenge concerned rendering it, which they accomplished in the Brazil Rendering System in 3ds Max. For this task, the team found the Per-Pixel Camera Map plug-in to 3ds Max particularly helpful. The Orphanage artists developed the plug-in for their work on the film *Hellboy*, and Autodesk began packaging it with 3ds Max version 7.

As Kevin Baillie, associate visual effects supervisor on *Harry Potter*, explains the artists rendered the trial chamber environment via projection mapping, a technique that relies on the theory of matte painting from the camera's perspective in that artists work on only what the camera will see. "It allowed us to take this environment whose look we had developed to a reasonable state, render out a few different views of it, and hand them to our matte painters, who painted on the frames all the details that would have been too difficult or would have taken too long to do in 3D," he says.

Then the matte painters handed the views to the 3D team, who used the 3ds Max plug-in to project the paintings back onto the Maya geometry and render them through the 3D camera in 3ds Max. "As a result, when we flew the 3D camera through the trial chamber, it looked like we were moving through this beautifully artistic environment," he adds. "With this tool, we made that environment really sing."

The Per-Pixel Camera Map plug-in also played an important role in the artists' work on *Aeon Flux*. According to Harman, who was a technical director on the film, one of the team's more-challenging shots concerned the gigantic city of Bregna and the lush forests surrounding it, all of which they modeled in Maya and textured and rendered in 3ds Max and Brazil. "In this shot, we flew the equivalent of 50 miles through and over the CG forest, and then into the CG city," he says.

In addition to adding a heightened sense of realism to the environment, the plug-in enabled the team to accommodate changes quickly and easily. "In a big shot like this, it was important for the director to be able to ask that the trees be greener or the walls on a building be mossier, for example, and for us to be able to make those changes quickly," Harman says. "The matte painters just had to go in and paint the trees greener and paint more moss on the walls. We didn't have to re-model anything."

Another challenge on *Aeon Flux* that the Autodesk software helped the artists overcome concerned the metal spheres the title character used to escape from prison. Prior to her imprisonment, as *Aeon Flux* crept along a maze of hallways en route to her assassination attempt on another character in the film, she had released several drops of liquid from a ring. While she's trapped in her cement cell, she whistles; the drops of liquid pop up off the floor and transform into metal spheres, which roll to her cell, assemble on an exterior wall, and explode, freeing her.

To handle the challenge of creating the spheres' photorealistic reflective surfaces, the team turned to the image-based lighting tools in Brazil and 3ds Max. "We used high-dynamic-range images captured on set to light the spheres and create the reflections," Baillie says. "If something has a bright highlight on it and it moves quickly, you want the motion blur to act properly when the object is moving—the highlight should streak and stay crisp and hot, and the rest of the object should get blurrier. We couldn't have achieved this look on those metallic spheres if we didn't use the image-based lighting technology in Brazil and 3ds Max to light the objects and map the reflections."

As an aside, Harman and Baillie equate the complexity of the reflections in these shots with the work the team completed recently for a Sprint/BMW commercial called "The Build." At one point in the commercial, as an actor reaches for the car's door handle, you can see the reflection of his arm on the side of the door.

"For this commercial, we had to create some tricky blurry reflections to provide an extra level of photorealism," recalls Harman. "The idea is that if you put your hand on a car and then take your hand away, as your arm moves away from the car its reflection becomes blurry but the reflection of your hand remains more in focus. With Brazil, we were able to get that extra level of photorealism; that blurry reflection."

Images courtesy of The Orphanage.

The team also had to do some tricky shader work in this Sprint/BMW spot to get the metallic look of the paint on the car. As Baillie explains, a car with a metallic finish actually has two layers of paint materials: base layers of paint with metallic flecks that provide the sparkles, and a clear coat on top that provides sharp reflections. "With the layer shaders in 3ds Max and Brazil, we were able to create the look of metallic paint on the car, which was necessary in order to sell the look of the car."

Another benefit of Brazil and 3ds Max on all of the team's recent projects was the products' support of the OpenEXR format. OpenEXR is the open source, high-dynamic-range file format developed by Industrial Light & Magic for advanced imaging in movie production. The main advantage of the format is that it allows up to 32-bit floating-point pixels and multiple lossless image compression algorithms of up to 2:1 lossless compression on film-grained images.

According to Harman, support of this file format has enabled the artists to speed up the rendering process on their projects. "Extra channels—for instance, a depth pass, or a vector channel pass, or an object ID pass—are included inside the file format, which in compositing can be broken out and used in different ways," he says. "For example, a vector pass can be used for motion blur, or a Z-depth pass can be used for fog to give more depth to a scene.

"Previously, we would have had to run out an environment fog pass to get depth into a scene, or run out a multi-segment motion blur where the camera goes through a scene repeatedly, and they would have been separate renders and separate elements taking up space on our network and taking up time on our renderfarm," he continues. "Having that integration in the one OpenEXR file format has allowed us to render single files that contain all of that information."

Although impressive, photorealistic environments and models aren't the only specialty at The Orphanage. The artists also specialize in character animation, as reflected in two film projects currently in production: *The Host* and *Superman Returns*.

Produced in Korea, *The Host* tells the story of a mutant fish-type predator that emerges from Seoul's Han River and begins attacking people. Baillie says that one of the biggest challenges for the team has been to set up a creature pipeline capable of handling the approximately 125 extremely long shots they must complete. "We've done creature work in the past, but nothing on this scale. So, we took a step back and reevaluated how we were doing things in our creature pipeline in Maya, and brought it to a new level."

As Baillie explains, typically it can take a long time from when an animator creates a piece of animation to when he can see the animation rendered. For this project, the team must complete their shots within a tight deadline, so using the MEL scripting language in Maya and MAXScript in 3ds Max, the studio's Brian Kulig developed a tool, called the Shiny Red Button, which is helping to speed up the process.

"This tool allows our animators, with basically a press of a button, to create an intermediate file that they can transfer from Maya to 3ds Max and render automatically on our renderfarm," Baillie says. "In this way, they can see what the creature is going to look like in the scene, with basic lighting and shading on it. It really quickens the feedback loop and it's a great example of the scripting flexibility of Maya and 3ds Max."

The team also used MEL to write the Asset Monkey, an interface that is helping them to manage assets being tracked by their tracking system. "This really is helping the creature crew to work with the 20 or so different versions of the Host creature that we created for various purposes on the show," Baillie says. "For example, there's the swimming Host, the burnt Host, and the jumping Host, as well as high- and low-res versions. The crew created this script to be able to swap out the different incarnations."

The revamped creature pipeline is also playing a role in the team's work on *Superman Returns* for their numerous shots featuring a digital double of Superman. The image-based lighting and global illumination features in Brazil and 3ds Max are coming to the rescue for the digital Metropolis shots the team is working on. In addition, the team also is relying on the SyFlex cloth simulator plug-in to Maya to create the digital Superman's billowing cape.

Since it was formed in 1999, The Orphanage has earned wide recognition as being a leading creator of visual effects for film and television, and has achieved much success with Maya and 3ds Max. "We've been very happy with what we've been able to achieve in these packages," says Harman. "They offer very powerful features and capabilities that complement each other and our pipeline.

"These two products have been under our roof for a long time," he concludes. "The interoperability between Maya and 3ds Max will only get better, now that they're under the same roof at Autodesk."



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