Double Negative
www.dneg.com

Autodesk® Maya®
Autodesk® Mudbox™

Autodesk Maya is the lynchpin of our entire pipeline. All the tools we use and create are running through or driven by Maya.

—David Vickery
  Visual Effects Supervisor
  Double Negative

Moving mountains for Harry.

Double Negative uses Autodesk software to create *Harry Potter and the Deathly Hallows*, bringing the beloved series to its grand finale.

Summary

Today's teenagers grew up with him. So did many of London's top visual effects companies. When *Harry Potter and the Deathly Hallows Part 2* hit theaters earlier this summer, it brought wizards, witches, goblins, dragons, death eaters, dementors, and the end of an era along with it.

Based on author J.K. Rowling's phenomenally successful book series, the film versions of the stories chronicling the school years of "the boy who lived" began in 2001, when an 11-year-old Daniel Radcliffe was cast as the title character in *Harry Potter and the Sorcerer's Stone*. Ten years and seven films later, the Harry Potter film franchise is the most successful in history and a generation of visual effects artists owe their careers to it.

"I graduated from university in 2002, and I immediately tried to get work on the second film, *Harry Potter and the Chamber of Secrets*," says David Vickery, now visual effects supervisor at London's Double Negative visual effects house. "Lots of people have made their careers on Harry's back. Personally, I went from being a junior technical director on the fourth film, *Harry Potter and the Goblet of Fire*, to supervising a significant portion of the effects work on the final film. I definitely owe a lot to Harry. It has been a pleasure and a very proud achievement."

Just as kids and visual effects companies have grown up with Harry Potter, the technology used to create the film series' increasingly breathtaking visual effects has evolved. And all along, Double Negative used Autodesk® Maya® software to make that magic...well...magical.

The Challenge

As the film series evolved, so too did the complexity of the visual effects and technology required to make the films. Each film aimed to outdo the previous and, from a visual effects perspective at least, they have done just that. With each successive film after its debut on *Harry Potter and the Prisoner of Azkaban* (2004), the role of Double Negative grew substantially. It should not be surprising, then, that the final installment is a visual extravaganza. Vickery and his Double Negative team worked on 410 shots of often staggering complexity.

"When I worked on Goblet of Fire, which came out in 2005, our biggest challenge was the 'Death Eater' effect," says Vickery. "We used Maya to create these mystical, smoky plumes with fully digital characters inside them. That effect pushed us to our technological limits at the time. By the final film, that effect had become something of an afterthought, something we could do with our eyes closed."

Autodesk®

© Warner Bros Entertainment 2011.

The same could not be said for the vast majority of the effects that appear in *Deathly Hallows 2*. The most challenging effects, however, involved a bank vault–guarding dragon and the now-legendary Hogwarts School of Witchcraft and Wizardry.

"We had a Dragon Team and a Hogwarts Team," says Vickery. "They were almost like two separate production facilities in many ways. The complexity of the work on this film was so massive, with this incredible white dragon and a fully CG Hogwarts that had to be destroyed in epic fashion. It was such a big operation, in fact, that the filmmakers held a lot of the work back for the first installment of *Deathly Hallows*, mainly so we could build a well-oiled machine for the second part. Maya, of course, was a big part of that machine."

The Solution
"Autodesk Maya is the lynchpin of our entire pipeline," says Vickery. "All the tools we use and create are running through or driven by Maya. Hogwarts was an interesting challenge because of the physical size of the model we had to build. Just to start, we had to create an environment measuring seven miles in length. We also knew the whole thing would be in stereo, so there was no room for error."

To create a suitably magisterial environment for Hogwarts, Double Negative's technical director Pietro Ponti set up a three-camera rig and mounted it on the side of a helicopter. Using Google Earth™ mapping service, Ponti then plotted several semicircular flight paths around some of the most famous mountains in Scotland: Glen Coe, Glen Donn, Glen Nevis, and The Three Sisters, as well as Loch Schiel, the lake that Hogwarts actually hovers above.

"Using Google Earth, Pietro was able to fly around every mountain and determine the correct time of day for our purposes," Vickery explains. "He showed up on the day of the shoot and gave all these GPS coordinates to the helicopter pilot, and they were able to fly to the perfect positions to get the perfect photographs."

Once back at Double Negative, Vickery and his team used Maya to line up and join the mountains into one epic vista: "We essentially tracked each of the mountains in Maya, which enabled us to align all the camera views with each other and create a series of projections," says Vickery. "Those projections in turn helped us define and create a piece of geometry the same shape as these huge mountains. We used that technique in Maya to create seven miles of terrain. It's quite a rush to be able to move those mountains around so easily. We also used Autodesk Mudbox to hand paint higher levels of displacement, texture, and detail into the spectacular mountain range we created."

For the spectacular dragon sequence—in which a ferocious, tortured white dragon is used by Harry and his friends to escape the impenetrable underground vaults of Gringotts Wizarding Bank— Special Effects Director John Richardson used a scene created using Maya by Vickery's team to create a complex rig for the young wizards to sit on.

"With the Maya data, John was able to create an elaborate mechanical rig," says Vickery. "We used Maya to previsualize the animation sequence with the dragon, and the film director really liked it. We had to make sure that we could translate the precise animation into something that could drive that physical rig. We used Maya to build a digital version of the mechanical rig, and then fit it into our animation. We also used the software to figure out precisely how far each of the pistons and paddles needed to move in each shot so we could perfectly re-create the animation. For the shoot, they put the kids on top of the rig, and then just ran our computer-controlled move for our animation. Once we got it back, we could guarantee that it would line up with our previz. In Maya, we could line up the digital mesh of the dragon perfectly with the physical rig, all with beautiful contact shadows and interaction between the kids and the digital dragon. It was fantastic."

The Results
A production as important as Deathly Hallows 2 is likely a bit too much for even the most efficient facility to handle. Vickery points out that Autodesk Maya was also of great benefit when working with other facilities: "The fact that Maya is so popular and widely used meant that we could easily share our data with other facilities working on the show," he says. "The production was so massive that we often had to share our environments between facilities. Since everyone is using Autodesk Maya, things went back and forth very smoothly, quickly, and easily."

At the risk of being a spoiler, it can be said that thanks to Double Negative, the Harry Potter film franchise goes out with a bang, not a whimper. And, like the effects work performed by Vickery and his team using Maya, it all works out well in the end.

For more information about Autodesk Maya, visit **www.autodesk.com/maya**.

For more information about Autodesk Mudbox, visit **www.autodesk.com/mudbox**.

Since everyone is using Autodesk Maya, things went back and forth very smoothly, quickly, and easily.

—David Vickery
   Visual Effects Supervisor
   Double Negative

© Warner Bros Entertainment 2011.

Autodesk®