Horrors! A giant vegetable-ravaging rabbit monster is attacking the gardens in a small northern England village. Who will save the day? Wallace and Gromit, of course.

Bonham Carter is the voice of heiress Lady Tottington, and Ralph Fiennes provides the voice for Lord Victor Quartermaine, but there is no dialogue for Wallace and Gromit, so there won’t be a voice... or even a mouth!

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Later, editors can piece the animation together digitally rather than by cutting negatives—a decided advantage.

Color Control
Color-timing, or color-grading, the digital film lets the artists fix lighting problems on the set—in this instance, “because things happen,” says Eason, rather than from shooting under different sky conditions, as is often the case in a live-action film. Some shots take place on stage for several days,” he notes. “Lamps tend to blow, [creating] lighting changes.” With digital color timing, the crew could smooth the lighting changes.
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By adding such computer-generated effects as dust to Aardman's clay animation, the Moving Picture Company helped transport Wallace and Gromit into their first full-length feature film.
For color grading, MPC used Quantel’s QCColor system; for monitor control, the group utilized FilmLight’s TrueLight color management system. “It’s noticeable how much DI has improved in speed and color imagery since Chicken Run,” says Eason. “And, what you saw on the screen only approximated what you’d see on film in those days. The colors were unpredictable; whereas, on Wallace & Gromit, what we saw on the monitor was close to what we’d see on film.”

For rig removal and other 2D “fixes,” and for 2D effects and compositing, the crew used Apple’s Shake. A custom pipeline that retained the film’s edge numbers within the DPX file headers throughout the VFX process helped automate the final assembly of the movie.

Two of the claymation characters, Lady Tottington and Victor’s dog, Phil, couldn’t stand on the weight of their own legs, so an apparatus always held them. Knowing that MPC would remove rigs for these characters and others, the crew shot clear plates—plates to use later, because every camera move in the film was motion controlled, the two plates—film with the characters and film without the characters—were isolated from the shots they’d be composited into. “Some of the most trouble we had was with the edges on the characters that happened when an animator inadvertently moved something in the set,” says Eason.

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Foggy Bottoms

The film’s 2D effects included fire, mud, fog, and mist. Compositors added fire—in a fireplace, on burning candles, and so forth—by blending filmed elements into the live-action plates. Working in Shake, they generated the mud kicked up by a rabbit digging a tunnel. “We used simple particle methods and noise functions,” says Stuart Lashley, who led a team of as many as seven compositors working on Wallace & Gromit. The compositors also handled the fog and the mist.

“This is a horror film, so a lot of the scenes were filled with mist and fog,” says Eason, “and it’s not possible to have stop-motion fog.”

In fact, Aardman tried motorizing pieces of gauze while shining light through them, but the result wasn’t what the animators wanted, according to Eason. If they filled the set with smoke to simulate fog, the smoke would be blown by the wind, and the wind of the set wouldn’t correspond to the wind in the model. Instead, compositors created the animal’s path into shots and then added the fog and photographic elements.

“When the compositors needed to work with characters filmed against greenscreen, they also received beauty shots of the same character without the greenscreen. The crew would position a character, shoot a frame, and then slide the greenscreen behind the character and shoot another frame. “We used the greenscreen as the matte key and then the beauty pass for the composite,” says Lashley. “It was an absolute perfect match. We never had to worry about green spill and light reflectance.”

In addition to blending characters into a fog, bluescreen techniques helped Gromit and another dog fly airplanes. “Gromit, in one airplane, is chased by a dog in another airplane, so a lot of the time during the dogfight, we had the planes against blue-screen for practical reasons,” says Eason.

The crew also replaced bluescreen in a car window with street scenes shot separately. “Usually you want to put bluescreen as far back as possible, but these sets were small and weren’t designed with space behind them, so the lighting wasn’t ideal,” says Eason. On the other hand, stop-motion photography meant that there was rarely a problem with motion blur on the edges, and rotoscoping was less demanding than is sometimes the case with live action.

As in a live-action movie, Aardman would often film the “actors” against greenscreen. MPC would composite the background in later.
Although the crew on _Chicken Run_ had used many of the same techniques, one difference with _Wallace & Gromit_ was that the effects and digital animation happened during principal photography. "In no way was this a postproduction effort," says Eason. "They would roughly cut the animation together and turn it to digital quickly; they were shooting final scenes and delivering them to us right up to the deadline." That gave the MPC crew, which topped out at around 20, longer to work on the film and the opportunity to get feedback as they worked.

That feedback was especially important for the 3D animation. "Aardman was tentative about 3D," says Eason. "But, they were open-minded." They had to be: They could not have created the scenes they envisioned in claymation.

### Digital Doubles

When Wallace and Gromit vacuum up the bunnies, the creatures swirl around inside a large container, something that would have been impossible to create with clay bunnies on little rods. When the bunnies are on the ground, they're clay; when they're in the air or touching down, they're CG. "They cut real clay bunny shots directly next to our CG bunnies," notes Eason.

Because it would have been impossible to rig and move clay bunnies inside Wallace's and The League of Extraordinary Gentlemen's haggling equivalent, they ended up using proxy bunnies. "We thought we'd better modify a 400-frame animation to look like clay, but then you see an animal giving an interview in the foreground and, in the background, something funny is happening," Wen says. "That's what we did with the bunnies."

Although Wen ended up animating every shot by hand, he still started with a dynamic simulation in Maya to create a flow of low-poly proxy bunnies that didn't collide or pass through one another. Then, he attached actual bunnies to the simulation. "That got me 60 percent of the way there," he says. Lastly, he hand animated the bunnies doing hero motion.

Wen began the hand animation by keyframing it, then once approved, baked it in Maya using a stair-step linear interpolation between the keyframes to create the animation on twos. However, this animation often produced strobos, especially in the ears, so Wen animated on ones—that is, he animated every frame. This took between 10 and 11 months to create the 35 shots. "It had to look hand animated," he explains.

Frame-by-frame animation was even taken one step deeper when MPC helped transform a clay hand into a furry paw for three shots in which one of the characters turns into a were-beast. "Because the clay changed constantly, to match it, we had to change the geometry from frame to frame," says Wen. For the fur, MPC used its Delilah, a custom plug-in for Maya the studio wrote.

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"F8" won Jury Honors at SIGGRAPH 2001, was the only animator on the project. He created 35 shots with as many as 30 bunnies in each. "The characters are simple," says animator Jason Wen. "But there were so many of them." Wen, whose animated short film "Lame" was reviewed in CGW, worked on the Claymation feature film _Chicken Run_. "I don't think you will ever see the characters as they are on the ground. The effect you see is how they look when they're in the air and moving," says Wen. "It's all CG."
for the werewolf in *Harry Potter and the Prisoner of Azkaban*.

Fortunately, the *Wallace & Gromit* bunnies did not have fur. Moreover, unlike many 3D creatures, the skin surface didn’t slide; the creatures had to retain their volume. Even so, at first, the digital models didn’t look quite right. So CG lighting artist Ben Toogood created the shading and lighting that made the digital models look like their plasticine counterparts.

“When we looked at our animation, we realized something was missing,” says Wen. “So we checked footage from the film and could see little fingerprint marks and indentations on the clay where the animators had bent an arm or had moved a head.” Toogood’s shaders reproduced that handcrafted look dynamically: The shaders determined the amount of stretching and applied thumb indentations on parts of the figure based on the amount of manipulation that had been done. This solved the problem for mid-ground bunnies, but close-up critters required extra attention.

“In one shot in particular, you see a bunny’s head go right past the camera, and it fills up the whole screen,” Wen says. “It does a little smile when it floats by and goes a bit googly-eyed.”

To create textures for that rabbit, MPC photographed the clay model with a high-resolution Canon digital camera, and used textures created from those photos to add detail. The texture artist placed textures in Right Hemisphere’s Deep Paint 3D to remove seams.

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**To create the mind waves for Wallace’s mind-melding machine, the crew at MPC crafted smoke rings in Maya that were then rendered with RenderMan and composited in Shake.**

BunVac to do a little bunny behavior modification via a mind meld. Of course, everything goes wrong.

Although in these scenes Wallace, Gromit, the backgrounds, and the various inventions are all real, the mind waves are CG. “The mind waves had to look physical,” says Eason, “because everything in *Wallace & Gromit* is gnarly, something you can touch. But, they also had to look ethereal. So it was a creative challenge.”

For references, the crew looked at the circles of lights generated by lady robots in Fritz Lang’s 1927 film *Metropolis* and at the crazy electrical effects in Frankenstein movies. “The mind waves were an homage to the Hammer horror movies of the 50s and 70s,” says Eason. The crew created the resulting luminous glowing circles of lights with a smoke effect that Toogood crafted in Maya using Mel scripts and rendered with RenderMan. “We tried to get the motion of smoke rings that roll through the air,” says Eason.

When Wallace’s inventions go haywire in the cellar, Wen and Toogood used hand animation and particle effects to add CG destruction—the glass shards flying around and the mind waves flying off into space—to that filmed on set.

“In stop-motion animation, you can take a certain amount of license because it’s a cartoon fantasy,” says Lashley. “But it’s still photographed in the real world. So, we made our CG bunnies look like they were shot in front of a camera with real lighting conditions. But for the magical bits like the mind waves, we took some license because they were not real.”

To duplicate the on-set lighting, the crew rendered the bunnies with additional passes for various light sources, shadows, reflections, and so forth, so that the compositors could more easily tweak the values in Shake. In addition, the compositors could use Shake’s compositing tools to play around with the lighting, which added a lot of flexibility, especially as the film progressed.

The secondary pass allows the compositors to easily change the intensity, color, and direction of light sources. This was necessary because the crew did a lot of filming, animation, and compositor passes and they wanted to keep the lighting consistent.

“An animated movie is put together the way we like to think,” says Eason. “Everything is planned out; there are storyboards before anything is shot. And the process of shooting an animated movie is more like postproduction than a live-action movie. I’d love to do another.” ☞

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