



# More bang for your Buck

**FILM FOCUS** The arty Elephants Dream brought its software to a worldwide audience. But for *Big Buck Bunny*, its second open-source movie, The Blender Foundation is heading firmly into Pixar territory **BY ROY SPENCER**

**A**msterdam's Blender Foundation has been busy, slaving over its new open-source film. *Big Buck Bunny* features the central character of a huge rabbit, loosely based on the oafish everyman roles of John Candy. "He always played a lovable goofy guy with a big heart," says Sacha Goedegebure, who's responsible for story and direction. "But if needed, he could easily put teenagers in the trunk of his car and play golf with their head as a target, like in *Uncle Buck*. It's that kind of contrast I wanted to give the main character and put into the story - and then exaggerate it."

Codenamed 'Peach' during production, the movie is pure revenge fantasy: "A big rabbit is being bullied by three rodents," says Goedegebure. "When they take it too far, he comes up with a plan to get even. It's packed [with so many elements], with a lot of contrast with characters, mood and story, that it just becomes silly."

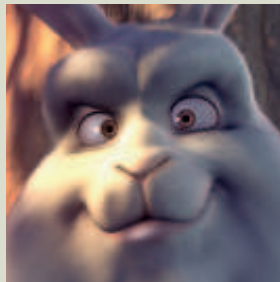
The style of *Big Buck Bunny* is miles away from the team's first open-source feature. *Elephants Dream* had characters that were more scary and bald than funny and furry. "We are trying to aim for a wider audience this time," says Goedegebure. "Young and old, boys and girls. There are a few moments in the movie that might be a bit too much, or too cruel, for very young children, but nothing that will damage their fragile little minds... I hope."

Besides the odd brain-warping and subversive element, *Big Buck Bunny* is, on the whole, a more mainstream movie than its defiantly arthouse predecessor. "Studios like Pixar have proven many times that a 'cute' style can still reach both a young and old audience," says Goedegebure. "From the perspective of [the Foundation's open-source 3D application] *Blender* and its development, it's pretty clear that we need to show what else the software is capable of. Making something completely different from *Elephants Dream* was pretty obvious."

## A HERD OF DVDS

The production budget is similar to that of *Elephants Dream*, clocking in at roughly €150,000. "This is excluding sponsoring 'in kind', for example for the rendering, or for music and sound," says Foundation chairman and lead *Blender* developer Ton Roosendaal. "For me personally, the main difference between the two projects is the fact we do this as an independent production company now. Previously, almost all of the production back office was organised by our partner, the Netherlands Media Art Institute. Setting up the Blender Institute and turning it into a working studio was a lot of extra work. The next projects will benefit from that a lot, though."

*Elephants Dream* clocked up 2,800 DVD sales. Roosendaal says that he stopped counting the downloads of the movie after half a



million. Although he has faith that *Big Buck Bunny* will surpass the its predecessor's commercial and critical success, Roosendaal is hoping this project will mimic the way the first movie placed *Blender* in a no-compromise production environment. "Perhaps the biggest success of *Elephants Dream* was that it proved to be an efficient development model for improving *Blender* as an application," he says. "It put artists together with an ambitious content target, which helped us to find the focus to get the technology and tools coded. We want to copy that model several times in the next few years, each time centred around specific aspects of CG creation."

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All the improvements this time around will filter down to *Blender 2.46*, an update to the software that has a release target of the end of April and will be bundled on the *Big Buck Bunny* DVD. A key change is the new hair system, part of a broader particle system overhaul in *Blender 2.46*. "There are tools available for combing, growing, shrinking and cutting individual hairs," says technical director Brecht van Lommel. "The grooming typically consists of a few thousand hairs. At render time, millions of child hairs are grown, driven by those manually edited hairs. The hair system can be adjusted with textures or painted vertex weights. For the bunny, ▶

● Showing off *Blender's* new hair system, three rodents aim to make *Big Buck* miserable. "We use level of detail to automatically reduce the number of child hairs as the characters get further away from the camera," says TD Brecht van Lommel





● Opportunities to enjoy the rich *Big Buck Bunny* environment on the big screen should be plentiful: sponsors have funded three 35mm prints. "We'll submit the film to every relevant festival," says Blender Foundation chairman Ton Roosendaal

for example, there are textures controlling the colour, base and tip, transparency, length and roughness [of the hairs]; and vertex weights controlling the density, length and roughness. We have a special hair strand primitive that can render faster and memory efficient than regular geometry."

### INSTITUTIONALISED

The working environment at Blender HQ consists of a big shared room for the workstations, a kitchen, calm lighting and a little room in the corner with a Wii console, in case a two-minute window presents itself for leisure time. "It's a little less central than last time," says lead artist William Reynish. "It's in the old docklands area, just opposite the zoo. There's plenty of space for our small team."

Since *Big Buck Bunny* is the Foundation's second open-source 3D movie, with Roosendaal and art director Andy Goralczyk working directly on the first project, the team has had the benefit of learning from issues the crew faced last time. "We generally had more of a strict plan this time, because we knew how the project was going to progress, and we have managed to follow it quite closely," says Reynish. "We were behind for a while during production, but we were able to fight back, and we're actually on schedule now. We postponed the deadline slightly because we want to increase quality, not just to be able to finish it."

Another time saving came from the decisions the team made about the soundtrack. In *Elephants Dream*, the voice acting was

handled by two actors – but in *Big Buck Bunny*, there is no dialogue at all. "The choice not to include dialogue is something I'm still very happy with, seeing the amount of work we already had on our plate," says Sacha Goedegebure. "It also meant we could, or were forced to, focus more on facial expressions and body language."

### PACKING THE PIPELINE

Although *Blender* drove the production, all of the project files were managed under industry-standard revision-control system Subversion. The pipeline is, therefore, pretty conventional. "It starts with modelling, then rigging, texturing, scene assembly, animation, lighting and compositing," says lead artist Nathan Vegdahl. "It varies a bit depending on when people get things done, but that's basically it."

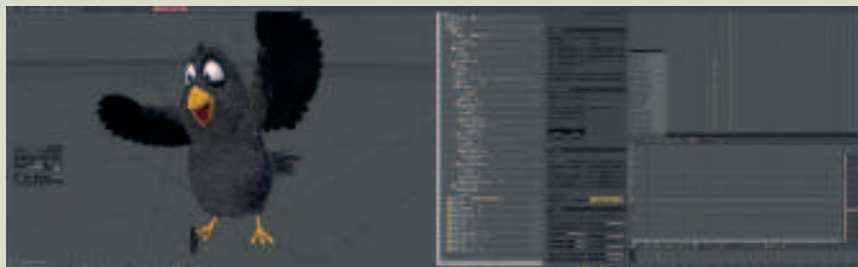
Each artist was able to work on different assets that could be linked in to other files. "This is great for production because it's really flexible," says Reynish. "You can recursively have links inside links, which allows you to link leaves into a tree, which you can link into a field, which you can link into the animation file. You can also link materials, keyframes and compositing set-ups, which have proven to be very important in our workflow."

The rendering on *Big Buck Bunny* wasn't handled in-house, however. It was calculated that the project would need 10 or so quad-core computers running full-time to do the job. After 'Peach' was announced, the Blender Foundation was contacted by several companies offering assistance with rendering, but one stood out.

"With the increased complexity of the scenes compared to *Elephants Dream*, we needed more than 2GB of RAM for rendering," says technical director Campbell Barton. "We chose Sun because they were the only ones offering 64-bit x86 systems. Even though we use Ubuntu, Solaris is similar enough to Linux that there have been no differences between renders in the studio and what we get back from the farm."

As *3D World* goes to press, *Big Buck Bunny* looks set to be made up of 131 shots, and will be released on both PAL and NTSC DVD, along with all the assets for *Blender* users to make their own

● "Feathers take advantage of the same particle system that has been developed for the fur," says art director Andy Goralczyk. "Different groups of meshes with alpha and colour maps were instanced across the skin and groomed to fit"







movies with. After *Elephants Dream*, Blender enthusiasts mailed plenty of re-edits and video clip mixes back to the developers, based on the open-source materials packaged with the DVD release. Very few edits turned up with animation fixes. "Most likely the 3D files were too complex for easy tweaks," says Roosendaal. "For *Big Buck Bunny*, we aim at solving this by providing step-by-step guides, and simpler versions of files for quick editing fun."

The Blender Foundation is looking to focus providing more documentation with this DVD package, to help people use the assets, with less emphasis on 'The making of' aspects that were bundled with *Elephants Dream*.

### OPEN FOR BUSINESS

The Blender Institute is now a permanent studio for open projects, and started its first open game project at the beginning of the year. "The game project is being executed by a new team made up of three Blender artists, two integrators and a hardcore game engine developer," says Roosendaal. "This team is going to mimic the typical studio pipeline for game production, giving us the clues and ideas for bottlenecks and essential improvements in Blender and Crystal Space. An important side target is also to deliver content on an

● (Left to right) Squash and stretch is deployed to give the animation an old-school feel; 3D artist Enrico Valenza acts out a character performance during a weekly team meeting; and art director Andy Goralczyk finalises lighting, compositing and colour correction for one of the movie's closing shots

industry-quality level. Many people still need to be convinced that you can do serious 3D game business with open source tools."

Besides the game, Roosendaal and his team are already preparing for their fourth project ("a 4K cinema epic with monsters") and, after that, VFX for film. "The epic short is in a game-trailer style, with monsters and battles, explosions, fire and smoke... typical adolescent fun: you get the picture," says Roosendaal. And the visual effects project? "That's a completely different side of the 3D tools and rendering: something we definitely need to work on in Blender. The only thing I think now is, 'Better not have more than two projects per year.'"

"It's always a busy period when you're working on one of these projects," says Goedegebure. "Not getting much sleep is pretty standard." Bleary-eyed or not, everyone involved has been committed to doing their best. "We really wanted to make something that would impress people," says Reynish. "Both for Blender's sake, to make it impossible to ignore this tool, and for our own. We all wanted something we can be proud of, and something that pushed Blender as much as ourselves." ●

**Big Buck Bunny has its official premiere at Studio K in Amsterdam, The Netherlands, on 10 April 2008**  
<http://peach.blender.org>



## IN DEPTH | The new Blender

The demands of Big Buck Bunny's production mean that several powerful new tools will be introduced in Blender 2.46, the upcoming public update to its open-source 3D software

**I**mproving Blender's hair and fur toolsets was the biggest development target at the Institute. That included the ability to interactively edit hair and integrate it into the modifier stack for animation. New fur shaders were developed, and more efficient rendering of large numbers of hair strands, with a greater level of detail, was achieved. "We ended up constructing a whole pipeline to make furry characters possible," says technical director Brecht van Lommel.

"The idea was always that we'd use furry animals this time round to show what Blender can do," says lead artist William Reynish. "We wanted to push rendering to be able to render huge amounts of hair and lots of details, and furry animals in a detailed forest with leaves and grass is the perfect scenario

for stressing the system. Lots of changes have been made. At the beginning of the project, there was no way we could render all the stuff we needed without running out of memory really quickly. Now we are rendering multiple characters with millions of hair strands, together with dense grass and thousands of leaves, all at the same time."

The animation system has also seen improvements in various areas. The constraints system has been rewritten, and a mesh deform modifier for deformation of fat characters has been added. "[There are] dozens of small features that resulted from months of feedback while the characters were being rigged and animated," says van Lommel.

For rendering, point-based ambient occlusion was added to help with the lighting of big exterior sets.



● Blender's viewport shows the bunny character rig interacting with a bow-and-arrow rig. "A few thousand hairs here will drive millions of hairs in the final render," says Brecht van Lommel

Instancing and other optimisations were added to help render more complicated scenes. Finally, a new method of anti-aliasing was fitted into Blender's toolset, which integrates with comping to get better-quality results.