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8 MUST-SEE CG SHORTS

FIX IT IN POST!

10 post-production challenges solved

+ Epic's character and cloth demands push Blue Sky to new heights: page 32

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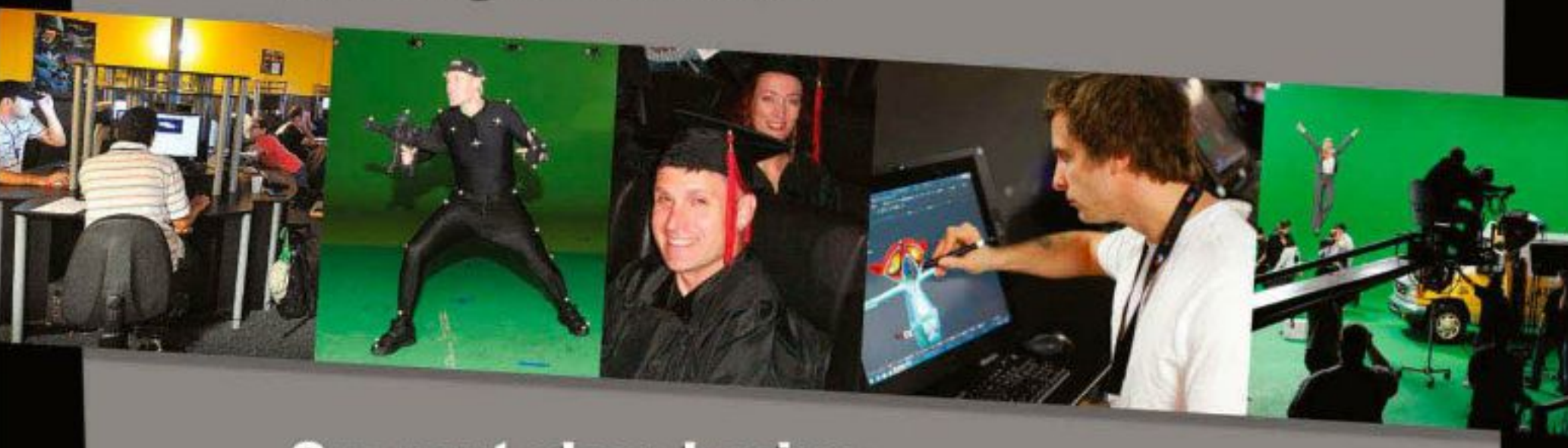

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3D WORLD

Highlights

Your cover stories this issue. Full contents: page 5

Issue 171 August 2013

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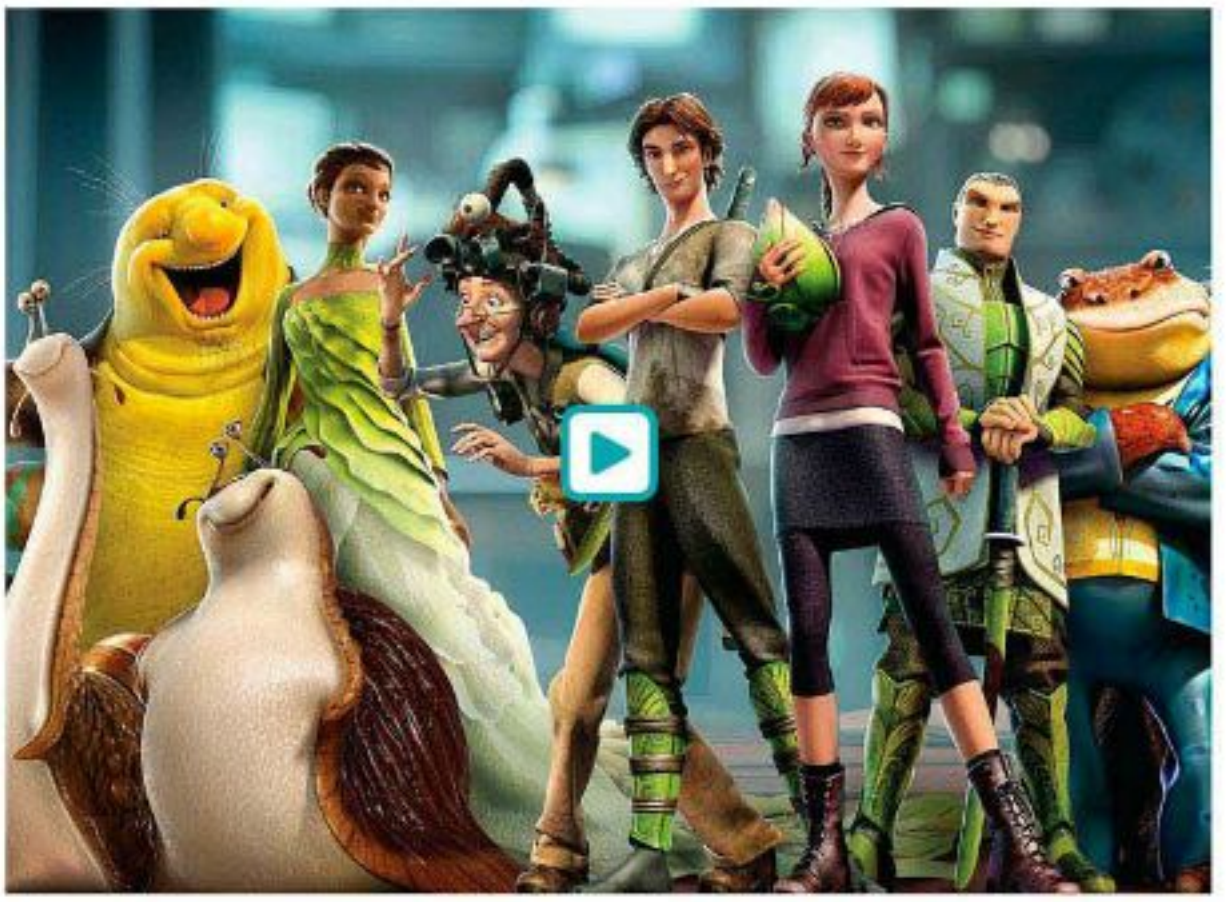
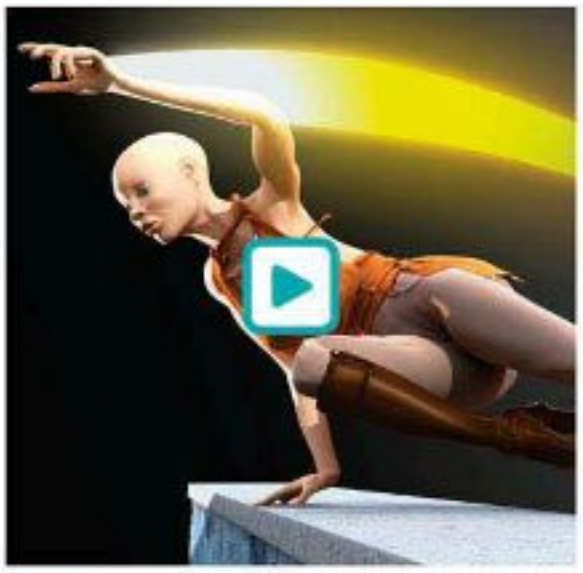


Includes video: see page 5

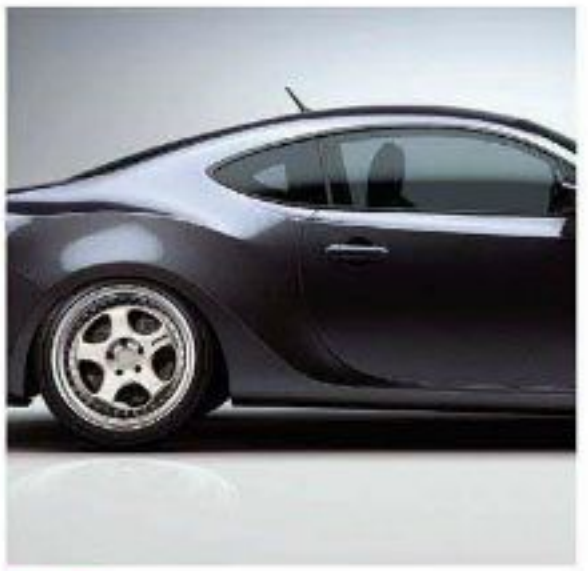
32 CHARACTER TECHNIQUES IN EPIC REVEALED

Blue Sky proves that small is beautiful, as its animators present the microcosmic world of Epic



78 Master Maya animation rigs with Digital-Tutors

How to work with forward and inverse kinematics rigs to create fluid performances in Maya



68 Fix it in post! 10 tricky post-production challenges solved

Dave Cox details how to make the most of your render passes with crafty Photoshop fixes

42 8 must-see CG shorts, chosen by 8 CG art greats

Jim Thacker asks eight leading CG artists and directors to name their favourite 3D shorts

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3D WORLD

Contents

Our complete line-up for this issue

Issue 171 August 2013

The leading magazine for CG training and artwork

Every issue, 3D World brings you the best training for popular CG apps like 3ds Max, Maya and ZBrush. Our tutorials are written by professionals working in the field. Look out for bonus videos and scene files to help you take your skills further. 3D World also offers inspirational new artwork, access to the artists behind the latest CG movies, and more!

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03 DOWNLOAD YOUR FILES
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COMMUNITY

FEATURES

TRAINING

REVIEWS

POST PRODUCTION

PLUS

3D WORLD

Welcome

Meet the team and our panel of experts

Issue 171 August 2013

Find out more about our advisory board members at **www.3dworldmag.com/board**

Improve your character skills with 3D World...

Characters should be at the core of any CG artist's skill set, which is why this issue offers in-depth help. Enjoy our complete animation rigging video, courtesy of Digital-Tutors, then join Antony Ward for a workshop focusing on creating reusable character models.

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Our panel of leading figures from across the CG industry give us their advice and help

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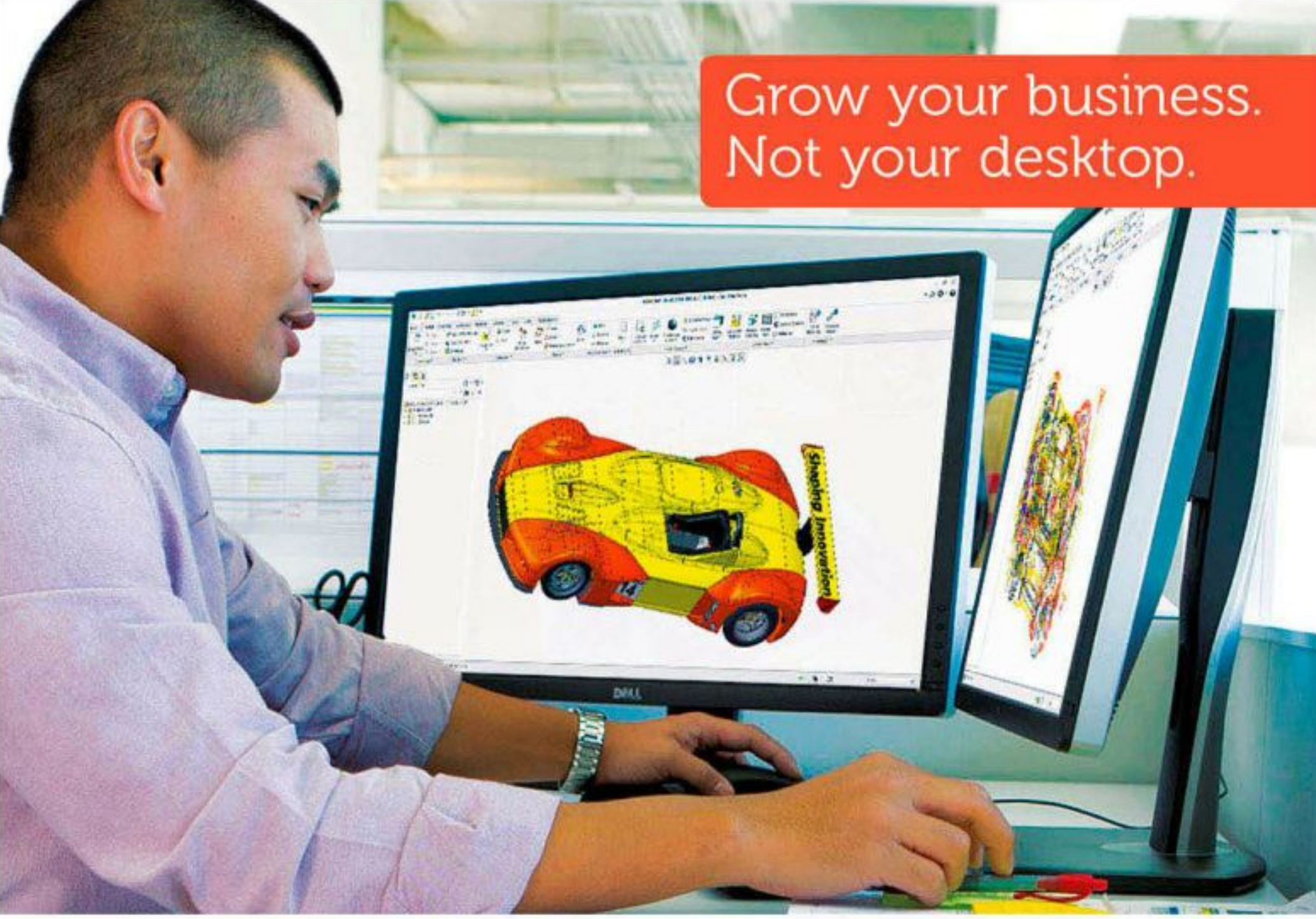

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Community

Images and opinion from you, the 3D World readers

Showcase

This month's round-up of commercial and personal work includes a tropical getaway, a herd of glass cows and some nifty motion graphics

Artist: Mark Fairless
Title: Martian Madness
Software: Cinema 4D, ZBrush, After Effects and Photoshop

Mark Fairless says: “I started using Cinema 4D about eight years ago and it made me realise how brilliant the whole 3D modelling scene is and how I had to be part of it.

“I am a 3D artist and motion graphics designer by trade and I also enjoy working on projects in my spare time. Martian Madness took me about two weeks to complete. It is heavily based on the Mars Attacks series, but I have created differences in the suits and faces. The skeleton body is a modified version of the skeleton that comes with Cinema 4D but the rest of the scene I created from scratch. I based the Martian on an action figure style so it would be easy to rig, as this an area I’m still getting to grips with.

“The modelling was done in a low-res form, so that all the detail could be applied with displacement maps. This allowed me the flexibility to get them posed and try out lots of different camera angles without slowing my machine down. Initially, I wanted the image to look like it was an action figure product shot, but once I got playing with the colour grading I couldn’t resist ramping up the schlock horror – I had a lot of fun sculpting the death rays!

“As an artist I am influenced by a huge range of things, but I have a soft spot for the macabre. What’s really exciting me about the world of 3D at the moment is 3D printing. I love the idea that in the future, kids and big kids alike might be able to print out their own action figures.”

www.darkusmarkus.prosite.com

Studio: hueMg
Project: Out of this World for DMG/Volkswagen
Software: Maya, Flame, Nuke, After Effects

You'd be forgiven for thinking this new video for design agency DMG and director Kaism Lim was a trailer for the latest Hollywood sci-fi blockbuster. But it is, in fact, a commercial for the VW Golf GTI. Lim first became involved with the project when two marketing directors from Volkswagen approached his producer, Jason Kirby. "We were given a brief to use the tag line 'Out Of This World' and to showcase the GTI in a totally virtual environment," says Lim.

"The GTI was to be placed within an alien race arena, which fully embodied a sci-fi theme. I visualised engaging phases, colourful lights and dramatic setups of the different scenes in this film. Colourful skies, natural elements, organic lightning, crystal surface race tracks, all combining to create a semi-realistic 3D and graphical approach." To create the surreal environment, artists from visual effects studio hueMg turned to the tools of Maya and mental ray. "With Maya, we were able to manipulate different camera angles to suit the flow of the shots easily," says lead CG artist Wubin Yow.

"The animation layers, which are a newly added function in Maya, were really helpful. We could control the main movements using the first layer and have secondary movements overlaying and so on. It allowed us to have many groups in order to have full control over the subject."

huemgfx.com

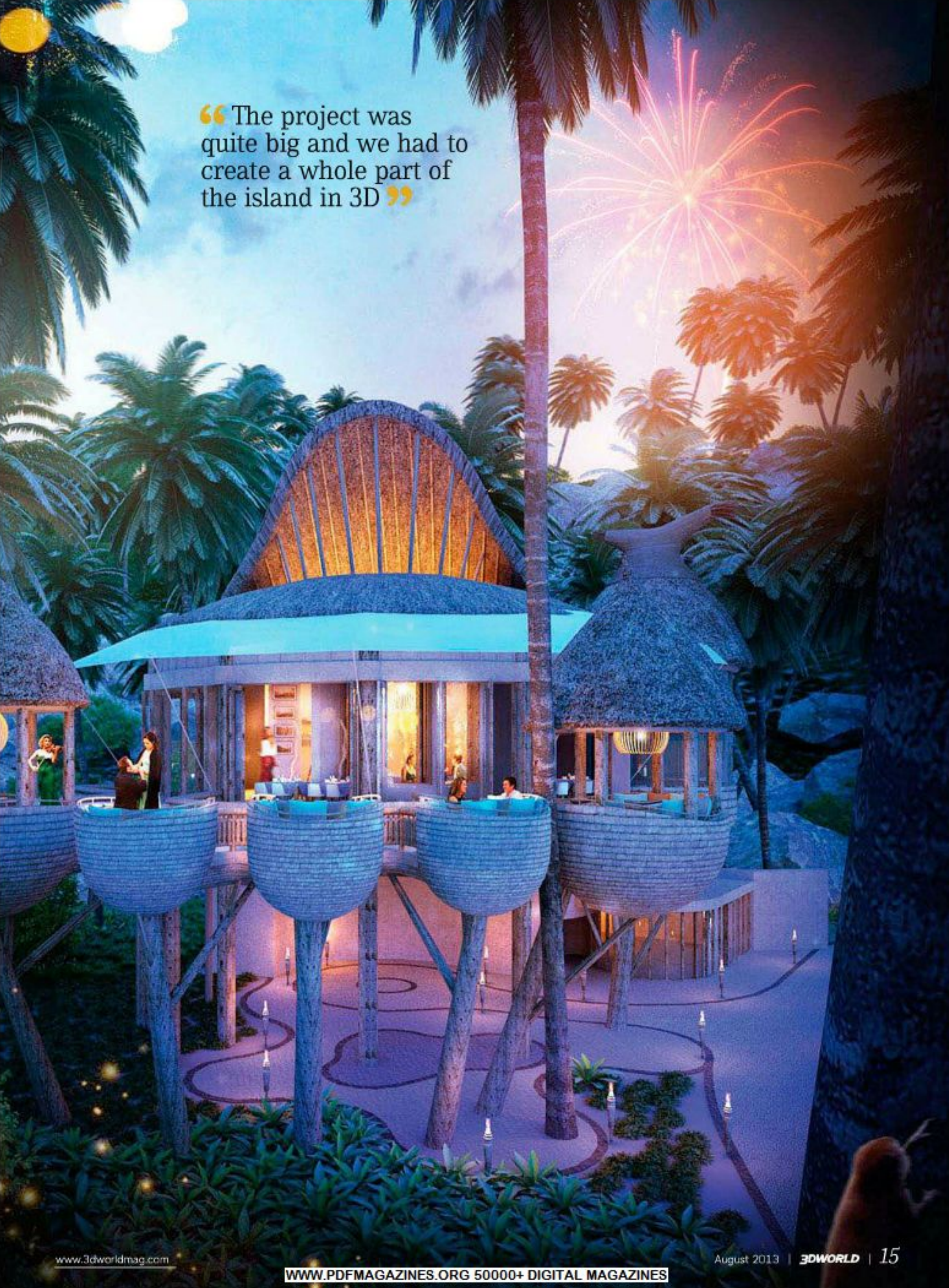
Studio: Nanopixel
Project: The Beach for Beach Projects
Software: 3ds Max, V-Ray, Forest Pack

If this gorgeous new CG development on the stunning Ko Phi Phi island, just off the coast of Thailand doesn't make you want to go on holiday, we don't know what will. The ultimate tropical getaway, this resort with suites and residences was created by Belgian-based studio Nanopixel.

Owner Dietrich De Blander explains: "First we made some stills and the marketing team of the Beach project liked them so much they asked us to create the full branding. So we ended up doing a movie, interactive app, stills and the full identity."

The Nanopixel team chose a 3ds Max and V-Ray pipeline to handle the job. But it was 3ds Max plug ins from 3D software development company iToosoft that proved particularly useful. "Forest Pack from iToosoft was invaluable," says De Blander. "The landscape design was very specific; the design came from the famous Bensley Design Studios who do a lot of luxury resorts. The project was quite big and we had to create a whole part of the island in 3D. Can you imagine what it would have been without Forest Pack? The vegetation scattering went smoothly, and we were really happy with it."

www.nanopixel.be



> “The project was quite big and we had to create a whole part of the island in 3D”

> “After a lot of trial and error I reached the desired result”

Artist Moises Gomes
Title African Woman
Software 3ds Max, V-Ray, Photobrush, ZBrush, Topogun

Moises Gomes says: “All in all, I spent about a month and half working on this project. It took me longer than usual as I spent a lot of time working on the render tests, the shading and the composition. But after a lot of trial and error I reached the desired result.

“I used cloth simulation to make it look more natural, and then I used ZBrush for the final finishing touches and to adjust the general proportions. All the modelling is my own work, while most of the textures came from **www.cgtextures.com**. The image itself was inspired by the many photographs I have seen of a similar nature, of women photographed in traditional African dress.

“I found this project quite challenging and there is certainly a lot of positives I can take away from it – especially the way I have improved my organic modelling and shading skills –and I think my future work will become more elaborate as a result. It was this challenging aspect of the project that I enjoyed the most. My favourite part is the eyes and the individual embellishments and composition.”

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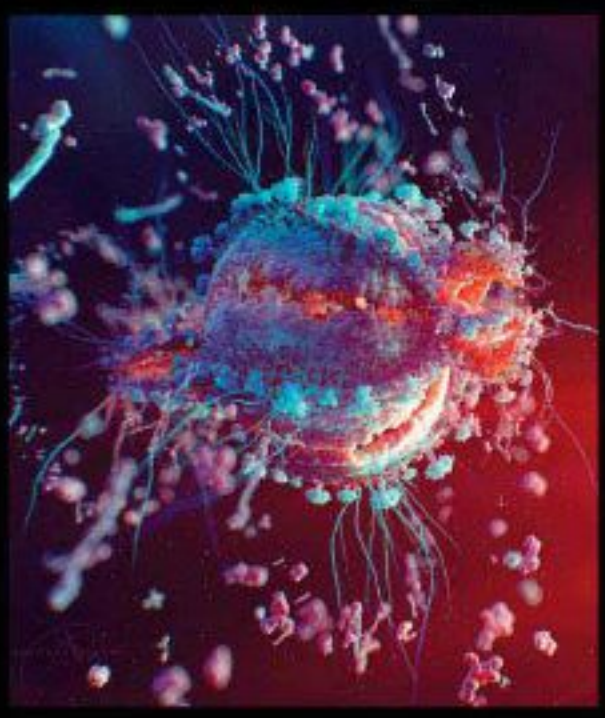
Artist: Alexey Kashpersky
Title: Human Immunodeficiency Virus
Software: ZBrush, 3ds Max, Cellpack, V-Ray, After Effects and Photoshop

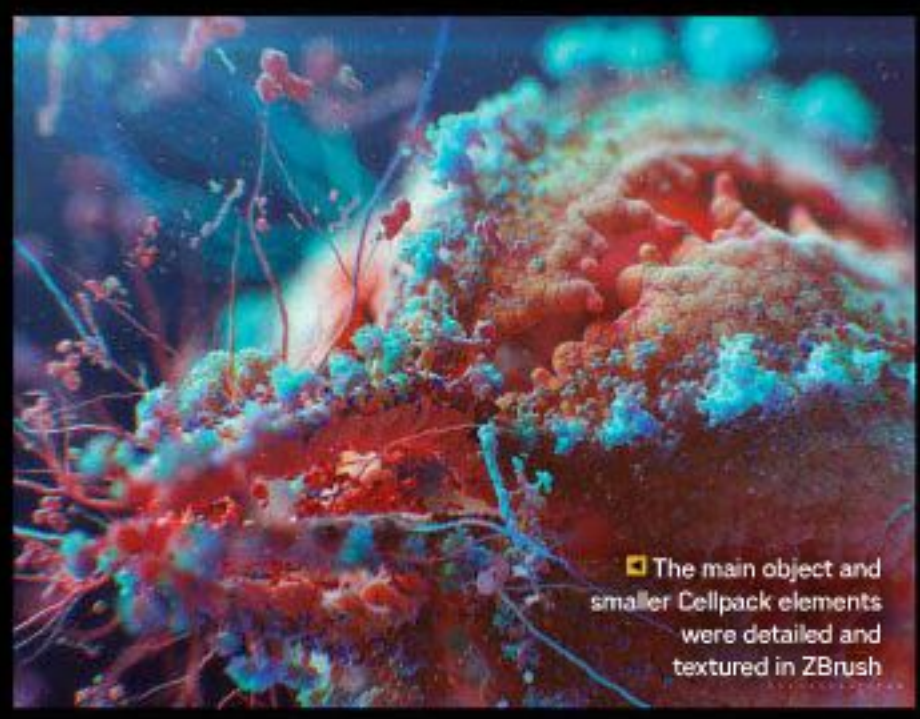
Alexey Kashpersky says: "This work took me roughly three weeks to complete. All the small elements except the body were taken from an HIV model generated with Cellpack (**http://sites.google.com/site/autofill21**). I just replaced the original sphere with my new model. The body object and Cellpack elements were detailed and textured in ZBrush, using Decimation Master to optimise the mesh and UV master for unwrapping.

"I created these scenes for CGSociety's Autopack Challenge (**http://autopack.cgsociety.org**) and won first prize in the Image category with them, an achievement I am immensely proud of."

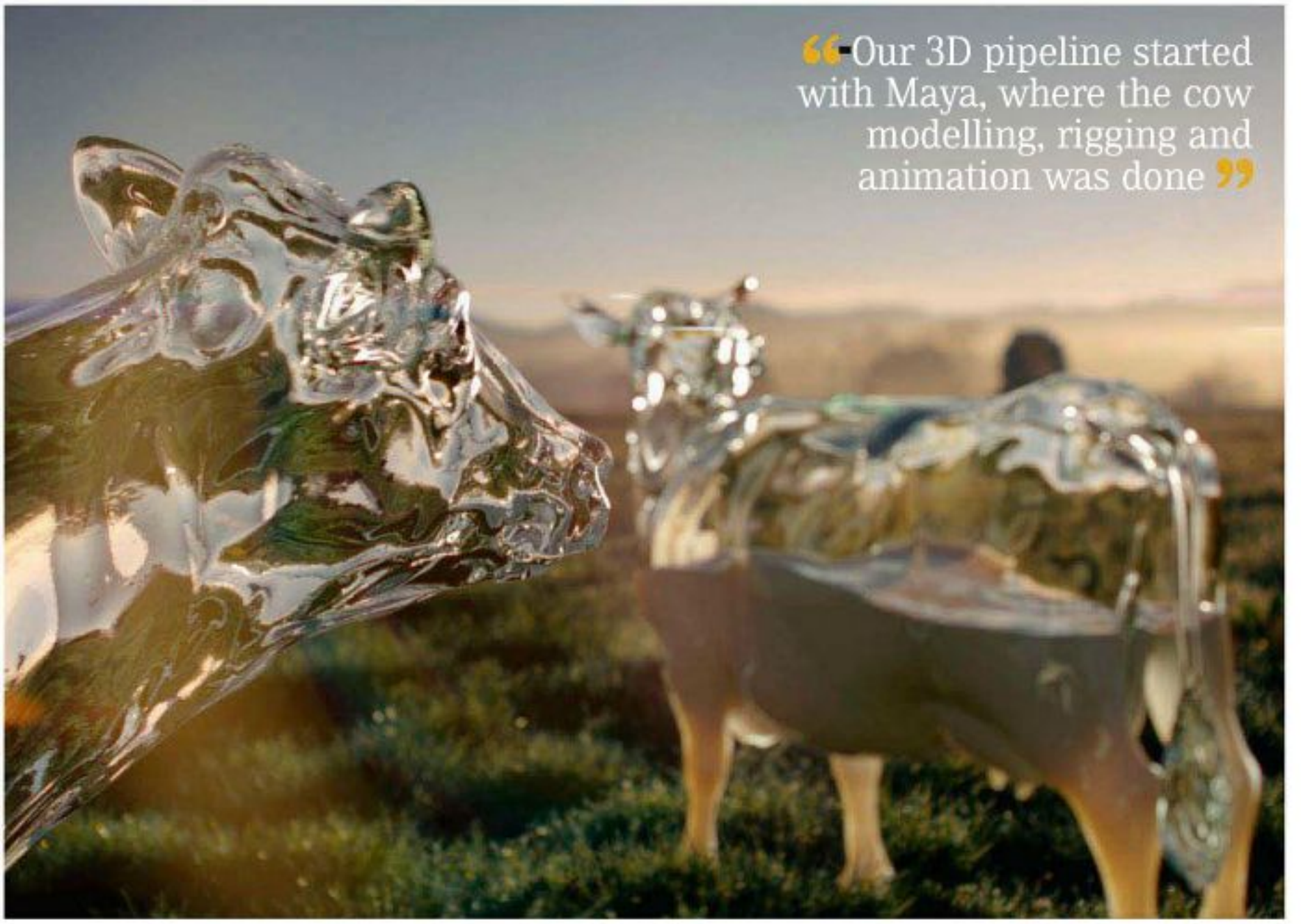
http://kashpersky.com



> I created these scenes for the Autopack Challenge and won first prize



The main object and smaller Cellpack elements were detailed and textured in ZBrush



> "Our 3D pipeline started with Maya, where the cow modelling, rigging and animation was done"

Studio: Assembly
Project: Glass Cows for Anchor
Software: Maya, 3ds Max

New Zealand-based creative agency Assembly round-up a herd of glass cows in this latest spot for Anchor, showing a new bottle design that prevents any damage to the milk from sunlight. The brief for Fonterra, supplied by ad agency Colenso BBDO, initially looked to go to an international post house, but the Assembly team was given the opportunity to pitch for the job and subsequently impressed with the glass cow tests they created.

"Our 3D pipeline started with Maya, where the cow modelling, rigging and animation was done," says Assembly VFX supervisor and technical director Rhys Dipple. "The animation was all keyframed. Maya Muscle was used to achieve convincing skin sliding and jiggle effects while maintaining volume. Despite the cows being made of glass, it turned out that these effects were an important part of getting the cows to appear lifelike and full of bovine character. We then used the built in point caching to transfer the completed animation to 3ds Max."

This was a project with many technical challenges, one of the biggest being the milk simulations. "We soon discovered that with a large volume of milk inside a closed and moving container, a massive amount of energy is generated," says Dipple. "This caused the milk to churn and splash around wildly. So we wrote a small Maxscript that stabilised the animated cows. They still walked and moved, but all in one spot, meaning that the simulation lost most of the massive injections of energy that caused all the ugly splashing."

assemblyltd.com

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> To achieve the stop-motion effect, we decided to work at 12fps

Studio: Plenty
Project: Nick IDs for Viacom
Software: Modo, Cinema 4D, V-Ray

In this new series of playful CG IDs for TV channel Nick, London-based creative agency Plenty, represented by Jelly London, developed a handmade look by combining frame-by-frame animation and 3D. Working in collaboration with Fun Job – art collective Friends With You's new production company – Plenty mixed artistic techniques to achieve the specific look.

Plenty owner and animation director Mariano Farias explains: "The most impressive aspect was the need to emulate stop-motion animation with 3D. We achieved it thanks to detailed modelling in Modo and the realistic render of Cinema 4D with V-Ray. To achieve the stop-motion effect, we decided to work at 12fps," says Farias. "This was a challenge when we got to the animation point, as we had to get full actions with just a few frames. It worked really well in pencil sketches, but with the 3D we felt we were missing some in-between instances. In order to solve this and to soften the animation we made small camera movements that compensated for the lack of frames."

www.plenty.tv

▲ The most demanding aspect was the need to emulate stop-motion animation with 3D

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In focus

Chinese artist Gangqiang Yu explains how he brought an ancient legend back to life

Artist Gangqiang Yu
Title Farewell My Concubine
Software 3ds Max Maya ZBrush Photoshop

"Farewell My Concubine is inspired by a very well-known historical story in China, in which the favourite concubine of China's West Chu's hegemonic king commits suicide. She did this because they were under a heavy enemy siege, and she didn't want to become a burden to the king before he made a last effort to escape. She knew he would die and refused the chance to escape, so committed suicide in order to die by his side. I decided to make an artwork of this story, because I love the tragic romance that encapsulates it.

"The creative process gives me an immense amount of pleasure and satisfaction to see what starts off as an idea or a vision to become a 3D-modelled reality. I work as a 3D artist full-time, but I enjoy working on projects out of work. It gives me the opportunity to explore my own personal creative ideas and it's excellent practice, which helps keep my skills fresh and up to date.

"This image took me three months to create. I worked with 3ds Max, Maya, ZBrush and Photoshop. The flames for the oil lamps were created using Phoenix, and it has created a wonderful fire effect. I really enjoyed the lighting and texturing stages, as it is there that all my hard work has really paid off."

Stage 1
Sketching and modelling

01 Initial sketches

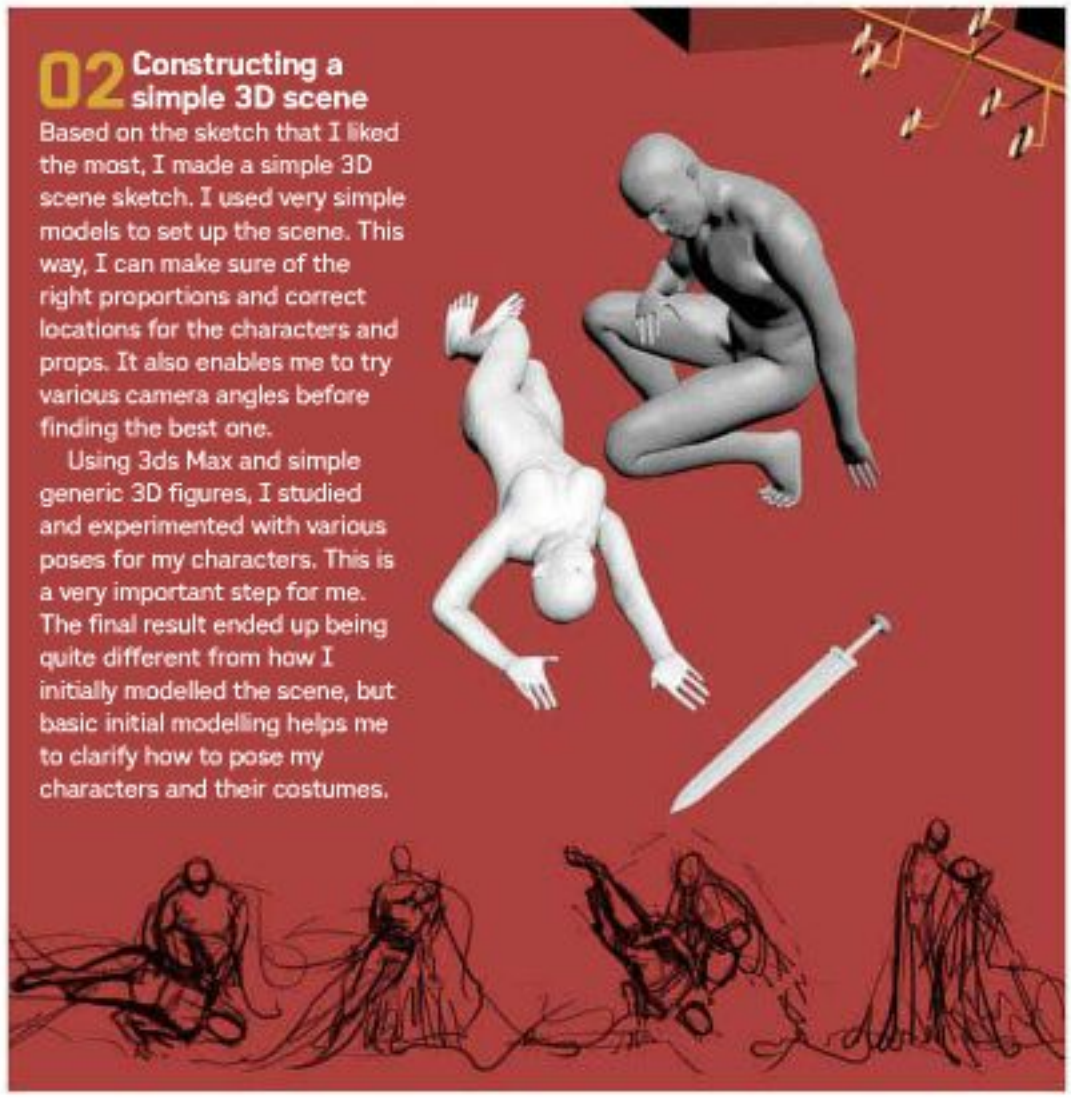
I started the process with lots of simple sketches. Using sketches is a way of studying composition, character's costumes, and shapes. I used a lot of ancient artefacts and movie costume designs, which are all related to the same historical period as my references. I wanted my work to be honest to the feel of that historical moment.

To create the warrior, Yu took inspiration from historical costumes of the time and costumes from the films of the story

02 Constructing a simple 3D scene

Based on the sketch that I liked the most, I made a simple 3D scene sketch. I used very simple models to set up the scene. This way, I can make sure of the right proportions and correct locations for the characters and props. It also enables me to try various camera angles before finding the best one.

Using 3ds Max and simple generic 3D figures, I studied and experimented with various poses for my characters. This is a very important step for me. The final result ended up being quite different from how I initially modelled the scene, but basic initial modelling helps me to clarify how to pose my characters and their costumes.



03 Making the base mesh

In ZBrush, I used DynaMesh to sculpt my characters and their clothing. At this point, I just focused on main shapes and mid-structures. Too many small details, such as small wrinkles in the clothes, will make topology harder. I used 3ds Max for hard-surface modelling, such as making the King's armour.

In ZBrush, Yu sculptured using DynaMesh, and moved to 3ds Max for the hard-surface modelling components

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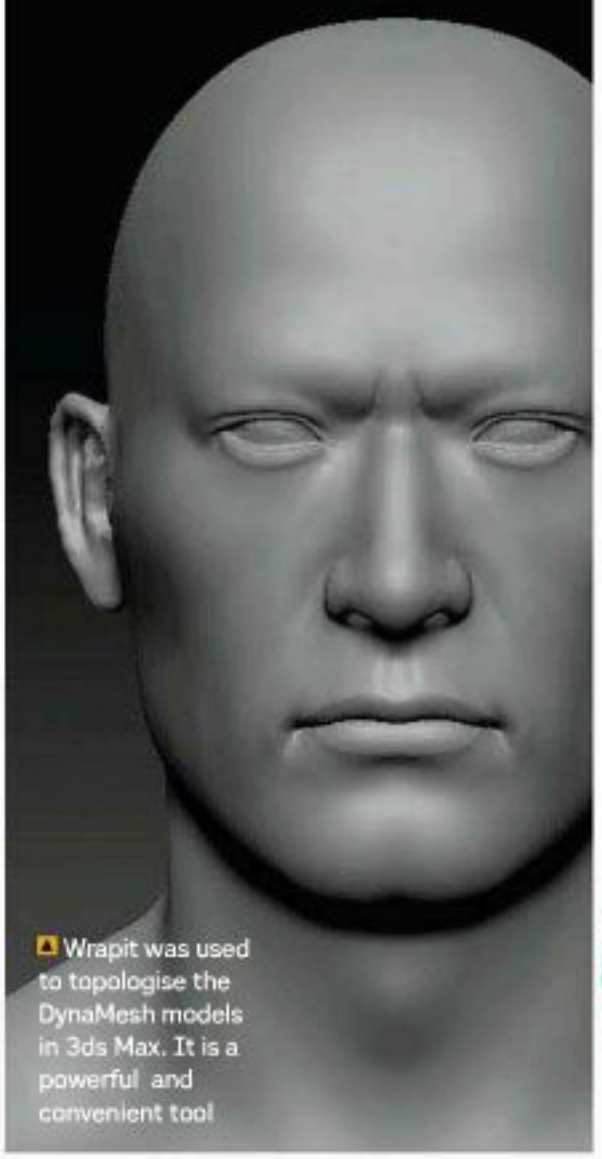
"She committed suicide in order to die with him. I love the tragic romance this encapsulates"

04 Topology

I used Wrapit, a plug-in for 3ds Max, to topologise my DynaMesh models. Wrapit provides a lot of convenient tools for topology work. I paid close attention to the flow and density of the mesh while I was topologising.

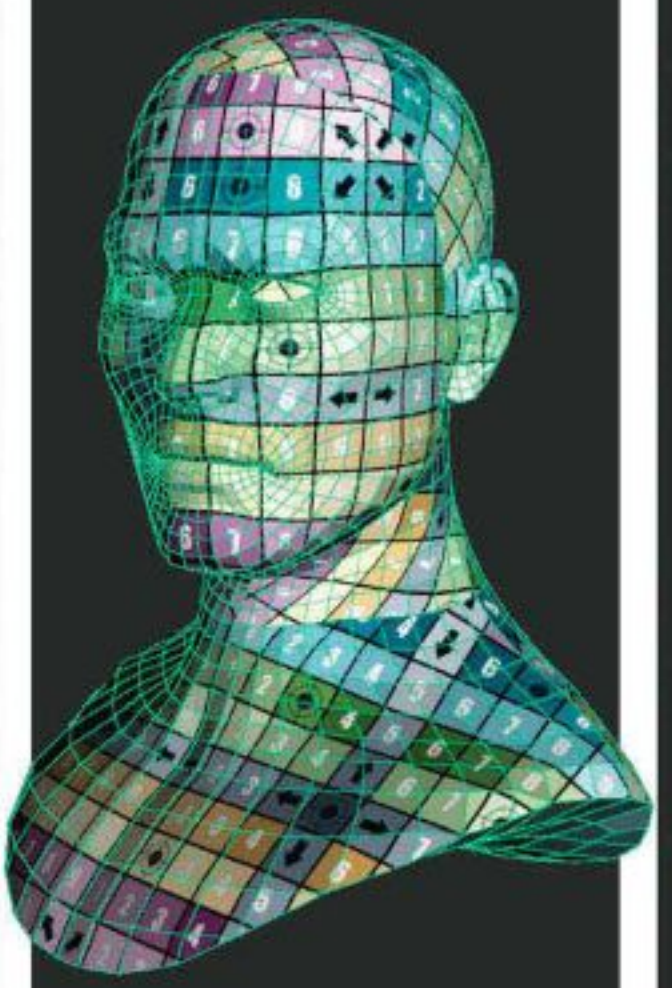


Wrapit was used to topologise the DynaMesh models in 3ds Max. It is a powerful and convenient tool

Stage 2
Textures and lights

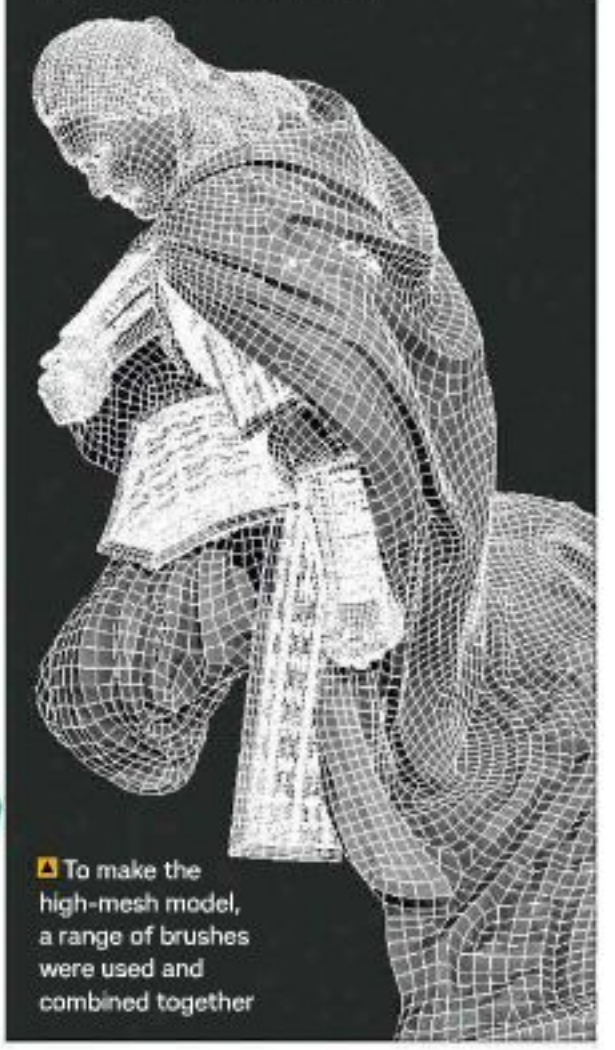
05 Unwrapping the UV map

There are lots of good tools for unwrapping UVs. I hide the cutting seams so that they won't show up in the final version. I used a UV-checker map to check out if the UVs were stretched.

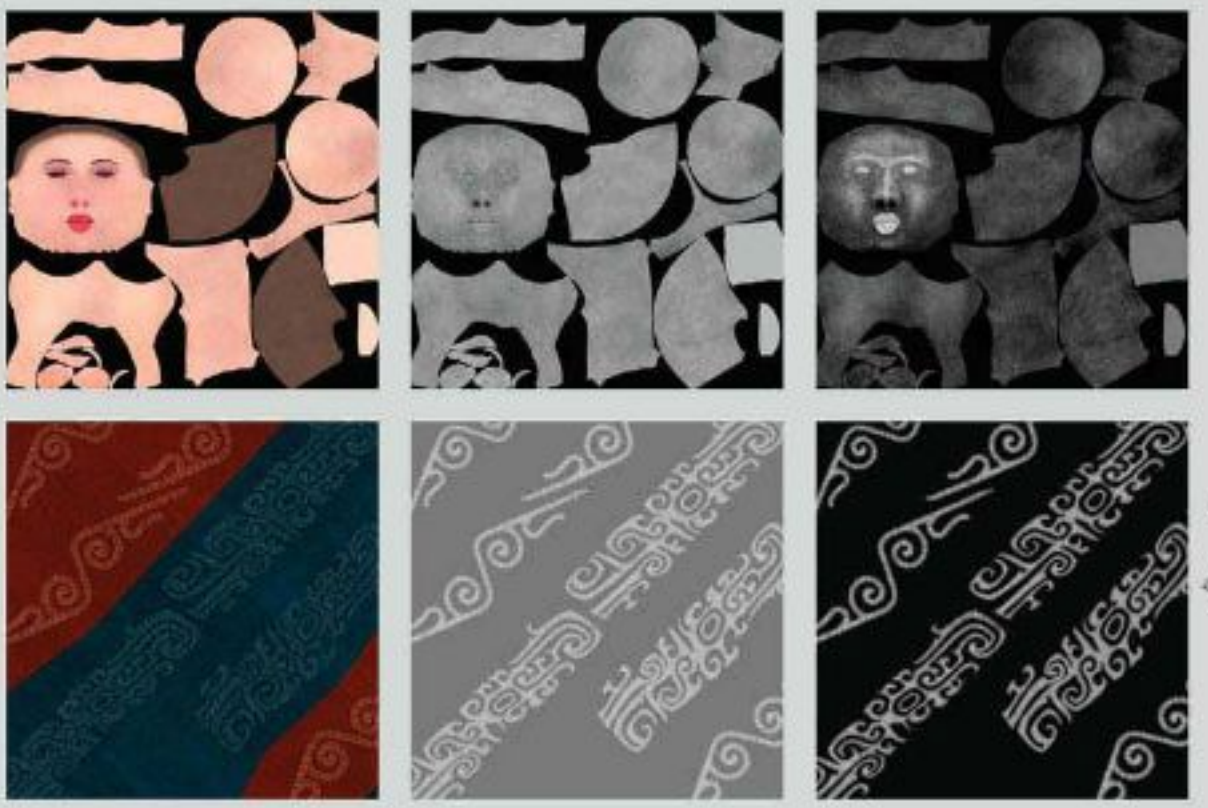


06 Making the high-mesh model

After I completed unwrapping the UVs, I then imported them back into ZBrush for adding more intricate details. I mixed up the brushes I used in ZBrush for sculpting the details. The brushes that I used the most for sculpting were Standard, ClayBuildup, Move, Flatten, Pinch and Inflate. Combining these brushes, and adjusting brush sizes and intensities provided me with all the tools I needed for sculpting details.

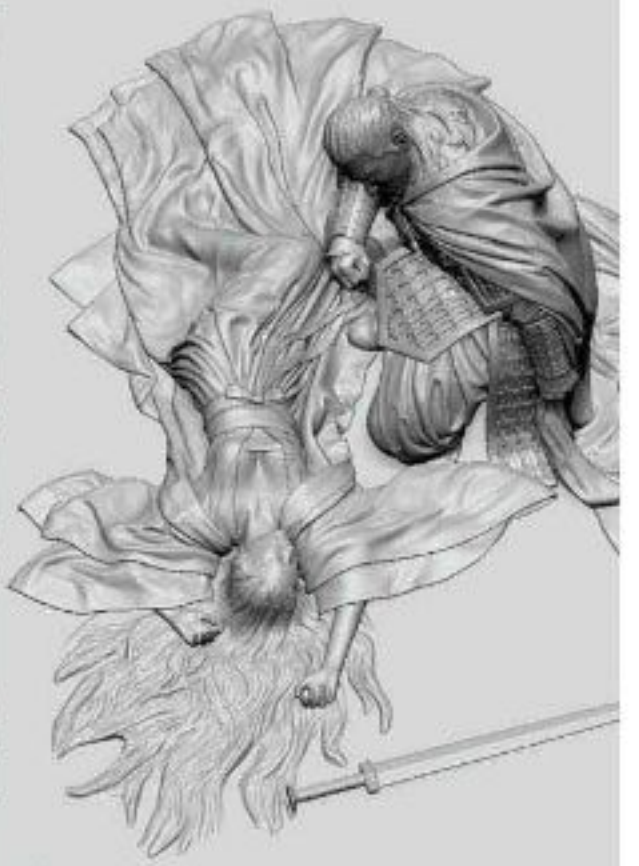


To make the high-mesh model, a range of brushes were used and combined together

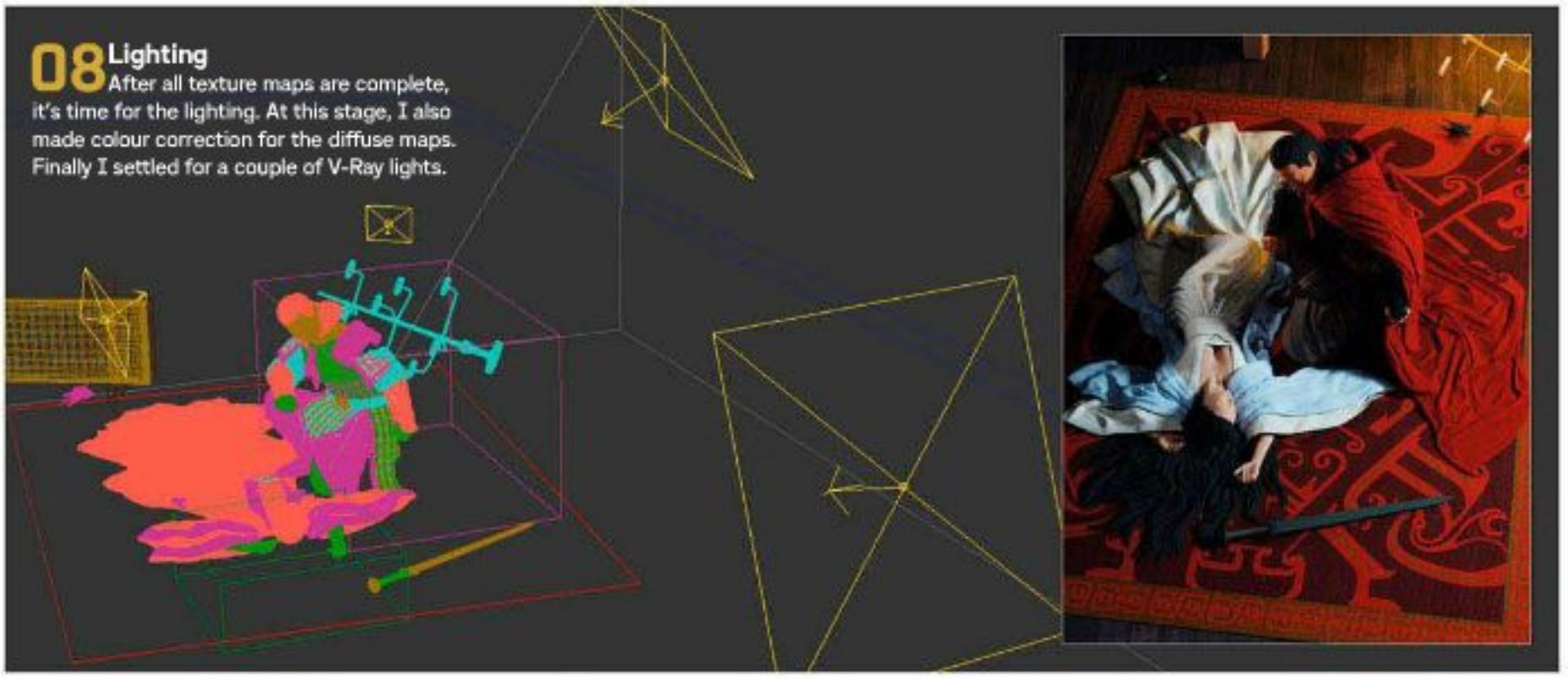


07 Making texture maps

I used Photoshop for painting textures. I applied three different texture maps to the models: diffuse, bump and specular. Using bump and specular maps produced very fine details for the model. That is how I made the fine patterns for my characters' clothes and the sword.



The base model had textures applied to it. These were created using three different texture maps: diffuse, bump and specular



08 Lighting

After all texture maps are complete, it's time for the lighting. At this stage, I also made colour correction for the diffuse maps. Finally I settled for a couple of V-Ray lights.

Hairtrix, a mixture of hairfx and Ornatrix proved invaluable for creating the realistic hair

09 Making Hairs

I used Hairtrix, which is a combination of the Hairfx and Ornatrix tools used for making hairs and is a really powerful tool. I used Comb and Guides to control the shape and styling of the hairs. Then, for the hair texture, I used the VRayHairMtl material.

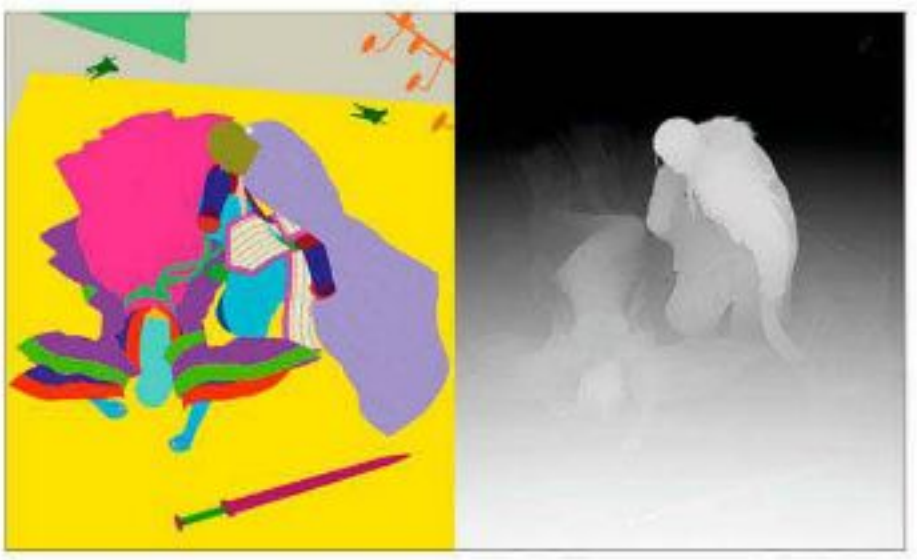
Stage 3
Finishing touches

10 Creating the flame effects

I used Phoenix to make the flames for the oil lamps, as it can make a wonderful fire effect. I rendered the flames in a single separated pass, then composited it with others later on.

11 Compositing

I rendered out a couple of passes, including Z-depth pass and ID pass for the convenience of compositing. I used Photoshop for the composite process. It included some adjustments on colour tone and adding flames and blood stains.



Outputting ID (left) and Z-depth (right) passes enabled Yu to control with precision the areas he wished to work while compositing in Photoshop

See examples of Gangqiang Yu's work at http://gangqiangyu.cgsociety.org/
If you would like to see your work in our Portfolio section, please send your images to: *portfolio@3dworldmag.com*

From jungle life to high-life, the monkey goes on a journey that will directly impact both urban and natural environments

Short Cuts
The best new animated shorts from outside the major studios

Monkey business

The dynamic animation and vivid colours in Shave It make this hyper-stylised short a true visual treat. Kulsoom Middleton meets co-director Jorge Tereso

Title: Shave It
Duration: 4:11
Website: www.3dtoc.com
Directors: Jorge Tereso and Fernando Maldonado
Production time: Six months
Synopsis: A monkey heads to the big city after shaving himself and ultimately extracts revenge after seeing the destruction of his jungle habitat
If you like this, watch...
Meet Buck, 2010, Denis Bouyer, Yann De Preval, Vincent E Sousa and Laurent Monneron

The visually stunning short Shave It kicks off with a colourful jungle scene, as a cheeky monkey unzips a tent to find a bag in which he discovers a shaver. As he switches the shaver on, the action cuts to a bulldozer destroying the trees. Then, the monkey shaves himself and disguised as a human decides to experience city life. There's more to the story than meets the eye, as the monkey ultimately takes its revenge on humans and their habitat.

The monkey is reminiscent of the stylised characters from DreamWorks' Madagascar. On this occasion though, the directors have taken this stylisation a step further with his crazy shock of blue hair, angular jaw, ping-pong ball eyes and floating ears.

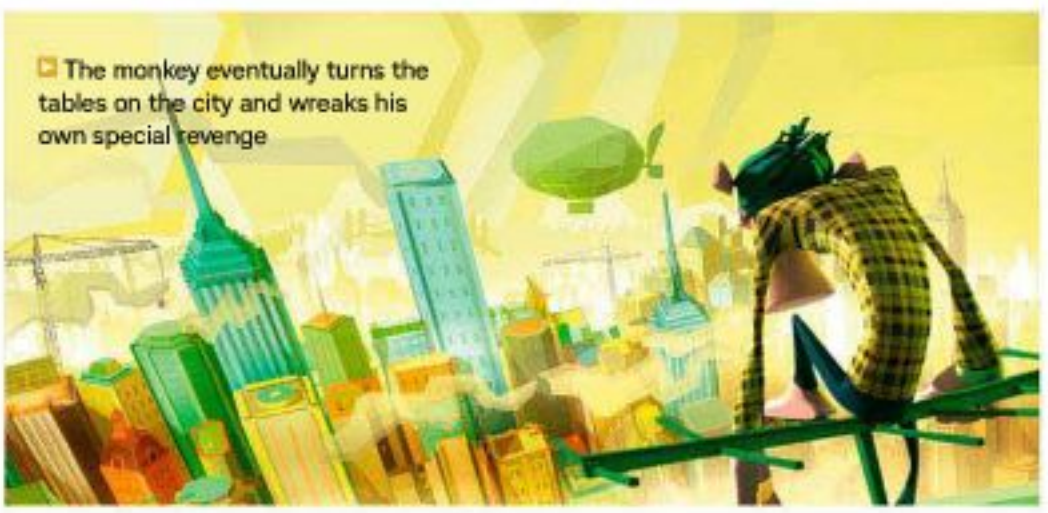
Directors Jorge Tereso and Fernando Maldonado had envisaged the monkey character from the beginning and knew they had to work in a certain way to achieve the stylised look. They called on the experience of rigger Vincent Souza to help. "We needed an extremely flexible rig, with a deep level of control," explains Tereso. "Vincent Souza's scripts and rigs for the monkey allowed us to have up to 15 controls for simple things like his upper arm." In total, the monkey's rig has about 150 controls.

The team used a visual user interface, mirroring and posing tools. There are layers of additional controls for each limb. "It also has many dynamic systems for things like the hair, the jaw, belly, eyelids and floating ears," says Tereso. The hair was designed to look natural and flowing, and its movement was controlled by a dynamic hair system. "We wanted it to move fluently, but not be too affected by gravity. It has five different controls. It can be animated by hand, stretched and squashed. And at any given point, we can turn the simulation on and it will start creating the key frames from there."

Taking control

While inspiration for the monkey came from a particularly hairy man, someone the directors actually knew, who used to shave his body in strange ways, they also took a couple of trips to the Amazon. This proved to be their very own jungle adventure and it injected them with a dose of wild enthusiasm. "We went on holiday to the Amazon, but it wasn't your classic type of holiday. We travelled a lot, looking for interesting experiences, knowing that it would fuel our creativity," says Tereso.

In search for some aesthetic inspiration, the team looked at a wide range of films including French short films such as Meet Buck and Jesus 2000, and Japanese anime movies such as Mind Game. "These [films]



The monkey eventually turns the tables on the city and wreaks his own special revenge

WATCH THE SHORTS

See Shave It in the Animations section of the 3D World website
3dworldmag.com/shaveit

The monkey undergoes a complete transformation when he reaches the city

paved the road years ago and opened up new ways of expression in 3D animation," says Tereso.

Artistic choices

The main software used on the animation was 3ds Max, but Tereso points out that they could have produced the short with any of the leading programs. "None of them limits you if you're trying to create something like Shave It."

Within 3ds Max they worked with the V-Ray renderer. "We put a lot of energy into lighting, and V-Ray is great for getting great results fast," says Tereso. They also wrote scripts for handling certain tasks like rig controls and the jungle plant generation.

In order to create the highly saturated colours and add more detail, the team turned to After Effects. "Every shot was rendered in separate layers and later retouched, edited and composed," explains Tereso. "We used lots of masks during colour correction – every shot was fine-tuned. We tweaked all the colours to take the saturation to its limit.

We also got to a point when we were animating in 2D over everything. Adding a lot details, not just aesthetic, but also conceptual details such as shadows and things that reinforced what each shot had to say." Drawing in 2D over the final animation gave such good results they ended up doing it on top of almost every shot.

After Effects was also to add some expressive 2D motion blur on top of the 3D animation. "This technique is used in 2D animation – for example, when a character leaves the frame running, he leaves a trail behind – but we think it's something we haven't seen in 3D animation before," says Tereso. It was a time-consuming task.

In scenes where the monkey would make a sudden move, they took the render into After Effects and added a layer of lines and shapes that reinforced that movement. "Seeing it without and then with [the additional layer] makes it clear how much it helps the animation," says Tereso.

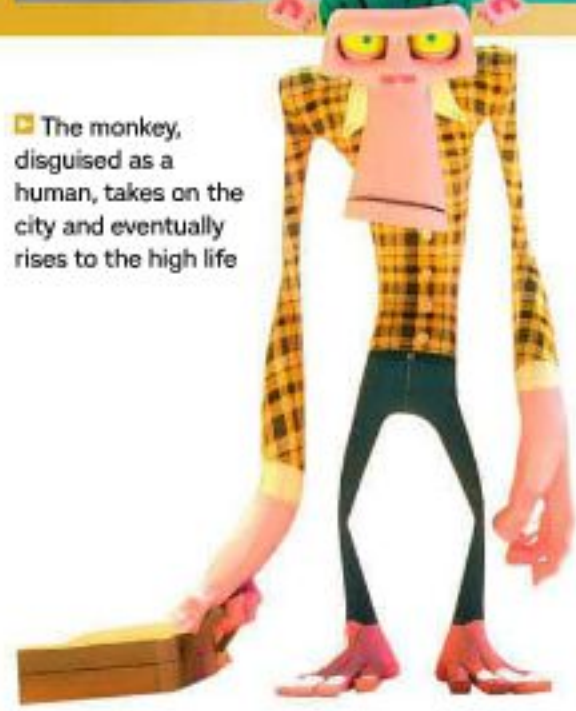
During the whole production, the most difficult task was finding a harmony between the 2D and the 3D worlds, says Tereso: "There was a lot of going back and forth between the two mediums until we found a unified language. It was hard to saturate things as much as we did without breaking the equilibrium of colours."

The short took six months to complete, with a lot time used to refine it. The directors assumed the roles of devil's advocates to solve problems. "We became enemies of the movie to find stuff that wasn't working. Then we made it better," says Tereso.

During production the team learned to trust their instincts, be more flexible, and discovered that every problem had solutions. "As John Lasseter once said: 'Be wrong as fast as you can. Mistakes are an inevitable part of the creative process'; and that quote is perfect as errors can sometimes lead to the most interesting stuff," says Tereso. ●

KEY TECHNOLOGY

Out of all the software the directors used to create Shave It, V-Ray was the most useful. "It helped us a lot while searching for the right balance between the 2D and 3D elements," says director Jorge Tereso. "We were demanding with the use of lighting. Even simple scenes could have up to 20 lights and V-Ray's speed was important to us." As a result, they didn't need to put too much energy into developing shades and textures.



The monkey, disguised as a human, takes on the city and eventually rises to the high life

Send us your short

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enquiries@3dworldmag.com

EPIC PROPORTIONS

Mark Ramshaw investigates how Blue Sky has proved that small is beautiful, with the microcosmic world of Epic

Rendered with Blue Sky's CGI Studio raytracer and textured using its procedural systems, Epic is a visually lush creation. Of all the studio's films to date, it's also the one closest to director and studio co-founder Chris Wedge's heart

Its finely-tuned blend of action, adventure, romance and comedy may tick all the matinee movie boxes, but Epic is a world away from written-by-committee CG fare. Instead this is a true labour of love for Blue Sky studio co-founder and director Chris Wedge – and, somewhat appropriately for a movie so rooted in nature, it's also a project that has organically grown and evolved during an unusually extended development period.

The initial inspiration came some 15 years ago, during a conversation with friend and author Will Joyce about an exhibition of Victorian fairy paintings. Joyce was moved to write the children's book The Leaf Men and the Brave Good Bugs and, after the pair collaborated on Blue Sky's 2005 offering Robots, Wedge began to look at how the idea of a tiny forest world could also be developed for a feature film. Epic's story and characters gradually and naturally grew from this miniature milieu, along with the notions of interconnectedness and the natural battle between life and decay – eventually becoming a deceptively large-scale action adventure.

Even with such a long gestation, much work was required by the Blue Sky team to usher the project through the last 18 months of full production. "Every single asset we needed was brand-new, and the concept was extremely ambitious relative to everything we'd produced previously," says CG supervisor Robert Cavaleri. "It took a lot of innovation and all the lessons learned from previous projects to be able to produce something of this scale."

"The team took a little longer to find a groove with the style, because these characters were more realistic than anything we'd done before"

Lluis Llobera, animation lead, Blue Sky Studios

These innovations included changes to the studio's handling of characters and its world-building tools. "We had a substantial need for more advanced cloth simulation this time," says Cavaleri. "Each Leafman wears over 100 individual pieces of armour, which is a whole different ball game to a character wearing a T-shirt and pair of shorts. And as well as simulating all these elements, we also had to spend timing designing workflows that could handle them – with between 60 and 80 animators feeding all the work to just 20 character technical directors."

In addition to fundamentally more complex characters, Epic's story also demanded scenes with hundreds and even thousands of Leafmen – and their enemies the Boggans – on screen. Even opting for off-the-shelf solution Massive, a lot of work was required to integrate it into the workflow. "We needed a pipeline that would allow for huge crowds moving with a good degree of intelligence all around our key characters," says Cavaleri. "To handle scenes like the one where a whole army of Boggans break from the surface of a tree, run down a branch and go on the attack required a lot of internal development, to support the movement of so many elements from Maya at the front end all the way out to our proprietary renderer CGI Studio." »

When it comes to the environments, Cavaleri notes that the world in Epic has a richness to it that greatly exceeds anything that the studio has accomplished before. "The issue is that when you put so many assets into a scene then you run up against the amount of data computers are capable of dealing with, both on the desktops and on the render farm. We've brought the latter up to around 10,000 cores in total, but even so files this large mean the amount of available RAM is an issue. So we had to find ways to render environments much more efficiently."

Asset creation

This included numerous optimisation techniques for the propagation of trees, foliage and ground cover. "The fact that everything needed to animate – even when just moving in the wind – meant that you couldn't simply do a repeat of the same asset, so we had to find a way to deal with all these unique elements," says Cavaleri.

While Blue Sky has long embraced procedural techniques for asset creation, Cavaleri stresses that the Assembly department and art director were very careful about building the right look and feel for the forest world. "There are a number of procedural tools for randomising elements, but there's also a lot of hand placement and sculpting, and working the elements relative to the camera to ensure balance in the frame and that the eye is focused on the action," he says.

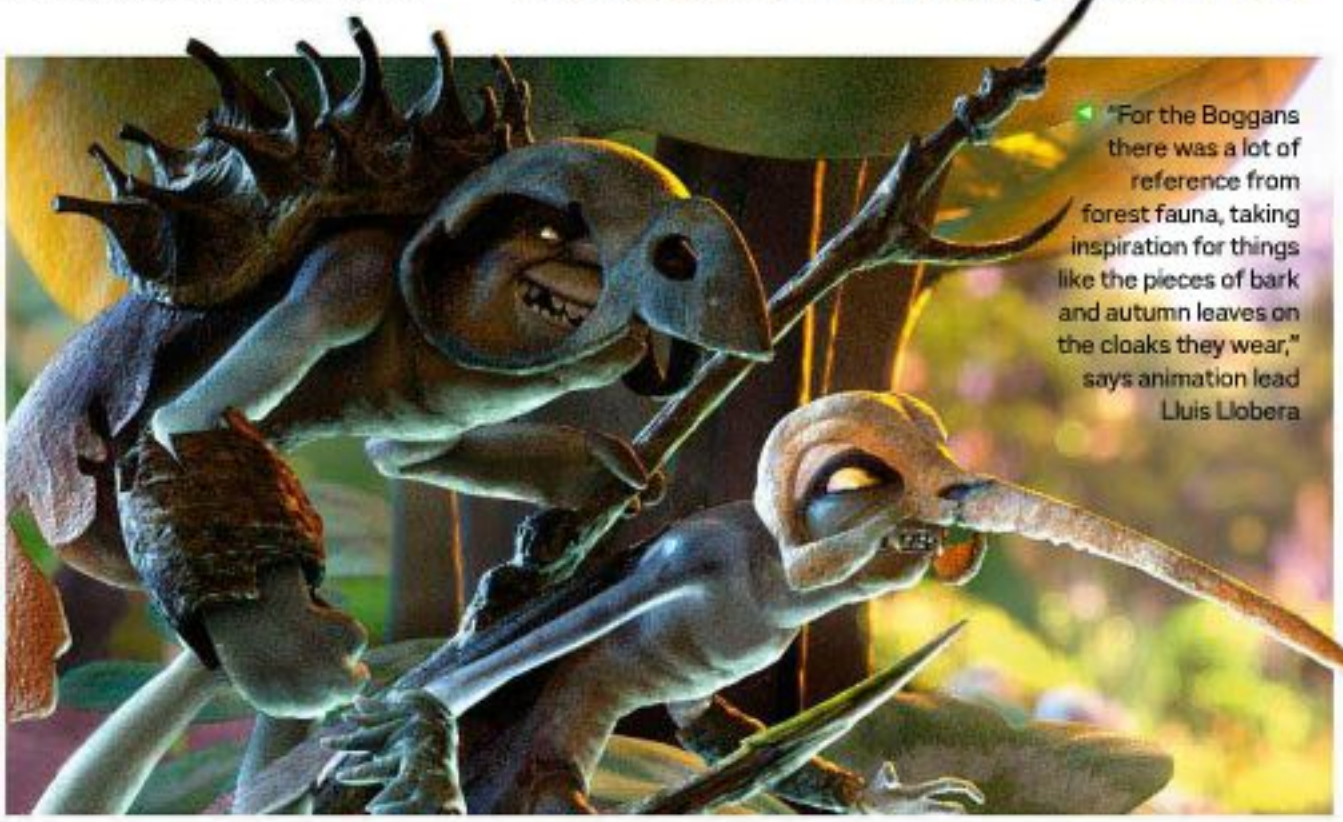
Epic essentially presents its story at two distances: one at regular human size and the other in the scaled-down, speeded up world of the Leafmen and Boggans. At the outset, there was some debate about whether to build two completely different environments or build one that would work from both viewpoints.

"In the end the solution was kind of a mix of both," says Cavaleri. "On a technical level we tried to create original hero assets and then we would go back in and add additional model and materials detail to accommodate the closer scale. That really required an understanding when shooting of where to strategically and surgically supply that extra detail once the camera was down at ground level. And then, on an artistic level, we also pushed to have differences in colour and the way the lighting worked, to help the audience differentiate between the two and understand which they were looking at."

"Our new rigging system took a lot of research, not only to allow for the creation of more realistic characters, but also to give us rigs that are much lighter and faster"

Lluis Llobera, animation lead, Blue Sky Studios

Some scenes feature armies of Leafmen and Boggans. "We utilised Massive quite a bit," says animation lead Jeff Gabor. "It was pretty daunting to hand-craft all the animation cycles required"



"For the Boggans there was a lot of reference from forest fauna, taking inspiration for things like the pieces of bark and autumn leaves on the cloaks they wear," says animation lead Lluis Llobera

Blue Sky's raytracer CGI Studio has long been regarded as one of its secret weapons. While the R&D department didn't make any major changes under the hood for Epic, more extensive deployment of subsurface diffusion did come into its own, allowing the artists to create forest scenes with glowing leaves and characters blessed with warm skin tones.

Cavaleri says Wedge constantly pushed them to look at real-world lighting, always creating initial scenes with simple skylight-based GI setups. "Then we'd go in and stylise as necessary, just placing one or two lights and reflectors as fill lighting – adding the 'special sauce' needed to achieve a nice balance."

Believable characters

In keeping with the richer, deeper and more complex world created for Epic, its characters are also substantially more detailed than anything Blue Sky have created before – charming enough to remain appealing within the context of a family-friendly animated adventure while skirting close enough to realism to allow them to have a good emotional range and connection.

"We've done plenty of fluffy animals, but here we had to pull off something much more believable," says animation lead Lluis Llobera. "The human world in particular needed to feel very much like our own, but even the Leafmen, the Boggans and the Jinn needed to be equally detailed. The aim was to have kids come out of the »

Character building

Behind the glow of CGI Studio's rendering lie some surprisingly traditional animation tools

While Blue Sky has several proprietary tools at its disposal, Jeff Gabor says that as far as animation is concerned, their system is around 90 per cent out-of-the-box Maya. "We have some bespoke things like a picker tool, a system for accessing our library of poses and our special blend shape system for deforming characters, but generally it's surprising how little we go outside of the main base program. It's in the underlying rig that the speciality code really lies."

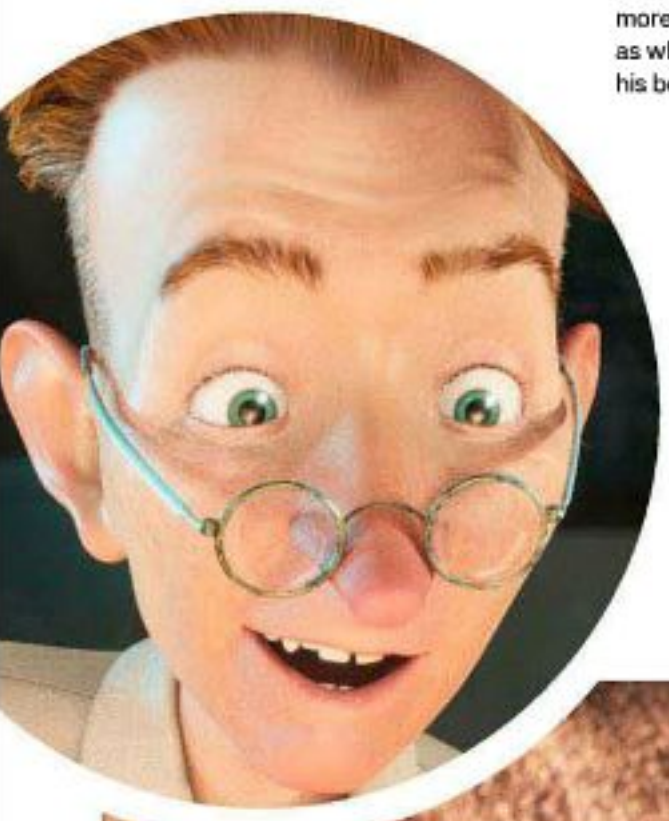
The studio had previously overhauled its rigging system for 2008's Horton Hears A Who, but Gabor says that by the time they were using it for Rio, the limitations were showing. "It would take around five seconds to update, so a lot of effort was put into developing something that could give us rigs that work close to real time. That really changes things for the animation team, making it possible to explore more options and animation choices."

As well as allowing for lighter and faster rigs, the new system does so while offering vastly increased rig complexity, with a controller count in the high hundreds for the more anatomically realistic characters in Epic. While Candy – the silhouette manipulation tool also originally developed for Horton – wasn't used here (in part because of the constraints of rendering for stereo 3D), the new rigging system did allow the animation team to rework the characters on the fly using the same remodelling tools developed for Rio.

"The tools were originally developed to allow for crazy poses, and had really been used to the extreme to contort Scrat in the last Ice Age movie," says Gabor. "Here though, we used it to create more dynamic poses – reworking an arm to make it very straight and angular when a Leafman pulls his bow back, for example."

Lluis Llobera on the importance of real-world reference

"We had some experts come in and give lectures to the animation team, including a Kata professional and a bow expert. As well as obtaining great reference, we also learned how they think about their weapons, how to really use them in battle and the philosophies behind them. Any time an animator was working on a shot of a Leafman shooting an arrow, they'd come over to my desk to try it out."



The same remodelling tools developed for Rio were used here to create more dynamic poses, such as when a Leafman pulls his bow back

film wondering if there really might be a Leafman over on that tree, or flying on that hummingbird."

Although he notes that the aim was to create stylised characters rather than attempt any kind of photorealism, Llobera says they were still very much aware of the uncanny valley: "We had to be mindful that the characters' bodies moved in the right way, so that the skin stretches correctly when their jaw opens, for example. The animators spent a lot of time analysing wrinkling on the face, and things like hip twists and arm/shoulder movements. They would often disappear to a special room where they could act things out and create reference."

"I think everyone was scared about the challenge of taking on human characters and emotions, but it was surprising how well the animators all took to it," adds fellow animation lead Jeff Gabor. "In fact, we ended up with the inverse problem. Now that they're jumping back onto Rio 2, they're finding it hard to get away from this more realistic animation style."

Gabor says that of one the more difficult aspects of pre-production involved working out how to differentiate the various groups in the story: "The most difficult one was dealing with how to separate the Leafmen from the human characters, not least because the idea is that the Leafman character Nod doesn't realise that MK [the film's heroine] is human until late on in the film."

"Epic isn't just a cut-and-dried franchise with a near-guaranteed box office. An original movie like this is a real leap of faith"

Jeff Gabor, animation lead, Blue Sky Studios

"Our fur system was enhanced to enable us to deal with characters with longer hair," says CG supervisor Robert Cavaleri

Emphasising differences between the Leafmen and the Boggans proved rather easier. While amphibians and lizards were used as inspiration for imbuing the latter with an itchy, bug-like quality, the stoic Leafmen more obviously referenced the characters featured in the work of N C Wyeth, the 20th century American artist whose work directly inspired Wedge in the early stages of development. "The Leafmen have very good posture and move in a very defined way," explains Gabor. "You can really see it when they use their bow and arrow, in the way they pull

Armour-plated

When one cloth simulation just won't do

Epic is Blue Sky's first movie with a female lead protagonist, their first with such realistic characters, and the first in which virtually every living thing in the world is clothed. "We needed full cloth simulation, but also to be able to art-direct it somehow," says animation lead Lluis Llobera. "That involved some back and forth between the animation and cloth departments, with our team drawing over keyframes to give them a guide to try to match the sim to. Along the way we learned a lot about what simulations can and can't do."

The Leafmen and Boggans were particularly challenging, as their clothes incorporated many sections of armour – sometimes around a hundred. As well as working with proxy geometry to give some guide of how animation changes would affect the armour, the animation team also had the ability to unhook sections from the simulation and instead control elements manually.

"The Leafmen needed to perform martial arts-style moves, but raising their arms would cause the shoulder pads to sink into character space, so we needed to be able to go in and make small adjustments," explains Llobera. "We took it even further with Mandrake, whose bat skin cowl is part-simmed and part hand-animated. The animators were given controls to blend seamlessly between the two."

"Mandrake's design is awesome," enthuses animation lead Lluis Llobera. "He's a little guy, but he singlehandedly killed a bat whose skin he wears. He's a force to be reckoned with"

The team mixed simulation and hand-drawn animation to make Mandrake's cowl

the string across their chest with a very sharp and precise motion."

"Because the Boggans are less realistic they were definitely a little easier to deal with," says Llobera. "We could use extreme poses without it feeling too unnatural. We would even scale the skull to allow for facial expression, making it slightly bigger when shocked or scaling it down when angry. And with lead bad guy Mandrake, we would even scale up his teeth and shrink his pupils to make the eyes more intense. It's still the same squash and stretch controls that we utilised on Rio, but here the aim was to use them much more conservatively."

Doing the maths

To further highlight the difference between the full-sized humans and the smaller characters, the movie plays on the notion that the inhabitants of the forest move much more quickly than the big, bumbling humans who live nearby. For this, the Blue Sky artists developed a whole rulebook of small-scale character physics that – akin to those governing the combat in wire-fu martial arts movies – govern the limits of their exaggerated abilities.

"The rules covered everything from the way they can jump far and high, to the nature of combat," says Gabor. "When a Leafman stops a Boggan with his fist there's a kind of bounce while the fist remains immobile, for example. There was even more we looked at in pre-production but which we didn't get to fully explore in the movie – such as the way surface tension on water makes it possible for these small characters to walk right over it – that would be great to dive into should there be a sequel."

While the movie's cast of thousands is crucial to the telling of the action-packed »

Many assets were created with both the macro and micro worlds in mind. "We'd create a base level of procedural material, and then the artists could go in and ramp up the frequency or amplitude of existing textures," says CG supervisor Robert Cavaleri

tale, Epic is also rich with well-defined lead characters. Mandrake, the villain of the piece, is an obvious standout – with a surprisingly dark look and demeanour for a kids' movie. "A lot of his design came together right off the bat, and from there it was quite easy to push for a crazy acting style," admits Llobera, whose role – as on Rio – chiefly involved dealing with the bad guys. "For inspiration, I looked at Hannibal Lector, a lot of Gary Oldman performances, and even Christopher Walken. We did find that some of his more over-the-top moments became too scary for younger children, so had to dial it back a little. I took that as a compliment!"

"The library of poses we created for MK was much larger than usual," says animation lead Jeff Gabor

Personal performances

With Bomba, the father of MK, the challenge lay in making him believable enough to sit correctly in the film's human world and carry some weighty scenes, while still sporting a pleasingly bendable, cartoonish air. "Chris Wedge would often act out his scenes, so we immediately knew how to approach the performance," says Gabor. "He especially wanted us to take inspiration from both Doc Brown and George McFly in Back To The Future, as well as Rick Moranis. To be honest, Chris himself was the big inspiration, although I'm not sure he's even aware of that. He really does look and act like Bomba."

"Chris Wedge would often act out his scenes so we immediately knew how to approach the performance. He really does look and act like Bomba"

Jeff Gabor, animation lead, Blue Sky Studios

"One of the new rig tools gave creatures like Mub the slug auto-detection with the ground," says animation lead Jeff Gabor. "The whole body would completely deform with seemingly correct physics and body mechanics"

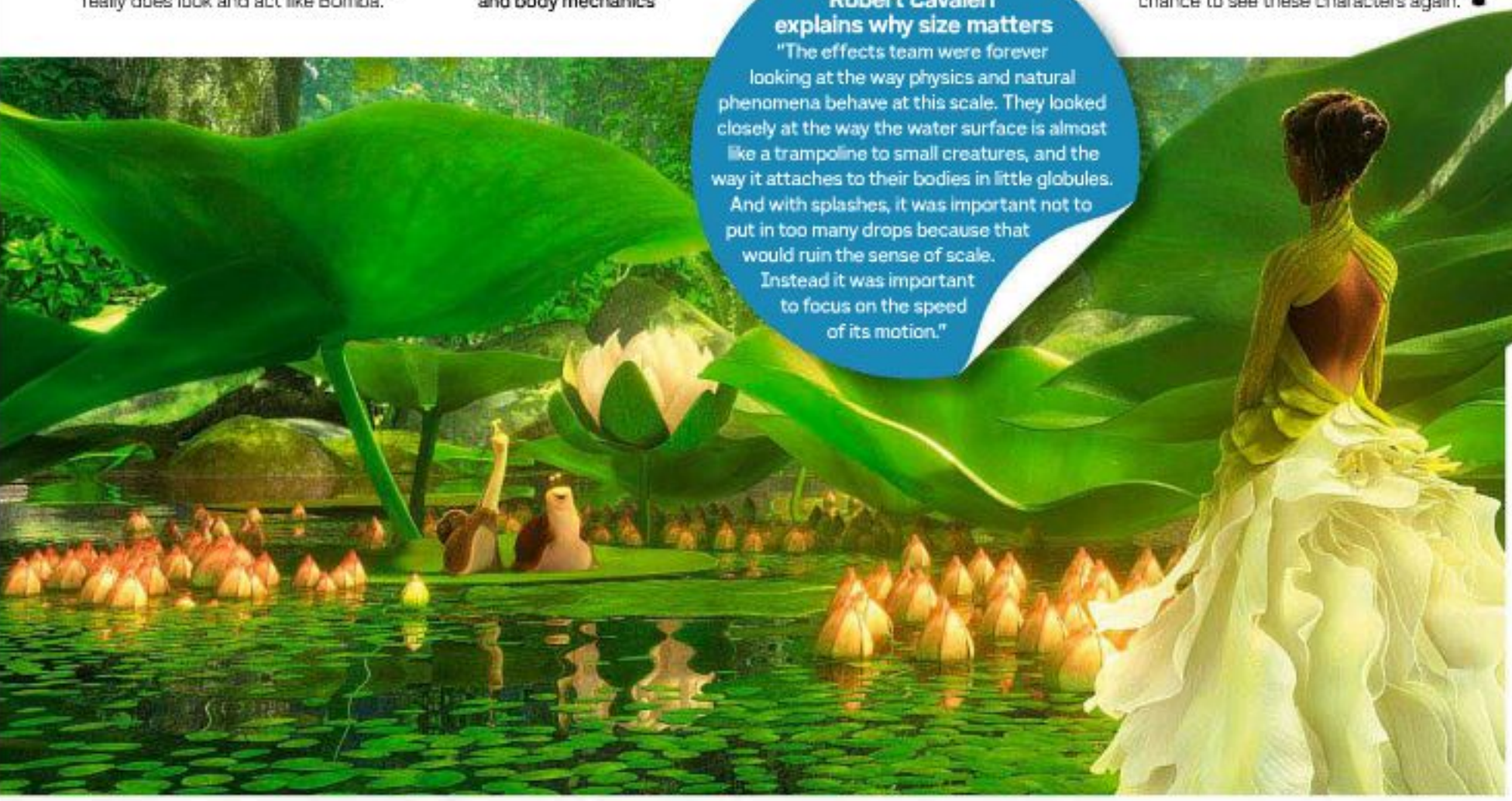
But it was the character of MK – the heroine of the piece and the window into the forest world – who proved the most difficult to get right. Gabor says that her face was continually reworked during preproduction in search of the elusive right formula. "Audiences want a 3D character they can relate to, who doesn't look generic, but doesn't look so real as to be creepy," he explains. "Movies like Tangled have definitely raised the bar in terms of female characters with strong personality and facial depth."

He also believes that female CG characters are inherently more difficult to get right. "You can get away with more extreme expressions on a male character without it looking off-putting. But to have a digital female that looks appealing while still displaying a wide range of emotions is very specific – and to get over 100 animators on all the same page with that is no easy task."

For Gabor, it's the depth rather than the breadth of Epic that made it such a satisfying project. "There are scenes in the film, especially those with interaction between MK and her father, that were very emotional and required some subtle acting. That's obviously something we very rarely get a chance to tackle in the world of CG animation, so I feel really gratified that this movie came along. For me, it satisfied a need to go beyond cartoon characters for a change and do something a little closer to acting. I definitely hope we get a chance to see these characters again." ■

Robert Cavaleri explains why size matters

"The effects team were forever looking at the way physics and natural phenomena behave at this scale. They looked closely at the way the water surface is almost like a trampoline to small creatures, and the way it attaches to their bodies in little globules. And with splashes, it was important not to put in too many drops because that would ruin the sense of scale. Instead it was important to focus on the speed of its motion."



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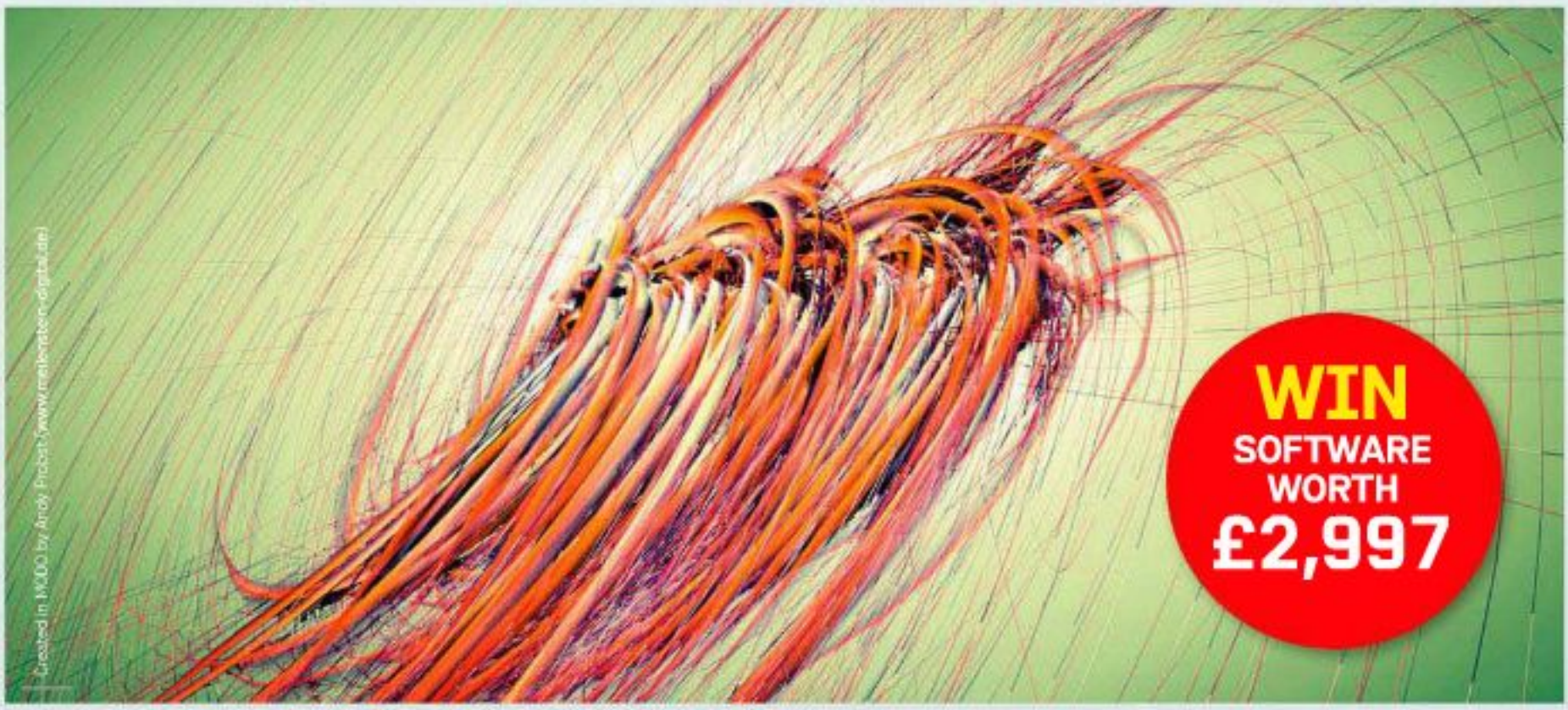

Created in MODO by Andy Probst (www.meisterpeter-digital.de)

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Created in MODO by Warner McGee (www.warnermcgee.com)

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The retopology tools also improve on speed and accuracy, and brand-new tools like the Contour tool add to MODO's already extensive feature set. Arguably the biggest new feature is the particle system, which makes MODO 701 an attractive option for VFX and motion graphics work. A Linux version will soon join the existing Mac and Windows versions.

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What makes a great animation? Story? Technique? Or another kind of magic? **Jim Thacker** asks eight leading artists and directors to name their favourite 3D shorts

KYLE BALDA PICKS...

KYLE BALDA has worked in animation at Pixar, ILM and Weta. He now directs animated features for Illumination Entertainment, and recently co-directed The Lorax

Luxo Jr

RELEASED 1986 DIRECTOR John Lasseter/Pixar

Luxo Jr was something I first saw as part of Spike and Mike's Festival of Animation. I was 17. It was my introduction to 3D animation and the thing that most made me want to pursue a career in computer animation.

For me, the essence of character animation is the empathy we inspire in the audience for the characters we create. Luxo Jr does this in spades. Through Lasseter's performance, viewers come to project the relationship of parent and child onto what would otherwise be two soulless household lamps. In spite of having no face to emote with, no arms to gesture with, or even a mouth to speak with, the characters communicate with perfect clarity. We know what they are thinking and feeling with every frame we watch. What's more, we are moved from curiosity, to sympathy, to celebration, through the trials that little Luxo Jr goes through in his brilliant two-minute odyssey. Shaders and lighting software have improved immensely since the film's creation in 1986. But Luxo Jr shows the art of animation is, and always will be, timeless.

SEE IT • Online at **http://bit.ly/17zIEQT**
• On DVD in Pixar Short Films Collection Vol 1, **http://amzn.to/15z8IQA**

GENIUS OF THE LAMP

Luxo Jr received an Academy Award nomination for Best Animated Short Film, becoming the first CGI film nominated for an Academy Award. Jim Thacker says: "The first short the Pixar team made was good. The second was Luxo Jr. A tale of curiosity, wonder and the parent-child bond, whose only characters are two animated desk lamps, it gained Lasseter the first of four Academy Award nominations. (He would later go on to win twice.) While most 3D shorts from the period are little more than historical curiosities, Luxo Jr transcends its technology. Its elegant visual style, strong emotional storyline and beautifully nuanced animation remain the hallmarks of modern Pixar productions. To this day, the company uses the Luxo character as its mascot."

Shaders and lighting software may have improved since it was created in 1986, but Luxo Jr reminds us that the art of animation is timeless, argues Kyle Balda

"For me, the essence of character animation is the empathy we inspire in the audience for the characters we create. Luxo Jr does this in spades"

MENI TSIRBAS PICKS...

MENI TSIRBAS acted as VFX supervisor on Star Trek: Deep Space 9 and created indie shorts like The Freak before directing the animated feature Battle For Terra

Locomotion

RELESED 1989 DIRECTOR Steve Goldberg/PDI

This charming early CGI short from Pacific Data Images – now part of DreamWorks Animation – is propelled by a brave hero, a reluctant sidekick, and a perilous obstacle.

Locomotion was made in 1989 and steered clear of human and animal characters (nearly impossible to pull off with any conviction at the time), instead choosing to anthropomorphise a steam engine.

The set-up is brilliantly simple: Engine No 9 is stopped in his tracks by a damaged bridge. Egged on by his cowardly caboose, he decides to reverse direction – only to be haunted by nightmares of being scrapped for arriving late once too often.

Technically, the film is distinguished by its landmark use of flexible hard-surface characters. They convey their emotional beats with perfect clarity, with the main character moving from fear to regret, conviction and, eventually, pride.

25 years on, it's easy to find flaws, but remember that animation back then was done by punching numbers into artist-unfriendly in-house 3D software. For everything that's changed since Locomotion, one thing remains constant: the value of great storytelling.

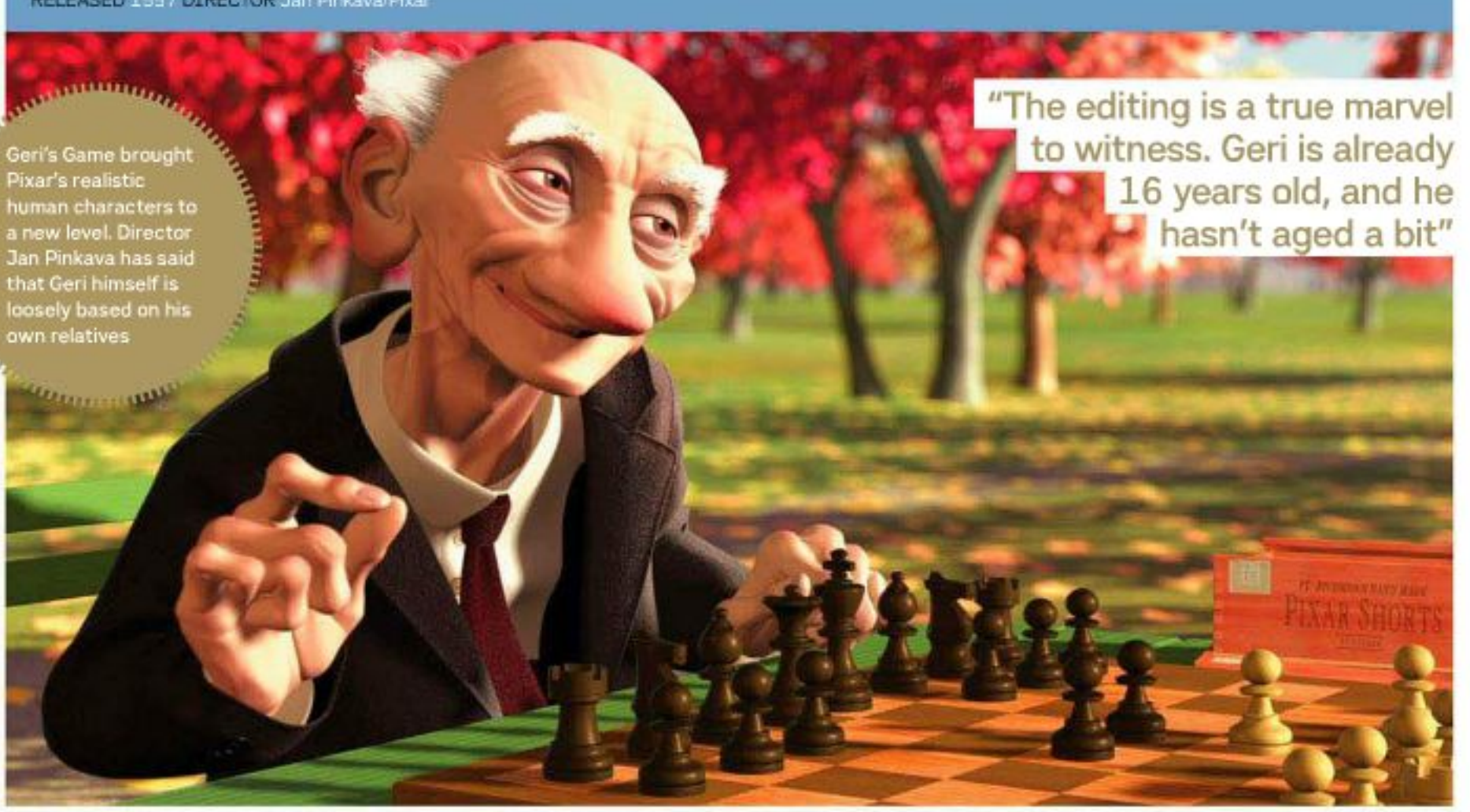
The film is notable for its use of flexible hard-surface models and its creative transitions to lead us through the hero's nightmare

PASCAL BLANCHÉ PICKS...

PASCAL BLANCHÉ is senior art director at Ubisoft Montréal. He was also art director at Frontier Developments and Jagex, where he helped refresh the visuals of Runescape

Geri's Game

RELESED 1997 DIRECTOR Jan Pinkava/Pixar



Geri's Game brought Pixar's realistic human characters to a new level. Director Jan Pinkava has said that Geri himself is loosely based on his own relatives

Geri's Game is special for many reasons, not least the advances Pixar made in creating and rendering realistic human characters – something that had yet to be mastered when the short was created back in 1997. It's a long list of technical achievements, including subdivision surfaces, better skin shading and realistic hair and cloth simulation. But the true star is the story. Geri's Game shows an old man playing chess against himself in a park, switching sides after each move to become his opponent. The fact that Geri is two characters in one demonstrates brilliantly just how important animation is for creating a sense of personality. One Geri is gentle, the other competitive; one looks frail, the other aggressive. Even the sparkle in their eyes is different. There are also a few subtle camera tricks that are reminiscent of Gollum's self-discussions in the Lord of the Rings movies. There was certainly a reference there for the artists at Weta. There also is a lot of humour, and a twist at the end, while the editing is a true marvel to witness. Geri is already 16 years old, but he hasn't aged a bit. He's still a reference to me when it comes to character animation.

SEE IT • Online at **http://bit.ly/10CT2T4**
• On DVD in Pixar Short Films Collection Vol 1, **http://amzn.to/15z8lQA**

RICHARD WILLIAMS PICKS...

RICHARD WILLIAMS is a triple Oscar-winning animator and has just released an iPad app of his best-selling book and 16-DVD box-set, The Animator's Survival Kit – Animated

Bunny

RELEASED 1998 DIRECTOR Chris Wedge/Blue Sky Studios

Bunny deservedly won an Oscar. It is a unique and original self-contained little masterpiece. I'd seen nothing like it before, and I've seen nothing like it since.

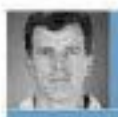
It captivates you immediately, drawing you into its own special world to meet an old lady rabbit and share her irritation at the moth disturbing her – a moth that is, as we discover, the bringer of a benign death experience, leading her into the light where she will be reunited with her husband. It's such an intriguing and unusual subject for a cartoon. It's such a thoughtful film: poetic and yet with a real narrative drive, building to a crescendo that is all the more effective for its understatement.

Everything in it is cohesive, including a brilliant soundtrack that makes use of silence and then, out of the blue, the emotional jolt of Tom Waits singing a song over the end credits – it's altogether so moving.

Chris Wedge's direction is flawless, intriguing and brave. As I watch it today, Bunny comes across as fresh and delightful as when I first saw it 15 years ago.

SEE IT • On DVD in the Bunny book and DVD set, http://amzn.to/17JqnND

Bunny won an Oscar for best animated short at the 1999 Academy Awards, launching Blue Sky Studios on to success in movies like Ice Age

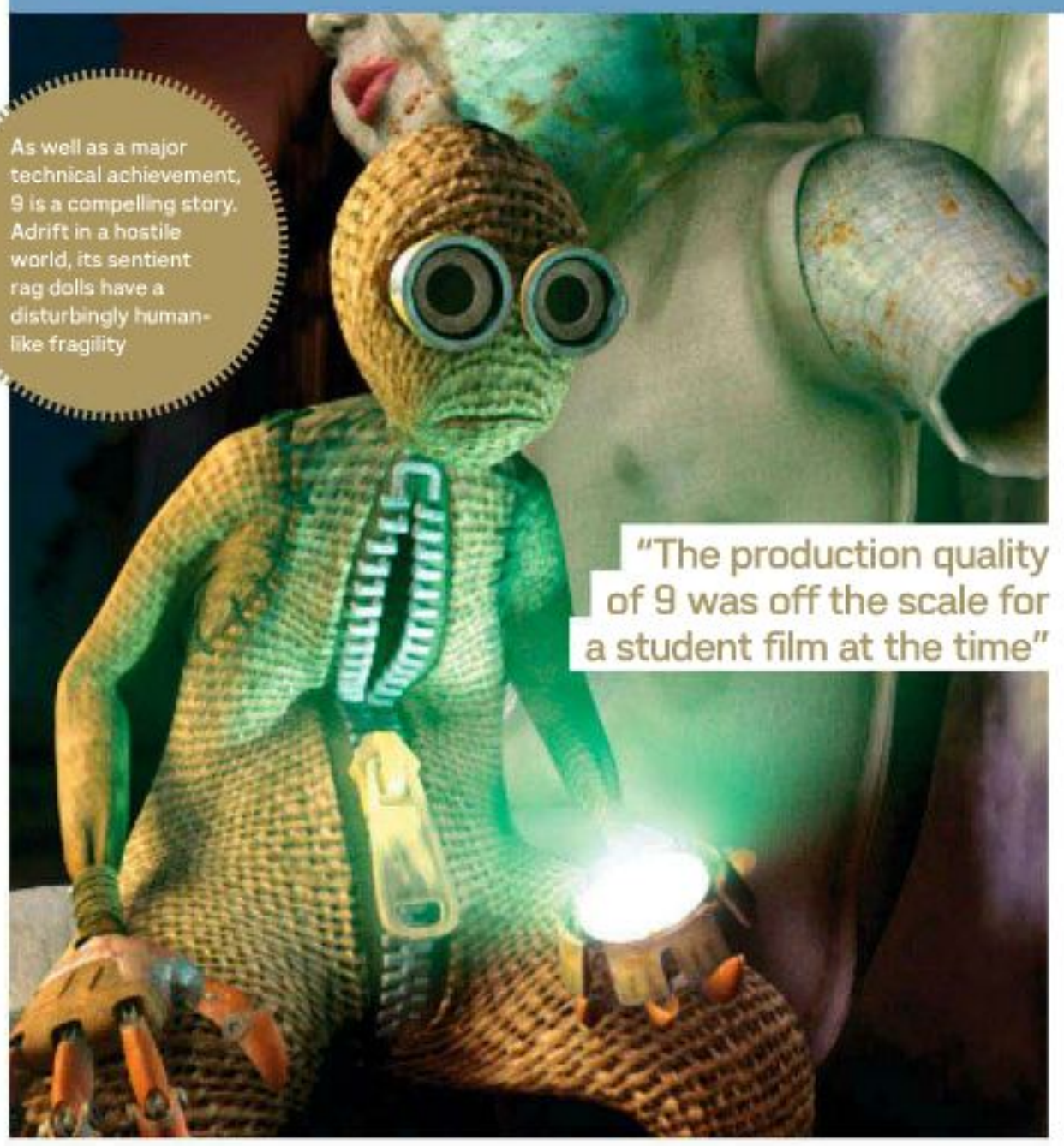


KEVIN SMITH PICKS...

KEVIN SMITH is VFX supervisor at Weta Digital, where he worked on the Lord of the Rings trilogy and recently completed work on The Hobbit: An Unexpected Journey

9

RELEASED 2005 DIRECTOR Shane Acker



As well as a major technical achievement, 9 is a compelling story. Adrift in a hostile world, its sentient rag dolls have a disturbingly human-like fragility

"The production quality of 9 was off the scale for a student film at the time"

The Electronic Theater at Siggraph 2005 was where I first saw 9. The Electronic Theater was always one of the best parts of Siggraph. You got to see a lot of really cool, technical, big-brain type stuff, and all the major players would show off with reels of what they'd done that year. So this student film comes on – and student stuff was always hit-or-miss – and it's this amazing thing.

The production quality of 9 was off the scale for a student film at the time. And not only was this an amazingly detailed little world, it was an amazing story. I wanted more. I wanted a whole movie of this little sack guy.

[Kevin got his wish. Shane Acker later expanded his tale of sentient rag dolls adrift in a dystopian world into a full-length feature. Co-produced by Tim Burton and Timur Bekmambetov, 9 the movie came out in 2009.]

The most exciting thing at the time was the realisation: "If students can do this, anyone can do anything they want." Suddenly you didn't have to be Pixar, or Disney, or PDI. All you needed was a vision.

SEE IT • Online at www.shaneacker.com

PERFECT 10

Shane Acker amazed audiences with the multiple layers of complexity and detail in 9

Shane Acker's thesis project for his MFA in Animation at the University of California, Los Angeles, features a rag doll in a post-apocalyptic world where all humanity is threatened. Acker used Maya, Photoshop and After Effects. "The challenge was to create a believable artificial world, complete with history and logic that's revealed through the short narrative," says Acker. The short astounded juries when it ran the festival circuit, winning Best of Show at a total of five fests: "People seem to really respond to the characters and the design," he says.

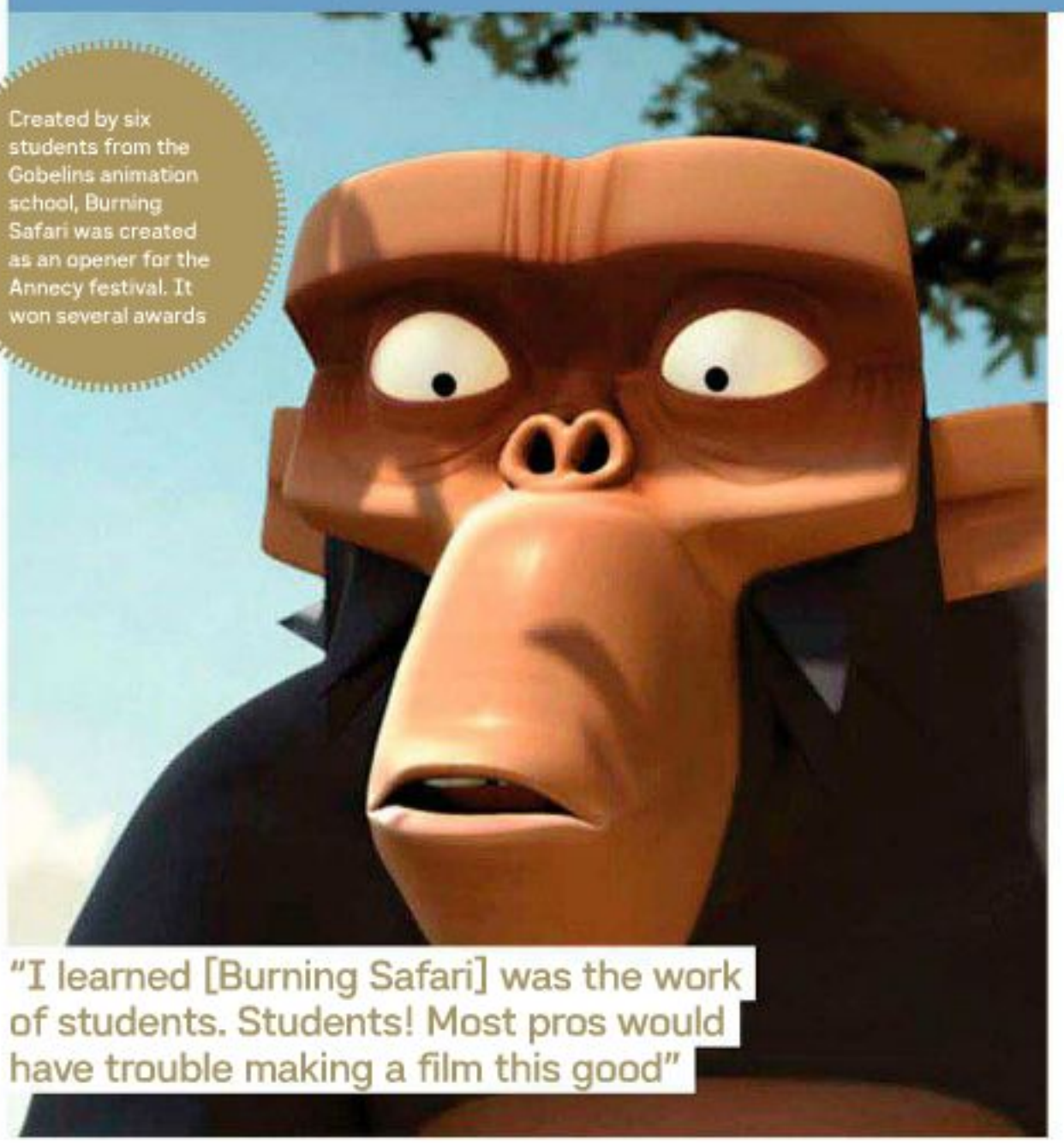
STEVE OGDEN PICKS...

STEVE OGDEN is studio art director at Firaxis Games, and a director, illustrator and graphic novelist. He edited much-missed online animation magazine **AnimWatch.com**

Burning Safari

RELEASED 2006 DIRECTORS Aupetit/de la Taille/Irzenski/Maleo/Predal/Trebutien

Created by six students from the Gobelins animation school, Burning Safari was created as an opener for the Annecy festival. It won several awards



"I learned [Burning Safari] was the work of students. Students! Most pros would have trouble making a film this good"

Burning Safari amazed me. It had the feel of a classic Warner Bros short, but with a much more contemporary edge. The story of an alien tourist's unfortunate encounter with a monkey, it made me laugh every time I watched it. Then I learned it was the work of students. Students! Most pros would have trouble making a film this good.

When I interviewed the creators, they told me the secret of its frantic magic: they had too much story for the time allotted, so they animated the whole thing normally, then sped it up. I watched the film with new eyes after that: although the action is intense, there are plenty of well-placed pauses. The piece is masterfully paced.

I give a lot of talks to primary school kids. I bring my portfolio and my animation files, and some trailers for games I've worked on. But I also show them Burning Safari. They always love it, wild laughter all around. And it's nice to tell them that it was a student film. You can see the wheels turning in their heads as future animators dream about the films they will create. If they turn out like Burning Safari, I can't wait.

SEE IT AT • Online at www.burningsafari.com

GOING APE

How students at French animation school Gobelins brought mayhem to a masterful short

Vincent Aupetit, Florent de la Taille, Jeanne Irzenski, Maxime Maléo, Aurélien Predal and Claude-William Trebutien made Burning Safari in their final year, where they had been studying 2D animation. It was their first 3D animated work, but they stuck to their 2D roots: "We wanted to make something very graphic, with a lot of action, humour and quick animation," says co-director Trebutien. "We took a simple approach: just pans, trucks or fixed camera. We don't like it when the camera spins around."

SHARON CALAHAN PICKS...

SHARON CALAHAN is director of photography at Pixar, where she has worked for over 18 years, joining in time to work on Toy Story. She recently acted as DoP on Cars 2

La Luna

RELEASED 2012 DIRECTOR Enrico Casarosa/Pixar

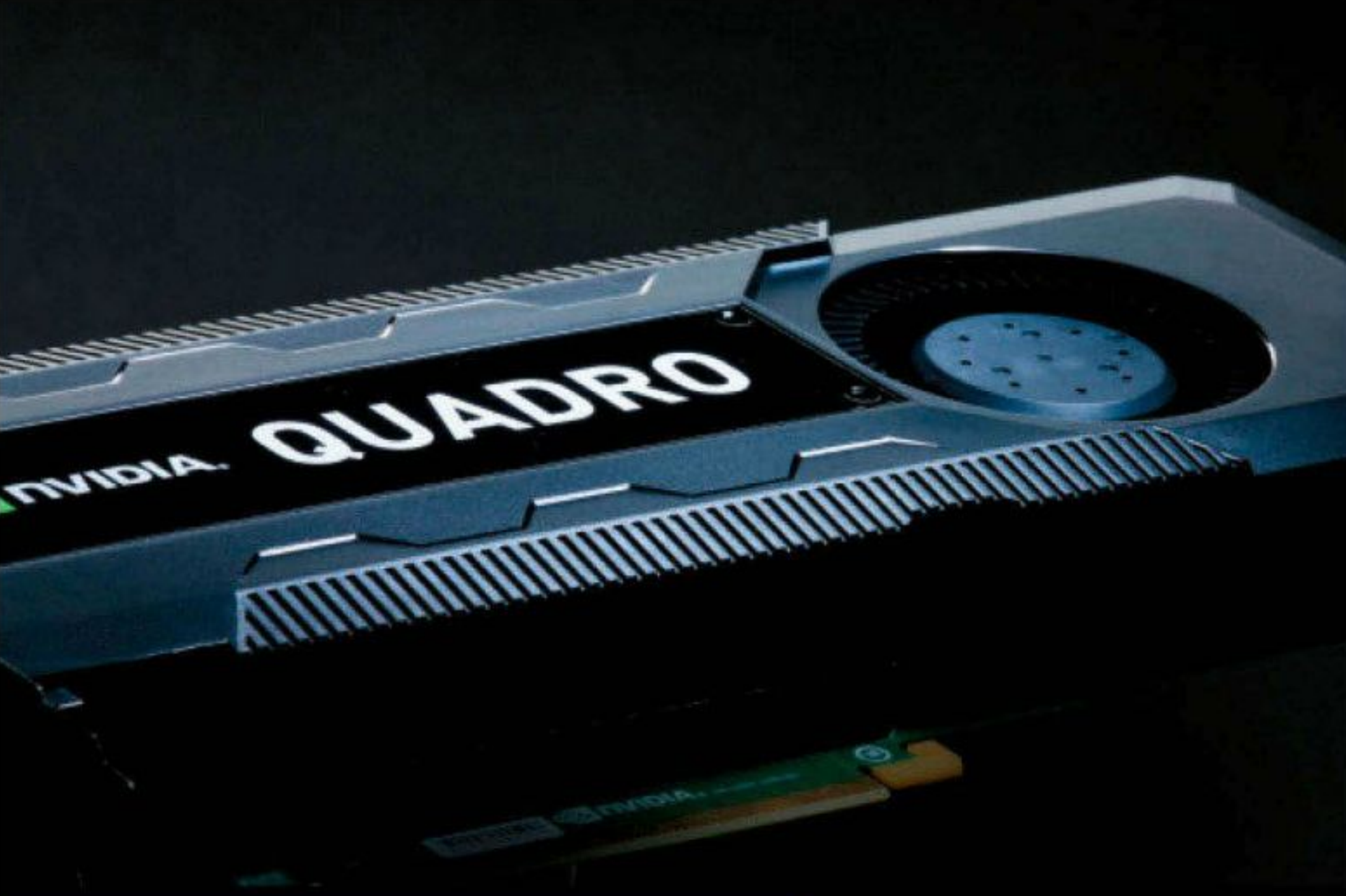
Because I work at Pixar, I was initially hesitant to choose a Pixar short, even one I didn't work on. However, if I describe why I chose La Luna well enough, perhaps I will be forgiven. This is the story of a rather otherworldly janitorial firm. La Luna is imaginative, quaint, charming, clever and simple. It has the quality of a vintage animated short.

I find the family dynamic really delightful, as is the idea of occupations that are passed down from one generation to the next. It think it helps that the story is told through the wide eyes of the little boy. I adore everything about the way La Luna looks, from the dreamy hand-drawn pastel quality, to the rich colour palette, archetypal character design and of course, the wonderful animation.

However, despite all of that, the principal reason I love it so much is that it is a story that is told visually, and a large part of this is in its use of light. The light feels both practical and intensely magical at the same time. And the story pay-off is incredibly satisfying, especially for a lighting designer like myself.

SEE IT • Online at http://bit.ly/15z7QWH
• On DVD in Brave, http://amzn.to/15fGkdq

Told without words, La Luna has a timeless, archetypal quality. The wide-eyed wonder of the little boy makes the action more magical



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ROB BREDOW PICKS...

ROB BREDOW is the chief technology officer for Sony Pictures Imageworks, where he served as visual effects supervisor on Cloudy with a Chance of Meatballs

Paperman

RELEASED 2012 **DIRECTOR** John Kahrs/Walt Disney Animation Studios

Paperman is one of my favourite CG shorts of all time. The story of a lonely office worker finding love through a thrown paper plane, the style of the film beautifully complements the simplicity of the storytelling – charming and classic.

The blending of 3D and 2D into a single animation is a particularly daunting task. I've had some experience with various non-photorealistic rendering techniques on movies like The Polar Express, and have been inspired by Disney's work in this area over the years. Barbara J. Meier's early paper on painterly rendering (**http://bit.ly/YsXEtD**) and George Katanics and Tasso Lappas's later work on the Deep Canvas software used in Tarzan by both significantly advanced the state of the art.

Technically and artistically, I think Paperman is the culmination of the best of these techniques, improved with an intuitive new drawing system that captures the feel of the pens held by some of the most talented 2D and 3D animators in the world.

It was also a joy for me to watch the short film with my daughters (aged seven and 10), who giggled and laughed throughout. Beautifully done.

SEE IT • Online at **http://bit.ly/10n9HuE**
• On DVD in Wreck-It Ralph, **http://amzn.to/ZFjh7E**

Disney's research into non-photorealistic rendering spans almost 20 years: experience put to use in Paperman's unique combination of 3D and 2D animation

PAPER CUTS

Animation supervisor Patrick Osborne explains the unique animation of Paperman

Animation supervisor Patrick Osborne says Paperman probably wouldn't have been possible without a proprietary tool created for an entirely different purpose: "[Disney software engineer Brian Whited] had been tasked a few years earlier to streamline the in-betweening process in hand-drawn 2D animation. Part of his project was Meander, a vector drawing tool built to stay fast and keep that connection between artist and work as tight as possible. He had even built in brushes to mimic the favourite brushes of Shiyoon Kim and Jin Kim, two of our fantastic character designers, so we knew it could handle the beautiful line work we were going to need."

"The style of the film beautifully complements the simplicity of the storytelling – charming and classic"

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Animator Wes Ball used RebusFarm to output his acclaimed CG short RUIN

When it comes to rendering, workstations are getting faster all the time – yet the growing requirements of modern CG projects mean that there's more strain, not less, being placed on our equipment. Large studios deal with this by building render farms, clusters of computers that distribute the task of rendering still or frame renders across dozens or hundreds of processors. Artists or studios lacking their own render farm facility can still call on the powers of this kind of resource, though, by hiring time on a commercial render farm service.

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Save time by creating reusable 3D models

Digital artist **Antony Ward** shows you how to plan for future projects while creating your own virtual actress

Time – there's never enough of it! You may not be able to add more time to get everything done, but there are ways to cheat it.

I have often discussed recycling, and how reusing existing models can give you a good head start on a project, in past tutorials. You have also probably seen this idea taken to the next level, with artists generating a base model that they can place in different settings, with different clothing, hair and accessories added to create a brand new illustration – like their own virtual actor, always ready to tackle the next demanding role.

But it's not all about saving time. Having this base model also gives the artist time to focus more on the props and environment, meaning everything in the scene feels fresh and polished. What I would like to do in this workshop is show you how to create your very own virtual model: a character that is fully modelled and textured, and which is ready to rig for animation (an area I'll look at next issue).

I will also look at some shortcuts you can use for quickly generating hair and clothing. Once you have completed this and next issue's tutorial, you will have a character ready for animation as well as illustrations – a double win!

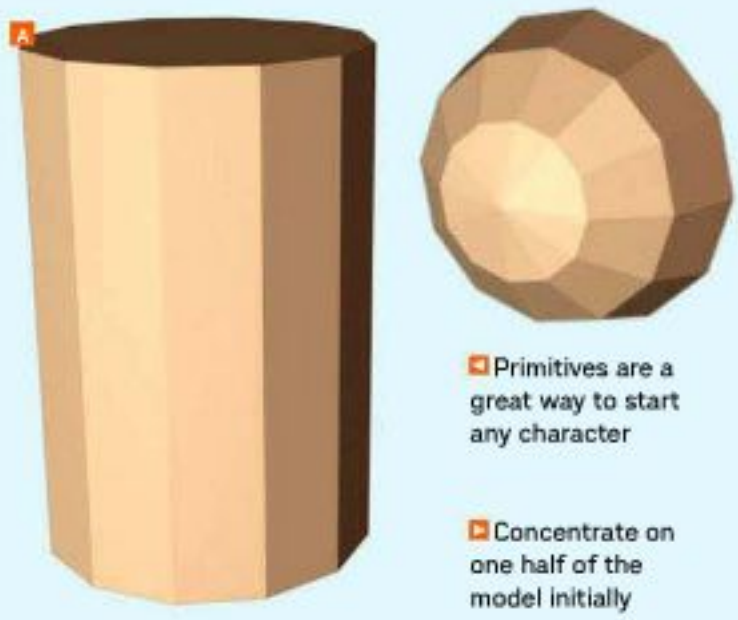
Video 1
Dive in

Every project has to begin somewhere. Normally I would recommend starting with a rough concept of the character, or at least a model sheet to guide you. There are times, however, when you just want to dive in, experiment a little, and let fate decide how things will turn out. I've used Silo, but you could equally use Maya or another app of your choice.

To create the foundations for your virtual model, you need a simple cylinder and half a sphere. A First, adjust each horizontal edge loop on the cylinder in turn to rough out a general torso shape. Remember this is going to be a stylised character, so don't be afraid to widen the hips and tighten the waist.

Next, turn your attention to the sphere and position it where her left breast would be. Remember that it shouldn't point straight ahead: try away from the centre and slightly to the sky, but this obviously depends on the shape you are after. It may also be easier at this stage to focus on just one half of the torso.

Combine the two models and then carefully weld the sphere to the torso, merging the vertices that are closest to each other until you have a single seamless mesh. B Remember to leave a polygon gap between her breasts or they may end up joined when you mirror and recombine the torso. »



A Primitives are a great way to start any character

B Concentrate on one half of the model initially

About the author
Antony Ward has been provoking pixels since the early 1990s. He has worked for some of today's top studios
www.ant-online.co.uk

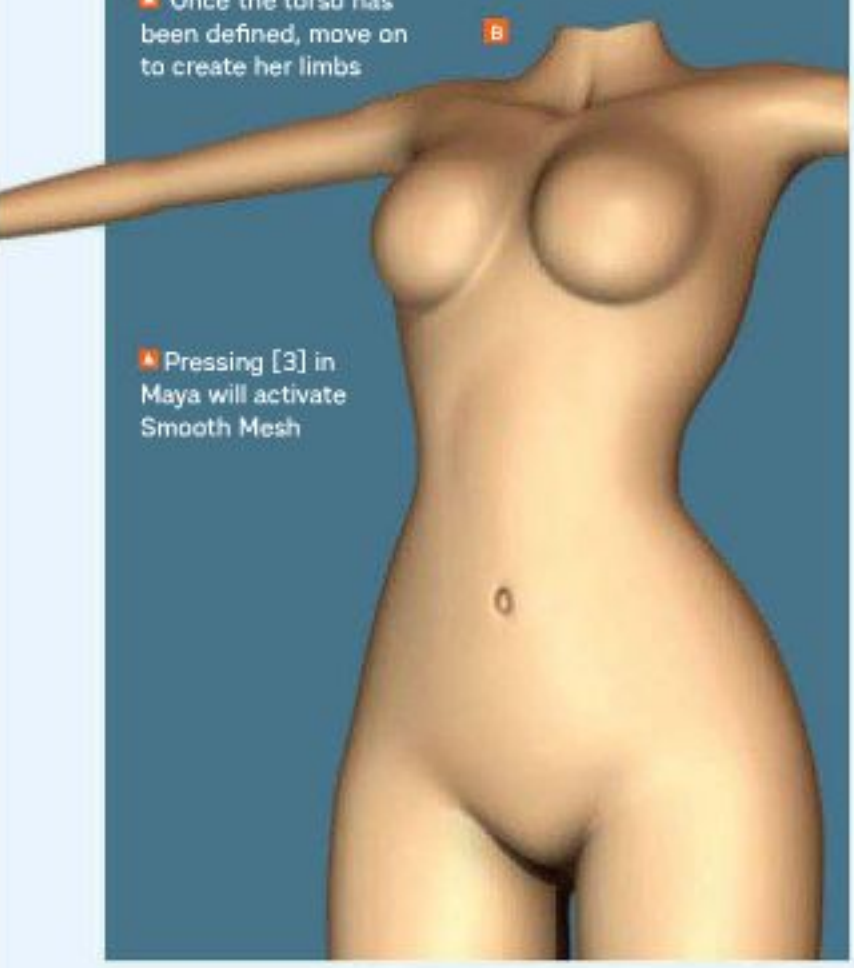
See how to create this female base model, which can be reused on many future projects

Video 2
Add in the limbs

Before you move on and start to flesh out the torso it's a good idea to add in the limbs. This will also allow you to work the shoulders, hips and waist into the character. First mirror and combine your torso half, making a full model, before extending the shoulders out a little. A

Start to define the waist a little more, building in the crotch while also forming the top of each thigh. Now you have the base for each limb, extend them further and continue to refine the shape of the arms and legs, as well as the overall figure. B

Once the torso has been defined, move on to create her limbs

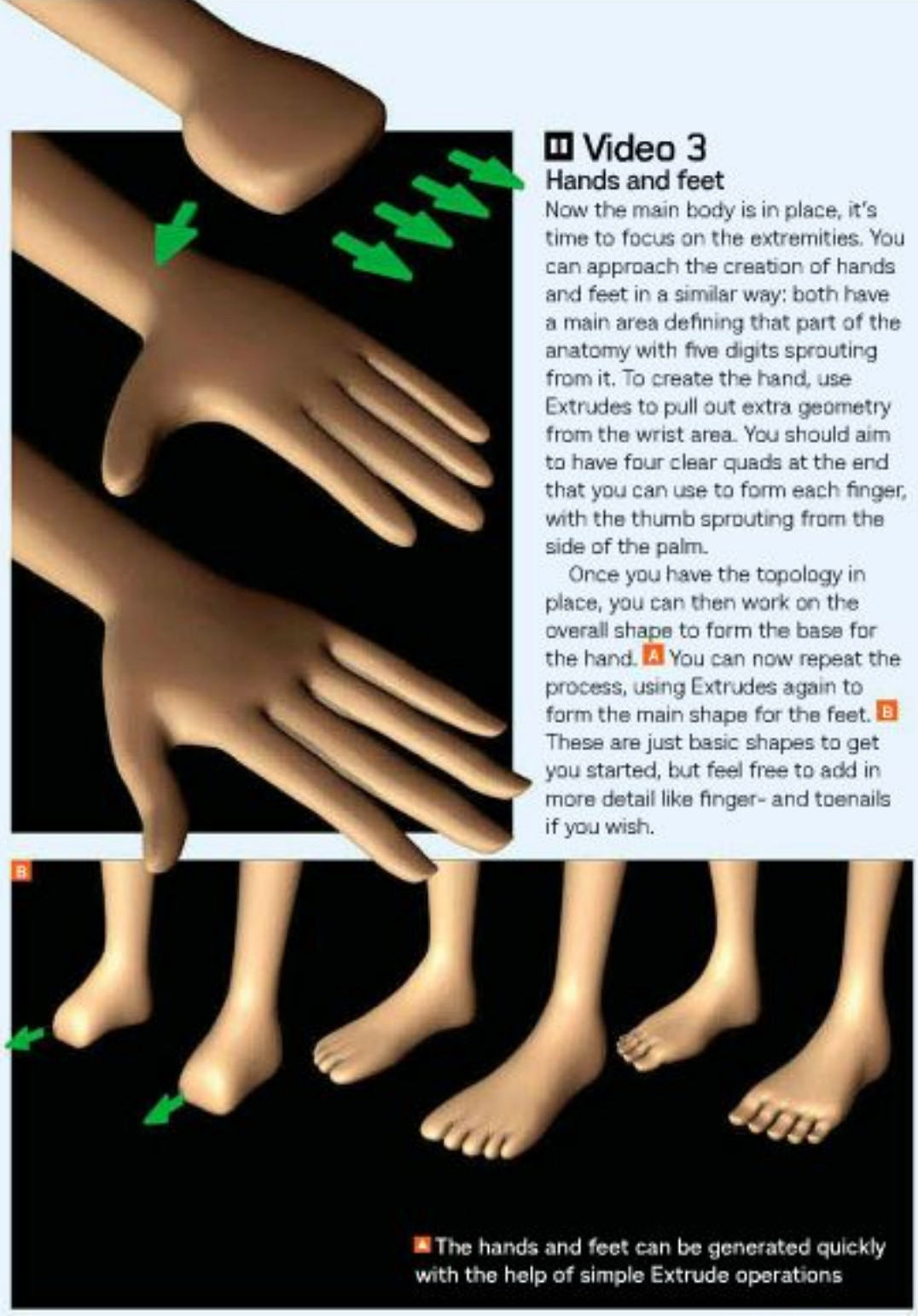


Pressing [3] in Maya will activate Smooth Mesh

Video 3
Hands and feet

Now the main body is in place, it's time to focus on the extremities. You can approach the creation of hands and feet in a similar way: both have a main area defining that part of the anatomy with five digits sprouting from it. To create the hand, use Extrudes to pull out extra geometry from the wrist area. You should aim to have four clear quads at the end that you can use to form each finger, with the thumb sprouting from the side of the palm.

Once you have the topology in place, you can then work on the overall shape to form the base for the hand. A You can now repeat the process, using Extrudes again to form the main shape for the feet. B These are just basic shapes to get you started, but feel free to add in more detail like finger- and toenails if you wish.



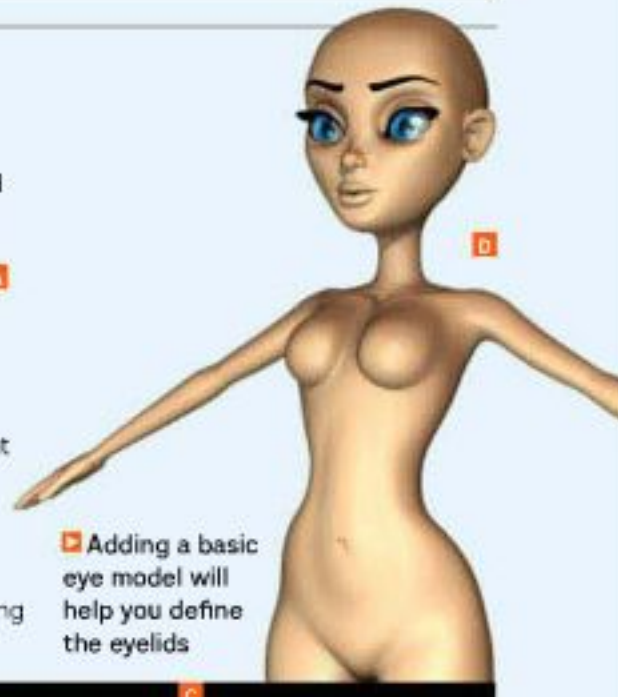
The hands and feet can be generated quickly with the help of simple Extrude operations

Video 4
Creating the head

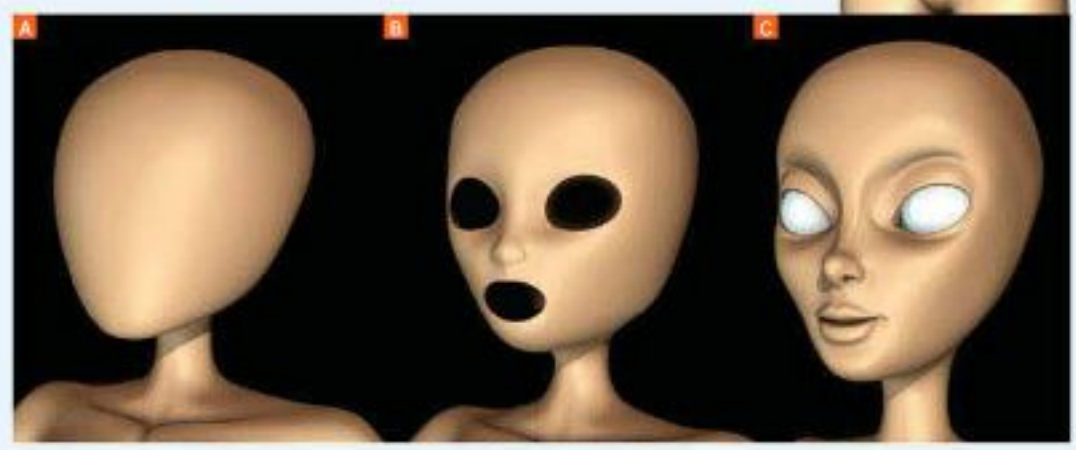
All your model needs now is a head. Just like the rest of her, you can start with a simple shape and expand upon it. Again, use Extrudes to pull the basic head shape up from the neck, making sure you give yourself enough topology to play with. A

You can now begin to work in the main facial features by introducing extra edge loops in key places, like around the eyes and mouth. B Keep repeating the process, adding in a little more topology to give you those key facial features, but don't go overboard. Only use what you need, as too much geometry can work against you. C

Now that you have a complete character, take some time to refine her as a whole – working in more details, optimising the topology and checking her proportions. D



Adding a basic eye model will help you define the eyelids



A For a more stylised, and flexible approach to hair, begin with a single clump and duplicate it

Video 5
Creating the model's hair

As you know, the idea behind these tutorials is to develop a virtual model that you can dress and customise to generate different characters. Because of this, it isn't really possible to focus on a single hairstyle. Instead, you want a solution that will allow us to generate numerous styles, quickly surprisingly and easily.

When broken down to basic shapes, you can visualise each hairstyle as a series of strands. Much like in many of today's games, it's possible to repeat a single segment and then mould the strands to create numerous styles.

The segment in question can be as simple as an extruded, tapered and smoothed cube, with enough cross-sections to allow it to be deformed. With one created, you can now repeat this and sculpt your various hairstyles. A These look basic at present, but you can improve their appearance with the help of diffuse, alpha and bump maps, and further tweaking and enhancement when you come to render.

It's important to state that each hair segment's topology must remain the same. This will allow you to UV one and then simply copy the UVs across to the others, using Maya's Transfer Attributes tool. »

Expert tip
When creating a character that will be posed or animated, keep your topology optimised. Too many edge loops will result in polys pinching when deformed

Facial topology rules

When building a face, follow a few simple rules to ensure it deforms correctly. Even if it isn't destined for animation, it helps your poses look convincing as your character emotes

Edge loop layout
The first thing to do is to ensure that your edge loops follow the actual muscles in a human face. Pay attention around the mouth and eyes: they are the key areas.

Deformation
Second, add an extra edge loop around the eyes. This will be absolutely essential when your character comes to blink and the eyelids need to stretch over the eyes.

Experiment
With these guidelines you will be able to build and pose your character's face, creating many different expressions. Remember to create the teeth and a tongue too.

Video 6
Creating clothing

Just like with the hair, you also want a quick way to generate various outfits for your model. She does love her clothing! If you stop and consider what you would like her to wear, and how you can speed up the process, you will find that you already have half her initial wardrobe modelled.

Duplicate the torso and use this as a base to generate a quick shirt model. Using the existing model means the shirt will automatically fit your model. A

Once you have a basic shirt model you can copy this and extend it to also create a quick dress B; a separate shirt and skirt; C; and even, with a bit more work, a bikini. D Like the hair, these are basic starting blocks, but from here you can add in much more detail – creases, folds, sleeves or anything your model may need.

A You can use the figure as a starting point for creating clothing

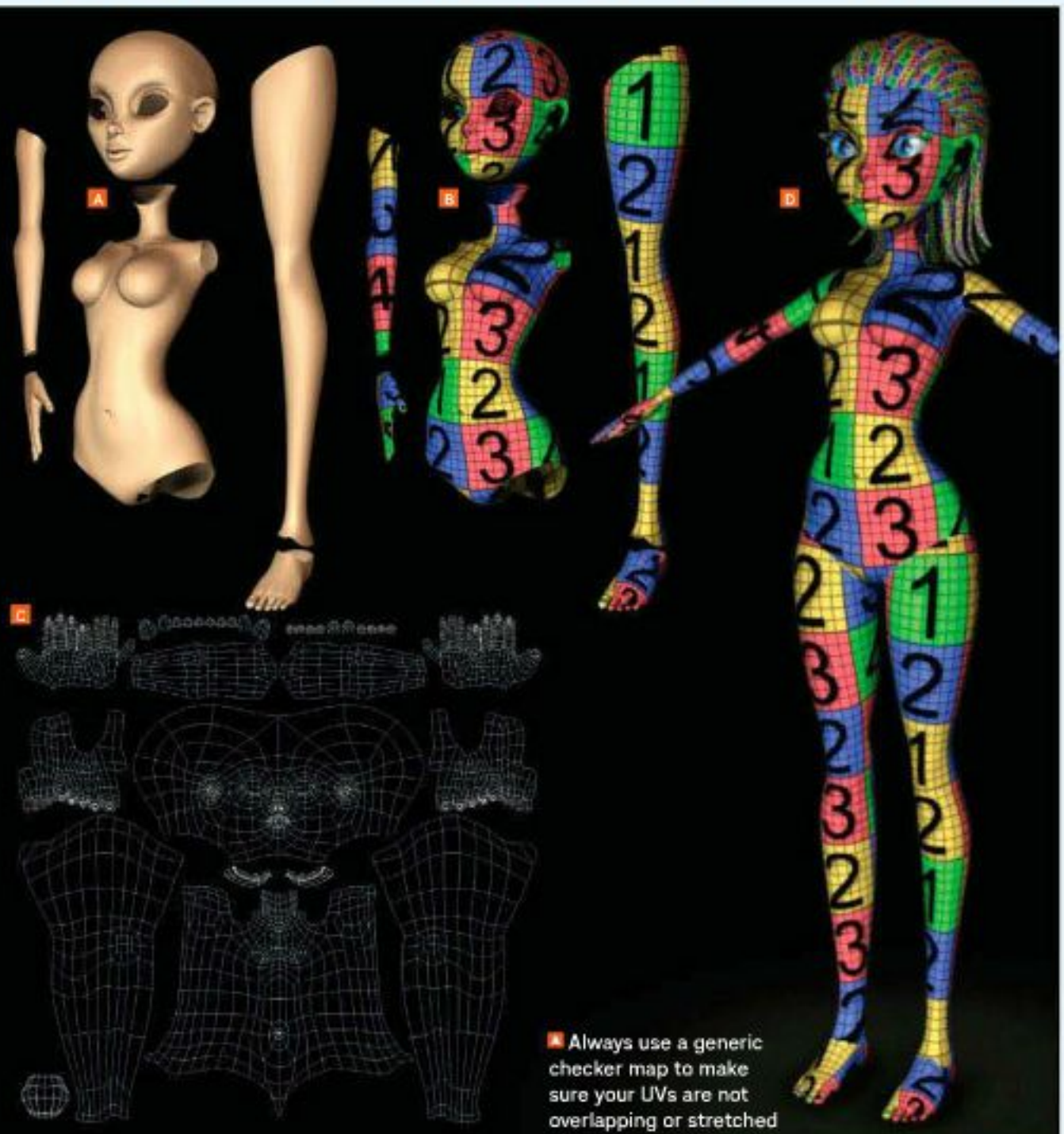
Video 7
Model UV mapping

With your models ready you can now think about how they will be textured. You could rely on simple shaders to give you basic colour detail, but taking the time to fully UV her now will in effect future-proof her, meaning you can do anything you want with her later. Maybe she will need a tattoo, striped tights or even zombie skin?

Before you can paint any textures you must generate, unwrap and organise your UVs. The simplest way to approach this is to divide your model into key sections, with one side of any areas that are symmetrical, like the limbs, being discarded. A Once one side has been UVed you can duplicate and mirror the limbs to make her whole again.

Use basic projections to start you off before defining UV seams in the UV Texture Editor. You can then use Maya's Unfold tools to unwrap each UV shell by activating the Unfold Constraints first Horizontally, and then Vertically for a cleaner unwrap. B

It's then a simple case of arranging your UV shells neatly on a page C – and, of course, recombining your model. D



B Create flexibility by future-proofing your UV layout. Make sure you make room for both sides of the model on your page

A Always use a generic checker map to make sure your UVs are not overlapping or stretched

Expert tip
If you're unsure how an area will deform, test it before applying UVs and textures. Adding a few quick joints or a blend shape could save you hours of work later

Video 8
Lighting your model

Now that your model has been modelled and UVed, you can look at bringing her to life with some colour. First however let's explore the setting up of a basic scene for her to stand in, complete with a backdrop and lighting rig, much like a professional photoshoot.

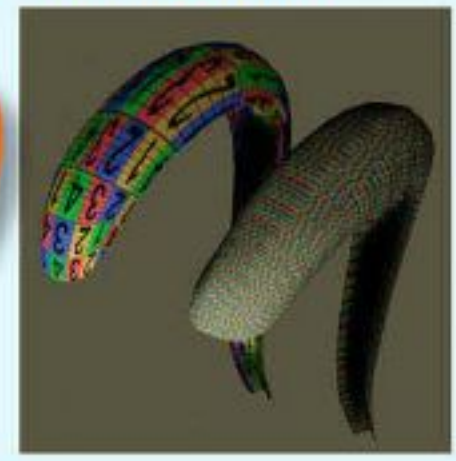
Once you have some lighting, you can then focus on the textures and shaders. Initially you need a background plate that is curved at the point where the floor meets the rear wall to help soften the horizon line. A

The first light you need is the Key light. This is the main light source, and casts the strongest shadows across the model. B In this rig use a Directional Light. Add to this a Back light, which is another Directional Light. This will brighten the opposite side of the character and help to enhance her silhouette. C

Next create an Area light to act as a Fill light that will lie between the first two lights and almost bridge the lighting across the model. Finally add a background light – usually a Spot light, to enhance the backplate. These lights will further enhance appearance and atmosphere of the character. D »

Transfer Attributes Tool

Building your hair from strips may seem a nightmare when it comes to applying UVs. If you initially retain the same topology between each strand, there is a simple way to transfer UV data



Define your base UVs

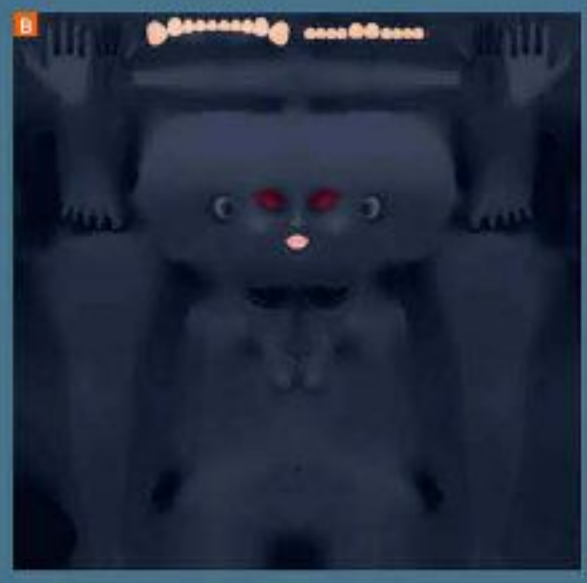
Focus on setting your UVs on a single piece of the hair – it doesn't matter which one, but pick a section that is the least deformed.

Transfer between models

Select your source and destination models, then go to Mesh > Transfer Attributes and set the Attribute Settings to Component. This will transfer UVs between components.

Repeat the process

Your UVs are now transferred to the other model. Repeat the process for the rest of the hair segments, by selecting your geometry and pressing [G] to repeat the last command.



Adding a Rim shader into the Ambient channel of your SSS shader will enhance the overall appearance

Expert tip
When using SSS with Final Gather, you may get a pink glow. To remove this, untick the Final Gather Cast checkbox under your model's mental ray tab

Video 9
Bold, simple textures

With any character, the way you approach texturing will be entirely dictated by its style. A hyperrealistic creature, for example, will require very detailed textures.

In this case, you have created quite a stylised character, so your textures should reflect this by remaining bold but uncomplicated. That said, you don't just want to rely on flat colours in your diffuse map. Taking the time to generate and overlay an ambient occlusion map will really help to add an extra element of depth to her skin. A

A specular map is also essential for dictating glossy areas like the lips and around the eyes; also, you may need to add glitter around her eyes in the future, and this can be achieved via a specular map. B Feel free to enhance your model further with the help of a bump map.

This could be as subtle as adding wrinkles on her lips, changing her hair – or even adding torn flesh if you were ever inclined to zombify her in the future.

Lamberts can make your model look a little flat and lifeless

The Rim shader will enhance the model's overall appearance

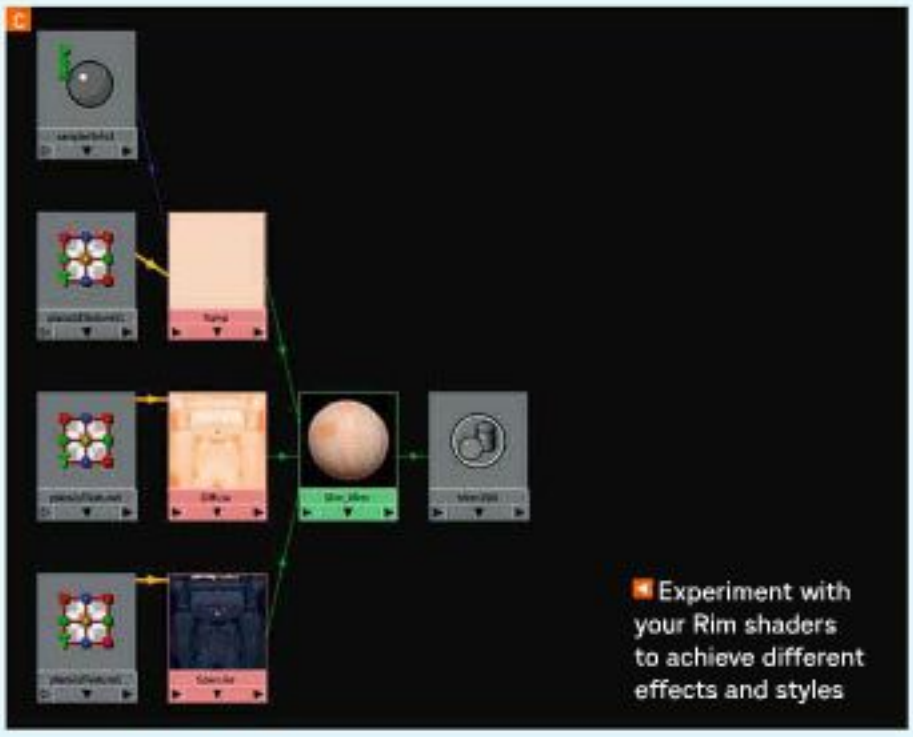
Video 10
Using shaders

Now your textures are ready and applied you can start to play around with your shaders. For the most part, using any of Maya's basic shaders will work well with the various elements of your model, but Lamberts can leave it feeling a little flat and lifeless. A

By switching to a Blinn you can really enhance the overall look with the help of Rim Shaders. These help to give her a much more stylised look, while also working to enhance her shape and details. B

A Rim Shader is created with the help of a Sampler Info node's facing Ratio attribute. This calculates where a camera is looking on a model, and tells Maya where the outer edges are, or in this case the Rim. By connecting the facing Ratio node directly to a Ramp texture's uCoord attribute (via the Connection Editor), you can control the rim's colour and size with comparative ease.

The Ramp Shader is then placed into either your main shader's colour or incandescence channel, depending on the intensity of the effect you are aiming to achieve. C Should you be feeling especially adventurous you could always use Maya's subsurface scattering shaders for softer, more realistic looking skin. D This is something that you can enhance further, should you want to with the help of a Rim Shader. E The choice is completely yours and is entirely dictated by the style you are aiming for. ●



Experiment with your Rim shaders to achieve different effects and styles

Avoid sticking with basic shaders for your character

Subsurface Scattering can greatly enhance your character's skin

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Creating stylised characters in ZBrush

Michael Ingrassia shows how you can develop your sculpting skills and find your artistic direction

FOR
ZBrush 4

TIME TAKEN
One hour

TOPICS COVERED
- Massing the base mesh
- Chiselling and polished edges
- Hair sculpting
- Stitch brushing
- Cloth folds
- Polypainting

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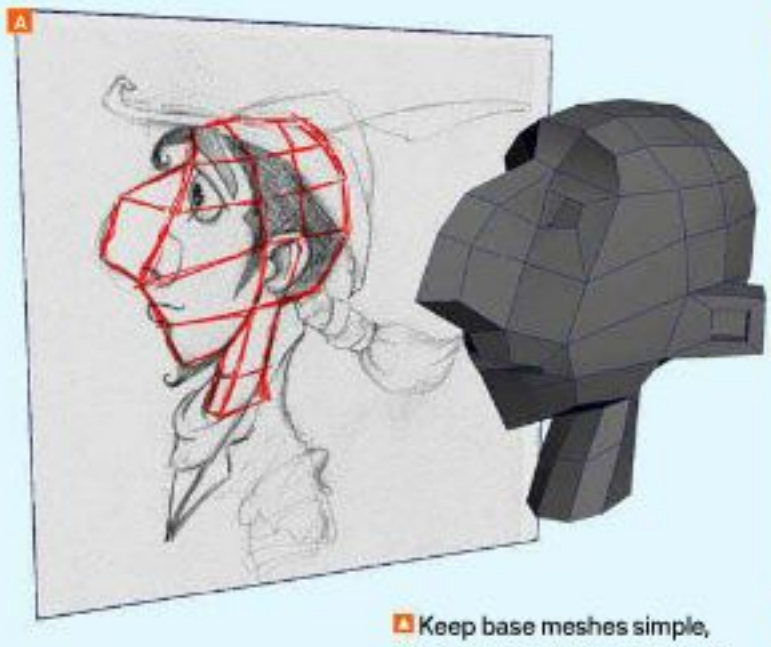
As a 3D game artist I have always preferred to work on stylised art projects rather than realistic ones. Stylising allows for creative freedom and extending belief of subject matter over realism. It's also a great way for students and artists still learning ZBrush to explore character development with impressive results and without the difficulty and challenge of realistic anatomical structure.

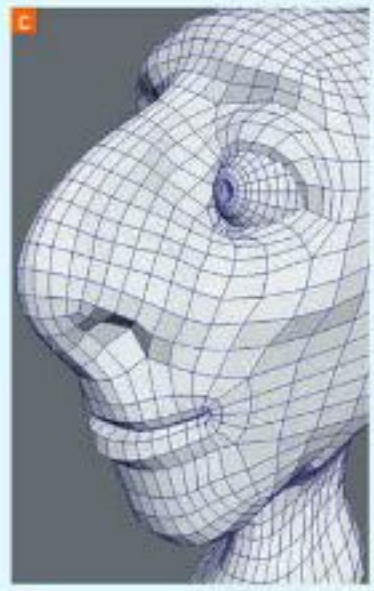
There are many tools within ZBrush that artists can use to achieve stylised sculpting effects, from massing out the form using DynaMesh to a wide variety of sculpting brushes and techniques. However, many of these tools and techniques can seem overwhelming or intimidating to artists who are just starting out. My tried and tested methods will help you streamline and simplify sculpting and stylising, using a few easy methods and tools you'll learn to master quickly.

As with any new character creation, it is critical to think about the character's design and look development first, so that you can establish a roadmap before you start your journey into modelling and sculpting. I began the design of Sir Robin by sketching several portraits, seeking to find the right look and age for my character. I invited student intern Vincent Coviello to assist me with the initial silhouetting and look-development process, to refine my sketch into a final colour concept I could use for modelling and clothing style reference.



A Keep base meshes simple, evenly spaced quads with the minimum of vertices possible

A Your focus with the initial sculpt should be on building up the main mass volume



A You'll quickly have a good base mesh that only requires some basic re-topping

Video 1
Massing the base mesh

One method I have used quite successfully in my years of sculpting characters is creating a very simple base mesh, doing some basic sculpting on the mesh (which I call 'massing'), then reimporting the mesh at one or two division levels higher.

It's a really quick way to get your character modelled efficiently, and the new mesh will only require a small amount of re-topping instead of having to re-top the entire character. This method is similar to ZBrush's new DynaMesh tool but with more control over the topology. I'm able to quickly add any necessary topology and edge loops in my 3D program then import the mesh back into ZBrush.

Game artists will find this process works really well because the new base mesh is game-ready and will handle the final decimated mesh when backing out normals and ambient occlusion maps in programs like TopoGun.

Try massing the head sculpt. A Look in the Source folder in the files accompanying this video, where you'll find base_meshHead.obj, a low-poly base mesh to experiment with. Keep base meshes very simple, evenly spaced quads with the minimum vertices possible. B In minutes, you'll have a good detailed base mesh that only requires simple re-topping. C »

About the author
Michael is a character artist and instructor, specialising in modelling and sculpture for games and film
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50 MINUTES
OF VIDEO

Download Michael Ingrassia's video from 3D World Vault
www.3dworldmag.com/vault

Stylised characters such as Sir Robin can easily be achieved in ZBrush

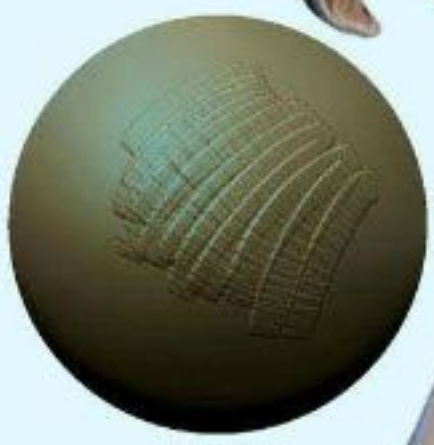
Video 2

Chiselling and polished edges

The main brushes I will be demonstrating in this tutorial include Standard, ClayTubes, MAHcut Mech A, Orb Cracks, Polish B and Rake. A Once I have the character's form massed out, I will begin working with several of my favourite sculpting brushes like Polish B and MAHcut Mech A to begin chiselling, carving and refining the edges, giving the character a nice clean and polished look. B

A

STANDARD



CLAYTUBES

MAHCUT MECH A

ORB CRACKS

POLISH B

RAKE

B

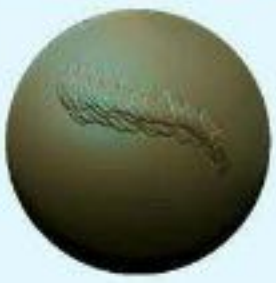
Stylised characters allow more creative freedom and fewer restrictions from realistic anatomy

Expert tip

Try rigging your sub-tool base meshes in 3D, pose the character then export the meshes back into ZBrush. This will make your character snap to the pose!

Easy facial hair

A quick technique for creating the character's eyebrows



Build up a structure

Start by selecting the ClayTubes brush and start layering in flowing strokes in a curving S pattern. Build up the strokes in layers.

Sculpting the hair strands

Smooth the ClayTubes layers then add a first pass of small strokes. Enlarge the brush draw size and hit a few areas with larger strokes.

Finalising the eyebrow

Once you have created the eyebrow hairs, the last step is a final pass using smaller strokes, just to tidy up any sloppy hair strands.

Video 3

Hair sculpting techniques

To create a manicured looking beard, mask out a section of Sir Robin's chin to sculpt some added mass, and define the shape of the beard further using the ClayTubes and Move brushes. A Then mask out the character's head to inflate the mesh uniformly before you begin sculpting a lovely head of flowing hair. B

Start sculpting by selecting the ClayTubes brush again, but this time disable the square alpha map to achieve smooth, thick, liquid strokes. C It's important to sculpt the lower lying hair first, then swiping upper hair strokes in alternating 'C' and 'S' shapes. Repeat some strokes using a reduced brush draw size and add final top layer strokes where you want the main hair peaks to be. D

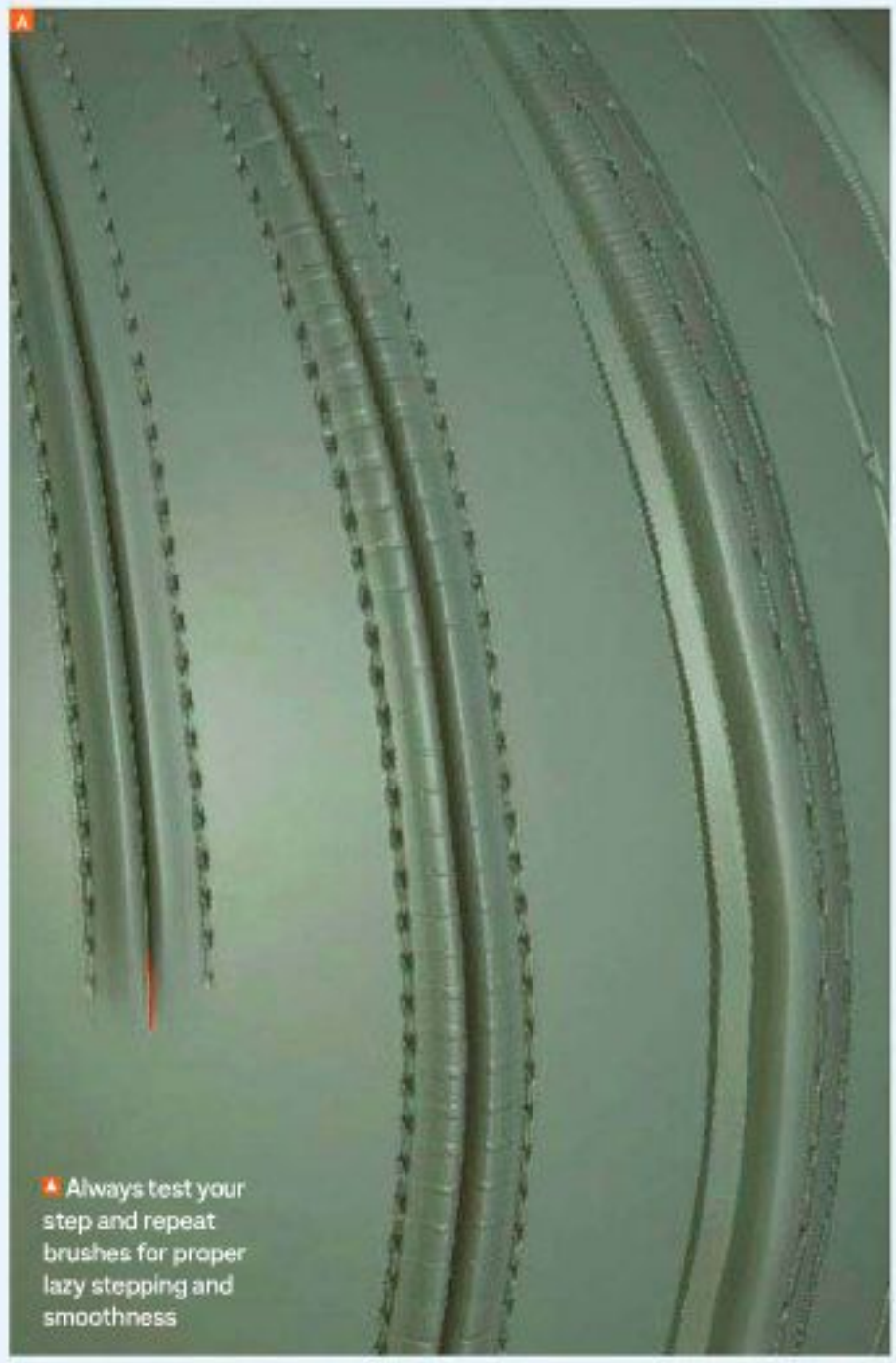
Soften the strokes you've made using the Smooth brush and then switch to the MAHcut Mech A brush. Holding down [Alt], outline the shape of each hair tuft first to establish the main individual shapes, then on a second pass come back through each strand's centre to enhance the primary curvature.

A Masking out the mesh before sculpting helps keep the beard looking clean and manicured

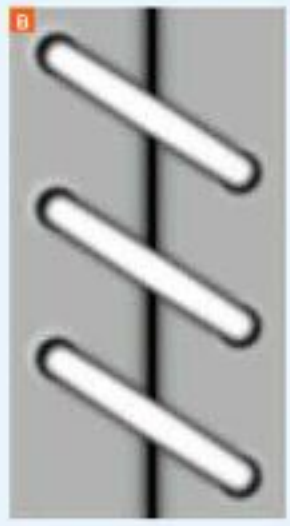
B Masking the hair allows quick inflating to build up the underlying scalp

C Sculpting the lower hair followed by a second and third layer is easy and looks more natural

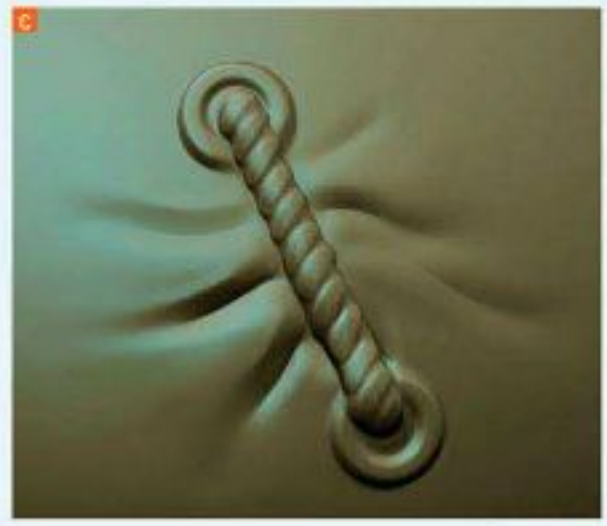
D Keep the final hair tufts in flowing C- and S-shaped patterns



A Always test your step and repeat brushes for proper lazy stepping and smoothness



B Create your own alpha library, such as stitches



C Sculpting rivets and stitches directly without using alphas is easy and can be really fun to do

Video 4

Stitch brushing tips

Before jumping into adding stitches on your sculpt, it's usually wise to prepare the different brushes' stroke and intensity settings. Whether using ZBrush's default stitch brushes or custom alpha maps, each stitch will react differently, so you'll want to practise each of the stitches on a curved shape, such as a sphere.

To give a unique look and feel on some parts of the character, I recommend sculpting some stitches directly rather than using a Stitch brush or alpha map. In the video I demonstrate how easy it can be to create a simple stitch with rivet and clothing stress pull. Paying special attention to little details like this will set your work apart from others.

If you're curious about creating your own Stitch Alpha map, take a look at MIstitch.psd, my custom stitch alpha in the scene files accompanying this tutorial. »

Video 5

Sculpting Sir Robin's cap

The first part of the cap sculpt will address the need for adding in some basic cloth folds. These simple folds will help to make the cap look more organic and less rigid. I'll then add a noise texture pass using a Spray setting with a Cracked Rock alpha. This gives the cap a nice felt cloth look quickly. It's important to do this texture pass first before adding details such as stitches. A

Getting the stitching pattern to step and repeat smoothly and flow along the model's contour can take some trial and error – especially when pulling a seam around a mesh that needs to be turned in order to finish the stroke. One method that works best is to gently smooth the last stitch of the stroke so you can continue pulling the stitches to the end. B At the end of the stitches, slowing down will give more control when ending the stroke. C

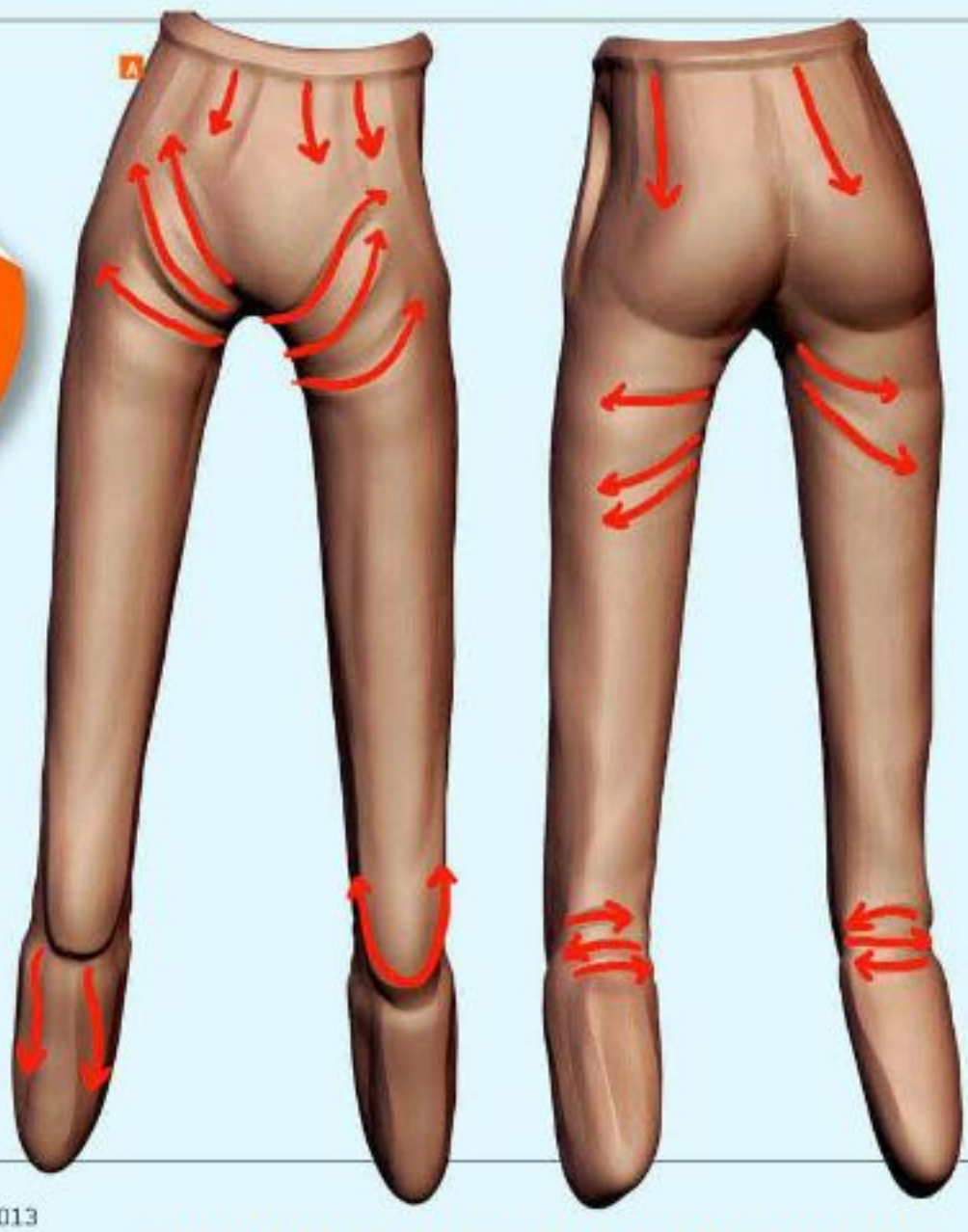
A Experiment with a variety of alpha textures and stroke types in order to find unique texture patterns that will suit your needs

B By smoothing the last stitch, you can easily continue a long stroke that curves around the mesh

C At the end of the stitches, slowing down will give more control when ending the stroke

Expert tip

When moving or smoothing large areas, lower mesh resolution by several divisions to get quicker results and to keep high-level sculpted details



A Don't be intimidated by cloth folds – just look at how your own clothes drape for reference

Video 6

Cloth folds

A When modelling fabric there are some key factors to consider: gravity and weight. Gravity affects cloth as it flows down and sags or drapes around the torso. Sweeping alternating curves help to provide a feeling of fabric weight due to gravity. Another factor is stress, and the tightness caused by the pulling effect on areas such as the armpits and crotch. This type of fold tends to fan outward from the primary point of tension. It's important to vary fold width and distance from one another – as well as varying thickness and length – to look more realistic.

Creases in areas such as inner elbows and behind the knee also need to be considered. Cloth tends to fold in a criss-cross or accordion shape; creating a series of alternating inward and outward strokes using the Orb Cracks brush helps to get nice results quickly.

Finally, don't forget the body wearing the fabric – the underlying anatomy. Some areas such as the shoulders, elbows and kneecaps cause a stress that displays the muscle or bone beneath the cloth. The folds near these areas tend to be small stress pulls, but it is important to pay attention to creating these subtle folds. A

Video 7

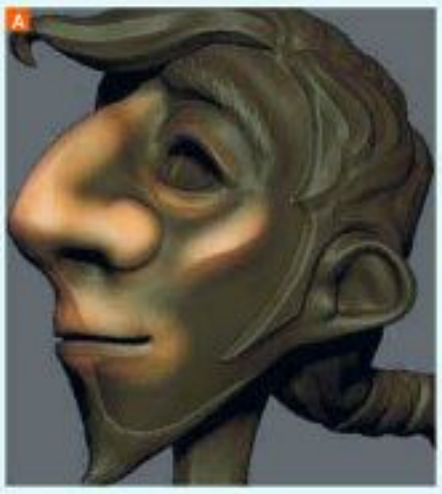
Dark-to-light Polypainting techniques

Polypainting can be difficult at times, especially when you're first learning the ropes. One method I personally prefer and which works well with stylised characters is painting 'dark to light'. It's an old traditional method used by the masters in oil painting that also works well in texturing: it helps simulate cavity painting without the pain of setting adjustments. A

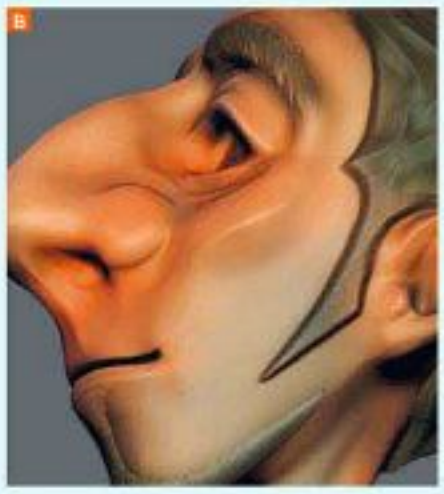
On skin textures such as the face I'll also use a heat intensity technique where I use a Colour Spray pattern and spray alpha to apply cool blues to colder areas of head and neck, and red/orange shades to the warmer areas of the face like the eyes, nose and mouth areas. B

I'll then do a final build-up of highlight tints – lighter flesh, pale yellow and finally a warm, off-white colour. I also change my alpha pattern to a scratched texture, which gives the appearance of burnished surfaces and hints of skin reflection. C

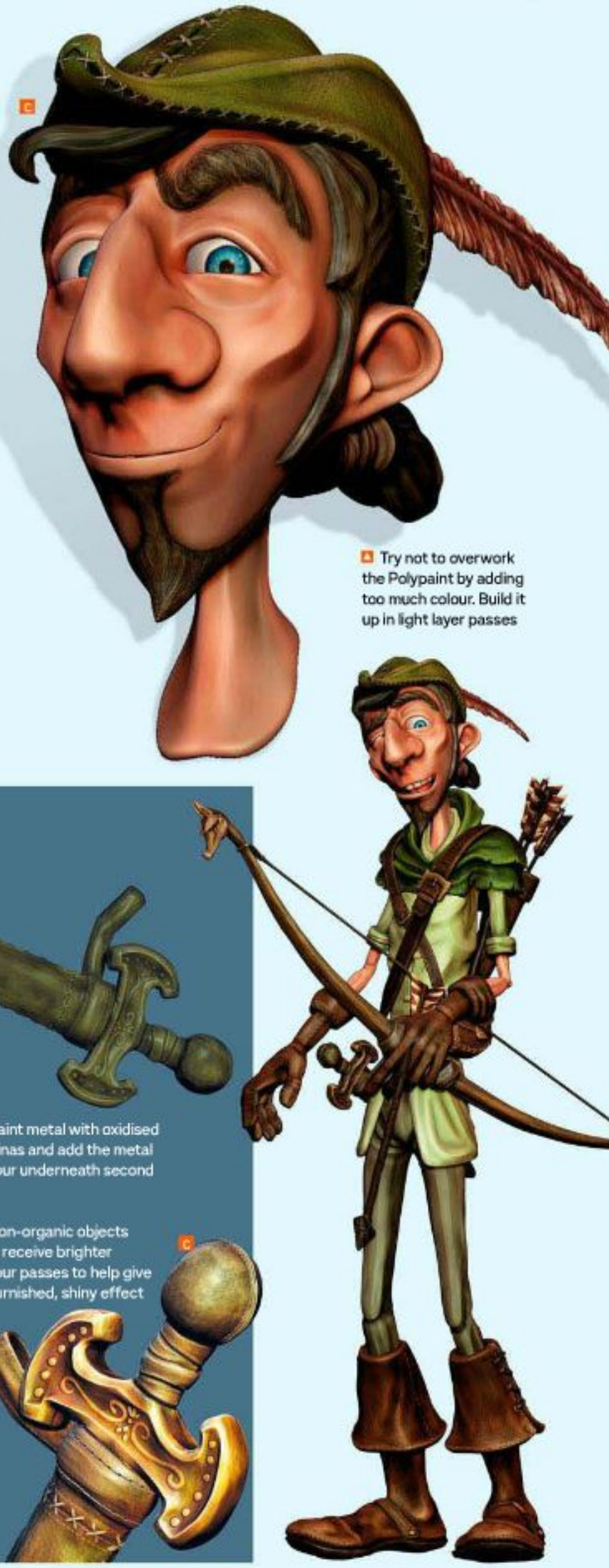
If you want to try Polypainting Sir Robin yourself, look for decimated_headSculpt.obj in the scene files accompanying this tutorial.



A Initially focus on the highlighted areas of the face when beginning to Polypaint your character



B Adding heat intensity colours like cool blues and warm reds will quickly add colour to the flesh tone



C Try not to overwork the Polypaint by adding too much colour. Build it up in light layer passes

Video 8

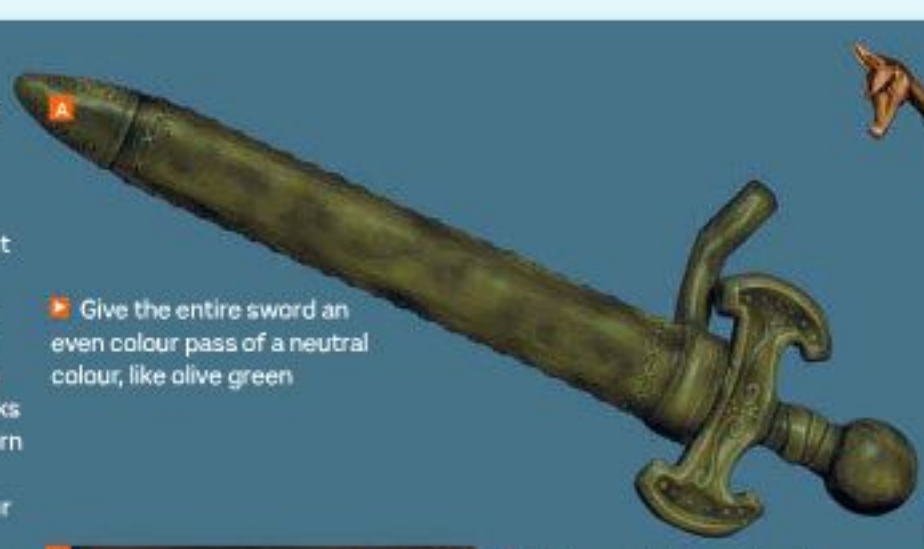
Polypainting Robin's sword

Working on the sword texture incorporates many of the same Polypaint techniques but with stronger colour shifts and highlight effects. Begin by colouring the entire object with black, followed by a spray pattern with dark olive green. A I use olive because it's a neutral earth tone shade that works well with many materials, from worn leather to shiny brass.

As I begin building up the colour layers, I'll also hit many of the different materials with the same shade of colour just to keep them in unison with each other. As I begin to fine-tune each material, I add highlights and burnishing effects.

One final trick I'll add is a gentle overspray of a complementary colour. For example, if a leather is greenish in colour, I'll gently run over some areas with a deep reddish brown shade to tone down the green and give it a more natural, realistic feel. On shiny brass or gold material, I'll add some soft desaturated purple or blue hues, which helps give a pleasant fill light effect. B C

In the accompanying scene files, you'll find swordPolypaint.ztl, the full sword .ZTL file with all division levels and Polypaint details.



A Give the entire sword an even colour pass of a neutral colour, like olive green

B Paint metal with oxidised patinas and add the metal colour underneath second

C Non-organic objects can receive brighter colour passes to help give a burnished, shiny effect

Fundamentals
Textures

FOR
• All software

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The fundamentals of using UV maps

Understanding UV maps is key to placing complex textures on your 3D model. **Mike Griggs** explains

Your commissioned model is finished, and covered in textures that look amazingly photoreal when you run them through your renderer. Then your client gets in touch saying that they like the model so much that they want to integrate it into an iPhone app, and are getting an animation company to use your asset in some online adverts – could you supply them models and textures? This where UV maps become essential to your workflow.

UV maps are extremely powerful texturing tools that can seem hard to get into, but they allow the sharing of image-based textures between 3D applications. This is because they keep a record of where a specific image should be placed on your 3D mesh via 2D representation called a UV (sometimes UVW) map, which takes vertex points from your 3D model's XYZ co-ordinates and applies them to a 2D image with a U and V axis.

This flat wireframe 2D representation of your model will most often looked like it has been peeled from your 3D mesh, alternatively it will look like many parts of your model laid out in a random fashion. Most 3D programmes will help you make UV maps from your mesh and organise them.

The benefit of using 3D maps is that they are 2D- and 3D-application agnostic, using base 3D file formats such as .OBJ. Models that have UV maps applied can be sent between 3D applications with comparative ease, safe in the knowledge that texture placement will be consistent across applications. This is important when creating real-time assets for game engines, which depend on much of their detail from image-based solutions.

A good UV map will provide the co-ordinates for images that depict colour, specularity etc. They can also be used to define the position of normal and displacement maps that have been generated from higher-resolution versions of the model but can impart this detail onto lower polygon versions.

The useful thing about UV maps is that they can be exported into 2D applications such as Photoshop, which then enables exceptionally fine control of your textures using an image editing workflow, as well as allowing you to place text etc on your model.

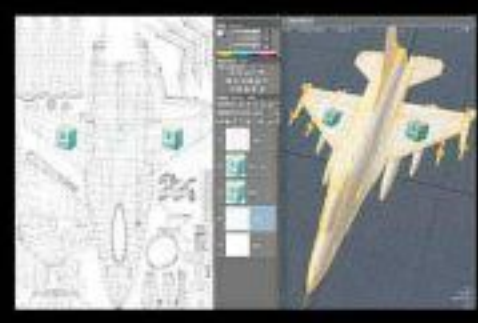
These benefits of UV maps make them an exceptionally efficient form of texturing your model. ■

About the author
Mike Griggs is a freelance concept 3D, VFX and motion graphics artist working across TV, exhibition and digital design
www.creativeblake.com

Exporting a UV map to a 2D program

01 Export the UV map
After I have made a UV map from my model, I use my 3D software to export the UV as an image, or I may decide to take a screenshot.

02 Import the UV into 2D software
I open my UV map in my 2D editing software, ensuring it is both square and conforms to the pixel sizes.



03 Manipulate your textures in the 2D application
Use the 2D map as a guide for making the texture, which can then be reimported into the 3D applications as a material.

Mapping tips

SIMPLE HINTS THAT WILL MAKE MAPPING EASIER

Start on a simple mesh

It is always best practice to UV on as simple a polygonal shape as you can. This allows you to see more easily how your UV can be arranged, as well as making it simpler for any UV flattening software to find the logical seams in your model in order to create the UV islands. As you put more detail into the model, you should find that the UV map divides with you.

Hiding Seams

When choosing your seams for your UV, try and make the seams in invisible areas – for example under hairlines or clothes, or on logical parts of a hard-surface model such as a door. This minimises chances of the texture pinching, especially when animated or when you decide to bake a texture for the creation of normal maps.

Scaling UV islands for detail

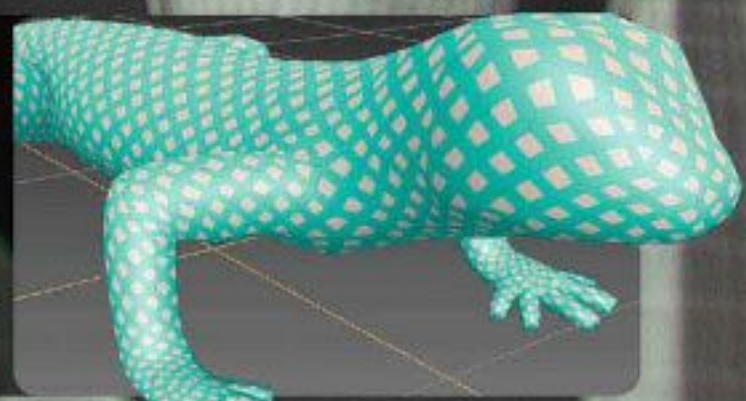
While it is generally a good idea to keep your UV islands the same relative size, there are times when it is appropriate to scale a UV island up or down. This is usually to allow areas where detail will be important or visible to have as access to as many pixels as possible. Scaling elements down allows you to get more of your model into the UV map and is more efficient when creating textures for real-time assets.

UV mapping applications

There are standalone UV mapping tools such as UV Layout (**www.uvlayout.com**) that can be used independently of your main 3D application. This allows you to develop an agnostic approach to UV mapping which may be useful if you work between many applications. Compositing solutions, such as the RE:Map plugin (**www.revisionfx.com/products/remap/**) for After Effects, allow you to change the imagery on your model using a UV coordinates pass without the need to re-render in your 3D application.

Ptex

Applications such as Mudbox and Mari allow the creation of Ptex textures. Ptex does not require UV maps to allow you to create complex textures, but instead allows you to paint without seams across your model, and will probably become the default paint method for most 3D applications over the coming years. However, only certain applications support Ptex textures for now, so if you intend to use them, make sure your 3D workflow supports it.



Expert Tips
Photoshop
Rendering

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Post-production not only optimises your renders but can also speed up your workflow

Making the most of your renders

Automotive CGI artist **Dave Cox** takes you through his top 10 tips for post-production in Photoshop

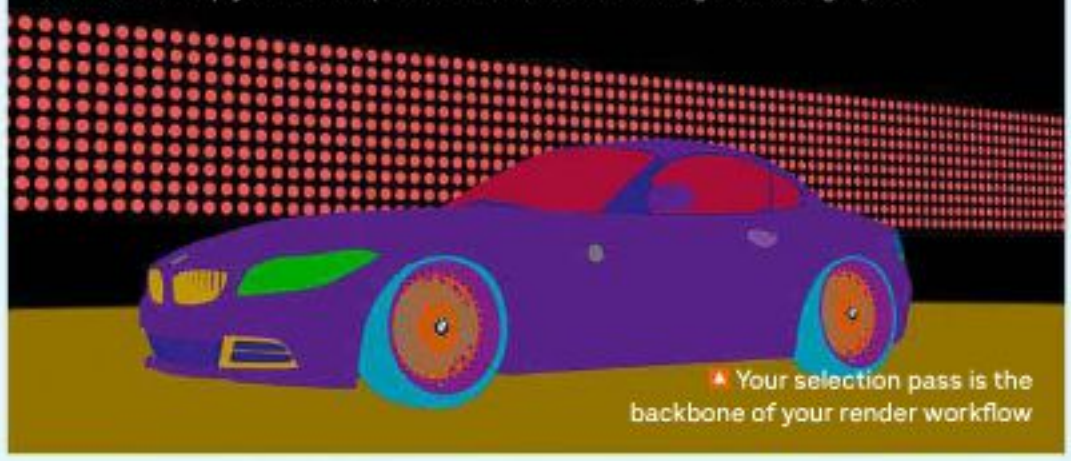
Post-production should be an asset in every artist's arsenal when it comes to creating 3D scenes. How you use it within the scene however is entirely up to you.

It can be as dramatic or subtle as you want. Used correctly, post-production can drastically speed up your workflow and take your renders to the next level.

This tutorial has been written to give you some tips on how post-production can be used as a pipeline tool, rather than just using it as an app to add vignettes.

01 Make a selections set

To me, the most important render element you could ever have (aside from the actual render itself) is a selection set. These may come under many names: MultiMatte, WireColour, ObjectID, Render Masks or Alpha for example. Whatever the name, it's essential to help you make super-fast selections for editing or creating alphas.



Your selection pass is the backbone of your render workflow

02 Knowing where to start

Sometimes you might not know where to start when importing your render into Photoshop to tweak it. In terms of my own workflow, I find it extremely important to know what each pass does individually.

So after stacking the passes so that they equal my beauty pass, I turn each one off and on to see how they affect the image. Once you know how these all work together, you can start to look for areas of the image that are too dark, too bright or too reflective, etc.

About the author
Dave Cox is a London-based automotive CGI artist working for the Burrows CGI studio in Essex
www.dav3design.co.uk

03 Is my image too bright or too dark?

An easy way to see whether your image has areas where it goes beyond the accepted range of black or white is by using a curves adjustment level.

By dragging the lower point on the histogram to the right, you will see if there are any areas that go beyond white. Conversely, if you drag the top point on the graph to the left, you'll see any areas that go beyond black.

If you do find that your image has some areas that exceed these clipping points, you may be able to rescue them by adding adjustment layers to your render passes to bring the blown-out areas back in.

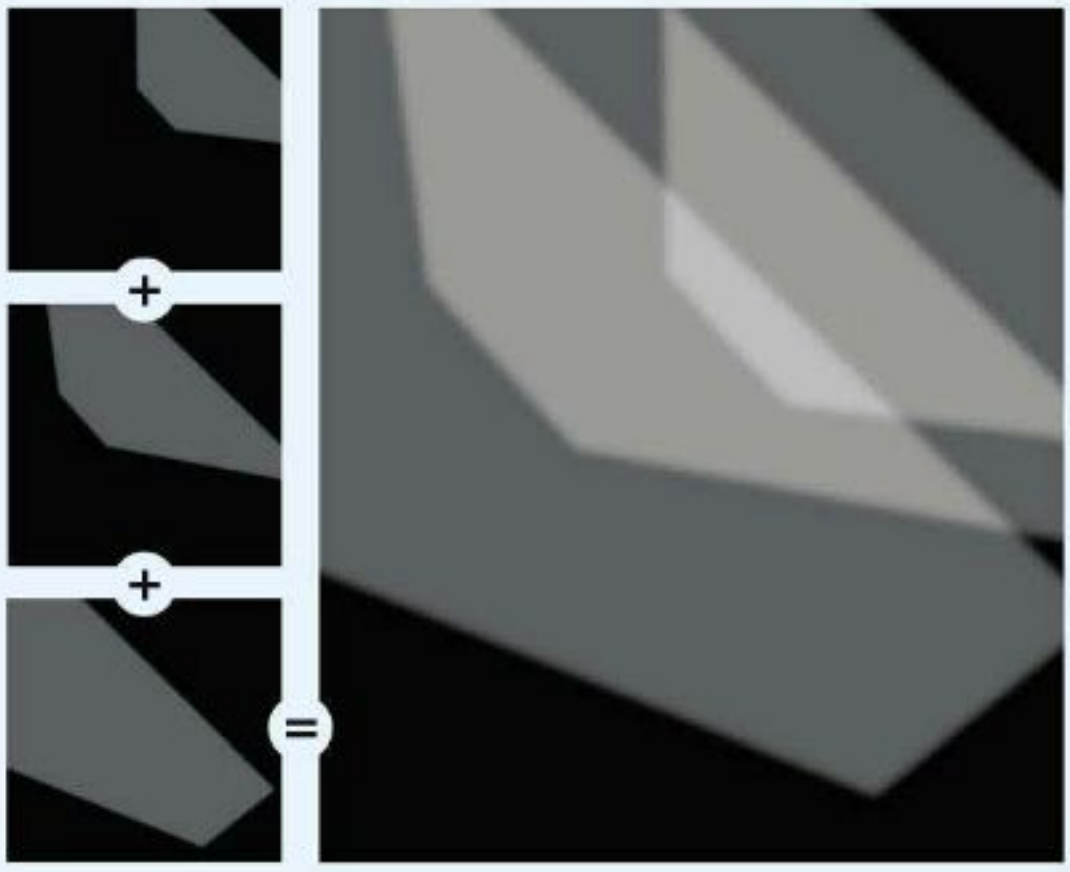
It is important to know if you are pushing colour information too far

04 Editing in small steps

Photoshop is a precision tool, so start off with small tweaks to your render passes (lighting, refraction, specular, reflection). Next, move on to colour corrections for specific areas of the image, then move onto general, overall adjustments.

05 Blend, don't just mask

Learning how to use the Wand tool and select parts of your image using the WireColor pass to create masks is very handy, but sometimes just masking your adjustement layers isn't enough. To make a more convincing image these masks need to blended in. Do this by using the Black Brush tool or the Gradient tool. This will help your adjustments sit naturally into the image.



06 Paint volumetric lights

Purists may hate me for saying this, but sometimes you just need to paint things in rather than render them in. It has to be done subtly though, and you have to layer it to make it look convincing. I like volumetric lighting and I often paint it into a scene – providing it looks right. In this example image, I started with the window furthest away and worked towards the camera. This gave me full control over each 'light' as it entered the room. The image shows how these volumetric lights stack up; they are simply feathered shapes set to Overlay at about 20% opacity.

Stacking light helps build depth into an image

07 Separate your background

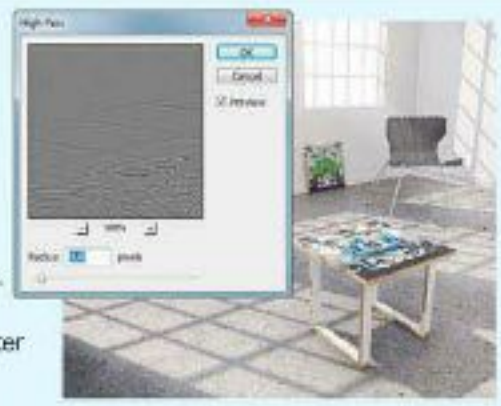
A common issue I have seen when artists make a studio render is trying to render the background into the scene. While this can work well, creating your background in Photoshop is much faster. Use your WireColor or Alpha to mask the car off from the background. You can then use your lighting or shadow information to affect the background.

Mask off the image's background and use the light and shadow data to make a backdrop

08 Bring out your textures

A way to make your textures come to life a little more is to use a High Pass filter to sharpen them up a bit. Create a new blank layer, then press [Alt]+[Ctrl]+[Shift]+[E] to make a flattened copy of your current image.

Desaturate this layer and set the blend mode to Linear Light. Go to Filter > Other > High Pass and use a low radius. Toggle the radius to see how changing the settings affects your image. To use it to full effect, mask it or change the opacity. Experiment!

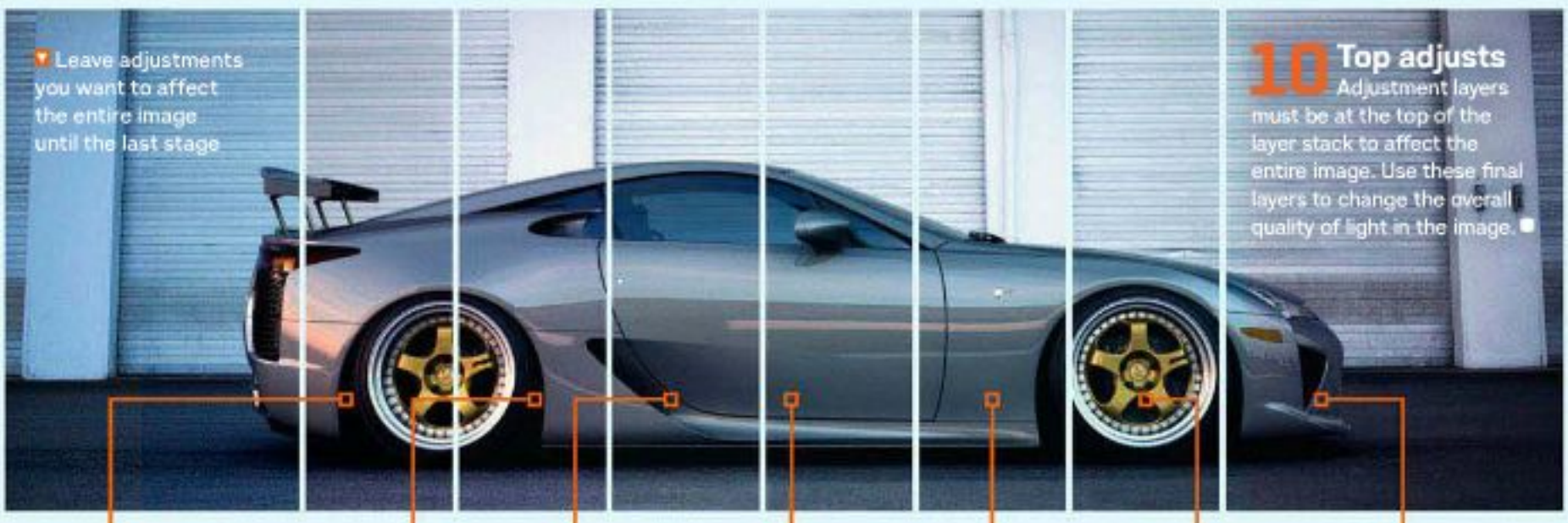


Don't overdo the use of the High Pass filter – large radiuses can make for undesirable results

09 Why you should stack render passes

Adding colour corrections will let you tweak how the image looks but it won't really change the render itself. If you have stacked your render passes correctly you can reuse passes to enhance certain areas.

Reusing some passes can enhance the render



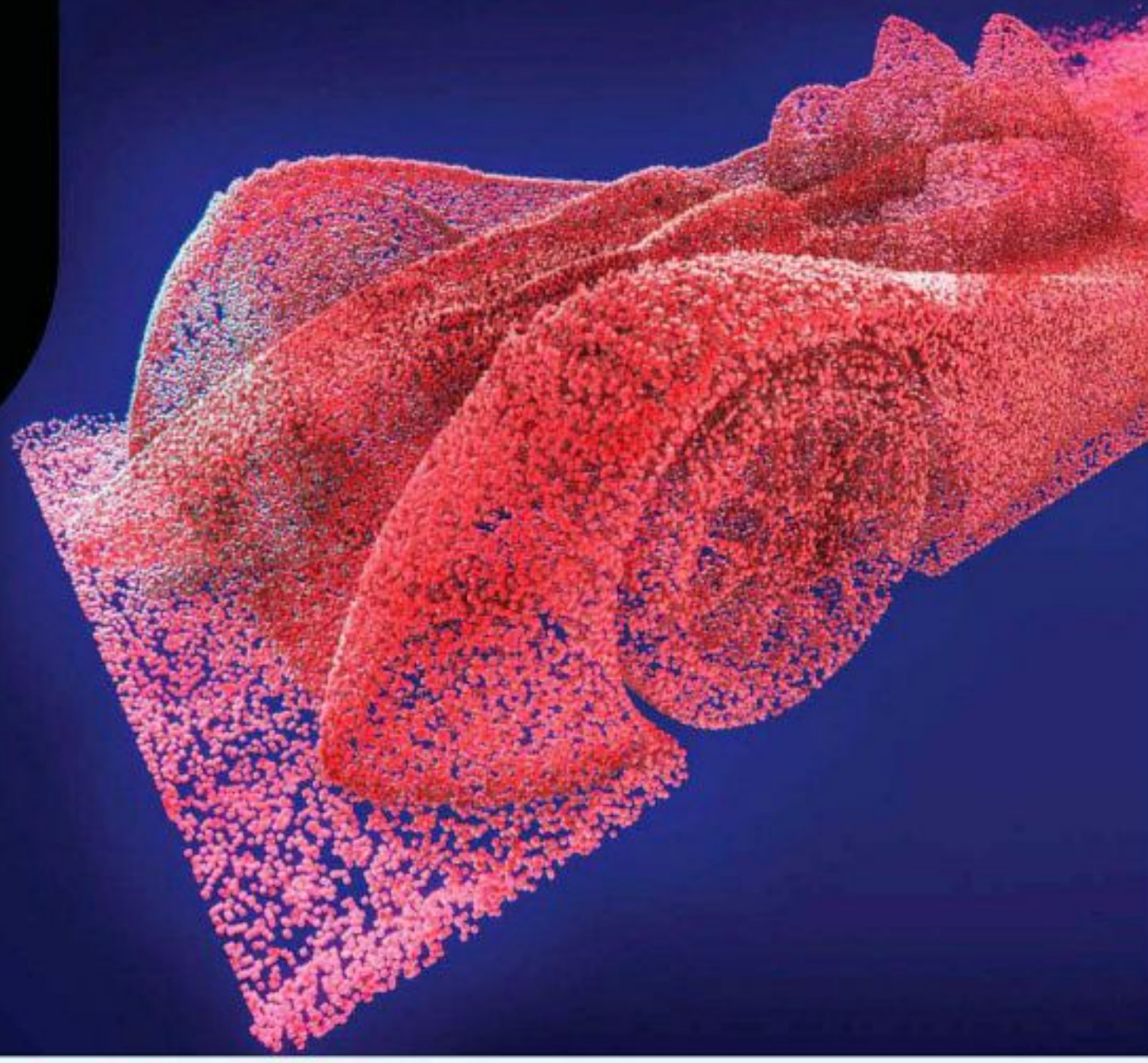
Leave adjustments you want to affect the entire image until the last stage

10 Top adjusts

Adjustment layers must be at the top of the layer stack to affect the entire image. Use these final layers to change the overall quality of light in the image.

Questions & Answers

Your software queries solved by experts



Supporting files

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Modo

"How do I use Modo 701's particle system to create an image of a shape dissolving?"

Chris Deacon

Mike Griggs replies:

The new particle system in Modo 701 has the power, when combined with the existing replicator toolset, to create complex imagery in minutes that could take hours in competing programmes. The major strength of the particle system in Modo is the caching speed alongside the deformers that can transform particle systems in beautiful ways exceptionally quickly.

For this example, let's to create an image of a representation of a sports car dissolving. Select the car mesh Courage 01.lxl from the automotive meshes that come with Modo via the Layout tab, and then press [Ctrl]+[Tab] to bring up the Setup window to start working on your particle system.

The particle system has the power to quickly create complex imagery that could take hours in other programs

Create a new mesh and create a six-polygon cube a couple of millimetres in size to act as your particle. Your particle can be whatever mesh you want, but for general speed the lower the particle's polygon count is, the better.

Select the Particles menu in the Commands tab on the left of the screen, where you can add a surface emitter; this adds a Particle simulation object to the item list. Whenever I create an object, I drag it to the Node view to have a better look at what is going on with my simulation. Attach the Courage 01 car mesh to the Surface emitter, which is already connected to the particle simulation. In the early stage of simulation work, I always click the Run Simulation At Present Time button (a lined green triangle at the bottom of the setup screen) to give myself a sense of how the simulation is performing.

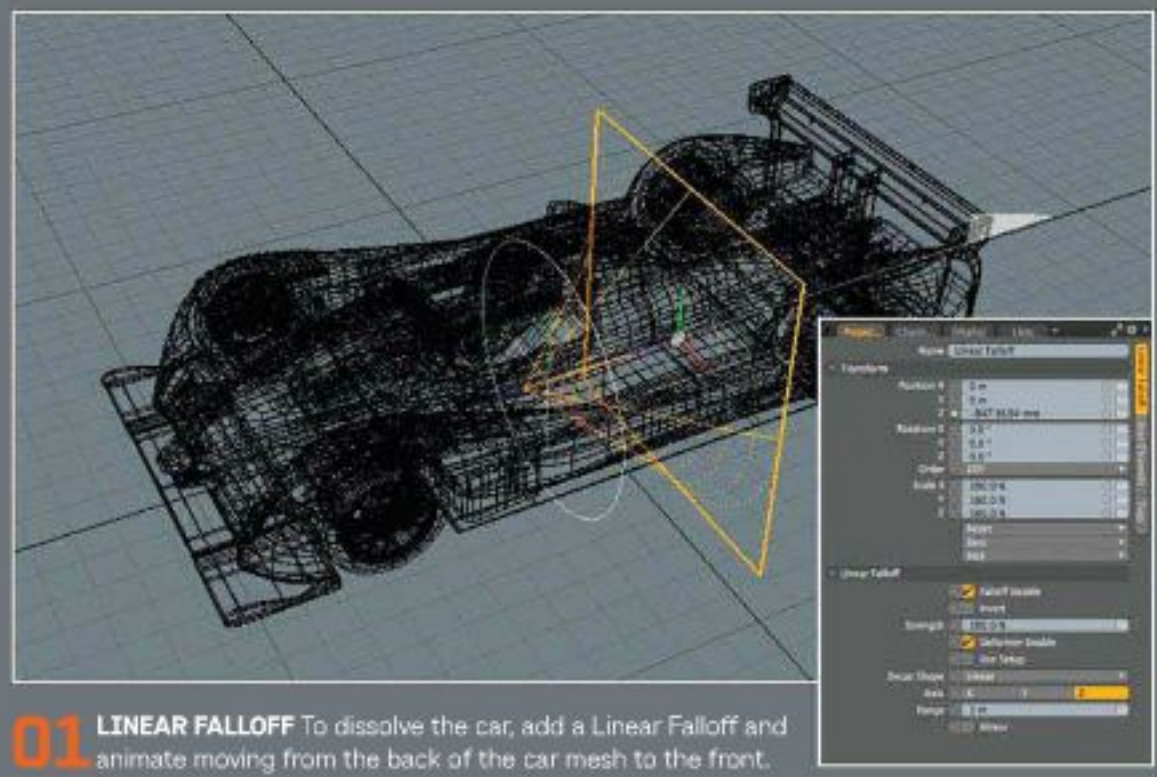
The new particle system in modo can create complex mesh based particle systems like this in minutes

You need the particles to remain rooted to the car mesh so that you can use forces to pull them away from the mesh, so zero out all the velocity properties in the surface emitter. It's now time to dissolve the car. As you do the initial particle animation, keep the emitter's emission rate reasonably low so that you can iterate the simulations quickly.

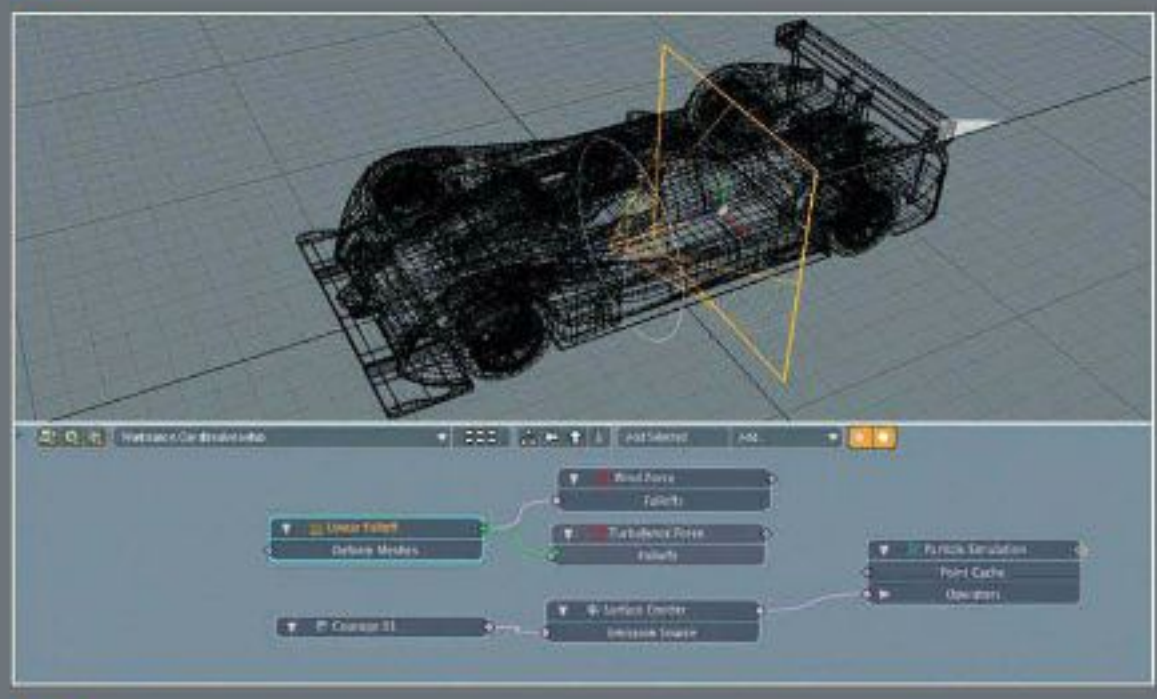
Add Turbulence and Wind force to disperse the particles away from the car shape, which you can add to the node view along with a Linear Falloff. Before you connect the nodes, animate the Falloff passing through the car from back to front. After you have done this, attach the Falloff to both the Wind and Turbulence forces, which you then attach to operators of the particle simulation node. Once you've adjusted the properties of both forces, start to increase the emitter rate. Rather than run the simulation, use the 'Computes channels and caches the results' button – a green arrow over a square at the bottom of the setup screen – to cache your simulation, until you have enough particles that you can use with a replicator object, which you can attach the cube mesh to. Finally, attach the Particle simulation to the replicator. ●

Mike Griggs is a freelance 3D, VFX and motion graphics artist, and a regular 3D World contributor. Meet him at Twitter via @creativebloke
www.creativebloke.com

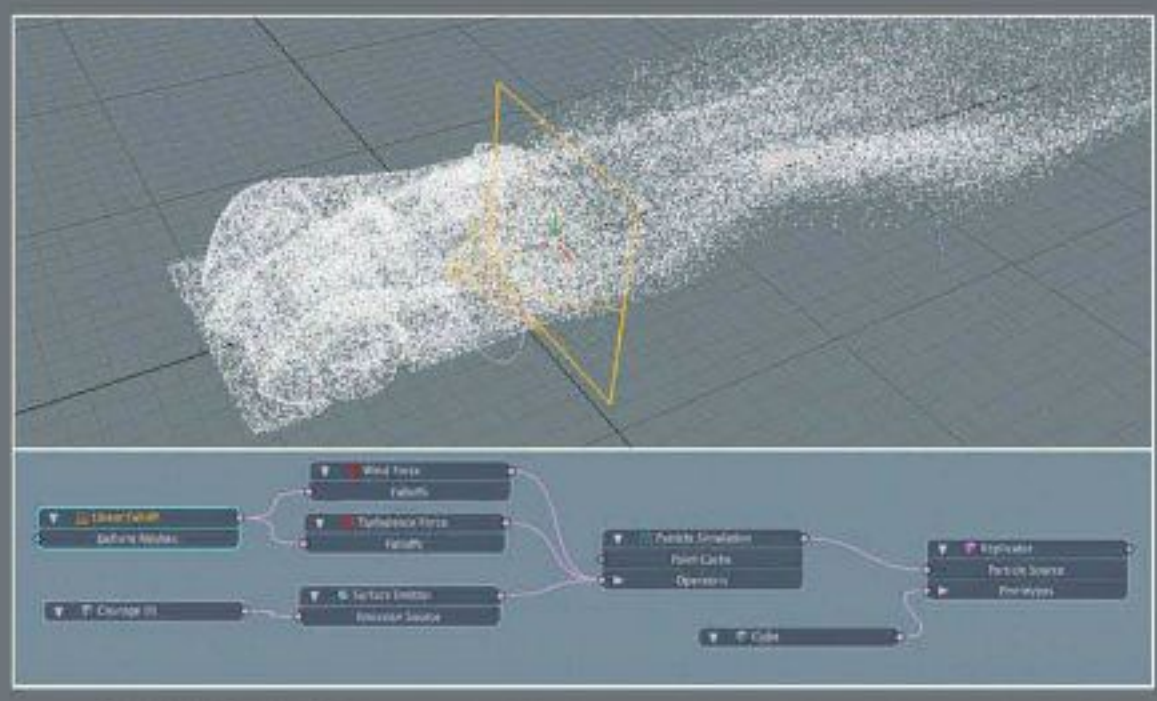
Adding the render and hiding the mesh



01 LINEAR FALLOFF To dissolve the car, add a Linear Falloff and animate moving from the back of the car mesh to the front.



02 WIND AND TURBULENCE FORCES Attach the Linear Falloff to the two forces that you have added to the scene, which you can then attach to the particle simulation.



03 REPLICATOR OBJECT You can then hide the car mesh and add a replicator to the simulation, which has a cube as a prototype to give yourself an object you can render.

Use the Grease Pencil to define areas for controlled destruction

Expert tip
Look at as much reference material as you possibly can, in order to understand how different types of materials break up under impact

Blender

"How can I control the way my objects shatter in Blender 2.6?"

Holly McRae

Rob Redman replies:
Almost every 3D artist I have ever spoken to enjoys destroying things digitally – there's something fascinating about watching a complex event unfold in front of you and having the means to control it. So you turn on whatever dynamics engine you use and start blowing things up, or crashing cars. The problem with this is that we often miss what makes these tools perfect for serious VFX as we indulge our inner demolition team.

What makes this kind of simulation so believable is that we have ultimate control over how things break. You can just add an object to a scene, hit Divide and then watch it fall – but for finer control, there are also methods of telling Blender exactly how you want the object to break. You could use particles for this, which is a useful method, but for the most intuitive workflow I'd suggest using the Grease Pencil.

Start Blender and press [Cmd]+[,] to open the Preferences. Under Add Ons, type **Cell** and activate Cell Fracture, which adds a new button to the Object menu. Load your object awaiting destruction – I'm using a basic sphere, but the principles apply to more complex objects too – and press [N] to switch to the Grease Pencil. Add a new layer and switch the mode to Surface, which allows you to draw directly on the surface of the model.

You can now define the areas that you want to break. Start off by adding simple dots to signify the centres of large chunks and make them close together for smaller chunks. You can even draw in squares, circles or other shapes to define patterns (such as the radial breaks you get in glass)

Once you are happy that you have given Blender enough guidance to create the destruction, you can go to the Object menu and click the New Cell Fracture button, which will open up the tool's options palette. Go to the Grease Pencil tab and adjust the number of pieces you want. (I used 250.)

To clarify the process, create a new material in slot 1, and then in the Cell Fracture window in the Mesh panel, change the material to 1 as well. You can leave the other settings as they are and click OK. You will see lots of chunks forming in a cube around the object and then disappearing again. If you changed the colour of the new material, the internal parts of the chunks will be the new colour. The external parts – the original geometry – won't change, which helps you to see what has happened.

Once the process is complete you might see the cracks, but to see the actual chunks switch to your next layer, where everything will become clearer.

You can now see that you have great-looking chunks of geometry and, when you move to Blender Game mode and add physics (don't forget to add a floor), the object will break apart in a much more controlled fashion, with more dense areas of destruction just where you want. ●

Got an appetite for destruction?

01 BREAK IT UP Prepare the geometry you want to break apart. It's best to use something with some thickness, so for this model run the Solidify modifier, but be aware of intersecting geometry which can break the cell fracture. Now using the Grease Pencil, draw out where you want the higher density of chunks.

02 DEFINE THE CHUNKS When your mesh is ready, press the new Cell Fracture button (once you've activated it in Preferences). In the Point Source panel, under Grease Pencil, change the Source Limit to define the amount of chunks. I used 250; higher numbers take longer to calculate. If you want a different material inside, you can assign it to the material slot under Mesh Data, then click OK.

03 BOUNDING BOX You will see all the chunks appear and disappear in an automatically created bounding box and, once complete, you can delete the Grease Pencil markings and move over to the next layer. There you will clearly see the chunks, clearly defined (with a slight gap, set by the margin of the Cell Fracture) and a mass indicator for each chunk, which is a guide to help with dynamics.

Rob Redman is a 3D artist with over a decade of experience, and is 3D World's technical editor. Look for @pariahrob on social media sites www.3dworldmag.com

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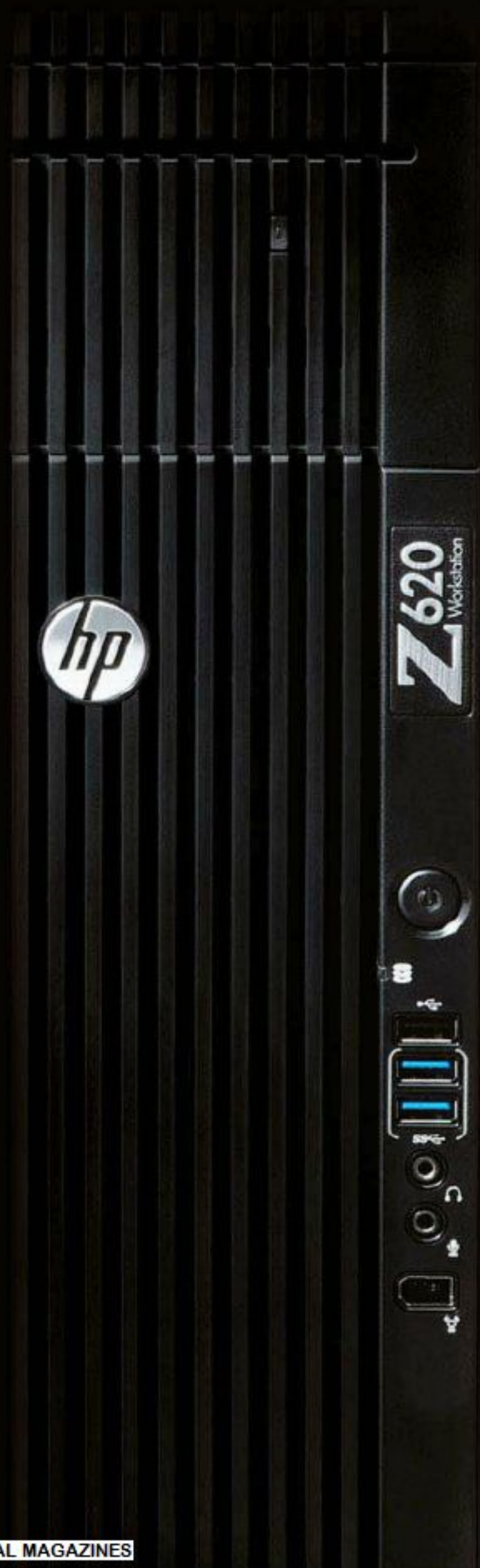
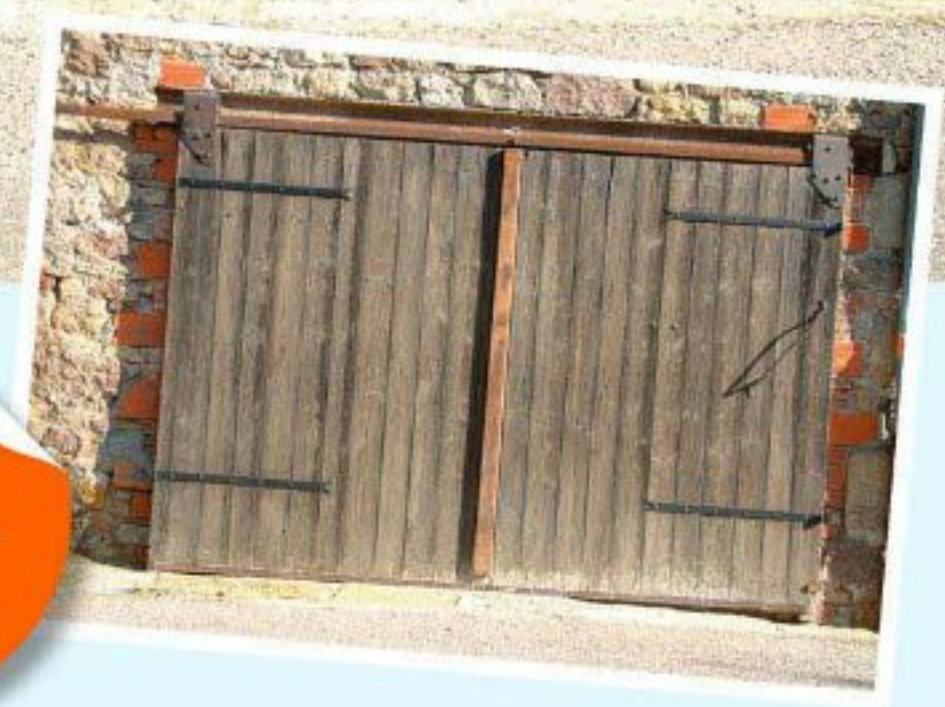


There are lots of tools in Photoshop to help you remove light and shadows



Photoshop
"How do I remove light and shadow info from a photo to use as a texture?"

Matt Kearney

Expert tip
If you wish to move an area to produce a new texture, tick the Sample All Layers box in the Options bar before using Content Aware Move

Richard Tilbury replies:

At some point, most 3D artists will probably discover what they feel is the perfect reference that best suits their texturing requirements, barring one major exception – the lighting conditions in the photo do not match the environmental criteria.

Many artists carry a camera with them while they're on the move so that they can add to their library of textures should they happen across an interesting subject or surface. Inevitably, though, many of these shots will include undesirable highlights and shadows. Being able to remove these will prove necessary when converting a raw image into a usable texture, be it tileable or not.

As with many tasks, there is more than one approach (and very rarely can these be fully automated), but there are a few tools that can certainly speed up the process and save time.

The first of these is Photoshop CS6's Content Aware Patch, found in the Tools palette adjacent to the Brush tool. (Hold down the left mouse button to see the sub-menu.) If you have an isolated highlight or shadow, then this is the best tool for the job: it removes unwanted content and automatically fills in the area by sampling a source area.

Start by selecting the Content Aware Patch and then draw a region around the culprit area. Now move your cursor to an area of the image that you wish to replace it with, and which you think would blend in. Think of it like searching for the missing piece in a jigsaw puzzle. As you move your mouse you will see the selection area match the location of your cursor.

This works best with a randomised pattern, but is nevertheless a swift way of removing a conspicuous highlight or shadow. Once you release the mouse button, Photoshop will blend in the edges. If the results are not perfect, you can try changing the Adaptation settings in the Options bar below the menu bar. These range from Very Strict to Very Loose, and can have a significant bearing on disguising seams.

Another method involves using the Content Aware Move tool, which essentially moves one selection area to another, then blends in the newly moved region and seamlessly fills in the original selection area. The way to approach this is not by directly moving the shadow or highlight, but by first selecting the unwanted section using the Magic Wand or Quick Selection tool.

You then need to switch to the Marquee tool and move the selection area to a part of the image you wish to replace it with. With the selection area active, reselect the Content Aware Move tool and drag back to the undesired region (which will fit perfectly). This will now substitute the conspicuous highlight or shadow with the current selection area and proceed to blend in the seams.

If you are lucky, these methods will work without any further intervention, but more often than not they will require some tweaking. The third tool, which can be used in support or independently if the corrections are minimal, is the Clone Stamp

These methods may work without any intervention, but more often than not they will require some tweaking

tool. This proves very useful for concealing seams and removing minor problem areas as it is used to replace an area of your image by sampling a different region.

Once selected, hold down [Alt] to turn your cursor into a target icon, and then click on the area that you wish to sample. Release the mouse button and begin painting out the unwanted area. Be mindful that this will not automatically blend in seams, as this is a manual technique, but it does offer more control if done with care. The shape and style of the stamp relies on brush selection, so you may need to vary the brush according to the nature of the image. For example, a random pattern would best suit a textured brush whereby a more architectural subject may benefit from a harder-edged brush.

One final tool that works well for refinement is the Healing Brush which, in a similar way to the previous tool, samples pixels from your image. But unlike the Clone Stamp, the Healing Brush matches the lighting and texture to the region being healed. Once you have carried out one or more of the above techniques, you can use this tool to remove any remaining imperfections. ■

Richard Tilbury works part-time at 3D Total as lead artist, as well as working as a freelance concept artist and illustrator
www.richardtilburyart.com

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No matter which 3D software package you use, our experts are here to help. Send your questions to the email address below and we'll try to find a solution. Include your scene file (no larger than 5MB in size, please) if it helps to illustrate the problem.
qa@3dworldmag.com

Get rid of unwanted shadows and highlights

01 CONTENT AWARE PATCH Select the Content Aware Patch and draw a region around the highlight. Next, move the selection area to a part of the image that would work best as a replacement (in this case slightly to the left). In an architectural context or one where straight lines are apparent, try to select an aligned area to minimise clean-up.

02 CONTENT AWARE MOVE Use the Magic Wand or Quick Selection tool to select the shadow left of the vertical beam in the centre of the gate. Now select the Marquee tool and move the selection area to a part of the gate that would best match it. (Use the tongue and groove as a guide.) Next, select the Content Aware Move tool, click and drag the selection area over to the shadow and release the mouse.

03 HEALING BRUSH AND CLONE STAMP Use the Clone Stamp tool to remove the shadow from the door handle. Click on a section of wood above the shadow to designate the source area and then begin painting out the shadow. Be careful to align the tongue and groove as you do so. The Healing brush could also be used as an alternative. Use the Quick Selection tool to select the shadow left of the gate and then lighten it using Image > Adjustments > Brightness Contrast. When similar, click OK and then use the Healing Brush tool to blend in the stone texture.

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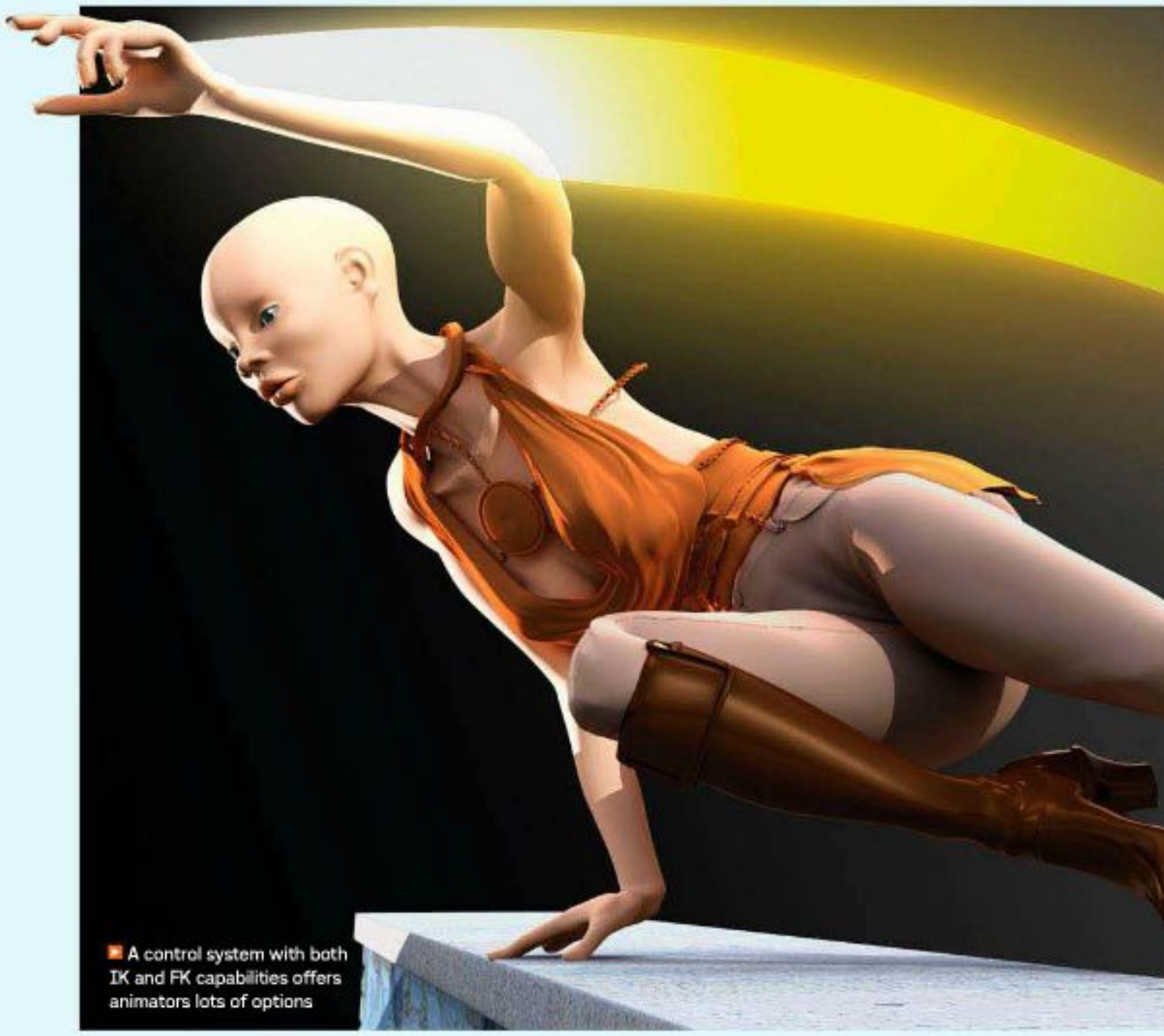

A control system with both IK and FK capabilities offers animators lots of options

How to animate using IK/FK rigs in Maya

Digital-Tutors on how to work with forward and inverse kinematics rigs to create fluid performances

Creature animation can be truly rewarding and very challenging to simulate due to the complex nature of body mechanics. Technical artists responsible for designing control rigs to animate these CG entities should always look for ways to help animation be an efficient and flexible process. Creating systems that allow animators to switch between FK (forward kinematics) and IK (inverse kinematics) is certainly a positive step in this direction.

Now, before we get too far, it's first important to understand how IK and FK work. The easiest to understand of the two is FK, because it is the starting point or foundation. Simply put, forward kinematics is the process of animating rotation down a hierarchy. A practical example of when we would use forward kinematics is when wanting to animate the follow-through motions of an arm swing as a character walks.

When the shoulder bone rotates, we'd naturally want the forearm to follow. Similarly, we'd expect the wrist bone to be controlled by the movements of the forearm. With FK, not only can this action be animated quickly but we'd also end up with the natural arcing patterns that the arm creates as it swings.

By now, you're probably fascinated with forward kinematics, and you may be asking yourself, "Why would I ever need anything other than forward kinematics?" Unfortunately, FK does have its limitations. Let's use the lower body as an example during the same walk cycle. At some point during the walk, the feet will need to plant. The problem with FK is that it is designed to follow the parent before it.

With this in mind, if we were to consider a character's legs, the hip would be their parent or 'driving object'. So if we were to animate the rotations of an entire leg, down to the foot, we'd have to do loads of

About the author
Digital-Tutors teaches people to make movies and games with the world's largest CG and VFX training library
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counter-keying to make the leg look convincing as it compresses and extends while it supports the weight of the body. At best, the animation might end up looking slightly shaky... and this is not good.

This is where inverse kinematics come in handy. IK will inverse the rotation of a chain of bones to follow an end effector, which is usually in the form of a point null, or handle. As the IK handle moves, the bones connected to it will rotate to follow. The great thing about this handle is that it is independent from the hierarchy of the chain it's attached to, meaning that we have full control over where it ends up, which makes it ideal for animating limbs that will, eventually, need to plant on a surface.

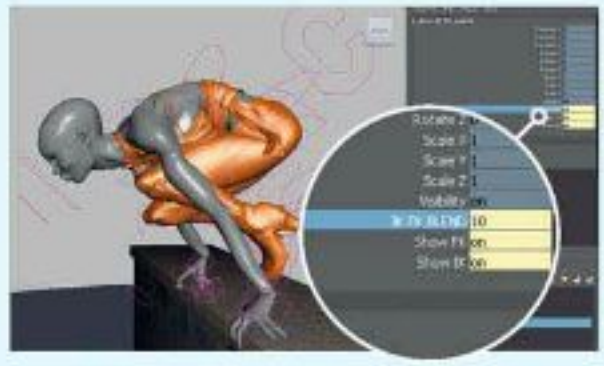
Like FK, IK has its share of pros and cons. The main disadvantage is that arcs do not come naturally when animating with IK, since it is the position of its handle that we'd animate, and no longer the rotation of bones. Therefore, the animator would need to spend more time and effort tracking and polishing the trajectory of this object to ensure that arcs still exist in an IK animation.

Thankfully, IK and FK can be bridged, which provides animators with the best of both worlds. A system can be made to blend back and forth between the two modes, and to ensure that both IK and FK chains will always be aligned during this transition.

More so, this entire system can be regulated by a channel to instantly set your desired mode for convenience. The challenge, then, becomes when to transition between IK and FK. The answer to this lies in good planning. If the time is taken to plan out a performance beforehand, one generally has an idea of what method would be most suitable for that particular sequence.

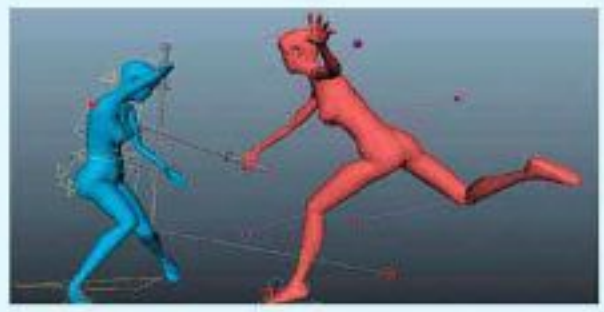
A control system that has both IK and FK capabilities will definitely get a thumbs up from animators because it provides them with more options. And the more options a rig has, the more likely that both the quality and the quantity of animations produced with the rig will increase.

So, make sure to incorporate the two kinematics systems into your own control rigs in the future, and you might just get the 'nod of approval' from your animators. ●

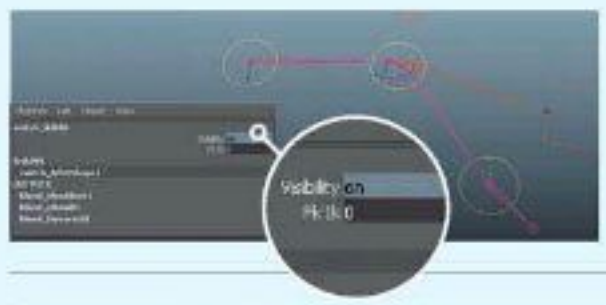


We could use IK and FK systems to animate a character running and vaulting over an obstacle

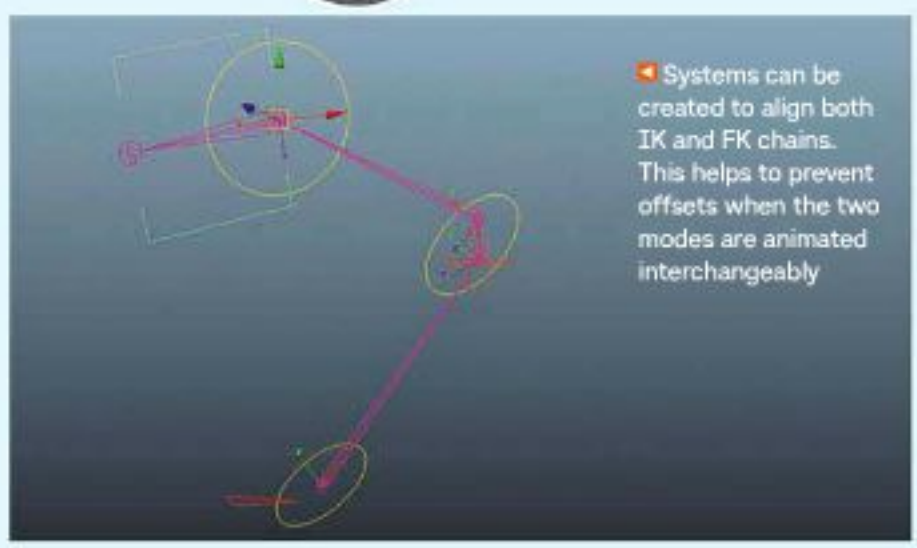
Forward kinematics will naturally produce arcs. It's also often easier to animate follow-through in FK, making it ideal for animating the swinging motions of the arms during a walk cycle



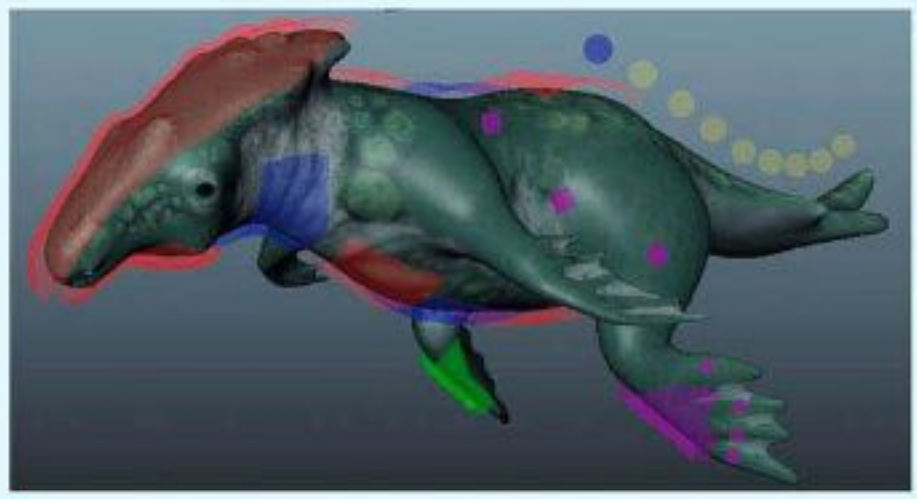
Use inverse kinematics if you want to animate a joint chain independently from the skeleton it's attached to. A good example of this would be animating a character's foot as it contacts the floor



Designing a rig with both IK and FK capabilities can make your rigs more efficient and flexible, providing your animators with more options



Systems can be created to align both IK and FK chains. This helps to prevent offsets when the two modes are animated interchangeably



When adding an IK/FK rig to a tail, FK can be used to animate its follow-through as the creature swims, and IK allows the tail to rest on an object

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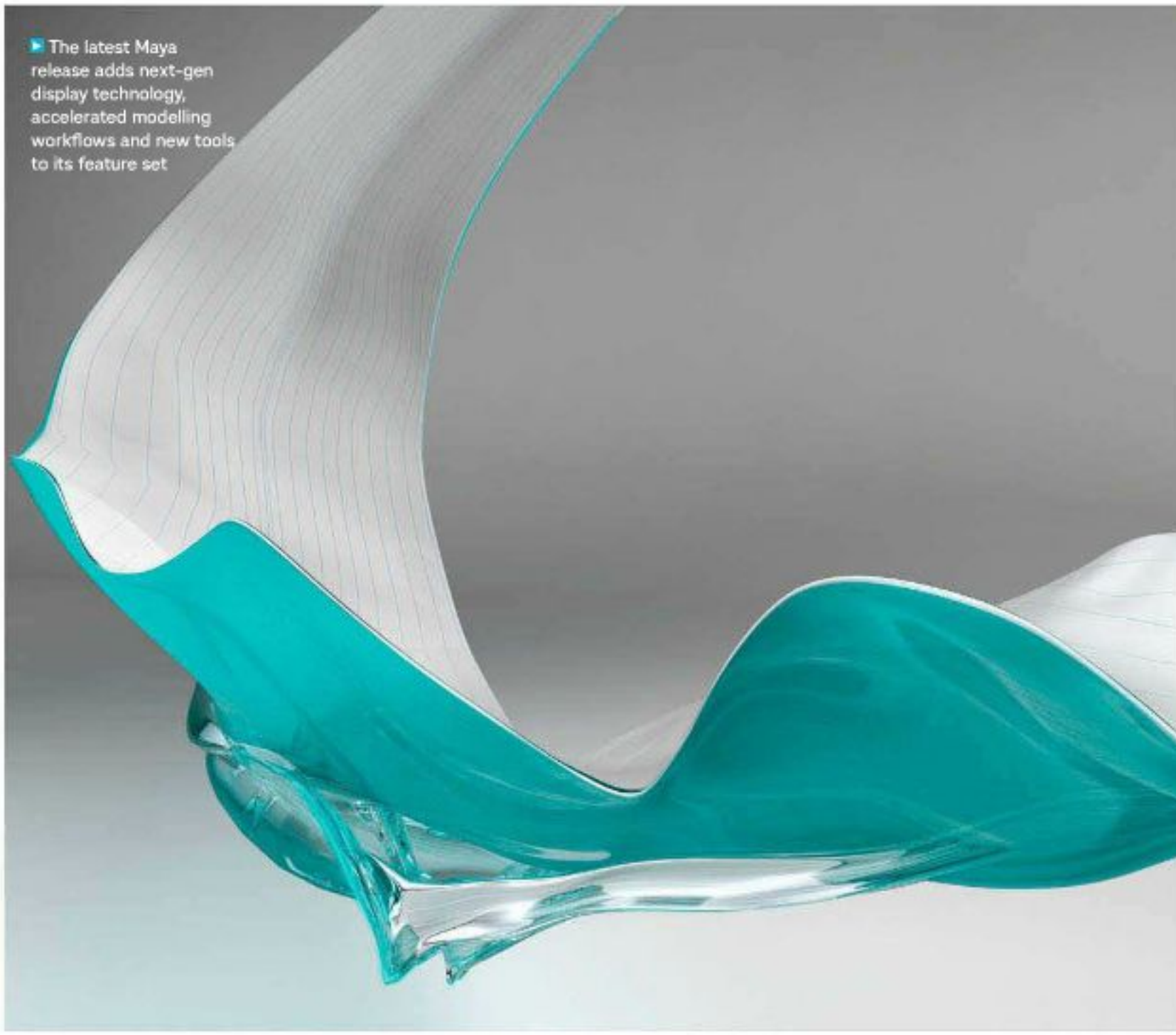


The latest Maya release adds next-gen display technology, accelerated modelling workflows and new tools to its feature set

Maya 2014

Antony Ward finds out if the promise of an advanced modelling workflow is enough to win back those who model elsewhere

About the author
Antony Ward has been provoking pixels since the early 1990's. In that time he has worked for some of today's top studios and written three books
ant-online.co.uk

For years there has been a battle between Maya and 3ds Max, and most users, particularly in game development, are either in one camp or another. Maya has superior animation tools, but 3ds Max has the polygon modelling toolset; Maya is easy to configure and code for, but 3ds Max has a better real-time viewport. The list goes on and on, and I suspect if you're reading this you have already decided which path you want to follow yourself.

Maya has been in development, in one form or another, for over 20 years. It began way back in 1993 when Alias, the creator of Power Animator, started working with Disney to build a new, customisable, all-singing all-dancing animation tool that the latter could use on future feature films.

Fast-forward to 2005 and, after earning a handful of Academy Awards and enduring a few unsteady years of being passed between companies, Maya came under the ownership of Autodesk, which has continued to develop it to this day. Since its inception, Maya has grown and

Paint Effects can be used like a traditional painting program or to paint repeatable textures that you can apply to geometry

You can make your high-poly models more efficient using Maya's Poly Reduce tool

evolved, with each release bringing a host of new features and improvements to make digital content creation easier and more accessible. As well as modelling and animation tools, the latest version boasts a full suite of dynamic tools to simulate cloth, fluids, hair and particles, enabling you to create any effect you can imagine.

With its roots firmly in the visual effects industry, Maya is also well known as a 'go to' tool for animation. From a technical standpoint, its rigging and scripting tools are easy to work with and allow users to create custom tools using its embedded languages, be that MEL, Python or C++. Animation itself continues to be a natural and fluid experience as long as you have the right rig – and rig creation is also one of Maya's strong points.

Imagine critiquing an animation: with the Grease Pencil, you can draw onto each frame to suggest pose or timing tweaks

With the release of Maya 2014, Autodesk has introduced a new addition to the animation toolkit: the Grease Pencil. This tool allows you to draw directly onto the screen, with each stroke of the pencil locked to the current camera. This may not initially seem like an animation tool as such, but you can add new frames into the Time Slider, essentially outlining an animated sequence before any 3D work is done.

Initially this seems like a gimmick: being able to draw onto the screen is a nice idea, but in reality how usable is it? In this case, it works well and has the potential to become a great way for managers to assess work in the same scene. Imagine critiquing an animation that has been outsourced. Rather than send a lengthy email, you could draw onto each frame to suggest pose or timing tweaks. This offers an intuitive way to work, and would be simple for an animator to follow (especially if there is a language barrier).

MODELLING FEATURES

If your skills lie in modelling then Maya is an ideal tool, with NURBS, Subdivision Surfaces and basic polygon techniques all catered for as well as a full suite of intuitive UV editing tools. That said, polygon modelling is one area of Maya »

The new Joint Tool Symmetry Setting makes the creation of symmetrical skeletons simple

that has needed updating for quite some time now, and because of this many users moved over to modelling in an external application.

With this update, Autodesk is finally taking polygon modelling seriously with the addition of the Modelling Toolkit. Anyone who has used the NEX modelling tools by digitalRaster will be familiar with the setup, as Autodesk has simply taken the toolset and integrated it into Maya.

Enabling the Modelling Toolkit brings up a set of handy new features in the right-hand panel. The idea is to take all the most common tools, dramatically enhance how they are used, and have them immediately available so you aren't searching through menus to find your next operation.

Toolkit panel to customise with your own favourite tools for ease of access.

REAL-TIME PREVIEW

Alongside the new Modelling Toolkit is the addition of the DirectX 11 display. I say 'alongside', as with the Viewport 2.0 update users can now fully preview their real-time artwork, which could be created with the Modelling Toolkit, so you can visualise your models as they would appear in-game. It's a welcome addition and something game developers have wanted for a long time.

As a game artist myself, I can already see how much time this could potentially save if an artist can set up the DirectX shader and export those settings directly to a game engine. Other enhancements in

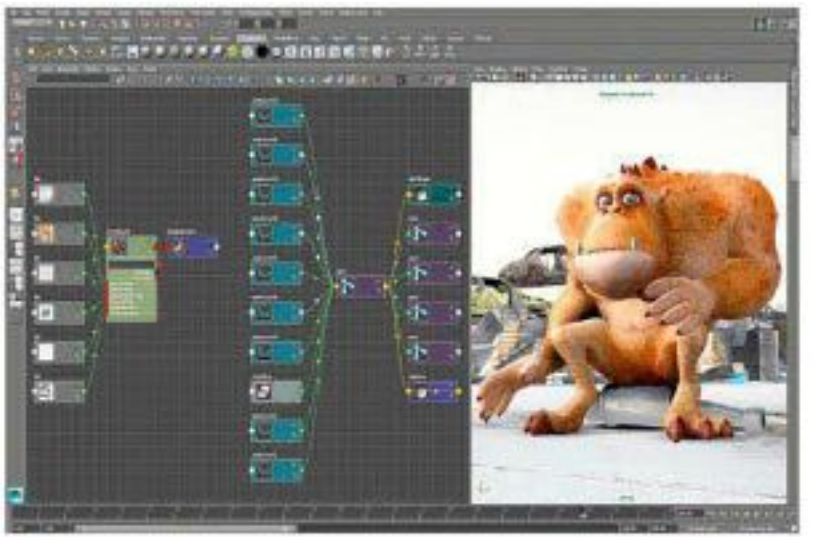
Users can now fully preview real-time artwork, so that you can visualise your models as they would appear in-game

Playing around with these tools, I was pleasantly surprised by how well they worked. Anyone who has enabled Smooth Mesh on an object and then tried to use the Split Polygon tool will know how painful it is to be forced back onto the proxy model. With the new Multi-Cut tool, you stay on the smoothed model, and are free to cut however you like.

Unfortunately the tools are still limited and you will find yourself having to dive back into the menus from time to time, but the developers have kept a small space free at the bottom of the Modelling

Maya 2014 have been made to the Joint Tool, Node Editor and the File Path Editor as well as the Polygon Reduce Tool. In fact, it seems each area has had some love and attention.

With this release, if feels like Autodesk have succeeded in addressing a lot of user issues while also including some much-needed improvements. If you're still wondering which camp to pitch your tent in, this update adds many of the features Max users have enjoyed into the Maya environment, making it a much more rounded and appealing choice. ●



The improvements to the Node Editor in Maya 2014 are focused on workflow and visual feedback

3D VERDICT

PROS

- Upgraded modelling tools
- DirectX 11 Shader & Viewport support
- Grease Pencil tool is very useful

CONS

- Expensive
- The Modelling Toolkit is more an evolution than a revolution

Autodesk has succeeded in addressing a number of the issues Maya users were experiencing, while also including some much sought after improvements, making this a worthwhile upgrade

RATING ●●●●○

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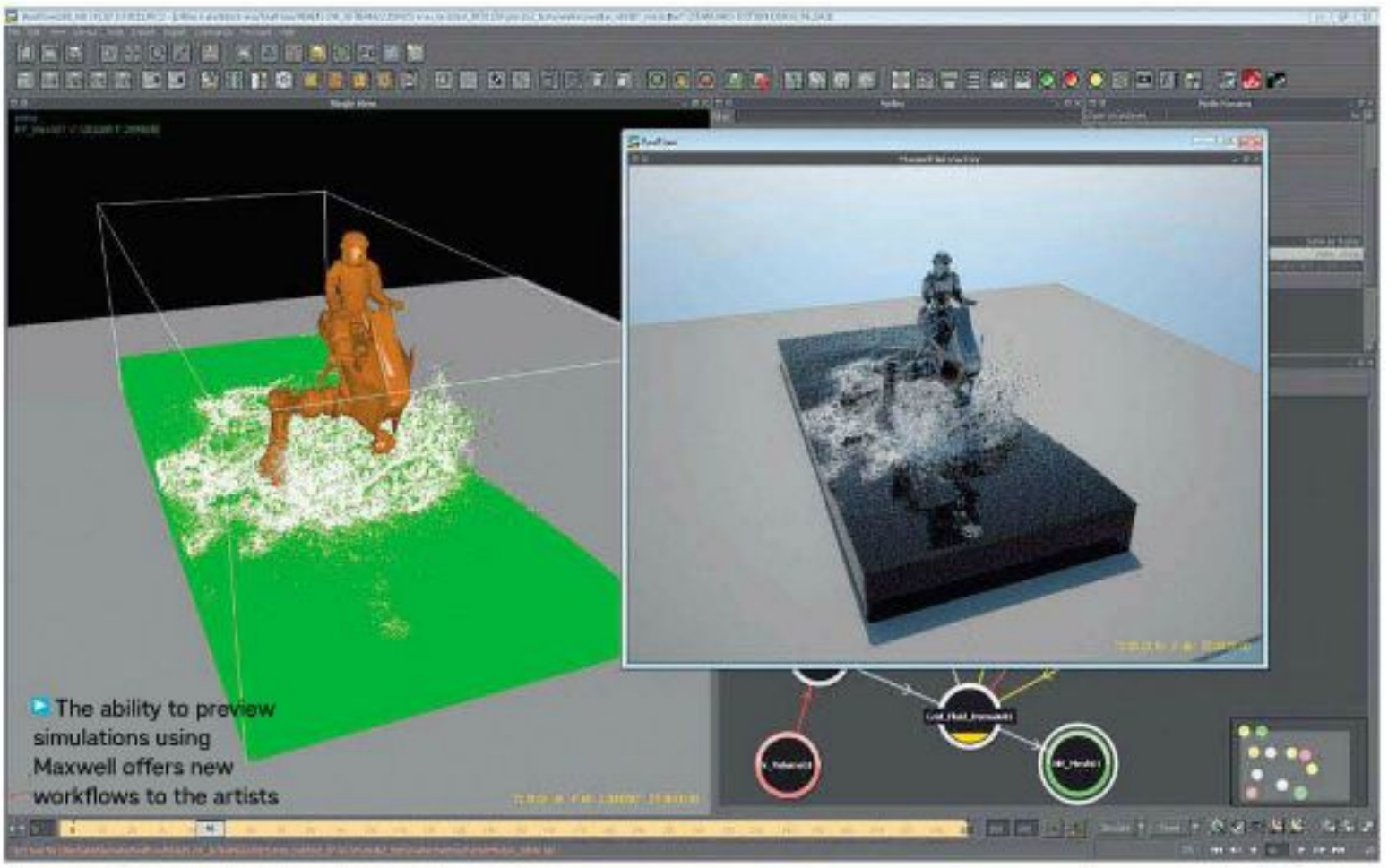


The ability to preview simulations using Maxwell offers new workflows to the artists

RealFlow 2013

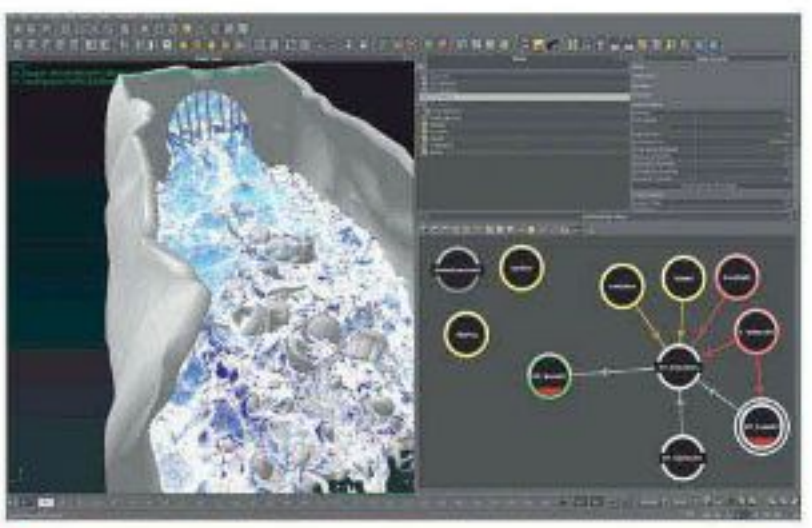
The latest iteration is probably the best off-the-shelf liquid and rigid-body package on the market, says **Florian Koebisch**

About the author
Florian Koebisch is a freelance FX technical director. He has been an expert RealFlow user for many years, and also offers training and worldwide project consultancy
http://fkfx.wordpress.com

RealFlow is a well-known off-the-shelf solution for liquids animation. The software from Spanish developers Next Limit has been used in recent movies such as The Avengers and Looper, and hundreds of commercials worldwide. Besides its liquids solver, RealFlow also comes with a fully integrated, stable and accurate rigid-body dynamics system, Caronte.

RealFlow 2013 has some new node-based tricks up its sleeve, too. The old scene management system with its Global and Exclusive Links has been sacrificed for a more modern node-based approach, and a node-based scripting system has been introduced. These script nodes offer valuable tools to technical directors and users who want more control over their simulations. Script nodes take advantage of multi-threading, as well as providing helpful tools such as Signed Distance Fields and processing of information from image files.

In RealFlow 2013, the Hybrido 2 system for simulating large bodies of water like rivers or oceans has been completely revamped. Now, a FLIP solver (FLuid Implicit Particle, a method originally invented in 1986) is the base for the liquid calculations – basically the same technology that is used in other packages such as Naiad or Houdini. In comparison with the previous Hybrido system in RealFlow, the new FLIP solver feels like a quantum leap – faster, more reliable and allowing much more detailed simulations.



Hybrido 2 integrates extremely well with Caronte RBD. Scene nodes are the new node-based way to work in RealFlow 2013

The Hybrido 2 system for simulating large bodies of water has been revamped, with a FLIP solver as the base for calculations

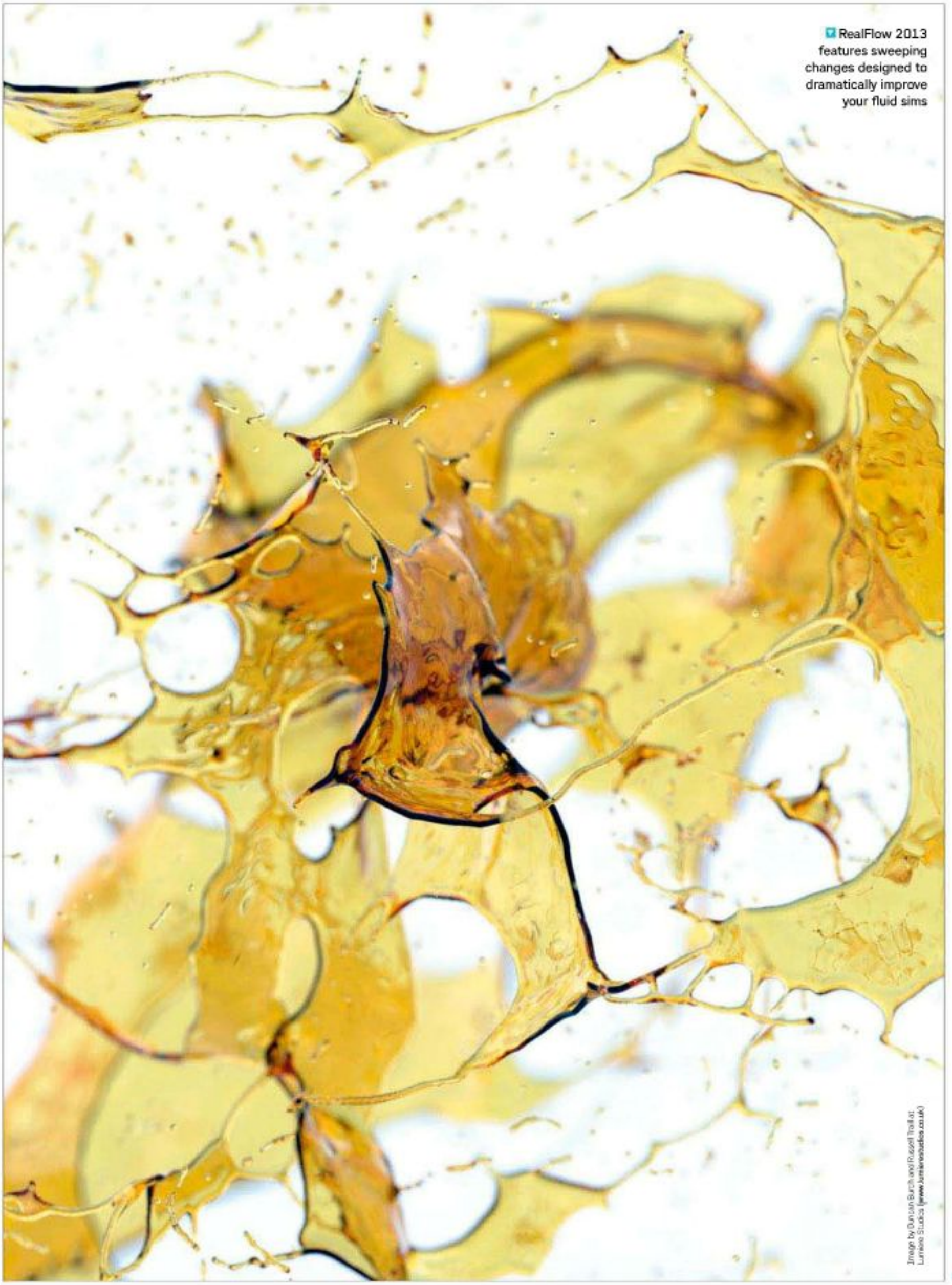
HYBRIDO 2

Hybrido was first introduced in 2010 with RealFlow 5, as a system for simulating medium and large bodies of water. Until then, this had been hard to do with RealFlow, as its standard SPH-based particle solver is more targeted towards splashes or tabletop-scale phenomena. SPH enables you to simulate virtually anything that takes a whole lot of detail, but those highly detailed simulations take their time.

Hybrido offered a simplified method for simulating the base liquid, so SPH was only needed for certain high-detailed areas. This worked fine in many situations, but Hybrido was limited: it was hard to get an acceptable amount of detail out of the base simulations, and one often needed lots of additional layers of SPH on top in order to get the desired quality.

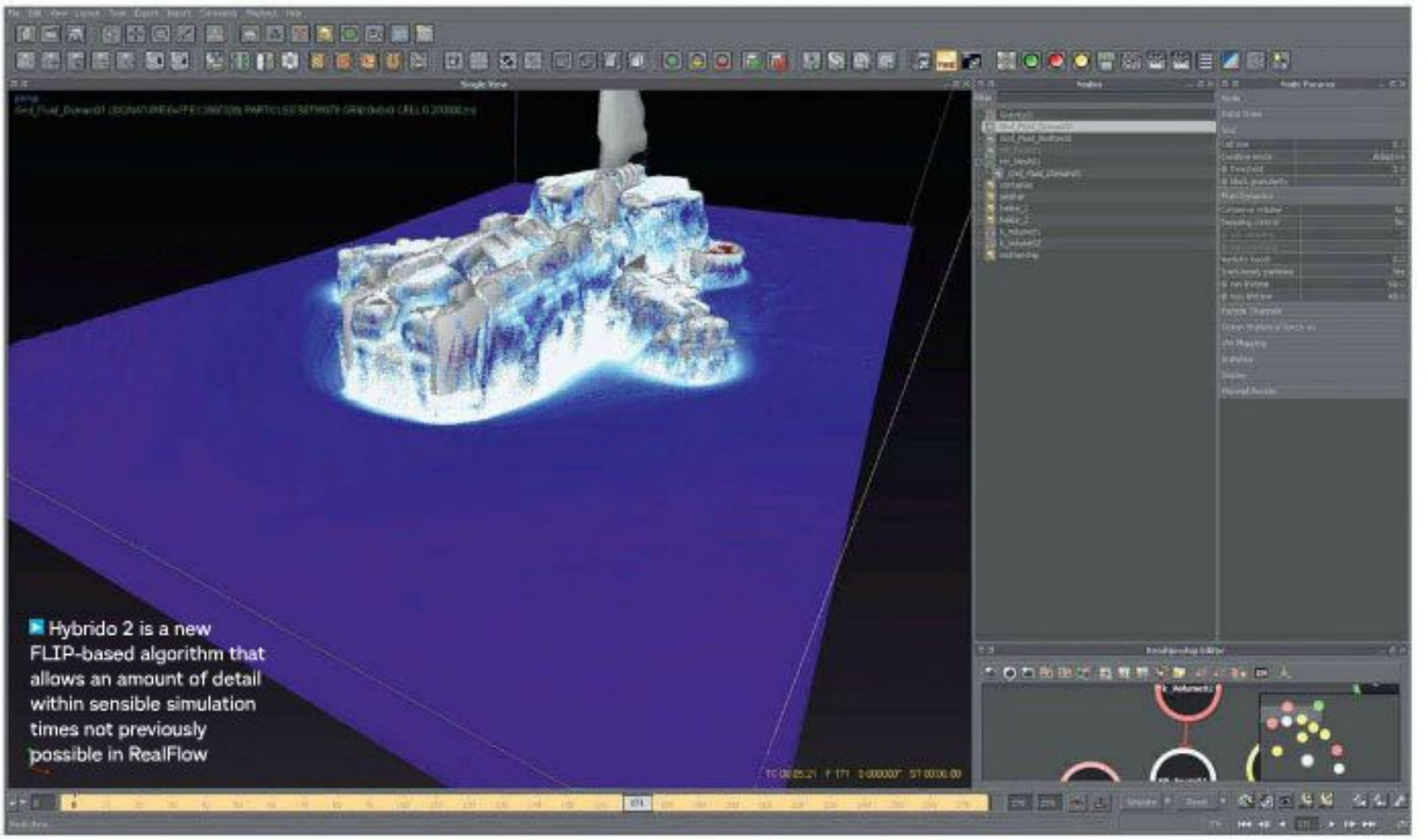
However, Next Limit has addressed the issue by introducing a FLIP solver to Hybrido 2 and renovating the secondary systems for the creation of more detail, foam or other additional elements for simulations. While testing, I was able to simulate a waterfall consisting of more than 200 million particles (base simulation, without additional layers) on an i7-3930K Intel-based workstation with 16GB RAM.

The simulation took its time, but the amount of detail was very high; this wouldn't have been possible with the old Hybrido system. The base simulation alone gives the user quality and detail that wasn't possible with the old system,



RealFlow 2013 features sweeping changes designed to dramatically improve your fluid sims

Image by Duncan Burch and Russell Trollet, Luminous Studios (www.luminousstudios.co.uk)



Geometry-based fracturing makes Caronte a valuable tool in any artist's arsenal

even adding tonnes of additional layers of particles on top. A new meshing algorithm has also been introduced, so now one can get the detail of the base simulation into the final mesh.

Hybrido 2 also supports OpenCL GPU acceleration to speed up simulations. Some steps of the FLIP algorithm's implementation are calculated on the graphics card, resulting in simulations up to 50 per cent faster. Due to the limitations of current graphics hardware, there are still bottlenecks for software like RealFlow: caches of more than 5GB per frame are not uncommon when it gets to real-world quality liquid simulations, so the majority of operations still have to be calculated on the CPU. But cutting simulation time by half is certainly handy.

It only took a few scenes to realise that the new node-based workflow was much more preferable to the previous system

SCENE NODES

After loading RealFlow, you will see that the old Exclusive and Global Links have gone, replaced by the new node-based interface. At first glance, the new way of working may be confusing – the interface, with its large icons, worked well on a dual-monitor setup but was harder to use on a 15-inch laptop. However, it only took a few scenes for me to realise that the node-based workflow was much more preferable to the previous system: it's faster and more intuitive.

Even more important than those new scene nodes – and probably the killer feature in RealFlow 2013 – are script nodes, which allow you to control virtually anything in the scene. There are nodes and tools for vectors, SDFs, Hybrido or SPH elements – for example, you can apply an animated image-based displacement (for example, a wave) that you created in any software. These are very useful tools for more advanced users, but without a basic knowledge of coding they might still be difficult to learn.

However these script nodes are hidden deep down in the user interface, so if you didn't know they were there you might never discover them on your own – and I'm not sure why the developers would want to bury such a useful feature set. (Under the Simulation Flow menu, right-click on one of the descriptions to open the Node Editor.) Once you've found the editor, it's easy to navigate to and work with, and hopefully Next Limit is planning some interface refinements in the next iteration to make it simpler.

The rigid-body dynamics system Caronte has also been updated, but it's still not that easy to configure: it's a typical example of software written by engineers for engineers. Thankfully it's fun to learn and, as a reward, you will get access to a rigid-body dynamics system that can quickly handle more objects than your standard 3D app, without any jittering.

Caronte has also been speeded up and there are some useful production quality fracturing tools introduced. A cut-down version of Maxwell now comes bundled with RealFlow – not the full package, but you will be able to make a quick render directly out of your RealFlow scene or shoot out rendered previews. This is very useful when trying to evaluate a mesh or particle animation.

RealFlow 2013 is a great product. With features like the FLIP solver, nodes, nodal scripting, new meshers, Caronte and Maxwell, it's probably the best off-the-shelf liquid and RBD package on the market. With some improvements to the interface, it would be unbeatable. ●

3D WORLD VERDICT

PROS

- Fast and reliable FLIP Solver
- Powerful script nodes
- Alembic support

CONS

- No upgrade of Standard Particles/ SPH
- User interface can be confusing
- No support yet for viscosity in FLIP

With highly anticipated additions like a FLIP solver and node-based scripting, RealFlow 2013 easily integrates into your pipeline

RATING ●●●●○

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The Cintiq 13HD is clean and smooth to use, as well as being light and portable

Wacom Cintiq 13HD

Rob Redman takes the latest offering in Wacom's Cintiq range, a small but high-resolution interactive display, for a test drive

Wacom has a reputation for making high-quality tablets and interactive displays. Its offerings are well built, with a luxurious and stylish finish. However there been some criticism that certain items, particularly in the Cintiq range of interactive displays, have been too unwieldy and too expensive. Wacom countered this with a range of 12-inch models – but unfortunately they fell a little short of the mark and, while usable, they weren't the high-end input devices required for professional use.

This brings us to the Cintiq 13HD, with its high-resolution display, low weight and improved setup process, making it an attractive proposition for 3D artists.

Setting it up is a quick and painless process. Gone is the massive breakout box found on some other Wacom displays. Instead, you have one cable that clips into the side of the tablet and then splits into power, USB and HDMI connections. This raises one niggle, however: Wacom hasn't provided an HDMI-to-DVI adapter (or a mini-DisplayPort-to-HDMI for Mac users), so keep this in mind if you decide to buy. Drivers and software come on a bundled disc, and can also be downloaded from the Wacom support site.

Once you have connected all the cables and installed the software, you are good to go. I chose to extend my desktop rather than mirror it, as I like to have other apps running alongside, such as reference images and email. The display appears far brighter than other Cintiqs, and the full HD resolution is sharp and crisp, with a good viewing angle and crisp blacks. The device as a whole is smaller and far slimmer than expected – it makes the 12-inch version seem pretty tubby in comparison – as well as making the screen itself feel bigger than it really is.

The supplied removable stand has three angle options, making adapting it for different workspaces easy. Being removable it also lets you work with the Cintiq on your lap, which feels very natural without the weight of a heavy cable.

CLEAN DESIGN

This latest Cintiq uses the same design language as the Intuos 5 range, with similar lines and curves, and the sturdy construction and soft-touch materials all help the 13HD feel like a professional piece of equipment. It may seem like a small point, but setting up the 13HD made my studio feel cleaner and more streamlined. In fact, it is almost as thin and sleek as the Intuos I use as my daily input device.

After a few hours spent in Photoshop and Painter, I thought that I might find the smaller screen and higher resolution difficult to read, or at least tiring, but it was actually pretty easy on the eye. This is probably due to both screen brightness and crispness – and the portability, which makes it far easier to get in the best position for working with it.

The ExpressKeys work perfectly well: the buttons are easily assignable, as are the pen buttons, app by app, so you can use them as your favourite shortcuts/modifier keys. It's a great tablet that works well in most situations, and it only really falls down when you want to see a complete piece with as much detail as possible – you may have to squint a little.

Other than that, and the cable – which is a pretty small niggle – it's a joy to use for both 3D sculpting and 2D work. Navigating around your OS isn't too bad either, as the small working area means less flying around with the pen. ●

3D VERDICT

PROS
- Light, slim and portable
- Excellent depth and brightness
- Responsive and accurate stylus

CONS
- Smallish screen
- Cable can be annoying

Wacom's Cintiq 13HD offers artists a great balance between size, weight and high-quality display properties, in a sleek and well designed package

RATING ●●●●○

About the author
Rob Redman has been a designer and 3D artist for over a decade, and is 3D World's technical editor
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About the author
Mike Griggs is a freelance 3D, VFX and motion graphics artist, and a regular 3D World contributor
www.creativebloke.com

Working in various 3D applications can at best be confusing with different keyboard shortcuts and mouse actions. This is where 3Dconnexion's SpaceNavigators come in handy. Using the custom stubby joystick you can manipulate your 3D viewport with a SpaceNavigator, in conjunction with a mouse or tablet. They revolutionise the 3D creation experience, especially when switching between 3D applications, as spinning and moving around your models has a unified physical input. With a range of programmable buttons, and software that allows you to change mapping of every input parameter of the device, they quickly become an essential part of your creative workflow.

The SpaceNavigator for Notebooks is the smallest and cheapest product that 3Dconnexion makes. Its small size is its selling point, and it even comes with a pouch to keep it safe on the road. This SpaceNavigator is well made from metal and plastic, which exudes quality, and the main handle has a much more precise feel than the SpaceExplorer. However, this does mean that the mechanism doesn't feel quite as robust. The only issue I found when using the SpaceNavigator, was with the placement of the two buttons – I would have preferred them on the front of the device rather than on either side, as I found them awkward to get to. As a long-time user of the larger SpaceExplorer, it is great to have a smaller device for working on site or on the sofa. ■

The SpaceNavigator for Notebooks offers the functionality of its larger brothers in a smaller, portable size

The SpaceNavigator for Notebooks, comes with its own travel pouch, which keeps it safe while travelling

3D WORLD VERDICT

The SpaceNavigator for Notebooks offers an affordable and portable entry point and could be enough for most artists

RATING ●●●●○

Software
Storyboarding
app

Storyboards 3D

Rob Redman discovers how this app makes the iPad into a useful tool for storyboarding

PRICE
Free

OPERATING SYSTEM
iOS

FEATURES
- Transformable 3D content
- Expandable Preset library
- Sharable storyboard renders

DEVELOPER
Tamajii
www.tamajii.com

About the author
3D World's technical editor Rob Redman is a 3D artist and trainer
www.3dworldmag.com

Storyboarding is a part of the animation process that is vital, not just for teams but also for lone animators. Properly planning and communicating your concept is an important step in the workflow and it also lets you spot problems early on.

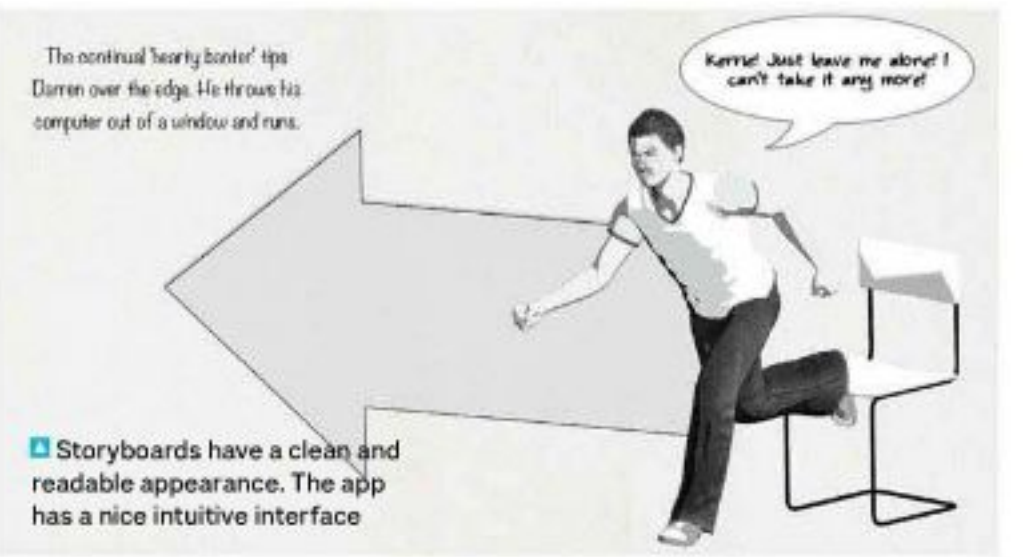
With that in mind being able to produce and view your storyboards on an iPad is a fantastic idea. Tamajii has already made 2D storyboarding apps, but now it has a 3D version, which is much more versatile.

The app is simple but doesn't feel lacking because of that. The interface is clean and functional rather than beautiful. It doesn't get in the way of the task at hand, though you may find yourself looking for in-app purchases to bolster the slightly thin collection of standard assets.

The app does ship with a number of presets, from arrows and speech bubbles to male and female characters, as well as a limited number of props.

Placing assets in a board is simple and once in you can treat it like a 3D scene, using touch gestures to transform, scale and rotate with ease. A simple bring back/forward button makes arranging depth in your scenes easy. For character work, there a few poses and facial expressions, with many more readily available as in-app purchases.

Once finished, you can render out in various styles (hand-drawn looks best), then share as a PDF via email, via native format (which can be edited) via iTunes, or print it directly. ■



Storyboards have a clean and readable appearance. The app has a nice intuitive interface

3D WORLD VERDICT

This free app (barring in-app purchases) is useful and well designed, and will help you get your boards done in minutes

RATING ●●●○○

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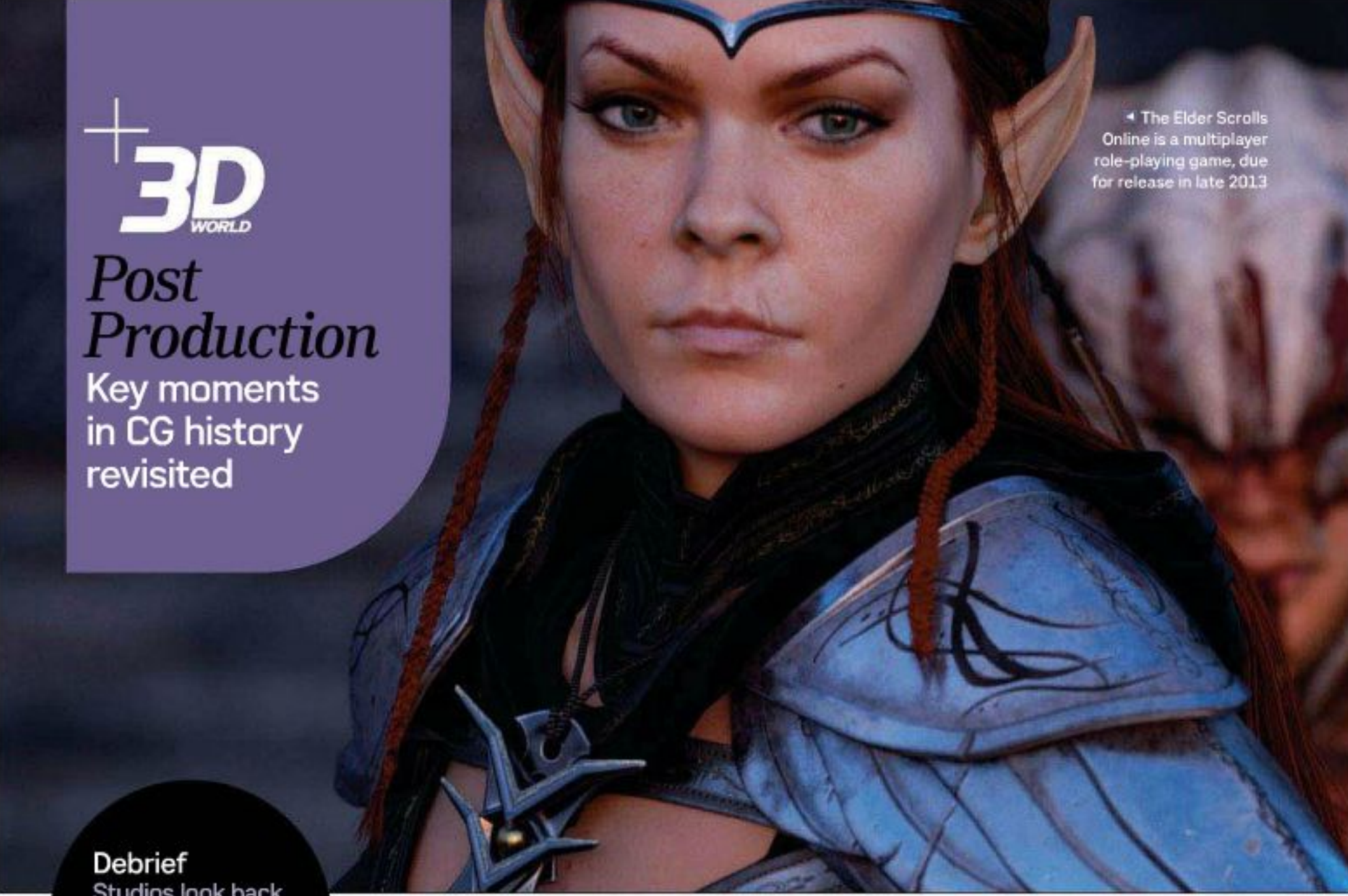
Post Production

Key moments in CG history revisited



◀ The Elder Scrolls Online is a multiplayer role-playing game, due for release in late 2013

Debrief
Studios look back on the highs and lows of recent commercial jobs

Scrolling credits

Blur Studio takes us through the fundamentals of creating its best project of 2012, an announcement trailer for the videogame The Elder Scrolls Online

VITAL STATISTICS
Project: The Elder Scrolls Online
Studio: Blur Studio
Format: Cinematic
Client: Bethesda Softworks and Zenimax Online Studios
Time taken: 26 weeks approx
Team size: 120 approx
Software used: Softimage, Vegas, Mari, 3ds Max, V-Ray, RayFire, ZBrush, Fusion, Photoshop, FumeFX
Release date: 22 January 2013
See it: www.3dworldmag.com/171blur

About the studio
Since 1995, Blur Studio has been creating award-winning visual effects, animation and design, producing 3D character animation, motion design and VFX for feature films, TV and videogames
www.blur.com

Having developed an excellent working partnership with AKQA and Bethesda on previous projects, Blur Studio was pleased to be contacted in January 2012 to gauge their interest and availability for Bethesda's next major project – an announcement trailer for The Elder Scrolls Online videogame.

They drafted a detailed pitch that expanded on their initial concept. From the very beginning it was a great collaboration, and everything they had hoped for wound up on screen. The studio is extremely proud of the spot: it is without doubt one of Blur's greatest projects of 2012.

The key project phases

1. Creating the characters

Mathieu Aerni says:

I am a lead character artist at Blur Studio, and was fortunate enough to be the lead on the 'Alliance' cinematic for The Elder Scrolls Online. One of our key goals was to elevate the realism of the characters, so naturally The Elder Scrolls Online became a challenging yet ultimately rewarding project, with several very detailed characters, complex hairstyles and complicated armour and outfits. The Blur character pipeline revolves around 3ds Max for modelling, lighting and shading, and a combination of ZBrush, Photoshop and Mari for sculpting and texturing. We use Ornatrix for the hair.

On the hero characters we decided to poly-model all the intricate detail of the armour, like symbols and runes, rather than do them in textures. We used the same approach with the heads of the three heroes. We really wanted to include as much detail as possible in the ZBrush sculpt rather than in the colour textures. This ended up working very well, especially in the close-up shots.

2. Refining the characters throughout the production process

Mathieu Aerni says:

One of our crucial decisions during the initial character texturing and shading phase was to spend less time tweaking the shaders in neutral lighting conditions. This allowed us

▲ The Blur team chose to use Ephere's Ornatrix for their character's hair and fur textures

Sculpting in more detail and refinement on close-up shots was done in ZBrush

more time later on for finessing the lighting scenario of the cinematic.

Once the overall look of the show was defined by our supervisor and approved by the client, we started an extensive phase of rendering turntables of all characters in the final lighting rig. We also started extensive tweaking of the shaders and textures. During the final stage of production, I started a second phase of character refinement by working closely with the scene assembly department and tweaking the characters directly in the shots. This included texture and shader refinement and sculpting more details in ZBrush on close-up shots.

3. Bringing the characters to life
Warren Grubb says:
I was animation supervisor on the Elder Scrolls Online cinematic. This was a very ambitious project for the animation team, with over five minutes of visceral action, mixing keyframe and performance-capture animation. However, we wanted to use the tense, close-up moments to raise the bar on realism for our characters.

First we focused on the proportions of arms and hands. This sounds simple, but it plagues a lot of CG animation – any tiny problem in modelling or pivots from the scapula down to the tips of the fingers translates into poses that are unnatural and lead into the dreaded 'uncanny valley'. We added extra quality control in modelling and rigging and tested with real animation, so we knew the foundation was solid before we even started animating shots.

Secondly we updated the rigs on the eyes and face, giving the animator enough subtle control to create the tiny, natural movements that really make them believable. This new technique worked so well that we will be revisiting the eye rigs for future shows, further fusing animator controls with physical deformations between muscles, eyes and the surrounding skin.

"This was an ambitious project, with over five minutes of action, mixing keyframe and performance capture animation"
Warren Grubb, animation supervisor, Blur

▶ A key challenge was creating environments that looked great from every possible angle

4. Environments, lighting and look development for The Elder Scrolls Online
James Atilano says:
I work in the scene assembly department at Blur Studio, and was one of four environment leads on the Elder Scrolls Online 'Alliance' cinematic. The challenge for each lead was to create an environment that looked great from multiple camera angles, yet was also »

▷ Intricate character details were poly-modelled in preference to depicting in textures

optimised to render with high-resolution characters, props, and atmospheric and FX elements. It was crucial to solve all technical issues early on. Defining the final render settings and monitoring memory consumption helped make room for the heavy characters and FumeFX grids that would be needed to render along with our environments.

Blur CG supervisor Jerome 'Jed' Denjean defined the lighting and colour grading for the show. He also worked with each lead to fine-tune the look development for their specific environment. It was up to the FX department to create several atmospheric assets implemented during look development. Once each environment was clearly defined, it was easy to maintain consistency between a team of artists working on several shots on the show.

5. Environment modelling techniques
Jerome 'Jed' Denjean says:
I was CG supervisor on this project. Poly-modelling intricate architectural details, such as ornate columns with complex components, can be a time-consuming process. Planning edge flow, avoiding penetrating geometry and UV unwrapping a model that will be out of focus in the background will cost more than it is worth. I needed to create these intricate models within the budget, while at the same time retaining a high level of detail.

By using ZBrush's DynaMesh feature, I was able to model several individual components that, for example, would make up a column, and then merge them into one final DynaMesh subtool. The resulting geometry was a clean, quadded model that I could simply add destruction and aging to in ZBrush. I used this method to speed up the modelling process, as well as to create assets that RayFire and thinkingParticles could easily use for simulation. Being able to create multiple-resolution models quickly from ZBrush was also a huge help.

"Using ZBrush's DynaMesh feature, I modelled individual components then merged them into a final DynaMesh subtool"
Jermone 'Jed' Denjean, CG supervisor, Blur

An exciting challenge

Creating the Elder Scrolls Online 'Alliance' cinematic was a wonderful challenge for the whole Blur team. When the goal is to achieve stunning visuals on a practical budget – as well as overcome technical issues that often limit artistic vision – efficiency, teamwork and execution are key. We hope that the end result enhances the legacy of The Elder Scrolls even further. ●

▶ DynaMesh allowed the CG team to create large volumes of intricate components, merge them and turn them into clean, quadded models

/BALLISTIC/

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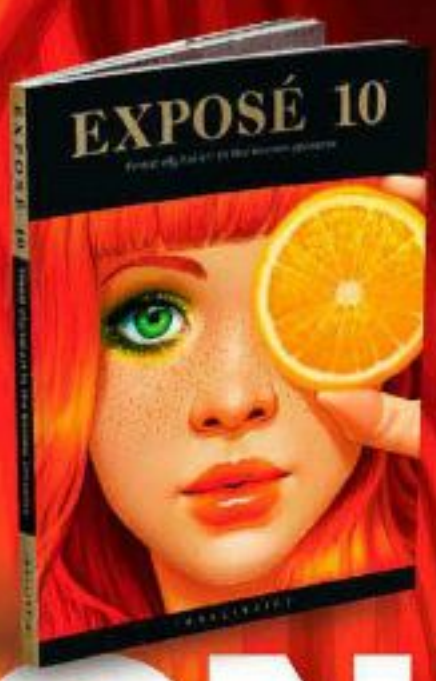

Image: Daniela Uhlig, GERMANY Red Orange

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"We used subdivision surfaces extensively, trying to keep the model as light as possible," says Kevin Baillie. "Even so, it came in at 800,000 polys, which was bumped up substantially at render time"

Freeze Frame
Key moments in VFX and animation history revisited on DVD and Blu-ray

Plane crazy

Atomic Fiction co-founder Kevin Baillie tells Mark Ramshaw how his studio reached new heights in the sobering drama Flight

There are many reasons to take note of Robert Zemeckis' latest. Flight marks the director's return to live action following a pioneering period exploring the world of performance capture. It sees star Denzel Washington in rare anti-hero mode. And it's a critical darling (recently gaining two Oscar nominations) that also packs a powerful visual effects punch. Thanks to the latter element – which recently earned a VES award - it's also a movie that puts pioneering newcomer Atomic Fiction firmly on the map.

"We'd done a few projects before - including shots for Transformers: Dark Side of the Moon, Underworld: Awakening, and the last series of Boardwalk Empire - but this is the largest project to date, and the first in which we were the primary (and in fact only) vendor," says studio co-founder and VFX supervisor Kevin Baillie.

Bailie and co-founder Ryan Tudhope had previously worked together at The Orphanage and then at Zemeckis' ImageMovers. "When Disney shut the door there, we figured we could just go work for somebody else, or take the amazing lessons we'd learned and philosophies developed to start our own thing," says Baillie.

Central to the studio's forward-thinking business plan was the idea of cloud-based rendering. Baillie says they opted to take this relatively new and unusual path in order to facilitate a talent-based studio structure: "Talented people are – deservedly – expensive. Skimping on that side of things would leave us dead before we even started, so we had to look at other ways to save money. That led us to cloud rendering, not only because of the obvious savings, but also because it meant we could ensure the artists would always have the resources needed to get the job done. It's not every day a chance to give artists more while spending less comes along."

While the use of the cloud was vital to handling the work on Flight, Baillie admits they expected resistance from movie studio Paramount. "We went into the first meeting with our bulletproof armour on," he laughs. "We had all our relevant information prepared, including all the data about security. But then the first thing they said was how excited they were about cloud rendering and its cost-effectiveness. They were able to look beyond the obvious panic call, study the realities and make an educated decision."

Building the aircraft

A key challenge on the project was to find a way to depict a fully working airport – not an easy task in security-sensitive, post 9/11 America. "We searched high and low without finding anything that looked right, until we made a contact over at Orlando International," says Baillie. "We were able to drive around the entire place, shooting enough reference material to ultimately build something very faithful to the overall layout and feel of the place."

> *"Every armature, hydraulic element, flap and rivet needed to be modelled"*
> **Kevin Baillie, VFX supervisor**

VITAL STATISTICS
Title: Flight
Released: 3 June(UK), 5 February (USA)
Formats: Blu-ray/DVD
Distributor: Paramount
Watch out for... The plane flying upside down, the moment when it clips the top off a church, and the scene where the cockpit collapses all around Denzel Washington

Maya, Modo and V-Ray were used to model all the digital airport elements. The scene is completed with a wealth of environmental effects

KEY TECHNOLOGY

Atomic Fiction blended a mixture of live action, 3D – using Maya and V-Ray – and matte elements, and simulations in order to depict the crash, both within the cockpit and for exterior views. Live material came via three Red cameras, each fitted with 14mm Ultra Prime lenses. "They overlapped, so we stitched them together to create a 240-degree moving panorama," says Baillie. "That accommodated just about any angle we might need, which was critical as we didn't know what shots were going to be needed until later.

"We then rendered a library of clouds, which could be added into the scene to give a point of reference for the plane's movement. A handful of shots also required fully digital versions of the environment, and for the shot where it hits the church we had to construct the entire building, as they'd only just put the framework up for the real one.

"I'd taken HDR images on the day of the shoot. Together with the live footage, that gave a good baseline for the ambient lighting. We used V-Ray lights and moving cloud textures to get reflection and diffuse lighting flickering in a subtle and believable way. Inside the cockpit, we added light flicker and elements such as dirty smudges on the windows, which again helped fluctuate the lighting and bring the scene alive."

With the film depicting the flight and pivotal crash landing of the passenger plane piloted by Denzel Washington's character, it was also necessary to build a completely photo-real digital aircraft – one that crucially wasn't closely modelled on anything produced by the likes of Boeing.

"Doug Chiang was brought on in the early stages to design the aircraft inside and out," says Baillie. "From that, one of our modellers built a first design pass, which we then spent around six months getting to a final design, tricking it out in 3D elements in a big way. Every armature, hydraulic element, flap and rivet needed to be modelled, so that we could create a believable amount of vibration and violent shaking. It would have been possible to cheat with camera shakes, but it's the complexity you get from all the components rattling and bending that sells it."

The crash

For the crash, the team looked at crashes in movies including Cast Away and Alive, but Baillie says this particular one was ultimately designed to be more matter-of-fact, and so hard-hitting. "It's a much more realistic approach, with the audience witnessing much of it from within the aeroplane. The personal aspect is what makes it so much more terrifying."

To create the views out of the cockpit in mid-descent interior shots, Atomic Fiction utilised a mixture of digital elements and live footage. For the latter, they took to the skies in a helicopter rigged with a custom camera setup consisting of three Red Epics, using these to stitch together panoramic footage.

The crash ends with a shot inside the cockpit. "We put Denzel in a real pilot's chair against green screen, and shot with a camera over-cranked to 120 frames a second," says Baillie. "We then used extensive photo reference from the live cockpit to build and light a digital version that crumples all around him."

If Washington found acting against green screen awkward, Baillie says he never gave them a hard time for it. "He's such a fantastic actor that he was able to instantly switch on and put himself into the head of his character. Really, actors can make or break our work. No matter what you do, without a convincing performance up there, the effects will never look believable."

For the final part of the crash, a range of solutions was used to generate the smoke, fire, dirt and collision debris effects. While the cloud was vital for rendering of frames, Baillie says that they opted to use a local render farm for simulation. "That's one area where we're not doing it in the cloud quite yet, simply because of transfer times."

Baillie views Flight as a particularly important project for Atomic Fiction in this early stage of its life: "Carrying a show with 395 visual effects shots has obviously put us on the map. But we got the chance to get involved with a movie that has really affected people and might even be of help to some. In our line of work, that's pretty rare. The sense of satisfaction is pretty amazing." ■

"Any exterior shot required retiming and digital reconstruction during pans, to ensure the camera moves matched up with the path of the CG plane," says Kevin Baillie

3D WORLD

On the cover

An Epic production from Blue Sky

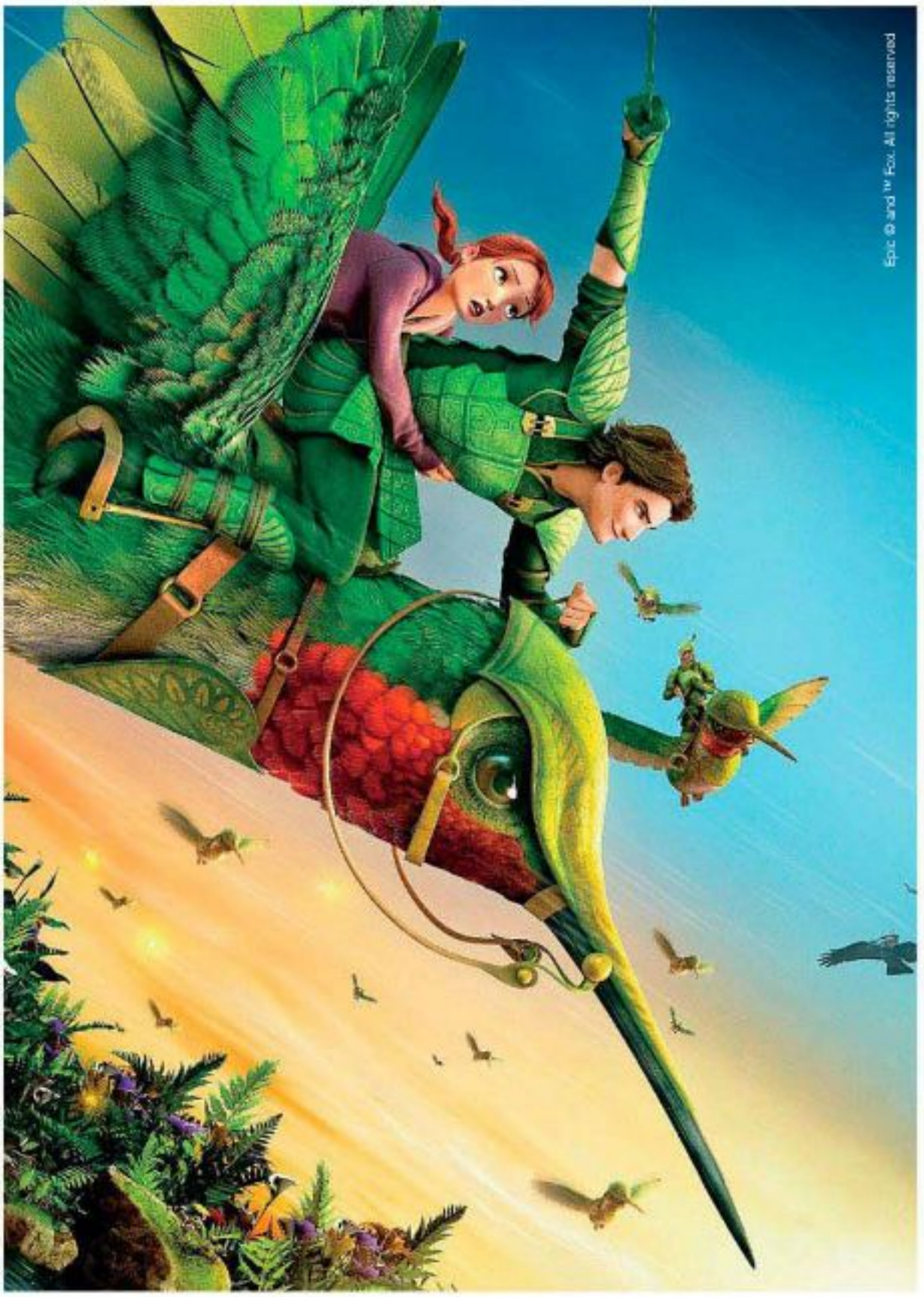
Issue 171 August 2013

This issue, we take a peek behind the scenes of Blue Sky's latest animated feature film Epic, and the technology used to create it. Epic is the story of an ongoing battle between the forces of good, who keep the natural world alive, and the forces of evil, who wish to destroy it, and features the voices of Beyoncé Knowles, Colin Farrell and Amanda Seyfried, among others.

It may tick all the blockbuster animation boxes, but Epic is much more than that: it's a labour of love for Blue Sky Studio co-founder and director Chris Wedge, and a project that has organically grown over an unusually extended development period, with the project's initial inspiration coming over 15 years ago.

Even with such a long gestation period, much work was required by the Blue Sky team to usher the project through to full production. "Every single asset we needed was brand-new, and the concept was extremely ambitious relative to everything we'd produced previously," says CG supervisor Robert Cavaleri. "It took a lot of innovation and all the lessons learned from previous projects to be able to produce something of this scale." Discover more about Epic's production on page 32.

Epic is out now in cinemas worldwide. See http://www.epicthemovie.com for more details.



Next issue

- Pixar special: artist tips and Monsters University
- Maya rigging made simple

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- US & Canada stores from 13 August 2013