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PLANET DINOSAUR

How Jellyfish Pictures delivered 2,100 CG shots for the BBC TV show

PLUS: Jellyfish's tips for creating your own giant reptiles

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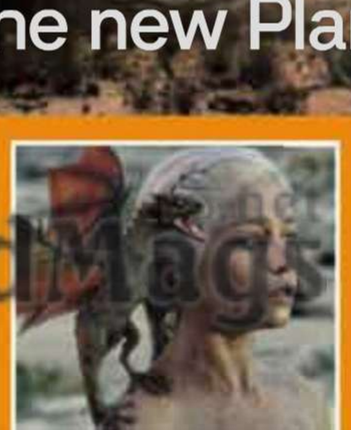
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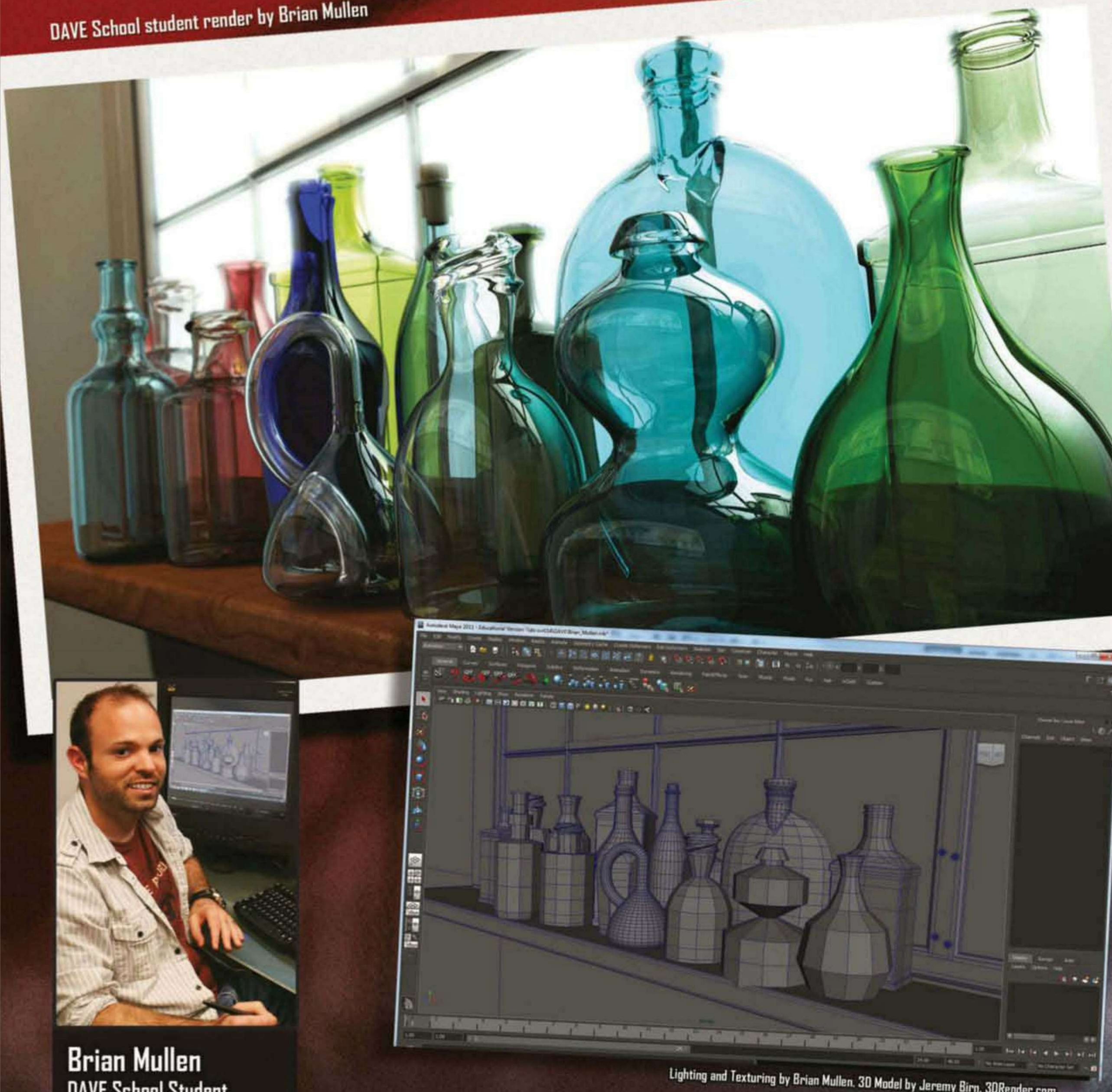
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3D WORLD

presents

Jellyfish Pictures

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The BBC's Walking with Dinosaurs was one of the most iconic natural history TV series of recent years. September's Planet Dinosaur, which will be shown on BBC One, is its spiritual descendent in many ways – but unlike its predecessor, this time the creatures and environments are all CG-based throughout the six half-hour episodes. Jellyfish Pictures created over 2,000 full shots for the programme, with over 45 different dinosaur species and 21 different habitats and environments featured.

"Each dinosaur was modelled first in Softimage and then in ZBrush, adding the finer detail as displacement," says Luke Dodd, VFX supervisor at Jellyfish. "The poly count for this alectrosaurus was 350,000 polygons, which was an average for all the animals Jellyfish created.

"Each model then went to the rigging department to envelope the intricate internal skeletons ready for animation. The detailed rigs allowed for complex facial animation, muscle deformation and, in some cases, independent feather animation. Next, our paint artist generated the dinosaurs' pelt textures in BodyPaint 3D and Photoshop, working at a 16K resolution to allow the camera to get super-close to key features of the animal.

"The rich level of detail was carried through to the environment elements. For the front cover's desert environment, the rocks and vegetation were placed using Softimage's ICE system, along with hand-placing foreground elements. The floor and sand dunes again went through our modelling, ZBrush and Paint pipeline allowing for close-up detail if shots required it.

"The lighting for this scene was again produced in Softimage, while the shading and rendering was done using Arnold. Finally, Nuke was our choice for the compositing phase."

This issue's monster-sized coverage of Planet Dinosaur comes in two parts. On page 44, Kerrie Hughes visits the studio for an in-depth exploration of Jellyfish Pictures' CG workflow, and on page 68, Jellyfish ZBrush artist Mathew Cooling shares his tips and techniques for sculpting dinosaurs.

- Explore the entire CG pipeline for Planet Dinosaur as we visit Jellyfish Pictures to meet the team: page 44
- Sculpt your own dinosaurs in ZBrush as Mathew Cooling reveals the techniques he used on the series





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Welcome to 3D WORLD

The black art of visual effects: who'd do this for a living...?



In an attempt to keep my hand in with a bit of CG, I thought I'd try a little VFX sequence of a flying saucer crashing into a building using some footage I'd shot in New York. My plan was simple: match-move the building; create a replica in LightWave; transfer to Cinema 4D for breaking; back into LightWave for rendering; layer it all in After Effects; wait for ILM job offer to roll in.

PFhoe delivered a decent track, so I was off and running. However, without on-set measurements I've no idea how big the building was, so I spent a tedious evening nudging boxes around in LightWave until it sort of lined up with what I'll generously term 'the live-action footage'.

I then spent hours modelling and texturing a detailed facsimile of the building, using images taken from the footage and un-warped in Photoshop. The first major hitch was importing my matchmoved LightWave scene into Cinema 4D, which removed all of my lovely textures. After more time spent stumbling blindly around in BodyPaint, I gave up and decided my building would be just fine as a rectangular block with a basic UV map.

Not waving but drowning

Next it was time to demolish it with Nitroblast – but, good as it is, the plug-in destroys your UV textures when there are too many pieces. Also, the top of the building was falling onto the camera, so after many more hours of tweaking, I decided on a subtler effect with the saucer merely dislodging a few chunks. I was going to create the dust particles in Cinema 4D, but every time I tried to replicate the simulation, half my building disappeared. Ah, bugger it... I'll do it in post. Yet more compromises.

So here I am. Four or five entire evenings later, I've got multiple composite layers cobbled together in After Effects with various masks to get rid of unwanted pieces and strange keying artefacts; layers that – for no adequately explained reason – don't line up any more; and a Particular effect that, while great, still isn't quite what I'm after. To be honest, I think I'm going to have to go back to near the beginning and start all over again.

So having sampled the pure horror of a pipeline that refuses to work, coupled with a lack of planning, and an over-optimistic client (my brain), I can only suggest that if you do this for a living, you are a martyr to the cause. I'll be sticking to the day job, thanks.

Steve Jarratt, editor

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Introducing our advisory board

Each issue, our panel of leading figures from across the CG industry give us their advice and help

Meet all of our advisory board members at **3dworldmag.com/board**

Spotlight on...



Alex Morris
DIRECTOR, ALEX MORRIS VISUALISATION

Alex Morris studied at Cambridge and Liverpool universities, qualifying as an architect in 1990. In 1996, he joined leading international visualisation studio Hayes Davidson, becoming a partner in 2001. He was responsible for many of HD's landmark images, including London's Millennium Dome and the Tate Modern. He is a judge for the CGarchitect 3D Awards and sits on the boards of numerous key industry bodies. In 2009, he left Hayes Davidson to found his own agency, which works on visualisation projects as diverse as teacups and city masterplanning. Alex was instrumental in selecting nominations for our 3D World CG Awards, the winners of which we'll be showcasing in the next issue.

Tim Alexander
VFX supervisor, ILM

Stuart Adcock
Technical art director, Ninja Theory

Jordi Barés
Joint head of 3D, The Mill

Pascal Blanché
Art director, Ubisoft

Tim Brade
Technical director, Aardman Animations

Rob Bredow
CTO, Sony Pictures Imageworks

Gustavo Capote
Art director, Neoscape

Andrew Daffy
Director, The House of Curves

Lee Danskin
Training development director, Escape Studios

Jonathan Davies
Head of 3D production, The Moving Picture Company

Sofronis Efstathiou
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Paul Franklin
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Eddie Leon
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Alex Morris
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Ximo Peris
Creative director, Crystal CG

Shelley Page
Head of International Outreach, DreamWorks Animation

Robi Roncarelli
Editor and publisher, PIXEL

Jolyon Webb
R&D art director, Blitz Game Studios

This issue's contributors



Eric Keller
FREELANCE ANIMATOR

Eric keeps busy creating animations for both the entertainment industry and the science community, writing books and instructing at the Gnomon School of Visual Effects. On page 62, he explores the latest fluid simulation tools in Maya.



Glen Southern
CREATIVE DIRECTOR, SPARKLEVFX

Glen has been modelling in 3D since the early 1990s and maintains an active freelance modelling career alongside his work at SparkleVFX. He continues his series on modelling basics on page 76.



Mathew Burniston
FREELANCE 3D ARTIST

Mathew is a motion graphics and 3D freelancer, with a wide range of skills from modelling and texturing through to rigging and 2D/3D animation. On page 78, he shows you how to use replicators in modo to make complex multi-component models.



Scott Spencer
DIGITAL SCULPTOR

Scott Spencer is a digital sculptor and designer at the Weta Workshop in Wellington, New Zealand, where he's burning the midnight oil on The Hobbit. Luckily, he still has time to share his ZBrush workflow tips with you on page 84.



Chris Hemming
DIRECTOR/ANIMATOR, PASSION PICTURES

Chris's directing projects include videos for Cornershop and The Winter Olympics. On page 104, he reveals the team effort behind Passion Pictures' exciting new stereoscopic cinema ad for Audi.

3D WORLD

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3D WORLD

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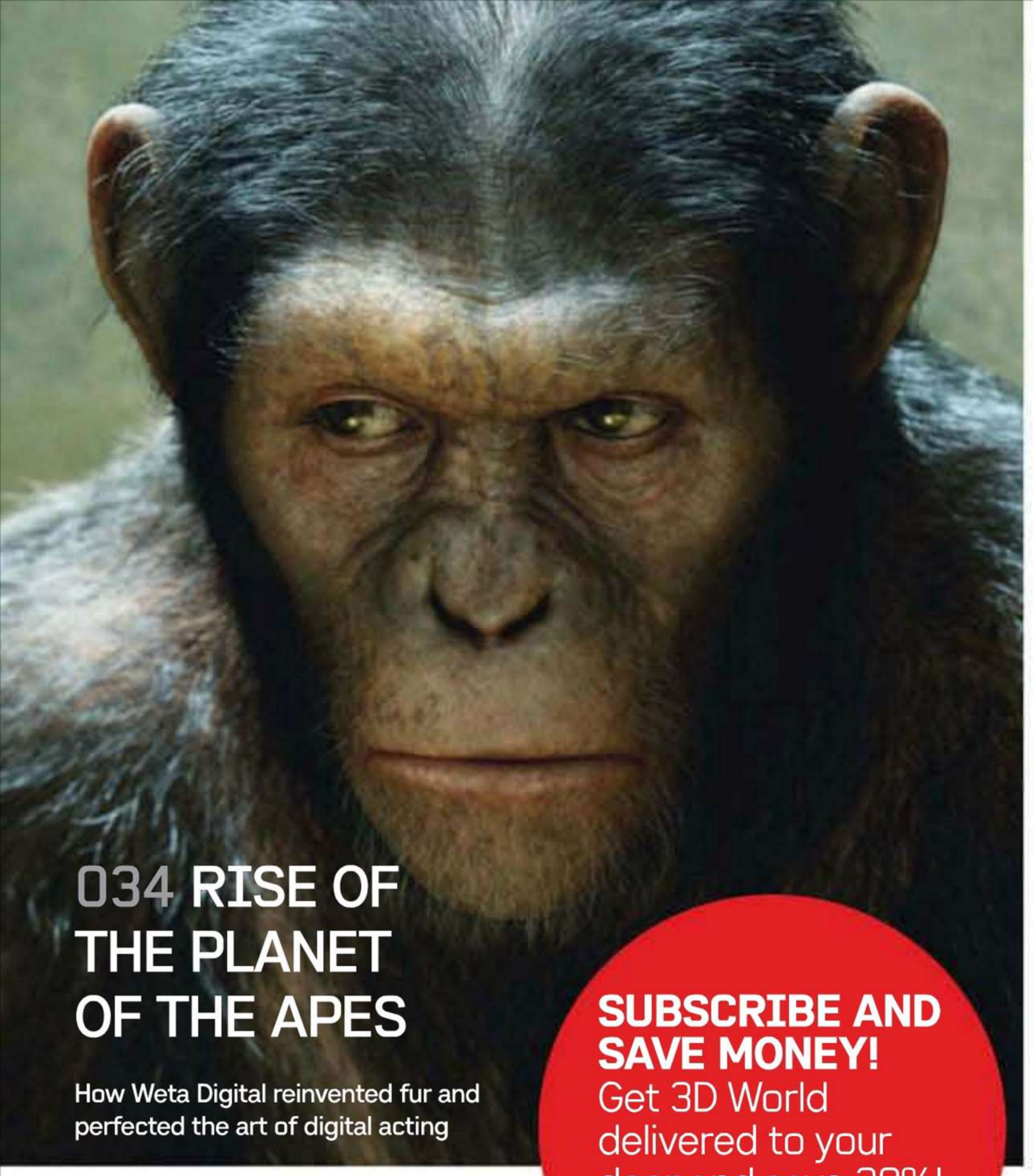
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Sergey Samuilov's pirate headlines a stellar line-up of new 3D artwork

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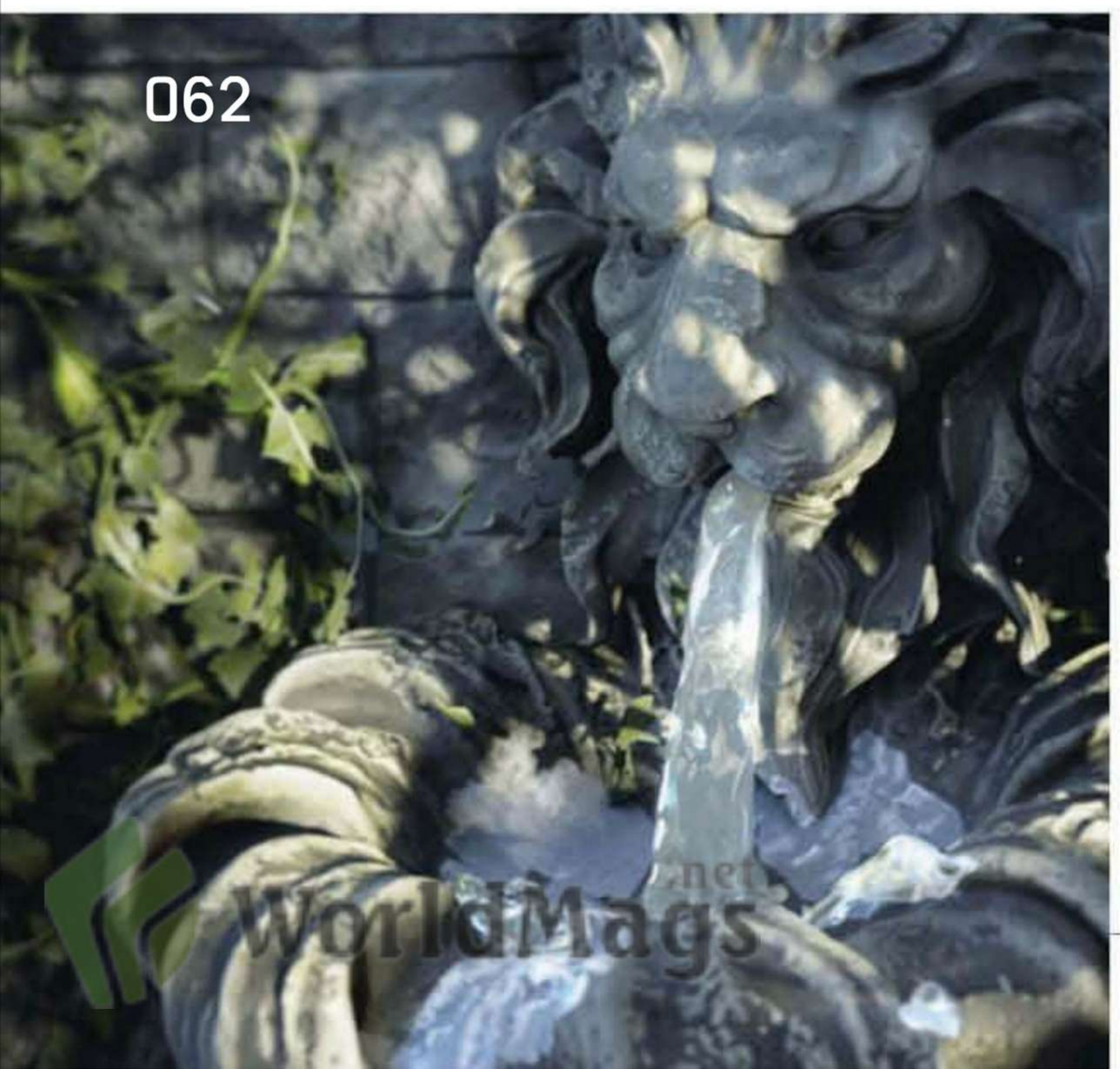
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PLANET DINOSAUR

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PLUS: How the dinosaurs were sculpted in ZBrush 068



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Images and opinion from you, the 3D World readers

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Portfolio

This month's selection of new 3D work features opulent architecture, stunning portraits and a trip into outer space



Artist Barbara Witkowska
Title The Piano
Software 3ds Max, Photoshop, V-Ray, ZBrush

"I work at Evermotion as a 3D artist and this scene is part of Evermotion Archinteriors Vol 23. I'm a 3D generalist, usually working on projects like this from scratch to final render. It requires such skills as modelling and sculpting, painting textures and making shaders, lighting up and rendering the scene.

"What inspires me most of all are various fields of art: modern dance, books, legends and their illustrations, music, photography, movies and paintings. And, of course, other CG artists' works, both 2D and 3D. For this piece, I tried to visualise – as close as I could – the Queluz National Palace ballroom in Portugal, with all of its ornaments and its unique mood. The inspiration for this work was photography and baroque architecture."

"The most enjoyable thing about creating this image was the possibility for learning. I improved my technical skills a lot, thanks to my own studies and advice given by friends from Evermotion regarding composition and post-production issues. A huge challenge was to find out how the architect of the Queluz National Palace ballroom managed to create such a beautiful space from five separate rooms and still make it look symmetrical – when, in fact, it's not!"

basia@evermotion.org
bazia.cgsociety.org/gallery

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portfolio@3dworldmag.com

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Artist Kenneth Fee
Title Gunbus
Software Maya, Painter, mental ray, Photoshop

"I work as a lecturer and programme tutor at the University of Abertay Dundee, teaching 3D Production and Computer Game Design/Production. This was a personal piece, so I could indulge a bit and try different character expressions and poses.

"I combined hand-drawn elements with rendered elements in an attempt to create an image that kept its stylised appearance. I wanted a painted look to some degree. The enjoyment came from trying to marry the hand-painted style with a 3D scene, and testing how successful that was through drawing 2D elements into the render. I was trying to ensure that in large part the viewer couldn't tell (or wouldn't care) where the 3D ended and the 2D began."

albanart@aol.com

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Artist Zhang Chen
Title Chinese Old Man
Software Maya, mental ray, ZBrush, Photoshop

"I'm a teacher in the CG industry, and was previously involved in the production of animated films. In addition to character modelling, I do some matte painting and make 3D scenes. It took me about three weeks to complete this portrait.

"I didn't use any highly advanced techniques for this personal piece: the main technique was the large amount of time I spent on the details. The thing I most enjoy when making artwork like this is that you can forget all your worries."

zcwww--2030212@163.com

> "I didn't use any highly advanced techniques: just the large amount of time I spent on the details"

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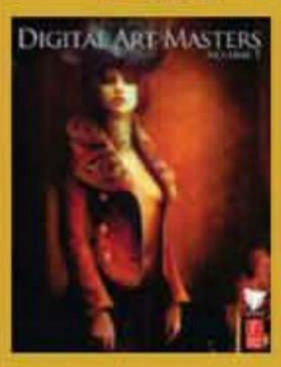
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Artist Sergey Samuilov
Title A Pirate
Software ZBrush, 3ds Max, mental ray, Photoshop

"I'm a freelancer, and my 3D experience includes game models. This pirate piece was a personal work, made for fun. The image took about three to four weeks to complete in my free time. I got some of my inspiration from the Pirates of the Caribbean world, and it's a challenge for me to make good-looking skin, so that's motivating, too."

artonzy@yahoo.com

3D WORLD Image of the month



Sergey Samuilov wins a copy of Digital Art Masters: Volume 5 – a collection of 50 stunning images plus artist commentary on how key renders were created **3dtotal.com**

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Artist Fred Bastide
Title VDS Carnotzet
Software 3ds Max, V-Ray, Photoshop

"I'm a CG artist and also do some animation. This image took me between two and three weeks to complete and was all very straightforward. The part that I most enjoyed was the render process. As an artist, I'm inspired by nature."

texwelt.net



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Artist Piotr Kolus
Title Designers Against Child Slavery
Software 3ds Max, ZBrush, Marvelous Designer, Photoshop

"I work as lead 3D artist at Ars Thanea, a creative agency in Warsaw. This piece was created for an exhibition that takes place in August in New York. We were asked to make it three or four months before, so we had a lot of time to complete the image. We've been working on it in our spare time between commercial projects. As well as myself, digital artist Michal Dziekan, design director and digital artist Peter Jaworowski and character modeller Marcin Klicki were involved in its creation.

"We used 3ds Max and ZBrush for the whole modelling and texturing process except the cloth, which I did in Marvelous Designer. This was one of the first projects on which I've used Marvelous: it's really nice software for cloth simulation where you're making cloths from real patterns. In fact, this was the most enjoyable part of the project."

pk@arsthanea.com
arsthanea.com

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Artist Petr Milerski
Title Abdullah Awad
Software 3ds Max, V-Ray, Photoshop

"I'm a 3D artist at Playground Postproduction and previously spent several years working at LivDucci studio. This image was created as a promotion for Abdullah Awad Advertising Agency, based in Riyadh, Saudi Arabia.

"It took about a month until we and our client were satisfied with the result. We used photography and 3D, with a photoshoot of people in Arabic clothes (by Jan Rambousek Photography, **janrambousek.com**), who were added in post. We used 3ds Max for creating the scene and V-Ray for rendering. Composition was done in Photoshop."

plgr.cz

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Portfolio: In focus

We cast our nets into the deep as Ricardo Bonisoli reveals how he hauled in this spectacular showreel, 'The Lady Walrus'

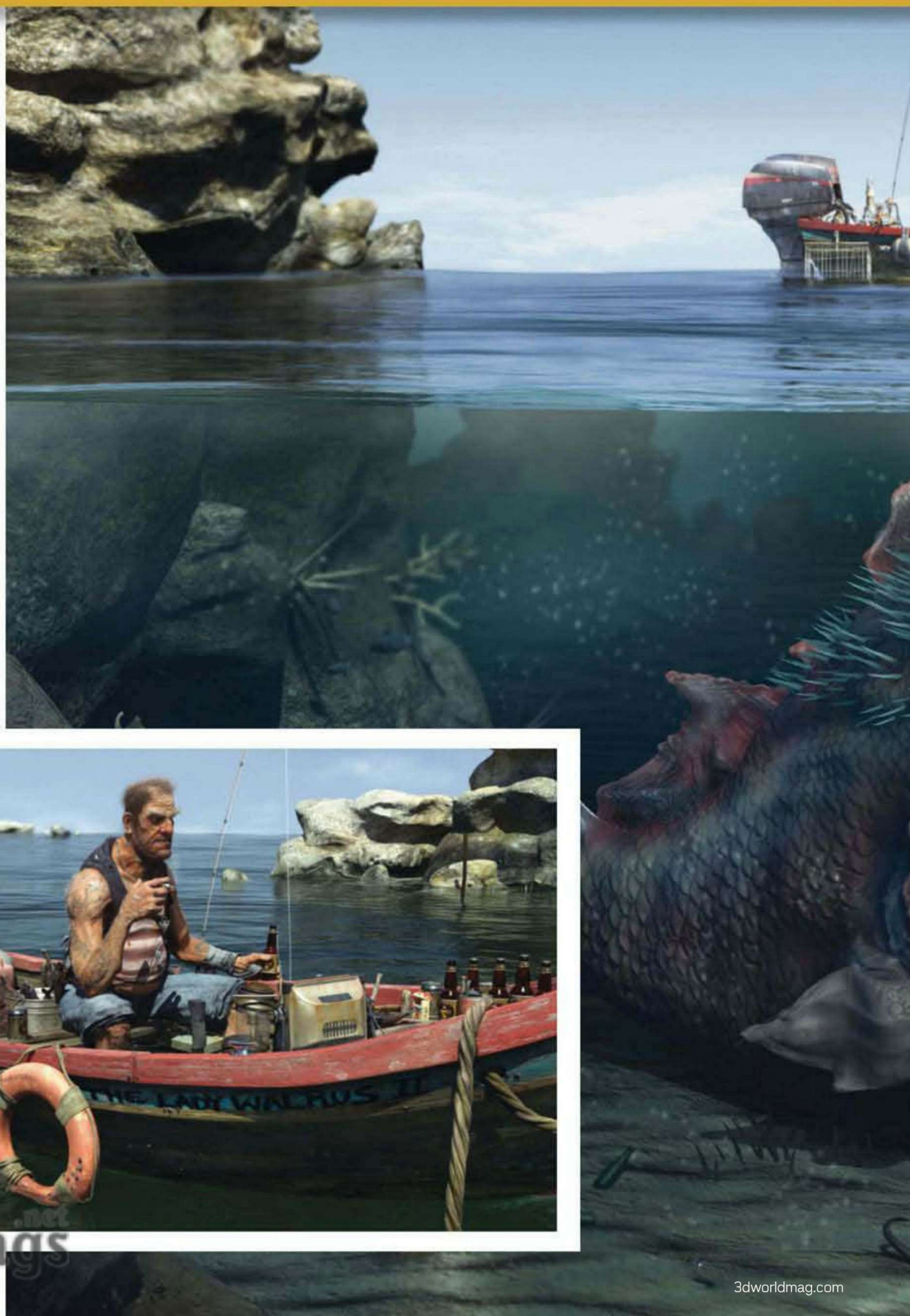


Artist
Ricardo Bonisoli
Title
The Lady Walrus
Software ZBrush, Maya, Photoshop, After Effects, Nuke and mental ray

I work as a cinematic modeller for Method Studios in Vancouver. I have a degree in illustration, and graduated from the 3D Animation and Visual Effects programme at the Vancouver Film School in April 2011. I created this reel while attending the course.

My inspiration for this project came from my love of the ocean and scuba diving, a crazy grumpy man that I saw once on a street, and the scenery from Isla Margarita in my home country, Venezuela. It took me six months to finish, and I pretty much enjoyed creating the whole reel. I love designing and sculpting characters with interesting personalities, so possibly the most exciting part was the creation of the fisherman. The fur simulation I used for his hair could be considered unusual because it's not typically used for human hair.

rbonisoli@hotmail.com
ricardobonisoli.blogspot.com



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Send in your work

Email your images to

portfolio@3dworldmag.com

It took six months for Ricardo Bonisoli to put together this reel, which showcases his modelling and texturing skills

> “My inspiration for this project came from my love of the ocean and scuba diving”

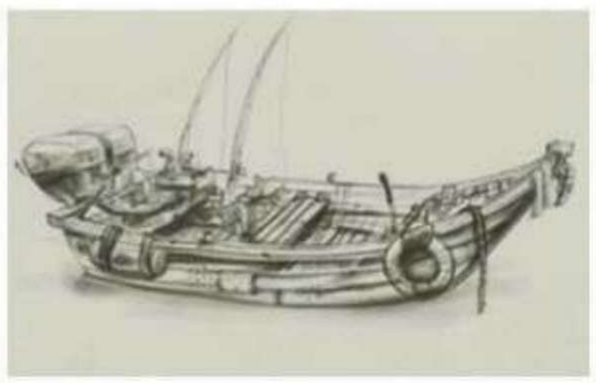
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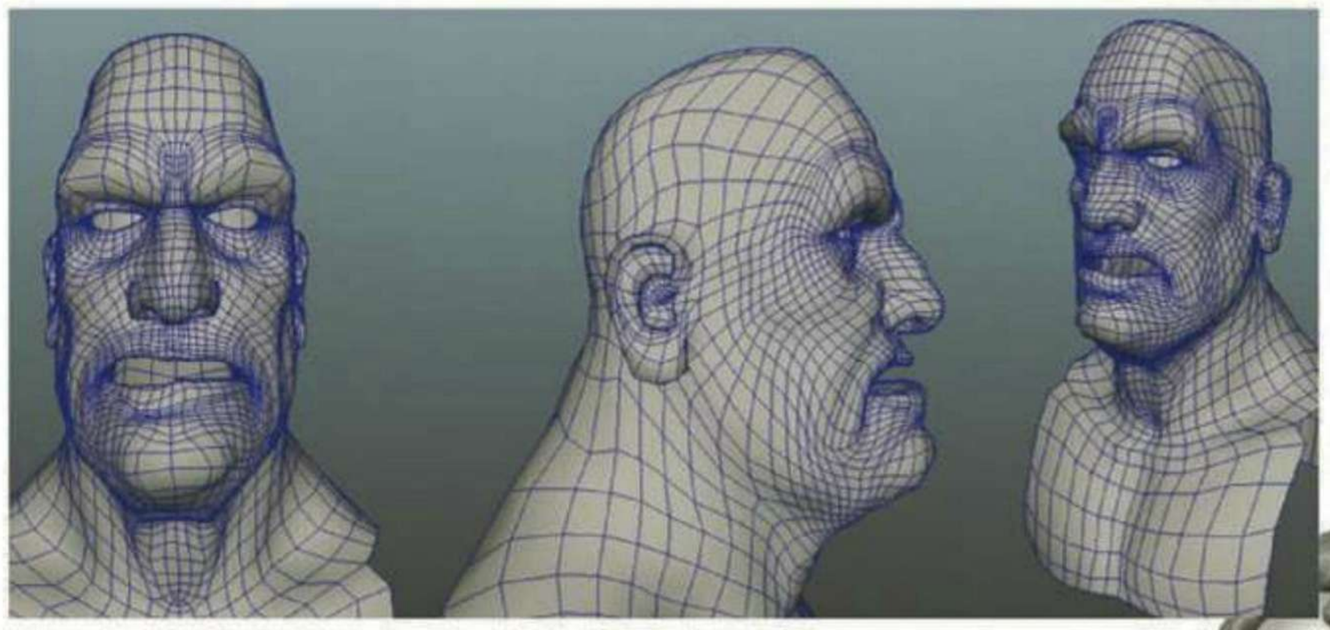
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Modelling
Concept and composition



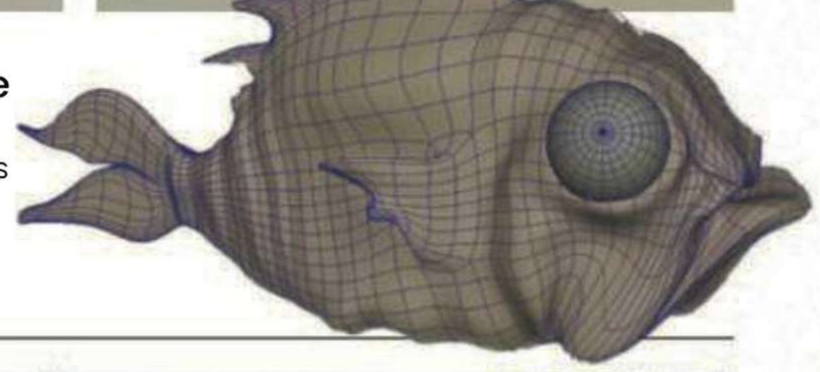
Pirate stories and other seafaring tales helped to inspire the atmosphere and character of the finished reel











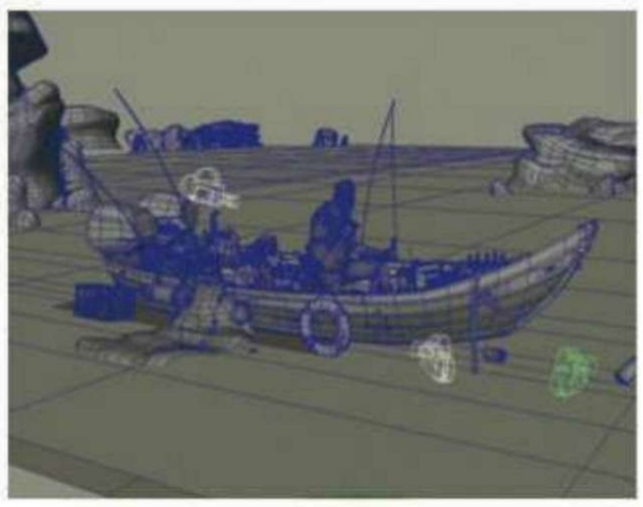
01 Concepts and pre-production

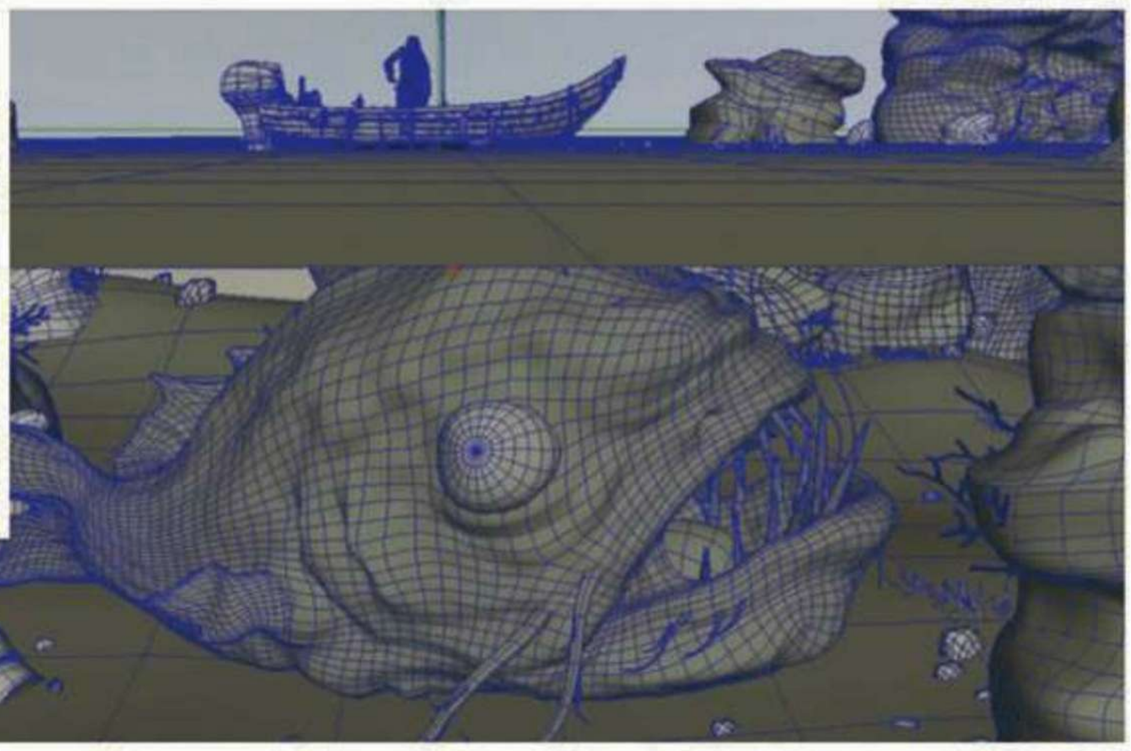
I think this is the most important step of every project. I did a lot of different versions of the character and the set until I was finally happy with the mood that I wanted to create. I had to do a lot of research about boats, fishing and types of fish.

02 Proxy and modelling stage

I used Maya to make the base meshes of all the props and the characters from scratch. Then, once they were unwrapped and had a nice lineflow, I was ready to add the details.







03 Composition and layout

After I knew my general concept and had the proxies made, it was time to set up all my cameras, even if they weren't final. This gave me a good idea of where I wanted to spend more time adding details for the close-up shots.





04 Detailed modelling

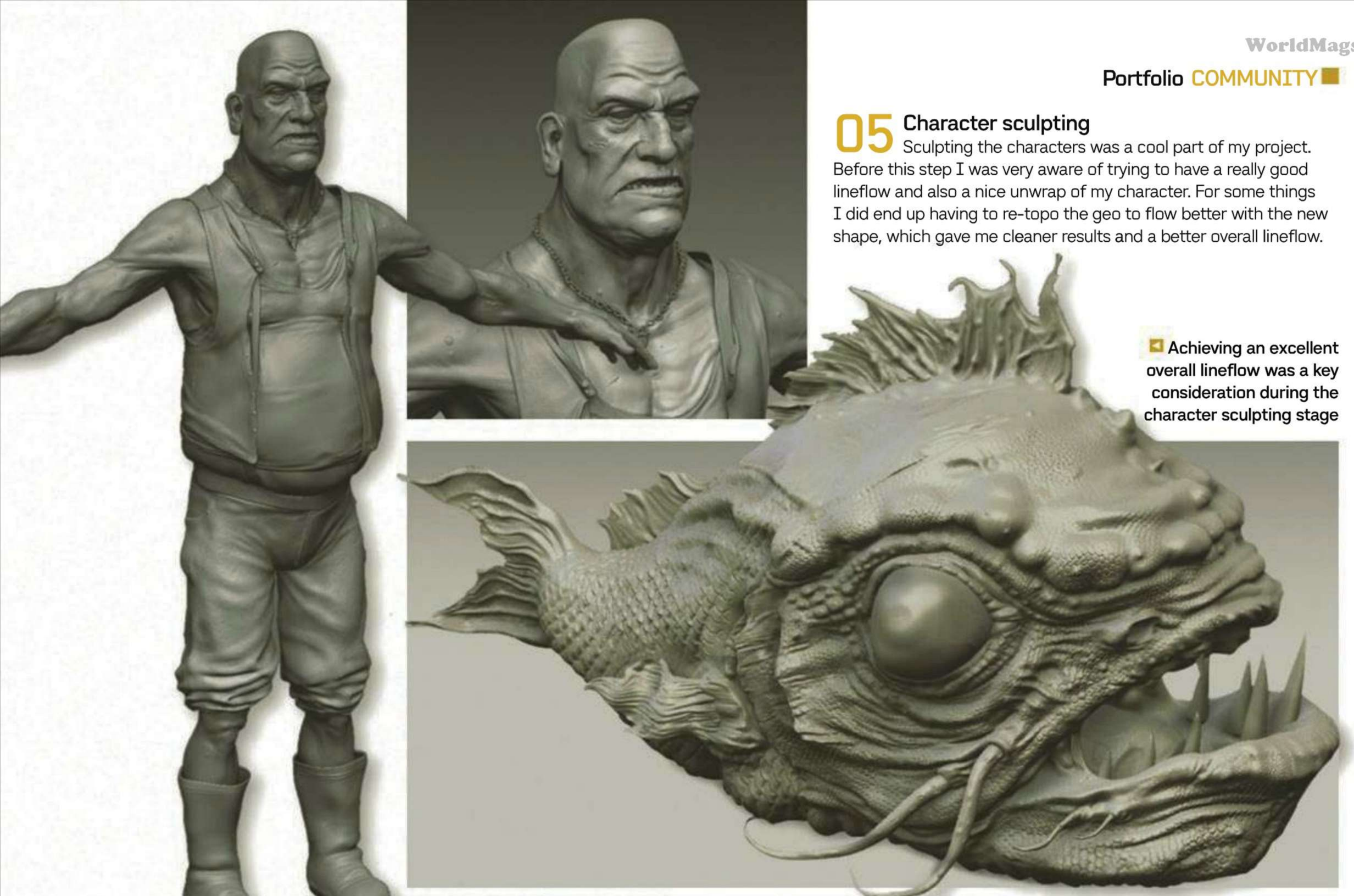
Once I knew which cameras I'd be using, I refined my proxies, adding more details. I used ZBrush for some of them, sculpting the objects at a high poly level and then generating surface detail maps, such as normal, bump and displacement. I improved my maps in Photoshop as needed.

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05 Character sculpting

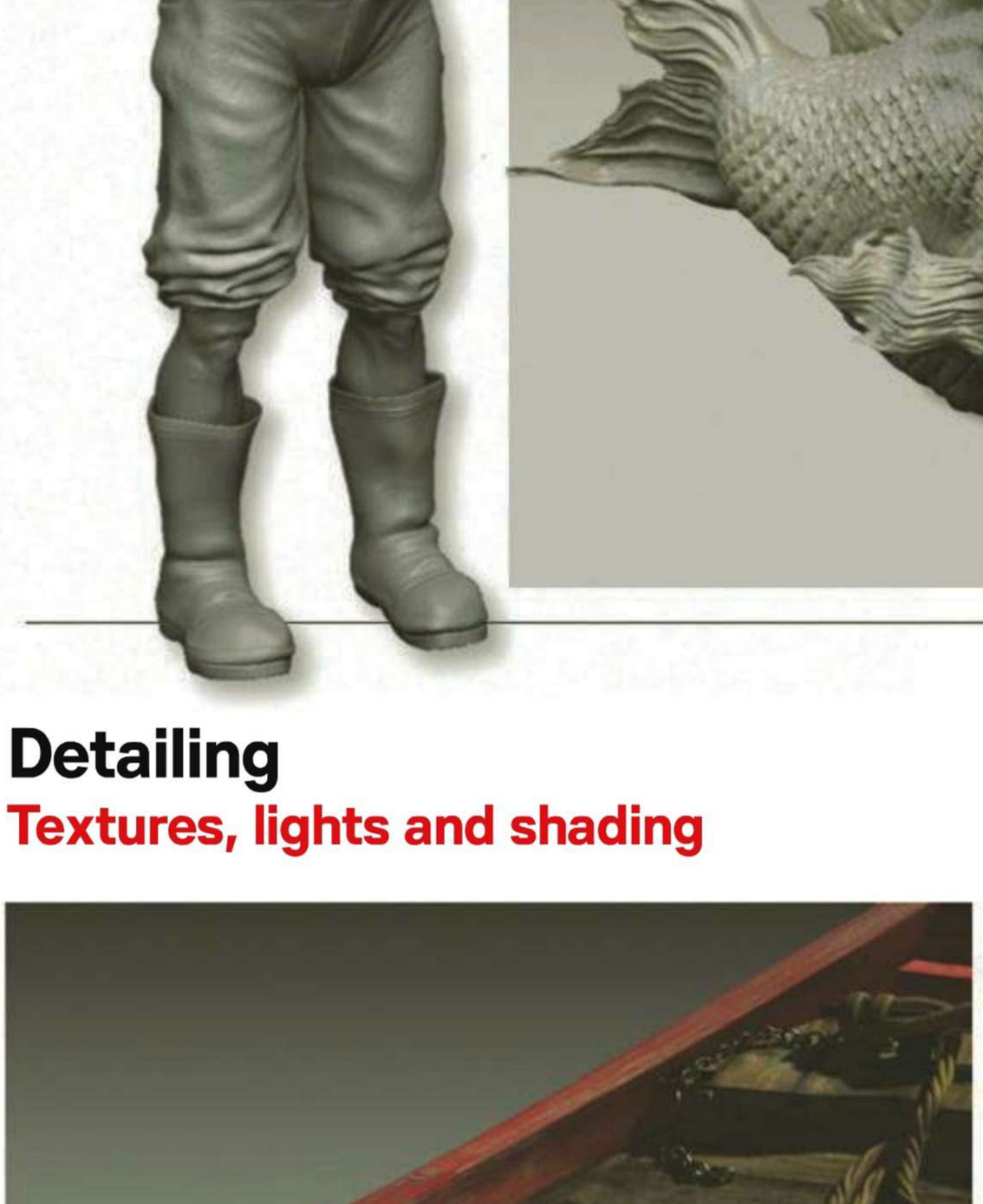
Sculpting the characters was a cool part of my project. Before this step I was very aware of trying to have a really good lineflow and also a nice unwrap of my character. For some things I did end up having to re-topo the geo to flow better with the new shape, which gave me cleaner results and a better overall lineflow.



Achieving an excellent overall lineflow was a key consideration during the character sculpting stage

Detailing

Textures, lights and shading





Metal is just one of the many materials featured. Tileable textures helped to keep things manageable

06 Shading and texturing

I used a basic light rig to help me to get an idea of the final look of my shaders and textures. I had to build a lot of different shaders and texture maps for my project: glass, water, wood, metal, skin and so on. I found that using tileable textures is very helpful, because you can easily reuse them and save disk memory and time.

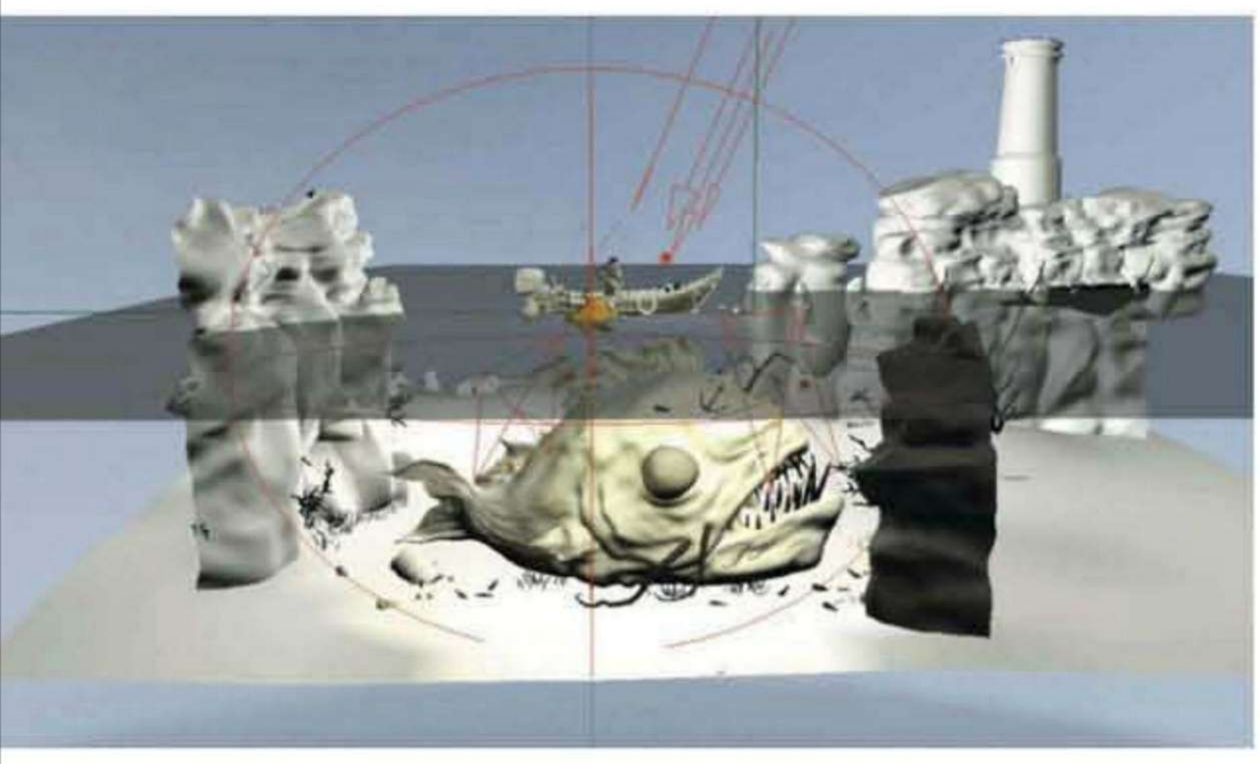
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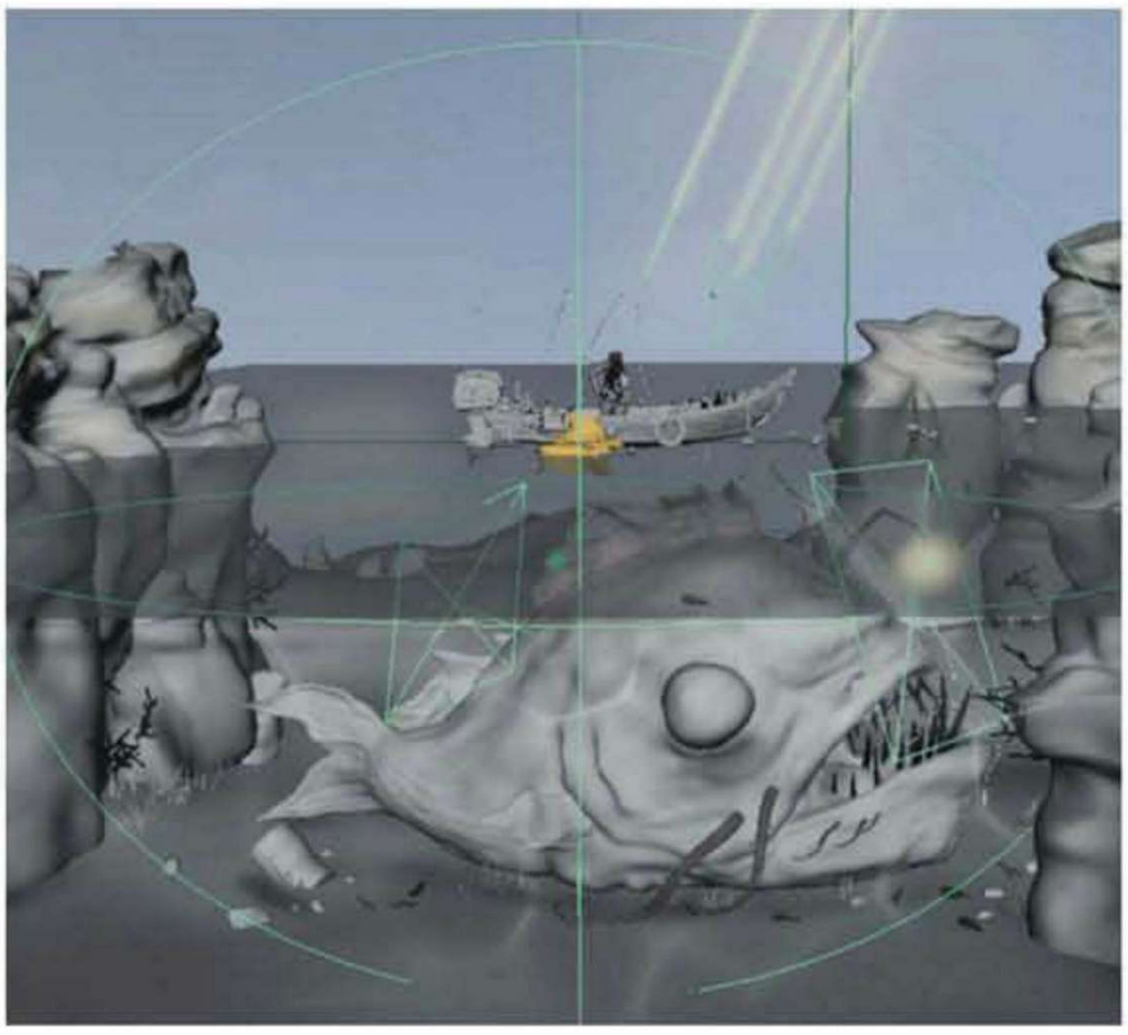




07 Character sub-surface scatter maps

The skin shader is one of the most important and complex shaders – it requires a good amount of work to perfect. In this project, I used it for both the fisherman and the fish.





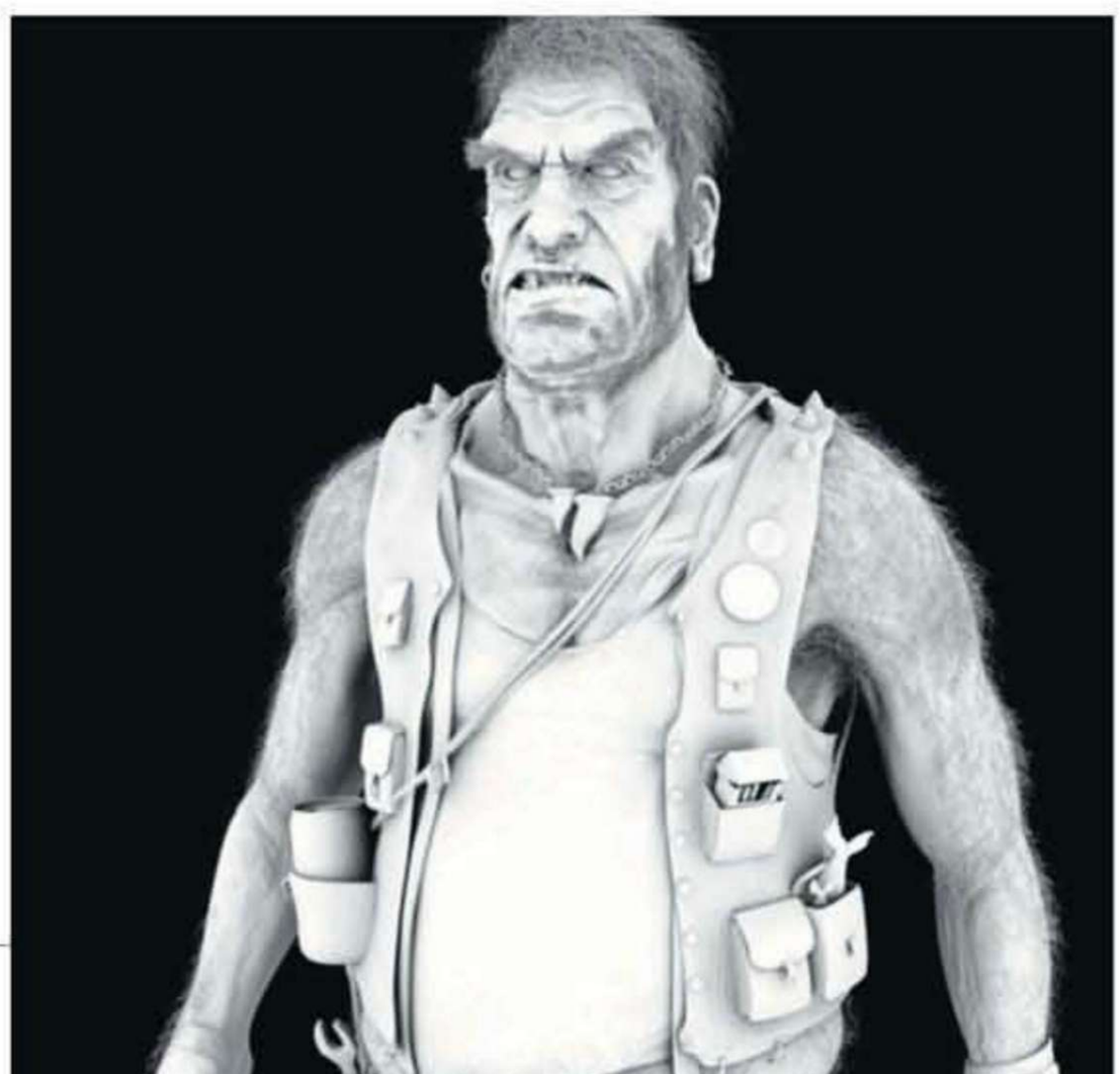
08 The lighting

For a sunny outdoor environment, the lighting is not too difficult to create. With simple indirect HDR lighting and some Physical Sun and Sky nodes you can get very good results. For the underwater part, I had to use many fake lights: area lights, spotlights and directional lights to get a more interesting look, along with some simple caustics.

09 Growing the fisherman's hair

I used the Maya Fur system for the hair of the fisherman (head and body). I had to paint some maps, such as baldness and length, to get extra control in certain areas.





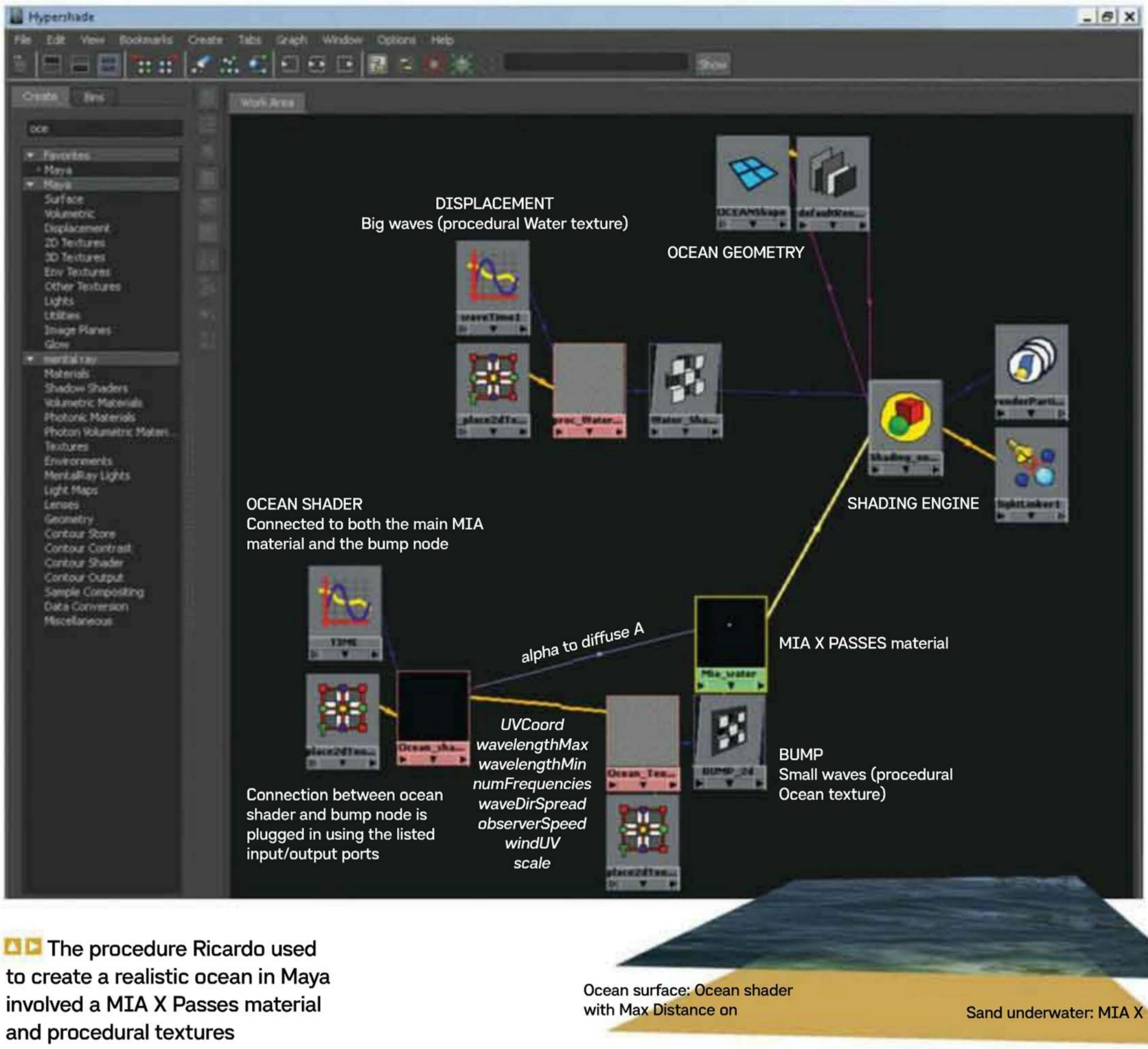
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Rendering
Compositing and post work

10 Dealing with ocean water

I tried multiple different techniques to achieve a believable look for the ocean. Ultimately I ended up doing it inside Maya, using a plane with a MIA X Passes material and just procedural textures for generating the wavy movements. Here, you can see what I did:



The procedure Ricardo used to create a realistic ocean in Maya involved a MIA X Passes material and procedural textures





11 Rendering in layers

I had to deal with some long render times because of the large quantity of reflections and refractions in the water in every shot, and the number of flickering issues they caused. I decided to render in layers to save some time – but even using this method, the water layer in some shots still took about two hours per frame.



12 Compositing and final editing

Using compositing software is a really important way to improve the appearance of your reel and create a rich look by adding cool elements such as depth of field, ambient occlusion, colour and gamma corrections, and so on. I rendered in different layers, so I had a lot more control over all of my shots in post.



View other examples of Ricardo Bonisoli's work
ricardobonisoli.blogspot.com
If you would like to see your work in our Portfolio section, please send your images to: ***portfolio@3dworldmag.com***

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



The environments were created to look as though they'd been built in real life, much like a stop-motion set

Food for thought

Der Besuch is a story that addresses some delicate issues of old age. Kerrie Hughes talks to director Conrad Tambour about the family-inspired tale





VITAL STATISTICS
Title Der Besuch (The Visit)
Duration 8:30
Website neuer-trickfilm.at
Budget €5,000
Director Conrad Tambour
Production time 2.5 years
Software Maya, V-Ray for Maya, Mudbox, Photoshop, Nuke, Unfold3D
Synopsis An old lady is cooking up a treat in the small hours of the morning for her long-deceased friends. She must be mad... or is she?
If you like this, watch...
Bunny by Chris Wedge, Hessi James by Johannes Weiland

Der Besuch (The Visit) is a tragic yet heartwarming tale of an old lady who can seemingly no longer differentiate between fantasy and reality. At a ridiculous hour of the morning, her son Wolfgang is awoken by noises coming from the kitchen. On investigation, he finds his mother talking to the cooker and insisting that her long-deceased friends are coming over for dinner.

Filled with despair and frustration, and clearly worried for her, Wolfgang hugs his mother, tells her no-one is coming and urges her to go to bed. Confused, the old lady begins to tidy up, resigned to the fact that her son is correct – but is he?

The idea for the short came from its writer and director, Conrad Tambour – a student of the German training facility FilmAkadamie. Tambour drew a lot of inspiration from his family, in particular his grandmother.

"She told me once that she had just been visited by her parents and, of course, they had died a long time ago," he explains. "Everybody was concerned about her, but I thought that the situation was touching as well as tragic." This encounter laid the foundations for the plot of Der Besuch.

With the narrative decided, Tambour and a team of colleagues set to work on the eight-and-a-half-minute film. The director worked on creating the sets and characters, which are also loosely based on the designs and personalities of family members.

Mainly Maya

Moving production forward, the next stage was deciding on which software to use to create the bulk of the work. This ended up being a fairly simple choice, considering most of the team members had experience using Maya. The 3D application was pivotal to production and its capabilities provided the team with the flexibility they needed.

Character TD Jonas Jarvers explains: "Within Maya we could create our own subtools, such as a character interface written in MEL. With that, it was possible for all animators to access the animation controls for every character in the scene and quickly set keyframes, copy animation or apply poses."

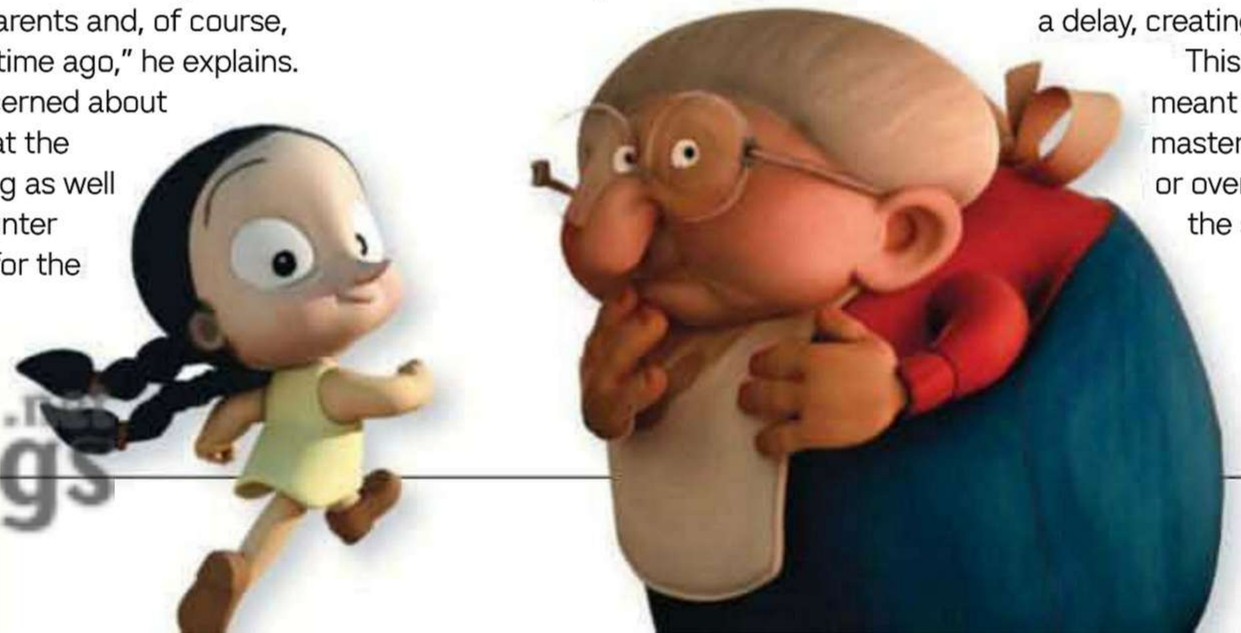


Early concept art helped to finalise the character designs

Tambour, who was also responsible for modelling and animation, agrees that Maya was the right choice: "The interface was intuitive and could be handled very well. You could touch the characters at every point by using handles that allowed us to give them almost any shape we wanted."

The team took full advantage of the MEL scripting language: it helped speed up their workflow and provided accurate and intuitive solutions to many challenges they faced. One example of this was the need for a fake cloth simulation. A Maya expression was automatically set up in MEL and added to a node that would follow another one after a delay, creating a drag effect.

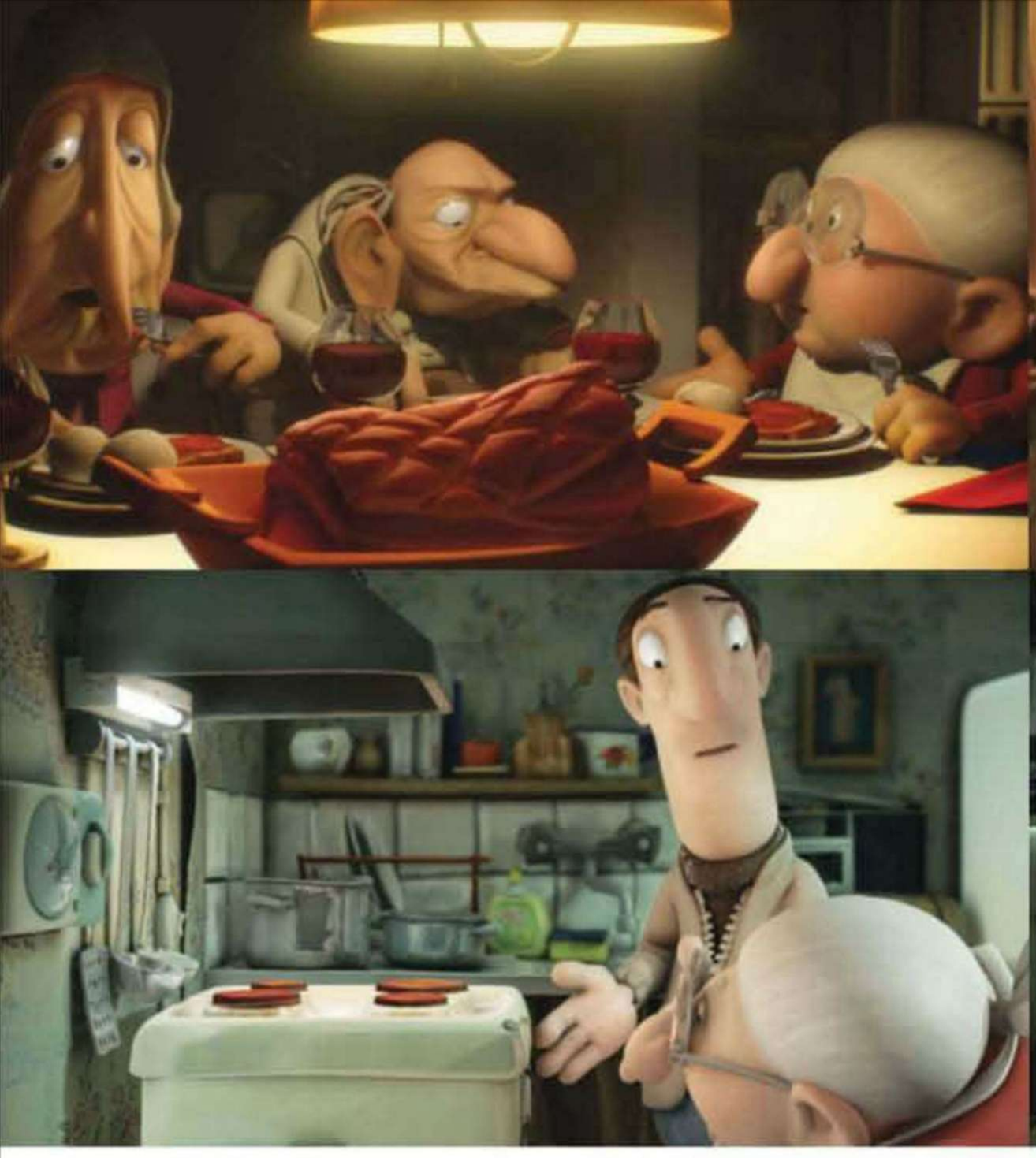
This simple, controllable system meant that the animators could master the strength of the effect or override it, saving a lot of time in the simulation process. MEL was



The personalities of the film's characters were based on the director's own family members

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The environments' different moods were achieved through the use of specific lighting rigs and scripts integrated in Maya and Nuke

also used to write a complete adjustable auto rigger, which created the same rig for every character in the scene with just a few clicks.

With the characters poised and ready to go, it was rendering time. Impressed by what they'd already seen, the team chose to use V-Ray for Maya – however, it hadn't been released at that time. Rather than change their minds, they used a beta version of the software, which meant a lot of technical challenges to overcome.

Lighting TD Karsten Wagenknecht solved them by working day and night, writing even more scripts in Maya, creating shading networks and generally dealing with technical issues to get the film where the team needed it to be.

A right spectacle

In a significant part of the film, where the old lady resigns herself to the fact that her guests aren't coming, she moves from room to room turning out the lights. This meant that lighting rigs were needed for on and off lighting situations. Her glasses were also an issue. "In these shots, the old lady is facing the camera from the front and you can see her face and heavy glasses, which cause black shadows," says Wagenknecht. "We used a special shadow shader for the glasses to be able to adjust the shadow."

Just when everything was going to plan, the team found that, for some reason, the GI pass for a particular dinner table shot couldn't be rendered. Confused as to what the problem was, they solved it by using Arnold Renderer after a friend recommended it. They later realised that it wasn't down to a bug in V-Ray, but a mistake caused by themselves, which could have been fixed and rendered in the initial software.

With the 3D jobs handled, focus moved to texturing and compositing software. The UV map generator Unfold3D was used to fully accomplish the textures on a huge number of objects in each scene. "A good UV layout could be made quite quickly with Unfold and easily transferred to Mudbox, where the objects were painted," Tambour explains.

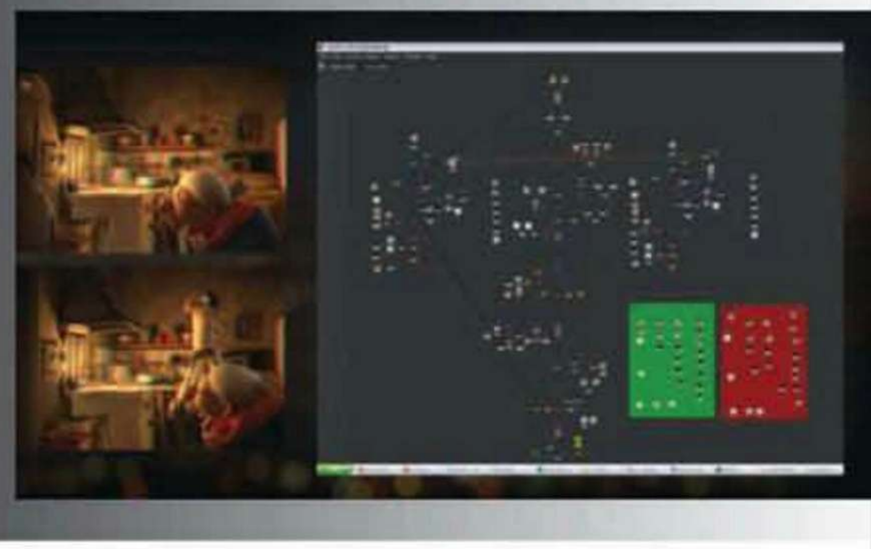
With assets and textures finalised, composition began; this was done entirely in Nuke. The team used standard layering techniques for many scenes, including separate render passes such as AO, specular, diffuse and GI. Creating the correct look for the eyes, however, was a very difficult matter and they required additional specular layers and meticulous colour correction to achieve. The characters' hair was also mainly defined in compositing, with one shot using approximately 12 layers to get right.

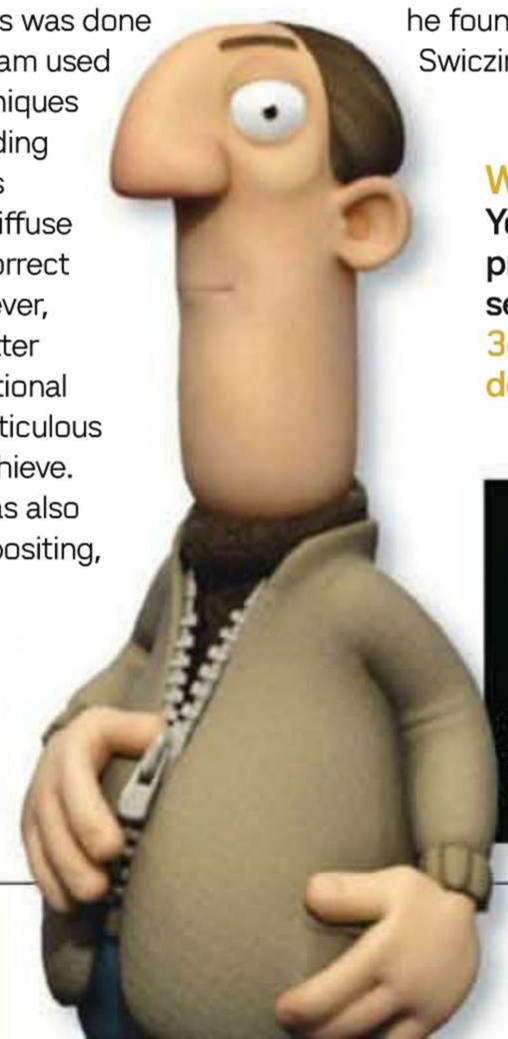
Der Besuch is still on the festival circuit, but is due for release later this year. At present, Tambour is working on establishing an animation business, Neuer Osterreichischer Trickfilm, in Austria, which he founded together with Benjamin Swiczinsky and Johannes Schiehsl.



KEY TECHNOLOGY

Lighting TD Karen Wagenknecht and compositing supervisor Sebastian Nozon made full use of Nuke's capabilities in the compositing stage. The duo wrote a Python script that would build a complete node graph in Nuke for each render layer and carry out some initial set-ups for each shot. This included colour correction for eyes and hair, vignetting and a glow. It accounted for at least five different lighting moods and light changes during a scene, too. "The script also uses shot and character-based metadata to set up the shots differently depending on the specific lighting moods," says director Conrad Tambour.





All of the film's characters were modelled, rigged and animated using Maya 2009 and MEL scripts

WATCH THE TRAILER

You can view a Der Besuch preview in the Animations section of our website 3dworldmag.com/derbesuch

Send us your short

To submit work for inclusion in Short Cuts, contact us at the address below, attaching a brief synopsis and at least three stills

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Inbox

We are now on Twitter. Follow us at twitter.com/3dworldmag

This month: supporting old software and the drawbacks of digital editions. Send your feedback to **inbox@3dworldmag.com**

Glossing over the facts

I'm new to 3D art, and I'm using LightWave and ZBrush. I get 3D World for information and tips, but quite honestly, I have no idea what a large amount of the terminology you use means. Understanding how to use a vector displacement stamp might prove useful if I had a clue what is actually is. It would be a huge help for novices like me if there was a glossary of basic 3D terms.
Robert Raithel, via email

We have an extensive glossary at 3dworldmag.com/3dterms. (Vector displacement is included!) We'll continue to update it as new terms appear (or if you point out things we've omitted). And if you want to send us your own entries and tweaks, we'll be happy to weave them in too.

Scan and Max

I'm wondering how I can get some animation equipment. There's a video on YouTube that can show you what I mean. It's a Tribute to Walking with Dinosaurs – Ten Years (tinyurl.com/dinotribute): the area of the video that has what I'm looking for is roughly between 1:34 and 1:49. I would describe it as a laser scanner, but I'm not sure what it's called.

I would like something like it so I could make plasticine models, then scan them into a digital form. It would also be nice if the equipment could connect to ZBrush.

I also have a question about what Autodesk product would go better with ZBrush: Maya or 3ds Max? I am currently in high school and came across the Autodesk Education Community website (students.autodesk.com), where students can get these for free. My Windows computers can sometimes struggle, so I don't want to fill them up with software I won't need to use as much, and the Mac I run ZBrush on is my dad's work computer, so I don't want to install much on it and slow it down.

Finally, would you be able to recommend a way of learning to use animation software? What would you say is usually the most effective: just randomly playing around with it, doing tutorials, watching YouTube, taking a class... or anything that you think is a good way of learning?
Matt Davis, via email

The device in the video is indeed a laser scanner. There are lots available, from small desktop systems right up to LIDAR devices that can scan entire locations. For your needs, look at something like the David Laserscanner Starter Kit (david-laserscanner.com). If you have a webcam and laser already, you can download the Windows software for free.

In terms of software, Maya can run on both Macs and PCs, while 3ds Max is Windows only. Both apps happily interface with ZBrush using ZBrush's GoZ plug-in. And to learn, you're probably best to try a mixture of all the solutions you mention – then decide which one works best for you. But you can't beat just doing it, and then finding solutions to problems as they crop up.

Soft Where?

I'm surprised by your comment "Softimage isn't high on our list, mainly because it's very complex..." (Inbox, 3D World 144). More complex than Max or Maya? I've found Softimage easier to learn than either.

I enjoy your magazine but would like to see at least some coverage of Softimage. I know it's all about numbers, but you'd be surprised how many of us there are now.
Len, actionart.ca

We'll be doing more on Softimage. In the meantime, check out page 44's feature on Planet Dinosaur, which employed Softimage to animate the giant reptiles.

Errata

3D World 145's In Focus credited Iwo Widulinski for the entire project. In fact Iwo created the concept art, while Ralph Waniek did the amazing 3D modelling, textures and render. Our sincere apologies to Ralph.

Mike de la Flor's review of Mudbox 2012 in issue 146 wrongly credited a piece of artwork to Robin Hall, when it should have been Robin Ball. Apologies to Robin. ●

RE: TWEETS

Oinkfrog
Graham Hannah
Watching a set of 3ds Max Graphite Modeling Tools videos ATM - thanks to my *@3DWorldMag* subscription.
3DW: **Yeah, and thanks to Digital-Tutors for this great content!**

SpeedTreeInc
SpeedTree
@3DWorldMag 25 greatest VFX sequences of all time: Avatar hometree destruction #1. SpeedTree happy to be involved: **speedtree.com/avatar**
3DW: **Check out the affordable new SpeedTree Studio on speedtree.com**

cgbeige
Dave Girard
One day, that mental roy dude in *@3DWorldMag* will write something worth reading
3DW: **That's what we keep saying – and yet he keeps on sending us his text...**

Adamarius
Adam Clark
Considering getting a digital subscription to *@3DWorldMag*. Anyone know if there is (or will be) a way to download the disc content?
3DW: **Get tutorial files via 3dworldmag.com/claim. We'll be instigating a digital locker system in the near future**

TropicalCyborg
Rogerio Lima
@pfhoe I was a little bit disappointed when I've discovered after having subscribed *@3DWorldMag* that the PFhoe offer was limited to UK only
3DW: **Er, it wasn't! It was a worldwide offer, and all subscribers should have received their licences by now**

T3chn0h1ppy
Andrew Gowland
Stop - 3D Morphing by Andrew Serkin: **bit.ly/nfHK0O**. A 3D satire about 3D?
3DW: **This a very sharp piece of motion graphics work!**

JohnW_3D
John Williams
Have enjoyed a Sunday evening catching up on my *@3DWorldMag* reading! Always a great way to feel inspired!
3DW: **Our inspiration comes from long planning sessions in the local beer garden**

TheRealGelfie
TheRealGelfie
RT @3DWorldMag: The 3 rules of cinematography for 3D animators: **bit.ly/nOOVzd**. Anyone remember the name of the short featured here?
3DW: **It's the 2004 short Annie & Boo, directed by Johannes Weiland, of course**

Jengkins
KahJeng Cheong
OK, I feel bad there're two that I missed. RT *@3DWorldMag*: 10 must-see VFX scenes! bit.ly/qr9Wpx
3DW: **That's why we put the video links in there: you don't need to miss a single one!**

3D World forum

Go online to talk about the hottest 3D trends and share tips. There's a Creative Challenge every month for you to flex your 3D muscles on, too
forum.3dworldmag.com



3D WORLD *Creative Challenge WINNER*

Congratulations to Jayden B, who took the biscuit with his CG cookie. All entries win a copy of Cloudy With a Chance of Meatballs on Blu-ray

Get published

Email us your feedback on the magazine or the state of the 3D industry in general at the address below, including the country in which you live. The sender of the best letter each issue receives a prize
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SMITHMICRO SOFTWARE

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Image by synthymonkey.
Miki3 from Content Paradise. Circus props by Sixus 1 and Luke A. TerraDome by Runtime DNA.

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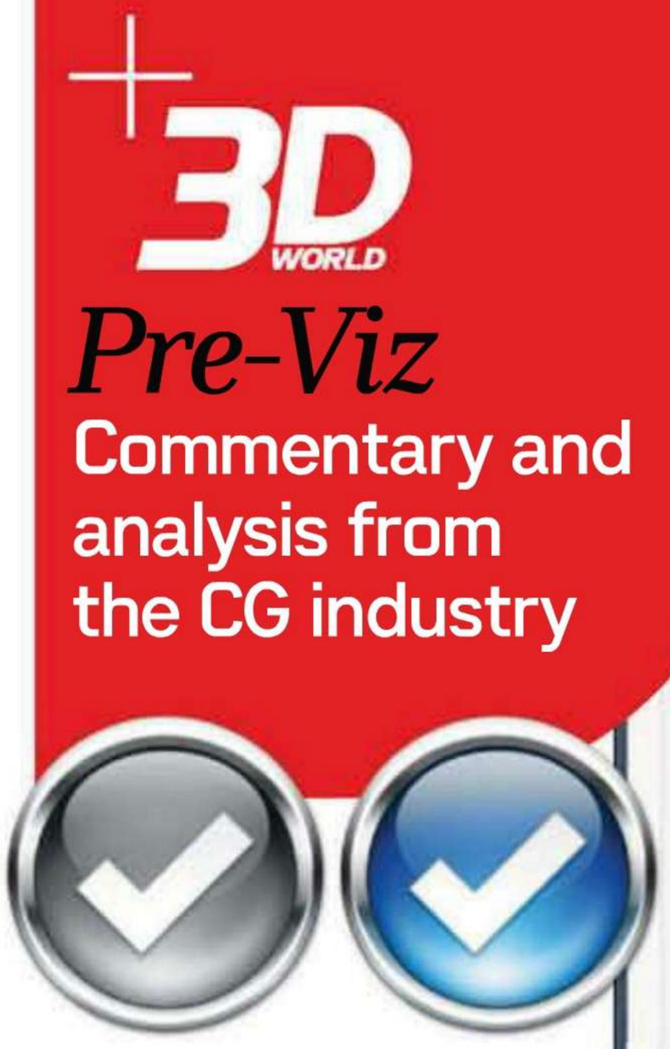
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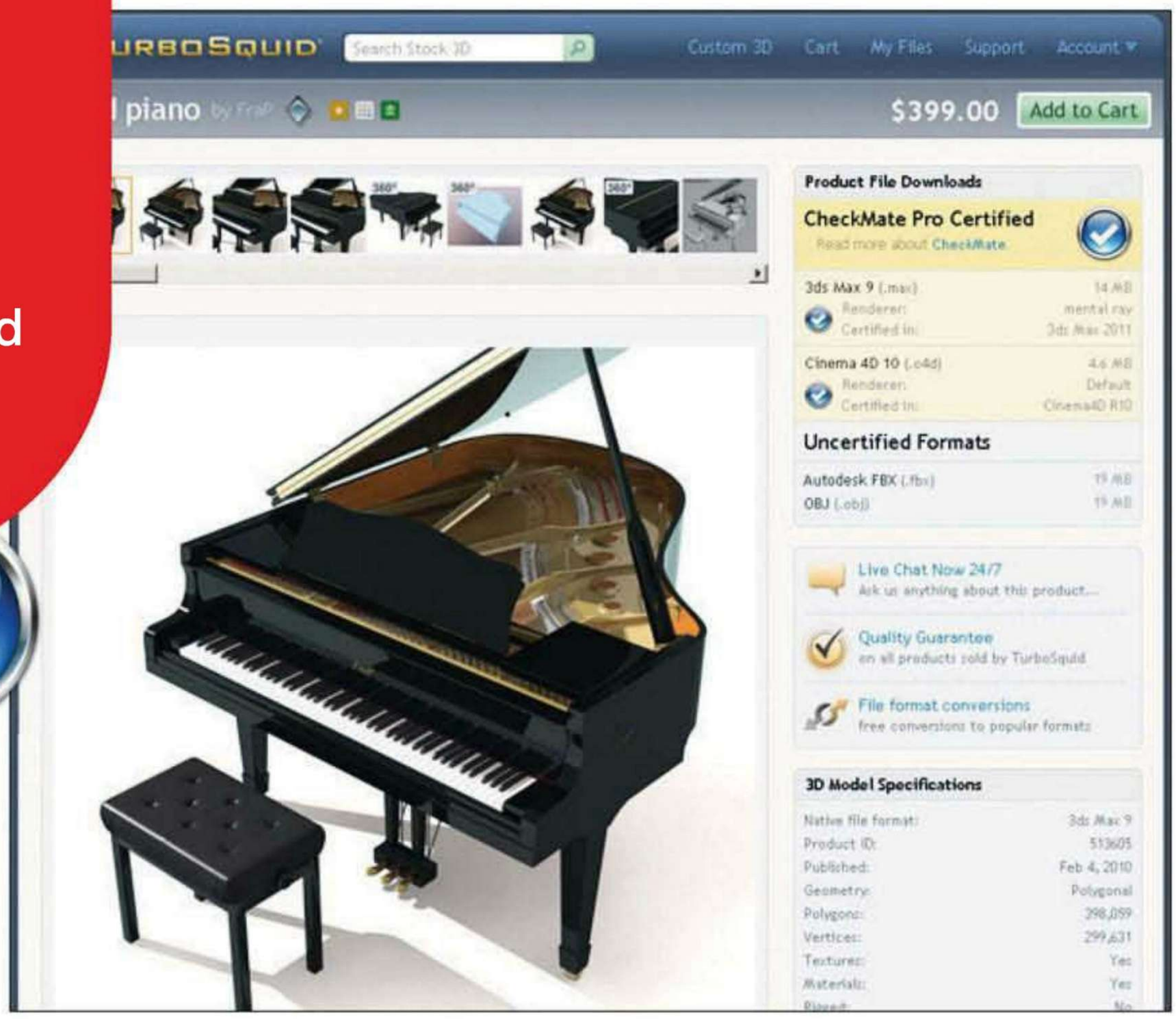
Pre-Viz

Commentary and analysis from the CG industry



The CheckMate tick marks are the foundation for a scheme intended to raise stock 3D model standards

The CheckMate logo appears prominently in model listings on the TurboSquid site, enabling participating artists to stand out from the crowd



A model of consistency?

TurboSquid's new CheckMate programme establishes a minimum standard for models sold via the site. But do quality assurance marks really guarantee better stock assets?

Kim Lee is not a happy man. "How do you think we feel when we spend $300 on a model, and things aren't named correctly?" he fumes. "The scenes we're working on are not just your one model. [It's] living in an ecosystem of a lot of other models. Name your stuff, guys. You're playing with the big boys."

The problem? Sloppily constructed or poorly described stock assets cost his company, boutique motion graphics studio Worlds Away Productions, countless man hours in lost time, fixing issues that should have been the responsibility of the asset's creator. It's a problem that will be familiar to most people who use stock models – but it's one that TurboSquid is aiming to stamp out.

The world's largest online marketplace is in the process of launching CheckMate: a new certification programme designed to ensure that assets bearing the logo meet basic standards of quality and accuracy demanded by clients like Lee. By the time you read this, it should be live.

So what does the CheckMate standard consist of? Are there universal rules that govern 'good' modelling? And can certification schemes like this really hope to eliminate shoddy work? We spoke to TurboSquid and its fellow online marketplaces to find out.

What clients want

TurboSquid has always provided good practice guidelines to artists who sell through the website, says VP of marketing Michele Bousquet. The problem, she says, was that the company had no way of enforcing them. "Even when we strongly suggested these practices to artists, there was still too much variation in model quality on the site. Each individual artist did what he or she felt was best based on their personal experience, which didn't always jive with what a broad range of customers wanted."

Two years ago, TurboSquid set out to quantify what those customer expectations actually were. Having surveyed over 1,000 site users and spoken directly to many of its largest clients, including Pixar, CNN and Zynga, it published the results on the company blog and began to solicit artists' feedback on its findings.

The result is CheckMate Pro, a 4,000-word specification setting out exactly what an artist needs to do in order to satisfy the broadest possible range of customers. It covers everything from construction history and file organisation to the way a model is described in the metadata, and the supporting images provided alongside it.

The company has put its money where its mouth is, too, hiring 12 full-time 'inspectors' to vet assets submitted for certification.

"With CheckMate Pro, customers who need a model that meets this rigorous standard can be assured of getting it," says Bousquet. "This is unprecedented in the stock 3D business."

A question of costs

The benefit to the buyer may be obvious, but Bousquet is quick to point out that there are clear advantages for the seller as well – not least of which is the opportunity to charge more for certified models. "The most surprising result [from the survey was that customers] would pay artists more for a model that had all the attributes they wanted," she says. "You can imagine how hard it is to get people to say they'll pay more

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for something. But 66 per cent said they'd pay 10 per cent more, and a substantial number [went higher than 10 per cent]."

Accordingly, while participation in the CheckMate programme is voluntary, TurboSquid hopes that most artists will want to do so to gain a commercial edge over non-certified rivals. The CheckMate logo shows up prominently in search results: important on a site that has over 220,000 assets for sale.

But while CheckMate certification carries a potential benefit in the form of increased sales, it also carries a very real cost in the form of the extra time taken to prepare a model for sale. So how onerous is standards compliance?

Not overwhelmingly so, says Bousquet: at least for models constructed with CheckMate Pro in mind. "If you know you need to use only quads and tris right from the start, it's not a burden at all. The same could be said for unwrapped UVs on characters. We expect that some artists will just use the standard going forward, and won't necessarily go back and fix up older models if it's too much hassle."

The sceptics speak

Rival online marketplaces are more sceptical about the CheckMate scheme. The3DStudio .com president Matt Anderson says that because



A team of 12 will be checking models submitted for the CheckMate programme before they're offered for sale

The CheckMate logo is intended to show at a glance which of over 200,000 models available on TurboSquid comply with good work practices



"Customers who need a model that meets rigorous standards can be assured of getting it. This is unprecedented in stock 3D"

Michele Bousquet, VP of marketing, TurboSquid

his company has historically vetted models by hand, weeding out sub-par content before it goes on sale, it has felt no need to develop a formal standard. The site uses customer feedback to determine a model's position in search results, in much the same way that Google ranks websites.

"While I wish TurboSquid the best of luck on their programme, my fear is that they'll bite the hand that feeds them while driving prices up for their customers," he says.

Another issue is that CheckMate certification is currently only available to members of the SquidGuild loyalty scheme, who have agreed to sell models exclusively through TurboSquid. If certification raises sales, why not just charge a small fee to cover »

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the cost of inspection and make the programme open to all?

"SquidGuild artists have given us a great starting point for our beta programme," replies Bousquet. "We were keen to reward that loyalty by initially offering the opportunity [only] to these members."

Access for all

But while CheckMate certification may be restricted to SquidGuild members for the time being, the Best Practices guidelines on which it is based are available to anyone via the TurboSquid site's Knowledge Base. Placing detailed research on what customers want from stock models into the public domain can surely only benefit the 3D community as a whole.

And regardless of whether the CheckMate standard itself ultimately succeeds or fails, there can be no doubt that it's an attempt to address a genuine problem in the industry.

"I've always felt that quality control on stock model sites was severely lacking," says Jeff Ling of motion graphics studio Artistic Image, another of the clients TurboSquid consulted during its research. "Buying a model always felt like a gamble. Knowing that models conform to rigid guidelines [gives you] a great sense of security." ■



A breed apart: Massimo Righi's stock animal models are some of the first to be bear TurboSquid's new CheckMate Pro quality standard

CheckMate Pro certification is available to TurboSquid's SquidGuild members for models priced at $149 or above. A Lite version of the standard is available for models priced over $39. You can read the Best Practices guidelines on which both are based at support.turbosquid.com

THE CHECKMATE SPEC

THE KEY POINTS OF TURBOSQUID'S CHECKMATE PRO SPECIFICATION

GEOMETRY
- No isolated vertices
- No coincident vertices
- No coplanar faces
- Face normals point outwards
- No n-gons (quads and triangles only)
- At least 90 per cent quads[1]
- Within 3 per cent of real-world scale
- Base of model "at or near" 0, 0, 0
- Entire model sits on ground plane
- Oriented to world up-axis

TEXTURES
- At least one material per model
- Must be unwrapped[2]
- No obvious texture stretching
- Seams hidden in less visible areas

RIGGING & ANIMATION
- Rig must function as expected
- Rig must include instructions
- Animation must loop smoothly
- No spikes in animation graph

ORGANISATION
- All objects, textures and materials named
- All names "descriptive and unique"
- No extraneous shapes or helper objects
- All objects grouped
- Group can be moved via single handle
- All textures have relative paths
- All transforms frozen

1 May be relaxed at inspector's discretion

2 Obligatory for character models only

An additional (and longer) section of the specification covers the metadata and supporting images that should be provided when a model is presented for sale. For the full specification, visit **turbosquid.com**

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MARI RULES

EMMY NOMINATED GAME OF THRONES

George R. R. Martin's critically acclaimed best selling novel, Game of Thrones, has successfully made the jump to the small screen becoming an international epic television series on HBO. Dan Weiss and David Benioff were the writers responsible for translating the novel into a TV series. The responsibility of recreating the magical creatures so intricately described by the author was given to BlueBolt Ltd, a London based visual effects facility. To satisfy the loyal fans of the medieval fantasy, it was imperative that BlueBolt bring to life the story while remaining true to the novel.

Armed with The Foundry's MARI, BlueBolt's Texture Artist, Andrea Giordano was part of the team that began work on the visually challenging and technically demanding project – a worthwhile endeavour that has resulted in the team's nomination for an Emmy in the category of Outstanding Special Visual Effects for a series.

The story builds up to the hatching of three dragon eggs, finally revealing the creatures: one gold coloured, one green and one black and red. Andrea Giordano explains how she used MARI to make the writers' concept of the dragons a reality.

"Game of Thrones" © HBO. All Rights Reserved.



Giordano begins, "When we started work on Game Of Thrones I was given a file of notes and images depicting what the writers hoped the dragons would look like. To do them justice I knew I'd have to work in 3D on high-resolution textures and that MARI would be the best choice to work fast and efficiently."

"I used MARI for the initial 3D texture concept and again to create the final detailed texturing for the dragons. MARI was extremely useful for this job fitting easily into our pipeline."

The benefits of using MARI are straightforward and instant. "The projection tool in MARI makes life as a texture artist much easier, allowing me to project a large image as a base for my textures, but also being precise enough to project fine detailing."

A NUKE <> MARI bridge is also now available to help artists fix problems encountered with projection work including seaming, stretching and occlusion. It's a quick, intuitive workflow between the two products.

When asked about the benefits of the NUKE <> MARI bridge Giordano replies, "As a team we're excited about the Bridge – the communication between the NUKE and MARI teams is already strong but this will allows us to give each other automatic feedback which will save us valuable time."

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The Filter

Our pick of the past month's 3D software and training resources, ruthlessly stripped of PR hyperbole. Visit 3dworldmag.com for more product stories and all the breaking news



Nuke & NukeX 6.3

DEVELOPER: The Foundry
WHAT IS IT? Update to the compositing package
WHAT'S NEW?
- Integrated 3D particle system
- New built-in planar tracker
- Wavelet-based de-noising
- Added support for deep compositing

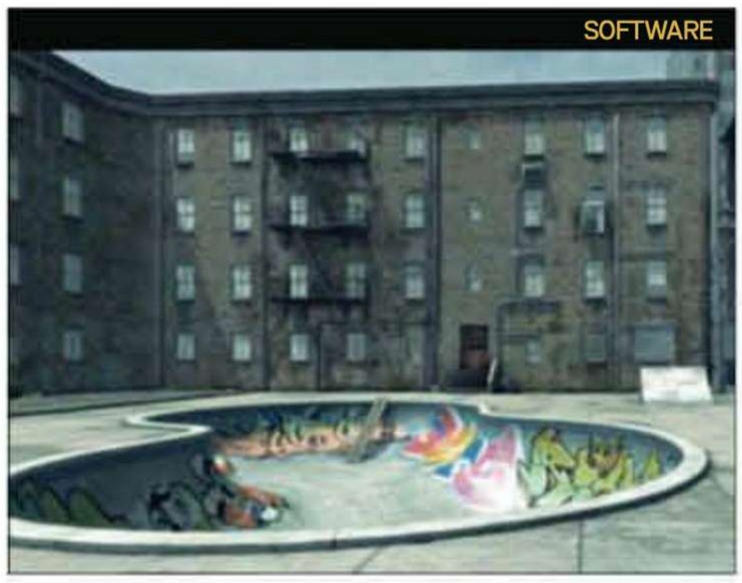
THEY SAY: "Nuke 6.3 is The Foundry's biggest ever release of Nuke, bringing improvements and additions that expand the parameters of traditional compositing. Nuke is designed to enable artists to stay within the software for longer, saving round trips with other departments and arming them to tackle compositing challenges in new and efficient ways"
WE SAY: Nuke continues to extend its lead over its competitors. This huge collection of new features makes it even more appealing to studios looking for a production-proven compositing system
PRICE: Free update for subscribers
MORE ONLINE: **thefoundry.com**



Phoenix FD 2.0

DEVELOPER: Chaos Group
WHAT IS IT? Update to the fluid dynamics engine
WHAT'S NEW?
- Enhance fluid simulations with foam and splashes
- Lighting and diffuse colour previews
- Blending of all atmospheric shaders
- Geometry-based region render
- Optimised fluid surfaces for better flat results

THEY SAY: "The grid-based simulator is ready to bewilder all fans with an amazing new feature added – the extension for liquid simulations! Phoenix FD now comes with foam, splashes and fluids simulation and enhanced GPU preview"
WE SAY: Phoenix's rapid development continues apace with a slew of new features, user-friendly options and bug fixes. The ability to preview the sim in near real-time is a huge workflow enhancer
PRICE: TBA (currently in open beta)
MORE ONLINE: **chaosgroup.com**



Amplify

DEVELOPER: Insidious Technologies
WHAT IS IT? Virtual texturing system for Unity Pro
MAIN FEATURES:
- Virtual textures up to 512K x 512K, per-material textures larger than 4K x 4K
- Seamlessly integrates into Unity Editor
- Real-time WYSIWYG editing
- Texture repeat/tiling, trilinear filtering

THEY SAY: "Amplify is a virtual texturing extension for Unity Pro that allows scene/level designers to use a large amount of textures – up to hundreds of gigabytes – without worrying about streaming or GPU memory limits"
WE SAY: By freeing artists from the constraints of the hardware and software, Amplify opens the gates for some sumptuous-looking Unity-based games, with access to almost unlimited texture data
PRICE: Free (non-commercial), $99 (Indie), $349 (Pro)
MORE ONLINE: **insidious.pt**



NOX

DEVELOPER: Evermotion
WHAT IS IT? Standalone unbiased renderer
MAIN FEATURES:
- 32/64-bit multithreaded standalone renderer
- 3ds Max plug-in and Blender script
- Supports multiple layers, physical based micro-faceting, transmission, dispersion, opacity, emission
- Sunsky system, bloom, bokeh, grain, vignette

THEY SAY: "NOX Renderer is a standalone application that renders images from 3D geometry, based on unbiased methods. Light behaviour is based on laws of physics with some simplifications. The Metropolis Light Transport algorithm is used for Global Illumination evaluation"
WE SAY: Another entrant into the burgeoning unbiased renderer market. With so many free tools, surely the days of paid-for renderers are numbered?
PRICE: Free
MORE ONLINE: **evermotion.org/nox**

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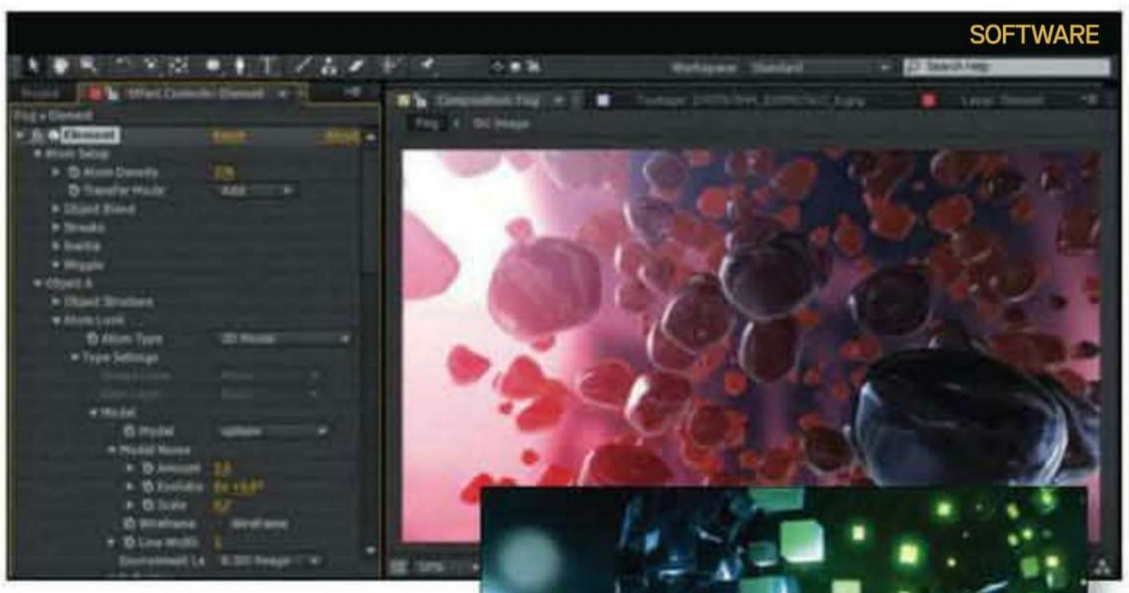


HitFilm

DEVELOPER: FXhome
WHAT IS IT? Layer-based editor and compositor
MAIN FEATURES:

- Multi-track editing with integrated compositor
- Range of 3D special effect presets
- 90 built-in effects for warp, distort, stylize, blur, etc
- Colour grading tools and 'film look' presets
- Built-in 3D particle generator (Ultimate edition)
- GPU acceleration for fast preview and render

THEY SAY: "HitFilm gives you blockbuster quality visual effects and compositing at an indie price. You have full control to create your own unique effects using cutting-edge technology"
WE SAY: If After Effects is out of your price range, this new app looks to be a brilliant, user-friendly alternative. Given that Trapcode Particular 2 costs the same amount, you could justifiably buy HitFilm Ultimate for the particle system alone. Our only gripe is that there's no Mac version. Given the prospective audience, we hope this is rectified soon
PRICE: $149 (Standard), $399 (Ultimate)
MORE ONLINE: **hitfilm.com**



Element 3D

DEVELOPER: Video Copilot
WHAT IS IT? Particle plug-in for After Effects
MAIN FEATURES:

- OpenGL-based particle rendering system
- Particles derived from images or 3D geometry
- Advanced material options (Smoothing, Diffuse, Specular, Shininess)
- Uses any image, including HDR, as reflection and refraction map
- Supports Motion Blur, Depth of Field, Fog and AE lighting
- Noise-based distortion of object geometry

THEY SAY: "Element is an intelligent particle array system that uses 3D objects as particles. The 3D rendering engine runs extremely fast on moderate graphics cards. Objects react to AE lighting, ambient occlusion, 3D model deformation, material options, depth of field, motion blur, 3D fog and much more"
WE SAY: One look at the demo video was enough to convince us that we need this plug-in. The ability to import your own objects – and have them deform – opens up a whole world of creative possibilities. And given its OpenGL-based architecture, you won't need a killer machine to run it either
PRICE: Around $150
MORE ONLINE: **videocopilot.net**

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Image Courtesy of Nicolas Gorlihe "God of Writing"

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Hail Caesar

Building on its experiences with Gollum, Kong and the inhabitants of Avatar, Weta Digital is back in the lead digital actor business. **Mark Ramshaw** speaks to the team responsible for ensuring that Rise of the Planet of the Apes raises the CG bar once again

No animals were harmed in the making of this movie. In fact, no animals – at least of the ape variety – were even used for Rise of the Planet of the Apes, Twentieth Century Fox's reboot of the beloved movie franchise. Given a story that pits mankind as ignorant overlords, with apes as the oppressed, director Rupert Wyatt (best-known for sleight-of-hand prison breakout thriller The Escapist) was adamant that putting trained creatures before the camera would be untenable.

But while John Chambers' prosthetics in the original Planet of the Apes films were groundbreaking, and Rick Baker's man-in-suit effects worked well enough for Tim Burton's 2001 stab at an Apes revival, the story here required a more naturalistic-looking range of creatures. And so Wyatt turned to the undisputed experts in digital actors, performance capture and all things simian-related: Weta Digital.

Though notionally a step back from the milestone digital character work of Gollum, with neither Caesar nor any of the other apes in the film required to speak, the character challenges faced by Weta were actually far greater than on either the Lord of the Rings films or King Kong. Gollum emoted, but was very much a fantastical creature. Kong was photoreal, but larger than life in terms of emotion as well as size. Caesar needed to look like a chimp, yet act with great subtlety and embody both chimp and human-like qualities. Crucially, he needed to be able to map out a huge character arc, from first steps to adulthood, that would underpin the entire movie.

Without ever uttering a word, the star of Rise of the Planet of the Apes had to be believable, understandable and utterly sympathetic, with the story essentially told from his perspective as he grows up, rebels, and ultimately leads his species in a revolution against mankind… And he needed to look good in fur while doing it.

With visual effects supervisor Joe Letteri once again at the helm, around 730 Weta crew members ultimately contributed to the film's multitude of creature »

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All images © 2011 Twentieth Century Fox

Caesar, the digitally generated star of Rise of the Planet of the Apes. Working with actor Andy Serkis, Weta Digital animated a photoreal lead creature, charting his journey from baby chimp to brooding rebel and freedom fighter

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"If you look at Apes against Kong," says Marco Revelant, "here we had around 18 months to create over 20 apes, including three hero creatures, versus three years for just one giant ape"

and environment-based effects shots. But while the 18-month production schedule (with much of the effects work completed in a year) might be deemed generous for a typical show these days, the VFX demands for Rise of the Planet of the Apes were by no means typical. "One of the biggest challenges was the sheer volume of what we needed to turn around in the time available," says fur lead Nick Gaul. "Even Avatar felt more generously paced in comparison, because we had three years to work on it."

This was also very much a milestone project for Weta Digital, with both the shooting method and the ultimate portrayal of the apes reliant on new techniques and technologies. In the case of the filming, Rise marked the first time that the studio's performance-capture system would be used on a live-action set and in full daylight.

With The Lord of The Rings, Andy Serkis had to deliver his Gollum capture performance separately from the on-set footage, with facial details rotoscoped rather than automatically tracked using markers. With Avatar, the capture technology was much improved, including head-mounted cameras to faithfully track facial motion, but the actors were still confined to a capture stage. But for Rise, the director was able to shoot scenes containing both live actors and those playing the creatures, with Weta capturing the performance data simultaneously.

Models supervisor Marco Revelant says this improvement made a crucial difference to the way the directors, actors and digital artists worked together. "Because we were capturing the data right there on set, Rupert had the ability to really define the movements and performance, and immediately have a strong idea of what he could expect us to deliver further down the line. Obviously capturing on-set means you have less control of the environment and less room for mistakes. But conversely you're going to get a better response from the actor working in the scene than from an isolated performance the second time around."

> "Even from the early stages I was really impressed with the work our artists were doing. They were creating things that closely matched the artwork"
> **Alasdair Coull, code department supervisor**

Andy Serkis once again donned a performance capture suit for Weta to help create the role of Caesar. While it's easy to assume that his time spent playing Kong provided good training, Serkis says the two characters are as distinct as Hamlet and Macbeth, with one a 25-foot-high lonely last of the species and the other an unknowing innocent who suddenly has to make tough choices to survive. Describing the film as a domestic piece rather than an effects-driven action extravaganza, Serkis reckons playing Caesar from infancy through to adult revolutionary has been one of his most challenging roles to date.

CREATURE CAST

While Caesar is undoubtedly the star, Revelant points out that it was by no means a one-ape show for the modelling team. "Keep in mind that for Caesar alone, we have him as an infant, a toddler and so on before we get to the grown chimpanzee who features in about two thirds of the movie. We have a similar level of detail for the other hero models, including a gorilla called Buck, an ape named Rocket, and Maurice, an orangutan. On top of those, we had a number of second-level extras, with an average of four variations for each species."

Despite the size of the digital cast, Revelant says they opted not to use a construction kit approach. "There are obviously ways to approach facial work where you have a kind of facial keyset, with noses, eyes and so on that you can choose from, but while we tried to keep some common topology, we choose to look for specific ways to capture nuances and individual details and add those by hand."

When it came to building and rigging its cast of creatures, Revelant says that Weta was driven as much by a desire to stay faithful to real simian



A key challenge faced by Weta Digital's technologists and artists was to find a way to build and groom a range of creatures that closely matched the concept artwork. "To match the artwork 100 per cent, we needed something that would allow for direct manipulation of the hair strands," says Alasdair Coull

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Performance capture

RISE OF THE PLANET OF THE APES SEES YET ANOTHER PROGRESSION IN WETA DIGITAL'S ACCLAIMED DIGITAL ACTOR SYSTEM



Weta mainstay Andy Serkis again donned capture equipment for the underlying performance driving animation for the movie's protagonist, Caesar. This time, he was able to perform on-set in full daylight. "Since Avatar we've also worked on the rigs to further minimise movement of the camera that captures the facial movements," says Marco Revelant.



The ability to capture performances on set further breaks down the barriers between director and visual effects team. In addition to giving Rupert Wyatt the ability to direct scenes with actors present and organically reacting to one another, he was also able to use live previewing to get some idea of how the capture data would translate to the CG models.

physiology as it was by production concept art. "In the case of Caesar, we ended up working mainly from the original reference art for the face and head; then, once we went down into the body, we looked more towards medical reference, including MRI scans. We spent a lot of time building a realistic, working skeleton and creating a musculature system on top. We really wanted to get as close to the real deal as possible, so spent a very long time on it from a physiologically realistic point of view."

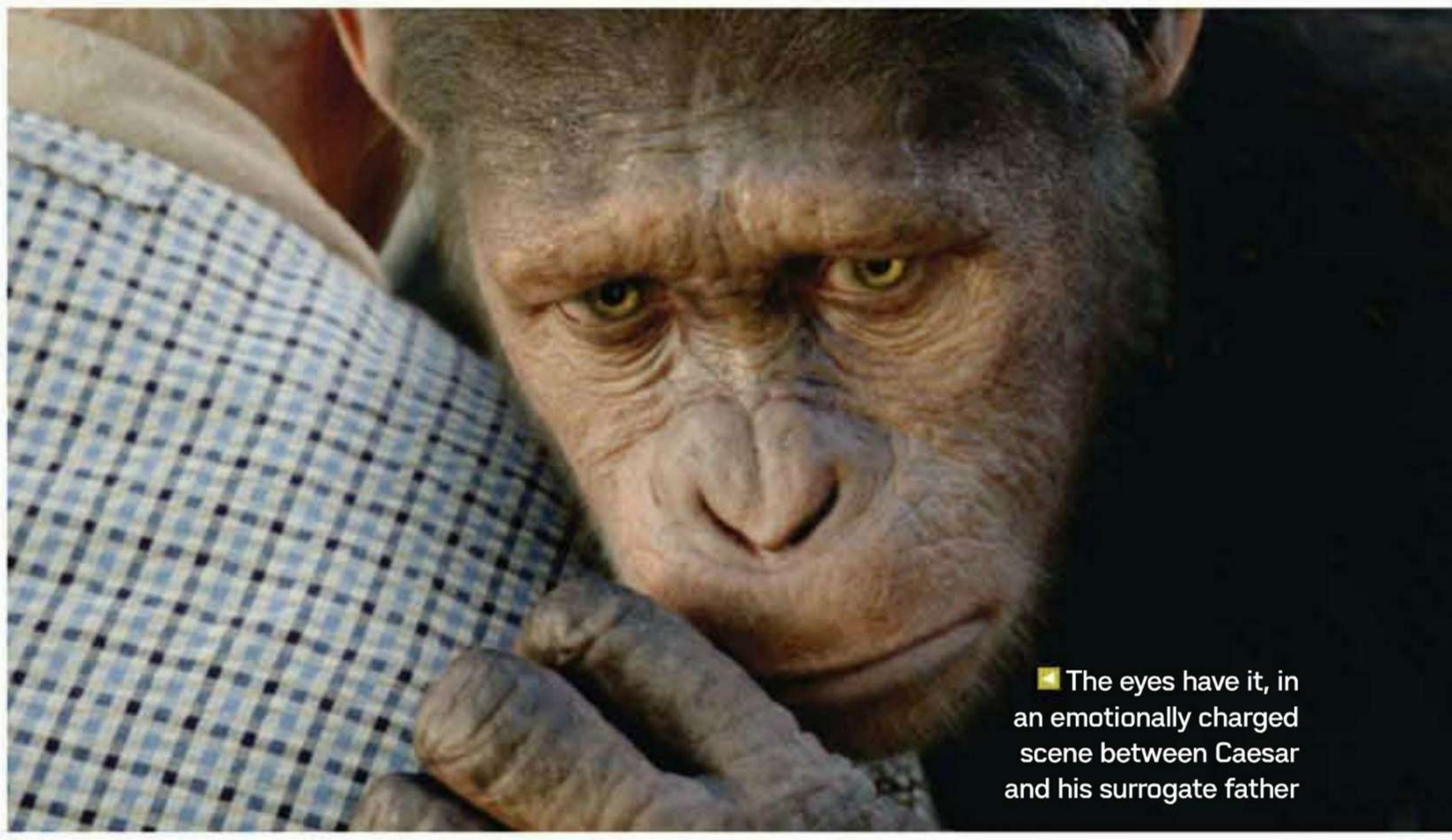
Wellington Zoo in Weta's home town also proved a valuable source of reference, giving the modelling and animation teams the ability to study the appearance, movement and behaviours of the real creatures up close. At one point, one of the chimps at the zoo had to undergo surgery, and so Weta was afforded an even closer look. "We took the opportunity of him being under general anaesthetic to take many close-up photos, getting a good look at the skin and fine detail," says Revelant.

While King Kong was an impressive creation, clocking in at around 50 thousand quads, Revelant says that the cast of Apes are in another league entirely: "That was six or seven years ago, and a lot has changed, especially after taking a big leap with Avatar. I'd estimate Caesar's face has the same number of polygons as there were in all of Kong."

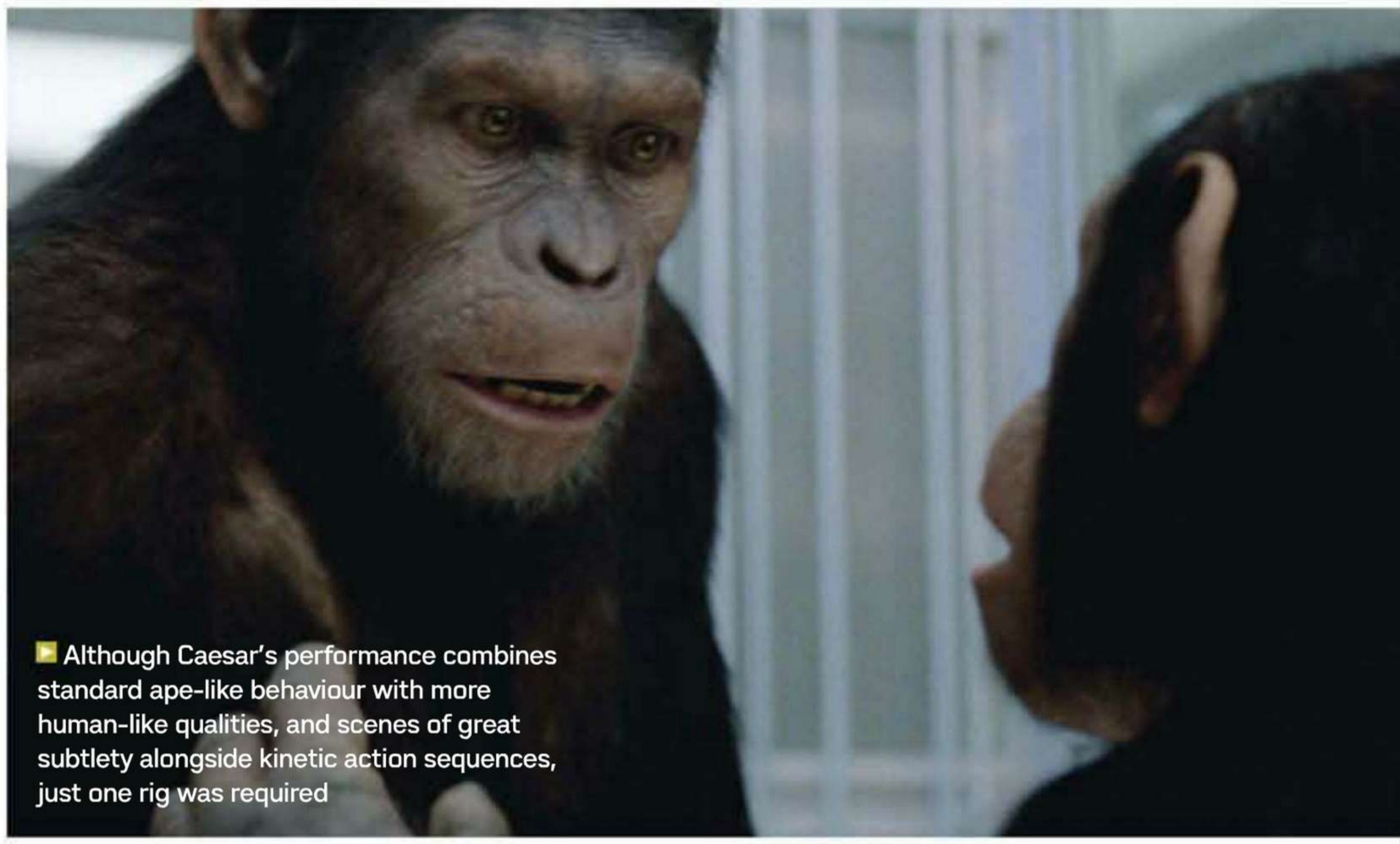
One of the payoffs of building such realistic creatures was the ability to assign a single rig to each creature. This is particularly noticeable in the case of the adult Caesar, who was required to exhibit both ape-like and human qualities in many scenes. "Because Caesar's rig was naturally the most complex, we were able to use that to create derivatives for the other characters," says Revelant. "Obviously the rig for species is slightly different, but by taking this approach, any changes made to the structure of the main rig could be easily propagated through to the others."

It seems the similarity between ape species also extends to humans, with Weta finding it relatively straightforward to map performance capture data from the human actors' bodies (albeit fitted with prosthetics to elongate the arms) onto the creature rigs. The facial performance data was another story.

"With the FACS system we'd used on Avatar, we knew how to activate the various facial muscles and controls to obtain any particular expression," says »



The eyes have it, in an emotionally charged scene between Caesar and his surrogate father



Although Caesar's performance combines standard ape-like behaviour with more human-like qualities, and scenes of great subtlety alongside kinetic action sequences, just one rig was required

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"The new fur shader is a lot more flexible than the one used on Kong," says Marco Revelant. "It's still a single shader, but with the ability to apply many different levels and co-shaders"

Revelant. "But with something like a chimpanzee, it's not such a straightforward process. The mouth of a chimp is very flexible and able to do things a human's can't do, for one thing. And they use their muscles to express behaviours and emotions in a different way, so you can't simply do a one-to-one conversion, activating the same muscle groups as on a human. Instead it's necessary to do more of an indirect translation, to convey the same emotion that the actor is delivering."

FUR COATS

While many of the techniques used to create Caesar and his compatriots have evolved at Weta over the last decade, the system used to coat the creatures in convincingly styled and rendered fur coats is all-new. Code department supervisor Alasdair Coull began work on the bespoke toolset, dubbed Barbershop, shortly after the studio wrapped on Avatar.

"Avatar itself wasn't too demanding in terms of fur, so we were able to work with our existing technology, but afterwards we had the time to step back and consider the best way to approach it," says Coull. "At the beginning, we were primarily working on it with Tintin in mind, but then once Apes came along, it was obviously going to have very different demands, so we really speeded up its development."

While several articles have alluded to Weta's involvement with computer science professor Eitan Grinspun, whose Columbia University team has researched the use of discrete differential geometry in simulations, Coull says the collaboration is concerned with ongoing research. Barbershop was developed wholly in-house. "When we started on Barbershop I was working solo, although the team eventually grew to five," he says. "I had done some fur stuff previously over at Framestore, but this was still a big learning curve. At the beginning, it was very much Marco and myself sketching up ideas, so everything was driven by the artist workflow."

Coull says the approach they ultimately chose was completely different to that used on Kong. "We took a completely different perspective on what a fur system needed to be. With Kong, the approach was very much a procedural one, manipulating the fur with deformers. But the tools were, in a sense, quite limiting. With deformers, you're always one step removed. Plus, there was a very big learning curve for the artists. With the new software, we've gone for something that's way more intuitive."

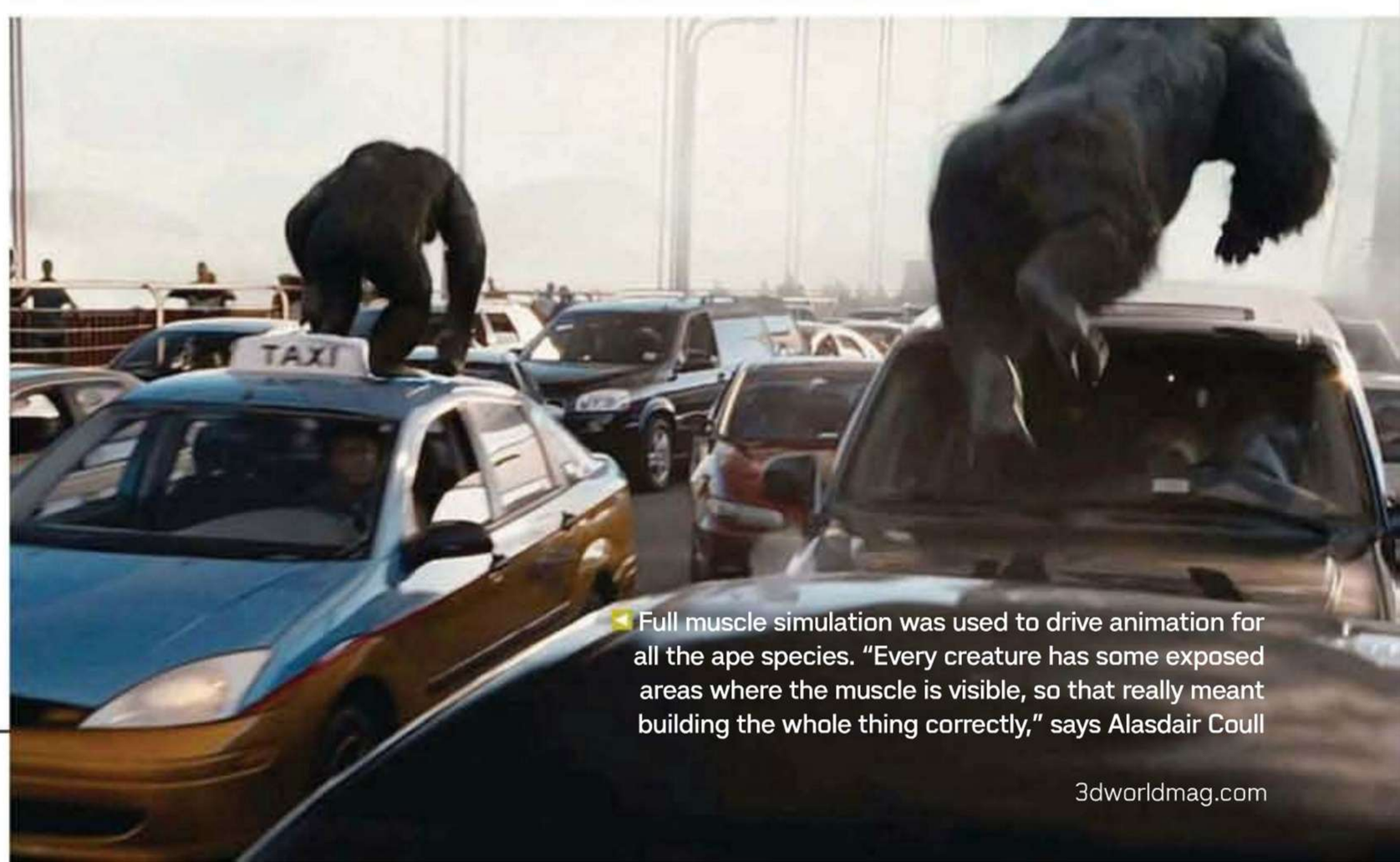
> "Barbershop gives our artists aspects of procedural control, but also offers the freedom to go in and make changes directly. It really is the best of both worlds"
>
> **Nick Gaul, fur lead**

Marco Revelant says that the key distinction is that, rather than generating the hairs at render time, the artists are able to groom the fur in real time. "With most systems, the artists work with guide hairs, controlling the hair at a very reduced density. We wanted something that would enable the artists to direct any single strand if required." »

Barbershop, he continues, is very much an open system, as opposed to the 'black box' set-up



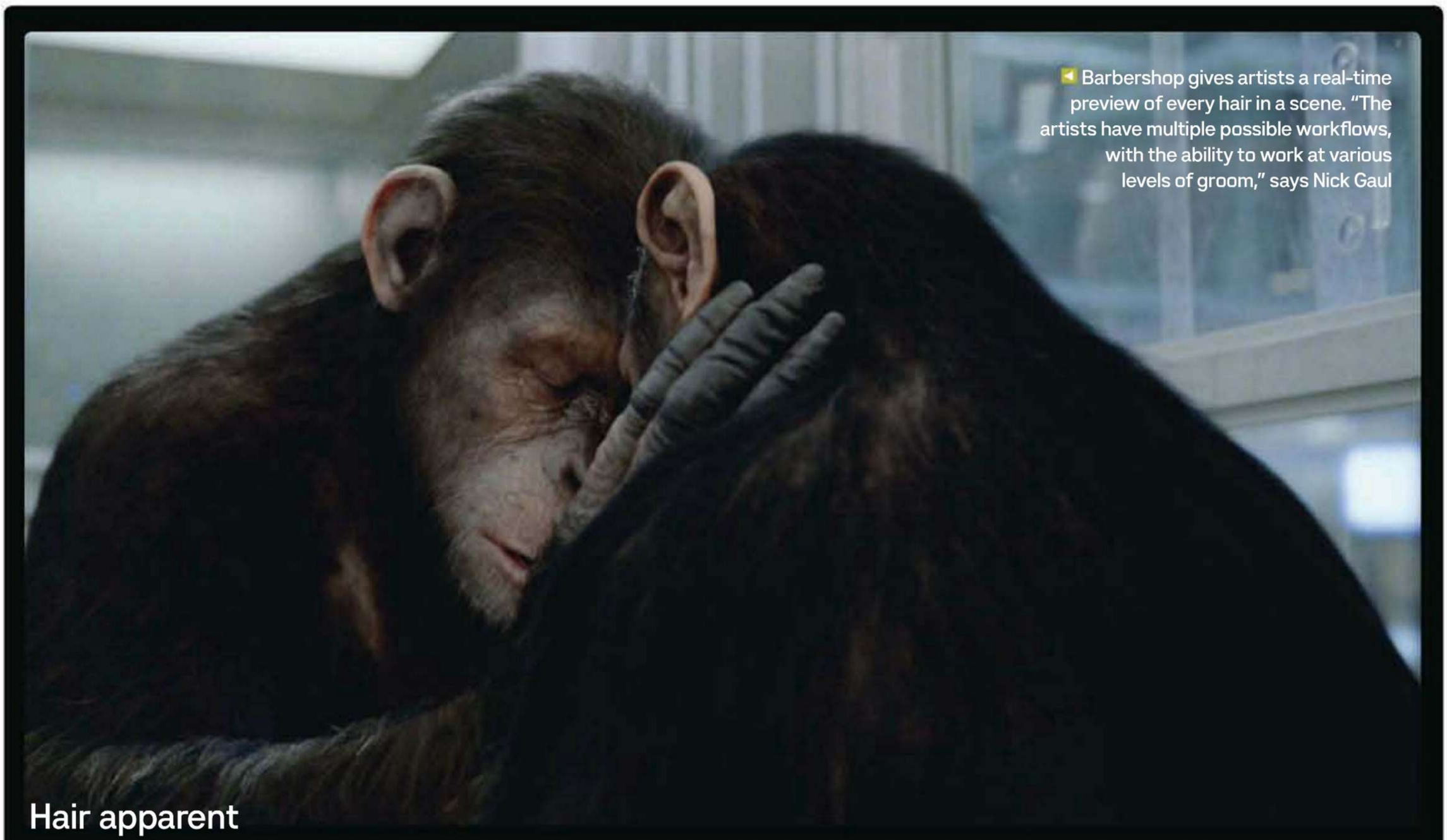
Caesar, the lead character in Rise of the Planet of the Apes, evolves from Andy Serkis' initial on-set performance (1) through rough animation (2) and fur grooming (3) to final render (4)



Full muscle simulation was used to drive animation for all the ape species. "Every creature has some exposed areas where the muscle is visible, so that really meant building the whole thing correctly," says Alasdair Coull

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Barbershop gives artists a real-time preview of every hair in a scene. "The artists have multiple possible workflows, with the ability to work at various levels of groom," says Nick Gaul

Hair apparent

FUR LEAD NICK GAUL REVEALS THE CUSTOM SOFTWARE RESPONSIBLE FOR THE 1,544,572 STRANDS OF HAIR ON CAESAR'S HEAD AND BODY

"You name it: hair length, curl, thickness at base, thickness at the tip, level of clumping... With Barbershop we can control it," *says fur lead Nick Gaul.* "Previously if I hired people, they had to spend three months learning how to groom fur. Now if they can shape a curve, they can groom.

"As well as real-time, direct control of the hair, Barbershop also contains a number of tools to speed things up. Obviously you don't want to control every single hair by hand, so what it offers is a range of both node-based and direct tools to make quick changes. You can select a certain percentage of the hair and add clumps to that to get a desired wet look in one area, for example. The artists can also control the resolution based on what level of detail is required, really fine tuning a tiny area if they like. And they can work with just 20 per cent of the hair and then use that to drive the rest, if they want to. It's a little like Mudbox, in a sense.

"Another key development with the fur system has been the ability to transfer fur from one character to another. With Kong, the fur lived right on the topology of the character, whereas the new system makes it possible to easily transfer the groom from one character to another. Without that, we would have had a very monotonous task, requiring us to start from scratch for every creature – akin to having to rebuild the topology of faces over and over. We could even transfer over just portions of a groom, replicating just an arm or a leg, for instance.

"I think for me, the big challenge we faced was ensuring that a system that we'd started building for a specific type of hair work (on Tintin) could be geared up to cover a lot more, and in a very short space of time. It's one thing to deal with a full head of hair on a character, but quite another when there are several creatures in a scene, all covered in fur. We had no choice but to make Barbershop work for Apes. It was quite a ride, but I'm super-pleased with the results."



"We'd love to simulate all of the hair to deal with collisions, but instead we would simulate a subset for key things," says Nick Gaul. "A lot of it comes down to good grooming, making sure we're not doing anything that's going to break further down the pipeline, through close collaboration between the models team and the creature simulation department"



The fur system needed to work seamlessly alongside Maya's nCloth, the clothing tool used by Weta on the movie. "Any time you see Caesar wearing clothes, all the hairs still exist underneath," says Nick Gaul. "We even used Barbershop to add peach fuzz to the sweater, so we had fur on top of cloth on top of fur!"

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previously employed. "Making any changes required a huge amount of effort every time, whereas Barbershop allows us to access the data quite easily and then build on top of it. Even from a dynamics point of view, you can choose on the fly exactly how much to apply."

Flexibility is Barbershop's key benefit, but as well as giving the artist the ability to select the desired area and granularity of control, Alasdair Coull notes that Barbershop also gives a more accurate preview of what the finished render will actually look like: no more setting the guide hairs and waiting for the final render to see how they affect a full head of hair. The one downside, he says, is that all the hairs exist in 3D space through the whole pipeline – whether they like it or not.

"Even though there are ways for the artists to cut corners with the way they deal with such a volume of hair, it's all still there on the creature. What you win in terms of artist control you do have to pay for elsewhere, and with Barbershop that area is data transfer. It's not such a problem in terms of the on-screen preview, though. We've used OpenGL and GPU acceleration to make sure the artists can groom in Maya and get a real-time preview of how the final lighting will look, and even where the highlights will be on the hair."

Revelant adds that preserving curve data for every single hair through the entire pipeline offered further benefits beyond the grooming stage. "It meant we knew where every hair was at any point in time and had every individual strand better applied in 3D space, which at the back end also came in useful for lighting and rendering."

The fur shading on Apes represented a step forward from the techniques used on Avatar, with several different lighting and shadowing techniques used for various desired effects. "While we still utilised deep shadows for small light sources with crisp shadows, when we needed to represent large area sources with soft shadows, we used image-based lights as well as a new addition, area lights," explains Jedrzej Wojtowicz, head of shading at Weta Digital. "These allowed us to work in a more physically based way, for example when matching on-set light sources, scrims and so on. The area lights could utilise either of those shadowing techniques as well as PantaRay shadows."

On Avatar, the Nvidia and Weta pre-computation engine PantaRay was used for quickly generating omni-directional occlusion, but here it was extended into generating shadows from area sources. Indirect lighting was also used where required, utilising a multi-bounce pre-compute technique that takes advantages of Pixar's native RenderMan solution, but which is pipelined to suit Weta's particular needs.

"For the skin shading, we utilised the quantised diffusion sub-surface scattering model BSSRDF [developed by Weta's Eugene D'Eon and Geoffrey Irving]," says Wojtowicz. "We were able to represent higher skin and lighting detail at the surface, while it also allowed us to push the scattering depths deeper or shallower than we were able to before, without artifacts or energy loss."

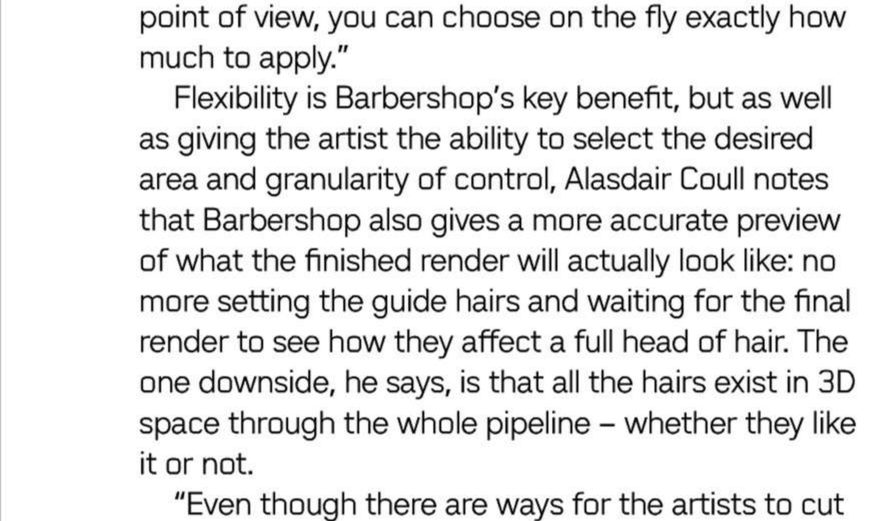
> "A show this demanding poses big challenges. Creatures are never easy. But then there's Caesar, with dry fur, wet fur, cloth on top of fur..."
> **Marco Revelant, models supervisor**

A NEW ERA

The popularity of the original Planet of the Apes movies can be attributed, in part, to their fusion of science fiction with political allegory. Whether Rise of the Planet of the Apes pulls off the same trick remains to be seen. But what is clear is that Weta has created a digital character capable of engaging audiences far more effectively than could be achieved with man-in-a-suit prosthetics.

After the performance capture thrills of Avatar, it's easy to forget what an achievement this is. Weta Digital has further broken down the boundaries between actors and directors on set and artists in the studio – and all within a post-production schedule of little more than a year. Caesar is a revolutionary character in more ways than one. ■

Rise of the Apes was released in US cinemas on 5 August, and in the UK on 11 August
riseoftheplanetoftheapes.com



Weta finessed visual effects shots for the movie until less than a month before it hit cinemas. At the outset, individual shots would take months; by the end, around 100 shots a week were finalled (many only taking three or four weeks to process)

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ONE CLICK FROM SKETCHUP TO THIS



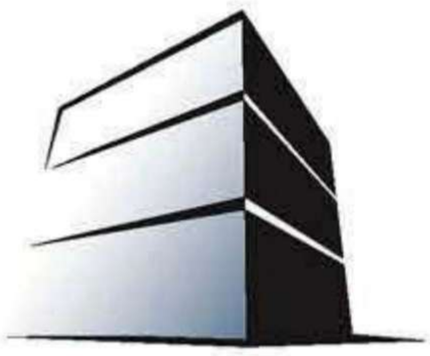












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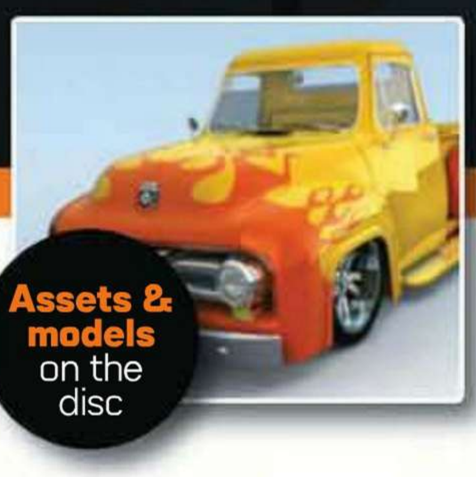
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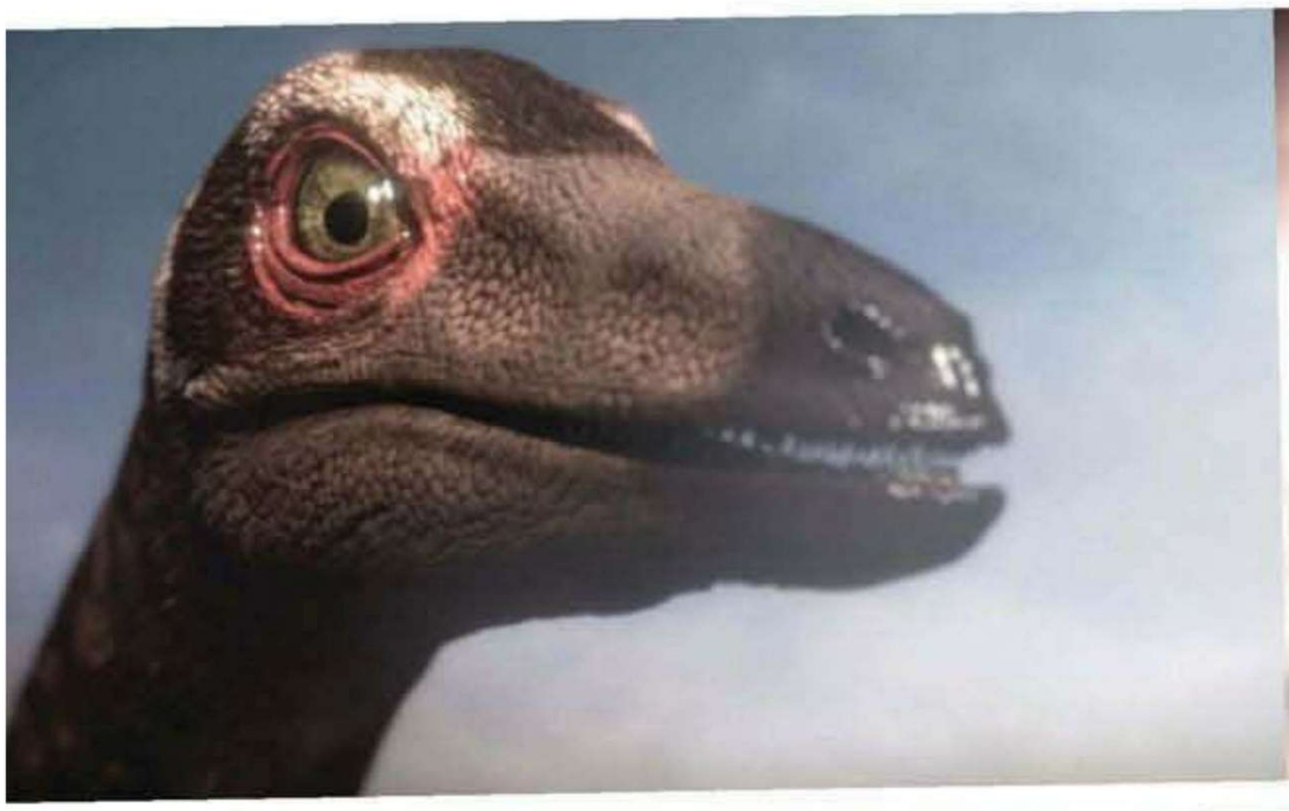


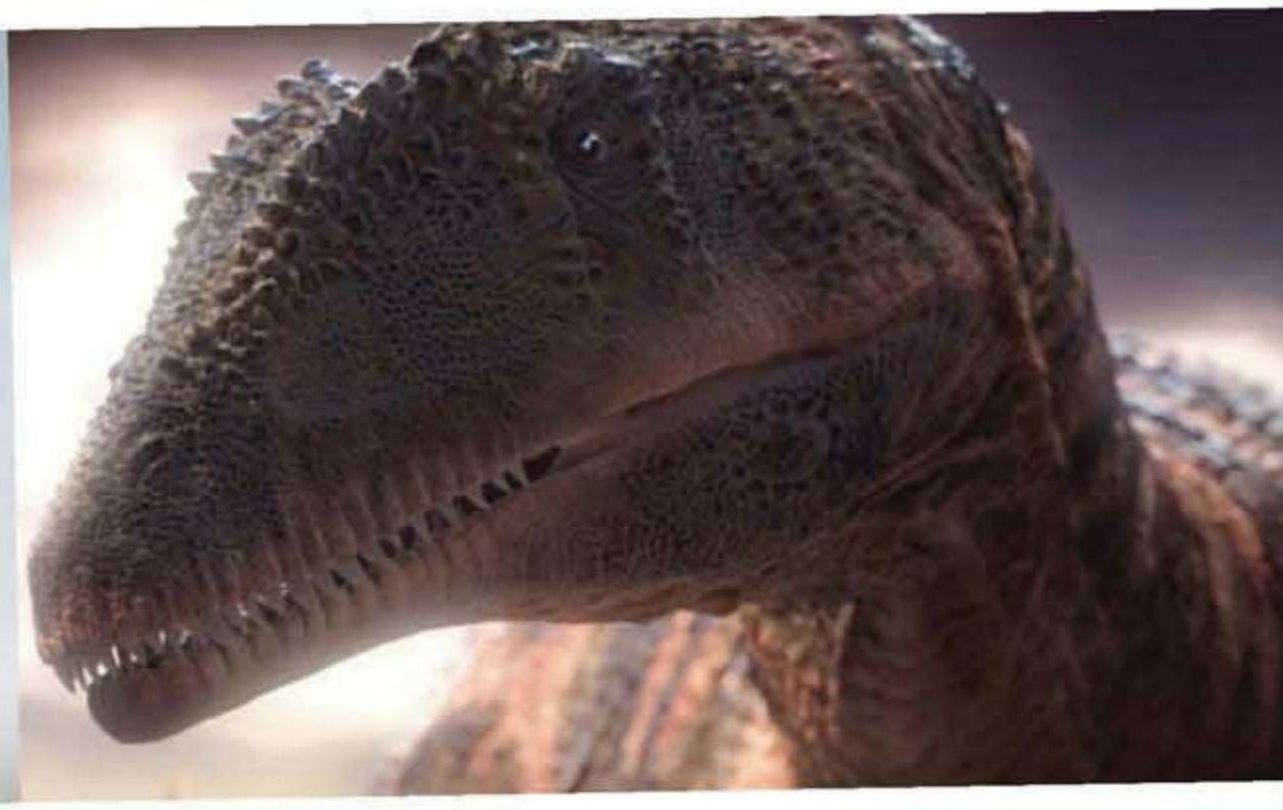
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PLANET DINOSAUR

Walk with new species of monsters in the BBC series Planet Dinosaur. Kerrie Hughes visits VFX studio Jellyfish Pictures to find out how its team of artists brought the ancient creatures back to life

First broadcast in 1999, the BBC's documentary-style series Walking with Dinosaurs offered the most accurate portrayal of prehistoric creatures ever seen on screen. Created using a combination of live-action, physical models and CG, the show attracted an audience of millions and was a huge success, winning three Emmy awards and spawning a touring show featuring animatronic creatures. A stereo 3D version for cinemas is in production for 2012.

Since the series' initial broadcast, discoveries about the prehistoric era have been rife, with the BBC describing the past decade as the "golden age" of dinosaurs. It was for this reason that the decision was made to make another reptilian show, this time using CGI throughout.

Philip Dobree, co-owner and creative director of Soho-based VFX studio Jellyfish Pictures, was approached by the BBC in 2009 about the possibilities and logistics of creating another dinosaur series. After using the studio on shows such as Fight for Life and Inside the Human Body, the BBC was keen to discover whether the Jellyfish team believed the idea was viable.

Dobree and his team got to work on the show's configuration. Their early development work, backed up by test shots, motion graphics and still images, was enough to win Jellyfish the pitch. "Stills were a big thing," says Dobree, who acted as VFX and CGI supervisor on the project. "We just did dinosaurs and made them look really good." »

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Experience these fully CG dinosaurs from the comfort of your home on BBC One this September

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Models were divided into four clusters – body, tail, legs and head – each with their own UV map

Planet Dinosaur required Jellyfish to deliver over 2,100 CGI shots and 700 motion graphic shots in 18 months. The entire Jellyfish infrastructure grew to accommodate the mammoth job, which saw its minimum workforce double to over 60. The main question was how they'd manage the project within the limited time and budget constraints. "The only way we were going to be able to make it on this kind of schedule and money was to do it in a 300 or Sin City style," explains Dobree.

Style counsel

At first, the studio and the BBC moved forward with a stylistic approach for the series. After a sequence had been completed for approval, however, BBC series producer Nigel Paterson had a change of heart. "I had a very bad 'production heart attack' early in the show, when Nigel said he wanted it to be photoreal," says producer Mark Sherwood.

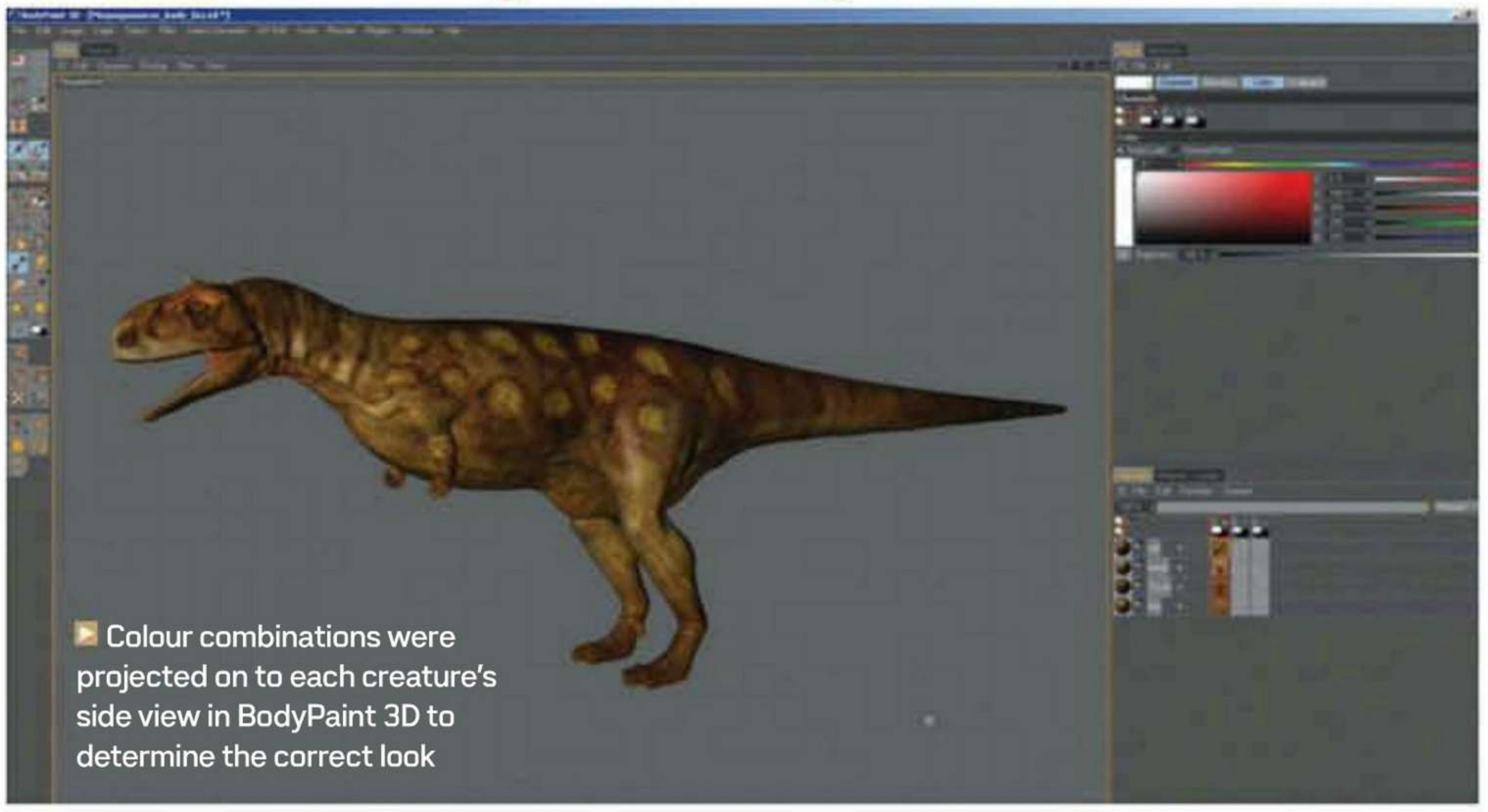
The shift in style meant a huge amount of extra work and was a major influencing factor behind a complete pipeline change. The initial 3ds Max and Brazil pipeline soon changed after issues were highlighted in early production. "Max couldn't handle the amount of geometry we needed it to – we just weren't getting there quick enough," says Dobree. In light of this, the team switched to Softimage and considered render choices carefully.

"We had previously used mental ray on projects approaching this scale," says Dobree. "But it hasn't been developed in years, and has become less and less integrated with Softimage. In the meantime, we were looking into Arnold and liked it more and more: it looked like it was going to be much more efficient."

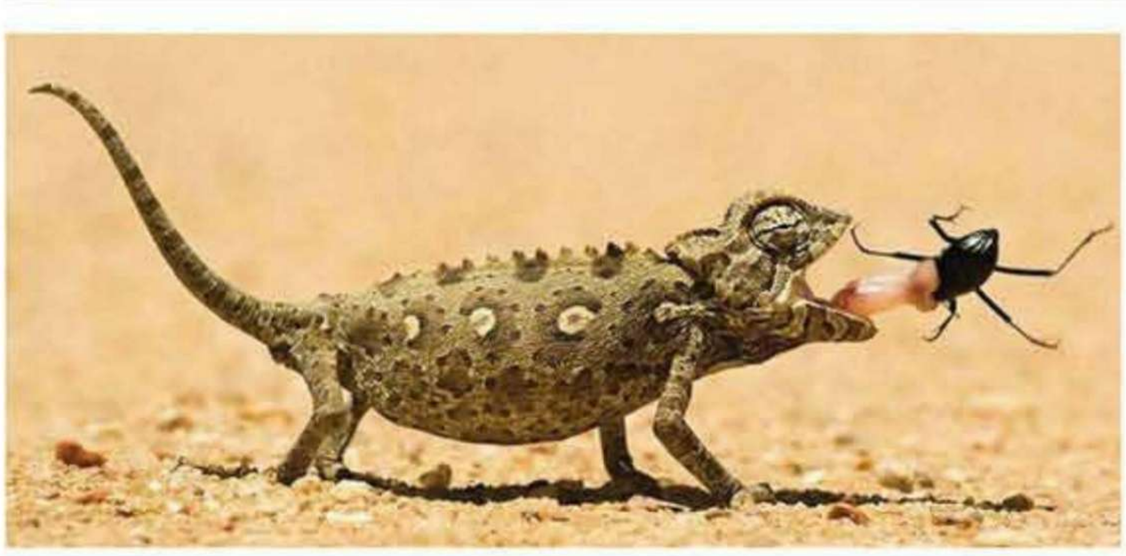
The bold step worked out well, with the combined powers of Softimage and Arnold creating an incredibly efficient pipeline that produced 70 shots a week in full flow. The software enabled the project to stay on schedule, but the tight organisation was due to a strong production team, who used task and asset management system Shotgun to manage the workload. "We made sure all the artists were working entirely through the tasks that were set in Shotgun, rather than any external task setting," says production manager Jessica Norton.

Artists were never in any doubt as to what was required and when. They were also easily able to identify which asset or shot they'd be working on, due to the clear and concise naming convention organised by Sherwood.

As well as managing the numerous shots, it was also vital to keep the workforce up to speed with regular communication. Production manager Carmen Perez-Marsa explains: "We had weekly meetings with head of departments and the production team, as well as people involved in the render farms and systems, which was really useful. It highlighted any potential problems and a view of the schedule, and it made the artists aware of where we were in terms of storage capacity, so they could be careful with this."



Colour combinations were projected on to each creature's side view in BodyPaint 3D to determine the correct look



Texture artists took inspiration for patterns and colours from animals living in the same environment

> "The only way we were going to be able to make Planet Dinosaur on this kind of schedule and money was to do it in a 300 or Sin City style"
>
> Philip Dobree, creative director, Jellyfish Pictures

Model assets

Production couldn't start without assets, so the magic began with the modelling team. Artists started by building low-res proxy models of each dinosaur, using packs that were provided by the R&D department of the BBC, which included images and illustrations of the creatures.

With a basic form and correct proportions, these assets were passed on to the pre-viz and ZBrush teams to keep production moving. Lead ZBrush artist Mathew Cooling and his team used these as starting points for refining the shape and adding fine detail. Working on over 50 dinosaurs, the ZBrush artists had to be smart in their approach to the huge workload. "I tried to get everyone working the correct way, starting off with larger forms and shapes and getting smaller as you go along," says Cooling. "I find this a structured way of working: it stops you from getting too far ahead of yourself."

Early plans did have to be worked around, though, to accommodate the pipeline change. "3ds Max is a bit more flexible on how it handles the displacement and the bump maps, so when we changed to Arnold I did have to rethink things," says Cooling. "With Arnold, all the dinosaurs' bump maps had to be the same strength, so in the end we used HD geometry."

Working across various subdivision levels provided efficient control when sculpting broad or fine details

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The ZBrush team spent a lot of time creating alphas for the detailed crocodiles

as necessary. To fully achieve the creatures' intricate details, a selection of default and custom brushes were used, including feather and scales.

"Scales was basically a standard brush with an alpha, created in Photoshop, that was totally tileable, so you could take it into Projection Master using a deco brush and get quite a seamless flow to the scales," Cooling explains.

After a lot of tender loving care from the ZBrush team, the detailed models were sent to the texture artists. In an attempt to keep things as efficient and light as possible, they'd normally receive assets with a medium subdivision level. These provided enough detail, including wrinkles and scales, without slowing the system. The ZBrush artists would also send over each model's corresponding displacement, cavity and bump maps for the texture team to work with.

One of the biggest problems at this stage was deciding the colour combinations for each dinosaur. The team researched the environments that they'd have lived in, looking at other animals' colours and patterns from the same kind of habitat. Once these were approved, the team used BodyPaint 3D and Photoshop to apply them. Their process divided each model into four clusters – head, tail, body, arms and legs – each of which had a UV map. This conventional method provided the control needed, but also created the problem of visible seams.

BodyPaint 3D's Clone tool provided the solution, although this wasn't always foolproof. When the assets got to the lighting department, some seams were still apparent, especially if the scene included a close-up. Artists had to plan the placement of the UV maps carefully. "We had to plan where the seams would go early on, but it didn't always work out," explains texture artist Richie Xu. "For example, on the stegosaurus you could see the join on the top of his back, so we had to fix it."

Models were subdivided to various levels of detail – the highest resolution has as many as 70 million polygons

Camera choreography

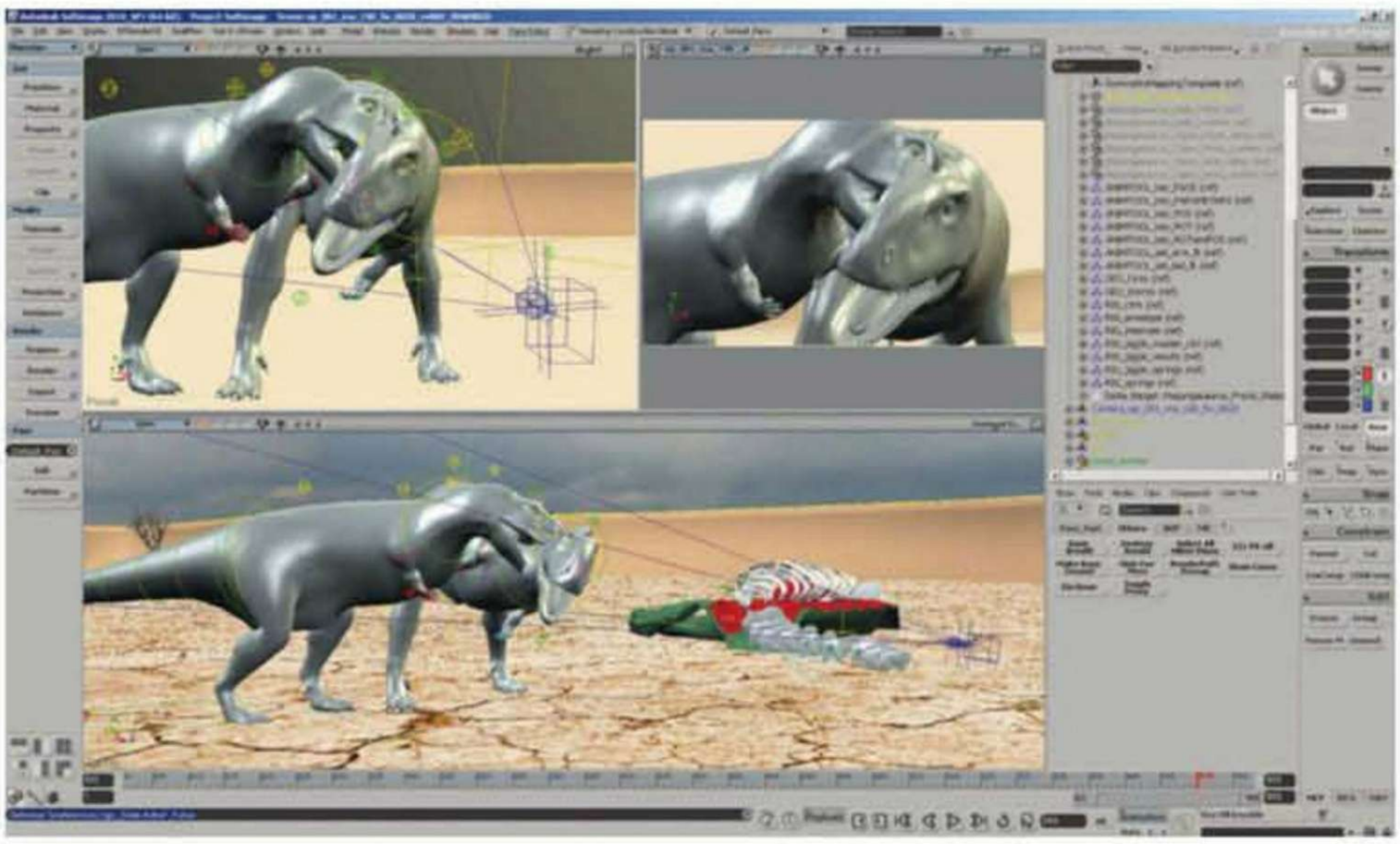
While the models were being produced, the pre-viz team worked on camera layouts. Working from bullet-point scripts provided by the BBC, six storyboard artists created a huge number of images, all of which ended up in the hands of animation editor Beverly Maguire. The illustrations were chopped up and put into a timeline, where Maguire would organise them into a cohesive sequence and add various notes, such as camera angles and moves that could work on that particular shot. Only after that process would sections be passed to a pre-viz artist to use as a guide.

Pre-viz is quickly becoming a more highly regarded discipline in the pipeline process, and this is definitely true in the case of Planet Dinosaur, where it provided the final camera layout for every shot. "Pre-viz and camera layout was one of the most important parts of the pipeline: camera choreography and storytelling is where things happen," says Dobree.

Working in Softimage's 3D environment enabled artists to block out basic animations of the dinosaurs and then play with camera timings, composition and cinematography from scratch. Unconstrained by »

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Pre-viz provided the final camera animation and layout for each shot of the entire series

reality, the team was able to choreograph specific camera moves to suit the show.

The handheld, shaky-cam nature of the series required some complex camera work, for which the team shot some generic footage, tracked it and tried it out with some earlier shots. 3D generalist Sam Howell explains: "The results were promising, but it was restrictive and time-consuming having to rely on this method. The pre-viz artists and director needed the freedom to change camera moves and durations of shots – often radically – while constructing the stories and sequences."

In the end, the team opted to animate all of the shots manually so they looked handheld. They also added fake random hand jitter, derived from tracked footage but tweaked to suit their needs. "We had a camera rig that had very fine, jittery hand moves on it, then further controls to provide the overall broad camera moves," Howell explains. "Tracking the shots from real handheld footage was too time-consuming to be practical on such a big show."

With camera layouts approved and locked, the scenes moved into the hands of the animators. "The animation stage is all about getting a performance, no matter what type of character you're dealing with," says animation lead Stephen Cavalier. "Pre-viz rough out the basic positional movements, and animators bring the character to life, similar to the role of actors."

The Planet Dinosaur animation team had to ensure that each dinosaur moved in a way that was scientifically correct, but also aesthetically pleasing. "We talked to top experts in dinosaur movements and used all of their advice, but there were certain times when it just seemed to contradict what makes good animation," says Cavalier.

> "The animation stage of the project is about getting a performance, no matter what type of character you're dealing with. Animators bring the character to life"
> Stephen Cavalier, animation lead, Jellyfish Pictures

Achieving the look involved lots of experimentation and a bit of compromise. "To give something weight, it has to go up and down, like a bouncing ball," says Cavalier. "But the experts were saying it shouldn't do that, so it was difficult to marry the two demands of what they wanted and what looked right."

As an understanding between science and technology was reached, the animation team got to work on refining the dinosaurs' movements. With so many different models, smart thinking was vital to maintain a delivery quota of four seconds per day.

After working on movements such as walk and run cycles, the team ended up with a library of motions that they could use for each model. Stored as actions, these movements could be moved between creatures, then converted to keyframes on the timeline for individual refinement. Unfortunately, not all sequences could be done like this, so the team had to manually devise the best way to achieve the correct movement. Difficult scenes, such as those where the creatures interact, were created using a certain amount of cheating the eye: only what could be seen in the camera was animated.

Flesh and bones

A portion of the creature animation was also taken care of by cleverly constructed rigs designed to make animators' lives as easy as possible. The Planet Dinosaur project had just two rigging artists, Antony Magdalinidis and Richard Costing, who were responsible for creating the skeletons of about 60 dinosaurs. To save the animators time, they came up with some clever secondary animation systems controlled by a simple set of scripted buttons.

Devised using tools in Softimage (see 'Swing in the tail', page 50), an automated tail system enabled a tail to sway in real time depending on the speed and direction the dinosaur was travelling. Another sophisticated set-up was the jiggle points rig, created using an even combination of manual tools and scripting. The jiggle points would make parts of the creature wobble when they moved.

Placed at first in obvious areas, such as the neck, stomach and calves, they were updated as the rigging team received feedback from the animators. "The jiggle points are spring operators that are parented under nulls, which are parented under other nulls," says Magdalinidis. "The pipeline was set up in a way that the animators did their job without having to think about stuff like this. They would animate, then the secondary animation would be turned on after their animation was locked," he explains.

Softimage also provided the solution to what would have been a mammoth enveloping task. The rig artists painted weights on the low-res versions of each asset, before using Softimage's GATOR tool, which takes the enveloping information and applies it to the high-res model. "Obviously, there were some problem areas, like between the legs where it's compacted in a small space," explains Magdalinidis. "So we'd go in and smooth it out, but that was about as much as we had to do. The enveloping was actually very easy thanks to GATOR. It works distance with approximation, so the closer the low-res is to the high-res, the better it transfers."

Softimage proved to be a worthy choice, its tools offering solutions to many time-consuming tasks. Each of the six half-hour episodes required full CG »



The hand-held mobile camera style gets the audience up close and personal with the action

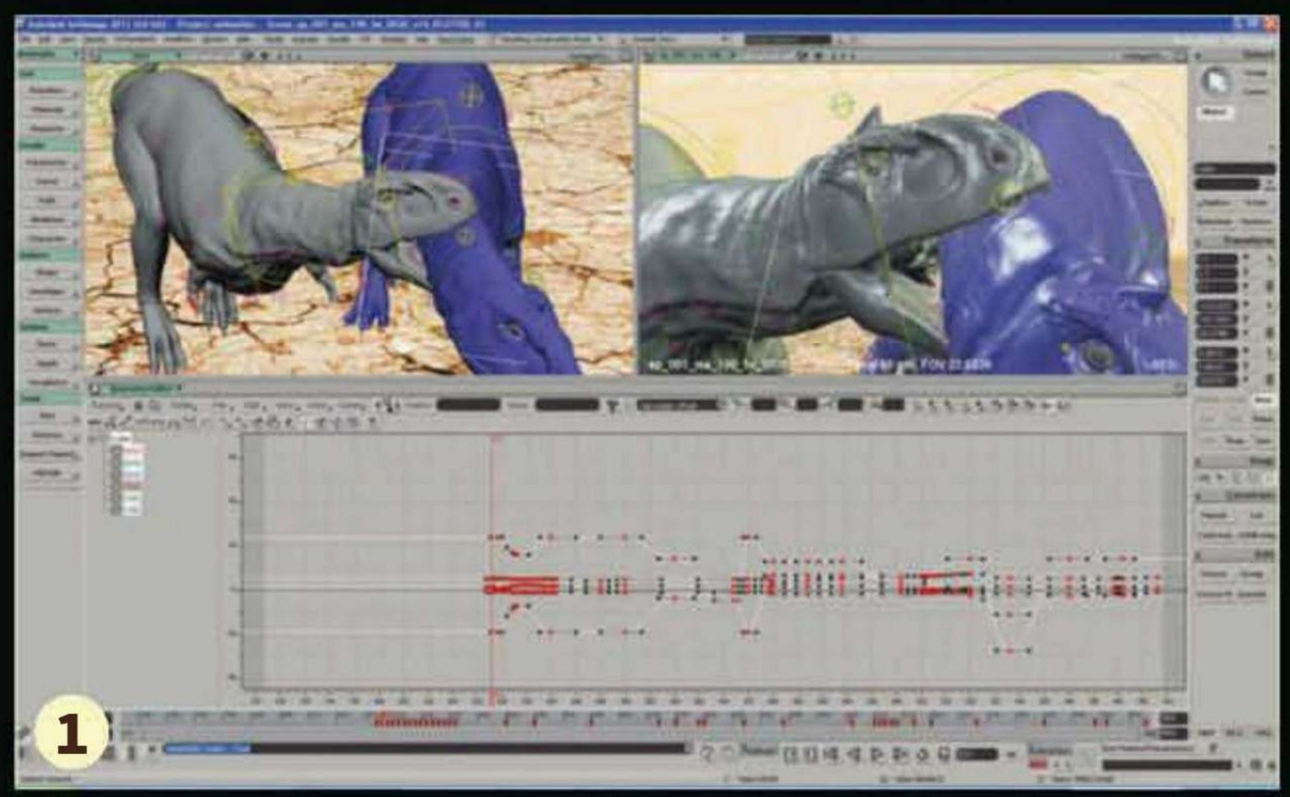
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Dinosaur domestics

TIME-SAVING TECHNIQUES WERE REQUIRED TO ACHIEVE MANY OF THE COMPLEX CHARACTER INTERACTIONS

Planet Dinosaur features many scenes where the creatures come into contact with each other. For these, the animation team had to devise various workarounds to speed up production. The two majungasaurus in this scene were set up so the female would control the movement of the male's neck once bitten, using constraints. Animator Chris Seed explains: "First off, I made two implicit cubes and matched the transforms of cube 1 to the head control of the female and cube 2 to the neck control of the male. I then parented cube 2 to cube 1 and pose-constrained the neck control of the male to cube 2. Cube 1 was then pose-constrained to the head control of the female. Now cube 1 will follow the head of the female and, because it's parented, cube 2 will follow. The neck of the male is constrained to cube 2, so when the head of the female is moved, it also moves the neck of the male."





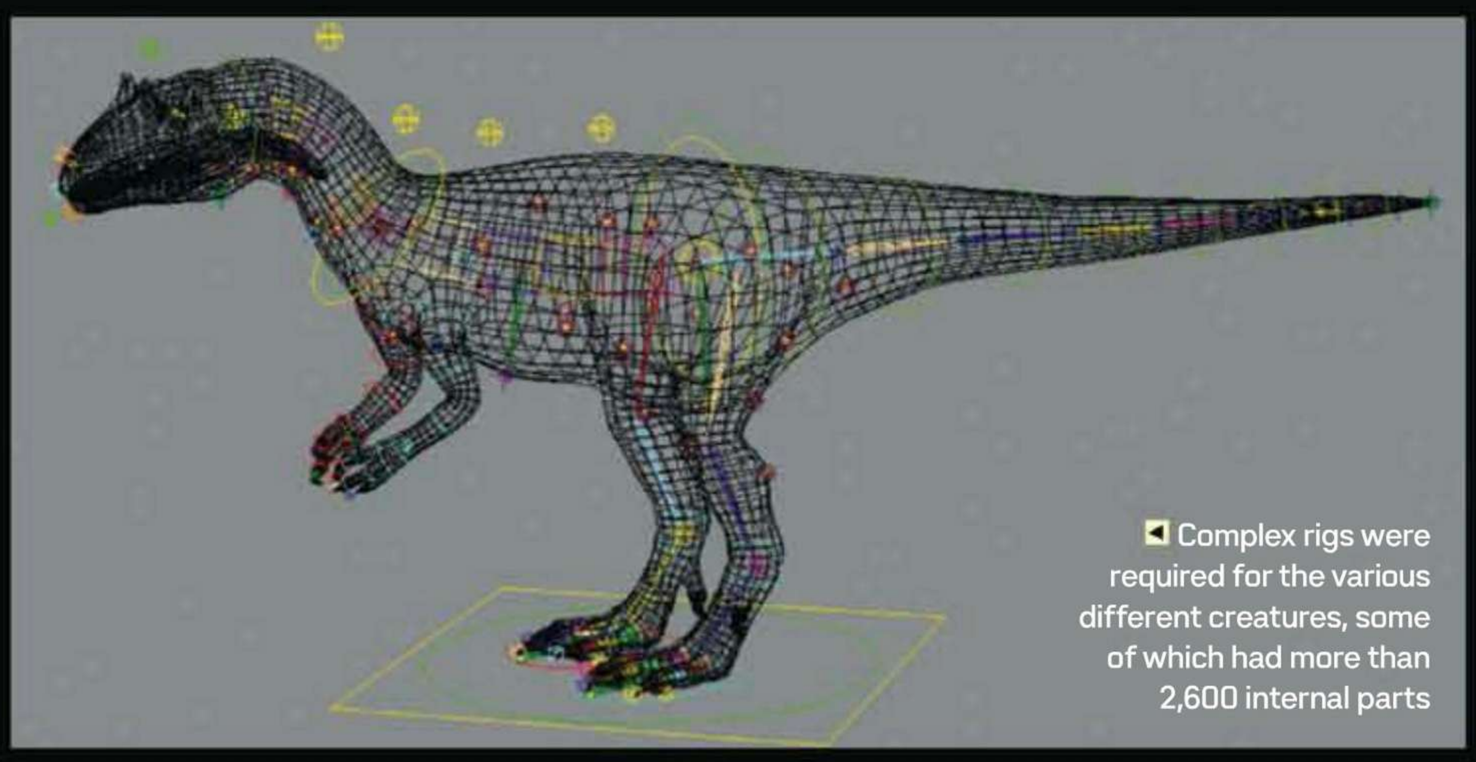


Working to the camera and time-saving techniques provided the answer to this tricky fight sequence

Shots were carefully choreographed to add drama and pace to the series, which includes grisly close-ups

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Complex rigs were required for the various different creatures, some of which had more than 2,600 internal parts

Swing in the tail

RIGGER ANTONY MAGDALINIDIS REVEALS HOW NATIVE SOFTIMAGE TOOLS ENABLED HIM TO CREATE AN AUTOMATIC TAIL RIG FOR PLANET DINOSAUR

The secondary animation systems set up for Planet Dinosaur were a vital part of keeping production moving, giving animators more time to focus on creating a performance. The auto tail rig was one such process, designed using nothing but native tools in Softimage.

Rigger Antony Magdalinidis explains: "Each bone of the tail is a bone chain by itself, linked to each other by parenting the last bone root to the previous chain effector. A null was created for each effector, which was then aligned with it and parented under the effector's roots before un-linking the effector from its root. We then constrained the effector to the null."

This system meant that when the weight of the constrain was at 0 or 1, the effector would follow as normal, but when the weight of the constrain was between 0.1 and 0.9, the effector would be dragged along behind the null. "The higher the value, the closer it follows the null," says Magdalinidis. "The lower the value, the slower it is."

environments, so the in-house R&D team developed a system using ICE and instancing to populate them. (See 'Tricky terrains' opposite). The combination of ICE and Arnold Renderer enabled the team to create the complex environments they needed. "The ecosystem in ICE made lots of geometry propagate everywhere – which was great, but our main concern was how the hell we were going to render it," says Philip Dobree. "The answer was Arnold."

Still in its beta phase, Arnold dealt remarkably well with the amount of geometry and lighting the team threw at it. "I haven't yet found [a limit to] how many of these geometry instances Arnold will cope with, so it really has been a great asset from that point of view," says senior lighting artist Dave Cook.

Even the lighting didn't phase it. "I used the fewest lights as I could get away with, which did vary," says Cook. "Sometimes it was just one light, an environment light like a directional sun and an HDR, but some scenes were much more complicated."

The main difficulty was lighting the dinosaurs. "The only large animals I've seen are mammals, which are either dull or furry – whereas I think a dinosaur would have been a bit shinier," says Cook. "So it was a sort of trade-off in specularity with the lighting: you want to get a little hit from the skin, but not overdo it." To add more control over this, the lighting was split between one purely specular and one diffuse light.

With geometry, environments and lighting completed, Arnold kicked in. It consistently produced render passes within 30 minutes, which enabled the team to manage their time, knowing that each shot would typically need between eight and 12 passes for the composition stage.



Nuke's STMap node enabled compositors to add extra-fine detail, such as blood and dirt, if needed

we didn't have to try and track anything in it. It could all be popped onto cards or on geometry, and we could get it straight in there."

To maintain the schedule and a consistent quality, the decision was made to keep render passes in composition to a minimum. "This was purely because of the amount of shots we had to generate in a relatively short period of time," explains Dodd. "Lots of passes means lots of data management and storage over complicated Nuke scripts, which are difficult to pass between artists."

Typically, the passes would constitute beauty, habitat, reflection, shadows, depth and UVs. The shaders were set up with individual buffers for every pass possible in order for the comp artist to request more should they need them. Once these were tweaked to achieve the correct look, foreground elements could be added for extra depth and detail.

No longer extinct

The final touches in each shot were 2D effects such as lens flares, dust, foot interaction, kick-ups and splashes. Nuke's toolset also enabled artists to add detail to shots if need be. "There's a very smart node in Nuke called the STMap, which works out exactly where a texture should be in 2D space," says Dodd. "It also understands displacement, so it makes things like blood and dirt actually run in the dinosaurs' creases and over the bumps."

Nuke was the only tool that the comp team needed to finish the production. "We pretty much used all of the stuff out of the box," says Dodd. "We haven't been programming Nuke; everything we wanted worked. It's really robust, is great at handling a lot of detailed geometry, is really reliable and renders quickly. It's pretty bulletproof."

> "We haven't been programming Nuke; everything we wanted worked. It's robust, great at handling a lot of detailed geometry, really reliable and renders quickly"
>
> Luke Dodd, VFX supervisor, Jellyfish Pictures



2D effects were used to add small but vital detail, such as water elements, dust and foot interaction

To bring the shots to life, the comp team started with big matte paintings and the 3D passes from the lighting artists. "We were using Nuke heavily to make shots work and feel real – or real enough," says Dobree. "That meant using a lot of matte painting."

The team took delivery of 21 matte paintings, provided by concept artist Chris Rosewarne, and dissected them into various layers. The camera animation and reference geometry were imported from the Softimage scene, and the layers were added to work for the camera move and shot continuity.

"That was one of the most important parts of this whole project," says VFX supervisor Luke Dodd. "Because we're getting everything in the 3D world,

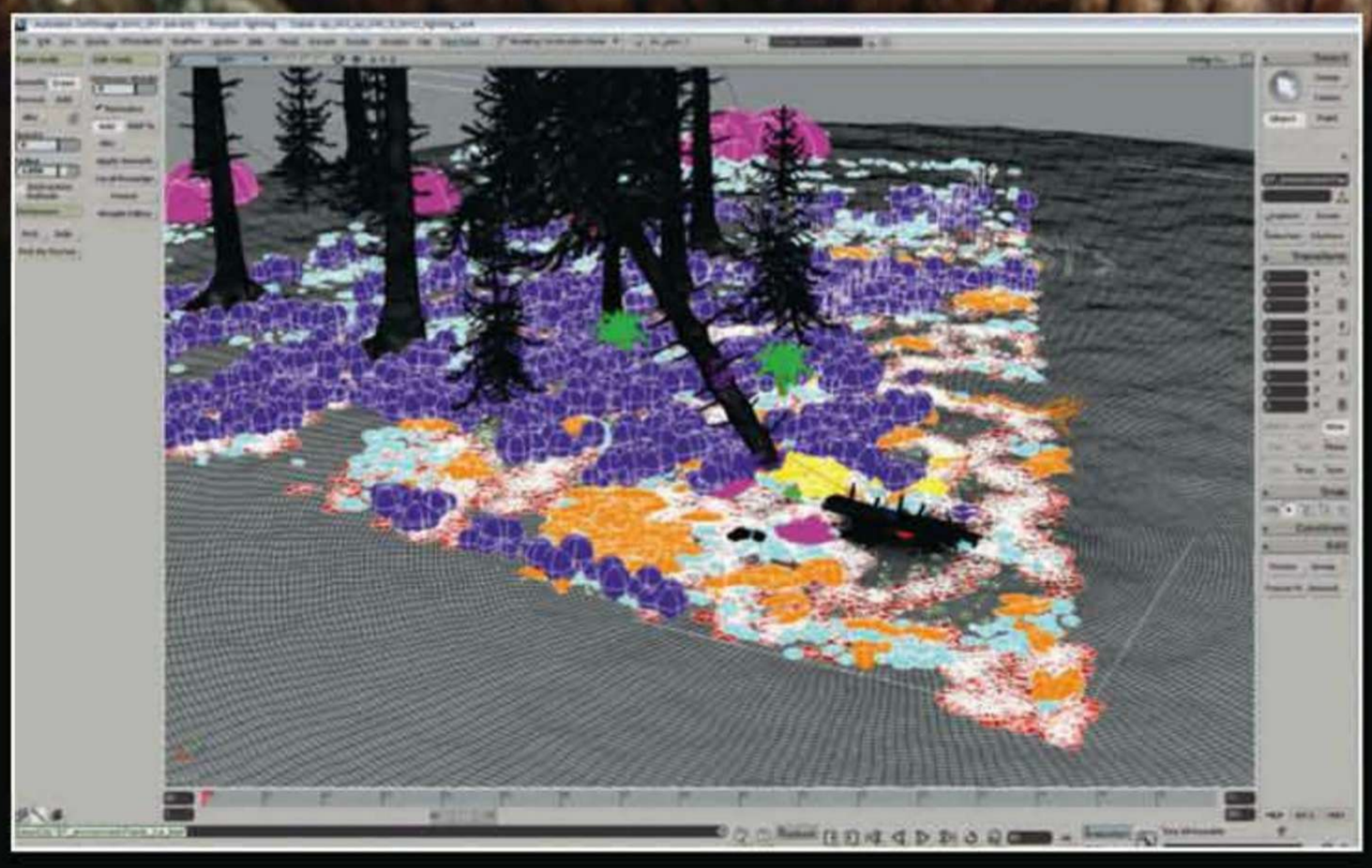
With the composition phase complete and approved, the final edits were delivered to the BBC on budget and to schedule. "Planet Dinosaur was an unprecedented challenge – three hours of full CGI on a TV budget," says Dobree. "The techniques and pipeline we set up enabled us to deliver above and beyond both our expectations and those of the BBC. From storyboarding right through to final compositing, we were able to deliver – a huge achievement for the whole team."

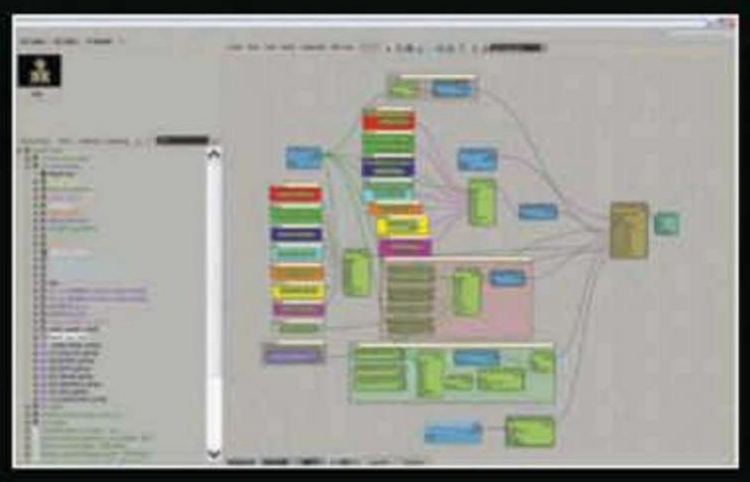
The six-part series Planet Dinosaur begins on BBC One at 8:30pm, 14 September

bbc.co.uk

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Complete control over specular and diffuse lights was vital to lighting the dinosaurs correctly





The densely populated CG environments featured in the series were created using a colour-coded proprietary ICE particle system

Tricky terrains

ICE ARCHITECTURE IN SOFTIMAGE PROVIDED THE SOLUTION TO THE HEAVILY POPULATED, DETAILED SCENES PLANET DINOSAUR REQUIRED

The environments started with a ground object, which acted as an emitter for all the ground-based plants and rocks. The same object had a number of weight maps on it, which would generate each different type of vegetation using the proprietary ICE particle system. "It was colour-coded to help [show] what weight map was generating which piece of vegetation," says senior lighting artist Dave Cook. "The ferns, for example, are cyan, which are instancing a single piece of geometry in some cases and a range of geometry in others, so it would cycle through several variations."

The particle instances were also randomised in terms of rotation and scale, as well as the piece of geometry, so each one had a separate randomisation and case number.

The ICE system was also designed with a way of culling particles if they weren't going to be in shot, using either camera information or dummy deletion volume, where everything inside the dummy was deleted.

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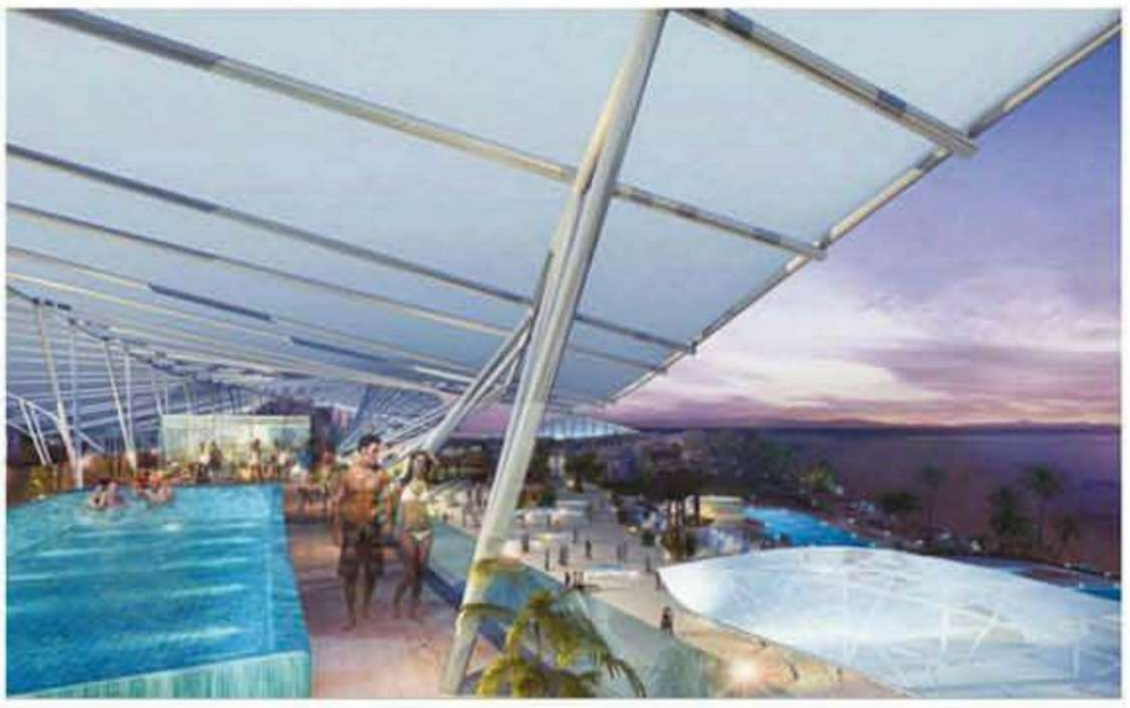
Showcase

The month's best new commercial 3D projects

Aegean Breeze's defining flowing rooftops were modelled in Rhino







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Projects

This month's round up of commercial work includes a robot with an empty stomach, a luxury resort and some nifty fingers



Project: Aegean Breeze at Alacati
Studio: Leo A Daly

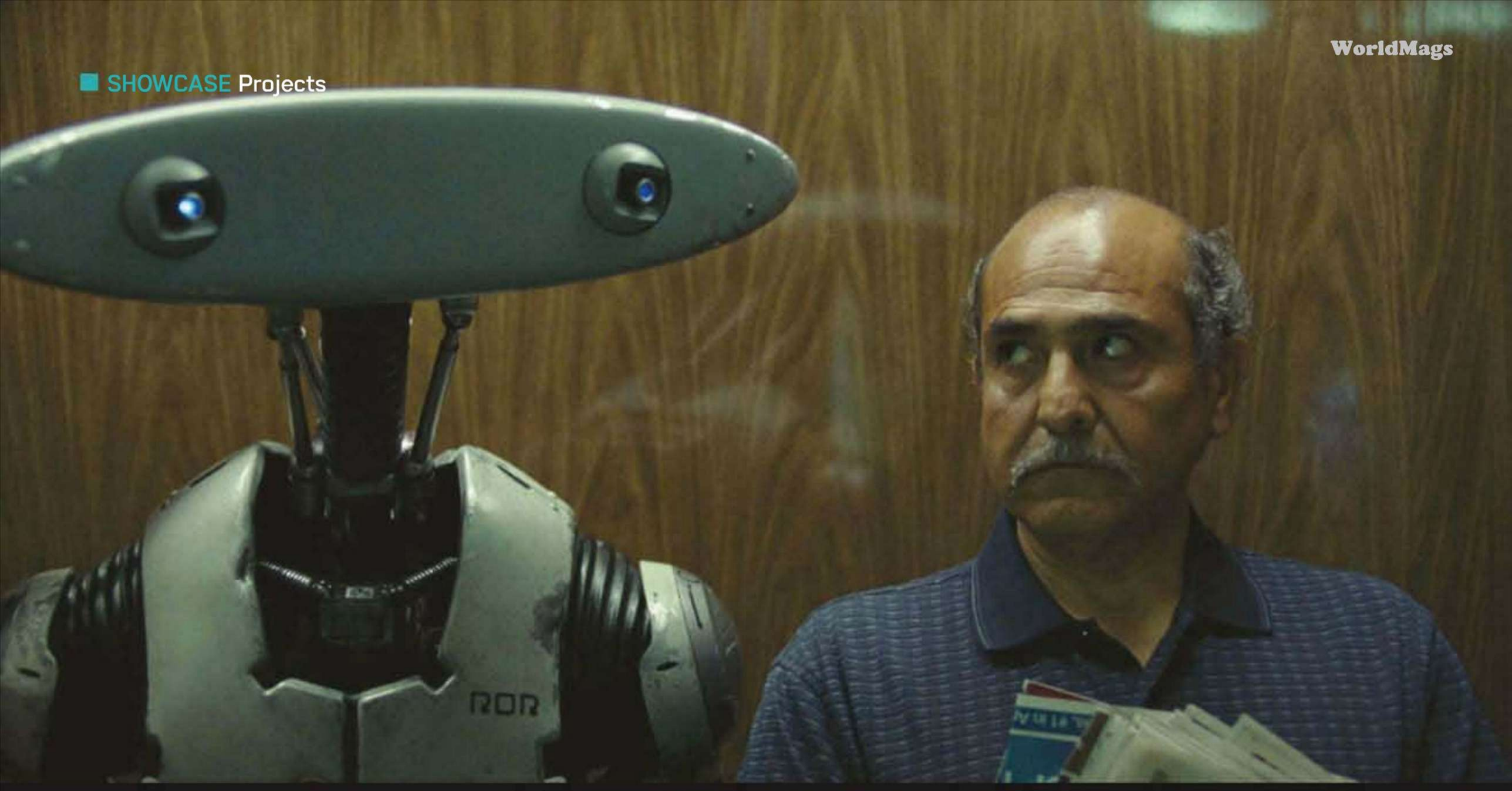
With the opening of this five-star beach destination resort next summer, the western coast of Turkey looks like the place to holiday in 2012. Global architecture firm Leo A Daly was responsible for the master planning, complete programming and fully developed concept architectural design for the Aegean Breeze project.

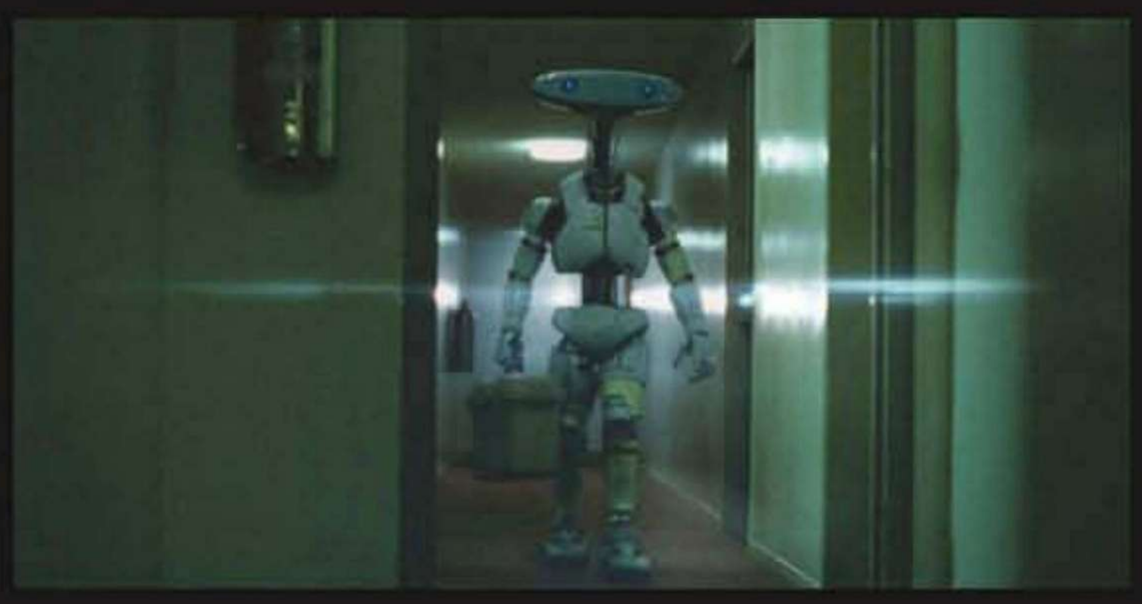
Architects at Leo A Daly used Rhino, SketchUp and 3ds Max to complete the designs, with SketchUp proving vital in enabling the quick exploration and study of multiple design concepts and options. Senior architect and senior associate of Leo A Daly's Washington office, John Barbara, explains: "The most impressive technical feat on this assignment was the development of the cantilevered Teflon-coated canvas roofs, which create the iconic architectural gesture that defines the project. The designs for these flowing forms were achieved by modelling them in Rhino and importing the models back into SketchUp, before completing final rendering in 3ds Max."

leoadaly.com

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Project: Carl's Jr 'Robot'
Studio: Eight VFX

If machines can't eat it, machines shouldn't make it. That's the headline of the new Carl's Jr spot by California-based creative agency David&Goliath. The robot it features comes home from a hard day's work at the office to enjoy his recently purchased Carl's Jr chicken sandwich. Unfortunately, without a mouth he's unable to eat it and slapstick humour takes over as the robot repeatedly mashes the food in his face in a frenzied rage.

Creating the spot required two visual effects houses: Eight VFX for the digital work and Legacy Effects for the practical robot. The team at Eight VFX used the photogrammetry tool Enwaii to create a CG version of the robot, which enabled them to replace the actor's elbows, neck, stomach, legs and knees. "The most impressive technical aspect of this project was being able to create an accurate reconstruction of the robot, achieved through photogrammetry," explains VFX supervisor Fred Hoppe.

eightvfx.com



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Project: Campari 'Welcome to Giulia'
Studio: Motion Theory

A young woman's day dramatically comes to life in this spot for Camparisoda. It transports the main character, Giulia, into a daydream world that takes her on a series of adventures. The concept was developed by Motion Theory, who also handled the direction of the live action. Sister company Mirada was responsible for post-production, visual effects and editing. This spot needed it all: 3D CG in Houdini and Maya, rendering in PBR and mental ray, tracking and matchmoving in SynthEyes, textures and matte painting in Photoshop, and rotoscoping in Silhouette.

The main challenge was creating the mirror scene, where Giulia jumps from one situation to another. VFX supervisor Jonah Hall explains: "There were so many variables in regards to weather, ground slope, film speed, bloop frames and so on that it was really amazing we were able to get it all to work. The entire second half of the scene had to be reconstructed and spun around in Houdini using elaborate camera blending and plate projections. It was a lot of work, but we're really proud of the results."

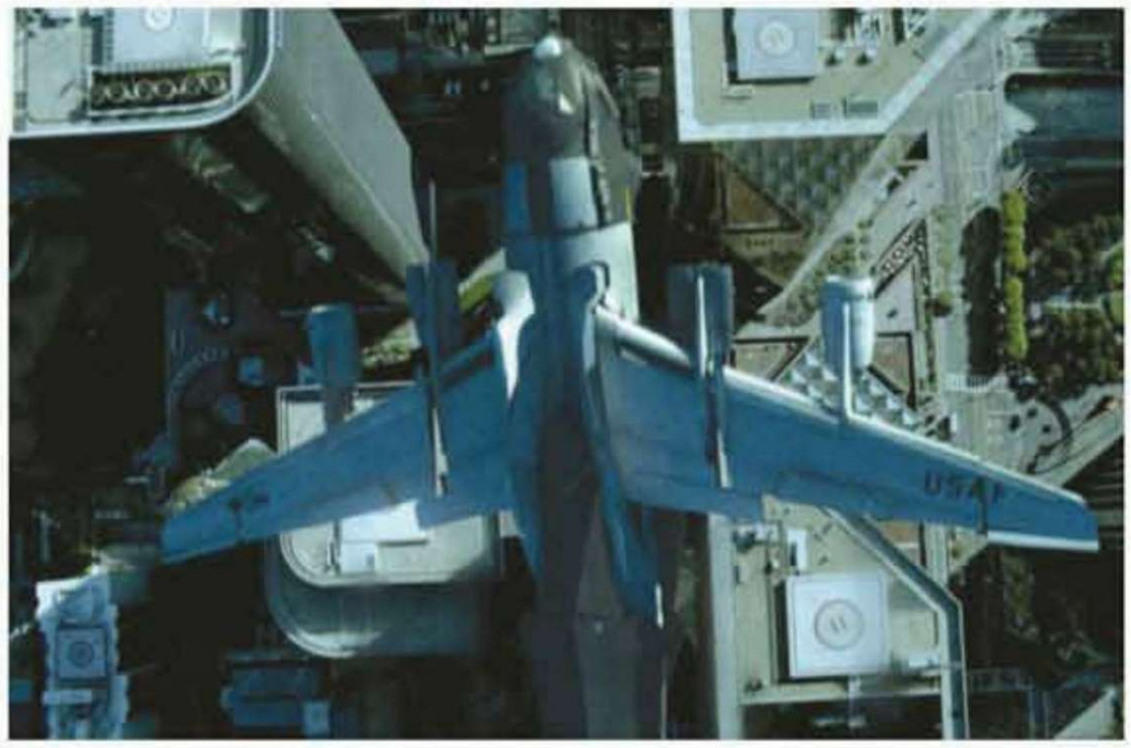
motiontheory.com

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Project: US Air Force 'Medevac'
Studio: MassMarket

The latest spot for the US Air Force is set in a post-apocalyptic future and follows airmen into a city to rescue some civilians from certain death at the precipice of a collapsing bridge. Using plates of downtown LA, the team at VFX boutique MassMarket created a post-disaster environment with a variety of smoke and cloud effects. They then worked with MJZ director Phil Joanou and advertising agency GSD&M to create a futuristic aircraft that turns into a modern-day C17 in the dramatic climax.

Software used included Maya, mental ray, boujou and Nuke. "We collapsed the 6th Street Bridge in downtown LA in CG," says CG lead Chris Sage. "We used a combination of hand animation, to be able to art-direct the larger sections of the collapse, and rigid body dynamics to create the smaller debris pieces that crumbled away. We also used Maya fluids to create dust and debris trails that would come off of the breaking pieces of roadway."

massmarket.tv







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Project: Samsung 'Unleash Your Fingers'
Studio: Motionfanclub

Samsung brought finger-tutting phenomenon JayFunk from LA to Paris to deliver the incredible choreography in this new spot for its Galaxy SII model. In charge of special effects and artistic direction was creative agency Motionfanclub. Maya was chosen for the 3D animation, particles and paint effects, with After Effects used for 2D composition. The most challenging part of the project was creating a climax with the effects in such a short space of time.

The spot starts out using lines, which turn into geometrical shapes, and ends with objects such as butterflies. Creative director Vincent Kherroubi says: "The spot combined a lot of techniques; tracking and animation, Paint Effects for the wings and particles for the smoke. The little glow at each intersection was a very important part of the look, for which we had to export a special layer in 3D with little points to add glow in 2D compositing. It was a real experience for us because we took care of a huge amount of the production. We're really happy with the final film."

motionfanclub.fr

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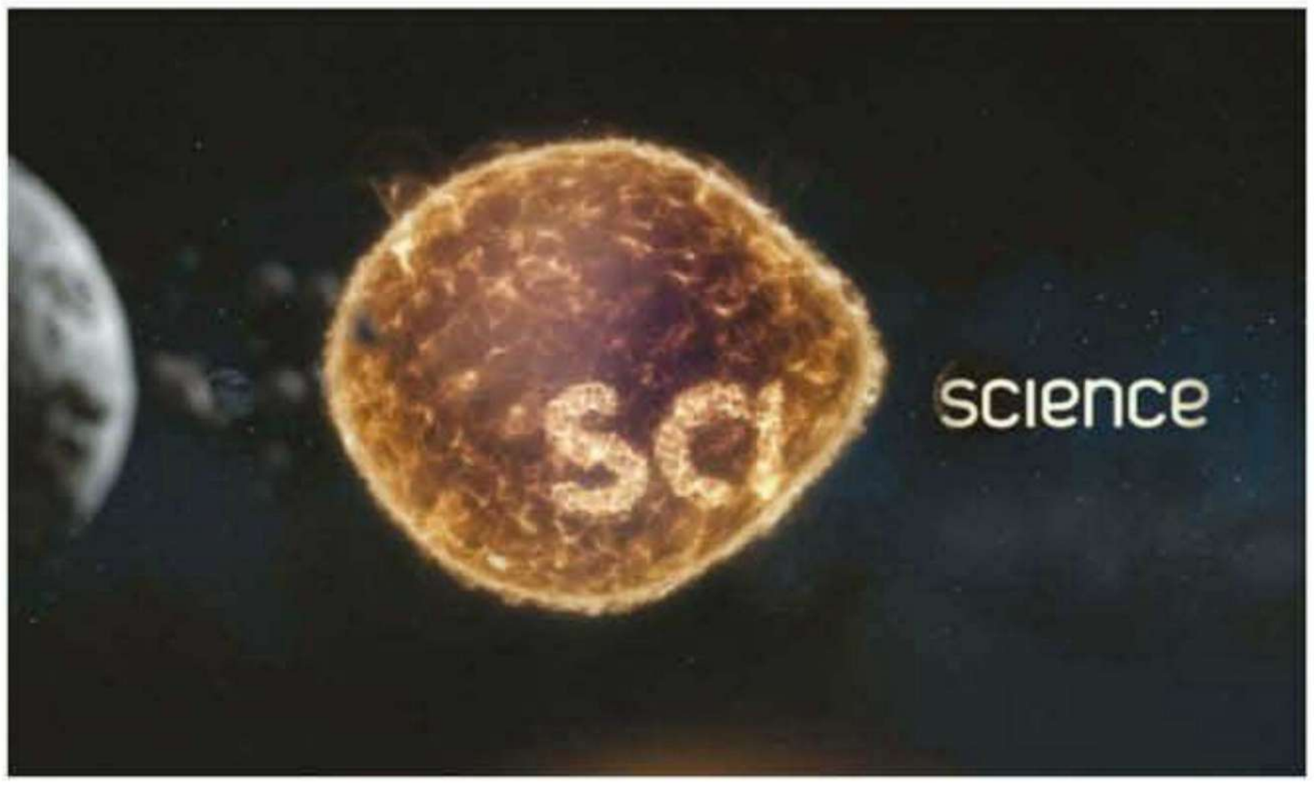
Project: Science Rebrand
Studio: Imaginary Forces

The recent rebrand of the Science Channel saw the creation of an egg-shaped graphic mark, aptly named Morph, which has become synonymous with the well-known TV station. The logo, designed by Discovery, has now been taken a step further and made into a character by creative studio Imaginary Forces.

The idea was for Morph to take on many different looks and represent the channel's scope of programming genres, from sci-fi entertainment to science documentaries. Responsible for the concept, designs and animations of Morph's identities, the Imaginary Forces team used Cinema 4D to create the complex animations. "Cinema 4D is the best 3D package out there," explains art director Ronnie Koff. "It allows designers to work in a 3D environment in an intuitive and fast way.

"Being able to create unique procedural displacement animations made it possible to do a very complex animation, and not have to model it from the ground up."

imaginaryforces.com





Submit a project

If you would like to see your studio's work featured in these pages, email us at the address below, including brief technical details and at least three print-resolution stills. Please note that we can only feature commercial projects released to the public within the last few months.

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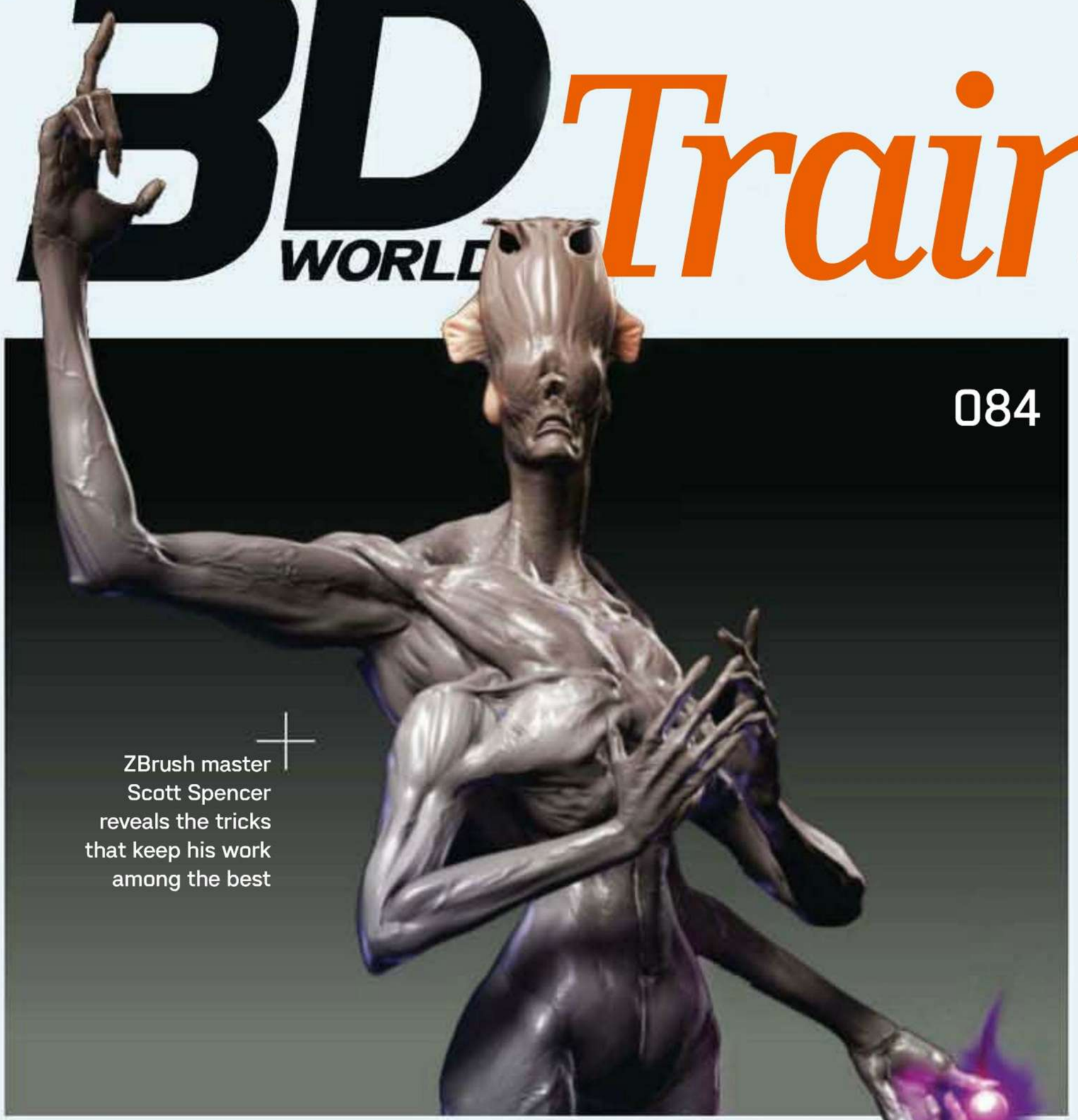
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3D WORLD Training



ZBrush master Scott Spencer reveals the tricks that keep his work among the best

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Our expert panel tackles queries for 3ds Max, After Effects, Blender and more







Everything you need for our tutorials



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Over 45 minutes of video training with our Maya and Fundamentals tutorials
Disc contents: see page 112

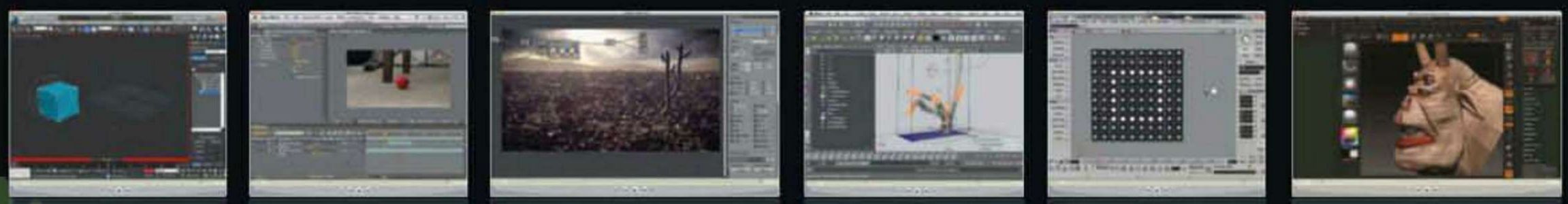


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Step-by-Step Maya VFX

FOR
Maya 2012

TIME TAKEN
One hour

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- Creating fluid containers
- Using presets as a starting point
- Creating collision surfaces
- Designing a water material

ON THE DISC
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Create a fluid simulation with Maya

Eric Keller explains how to use Maya's fluid dynamic tools to create a realistic water fountain effect without extra plug-ins

In the past, Maya fluids were great for creating clouds, flames and gaseous effects. Now, making sloshing liquids, dripping taps and fountain effects is also easy, because Maya 2012 enables you to easily create the look and behaviour of realistic liquids through additions to the existing fluid simulation system. If you've used Maya's fluid system before, you'll find these new features have been integrated seamlessly. If you've never played with Maya fluids before, now is the perfect time to, ahem, get your feet wet.

In this edition, Maya adds two simulation methods that allow for more realistic liquids. These are found as options in the Attribute Editor for the fluid's shape node: look for the Liquid Method setting under the Liquids rollout to choose between them. The Liquid and Air method considers which parts of the fluid container are water and which are air, based on the density of the fluid. This works well for creating the effect of a fluid shape moving within a volume. The Density Based Mass method varies the mass of the fluid within the volume based on density, which is great for simulating two different types of fluids interacting with each other, like oil and water. In this tutorial, you'll use the Liquid and Air method via a preset.

In this tutorial, you'll use Maya fluids to create the water coming out of the lion's head and into the stone bowl. I've designed the tutorial to get you up and running with Maya fluids quickly. Once you grasp the basic concepts, you'll find that you can easily apply them to your own effects.

Fluid simulations generally take time and processing power to calculate. It's possible to create highly realistic liquid behaviour using Maya, but at the cost of more processing and rendering time. For this reason, I'm keeping the effect in this tutorial fairly simple. The files accompanying this tutorial include the project folder you need to follow the steps.



36 minutes of video on the disc

WATCH THE VIDEO TUTORIAL

Follow Eric Keller's complete workflow for this project and pick up more great techniques with the video on the disc. See page 112 for your complete disc contents



About the author
Eric Keller is a freelance animator working in Hollywood. He creates animations for both the entertainment industry and the science community. He has written books covering both Maya and ZBrush and is an instructor at the Gnomon School of Visual Effects
bloopatone.com

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Eric Keller's animation is created entirely in Maya 2012

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01 Set up the scene

Copy the fountain project folder provided in the tutorial files to your hard disk. In Maya 2012, set the current project to fountain via File > Set Project. Choose File > Open Scene and select fountainStart .mb: the scene contains the model of the stone fountain in front of a simple wall, as well as some plants created by converting Paint Effects strokes to polygons. In the Outliner, select the Plants group and choose Display > Hide > Hide Selection to hide the group containing the Plants geometry.

02 Add a container

Switch to the Dynamics menu set and choose Fluid Effects > Create 3D Container.
A container appears at the centre of the grid. Select the fluid1 node in the Outliner and rename it **water**. You don't have to move or scale the fluid container at this point. Since the fluid will be set to automatically resize as the simulation calculates, the actual container can just remain at the centre of the grid.

03 Choose a preset

I like to start designing my own fluids by using one of Maya's presets. This cuts down on the guesswork, and many of the presets come with helpful notes, which appear in the Notes section of the Attribute Editor. Select the water fluid node you've created and open the Attribute Editor's waterShape tab. Click the Presets button and choose basicLiquid > Replace.

04 Add a fluid emitter

Now you need to add an emitter. Select water and choose Fluid Effects > Add/Edit Contents > Emitter. Select fluidEmitter1 and open its Attribute Editor. Under Basic Emitter Attributes, set Emitter Type to Volume and Rate (Percent) to 100. Under Fluid Attributes, set Density Method to Replace, Density/Voxel/Sec to 2 and Fluid Dropoff to 0. Under Emission Speed Attributes, set Speed Method to Replace and Along Axis to 180. Under Volume Emitter Attributes, set Volume Shape to Cylinder.

05 Position the emitter

Select the Emitter, and use the Scale, Move and Rotate controls to position the emitter so that it sits inside the lion's head and is pointing downward towards the stone bowl. The arrow that points out of the emitter indicates the direction in which the fluid will leave the emitter.

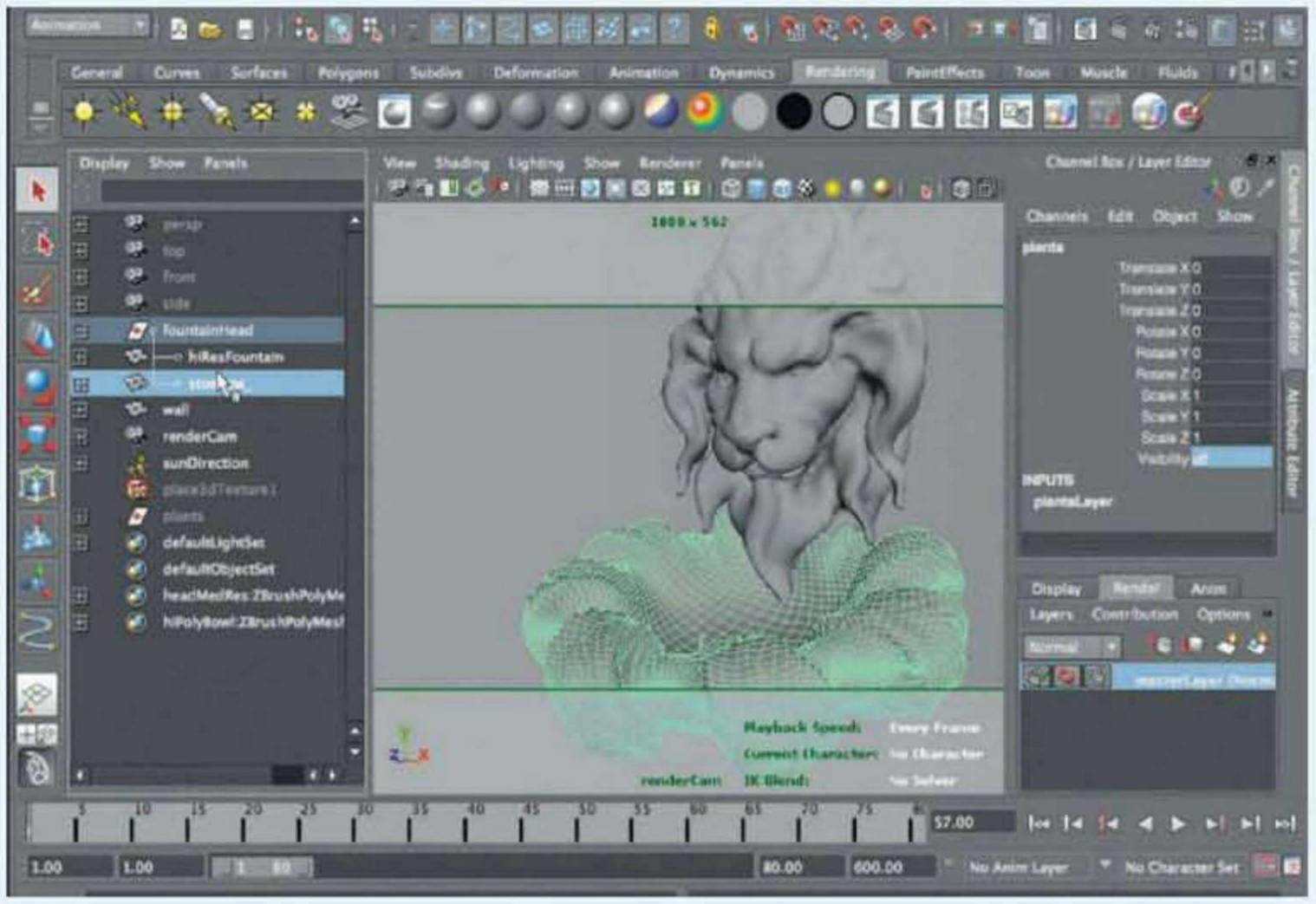
06 Set up object collisions

Select the hiResFountain geometry found in the fountainHead group node and [Shift]-select the waterShape node so both items are highlighted. Choose Fluid Effects > Make Collide. Do the same with stoneBowl and waterShape.

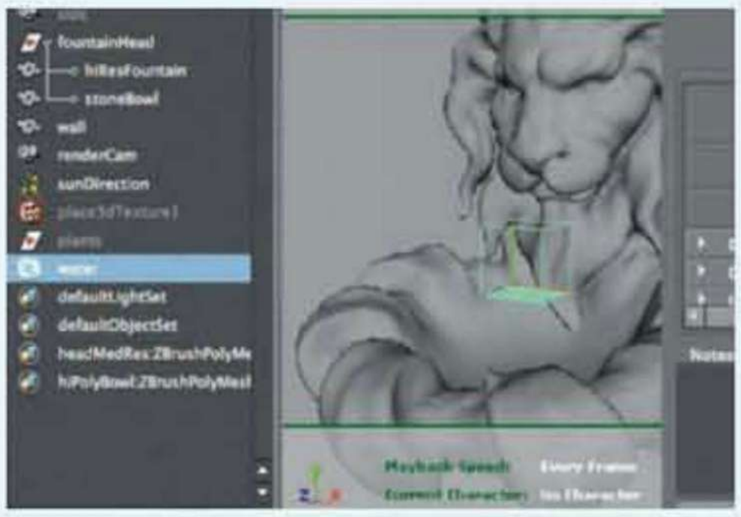
07 Test the basic set-up

Set the timeline length to 25. Rewind and play the scene. You should see the fluid surface start to pour out of the mouth of the stone lion. Notice that the 3D cube that indicates the fluid expands in size as the fluid surface moves through the scene. The fluid is set to automatically adjust its size to accommodate the simulation.

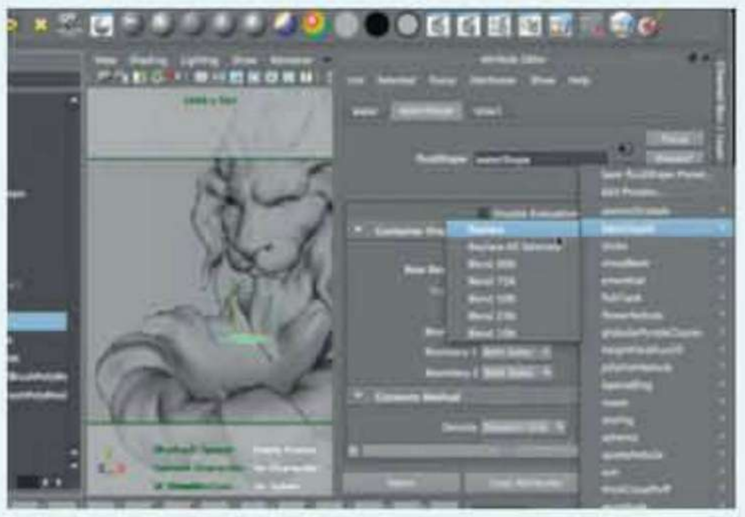
This option was enabled as part of the basicLiquid fluid preset you chose in step 3. This preset is a great place to start, but you have the ability to adjust the



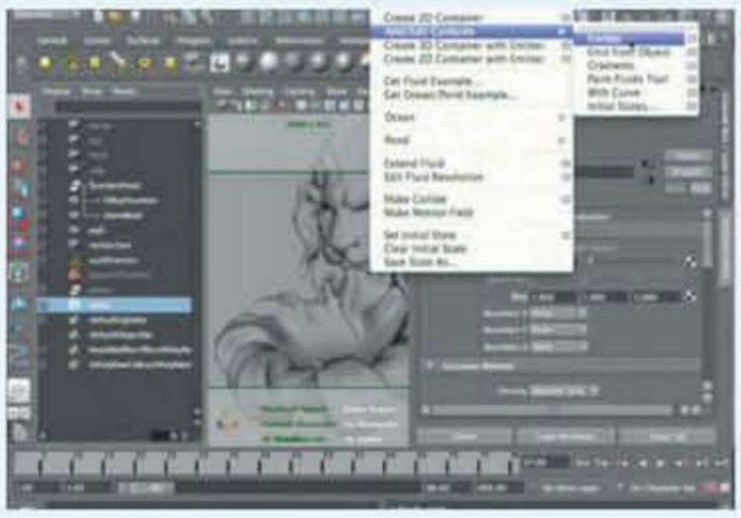
01 The initial scene for this tutorial is provided in the accompanying scene files: the geometry of the lion-shaped fountain head and the stone bowl is already set up for your use



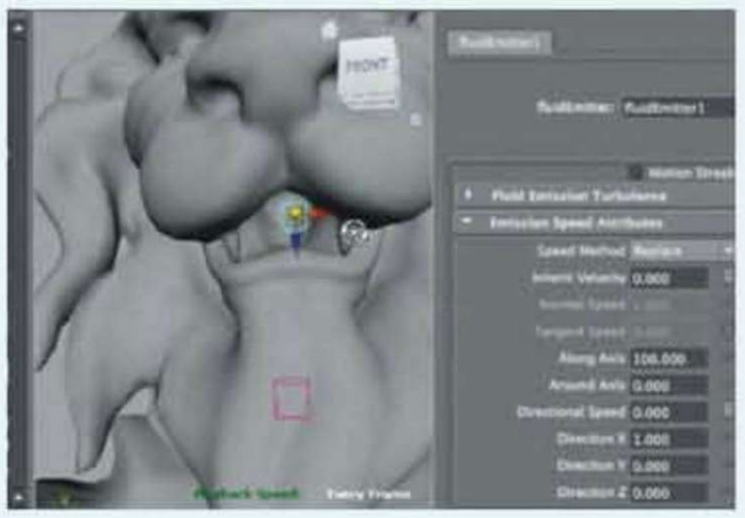
02 The initial fluid container can just remain where it appears as you create it



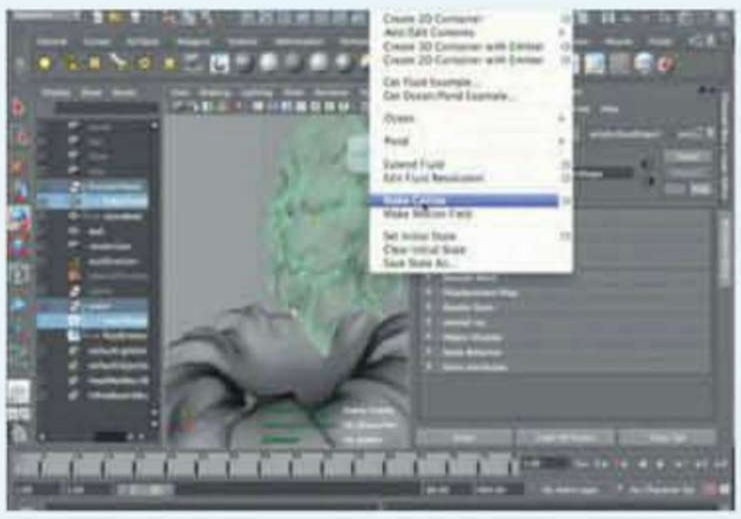
03 Selecting one of Maya's presets gives you a decent foundation to customise from



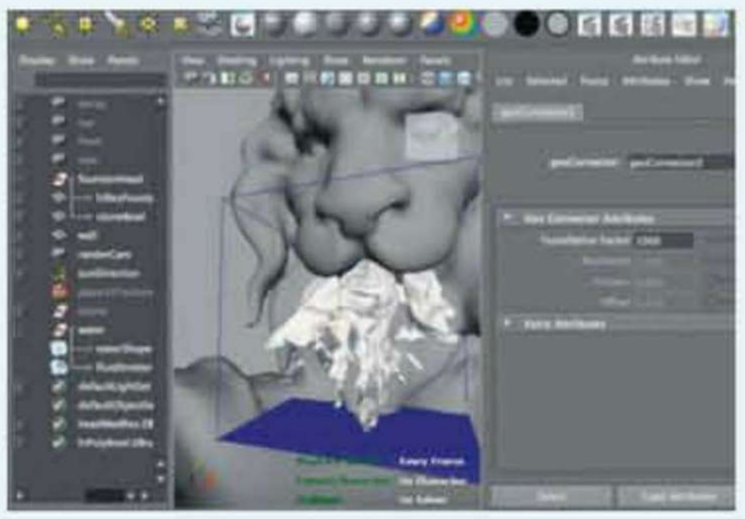
04 The second component in your simulation is a fluid emitter, the source of the water stream



05 Position the emitter inside the lion's mouth; make sure it's pointing out of the mouth



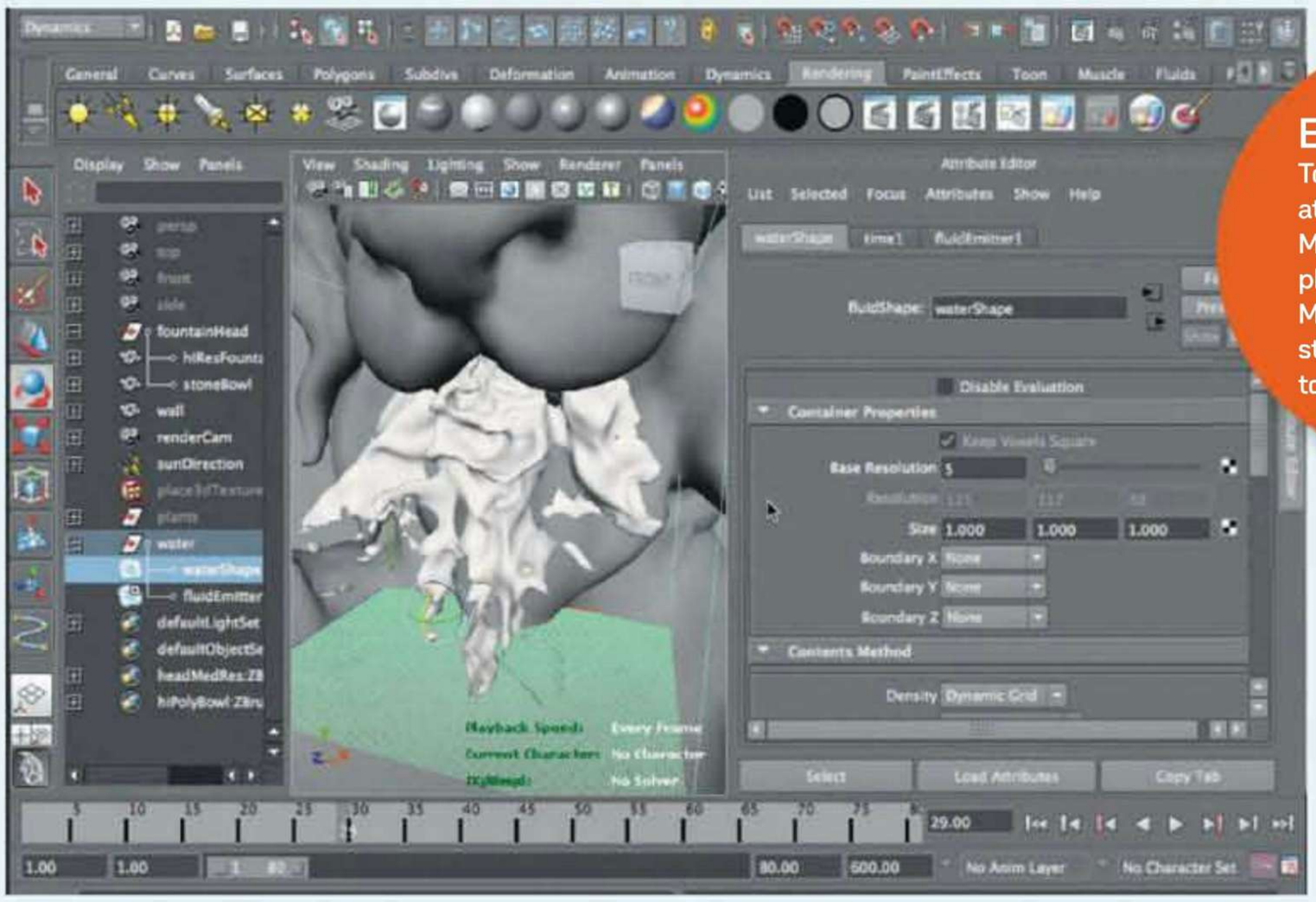
06 Object collisions ensure that the geometry behaves like a solid object against the water



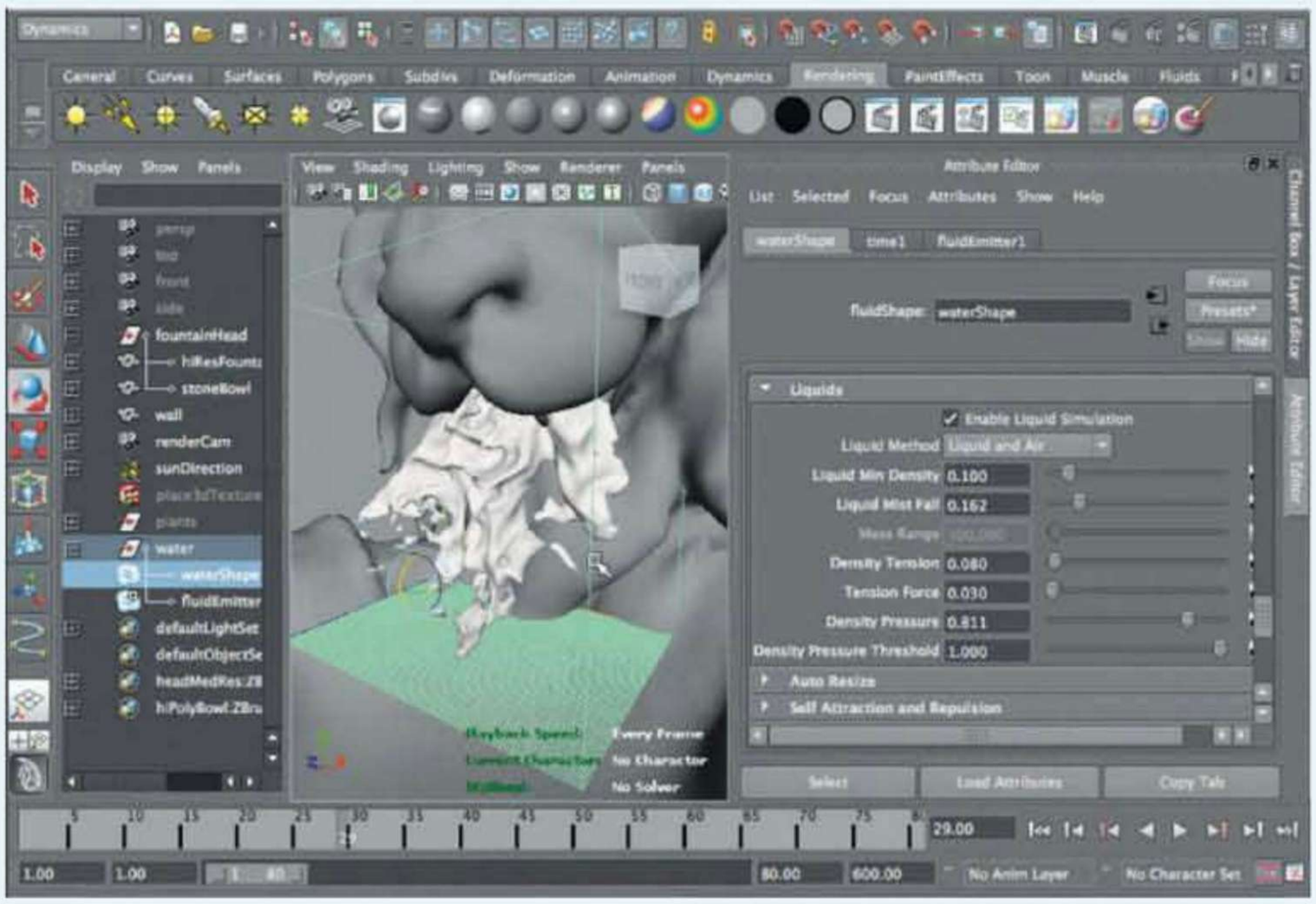
07 Test the basic simulation. If you used a preset, the fluid container cube should expand automatically

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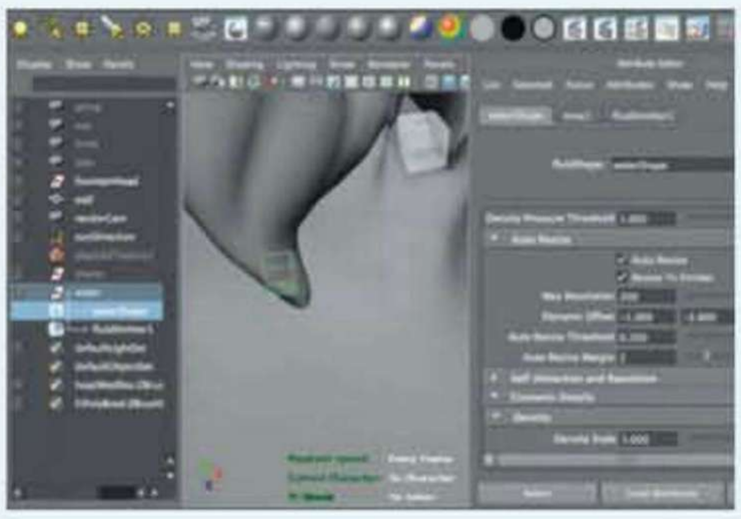
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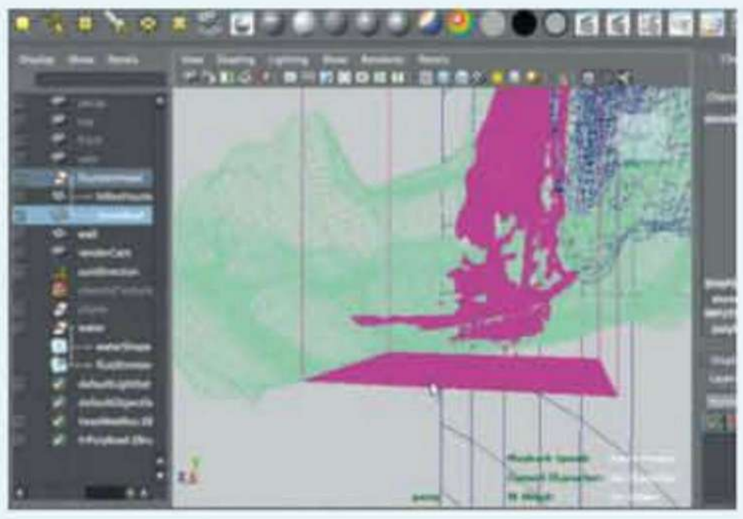
08 Tuning the simulation begins with the waterShape node. Adjust Basic Resolution downwards while you experiment with other settings: this will save you a great deal of test simulation time



09 The Liquids rollout in the waterShape node Attributes helps you control the fluid behaviour, including the degree to which it can remain cohesive and the size of blobs that are able to break away



10 Once the fluid container goes beyond your camera frame, there's no need to let it keep growing



11 If some water is leaking through the bowl, adjust the fluid container to compensate

Expert tip

To stop the playback at any time, press [Esc]. Most likely the scene playback will be slow, and Maya can sometimes be stubborn when you try to use the Stop button

waterShape node to make the fluid look more like a stream of water.

08 Adjust the fluid container

Select the waterShape node and open its Attribute Editor. Base Resolution is an important setting that determines the amount of detail that will be seen in the fluid effect. It's tempting to crank this up at the outset, but higher settings will take longer to calculate. While testing the settings of the fluid, it's best to leave this at 5. Set Damp to 0.01 to help stabilise the simulation.

09 Liquid settings

The Liquids section in the waterShape node's attribute editor is new to Maya 2012. Thanks to your use of the preset, Liquid Method is already set to Liquid and Air. Under Liquids, set Min Density to 0.1. In this simulation, a high Min Density setting can cause little blobs of fluid to float away from the stream. Set Density Tension to 3 and Tension Force to 1.5. This creates surface tension in the fluid; higher values make the fluid behave more like a more cohesive surface.

10 Manage the container size

The Auto Resize settings determine how the fluid grid will update as the simulation calculates. Max Resolution is the most important setting in this section. As the fluid plays, the resolution increases as the surface expands in the scene. Once the Max Resolution value is achieved, the fluid box stops growing and the edges of the fluid are cut off.

You can increase the efficiency of the scene by keeping this value low: just make sure that the cut-offs of the fluid edges are not in view of the camera. In this case, try setting Max Resolution to 200. Keep in mind that you may need to revisit this setting later on as you continue to design the look of your fluid simulation.

11 Make the bowl watertight

Create a playblast of the scene from the renderCam camera. You'll notice that the playback is pretty slow and you may also notice that the water seeps through the stone bowl. Here's a simple trick you can use to help fix these problems. In the Auto Resize rollout of the waterShape Attribute Editor, turn off Resize Closed Boundaries. Then scroll up to the top of the Attribute Editor: under Container Properties, set Boundary Y to -Y. This means that the fluid will collide with the bottom of the fluid container. It also means you will need to make some adjustments to ensure that the bottom of the fluid container is aligned with the stone bowl. »

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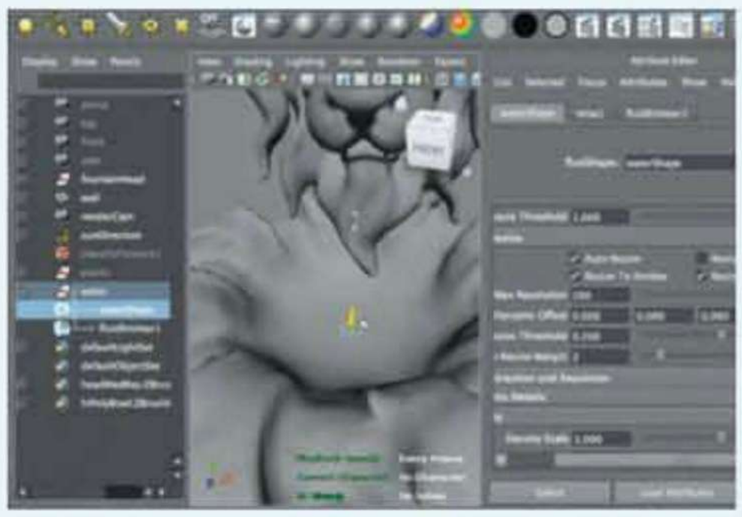
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12 Align the water and bowl

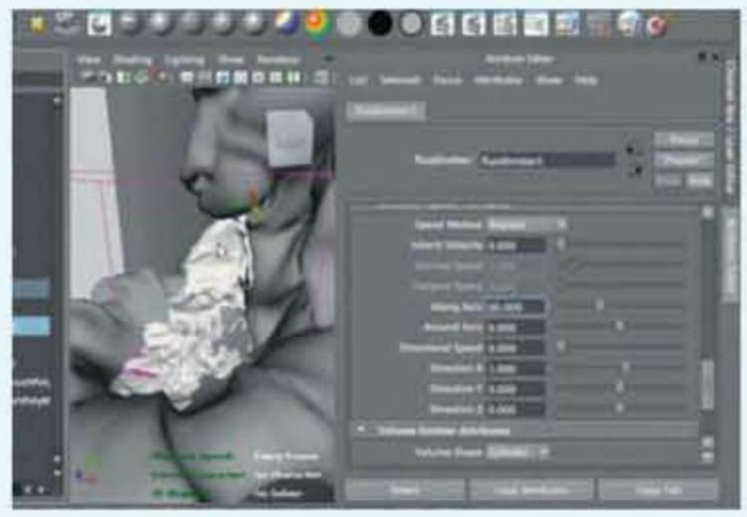
Select the waterShape node in the water group and move it down so that it is aligned with the surface of the stoneBowl object. Make sure you don't move the emitter, otherwise the water will not exit the lion's mouth correctly.

13 Fine-tuning

Create a playblast of the scene. To fine-tune the effect, some settings may need to be readjusted. In the Attribute Editor for the fluidEmitter1 node, set Density/Voxel/Sec in the Fluid Attributes rollout to 1. In the Emission Speed Attributes, set Along Axis to 60.



12 Move the waterShape node – not the entire emitter – from the mouth to the bowl area



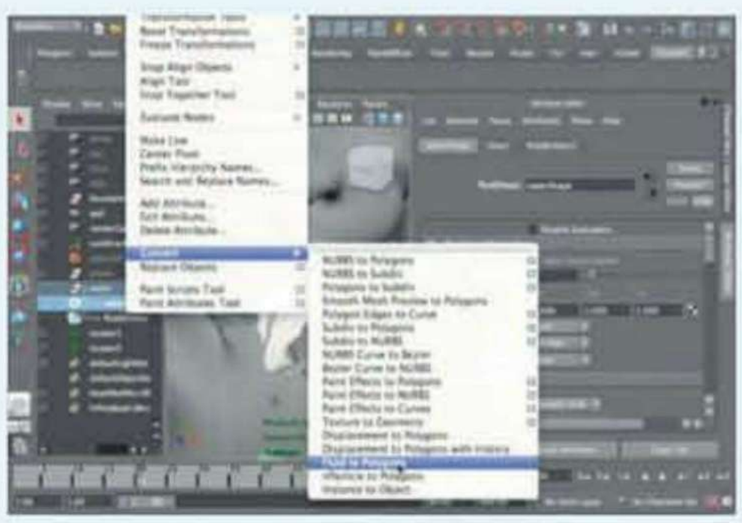
13 Finish the fluid simulation stage with some fine-tuning of the water's speed and direction

14 Convert the fluid to a mesh

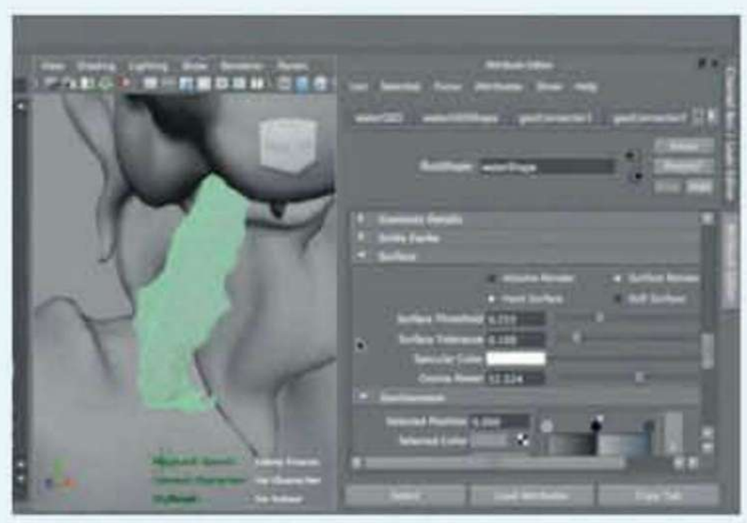
In most situations, you'll want to render the fluid using mental ray so that you can use realistic shaders and rendering techniques. To do this, you'll need to convert the fluid into a polygon mesh. Select the water node and choose Modify > Convert > Fluid to Polygons. The water will become a mesh. As a result, the waterShape node disappears from the Outliner, but you can still access the settings and modify the water by selecting the new polySurface1 node and opening its Attribute Editor to the waterShape tab.

15 Edit the mesh

Select polySurface1 and rename it as **waterGEO**. In the waterShape tab of the Attribute Editor, expand the OutputMesh rollout and set Mesh Smoothing Iterations to 1. You can also adjust Mesh Method and Mesh Resolution to change how the water surface is converted to polygons, although I'm sticking to the default settings. Expand the Surface rollout and set Surface Threshold to 0.255. This helps reduce the detail in the water mesh.



14 To render the fluid using appropriate shaders, you need to convert it to polygons



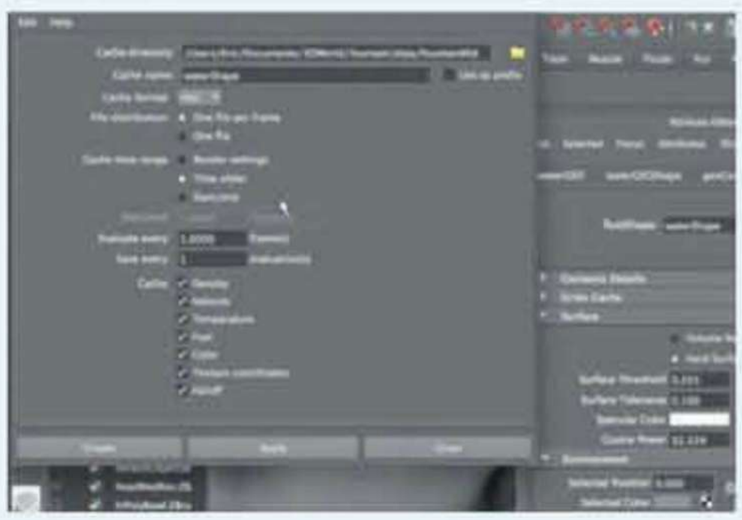
15 The conversion settings help you find a balance between realism and CPU-draining fine detail

16 Create a fluid cache

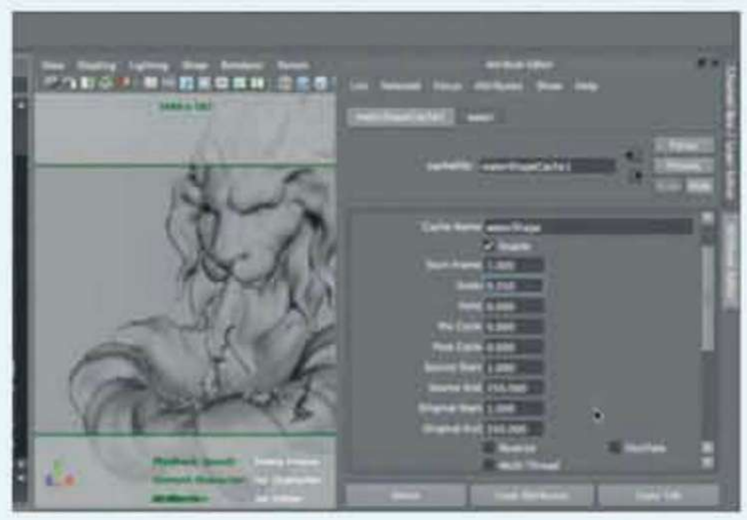
It's always a good idea to create a fluid cache before rendering: this ensures that the effect in the render matches the effect you've worked to create. You can also alter the playback speed of the water after creating the cache, making the liquid appear to move faster if needed. It also cuts down on the render time significantly, even though creating a cache can itself take several hours.

Set the Time Slider to 250 frames. You want to cache more frames than will appear in the final animation so that you can speed up the playback after the cache is complete. Also be aware that the cache file itself can be quite large, sometimes 20GB or more! So make sure you have plenty of free space on your hard drive.

Choose Fluid Cache > Create New Cache > Options. In this dialog, you can set the directory where the cache will reside. If you plan to render on a network, make sure that all render nodes have access to the cache directory. Set Cache Time Range to Time Slider.



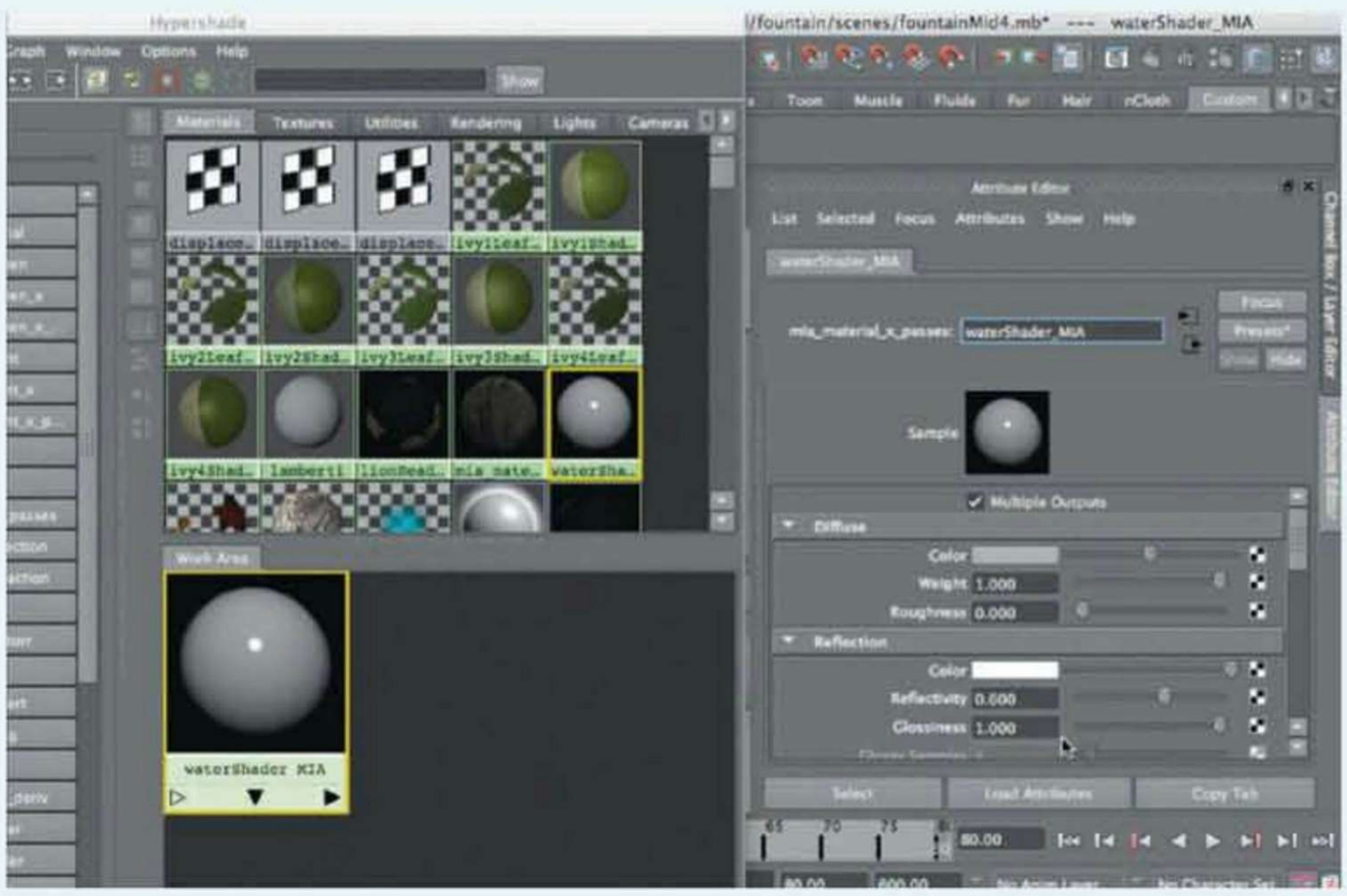
16 Even though creating a fluid cache can take time, it's likely to cut your overall rendering time



17 Once you have a fluid cache, speed up to make the fluid behave more like water

17 Speed up the effect

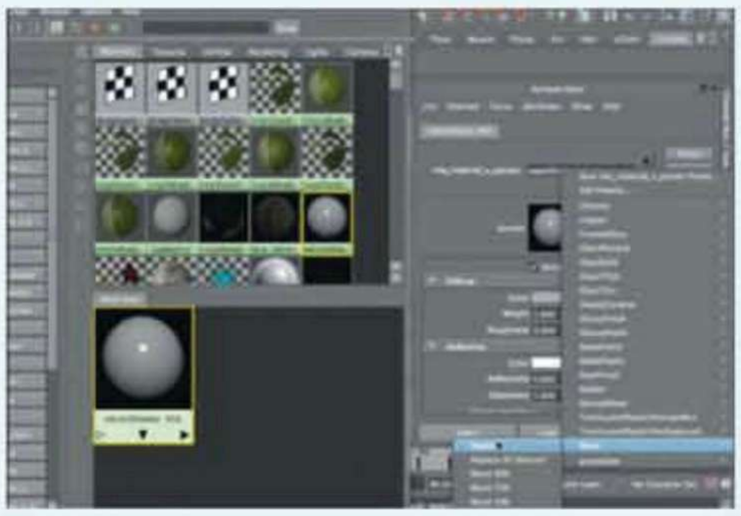
Once the cache is complete, select the waterShapeCache node and open its Attribute Editor. In the waterShapeCache1 tab, set Scale to 0.35. This means that the water will move faster because the amount of time the cache has to play has been reduced. Set the Time Slider to 80 frames and create a playblast.



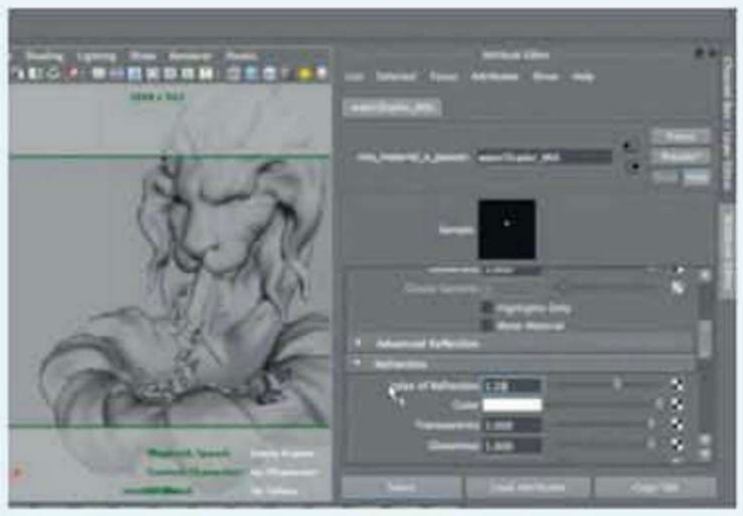
18 The mental ray architectural material mia_material_x_passes is the foundation for your water material shader; select it and rename it via the Hypershade's material-editing environment

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19 Assigning the material requires access to both the Hypershade and the Attribute Editor



20 Using the substance's real-world refraction index helps to make the material look realistic

18 Create a water material

Now that you've created the mesh, you're ready to render it. I tend to use the mental ray architectural materials (labelled in Maya as mia shaders) for almost everything: they work well with render layers, and the shaders have presets that provide a good starting place for your own shaders.

Open the Hypershade and expand the Materials section. Under the mental ray materials, open the materials list and click mia_material_x_passes. This will create a brand-new material: select it and rename it as **waterShader_MIA**.

19 Assign the material

Keep the Hypershade window open. In the Outliner, select waterMesh. In the Hypershade, right-click over waterShader and choose Assign Material to Selected. Open the Attribute Editor for waterShader. Click the Presets button in the upper right and choose Water > Replace.

20 Make it look like water

The Water preset for the mia shader is bright green and doesn't look much like water, but you can easily fix that. The next steps will take you through the basics of creating a decent water shader. First, set Reflectivity and Glossiness to 1 so that the material is nice and shiny. The Index of Refraction for water is 1.33. For this scene, however, I found that a setting of 1.28 worked better; this is purely an artistic choice on my part. Set Transparency color to white and the Transparency value and glossiness to 1 so that the water is completely transparent.

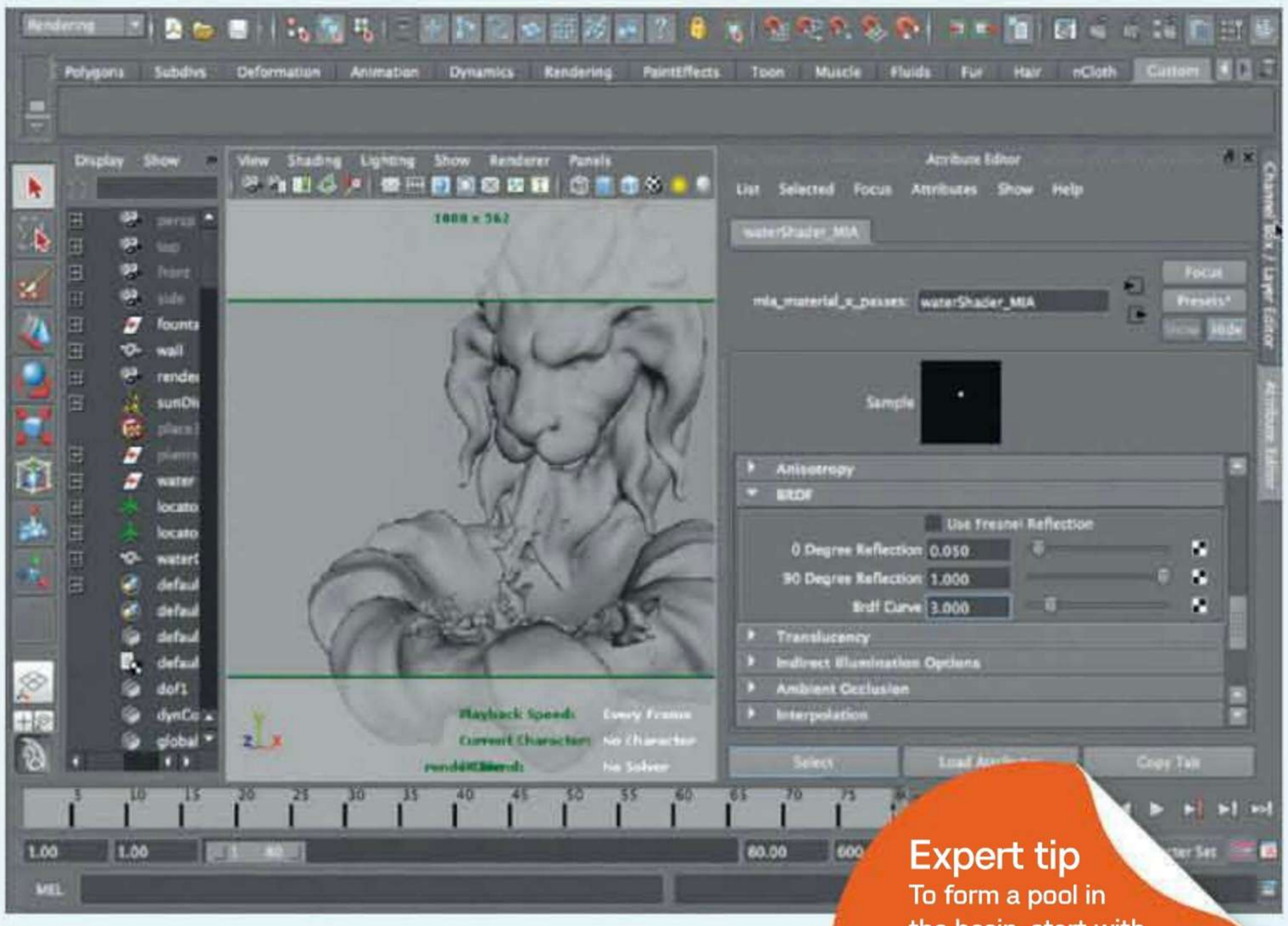
21 Adjust the reflectivity

The most important settings for creating convincing water are found in the BRDF rollout. They determine how reflections are calculated based on the facing ratio of the water surface to the camera. Turn off Fresnel and set 0 Degree Reflection to 0.05 and 90 Degree Reflection to 1. The Brdf Curve setting determines how the reflectivity transitions between 0 and 90 degrees. Adjusting this value has a huge impact on the look of the water. After some experimentation, I found a setting of 3 makes a nice-looking water surface.

22 Finishing touches

Play the scene for about 80 frames and select the Plant group in the Outliner. Unhide the Plants group and create a test render in the Render View window from the renderCam camera. Hyper-real water effects are ultimately achieved through compositing and a motion blur certainly helps, but I think for a good start, the mia shader with these settings will work just fine.

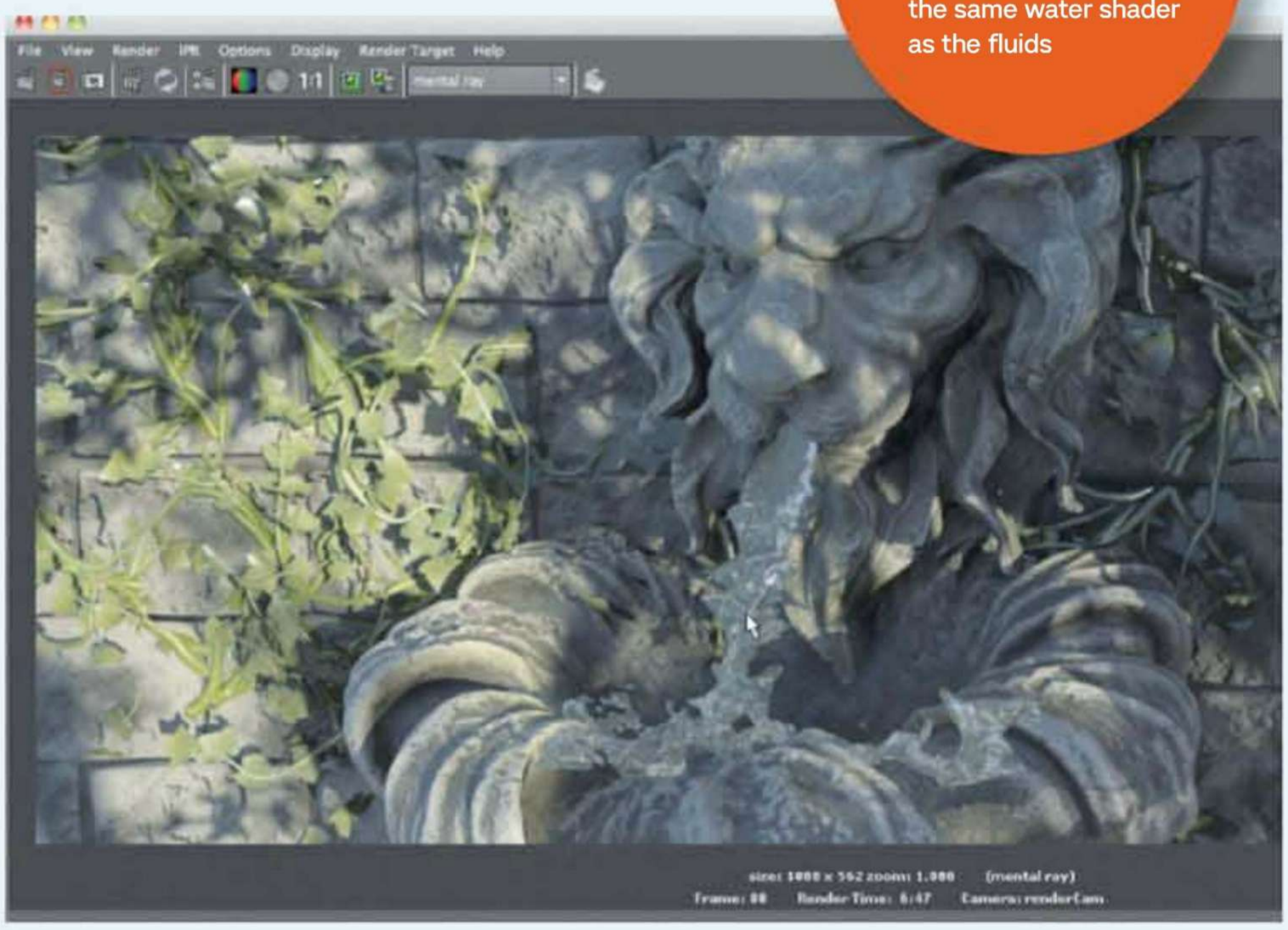
Provided with the tutorial files, the final scene uses Physical Sun and Sky, as well as custom shaders I created for the fountain. And there you go! Fluids are pretty easy to set up. The trick is all about tuning the effect to get the look you want. ■



21 The BRDF rollout helps you control how your water material reflects the surfaces surrounding it

Expert tip

To form a pool in the basin, start with Fluid Effects > Pond > Create Pond, and apply the same water shader as the fluids



22 The result is a convincing fluid simulation without plug-ins, although some work with compositing and motion blur will help you refine the effect to achieve an even better result

View the final animation

Get Eric's animation with the scene files on the 3D World website 3dworldmag.com/147



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Expert Tips ZBrush Sculpting

FOR
ZBrush 3.5 and 4

ALSO REQUIRED
Multi Map Exporter, Transpose Master and SubTool Master (all free at pixologic.com/zbrush/downloadcenter/zplugins)

TOPICS COVERED
- Preparation
- Sculpting form
- Best practice for layers
- Alphas and displacement
- Exporting maps

Monster-size sculpting tips

Mathew Cooling from Jellyfish Pictures shares his workflow for modelling the creatures from the stunning new BBC TV series Planet Dinosaur

Creating dinosaurs for a TV series can be a tricky process. In my experience, deadlines are tight and most of the time you only have one shot at getting the creatures right. But with some basic planning and forethought, you can focus on creating the creatures – knowing that they will fulfil all the necessary requirements – and facilitating any changes that may be required.

At Jellyfish Pictures, while working on Planet Dinosaur, it was decided that the theropods (I sculpted 27 of them) should have scaly skin, which can be time-consuming. So I planned a quick and simple character pipeline that would ensure consistent style across all the characters and enable artists to follow the same style.

This is an overview of the settings, brushes and steps we used to create the dinosaurs. I hope you can find something that will be of use to you.

ZBrush has been designed with creativity at its heart. Unlike a lot of 3D packages, ZBrush's workflow is not linear and is open to how you want to go about creating something. There are general guidelines but you're free to think of new ways to use the tools at hand. Experiment and try what comes to mind. Just as no single person will create something in the same way as another, knowledge and technique constantly evolves.

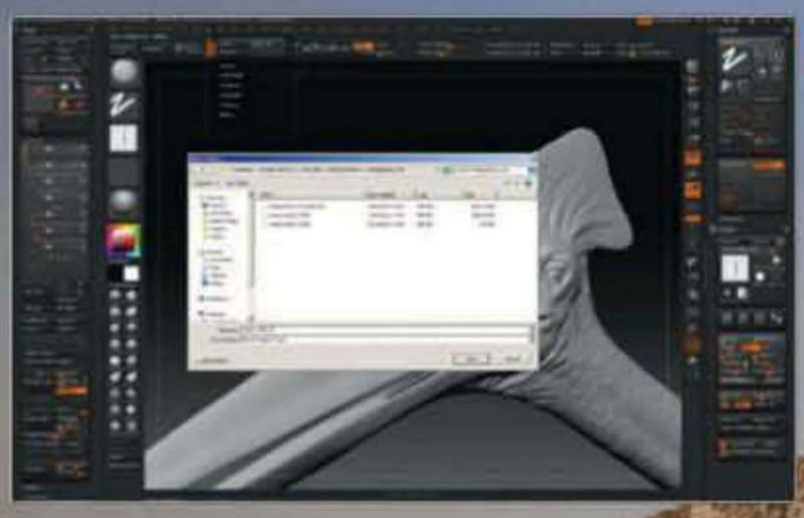


Complex models may overtax your system resources

01 Know your system

The Windows version of ZBrush is a 32-bit application, which means it can use a maximum of 4GB of memory (and some of that is saved for system operations). To see how that can affect you in practice, create a file and subdivide it as many times as you can, then add layers with PolyPaint, sculpted detail and mask information. Now save the file and see what size it is. From my experience, if it's over a gigabyte in size, your system may have some issues opening it. (This will vary from computer to computer.)

Even if your workstation can handle the overall file size or the amount of polygons that a SubTool has, it may still have issues generating an adaptive displacement or bump map. If this occurs, you may have to create non-adaptive maps, which may not be as accurate or clean. There is another way around this, though, which I will cover in tip 6.



Saving your work as a ZProject has benefits, but make sure you weed out unwanted items

02 ZTools vs ZProjects

Saving a file as a ZTool gives you a clean, efficient file with only the model you have been working on. No space is wasted on information such as materials, timeline and render settings. ZProjects are very useful if you create a lot of preview renders, as render settings are saved and don't need to be re-entered each time the file is opened.

If used carefully, a ZProject will only be minimally larger than its equivalent ZTools. But the file can balloon if unused ZTools and OBJs are not cleared out after use. To delete contained ZTools, you sometimes have to save a ZProject, load it up again and then delete the ZTools that are no longer needed. »

About the author
Mathew Cooling was the ZBrush artist on Planet Dinosaur, a fully CG natural history series due to transmit on BBC One in September
jellyfishpictures.co.uk

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Mathew Cooling's modelling was part of Jellyfish Pictures' amazing Planet Dinosaur project

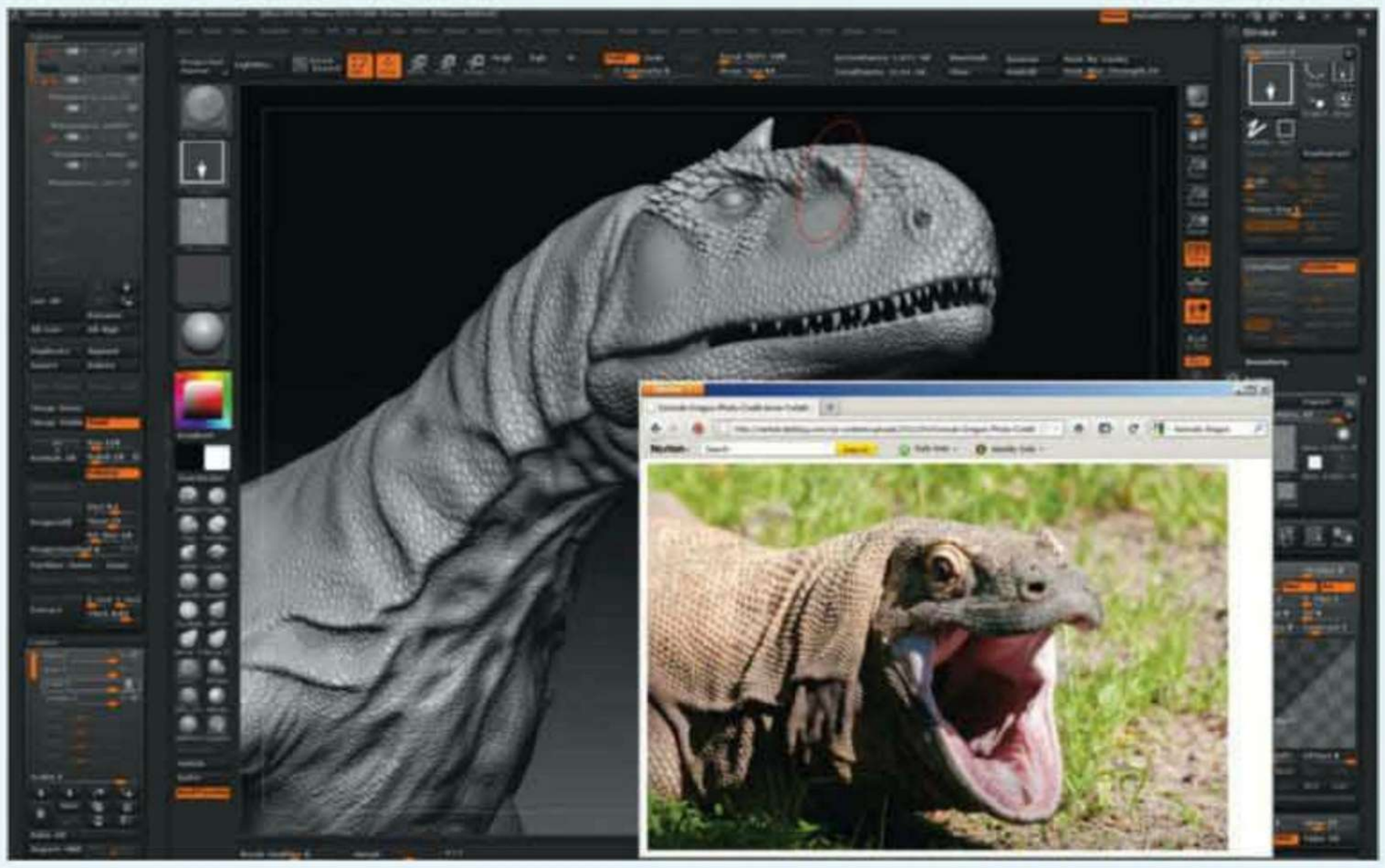
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03 Reference matters

Even before you start sculpting, it's a good idea to search the internet for reference. There's a good selection of artists' interpretations of what a dinosaur could have looked like.

Tracking down photos of living creatures that have some characteristics of dinosaurs is useful, and should be a priority. Rhinos, elephants and reptiles in general give a good overview of how anatomy and skin type work on different shapes and sizes of creature. Photos of birds are extremely useful: they're the nearest living equivalents to what a theropod (a bipedal, largely carnivorous suborder of dinosaur) looked like, just on a smaller scale. Birds such as the cassowary and emu have wonderfully theropod-like feet and legs.



Dinosaurs share characteristics with some animals alive today: make the most of this in your modelling

04 Sculpting basics

If you want to learn the best way to sculpt characters and creatures, I heartily recommend the books by Scott Spencer, especially ZBrush Character Creation and ZBrush Digital Sculpting Human Anatomy. Scott gives a very thorough overview on how it should be done. In the meantime, these are some basic techniques I have come to use:



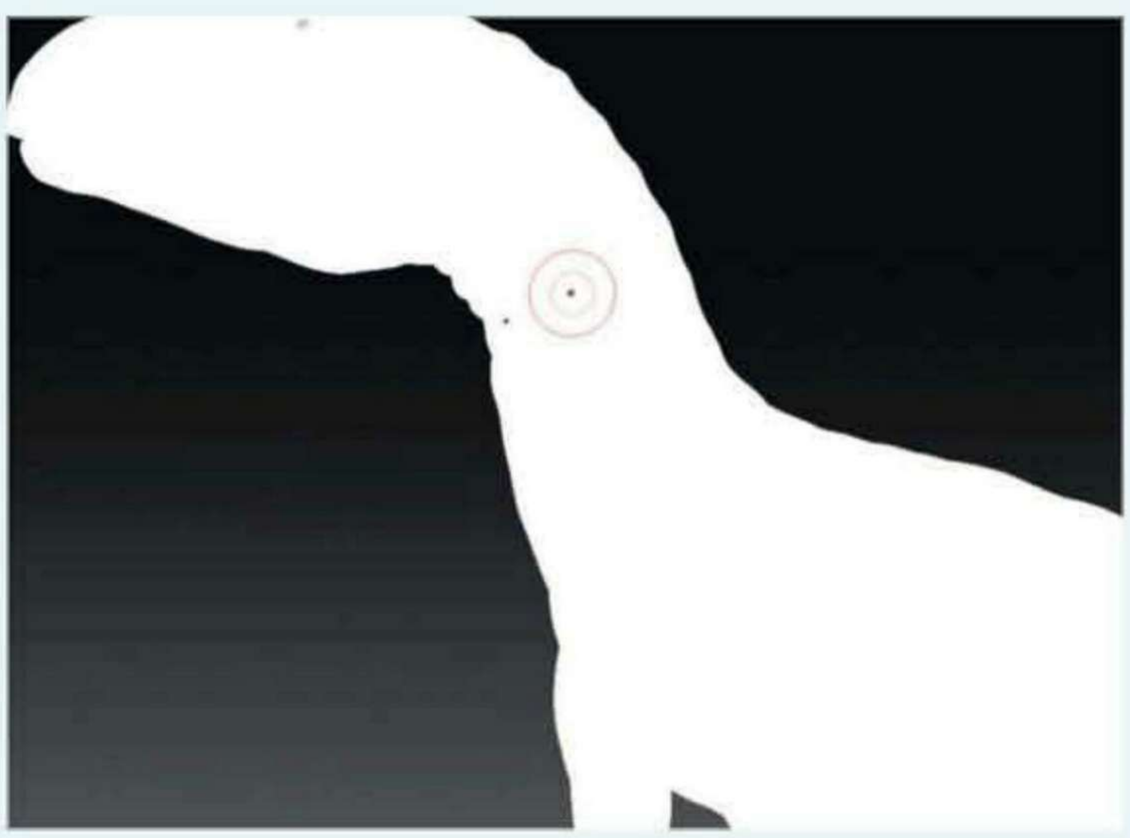
A Keep the ZTool at a resolution that's no higher than you need for the kind of detail that you are applying. If you're adding form, for example, start at a low resolution: the brush strokes will be fast and accurate, and will help you get a nice, clean and smooth model.



B When adding form, use a relatively large brush size with a low intensity. It's better to define a muscle form with just two or three brush strokes rather than a few dozen. Don't be afraid to use the Move tool as well if you have to deal with large areas of reshaping.



C Try not overwork a stroke. Keep your arm relaxed and let the odd mistake happen: it could open your eyes to another idea that you hadn't thought of. Sometimes your best friend in sculpting is the happy accident. A relaxed stroke will also give a more organic, natural feel to the sculpt.



D View what you're sculpting as a silhouette at regular intervals: it's the best way to see exactly the form you've just applied. Don't just rely on the angle you're sculpting at.



E Use the Interactive Light, which can be found in the Zplugin palette, to get a real-time idea of how light will play over the surface. Always use this function when the model is being viewed with a Standard material.

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05 Layers

Layers are a useful feature to use when applied logically and carefully; otherwise, they can become convoluted and increase the file size considerably. Layers hold PolyPaint, sculpting and masking information, but no material information. Materials need to be applied without a layer selected.

My preferred way of working is to subdivide the model to the highest level that I want to work on, then create the layers on that level. Creating layers on a lower subdivision means that if you delete a layer, all the sculpted detail on higher subdivisions is still present on the model. If you choose to use HD Geometry, you will be left with faint detail once a layer has been deleted or hidden.

To keep layers efficient, a good working practice is to break your hierarchy into specific uses and to name each one simply. Use as few as possible to keep things straightforward and easily manageable. For creatures, I break my layers down along these lines:

Pose

Keep a layer for posing your dinosaur's mouth or eyes. If the dinosaur is built with its mouth closed, open it with Transpose and the Transpose Master plug-in to move the teeth and tongue, so they fit perfectly into the jaw. Create a Pose layer on the teeth and tongue SubTools. If you don't want to use SubTool Master, you can use Stroke > Replay Last to apply the last stroke or movement you did to different SubTools. Posing the jaw means you can get inside the mouth with ease. After you've finished sculpting, hide the layer so the rigger has a model that's easier to work on.

Form

As the name suggests, this layer is where the majority of the sculpting is done. Focus on proportions, form, position, joint pivots and facial features. Work on the lowest subdivision level you're comfortable with.

Wrinkles and folds

Once you're happy with the dinosaur's form, start to add the larger skin folds and wrinkles. Keeping these separate means you can hide this layer when adding smaller details such as scales and skin: you'll get less stretching when applying fine detail in complex areas like the neck, when this layer is hidden and you're just viewing your form layer.

Again, this should be done on not too high a subdivision level. It helps you keep the model topology evenly spread: neither overly dense in some areas nor stretched out in others, which can occur if you use the Pinch brush a lot.

You can also turn off this layer when you are sculpting scales: with it hidden, the textures will distort less when applied.

Scales

If you're working on a theropod, it's probably going to have scales – which can be time-intensive, especially on the head, hands and feet. You can normally speed the application of small details up by using the DragRect stroke with different brushes and alphas, Projection Master or Spotlight. Keeping general scales on one layer makes it easy to backtrack if need be. Sculpted form or detail can easily be removed from layers by using Morph Target and the Morph brush, which I cover in tip 7.

Large scales and design features

Keeping larger scales and more specific design elements on separate layers means that you can easily backtrack. Even though you would create the smaller scales first, you can overlay larger scales without the smaller scales coming through by using the Smooth brush on the fine detail in areas such as the back or brow. Sculpt in the larger scales in that area and then use Morph Target and the Morph brush to bring back the small scales you smoothed out earlier.

With feet and hands, it can be a good idea to place down the larger scales before sculpting the smaller scales. It's easier to control where the smaller scales stop when they come up against a larger scale than trying it the other way around.

Scars, etc

Once the dinosaur is looking detailed enough, you can add bite marks, old scars, pitting, damage to horns and scuffs. If you started off with hand-created, clean-looking scales, this stage will make the dinosaur look more natural and organic.



Specify which model part you want in HD

06 HD Geometry

On Planet Dinosaur, we used HD Geometry: it was the most straightforward way to get the ZTool to a high enough subdivision to apply details like scales. (The other way would take up a few pages on its own.) HD Geometry is easy enough to use. You simply open Tool > Geometry HD and press DivideHD. HD Geometry doesn't work seamlessly with layers, though: any sculpted detail created on a subdivision higher than the level the layer was created on is not stored in that layer. So when you turn off a layer, you get the ghost of sculpted detail created in a higher subdivision.

It's good practice to specify the part of the model you want to work on in HD using PolyGroups. Make sure that the polygon total is within what ZBrush says your system can handle. The idea is to have a nice straight separation when ZBrush takes the model into HD. Now and again the HD process can leave you with small but sharp edges, and it's a lot easier to find and clean them in Photoshop. Again, Morph Target and the Morph brush are useful, so save a Morph Target each time you are about to go into HD.

When using HD Geometry, take into consideration that for ZBrush to be able to view the large amount of polygons, it will temporally disable UVs, so you can't apply a seamless texture from using the model's UV layout and selecting Tool > Displacement Map > Apply DispMap.

07 Morph Target

Morph Target in ZBrush is a powerful and flexible means of fine-tuning and editing a model. Saving a Morph Target at the highest subdivision level before you start the next stage of sculpting can help to blend different types of detail together, adjust the strength of any sculpted detail or form, and remove unwanted detail from different layers. Setting the Morph brush to a low strength (say a Zadd or Zsub setting of 3 or lower) will exaggerate or reduce the scales depth so that they have a more uneven and organic feel to them. »



The Morph brush can help scales look more organic

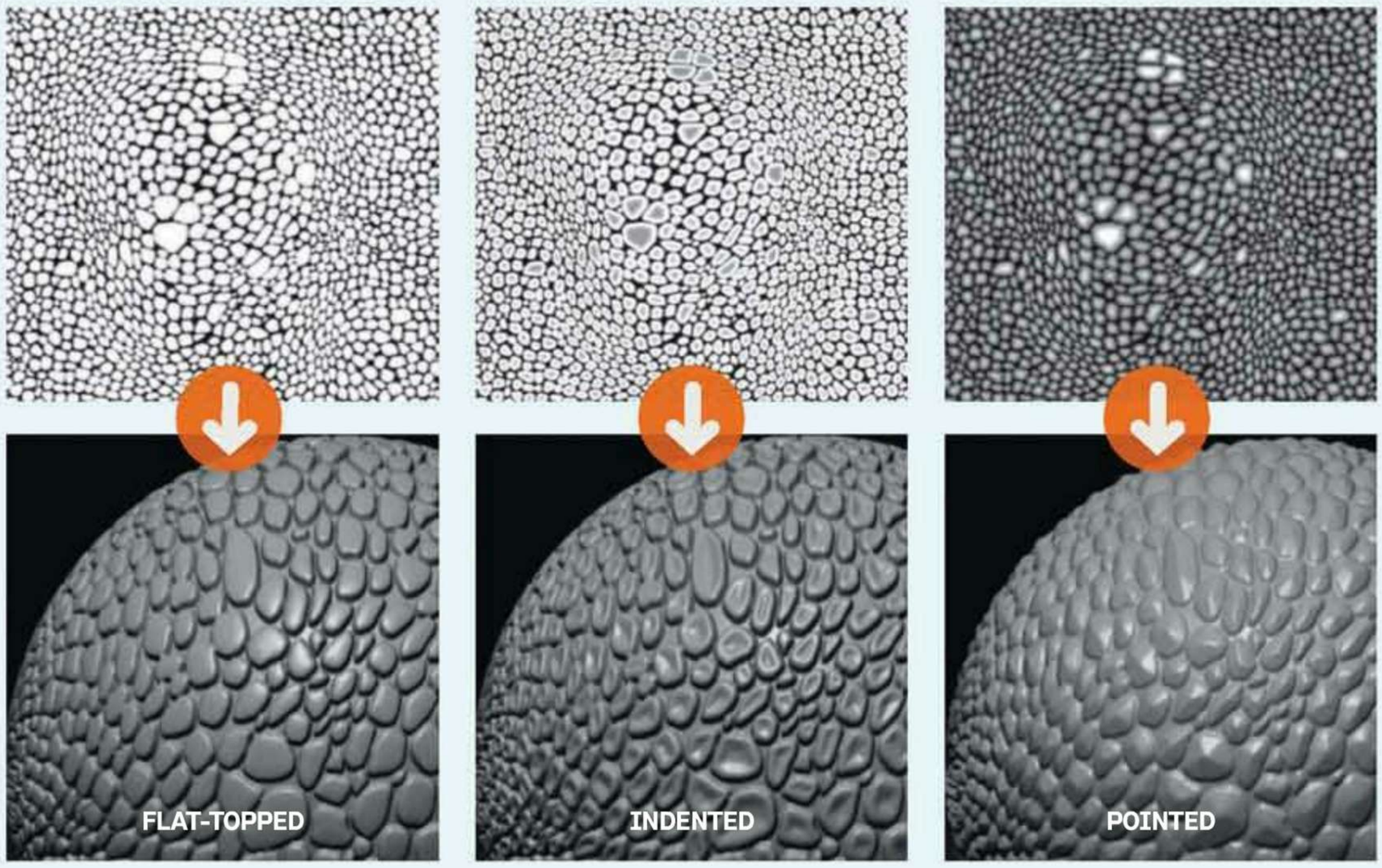
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08 Alpha variations

For Planet Dinosaur, I created a basic selection of brushes and alphas for each part of the detailing process. The general scale alpha was created in Photoshop as a tileable, solid black-and-white scale pattern. In Photoshop, create the scales in two layers, then give the scales a bevelled edge using the Outer Glow layer style set to black. Take this bevel to almost the centre of the medium-sized scale so it's almost entirely a gradient.

Even if you want the scales to be flat-topped, you can change the AlphaAdjust curve in the Alpha menu to flatten out the gradient so it's white and flat. Having this gradient means that you can take a simple, clean alpha and create a varying array of scale types, such as flat-topped, indented or pointed.



Adjusting a single alpha's gradient can yield different looks

09 Deformed alphas

To get more variation with a scale alpha (or any other alpha), you can apply them to a subdivide planar in ZBrush, then deform the planar using the Move brush; use any of the deformers in the Tool palette and grab the Z-depth when you're happy with the effect. To do this, try these steps:

A Add a Plane3D Tool and select Make Polymesh3D. Deactivate Smt in the Geometry palette. Divide several times until the geometry is dense enough to handle the detail.
B Create a new texture in Tools > Texture Map; it doesn't matter what size.
C Import the alpha and load it as a displacement map. Set the displacement map intensity at a low setting or until you like the look of it.
D Select Displacement Map > Apply DispMap.
E Save the Morph Target via Tool > Morph Target > StoreMT.

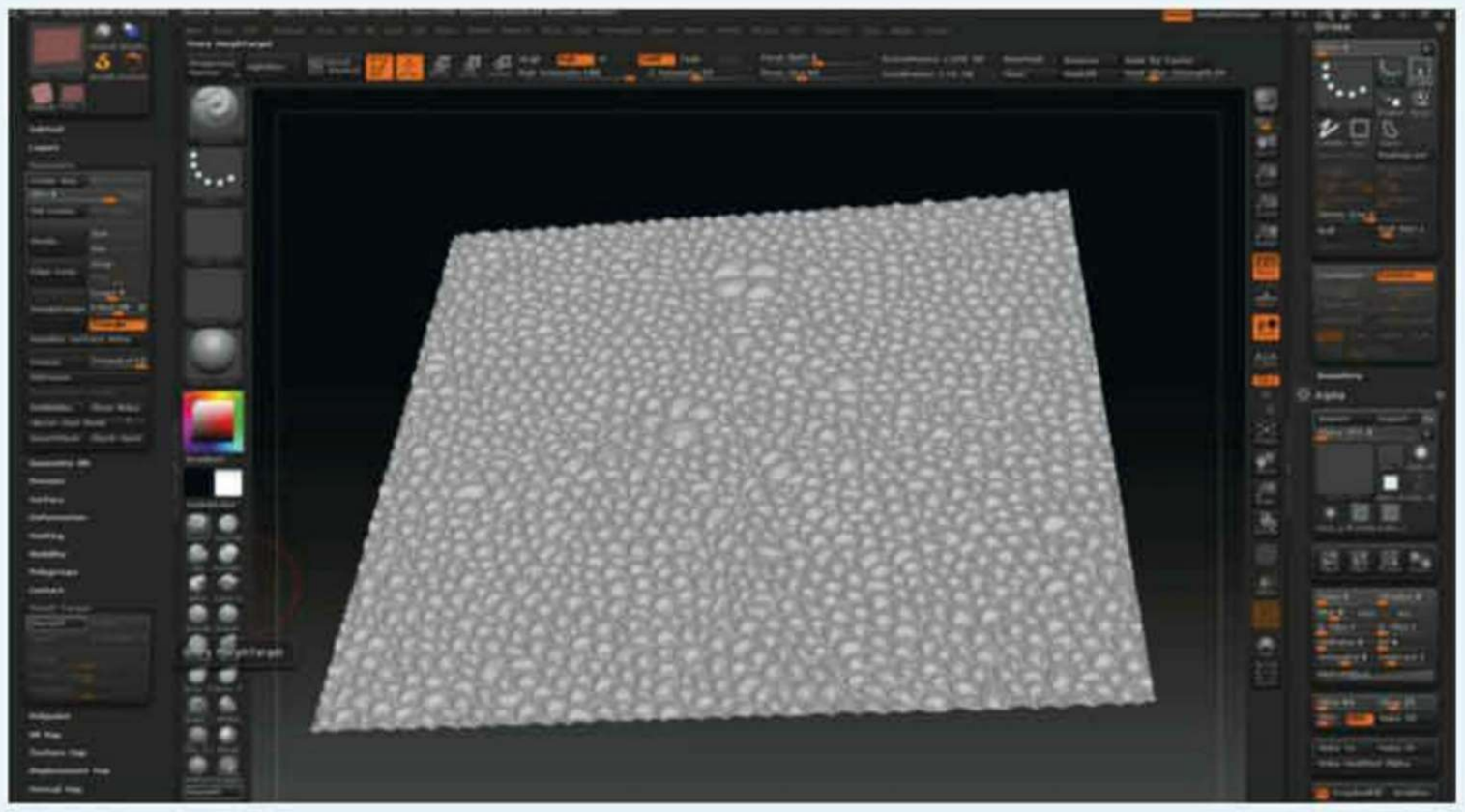
At this stage, you can distort the flow of the scales so they can move with a section of the body or increase in size in places. Inflating the plane that has the applied detail can give you different effects; it also ensures that the plane stays flat and subsequently produces a clean alpha.

If you want the alpha to tile, keep the edges of the plane as close to their original shape as possible. As you have saved a Morph Target, you can achieve this by using the Morph brush.

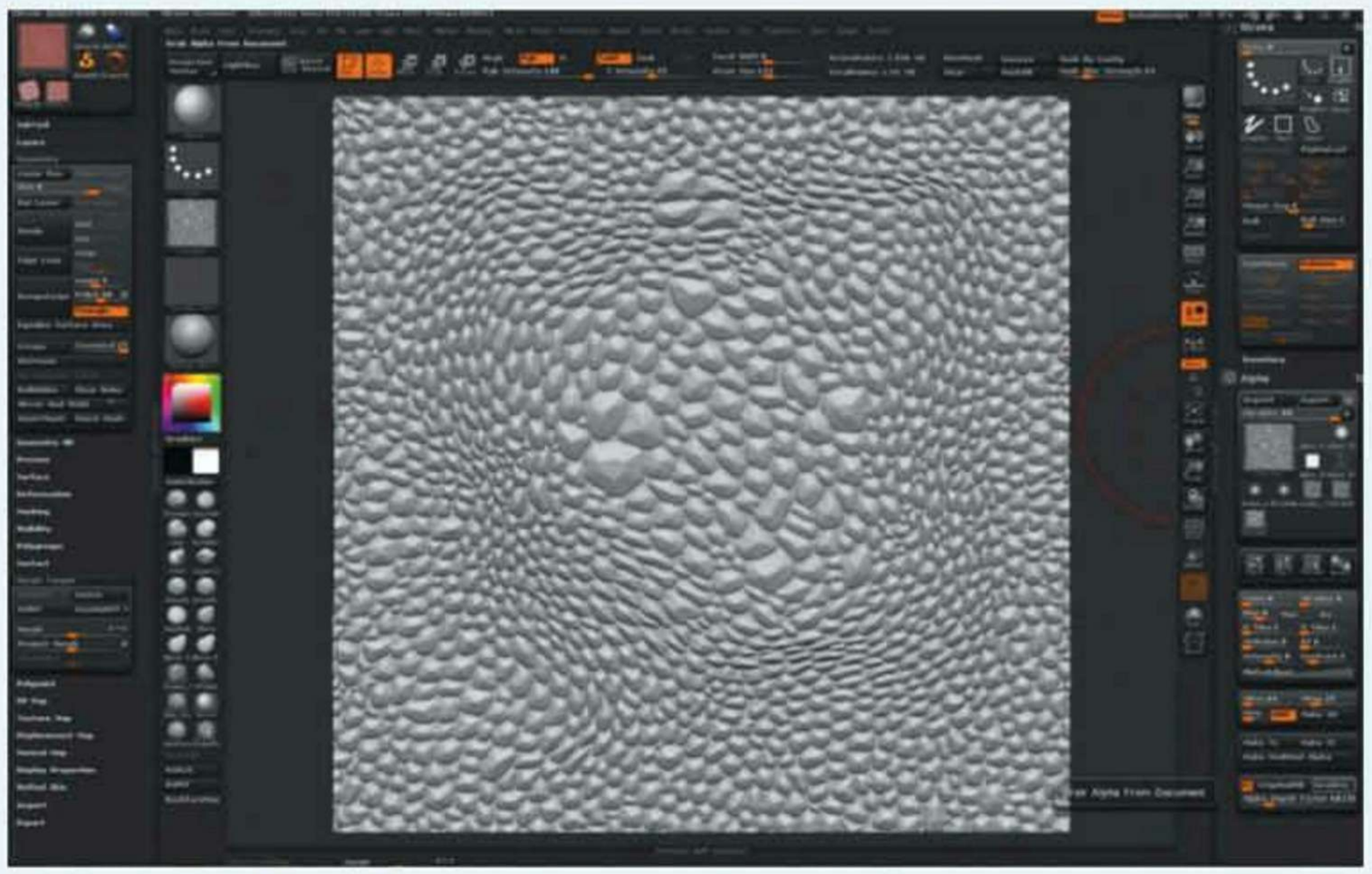
If you've pushed out from the centre of the plane with the Move tool and the plane won't snap nicely inside the Document window, you can simply switch back to the saved Morph Target.

To capture the new detail from the plane, follow these steps:

A Turn off Pro in the Document palette and create a 1K- or 2K-sized document. Place the detailed plane onto the canvas and select Edit mode.
B Turn off Perspective Distortion to the right of the canvas. Make sure the plane is flat onto the canvas by [Shift]-clicking it.
C If you want to capture all the detail on the plane, click the Frame button to the right of the canvas. Otherwise, just scale the plane until the detail you want to capture is visible at the desired resolution. Make sure that all the canvas area is taken up with the plane.
D Select Alpha > GrabDoc.



Apply an alpha-derived displacement map and store the mesh as a Morph Target



Make sure the plane is flat against the canvas before you use GrabDoc to capture the final alpha

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10 Brushes and Projection Master

The basic technique for placing down large amounts of detail quickly is to use the Standard brush with the DragRect stroke. Using DecoBrush in Projection Master can give you natural flowing detail that works with the contours and forms of the dinosaur. As always, save a Morph Target before you do this: when you come out of Projection Master, you can fine-tune and clean up the detail you've placed down. To ensure that you only apply the detail where you want it to be, mask off everything else.

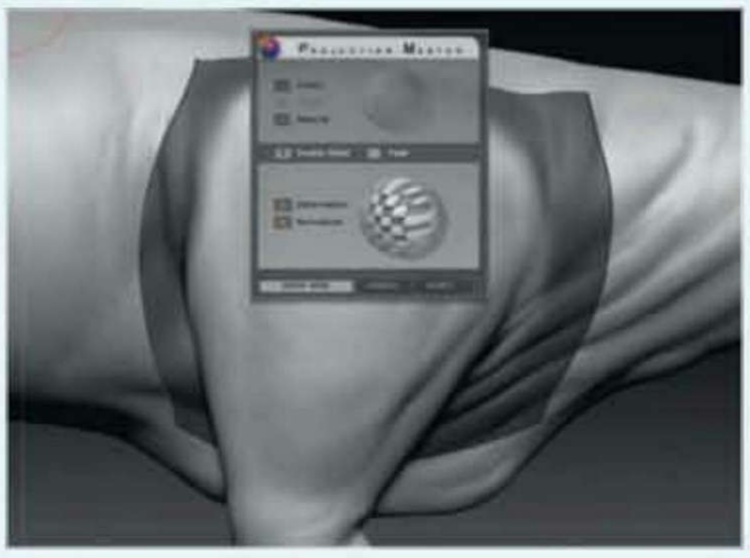
For best results, select Double Sided, Deformation and Normalized in the Projection Master dialog. If the alpha you are using is tileable, activate Tile Texture in the DecoBrush Modifiers. You may not get the desired effect with the first stroke of the brush, so redo it until you get something you're happy with. If you only like a small section of the stroke, erase the rest using Morph Target once you come out of Projection Master.

When you use Projection Master, ensure that the scale of the model you've placed down is enough to allow the detail applied. If the model is too small on the canvas, you will get pixellated detail.

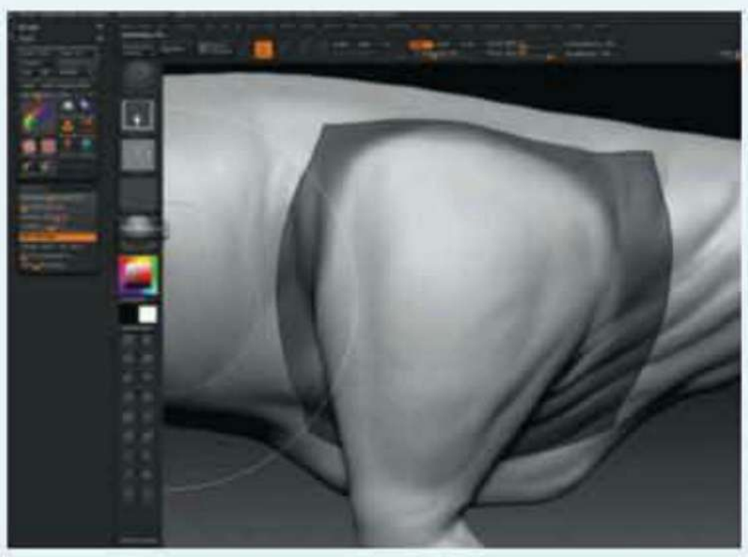
A slow part of the detailing process is blending different groups of alphas together. There are different ways to do this. One is to mask off the scales by hand, then use the Clay brush to bring the new scales up. The other is to use the Clay brush with a depth of 4 to draw in the scales between the existing groups of scales. ZBrush was designed to provide many ways to do a task; if you discover a new way to do something, give it a go!



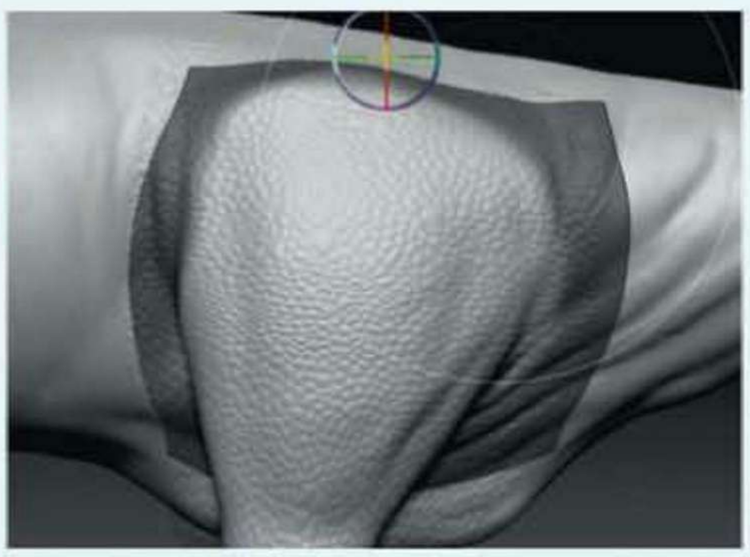
A Select the part of the model that you want to take into Projection Master to apply detail. Go into HD Geometry and mask off the edges.



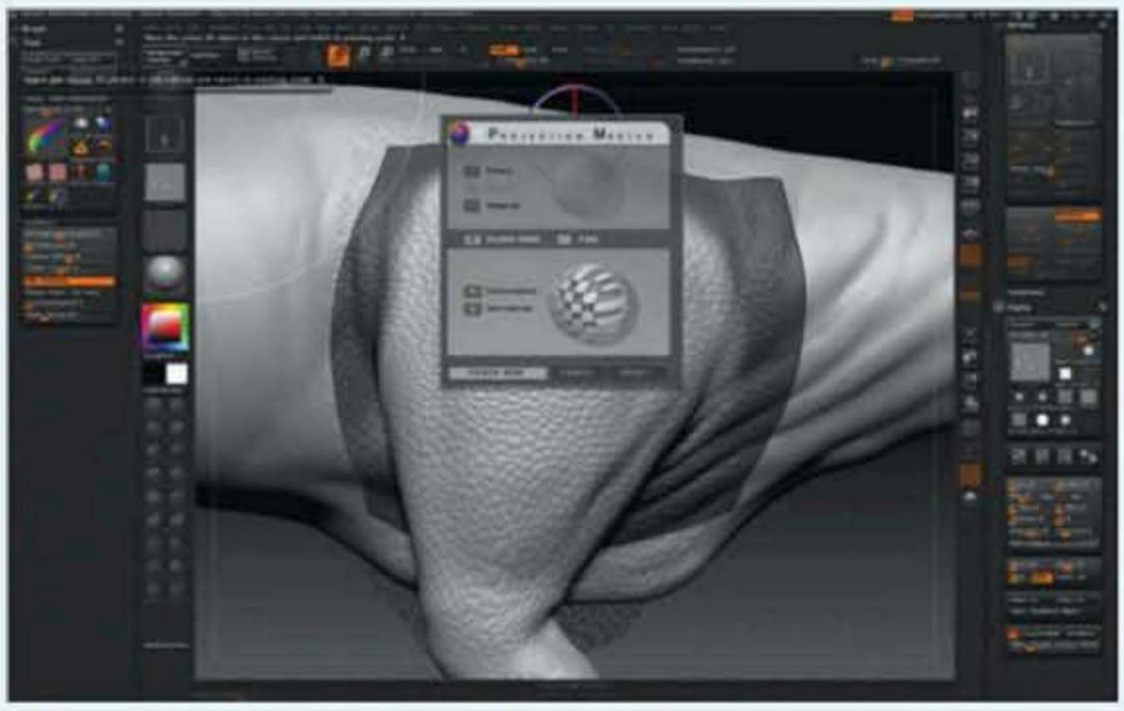
B Position the model part so that it's large on-screen, then select Projection Master. Enable Double Sided, Deformation and Normalized.



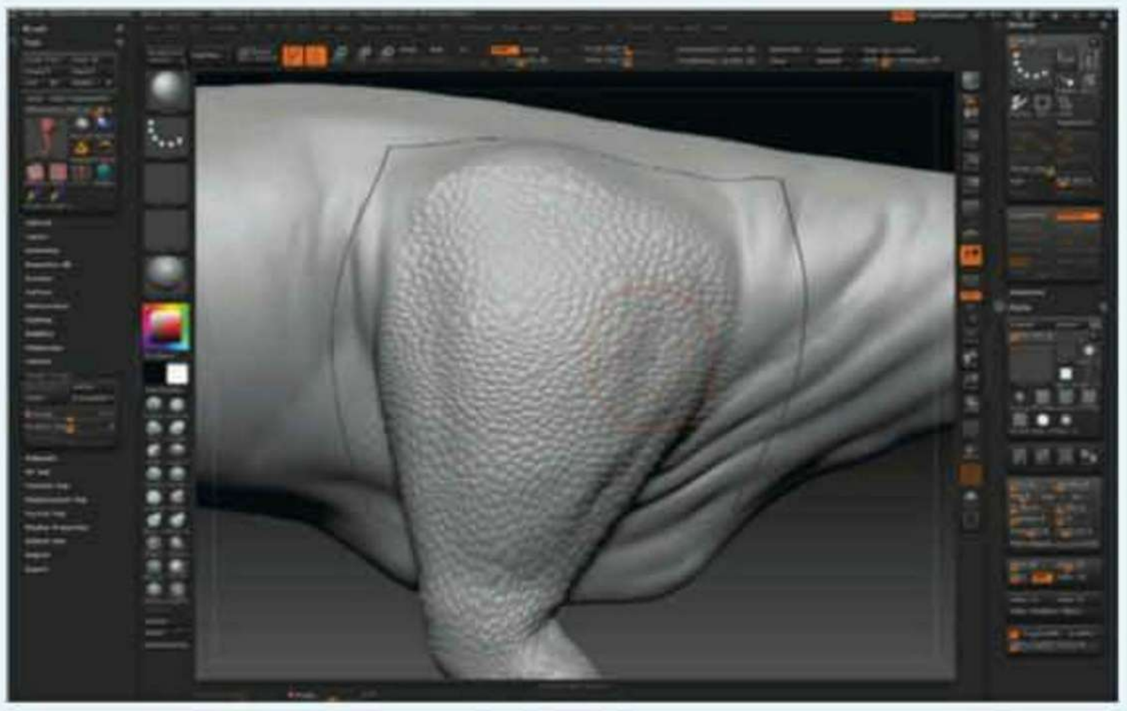
C Select DecoBrush. Turn on Tile Texture in the Modifiers that appear once it's selected.



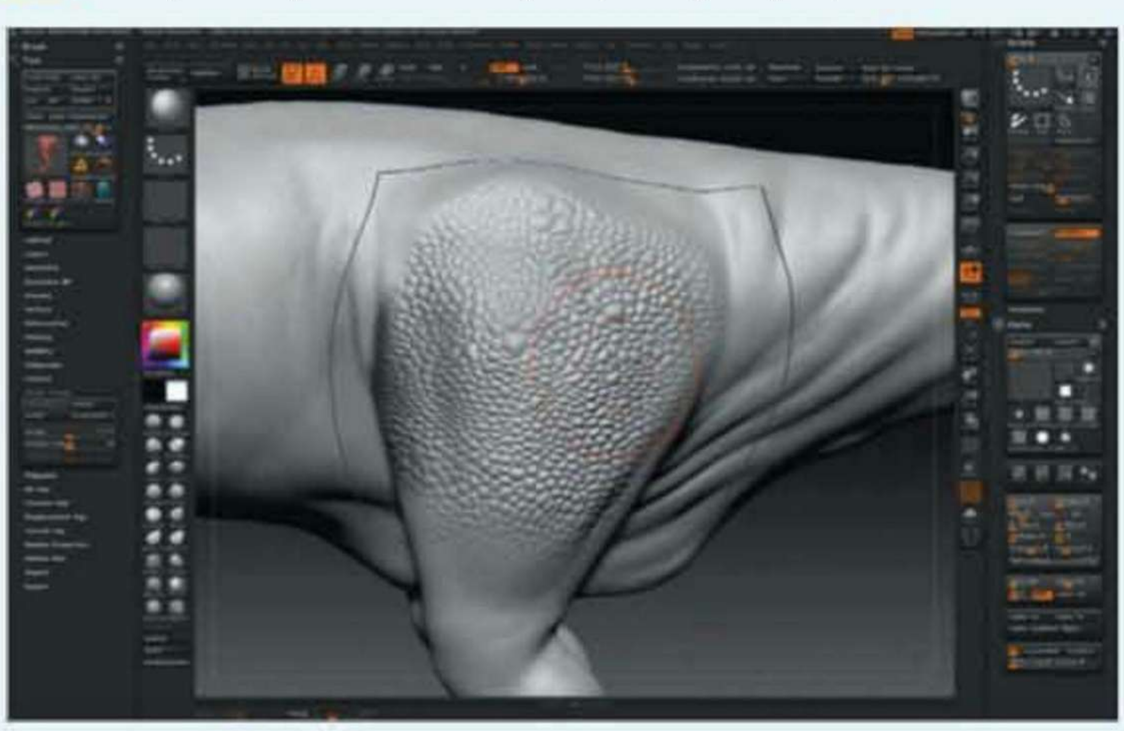
D Apply the DecoBrush stroke on your model part – watch out for pixellated details.



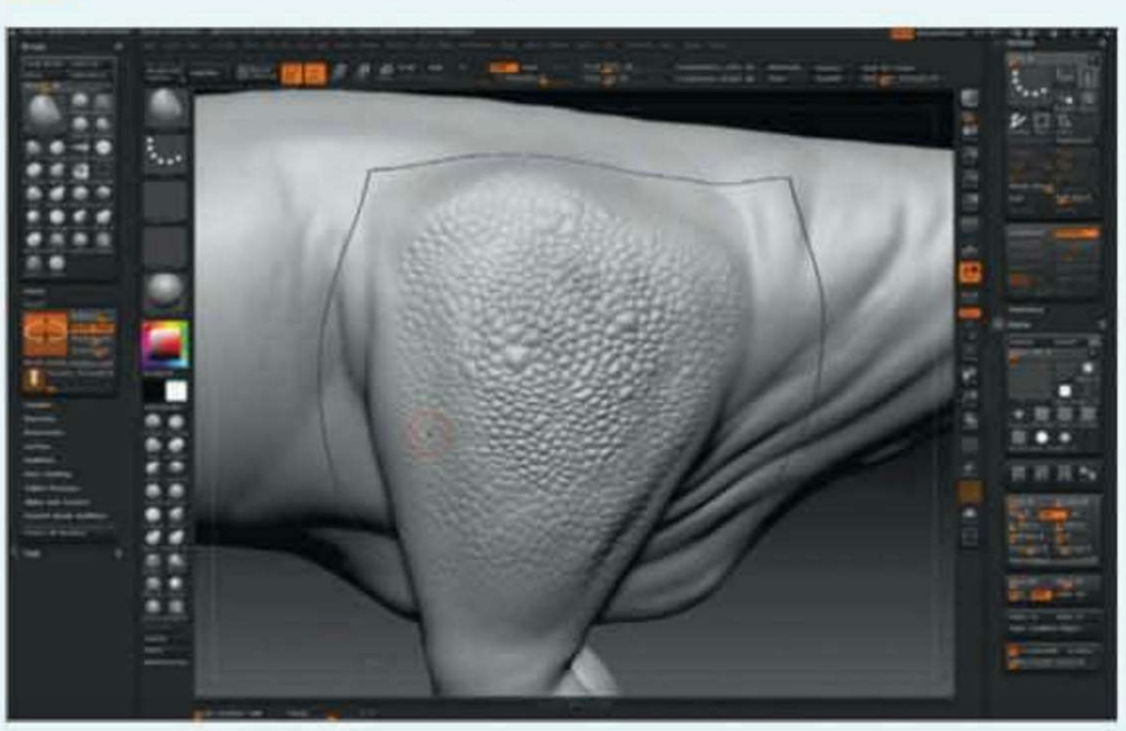
E Once you're happy with the look, pick up the model in Projection Master. Erase parts of your stroke using Morph Target if you prefer.



F Apply the detail to the model. The mask you created at the start means the scales appear only where you choose.



G Use the Morph brush to add variation to the strength of your applied scales for additional textural interest.

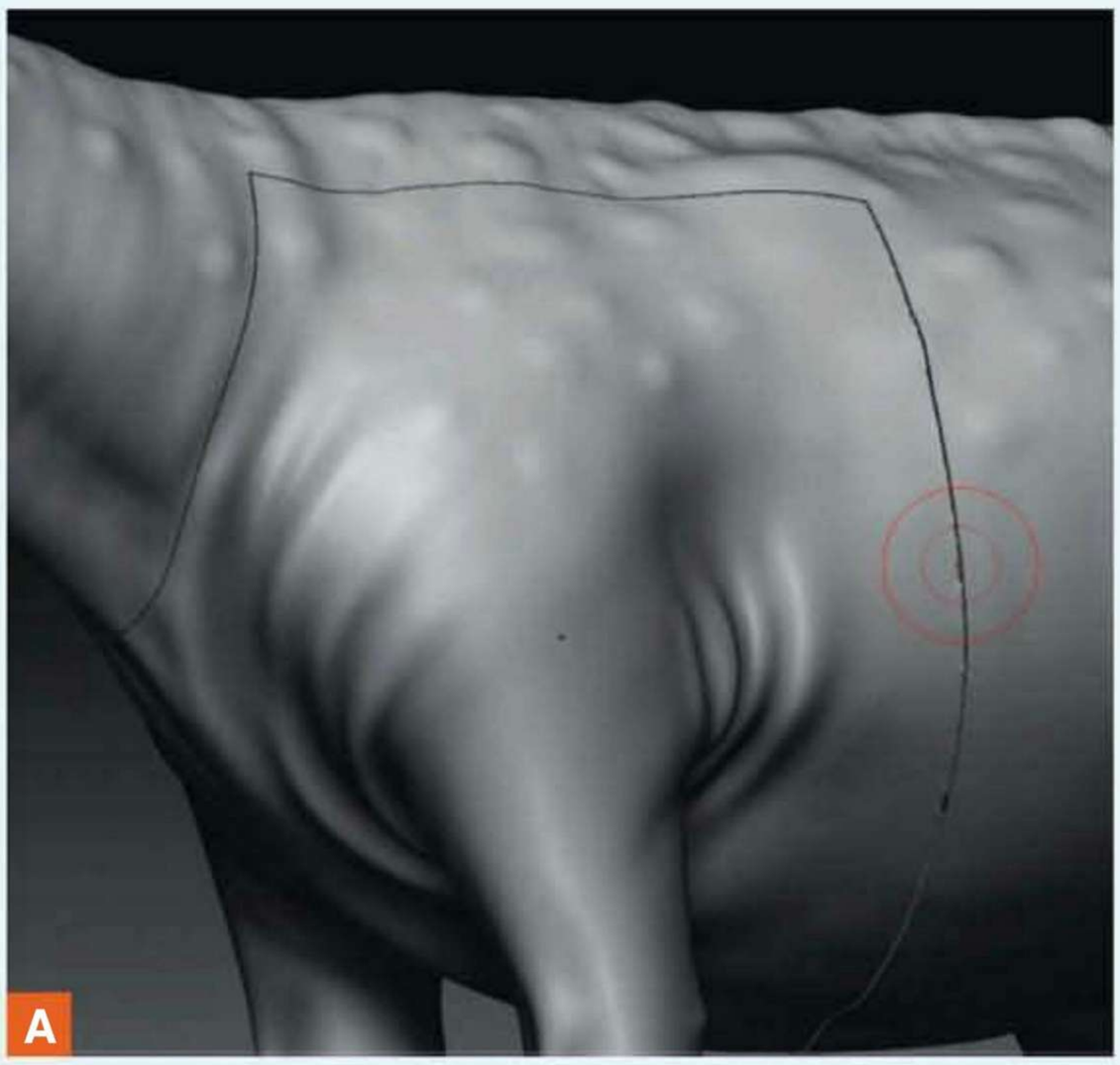


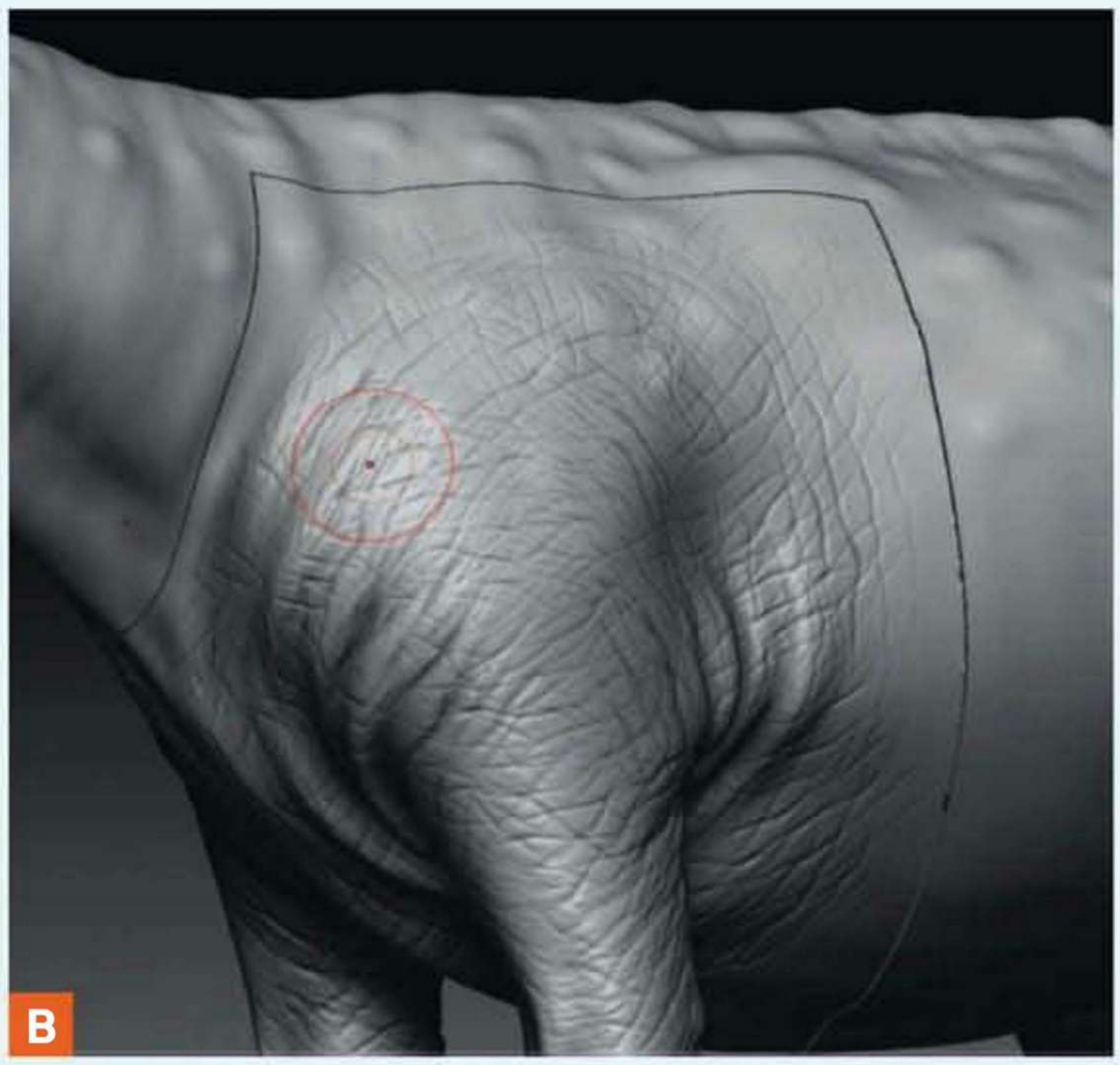
H Use the hPolish brush with a Depth > Imbed setting of 4 (instead of -4). Use a small brush size and flatten off some scales.

»

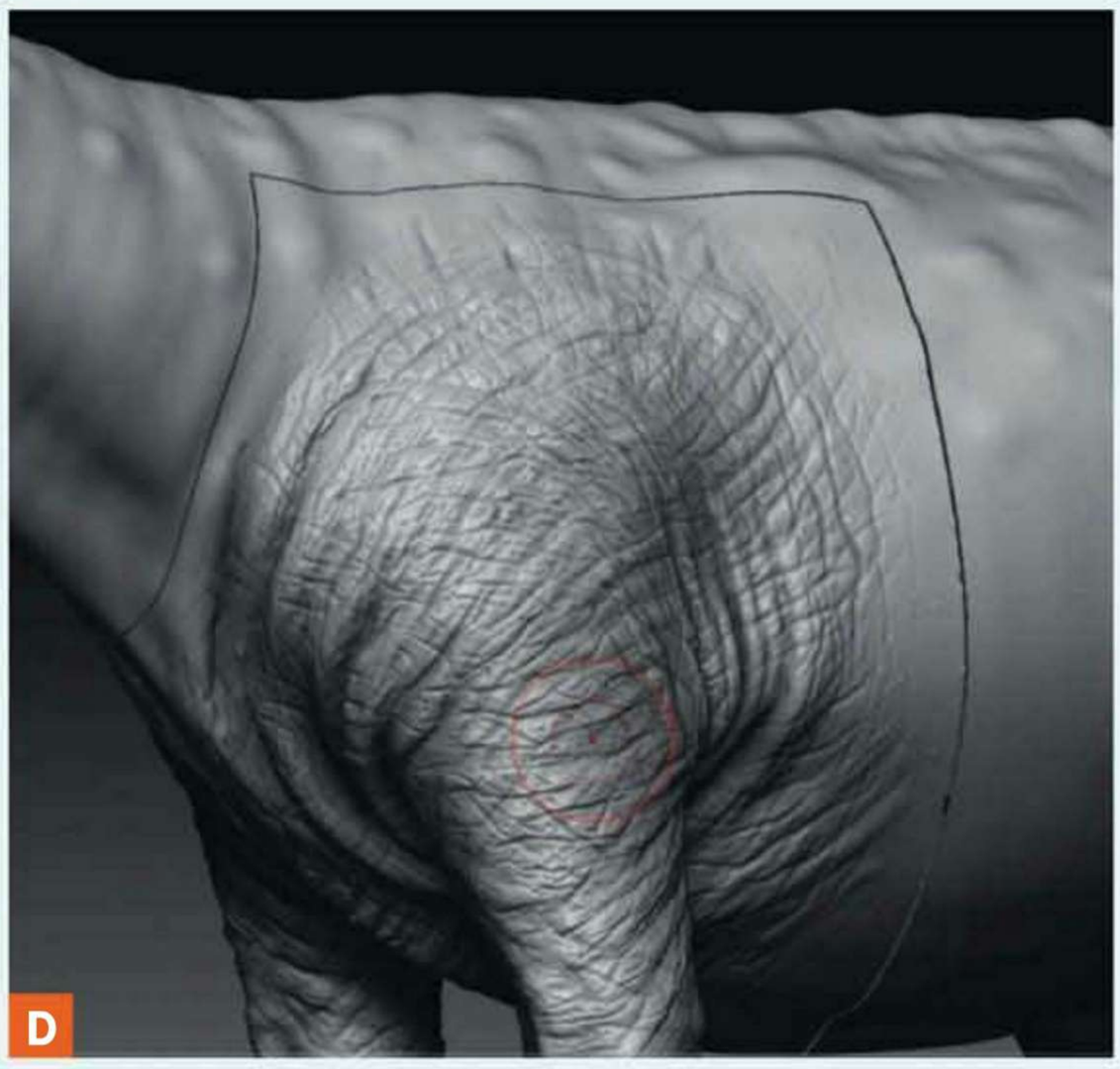
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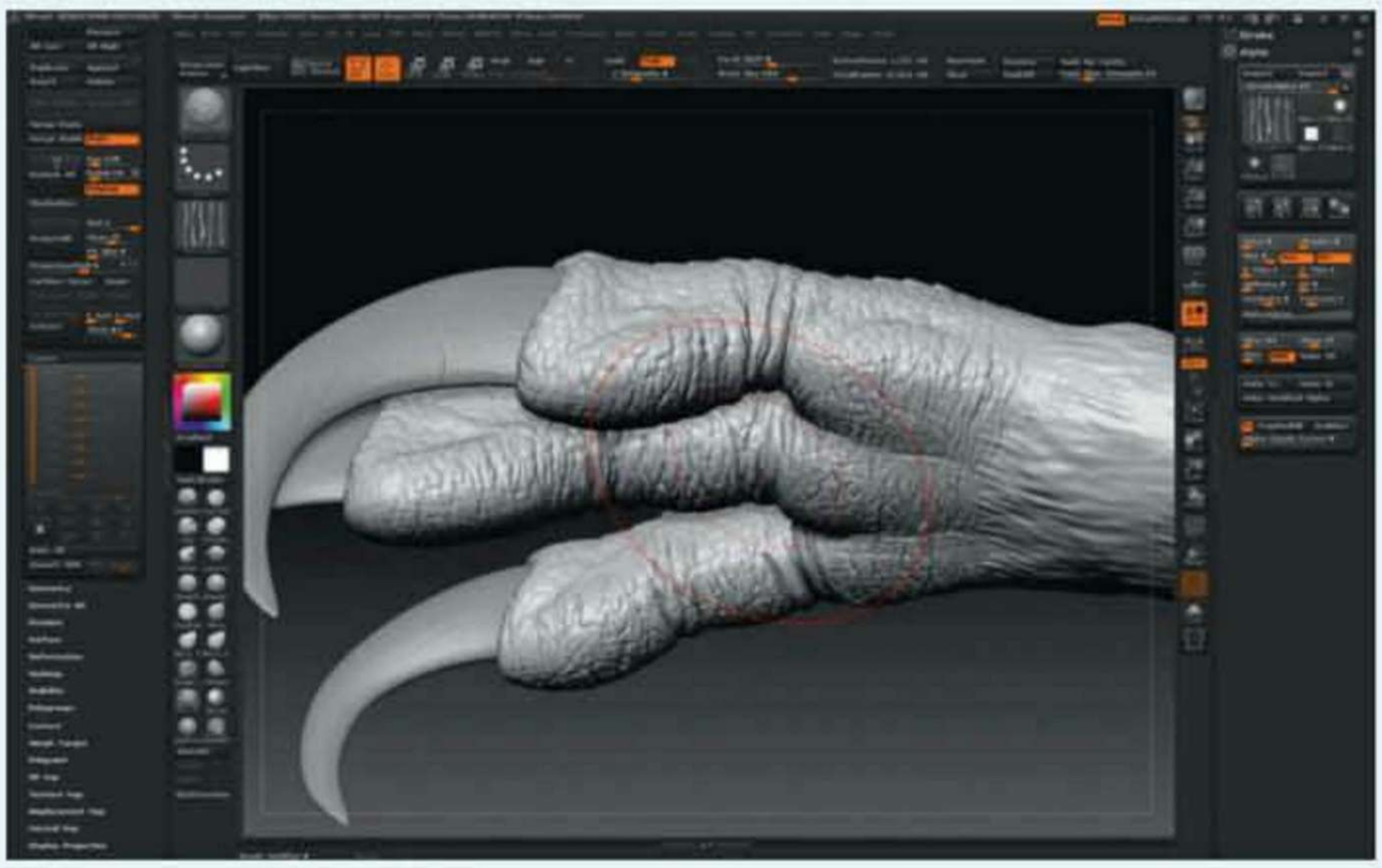




11 Skin details and wrinkles

One brush I've found extremely useful is the Track brush combined with Alpha58. Change the Alpha settings so that MidValue is 0, use a low brush intensity and try varying the alpha's Blur strengths to get different effects. Apply the brush stroke in different directions on the model with the form and joint movement in mind to get a natural feel.

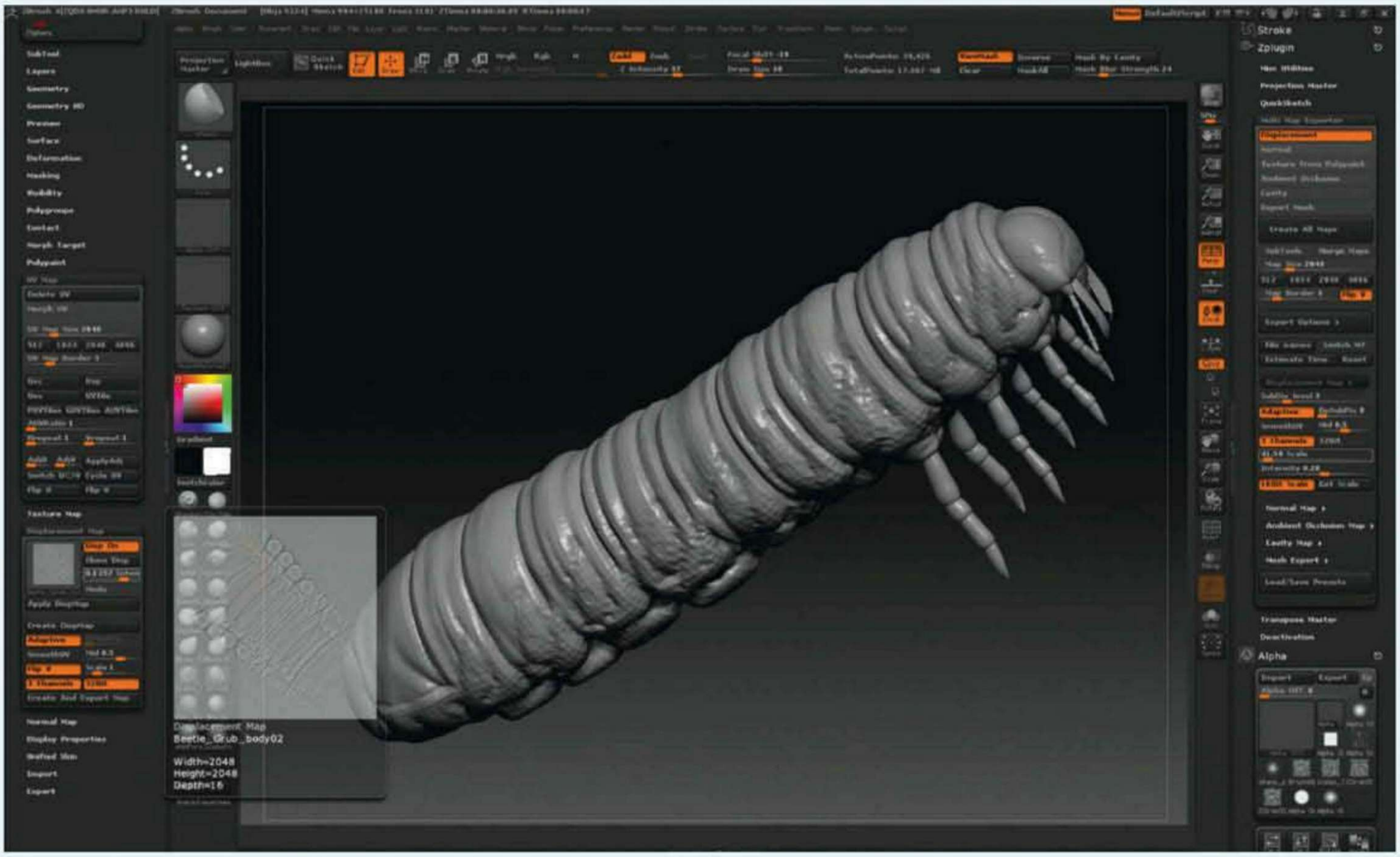
Laying down the detail is just the start of the process. Once it's placed down, it's time to work into it using whatever brush you think will do the job. The Form and Inflate brushes can give a nice soft feeling. This can be fine-tuned using Cavity Masking. If the scales you've previously placed down are giving an undesired effect when using the Cavity Mask, you can simply hide the scale layer and re-generate the mask.



Follow the form with your strokes to achieve the best results as you apply wrinkles

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Here, Multi Map Exporter is using a level-3 subdivision as the basis for a displacement map

12 Exporting maps and creating clean cavity maps

Once you've got the dinosaur where you want it to be, it's time to export the maps to be rendered. You will need to export specific maps to match your chosen renderer. The basic maps we used on Planet Dinosaur from ZBrush were bump, displacement and cavity. From these, other maps such as diffuse, dirt and specular were created using BodyPaint 3D and Photoshop. These three maps can be useful when using Mari to paint textures.

Displacement maps

These are straightforward to export from ZBrush. The basic settings to be used in the basic map generator or the Multi Map Exporter plug-in are the same. Selecting Adaptive, FlipV, 3 Channel and 32Bit does the job for the renders I've mentioned. Issues can arise after selecting SmoothUV when a UV border cuts across a vert with more than four edges connected to it. This issue can also arise when SmoothUV is not selected, so it's best to cut UVs away from these verts.

Bump maps

For most renders, it's OK to use the same settings as for displacement maps – but select Create DispMap, which keeps the map in ZBrush. If you're not using Multi Map Exporter, Clone Disp sends the alpha to the Alpha palette. Once it's there, you can apply FlipV if needed and export.

Make a note of the alpha depth factor and include it into the image file name. This informs the person who is rendering out the character and maps what intensity to set the bump map at. For them to use this number, it's a case of multiplying the value by 100 to get the bump strength.

If you're using Arnold Renderer, as we did for Planet Dinosaur, make sure that all the bump maps have the same alpha depth factor, as Arnold can only handle one UV set. This can be done in Multi Map Exporter by setting the Scale slider higher than 1. Even though ZBrush can calculate what the scale should be, I find in most cases that a setting of 1.5 will give a usable map, where neither blacks nor whites are clipped. Try different settings to see what gives you good contrast in the image without the clipping.

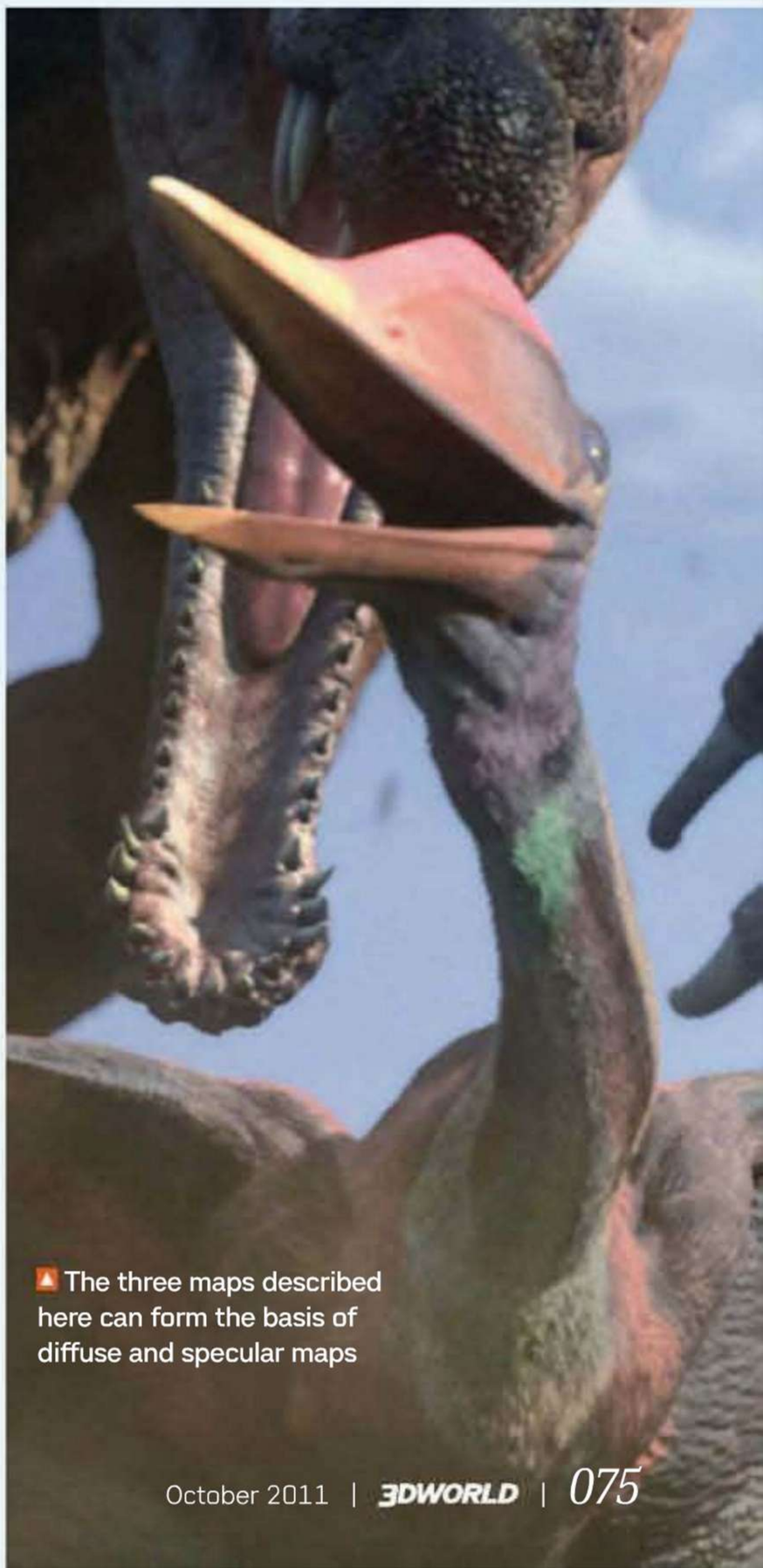
Once the maps are exported, they can be pasted together in Photoshop and work when rendered, as they will be the same strength.

Cavity maps

If you use the basic Displacement Map Exporter, you can create a clean cavity map by selecting the Basic Material 2 and Crop and Fill, and dropping the alpha onto the canvas. Once the alpha is dropped, make these changes to the Material settings:

- **Ambient: 100**
- **Diffuse: 100. You can set this to any strength to fine-tune the final map**
- **Specular: 0**
- **Cavity Intensity: between 100 and 200, or whatever gives the right amount of coverage**
- **Cavity Radius: between 1 to 4 to achieve the result you want**
- **Cavity Colorize: 1**

Turn off Shadows in the render settings and select Best Render. Once rendered, select Document > Export and save out the file. If you use Multi Map Exporter, you have to change the image to a greyscale image in Photoshop and save it as a PSD if it isn't already. Load it back into ZBrush and follow the render and export steps above.



The three maps described here can form the basis of diffuse and specular maps

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Fundamentals
Any software
Modelling

FOR
Any software

TIME TAKEN
15 minutes

TOPICS COVERED
- Displacement maps
- Sub-polygon displacement

ON THE DISC
- Video tutorial

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Reading the map

Displacement mapping is a powerful way to deform a model using maps. **Glen Southern** shows you how to make a displacement map and use sub-poly displacement

Displacement mapping is a way to deform a polygonal model based on a greyscale map. The displacement usually happens along the surface normals of the model, and it uses the greyscale information to move either in or out along these normals. Displacement mapping differs from bump mapping in that it actually moves parts of the mesh. If you use a bump map and turn the mesh, you will still see the underlying polygon silhouette. With displacement mapping, the actual mesh is deformed and the silhouette is changed accordingly.

To create a displacement map in ZBrush, create or load a model that already has UV co-ordinates. You can quickly see your UV layout by selecting Tool > UV Map > Morph UV.

Sculpt the model to as high a level as you need. Generally, the higher the poly count, the higher the displacement detail. In the UV panel, you can set how big you want your map to be when it's generated. Lower the subdivision levels down to the base level, then select Tool > Displacement Map. Using the Adaptive and DPSubPix controls, you can create better-quality displacement maps. When the map is generated, you can clone it and then export it for use in your 3D suite via Tool > Texture Map.

When you've created your displacement map, you can use it in any major 3D program. In the video, I look at how to use one in Cinema 4D. Load up the base head mesh. Add some basic lighting; a three-point scheme is good for showing off the displacement effect on your model. Create a material and double-click it to get access to the Material Editor. Tick the Displacement channel to activate it. Click the main Texture button and navigate to where you saved your displacement map, then load it in. Now you can render and see the first results.

To improve on this, you can add a HyperNURBS null and drop the model into it. This will smooth the mesh, but not improve the displacement. To do that, enable the Sub-Polygon Displacement in the Material Editor's Displacement channel. With Sub-Poly activated, you can try different settings to improve the look of the render. Try enabling Round Geometry then, if needed, increase Subdivision Level. Beware! This will massively increase your render times.

This is the basic process for using a displacement map on a low-poly UV model in Cinema 4D. With sub-poly displacement, of course, you don't have to just use generated displacement maps: you can simply use some of the native texture settings on any polygonal object. You can deform a sphere into all sorts of shapes by using noise in the displacement channel for example – and that can then be animated over time for some fantastic effects.



WATCH THE VIDEO TUTORIAL
See Glen's workflow for creating and using a displacement map in the video on the disc



About the author
Glen Southern has been modelling in 3D since the early 1990s and has been an active ZBrush user for 10 years. He's the creative director and a partner at SparkleVFX in Liverpool, and maintains an active freelance 3D modelling career
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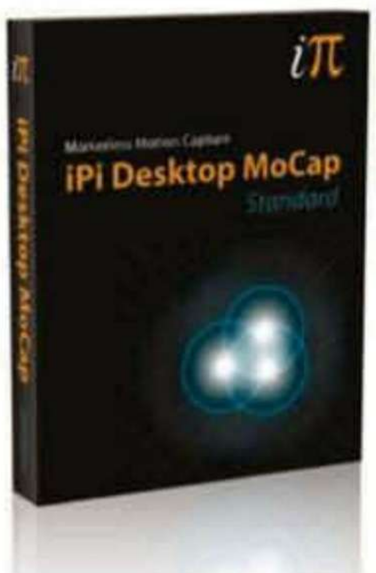
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Video Guide
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FOR
modo 501

TIME TAKEN
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TOPICS COVERED
- Creating simple geometry
- Building replicators
- Creating advanced texture layers

ON THE WEB
- Video tutorial
- Scene files
- Reference screenshots

3dworldmag.com/147

Create photoreal plants in modo

Generate realistic interior props without taxing your workstation as **Mathew Burniston** reveals the secrets behind working with replicators

Being asked to create and render plants and flowers can send a shiver down even the most competent 3D artist's spine. Dealing with a huge amount of geometry and creating a natural, randomised look to plants can be challenging. There are several applications that can help create stunning landscapes and generate foliage, trees and plants at the click of a button. But what if you don't have a budget to buy new software, or the deadline is fast approaching and learning another program just isn't an option? Well, a deeper look into some of the newer features in modo might be able to help you out.

You might have heard about replicators, but what exactly do they do, and why would you need to use them? In short, they give artists a powerful way to generate massive amounts of geometry without additional costly render time. This new technique is perfect for applying leaves to trees, planting a forest in a landscape or adding dew to a soda can in a product shot, for example. It's possible to replicate millions of instances of your geometry and still avoid the 'out of memory' box when you hit the render button.

In this tutorial, I'll demonstrate a number of techniques I've learned over the last few years that have become staples in my workflow, and which can help you get to grips with controlling and manipulating replicators in a variety of ways. I'm using plants in this example, but all of the techniques can easily be adapted to almost any scenario you might have, by simply switching out assets and a little creative thinking.

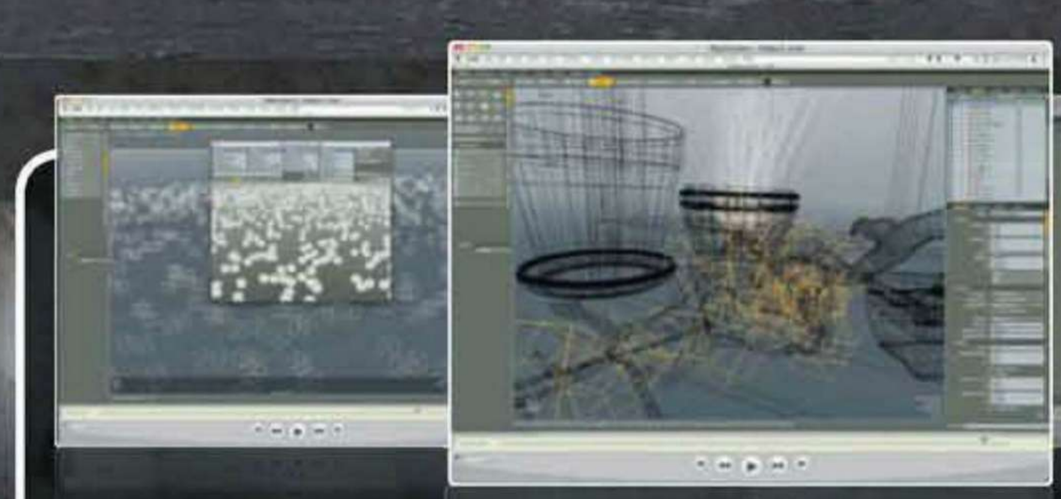


About the author
Mathew Burniston is a motion graphics and 3D freelancer with a wide range of skills from modelling and texturing through to rigging and 2D/3D animation. He's based in New York
hesthereallweek.com

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110 minutes of video at 3dworldmag.com/147



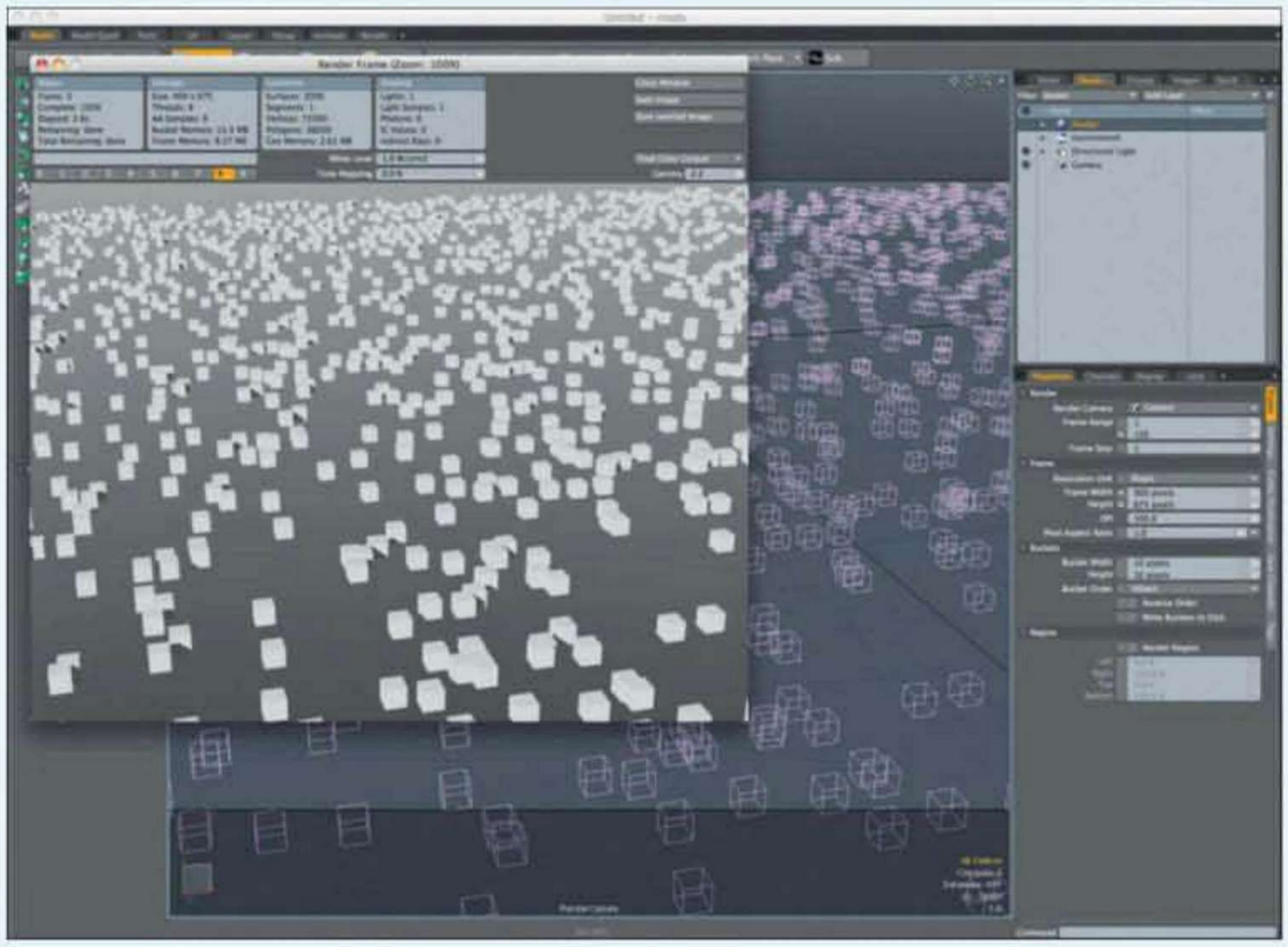
WATCH THE VIDEO TUTORIAL

Follow Mathew Burniston's complete workflow for this project and pick up more great techniques with the video on the 3D World website
3dworldmag.com/147

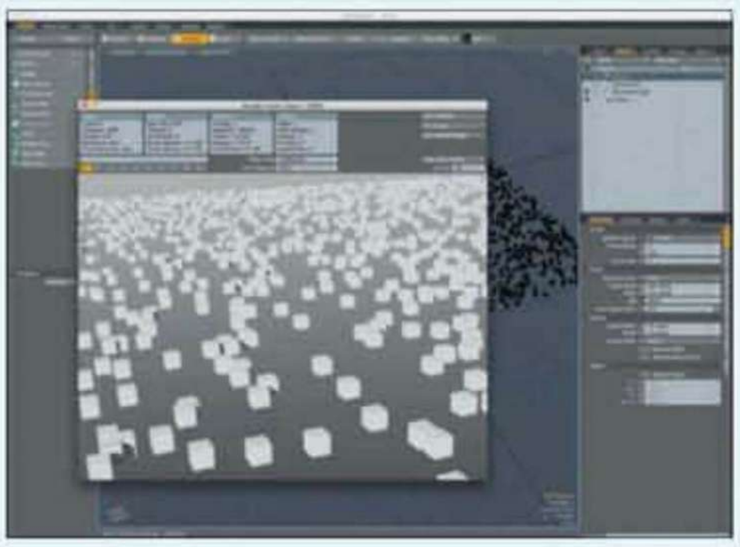
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Video 1 04:43
Using Instance replication, the render time drops by over 50 per cent to 2.9 seconds



Video 1 01:20
A first test using geometry replication. Note the render time of six seconds



How to use this tutorial

First, visit 3dworldmag.com/147, where you'll find details of the screen-capture videos that accompany this tutorial. The videos are also available at youtube.com/3dworld. Use the video player's controls to skip to a timecode listed in the text, read the overview, then play the footage.

Stage 1

Replicators, replicators, replicators

So what exactly are replicators, and why would you want to use them? In this introductory video, I'll take a look at the differences between duplicating geometry, using instances and generating replicators. I'll cover the advantages and disadvantages of each method and discuss the impact that each one can have on render times.

Video 1 01:20
Geometry duplication

The first example of duplicating geometry uses the Scatter Clone tool, which can be found in the Duplicate tab of the Model view. This tool simply takes any currently selected geometry and duplicates it using a set of editable parameters.

This method works well for small amounts of duplication, but if your object has a lot of complex geometry, then the scene file will get heavy very quickly and your productivity could soon grind to a halt. And if you do try to duplicate some serious amounts of geometry with this tool, get ready for your machine to start chugging, for modo to crash, or for the dreaded 'out of memory' pop-up to appear before you know it.

Video 1 04:43
Instances

For the second test, let's see what happens when you use the Instance Scatter tool. If you can't see this tool, you can click and hold the Scatter Clone button to see a drop-down with alternative options for that tool, including Instance Scatter.

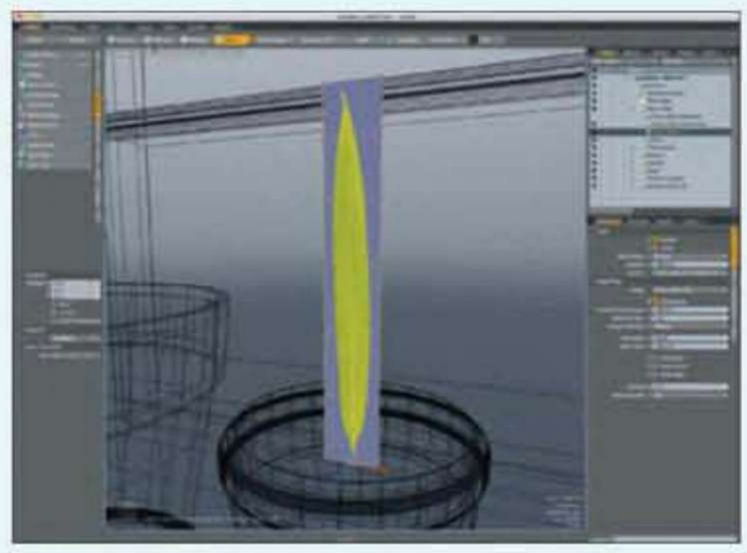
Instancing is a nice solution to duplicating lots of geometry, but it has limitations. The advantages are that render times are greatly reduced, and any further editing of the original mesh is transferred to its instanced children. One of the main problems is that each of the instances is created as a separate item in the item list; they can be grouped and organised, but can quickly bloat your item list and become a little confusing. This can also be advantageous at times: because the instances remain fully editable, they can be moved, rotated and scaled individually at any point.

That being said, my recommendation for instances is to use them on small amounts of replication. I wouldn't suggest exceeding more than a few hundred in one scene. They're also best used when you have a predefined plan of where you want them to live in your scene: once they're placed, it can be time-consuming to rearrange hundreds of instances.

Video 1 07:20
Replicators

Now it's time to look at replicators. In this test, I'll use the Replica Scatter tool to reproduce the same geometry as the previous two scenes. Replica Scatter can be found in the same place as the previous two tools, and once activated has a similar operating method. After making the replication and running a test render, you can see that the render times are substantially reduced – similar to what you saw with the previous instances test.

So why use replicators over instances? Well, the main advantage of replicators is the ability to adjust each individual replication after it's been created. The Replicator item has a set of parameters found in its Properties panel, which gives you the ability to randomise the created geometries' rotation, scale and position. This ultimately enables you to produce a nice range of variation in your scene very quickly, using thousands, if not millions, of replications. When you're trying to reproduce objects found in nature, such as trees, these tools become invaluable.



Video 2 02:23
Creating your geometry in the correct place is vital for replication. Use the item's transform handle to line it up where you want it to be centred

Stage 2

The basics

The first method I'll use to create replicators is the easiest and quickest way to begin getting results. With the creation of some simple geometry and a click of a few buttons, you can start filling in the scene provided with some great-looking plants.

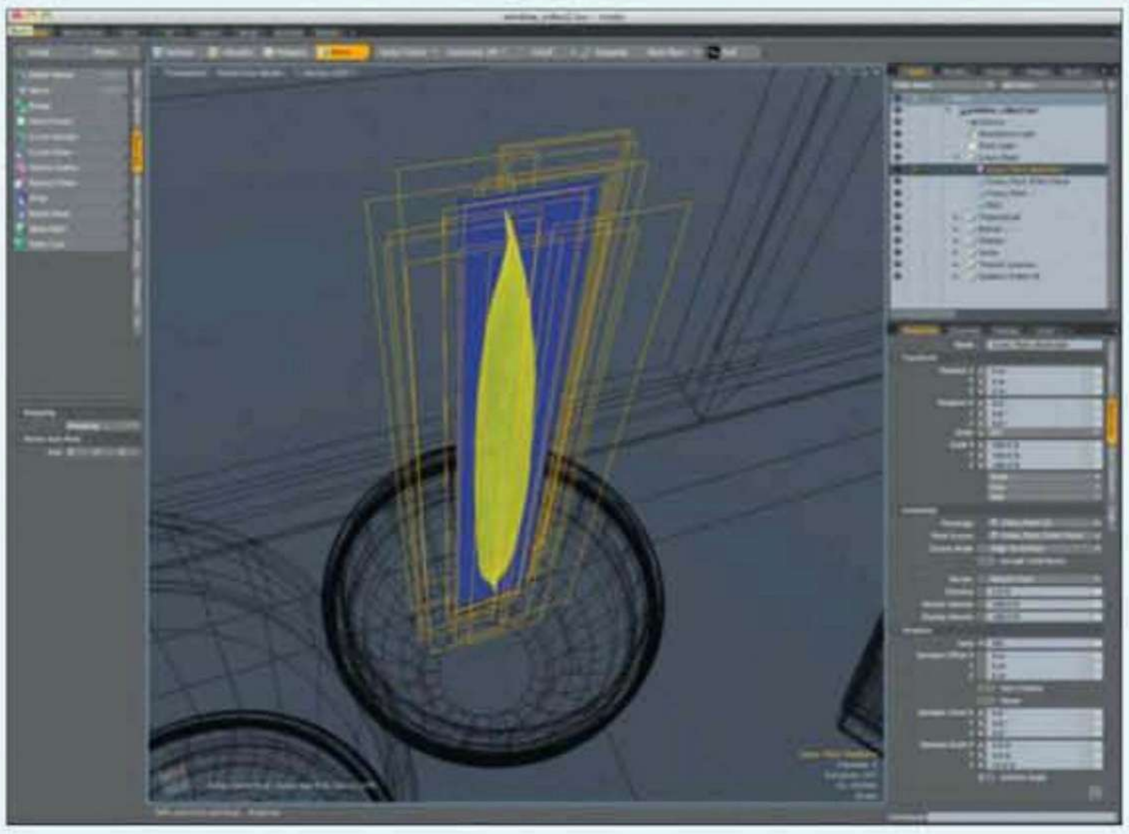
Video 2 02:23
Creating some leaves

After opening window_start.lxo from this tutorial's scene files and familiarising yourself with the set-up, the next step is to start creating some simple geometry to represent the leaves in your first pot. Use the Cube Primitive tool to create a rectangular plane with a few divisions. The simplicity of the geometry is key to a lot of the techniques you'll employ in this project. Using unnecessary detail will choke up your system very quickly when starting to generate thousands or millions of replicators.

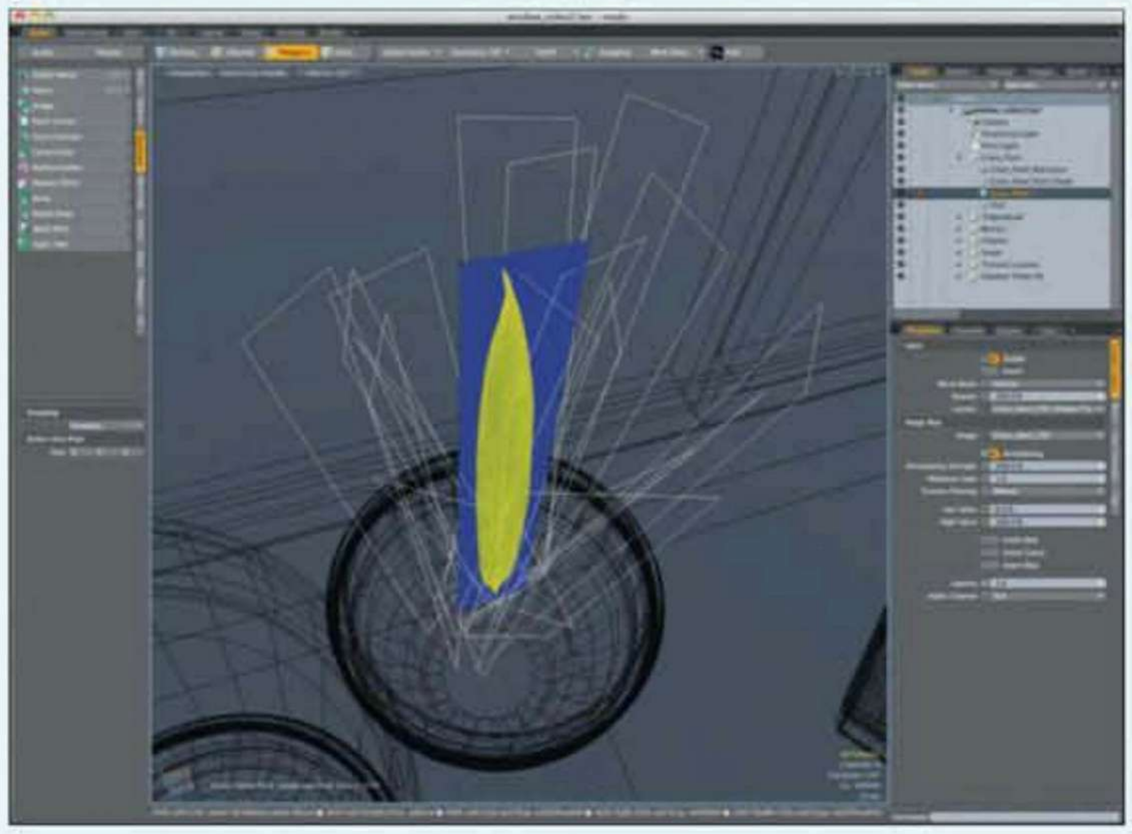
Knowing what the final size of the item in the scene will be can help you define how much detail

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Video 2 09:25
The first step in replicating the plant gives unnatural effects. Each leaf is facing in the same direction and is an exact replica of the original



Video 2 16:07
Once you've made adjustments to a few parameters, the leaves begin to look a lot more random, and closer to how they'd appear in real life

you should include. This first leaf is a simple grass-like plant that will be relatively small in the scene, so using only a few polygons will be more than enough on this occasion.

The main point here, which I can't stress enough, is always to make sure the geometry you want to replicate is placed at the point in the item where you want the centre of your replication to happen. This will not only be the point from which the replication will be produced, but also where it will be rotated and scaled dynamically later. The easiest way to ensure you have this set up correctly is to check that all of the transforms are set to zero at the item level, then double-click your geometry to make sure it's all selected, and select Edit > Center Selected > All. Your geometry will be moved to the centre of your scene. Now you can use the Move tool to realign it so that the position you want it to be replicated and rotated around sits at the 0, 0, 0 point on the workplane.

Video 2 09:25
Replica scatter

Now that you've modelled and textured the leaf, it's time to start replicating. In this first example, you'll use Replica Scatter. In Item Selection mode, select the object you want to replicate, then click the Duplicate tab and select Replica Scatter. (You may need to switch from Scatter Clone or Instance Scatter via the drop-down.) Now click once in the viewport to activate the tool. You should see a list of parameters appear in the lower left-hand corner of the interface: this is where you can start to determine how your replicator takes shape.

Video 2 16:07
Randomisation

When the replicator tool is first run, it produces unnatural results: each duplicate is standing straight and facing the same direction as the original. For this interior scene you're working with plants, so you'll have to explore some additional settings to give the replicas the randomisation you'd expect to find in nature. This is where the real benefits and power of replicas come into play; the Random Twist and Random Scale values will become your best friends when working with replicators.

The Random Twist parameter is the one I use the most, although I'd much rather it were called Random Rotation. The word twist suggests that it will distort the geometry, where in fact it only spins it around its vertex pivot. As you might expect, the Random Scale value works in the same way, randomly generating different-sized duplications in your scene.

Just as nothing in nature grows with the same size, colour, shape or direction as the thing next to it, these two values will create the same effect for your CG worlds. The ease with which you can inject randomness into your scene is what really makes this workflow stand out from anything else in modo.



Video 2 20:33
The preview render shows that with some simple tweaks, such as using the Bend tool to give the impression that it's bloomed in the available light, you can create a very realistic looking plant

Video 2 20:33
Bending nature

The final step in creating the first plant will help to give that extra touch of realism to the scene. You might have wondered earlier in the video why I created the leaf with five segments in the geometry, when the leaf is perfectly straight. What grows that straight in nature? Not much.

There's a method to my madness. After selecting the geometry, use the Bend tool, which you'll find in the Deform tab in the modelling viewport, and add a slight curve to the whole leaf. Bending the leaf just a little makes the plant appear to be growing out of the pot and blooming in the sunlight.

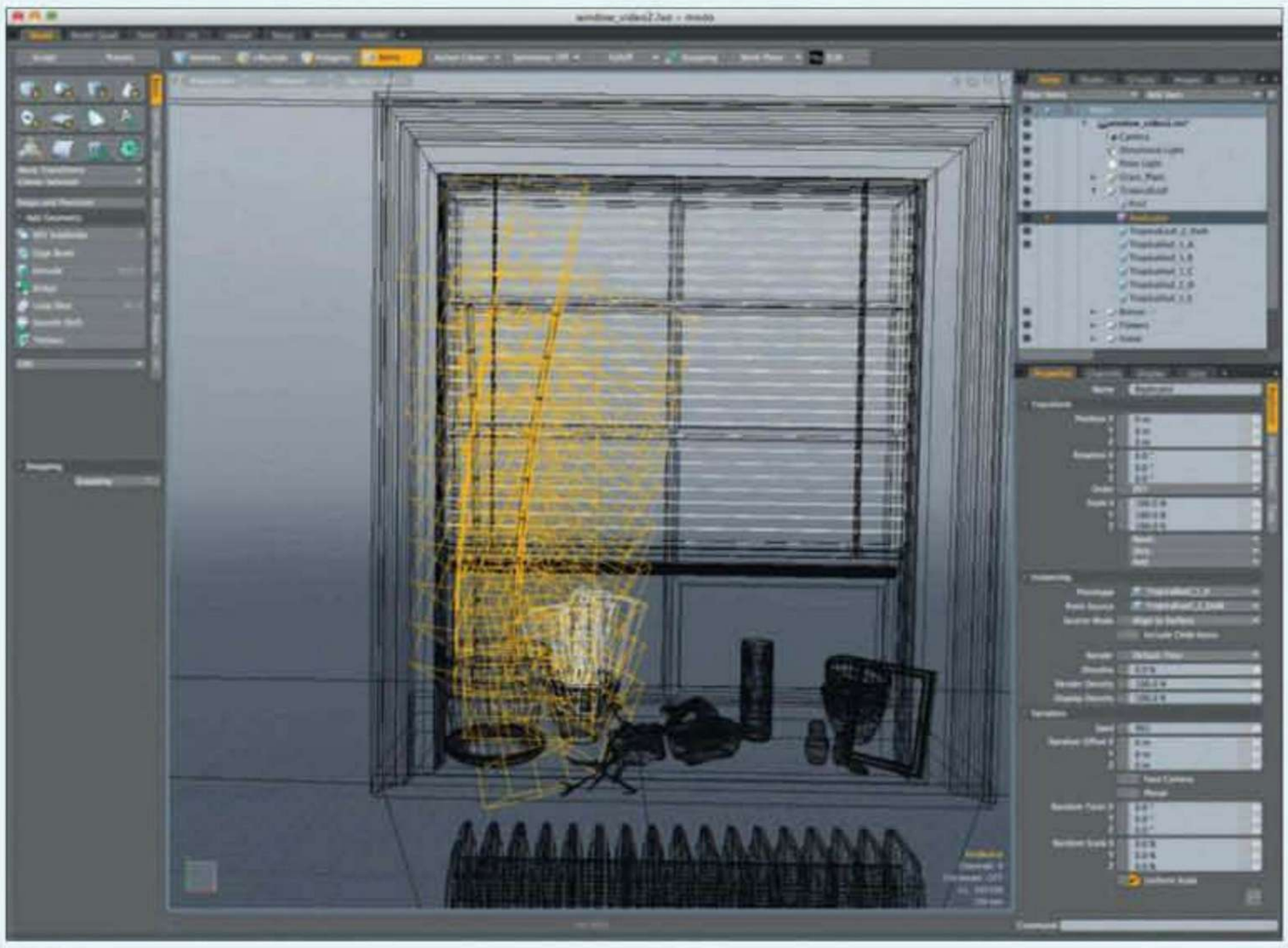
Stage 2

Getting tropical

Building on the first two videos, you'll begin creating the geometry for the next plant, this time using a slightly different technique. This second leaf will have a lot more detail. However, since you now have a basic knowledge of replicators, you can handle more of the set-up yourself, rather than letting modo automate it for you. »

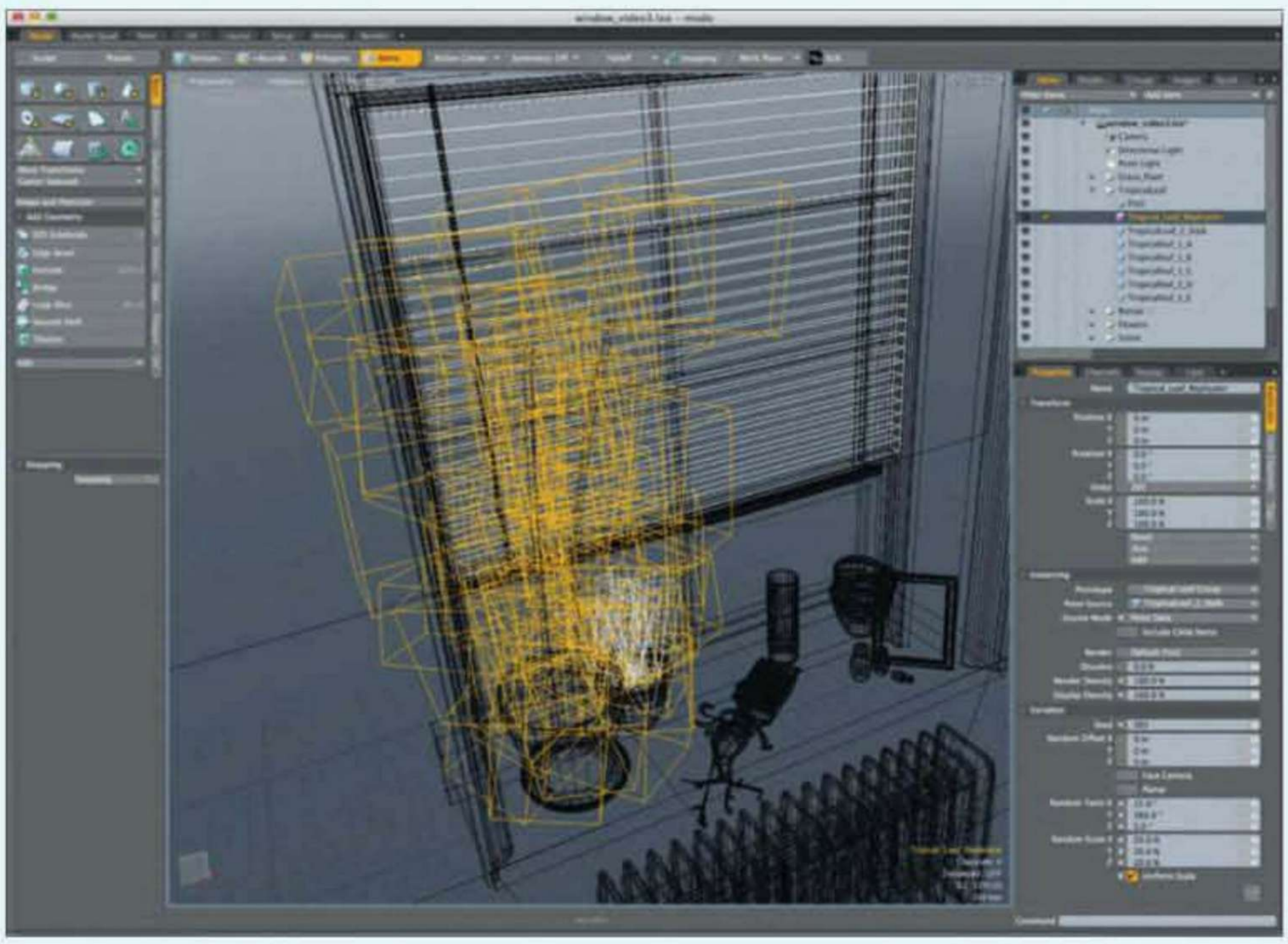
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Video 3 13:25

Start making your choices for the replication. Setting the Point Source value in the replicator's Properties panel to use a mesh will create replications from each of its vertices



Video 3 23:18

Random Twist and Random Scale are the backbone of creating randomisation with replicators

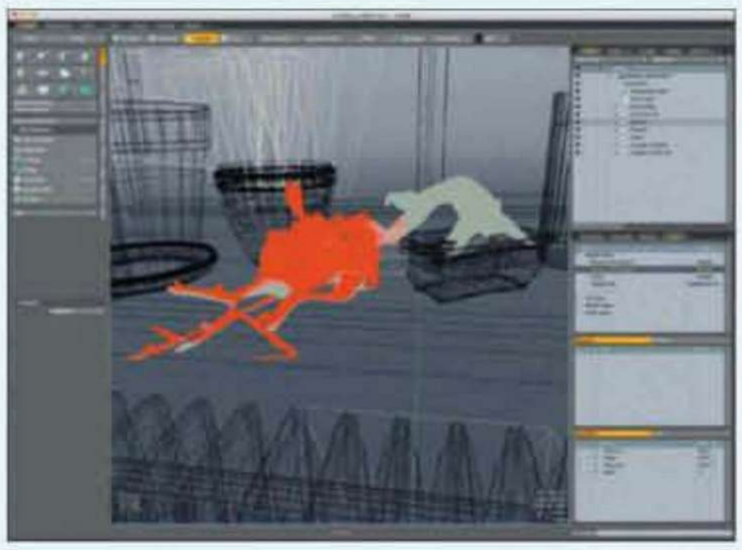
Video 3 03:42

Building a detailed base

Using background reference plates when modelling is a common technique that gives you the ability to create something accurately in a short amount of time. I use the Pen tool to draw out the centre spine of the leaf, then extend the edges to create the fan-like leaves. I then use the Element Move tool [T] to drag around the vertices and edges until I'm happy with the overall shape. As you can see in the video, the leaf ends up with substantially more geometry than the simple leaf from Video 2. Although it's generally best to keep your models as simple as possible, I'm planning for this leaf to be rendered considerably bigger than the previous one, so I've decided to use geometry instead of images to produce a lot of its details.

Take the time to beef up the textures for this leaf. You don't want the viewer to notice that it has the same texture on the front and back, so I show you a technique that combines multiple images and gradients to resolve this. I use ZBrush to sculpt a quick normal map, but you could use an application such as CrazyBump to achieve a similar result.

The additional geometry you use and the extra work you put into the textures will pay off at render time, when the image looks as photorealistic as possible, but don't go crazy: a little goes along way.



Video 4 01:15

Using a vertex map to control replication density gives live feedback showing where the leaves will and won't grow

Video 3 13:25

Building a replica from scratch

You're ready for your second replicator, but this time you'll build it yourself: this will enable you to replicate leaves coming out of the plant stems that are already in the scene. Choose Add Item > Duplication > Replicator from the Items tab's New Item drop-down; you should see a new replicator item appear.

In the Properties tab below, you can start dialling in values and begin setting up the replication. Simply navigate to the Prototype and Point Source drop-downs and select the corresponding items from each list: Prototype is the item you want to replicate, while Point Source is the item around which you want it to be replicated. The Point Source can be any item that has vertices, edges or polygons in it.

Video 3 23:18

Geometry randomisation

Although you can use Random Twist and Random Scale to make it seem like each leaf is unique, here you can go a step further and set it up so each leaf is randomly picked from a predefined set of leaves you create. This is where Groups comes in.

You might have seen the Groups tab next to your Shader Tree tab, but never realised what you could use it for. Well, one use is as a powerful tool when working with replicators. All you have to do is click New Group, then, in Item Selection mode, select the items you want to include in this group, right-click your group and select Add Items. Now select this new group in the Prototype drop-down in your replicator's Properties. Instead of it using a single item as the Prototype, the replicator now randomly picks and distributes items from the group.

The Random Seed parameter in Properties influences all random attributes throughout the replication. This includes the random selection of geometry from a group, as well as the Random Twist and Random Scale attributes.

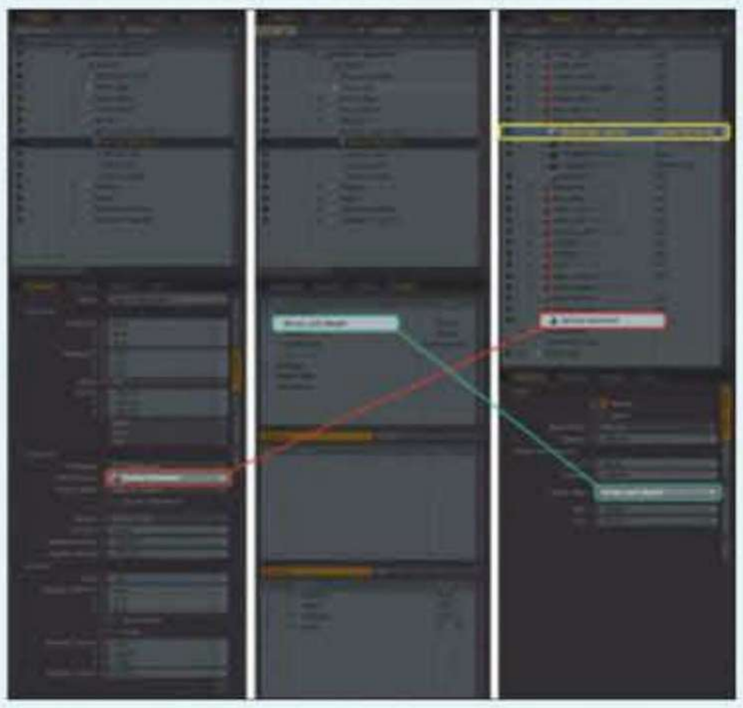
Video 3 27:10

Scene speed

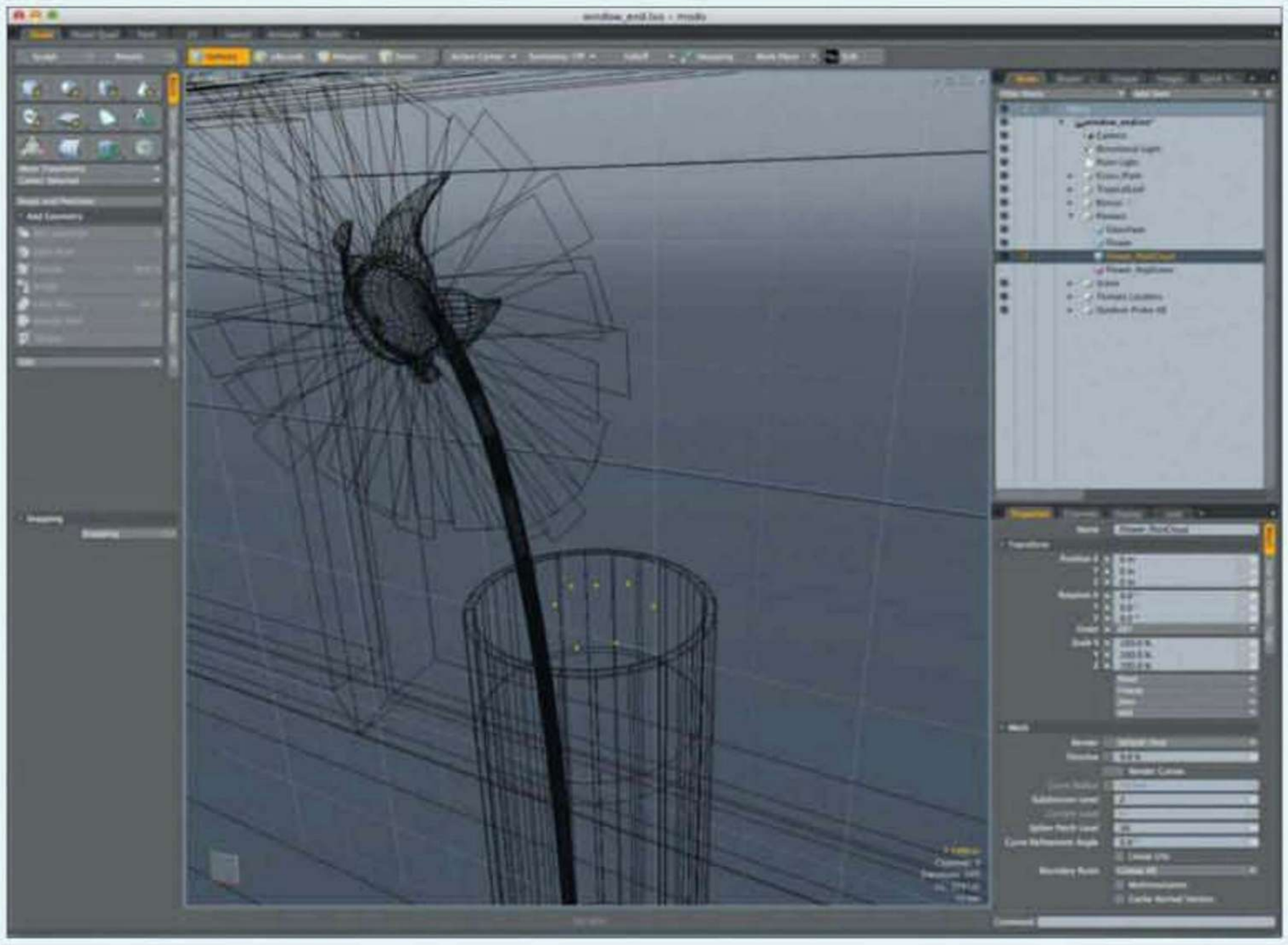
Even with two replicators enabled in the viewport, you might have noticed that things can get a little slow. If this happens, there's an attribute that might help you out. In a replicator's Properties tab, look for Display Density. If you decrease this value, some of the replications will start to disappear. Everything will still render just fine in the Preview Render and Final Render: it will just dial down the number of replicators in the viewport, helping keep your window a bit cleaner and, hopefully, running a lot smoother.

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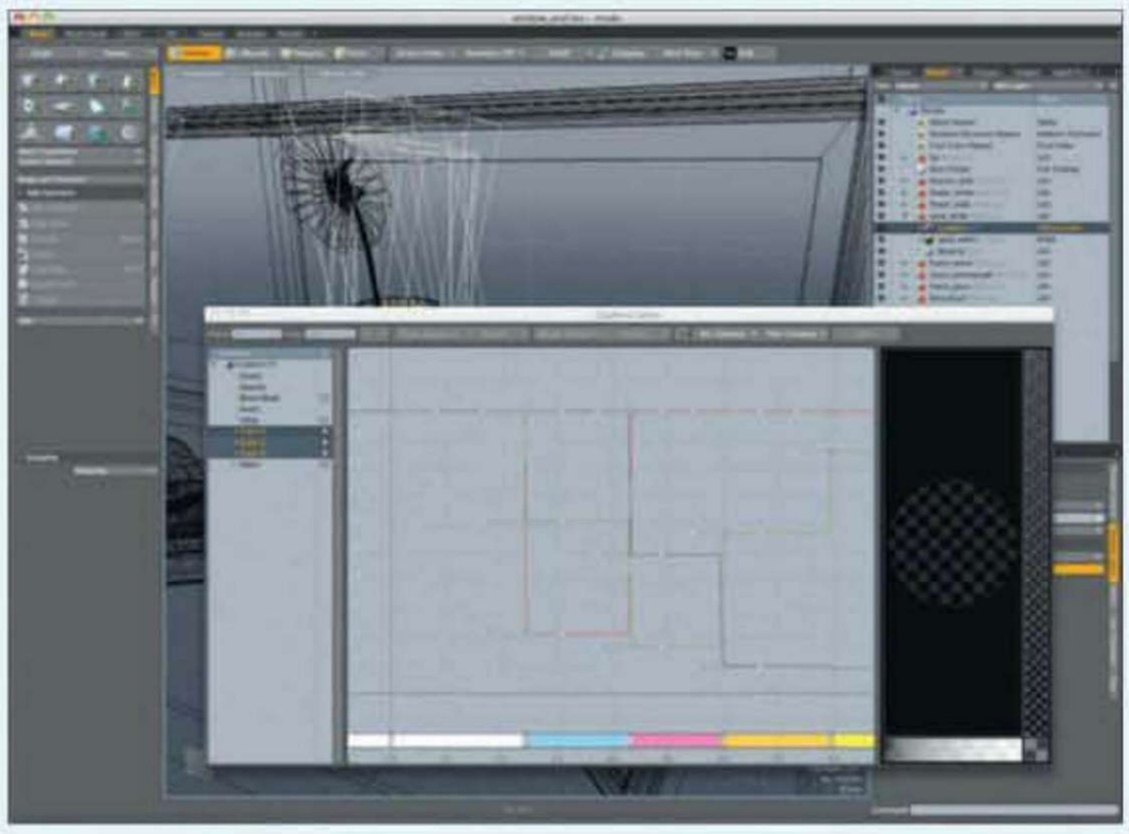
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Video 4 09:53
A simple diagram showing what connections are being made to pipe a vertex map into a replicator



Video 5 03:28
Place vertices where you want replicators to appear using the Pen tool and generate extra flowers



Video 5 12:25
The Gradient Editor window can be used to give the replicators a random colour

Stage 4

Surface generation

Surface generators are one of my favourite ways to use replicators, not only when working on foliage, but for many other applications. When creating dew on product shots, skyscrapers in a city scene or particles in the air, replicators and surface generators are my go-to workflow. This makes it simple to create thousands of replicated geometries and render them with ease.

Video 4 01:15
Weight maps

Surface generators are the ideal solution to covering a whole surface with replicated geometry, but what if you don't want leaves growing from everywhere? You can use a weight map to tell the replicator where to grow leaves. Unlike image maps, vertex maps are data stored at the vertex level. They can easily be applied, removed and manipulated; they aren't resolution dependent, and stay editable indefinitely.

To add a new weight map, first select the item you want to add a map to, and navigate to the Lists tab, which is on the right-hand side of the screen near the Properties panel. Once open, twirl down the Weight Maps group, then simply click New Map. When working with vertex maps, you'll need to change your viewport shader mode to Vertex Map via the drop-down at the top of the viewport. Apply your map by selecting polygons on the geometry.

To get started with the editing, select Vertex Map > Weight Tool, click-and-hold in the viewport and drag right and left to edit the value. When applying the weight, you'll see the default green texture turns red or blue depending on the value you dial in: this will drive the density of the replication once you finish setting things up.

Video 4 09:53
Linking it all together

All the pieces of the puzzle are ready and it's time to link everything together. The link happens between the replicator in the Item list, the surface generator and weight map Texture in the Shader Tree, and the vertex weight map in the Lists panel.

Once everything is up and running, the three most important values that will alter your replication can be found in the surface generator's Properties panel. Average Spacing and Minimum Spacing can be edited to define the density of your replications; the smaller the numbers, the closer together each leaf becomes. This can cause a problem at render time, with bald spots appearing on your base geometry. Solve this with the Particle Ceiling parameter: crank up this value and the bald spots will fill in. Be careful, though: turn it up too high and you might crash your machine or run out of memory at render time.

Stage 5

Flower power

So far, you've used replicators to randomly generate geometry with dynamic size and rotation, and to select a random geometric instance from a group. In this stage, you'll use advanced layers in the Shader Tree to generate randomly coloured objects within a replicated item.

Video 5 03:28
Making the right points

Although this technique is similar to the ones from the earlier videos, it has the advantage of giving you complete control over where the replicas are created. It isn't necessary in this example, but there's also an option to turn on Snapping when drawing out your vertices: that way, you can essentially replicate items right onto any surface in your scene.

Video 5 12:25
Random colours

When you replicate an item, it's identical to the original until you start to edit it with scale and rotation. You can also randomly generate colours in your replicators by using gradients.

If you add a gradient to the petal texture in the Shader Tree, you can then use this gradient's colour values to randomly apply colours to the petal's replicas. Simply middle-click on the bottom bar in the Gradient Editor and choose a variety of colours. When satisfied, select all the points in the graph and change Slope to Stepped. Set the gradient's Input Parameter to Sample Parameters > Particle ID. When the scene is rendered, the replicator will choose points in your gradient and assign it to the diffuse colour of a random replicated geometry, giving you a beautifully coloured bouquet of flowers.

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Expert Tips ZBrush Sculpting

FOR
ZBrush 4.0

TIME TAKEN
45 minutes

TOPICS COVERED
- UV Master plug-in
- Image Plane plug-in
- Customising the startup material
- Adjusting the BPR Shadow settings
- Creating Booleans

ON THE WEB
- Video tutorials
- Reference screenshots

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45 minutes of video at 3dworldmag.com/147

WATCH THE VIDEOS
Follow Scott Spencer's tips on UV Master, Booleans and more!
3dworldmag.com/147

Follow this issue's tips for improved models and a smoother workflow

Get the most out of ZBrush

Explore the world's most popular sculpting program in more detail as Scott Spencer shares smart techniques for better-looking models

In the following selection of tips, I'll focus on using two ZBrush plug-ins, as well as other useful but under-documented features. By understanding these plug-ins and techniques, you'll be able to fully exploit the power of ZBrush and use it efficiently in a production pipeline.

Pixologic has a full suite of extensions to expand the functionality of ZBrush in areas as diverse as UV generation, working with SubTools and transferring models from ZBrush to external 3D applications. I'll show you how to use the ZBrush plug-in UV Master in conjunction with Maya, leveraging the strengths of both applications into a single approach to creating multiple UV shells outside the 0 to 1 space. I'll also explain how Image Plane can be used to load reference materials directly into the ZBrush document window. Both UV Master and Image Plane are free to download from **pixologic.com/zbrush/downloadcenter/zplugins**.

I'll also consider how to adjust the look of a model within ZBrush, from changing the startup material to harnessing the power of the BPR Shadow settings. Plus I'll explore an undocumented feature used to create Booleans in ZBrush. This last tool is a powerful way to generate complex mechanical parts at record speed.



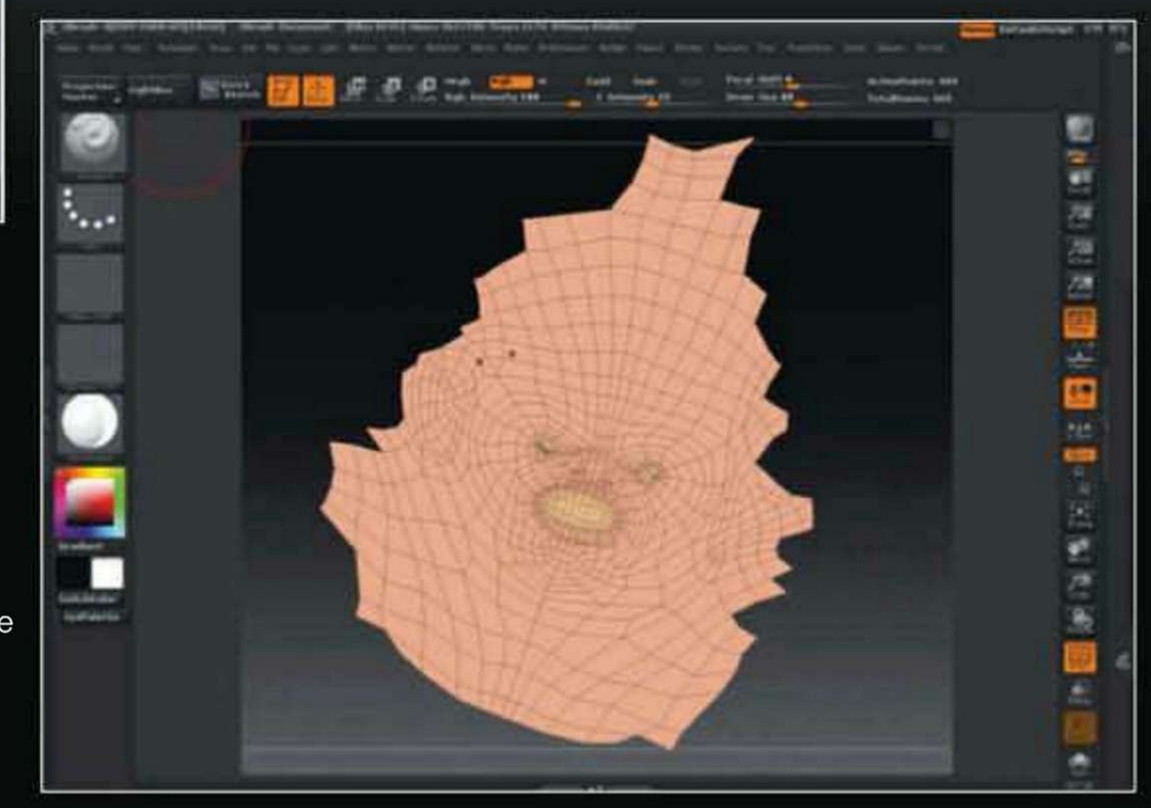
About the author
Scott Spencer is a digital sculptor and designer at the Weta Workshop in Wellington, New Zealand
scottspencer.com

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The free UV Master plug-in helps you define where your UV map seams will appear



The UV Master plug-in creates readable unfolds, ideal for easy editing

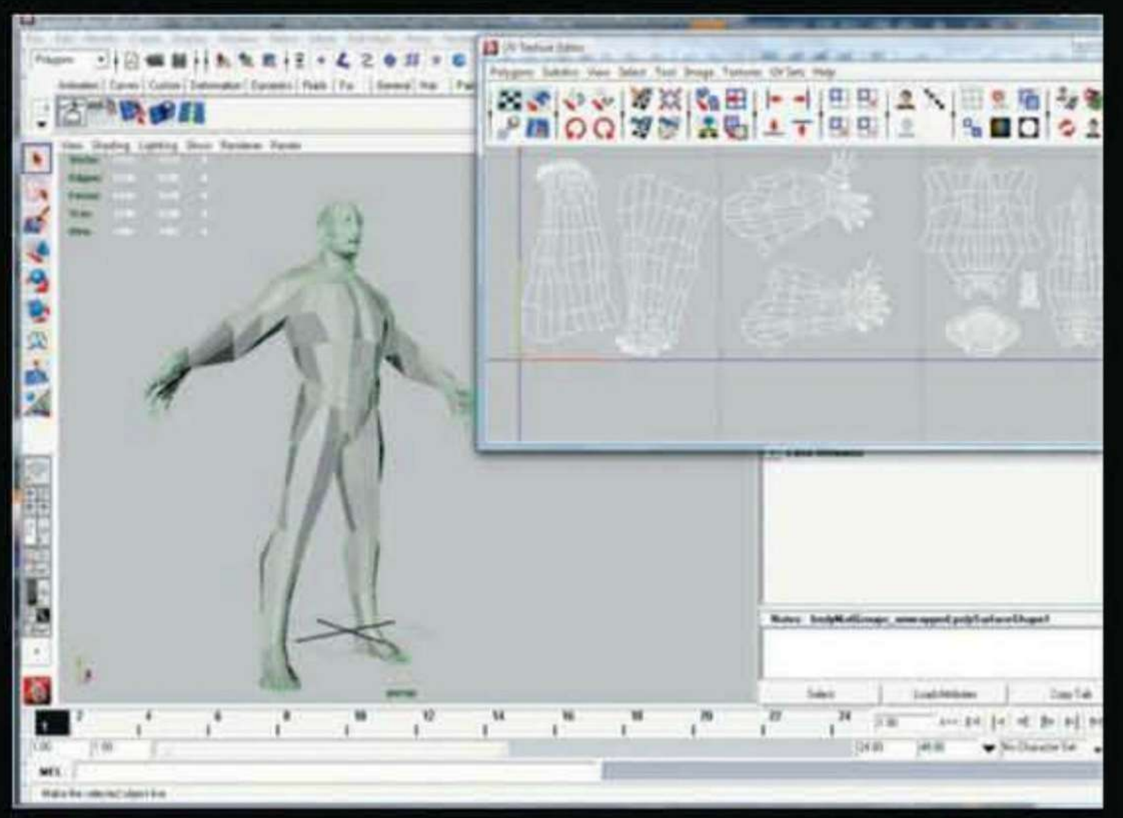
01 Use UV Master to quickly create human-readable UVs

The ZBrush plug-in UV Master is a quick and effective way of generating human-readable UVs in a semi-automated manner. Unlike the other automatic mapping techniques available in ZBrush, such as AUV and PUV tiles, UV Master unwraps a model in a manner that's readable to the human eye while maintaining the least distortion and highest efficiency possible.

Other automatic mapping solutions create a UV unfold that's understandable to the machine and not the naked eye. This often introduces problems later in the process when you want to edit a map in Photoshop to paint elements in or out. It's also harder to track down and correct artefacts when the map isn't clear to the human eye. UV Master allows for user input to help determine where the seams are placed, as well as the texture scale for various parts of the model.



Break the texture map into multiple sections for maximum quality



Get more control by specifying the seam placements in Maya

02 Use Maya to help support UV Master

While UV Master enables you to paint regions where you'd prefer the seams to lie, it's possible to combine UV Master with Maya and specify exactly where the UVs will be cut. Unfolding the model into multiple UV islands based on polygroup, ZBrush will then unfold the shells exactly as defined by the user. By taking this approach, you can use ZBrush to unfold a body into multiple user-defined shells, then distribute those shells across several UV regions.

The power of this technique is that it enables you to generate a separate colour and displacement map for each UV region. This means a single character can have its detail distributed across multiple 4K maps, rather than packing it all into limited pixel space. This vastly increases quality and is imperative for some applications. When using HD geometry for colour and detail, it's necessary to use multiple high-resolution maps to capture the level of detail HD is capable of presenting. By breaking the texture map for the body into individual maps for the head, arms, legs and torso, you maximise texture resolution and final quality.

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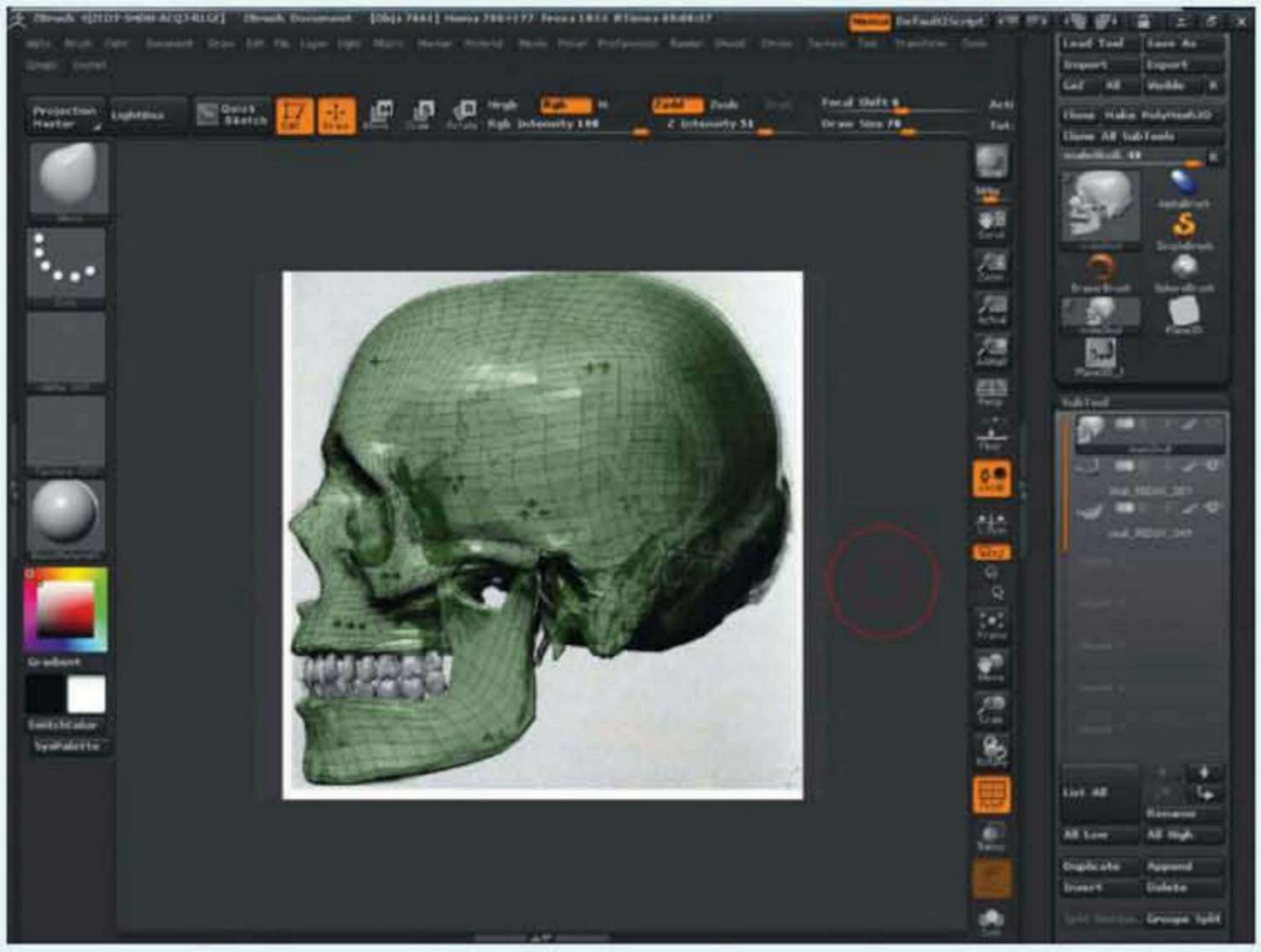
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03 Store viewport planes with Image Plane

ZBrush differs from Maya and most other 3D applications in that there's only one viewport and you're moving the actual model when you navigate, rather than moving a camera around a central point. This causes some issues when trying to create a reference image plane to use in modelling.

To resolve this, Pixologic released Image Plane, a plug-in that enables you to create multiple reference images. Linked to a button or hotkey, each image can be recalled to screen with a single press. Image Plane also stores the position of the model relative to the background image, so you can easily have front, side, top and other views instantly available. The model opacity is also editable from the plug-in interface, which enables you to see through the mesh as you work.

The plug-in was previously available for ZBrush 2.5, but has been thoroughly updated and rewritten, and is almost an entirely new suite of image plane tools. You're now able to store project files of your image plane data, which includes the model positions as well as the raw image plane information. This is one of the rare plug-ins that doesn't appear under the ZPlugin menu once installed: it's found under the Texture menu.





If you'd prefer a startup material other than the default Red Wax, it's easy to pick your own

04 Change the startup material from Red Wax

By default, ZBrush starts with the Red Wax shader as the selected material. Even if you set a new startup document, this material default will remain unchanged. Luckily, it's possible to customise your materials so that the Red Wax shader isn't the default.

In the Material menu, select the Red Wax material and save it to the folder ZBrush 4 / ZStartup / Materials. (In Windows, this is inside Program Files; in Mac OS X, it's inside Applications.) Back in the Material menu, select the material you'd prefer as your startup and press the CopyMat button. This copies the material into memory. Now select the default Red Wax shader and press the PasteMat button to overwrite it with your new choice. You saved a copy of Red Wax in ZStartup, so the material will still be available on startup, but the default material slot now has a new shader in its place.

To finish, make a small mark with your brush in the corner of the document, making sure that the Material Channel (the M button in the top toolbar) is active. Save the document via Document > Save As Startup Doc. This will ensure that when you next start ZBrush, the default material will be your new selection.



The new BPR rendering engine for ZBrush 4.0 enables you to create more accurate-looking shadows. You can fine-tune the effect by tweaking settings including Strength, Rays and LDepth

05 Customise shadow settings in BPR

BPR is a new rendering engine developed for ZBrush 4.0. One of its benefits over the previous standard render modes is that BPR calculates far more accurate shadows. You may also introduce ambient occlusion by clicking a few options in the Render menu for a much more realistic and compelling final image than the standard settings supply.

These shadows look good under default settings, but you can exert more control via Render > BPR Shadow. Strength adjusts the intensity of the shadows, for example, while Rays helps to soften the edge of the shadow by increasing the number of rays cast to generate it.

The most useful slider in my experience is LDepth, which calculates shadows based on the angle of the light. Adjusting this to a negative value helps create a stronger contrast between light and shadow. VDepth performs calculations based on the viewer.

Enable Ambient Occlusion under the Render menu and dial down the gamma for a darker, more contrasting effect. In the image above, I've rendered the head with the following settings: BPR Shadow: Strength, 0.6; Rays, 70; LDepth, -5. BPR AO: Strength, 1; Rays, 44; Gamma, 5.

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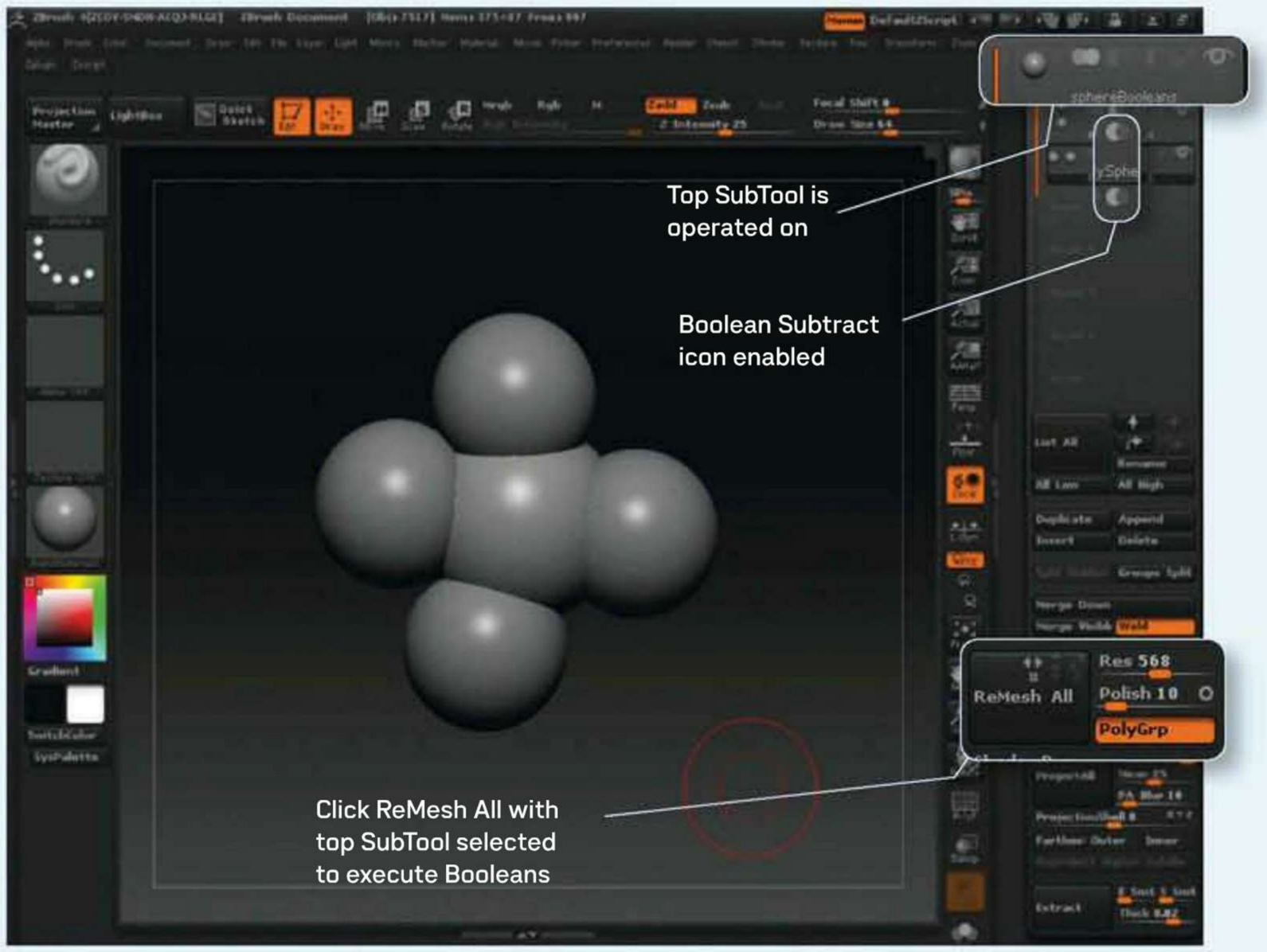
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06 ZBrush for Booleans

Booleans in Maya are sometimes difficult to make work, especially as the mesh becomes more complex. Booleans in ZBrush 4.0 are far more accurate and consistent than those found in Maya. They work by calculating the volumes of the SubTools and generating new meshes to reflect the selected Boolean operations. One of the benefits of this approach is that the meshes generated are all quad and even polygrouped into the new surfaces.

Booleans are set by selecting the icon in the subtool that corresponds to the action you want to perform. The top SubTool is the mesh on which the operation will occur. The Booleans calculate by working their way down each successive SubTool that's visible on the list.

In this example, the SubTool will be subtracted from the top-level tool. To execute the Boolean, select Tool > SubTool > Remesh All. You can adjust the resolution of the resulting mesh with the Res slider. The original parts are unaltered, but a new tool is appended to the end of the SubTool list. Note that the resulting mesh is polygrouped and all quad.



ZBrush 4.0's approach to Booleans offers a higher level of accuracy than Maya's

07 Smooth strokes with Trails

Brush strokes can be smoothed out by enabling Stroke > LazyMouse, but this tends to create a delay on the brush. You can smooth the stroke without this delay by using Brush > Modifiers > Trails. This creates multiple instances of the brush, slightly offset to help create smooth, even strokes.



Choose the Trails setting for smooth strokes with no delay

08 Replay the last stroke

To replay the last stroke applied to the model, click Stroke > Replay Last. This helps to build up forms by repeating the application of a brushstroke with the same location and pressure. Using this technique, textures can be built up gradually by replaying the application. You may also use this to increasingly deepen or raise lines on the surface to help create more machined shapes.



Use Replay Last to repeat your most recent brushstroke

09 Image Plane view hotkeys

When using Image Plane to store model views, it can greatly increase productivity to set hotkeys for those views.

To store a hotkey, hold [Ctrl] and click a view button under Texture > Image Plane > ReferenceViews, and then press the key that you want to store as a hotkey. (For this purpose, I tend to use a combination of [Alt] and the numeric keys.) Now when you press your hotkey, the model will snap to the correct position, with the reference visible on screen.

10 Create a rim light

Be sure to set up a rim light to help accentuate your renders when using standard materials. (Note that this won't work with MatCaps.) The rim light helps to define the edge of the object and pull it out from the background.

To create a rim light, turn on a new light in the Light menu and raise Intensity to 2. Click the sphere once to put it in the back of the model. As you move the light, the illumination appears to come from behind the model and highlights the edge.



Make your object stand out from the background by adding a rim light

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Questions & Answers

Your software queries solved by experts

Supporting files

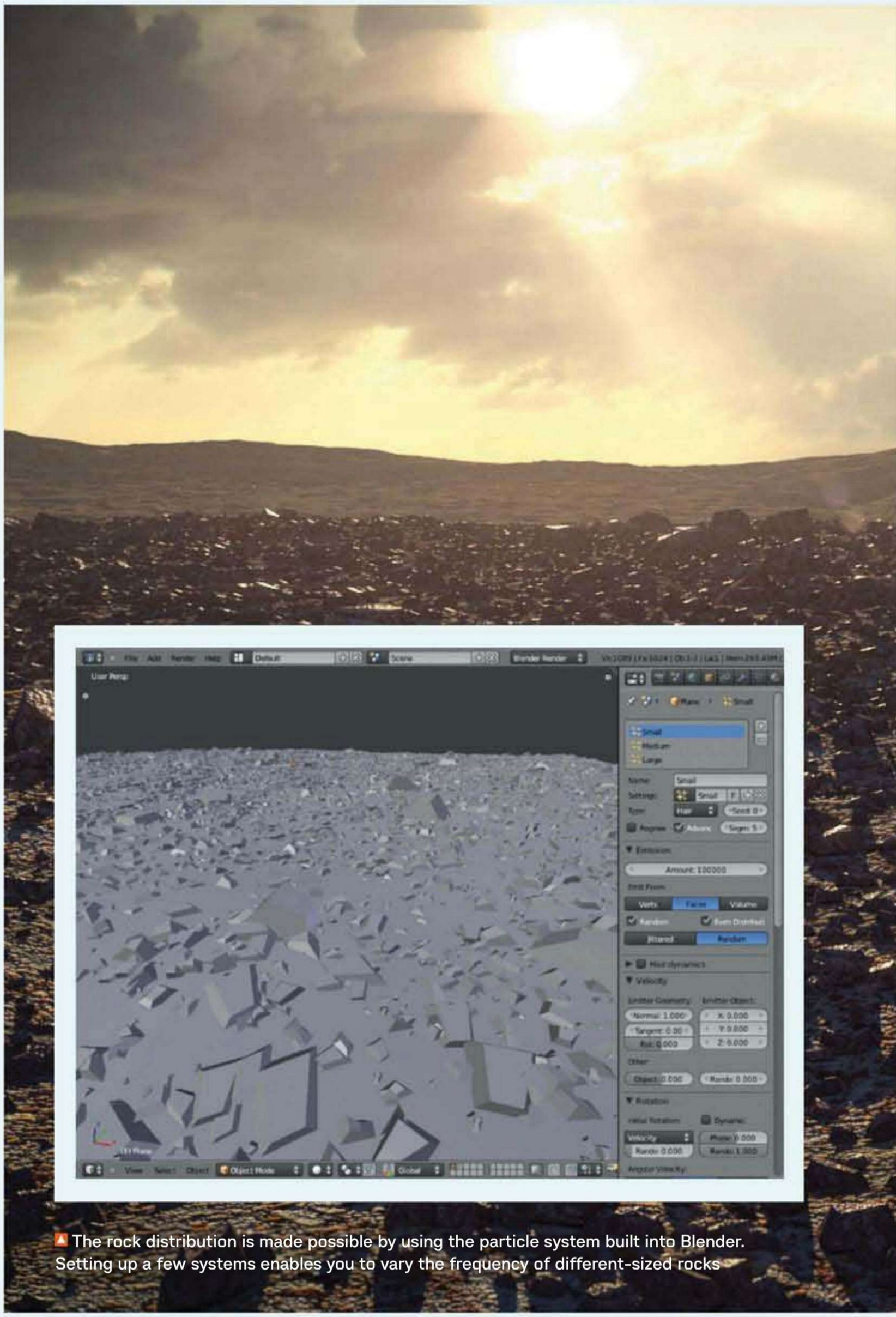
Most Q&As are accompanied by files and a video to help you explore its topic in more detail



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Get scene files and full-size reference screenshots
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Visit the 3D World website to see the videos accompanying five Q&As
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The rock distribution is made possible by using the particle system built into Blender. Setting up a few systems enables you to vary the frequency of different-sized rocks

Send us a question

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

Blender

"How do I quickly distribute rocks across a plane?"

Rayhan, from the forums

Andrew Price replies:

Rocks are great for outdoor scenes, but placing them one by one would be a painful experience. To save yourself plenty of time, though, you can use the particle system to quickly generate thousands of copies across a plane. Although they're all based on the same few originals, the rocks can all vary in orientation and scale.

Start by modelling a low-poly rock. Select the default cube and go into Edit mode [Tab]. Move all the vertices above the origin point to stop the rocks from going through the ground, by pressing [G] then [Z] and entering **1**. Move the vertices to form the basic shape of a rock. You can add more vertices by subdividing via [W] > Subdivide, but don't go overboard or your render times will suffer. Once you've created one rock, duplicate it via [Shift]+[D] and randomise it by moving the vertices around. Repeat this until you have three or four distinct low-poly rocks.

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Expert tip
Locate and use reference images of real rocks when modelling. It will result in a more realistic scene

This method can be used for distributing any object across any surface, so it's perfect for plants and trees as well

Select all the rocks [A] and add them to a group via [Ctrl]+[G]. You'll use this group in your particle system later. To ensure the correct rotation of the rocks when they're placed on the plane, go to the Side view [numpad 3] and rotate the rocks by 90 degrees clockwise to lie on their side.

Next, add a plane and scale it to 11 to fit the viewport by pressing [S] and entering **11**. To give the plane some variation, subdivide it five times and set Fractal in the toolbar to 15; also set Shading to Smooth.

Now switch to the Particle panel and add a particle system by clicking the + button. You'll be creating multiple particle systems, so label this one **Small**. Tick the Advanced box for more options. Change Type to Hair and set Emission > Amount to 100000. Change the Emission distribution type from Jittered to Random. To reduce the load on your graphics card while you work on the environment, set the Display rollout's Display value to 5.

Under Render, set the type to Group, and select your group name from earlier from the drop-down menu. Under Physics settings, set Size to 0.010 and Random Size to 0.900. Under Rotation settings set Phase > Random to 1. You should now see lots of rocks with random sizes and rotations distributed across the surface.

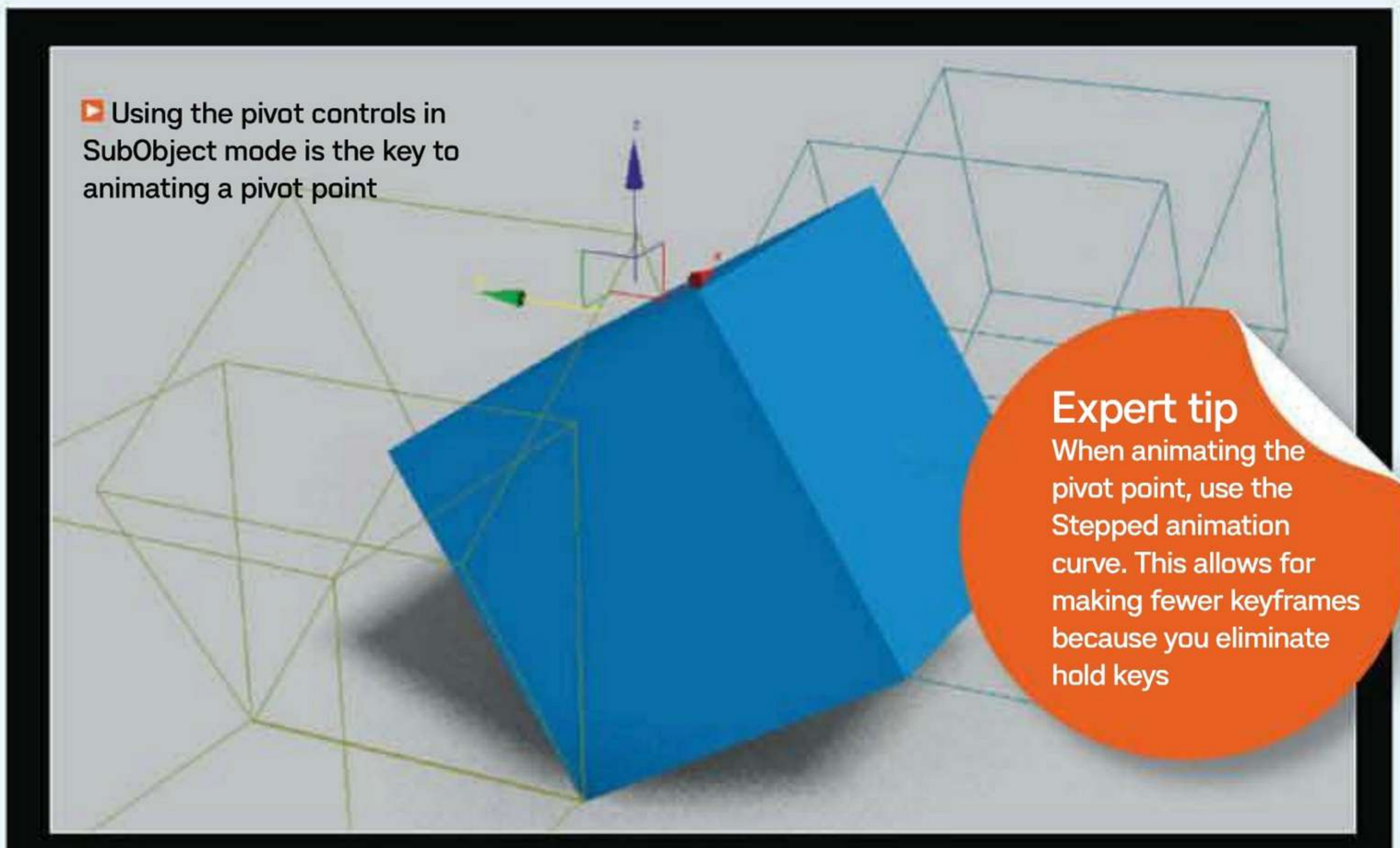
For more realism, create two more particle systems of different sizes. Click the + button in the Particle panel to create another particle system. To use the settings from the previous particle system, click the button next to the name and select the Small particle system from the drop-down list. Click the 2 next to it to separate it, and change the name to **Medium**. Change Emission > Amount to 20000 and Physics > Size to 0.020. Create another particle system in the same way and change its name to **Large**, this time setting Emission > Amount to 200 and Physics > Size to 0.070. You should now have a plane covered in randomly distributed, rotated and resized rocks.



Andrew Price has presented at two Blender conferences and has written The Wow Factor, an ebook on compositing in Blender
blenderguru.com

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3ds Max
"How can I animate a rotating pivot point?"

Brian Pai, via email

Michael McCarthy replies:

Usually this type of problem is handled best by a simple rig of a few null objects. Even though a simple hierarchical rig or scripted controller are options, the first logical thing users want is to animate a pivot point. It hasn't always been possible in 3ds Max to animate the pivot point of an object so it can rotate around a different pivot at varying points in time, but in the more recent releases (2010 Subscription Pack and above), a new controller provides the ability to have an animated pivot point.

This functionality came along with the addition of CAT (Character Animation Toolkit) to the base package of 3ds Max. CAT has the functionality to animate pivots for rigs: it achieves this by adding a new Transform controller. Fortunately, this controller can be added to any object to give it the ability to have an animated pivot point. Let's have a look at this using a basic rolling cube example.

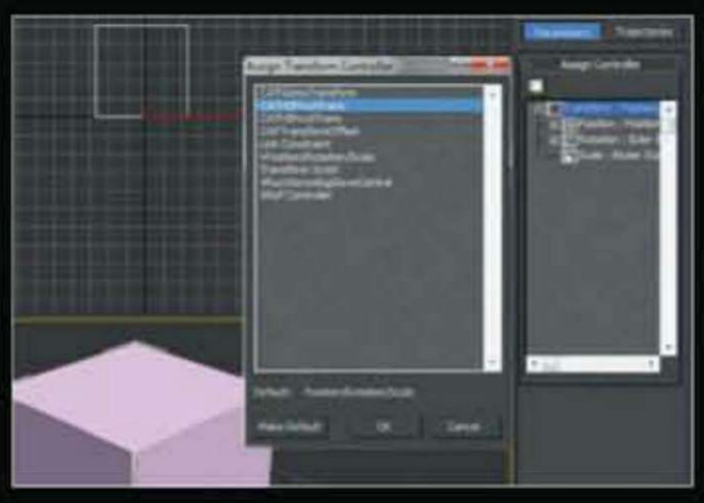
First, create a cube in the Top viewport. Go to the Motion panel and open the Assign Controller rollout. Here, you will assign a new controller to the Transform track of the object. It's common to assign a controller to a Position, Rotation or Scale track, but it's not too often that you would assign a controller to replace the entire Transform. Select the main Transform track and click the Assign Controller button. From the list that appears, you may see a few new CAT controllers you haven't seen before. Choose CATHDPivotTrans. Now you have an extra track to play with that will allow you to animate your pivot point.

In the Motion panel, click the SubObject button to get into PivotControls SubObject mode. Move the pivot point to the left corner of the cube. Turn on Autokey. At frame 10, rotate the cube over this side. Next, go back into SubObject PivotControls mode; with Autokey still on, set a hold keyframe for the pivot point at frame 9. At frame 10, move the pivot point to the next forward edge. Now you can hop back out of SubObject mode and rotate around the new pivot point. This will make the box look as though it's rolling up on its edges over the ground.

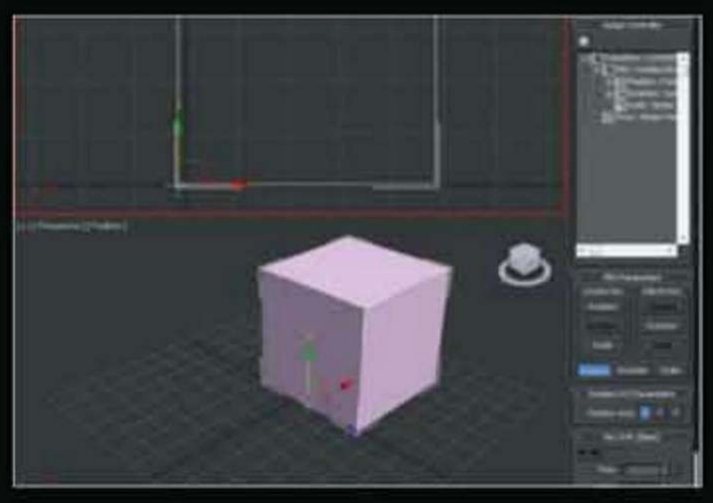
While switching to SubObject mode can be cumbersome, this is a great way to improve your animation toolset. You can even apply this controller to custom bone or vehicle rigs.



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mmccarthy.com



Here are the settings for the Assign Controller dialog. Here you will add the CATHDPivotTrans controller



Here are the settings for the SubObject PivotControls. Move the pivot point to the left-hand corner of the cube

Softimage
"How can I animate a wall of light bulbs in different patterns?"

Daniel, via email

Ola Madsen replies:

Nine times out of ten, you're over-egging the pudding by adding actual light sources to the setup: you could probably get away with using a really bright material on the object.

Start by opening Light_Wall.scn from this Q&A's scene files. There are several ways you can animate the lights switching on and off, but perhaps the most intuitive is by using an image sequence. Select the Wall object then Get > Property > Texture Map > Texture Map. In the Clip section of the PPG that opens, click the New button and choose New From File. In the Browser, select the LightSwitch.pic sequence from the Pictures folder and click OK. In the UV Property section, click the drop-down menu and select Texture_Projection. Close the PPG.

Select Get > Primitive > Point Cloud > Empty and press [Alt]+[9] to open an ICE Tree. In the ICE Tree menu, select Create > ICE Tree. Press [8] to open an Explorer, and drag the Wall object into the ICE Tree. Get a Get Data node and connect the Wall node's Out Name output to Get Data's In Name input. Open its Property Page (PPG) and enter **PolygonPosition** as the reference. This will get the centre of each of the polygons of the Wall object; but as the object itself is rotated, you'll also need to add the global rotation. This is done by multiplying the polygons' position with the object's global matrix.

Get a Get Data node. Enter **kine.global** as the reference and connect the Name output of the Get Wall node to this node's In Name input. Then get a

After Effects
"How can I fake a camera shake?"

Pete Williams, via email

Tom Skelton replies:

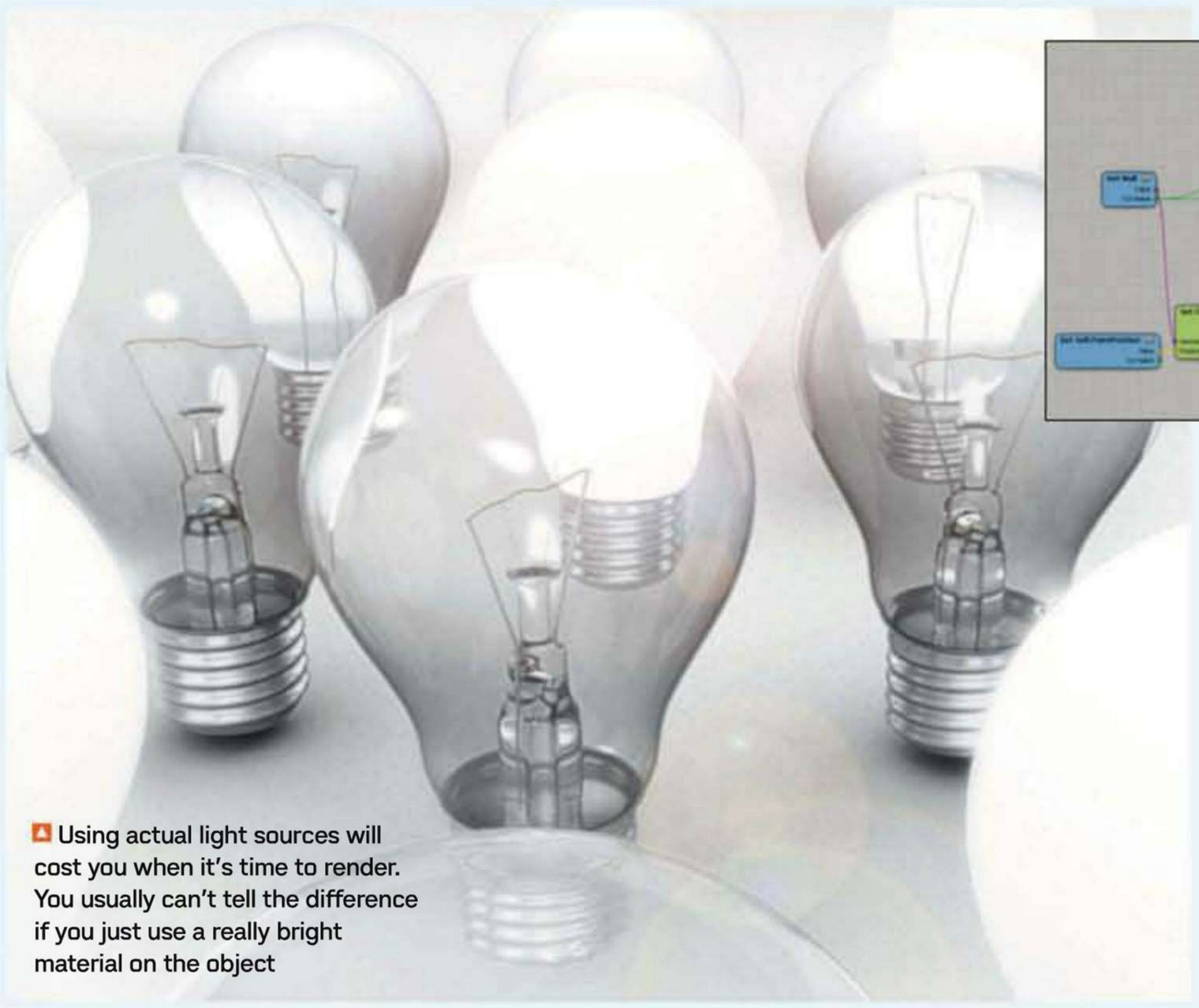
This camera shake technique is simple to implement but versatile in use. The key to getting the technique right is to match up the two layers it relies on. A quick way to create new in and out points for a layer is to press [Alt]+[for a new in point and [Alt]+] for a new out point. Be sure to use the [Alt] key, or you'll find your layer has a new start point instead.



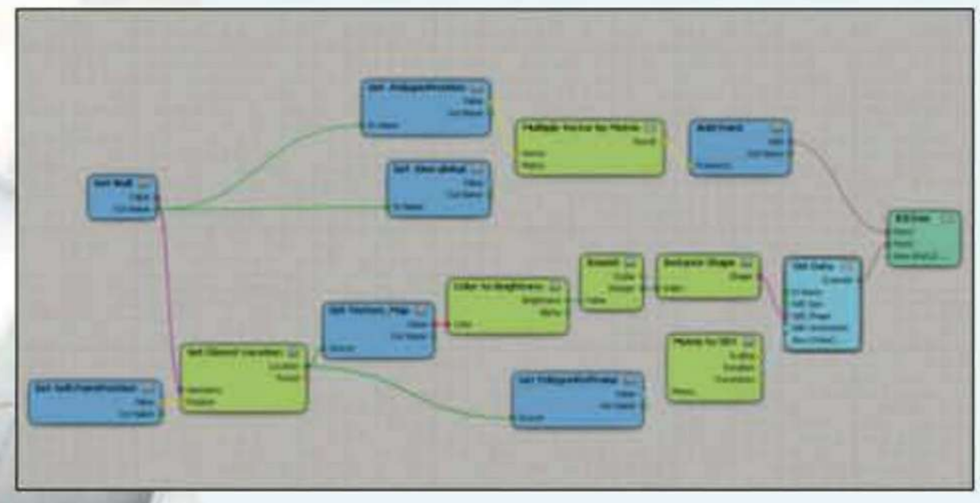
Tom Skelton is a freelance digital producer based in Hertfordshire. Recent clients include Philips, Red&Pink and Sophie Hiller
tomskelton.me

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Using actual light sources will cost you when it's time to render. You usually can't tell the difference if you just use a really bright material on the object



Perhaps the most intuitive way to create patterns for lights switching on and off is by using a texture map to control the distribution of light

Multiply Vector by Matrix node. Connect the Value output of the Get PolygonPosition node to the Vector input, and the Value output of the kine. global node to the Matrix input. Get an Add Point node, and connect the Result output of the Multiply Vector by Matrix to Add Point's Positions1 input. Connect the Add output of the Add Point node to the Port1 input of the ICE tree. Get a Set Data node. Enter Self.Size as the reference, then set Size to 1. Connect the Execute output of the Set Data node to the Port2 input of the ICE Tree.

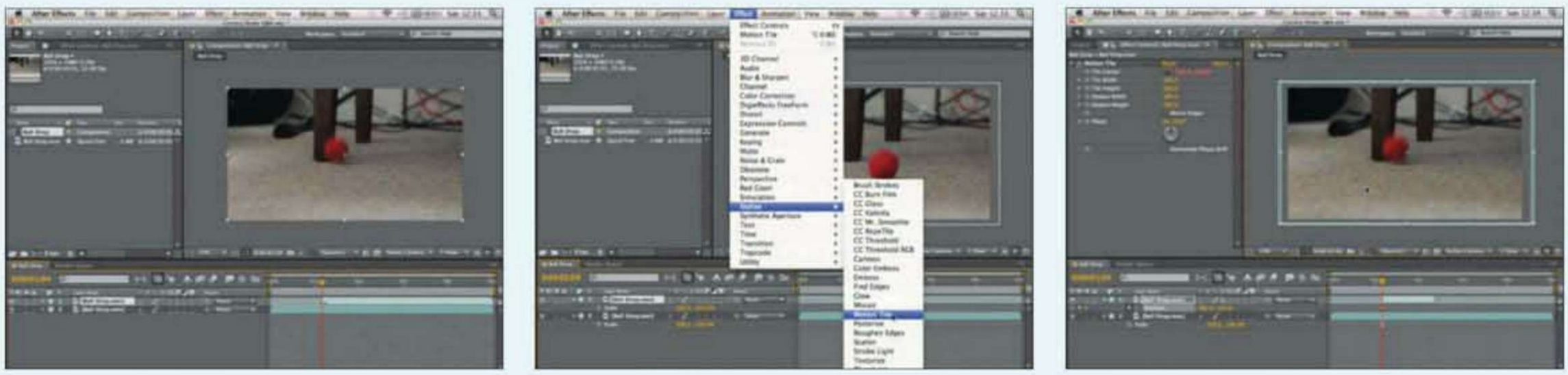
Get a Get Closest Location node, and connect the Value output of the Get Wall node to its Geometry input. The location you want to get is the location closest to each point, so get a Get Data node, enter **Self.PointPosition** as the reference and connect it to the Position input of the Get Closest Location node. Then connect the Value output of the Wall node to the Geometry input. Get a Get Data node, enter **Texture_Map** as the reference and connect the Location output of the Get Closest Location to its Source input. Get a Color to Brightness node and connect the Color output of the Get_Texture to its Color input.

Get an Instance Shape node and open its PPG. Click the Explore button and select the Light_Bulbs group. Change the Hierarchy Mode to Object and Children. The Index value controls which object and hierarchy should be used. If the lightness value of the texture map is less than 0.5, the light should be off and the light bulb hierarchy with Index 0 should be used. If the lightness is higher than 0.5, the light should be switched on and the hierarchy with the added point light (index 1) should be used instead. Get a Round node and connect the Brightness output of Color to Brightness to its Value input. Then connect the Integer output of the Round node to the Index input of the Instance Shape. Connect the Shape output of the Instance Shape to the New(Value) input of the Set Data node. Open the PPG and enter **Self.Shape** as Reference1.

Although the points are in the right locations, they're facing in the wrong direction. To fix this, you can use each polygon's orientation to set the points' orientation. Get a Get Data node and enter **PolygonRefFrame** as the reference. Get a Matrix to SRT node and connect the Value output of the PolygonRefFrame to the Matrix input. Connect the Rotation output of the Matrix to SRT to the New(Value) input of the Set Data node. Open the PPG; enter **Self.Orientation** as Reference2.



Ola Madsen is a Softimage Certified Instructor. He currently works as a 3D artist at Digital Context in Sweden
caffeineabuse.blogspot.com



01 Set up the comp

Import your footage into a new project, either by double-clicking within the project window or by selecting File > Import > File. Drag the footage over the New Composition icon at the bottom of the project window to create a project that matches the clip's settings. Scrub through the footage to find the appropriate in and out points for your artificial camera shake.

02 Add a wiggle

Once you have decided the range, duplicate the source layer via Edit > Duplicate. Pull in the handles of the new layer to match your selected area. Make sure the clip you want to apply the shake to is selected, then choose Effect > Stylize > Motion Tile. Next, you'll add a wiggle, one of After Effects' most common expressions. With the Effect Controls window open, [Alt]-click the stopwatch for Tile Center; in the text field that appears, type **wiggle (5, 30)**.

03 Align the clips

Because the wiggle occurs throughout the affected clip, it won't have the same in and out position as the original layer, causing an unnatural jump in position. Open the Transform properties of the duplicated layer and reduce Opacity until you can clearly see both clips at once. At the in point of the new layer, keyframe its Position properties so it lines up exactly with the clip beneath, then repeat at the out point. Bring Opacity to 100% and play back your composition.

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Vue

"How can I speed up depth of field?"

Eric Shafer, via email

Conrad Allen replies:

Depth of field can bring a huge realism bonus to 3D scenes, but it comes at a cost. Most users will just simply avoid it as a result, but I'll show you a couple of techniques that will make setting up DoF a two-minute process. You'll be creating a macro scene in a rainforest in this example.

First create a procedural terrain and load the Scaling Off Crust material from the Material Layers folder. Change the overall terrain Scale to 0.1 and add an ecosystem. Change the mapping of this layer to Object Parametric: this will give you more control over density, scaling and colour fractals we'll load in next. Add the Small Grassfield Plant types 2 and 3.

To create some variation, set the Presence of one instance to 0.685. In the Density tab, set Overall Density to 100%. Tick Variable Density and load the Asteroid function from the Fractals preset folder. Change Function Scale to 0.25 on all axes. In the Scaling & Orientation tab, set Overall Scaling to 2.5. Enable Variable Scaling and load the Stones In Dirt function from the Fractals folder. Change the Size filter, bringing the minimum size up halfway to 0.00. This will restrict the minimum variation to a larger size.

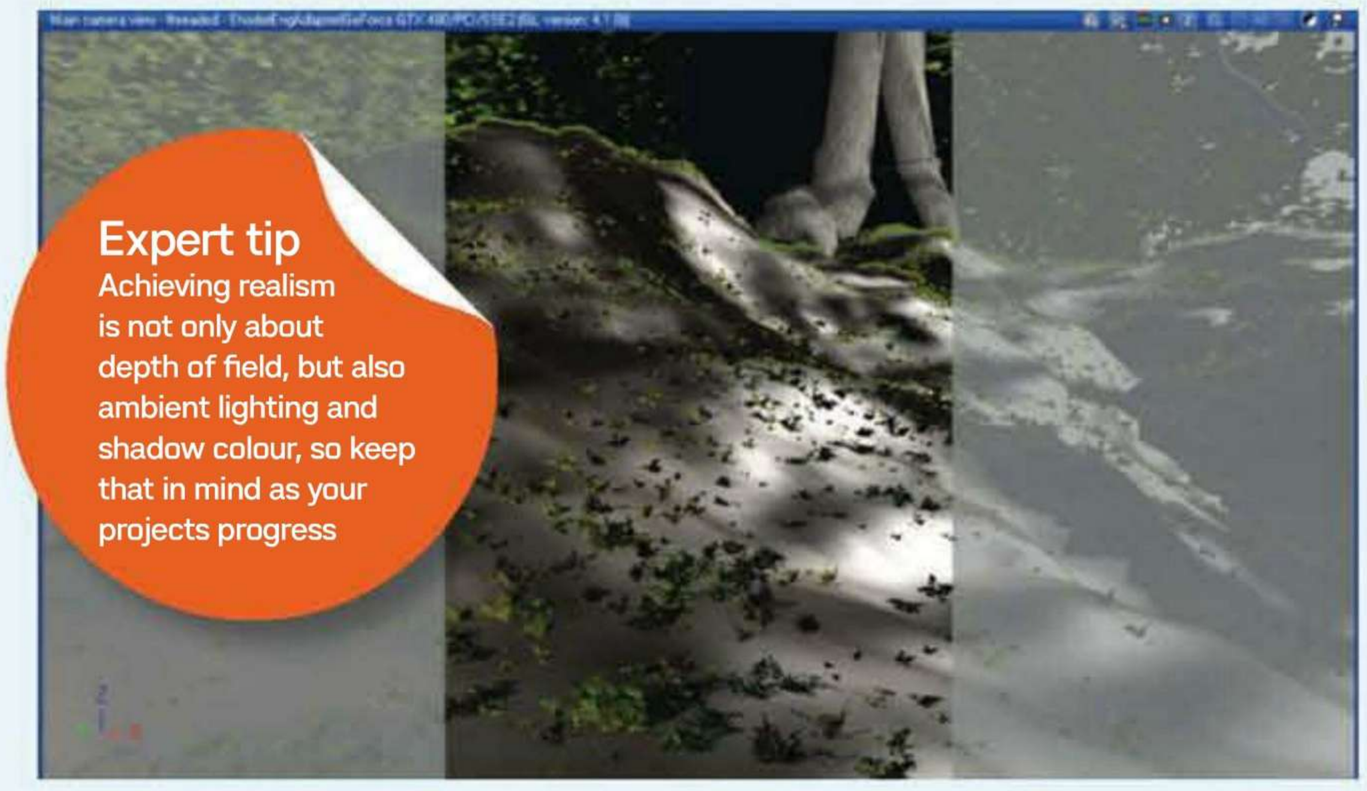
In the Color tab, tick Variable Color and load Asteroid from the Fractals folder. Leave Function Scale at 1, change Influence of Variable Color to 50% and load the Fields colour map from the Rocks and Grass folder. Finally, click Populate.

Place your camera where you desire. Watching the Top viewport, change the camera Focus to 30m to start. You will see the target box: this is the point that will be in focus. In your camera settings, change Blur to 150%. This will cause the depth of field to be very obvious from just a single pass.

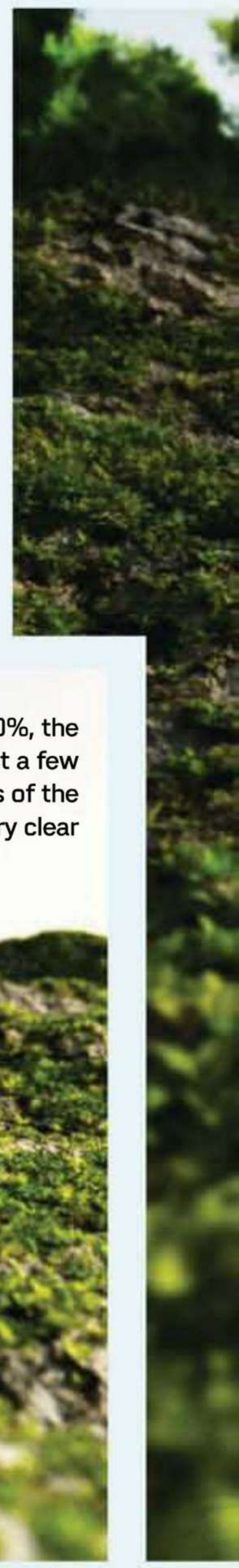
In the Render Options dialog, pick User Settings, click the Load arrow and load the preview.urs file. This preset disables DoF by default, so tick Enable Super-sampling, tick the Depth of Field option and click Edit. Enable Hybrid 2.5D and set Number of Passes to 1. With a camera blur of 150%, the focal point will be very clear. Using these settings, you'll be able to quickly adjust the focal point of the camera to where you want.

Tweak the camera's Focus until you're happy with the result. Reduce Blur to 50% and increase the Hybrid 2.5D passes to 3. Re-render and tweak your camera blur once more to your liking. About five passes is enough for a final render.

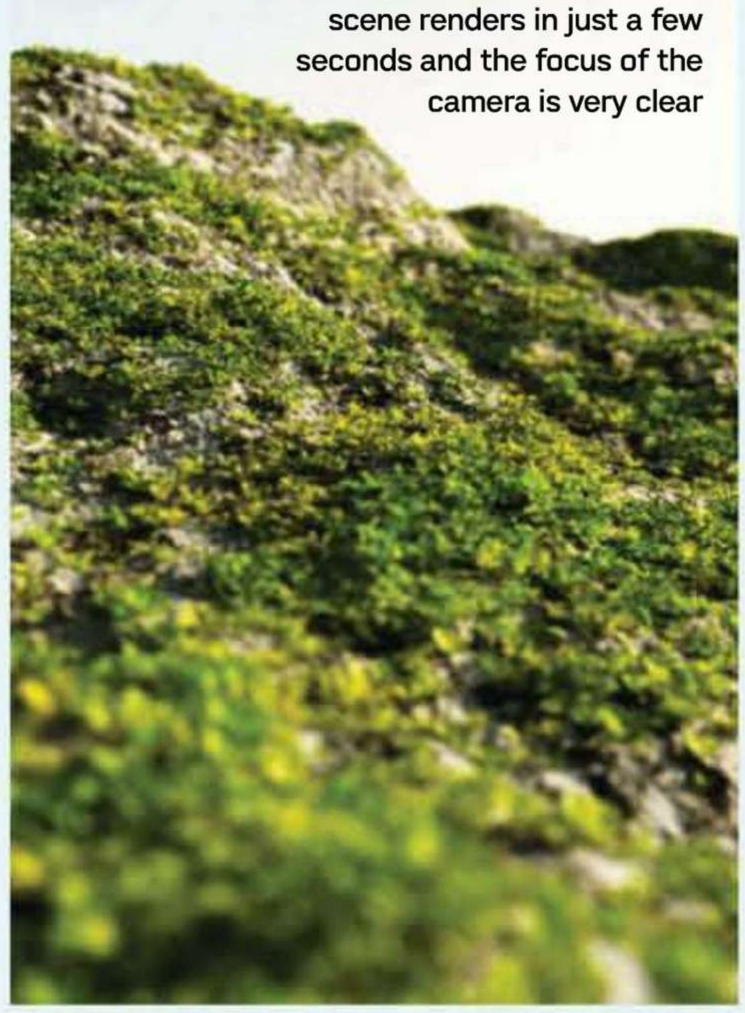
Expert tip
Achieving realism is not only about depth of field, but also ambient lighting and shadow colour, so keep that in mind as your projects progress



Composition is extremely important in scene creation. Make sure you include various elements to help portray the scale of the scene.



Setting the blur to 150%, the scene renders in just a few seconds and the focus of the camera is very clear





Conrad Allan is the owner of ExtremeProjects, specialising in full 3D environments for architects, film and TV
extremeprojects.com.au

V-Ray

"How can I adapt my materials to speed up renders?"

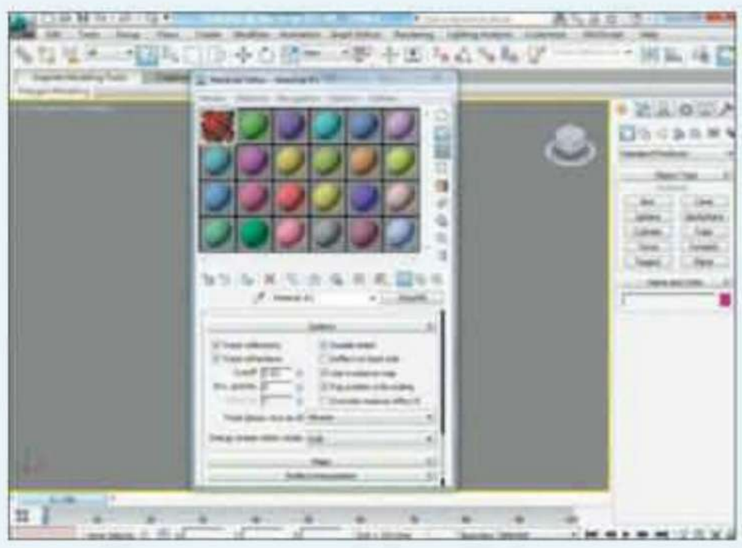
Paul Dixon, via email

James Cutler replies:

It's important to optimise your materials so your scene can be rendered in the shortest time possible. An appropriate image sampler also helps: adaptive subdivision is best for flat non-reflective materials such as buildings, while adaptive DMC is good for glossy materials and camera blur.



James Cutler is a digital 3D designer and founder of MintViz, which offers tutorials, tips and resources on digital design
mintviz.com





01 Make the light cache calculate glossy materials

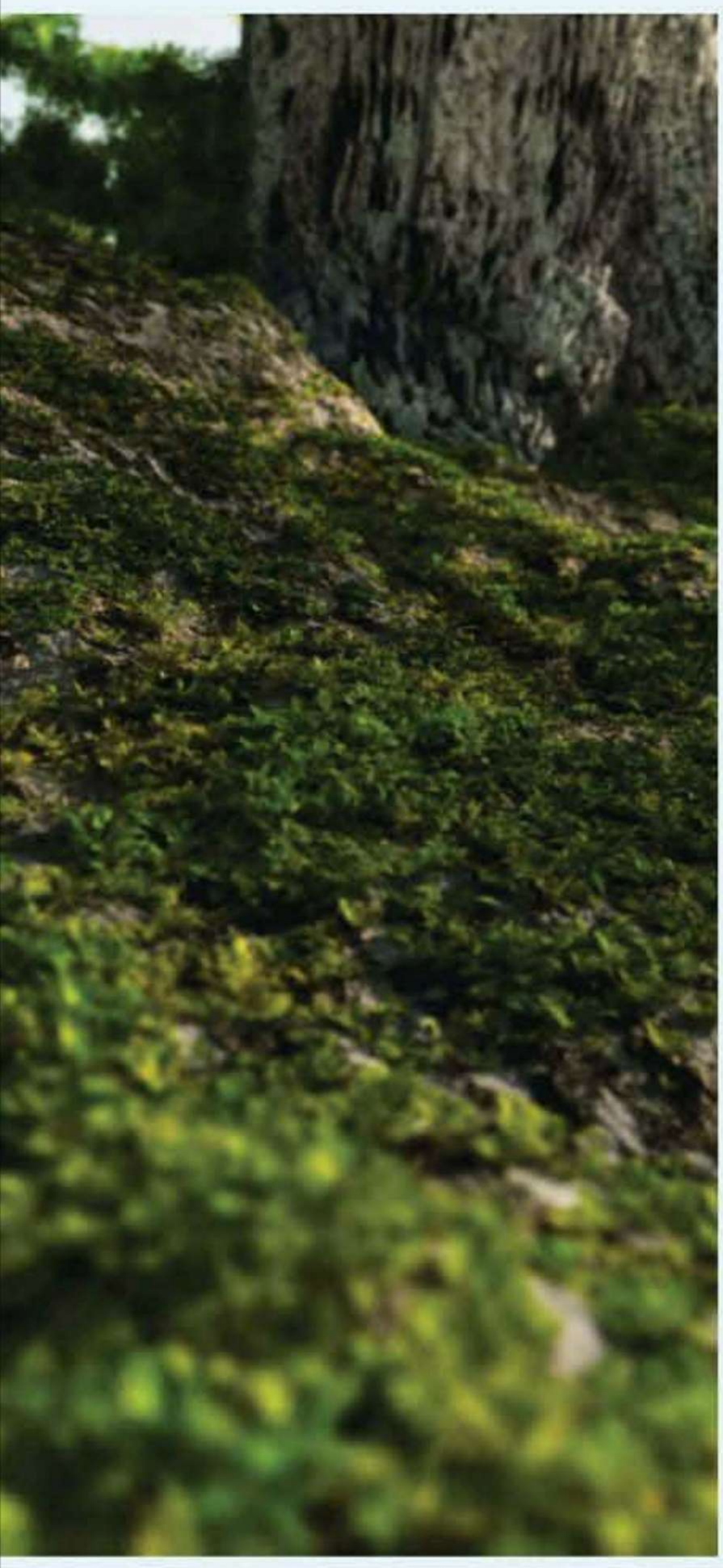
Start in the Indirect Illumination tab of the Render Setup dialog. Ticking Use Light Cache for Glossy Rays will speed up your renderings, but you may notice the light cache samples appearing within the reflections nearer to the camera. Instead, you should untick this global option and set individual materials to use it: you can do this by changing the Material Editor option Treat Glossy Rays as GI (in the Options rollout) to Always.

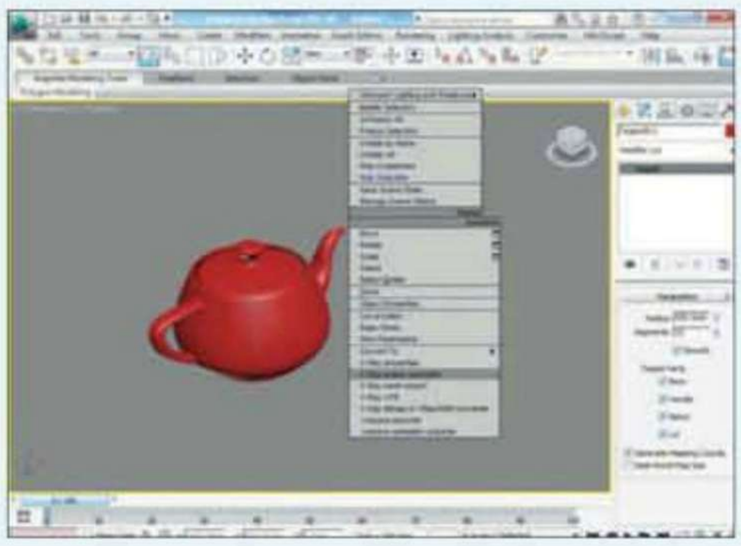
02 Blurry glossy materials take longer to calculate

Keep the material's Reflective Glossiness as close to 1.0 as possible. A range between 0.75 and 0.95 is adequate for most common materials. Glossiness and subdivs work hand in hand: lower glossiness values require higher subdivs.

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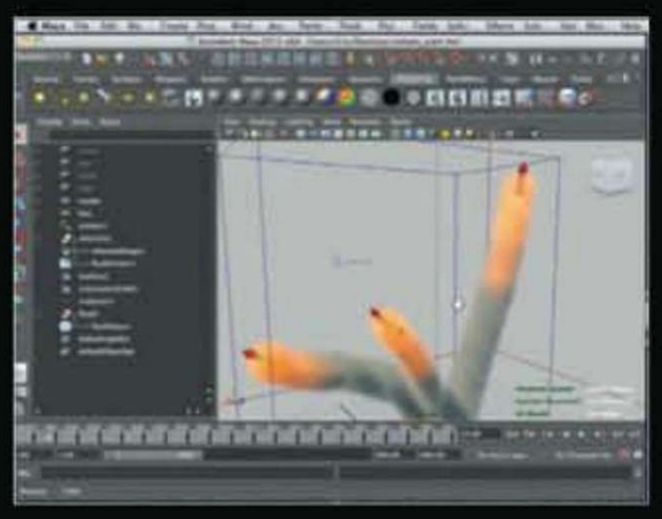


03 Use V-Ray materials throughout
V-Ray calculates its own materials faster than non-V-Ray materials because they are specifically optimised for the render engine. A scene can easily be converted to use these materials by right-clicking the viewport and selecting Vray Scene Converter from the menu that appears. You may still need to tweak some of the converted materials manually for optimum results.

Expert tip
Find good settings fast by importing an example scene from the Visor, applying its settings to your fluids and going from there. See the video



When the nParticles are set to emit fluids and the settings are adjusted, the rockets leave a smoke trail



Rocket geometry is instanced to the nParticles. Set Aim Direction to Velocity to make the rockets point along the direction of their flight

Maya

"How can I create dynamic smoke trails for multiple rockets?"

Diana Zeng, via email

Eric Keller replies:

My favourite way to accomplish this effect is to take advantage of the fluid emission features that were introduced in Maya 2011. With these tools, you can use nParticles to emit fluids; and thanks to the Automatic Resize feature, you are no longer restricted to keeping your fluids within the 3D fluid container as you were before.

To try it, open rockets_start.ma from this Q&A's scene files. In this scene of a box full of exploding bottle rockets, I've already set up the emitter and placed it within the box geometry, ensuring that the emitter is rotated so that the particles fly out the top.

Even though the fluid container will be set to auto-resize, you want to restrict the amount of 3D space somewhat so that the simulation doesn't get out of hand. To do this, I'm keeping the nParticles trapped inside a Volume Axis field, which also helps to give the nParticles some nice random motion.

With the basics established, you can start by instancing the rocket geometry to the nParticle. With both items selected via [Ctrl], switch to the nDynamics menu set and choose nParticles > Instancer (Replacement). In nParticle1's Attribute Editor under Instancer (Geometry Replacement), set Aim Direction to Velocity. Under Shading, set Opacity to 0 to remove the original particles.

Once you have the rockets moving around in a nice, chaotic motion, you're ready to add the smoke trails. Switch to the Dynamics menu set and select Fluid Effects > Create 3D Container. In the container's Attribute Editor under Auto Resize, enable Auto Resize. Then select both the nParticle and the fluid node and choose Fluids Effects > Add/Edit Contents > Emit from Object.

With just the fluid container selected, go to the Attribute Editor's fluidEmitter1 tab. Set Rate to 100 and Density/Voxel/Sec to 1, and turn on Motion Streak. (If Motion Streak is off, the smoke trails will appear blocky.)

In the fluidShape1 tab, set Base Resolution to 31. Under Contents Method, set both Density and Fuel to Dynamic Grid and Color Method to Use Shading Color. Under Auto Resize, set Max Resolution to 800. Under Contents Details > Density, set Density Scale to 0.5, Dissipation to 6, and Diffusion to 0.1. Under Fuel, set Fuel Scale to 0.64, Reaction Speed to 0.008 and Ignition Temperature to -0.1.

To create the look of volume for the trail, head for the Surface rollout. Turn on Volume Render and set Surface Threshold to 0.01. Under Shading, set Color Input to Constant and make the ramp dark grey on the left side and light brown on the right.

Under Incandescence, set Incandescence Input to Fuel. The ramp should go from black on the left to orange, yellow and finally white on the right. Under Opacity, set Opacity Input to Density and slope the curve upward from left to right. Playing with the input Bias slider on the settings can help refine the look. ■



Eric Keller is a freelance CG artist in Hollywood, and teaches at the Gnomon School of Visual Effects
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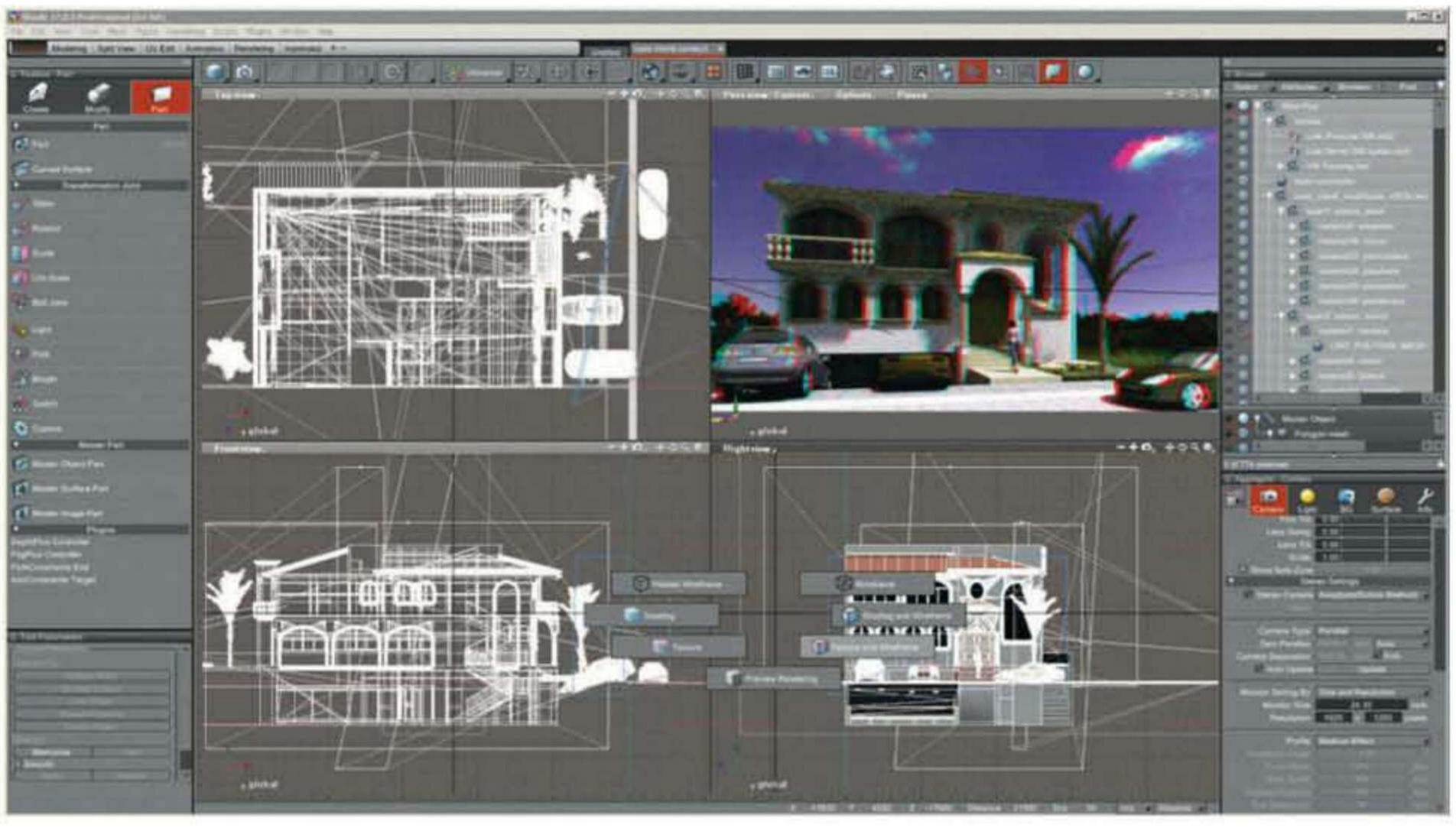
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WEBSITE
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Shade Professional 12

Shade 12 boasts a completely new Qt-based interface, as well as stereoscopic cameras and viewport preview rendering

Juan Manuel Bautista Hoepfner assesses the all-new interface and revamped toolset in this upgrade to a cult favourite

It might not be widely known that Shade is one of the oldest 3D products available. Launched in 1986, it even precedes LightWave (1988) and 3D Studio (1990). Developed in Japan, Shade's relative obscurity certainly has to do with the language barrier: until version 4 in 2001, there was no English version, yet it already had over 200,000 users. Shade's relative isolation has had a curious effect on its development.

While most 3D programs evolved together in a broadly similar fashion, Shade has grown in ways not typically seen in the west. And just when it was finally starting to have more acceptance here, e-frontier sold e-frontier America to Smith Micro – and with it, all non-Japanese support for Shade. Mirye Software later came to the rescue, providing English-language support and distribution. But the damage had already been done.

So how are e-frontier and Mirye responding to the challenge of re-establishing Shade in the western market? Shade 12 is the answer. It's the result of keeping Shade's original workflow paradigm, but incorporating what have become standard 3D tools, like the transform gizmo, a more intuitive Qt-based user interface, and a host of other improvements that really make it shine.



The new render engine supports render layers to save in a single EXR, PSD or Epix, or as multiple images

NEW INTERFACE

The entire interface has been revamped in Shade 12. This is no mere eye-candy improvement: it's evident that a lot of thought has been given to the iconset design and dialog box layout, while the keyboard shortcut manager accepts vastly more keyboard combinations. For those new to Shade, the initial learning curve has been greatly reduced, and for those coming from previous versions, the new look and feel does not interfere with how things worked before. There are many things that were already possible in previous versions, but it's now more obvious how to actually do them.

The viewport display modes now boast GLSL Phong and stereoscopic 3D options. The first means more accurate speculars, while the stereoscopic mode enables you to see in 'real' 3D with the help of either cyan-red anaglyph or Nvidia 3D Vision glasses. The stereo camera settings dialog is straightforward, combining common presets with the freedom to tweak.

While viewing transparency in the viewport's shaded mode is not yet



About the author
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Shade 12 is great for arch-viz renderings. With COLLADA and SketchUp support, importing props just became much easier

possible, the new Preview Rendering mode can show not just transparency, but raytraced shadows, global illumination, reflections and refractions. It's a progressive type of rendering, giving near real-time feedback in most situations. The preview can be almost as good as the 'real' render in a fraction of the time. You can even export an image of the result.

Shade also comes with Sketch Modeling and Photo Modeling, the main difference being that the latter is for more precise work and requires less user intervention on the resulting mesh. Polygon meshes now support multiple mesh/material groups. There are also custom workplanes, surprisingly clean mesh Booleans, and vertex, edge and object snapping. In all, the modelling toolset has been vastly improved, although an external modeller like Silo might still be more suitable for heavy-duty mesh work.

Another huge improvement has been made with the native renderer, which no longer needs (or even includes) the Callisto external renderer. It now supports normal maps, displacement maps, volumetric lights and materials, as well as subsurface scattering, controlled at the material level. Global illumination includes photon mapping and path tracing, and supports caching to reduce render times. Volumetrics can slow down renders to a crawl unless set up correctly. Again, the viewport preview rendering comes to the rescue: it can preview the effect of user-configured render settings, to give visual feedback on optimising render times.

Another welcome addition is that Shade now supports SketchUp and COLLADA import. SketchUp import works surprisingly well, although with the COLLADA format not all of its features are currently supported, camera animation being one of them.

Previous versions of Shade could generate enormous files when saving: packaging everything in the scene to a single file was great for migrating scenes, but was otherwise a space hog. This has been solved with the ability to have pretty much everything be an external reference. File sizes can be reduced dramatically, and updating textures becomes a snap.

ANIMATION TOOLS

Animation is an area in Shade 12 where there remains room for improvement. Entities are not directly animatible: they must be contained inside a part that drives the animation. This has advantages, as changing what is being animated without adjusting the animation parameters is a piece of cake; but certainly the way to accomplish things is not how things are normally done outside Shade.

And while the new system does support inverse kinematics and bone deformation, and has BVH import, this might be the only area where the improvements do not feel so impressive. Character animation, while possible, is not as straightforward as in messiahStudio, for example, and lacks the visual feedback you receive elsewhere.

The material settings window, while also improved and closely tied to the render enhancements, uses a layer-based system to create surfaces. Obtaining gradient transparencies (and indeed, gradients in general) is much easier than before, but for some meticulous tasks, a node-based material alternative would be welcome.

Some common settings, like having all imported images be external reference, are reset to a default when the program is restarted. Remembering these settings across sessions or across scenes would streamline the workflow. Scripting support via Python is tightly integrated, but its English documentation is still incomplete.

Shade 12 is a massive improvement over previous versions. It no longer feels like a program that works best in isolation, and is quickly becoming a serious alternative to the other 3D programs more commonly used in the west. ●



Image by Stefan Claas

Importing meshes from outside (TopMod) and toon rendering in Shade 12 is much easier now

"Shade 12 is a massive improvement over previous versions. It no longer feels like a program that works best in isolation"

3D WORLD VERDICT

PROS

- Prettier, friendlier, faster
- Great render engine
- SketchUp and COLLADA support

CONS

- Animating can be confusing
- No ambient occlusion

Shade in English returns from a long absence, with a new GUI, better and more robust import, a much improved render engine, and viewport preview rendering. Almost everything has been improved

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Hardware
Workstation





An excellent performer for the price, the WSX4 displays strong abilities for 3D animation

Workstation Specialists WSX4

James Morris assesses a highly capable budget workstation based on Intel's latest Sandy Bridge processor generation

PRICE
- £2,004 / $3,261 / €2,289

MAIN FEATURES
- 3.4GHz Intel Core i7 2600K running at 4.5GHz
- 8GB DDR3-1600 SDRAM
- 2GB Nvidia Quadro 4000 graphics
- 300GB Intel 320 Series solid state disk
- 1TB Seagate Barracuda 7200.12 7,200rpm hard disk
- Sony Optiarc AD-5260S 22x DVD rewriter
- Windows 7 Professional 64-bit
- Ports: 8 x USB 2.0, 4 x USB 3.0, 1 x LAN, 2 x eSATA, microphone input, 7.1 surround audio output
- Warranty: 3 years RTB

MANUFACTURER
Workstation Specialists

WEBSITE
workstation specialist.com

Intel's Sandy Bridge processors may only be available with a maximum of four cores so far, but their tolerance of high-frequency settings has made them ideal for workstations. The WSX4 follows a similar pattern to Scan's 3XS 2600K (Reviews, 3D World 140) and InterPro's IPW-Ci7 (Reviews, 3D World 141), taking the top Core i7 2600K and increasing its clock frequency well above its nominal 3.4GHz. The result is a potent but keenly priced configuration.

Even at its stock frequency, the Core i7 2600K incorporates Turbo Boost, which dynamically increases clock speed when required. But Workstation Specialists has set its processor permanently to 4.5GHz, although this still ramps down when not under load. The processor also supports Intel's Hyper-Threading, so each physical core is presented as two virtual ones, giving this quad-core CPU eight virtual processing units, which can be particularly beneficial when running a multi-threaded parallel task such as rendering. Putting these two features together, there's huge power for single-threaded tasks and a healthy amount for rendering, although here more physical cores are usually best.

Workstation Specialists has partnered the processor with a reasonable 8GB of 1600MHz DDR3 SDRAM. There's an Nvidia Quadro 4000 to accelerate real-time 3D graphics display. This is one of Nvidia's most recent Fermi models, in this case sporting 256 CUDA processors and 2GB of GDDR5 frame buffer. It's a potent combination, and places the 4000 significantly ahead of the Quadro FX 4800 it supersedes. A decent array of storage is provided, too. An Intel 320 Series SSD with 300GB capacity takes care of main operating system and application storage, while a 1TB 7,200rpm Seagate Barracuda 7200.12 hard disk is on hand for more general data tasks. There's a 22x Sony Optiarc DVD rewriter for removable storage, but no memory card reader is included.

We ran an array of tests to assess the WSX4's performance, and it mostly acquitted itself well. With a high-end Nvidia Quadro 4000 and high clock speed, it achieved 59.17 in the OpenGL portion of Cinebench R11.5 – a decent score for a system at this price and noticeably ahead of previous Sandy Bridge-based systems we've looked at, which used the more midrange Quadro 2000. SPECviewperf 11 results were similarly commendable for the price, with highlights including 53.75 in maya-03, 43.34 in sw-02, and 44.45 in lightwave-01, showing strong abilities for 3D animation or product design.

Rendering results were more run-of-the-mill, however. The WSX4 achieved a score of 8.77 in this portion of Cinebench R11.5, which is decent for a single-processor workstation, although systems with more cores, such as Armari's F4e-KO (Reviews, 3D World 136) do noticeably better here, as rendering benefits more from further cores than extra clock speed.

The WSX4 has another trick up its sleeve here, too. On its own, it's another excellent Sandy Bridge-based workstation, like a few we've seen before, albeit a relatively pricey one. However, you can also partner the WSX4 with Workstation Specialists' RS-D2600 render node. (See opposite page.) This does more than double the price, but it also more than doubles the rendering power and enables you to keep modelling while rendering is in progress. So while the WSX4 is a decent choice for independent 3D content creators or graphics companies on a budget, the combination could really give your workflow an edge.



About the author
James Morris has tracked the rise of every new development, from OpenGL accelerators to multi-processor workstations, over more than 15 years of testing 3D content creation hardware.

3D WORLD VERDICT

PROS
- Capable modelling performance
- Decent rendering power
- Designed to work with RS-D2600 render node

CONS
- More expensive than previous Sandy Bridge workstations we've tested

It's not quite as good value as some Sandy Bridge systems, but the WSX4 workstation is still a great budget choice

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Hardware
Render node

PRICE
- £2,470 / $4,019 / €2,821

MAIN FEATURES
- 2 x 2.66GHz Intel Xeon X5650 processors
- 24GB DDR3-1333 SDRAM
- Integrated 8MB 2D video controller
- 240GB OCZ Vertex 3 solid-state disk
- 120GB Intel 320 Series solid-state disk
- Windows 7 Professional 64-bit
- Ports: 2 x USB 2.0, 2 x LAN
- Warranty: 3 yrs RTB

MANUFACTURER
Workstation Specialists

WEBSITE
workstation specialist.com

This standalone render node offers hefty processing power in a small box



Workstation Specialists RS-D2600

James Morris enjoys dual-processor rendering performance for a fraction of the usual price with this standalone render node

Independent 3D content creators and small companies can be stuck between a rock and a hard place. A high-end workstation with strong rendering as well as modelling will be a relatively major expenditure, and won't be available for further design work while outputting. However, a cheaper system won't have the same rendering grunt, and a dedicated render farm will be out of the question. Workstation Specialists has another option: the RS-D2600. This is a standalone render node, offering the processing power of a high-end system for a fraction of the price.

Despite measuring just 95 x 220 x 500mm, the RS-D2600 has a hefty specification. It sports a pair of Xeon X5650 processors running at 2.66GHz, which aren't the fastest around, but still offer six cores each. Intel's Hyper-Threading technology is also in evidence, subdividing the real cores into two virtual ones apiece. So 12 virtual cores are available, and Workstation Specialists has partnered these with 24GB of 1,333MHz DDR3, configured as three banks of 4GB per processor. This takes full advantage of the Xeon's triple-channel memory architecture. There's a 120GB Intel 320 series SSD for the operating system and any software you need to install.



The perfect team: the RS-D2600 is designed to sit neatly on top of the WSX4 workstation chassis

The one thing missing is high-end graphics. The RS-D2600 is configured to act as a 'headless' system, so works without a keyboard, mouse or monitor attached. It still runs 64-bit Windows 7, but to change settings you must connect to it via Remote Desktop using another system over your local network. The concept is similar to Boxx's RenderBOXX, except that the RS-D2600 is intended to be sold alongside a specific desktop system. This is where Workstation Specialists' WSX4 comes in. The RS-D2600 is designed to sit on top of the WSX4, and is styled to match its chassis. It adds little to the chassis' height, so you can still have both at a single desk.

If purchased together, Workstation Specialists will set up the WSX4 so that it has an icon on the desktop taking you straight to the RS-D2600 remotely over the network. This enables you to start up the network rendering client of your choice, which you can load either over the network or by connecting an external storage device using one of the USB 2.0 ports. You can then send jobs to the RS-D2600 and leave it to render these independently while you carry on modelling. Alternatively, you can use both if you really need to focus on processing a job as quickly as possible.

To illustrate the extra potency the RS-D2600 can provide, we ran a series of rendering tests. The rendering portion of Cinebench R11.5 achieved a result of 14.11, similar to Workstation Specialists' own WS2600 and faster than InterPro's IPW-DX6, both dual-processor systems costing around twice the price. This is just two-thirds of the performance of Cryo's phenomenal Octane EDP-WS, but nearly twice as quick as the WSX4, which the RS-D2600 is intended to partner.

We also ran a test render in 3ds Max's Backburner to show the ability to send a render and keep on working. The test scene took six minutes and six seconds on the RS-D2600, although only three minutes 58 seconds on the WSX4. The overhead of sending the job over the network clearly favours longer renders.

3D VERDICT

PROS
- Fast rendering
- Leaves workstations free for work
- Would be a suitable choice for a single-workstation business

CONS
- Can only be used for rendering and CPU-focused processing tasks
- No option for GPU co-processing

The RS-D2600 is a decent investment for a small company where a full render farm is beyond budgetary constraints



About the author
James Morris has tracked the rise of every new development, from OpenGL accelerators to multi-processor workstations, over more than 15 years of testing 3D content creation hardware

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Software Dynamics plug-in for modo

PRICE
- £122 / $199 / €140

PLATFORM
Windows / Mac

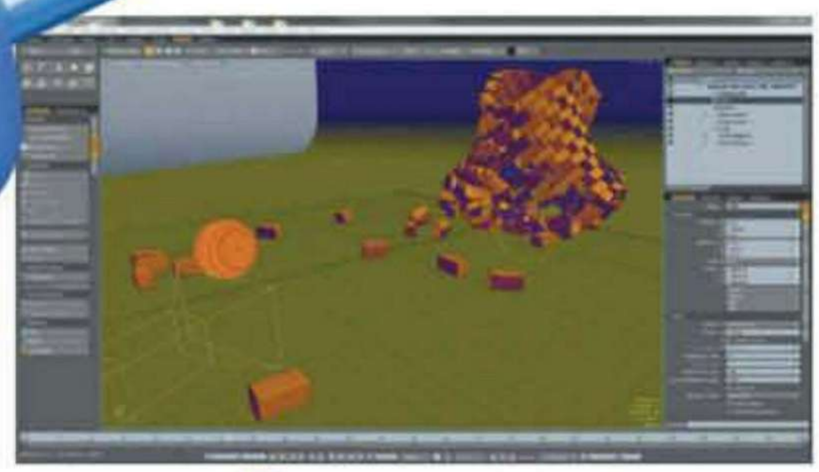
MAIN FEATURES
- Simple-to-use plug-in
- Rigid body dynamics
- Spring and motor effects

DEVELOPER
Eric Soulvie

WEBSITE
luxology.com



recoil can be used for stills as well as animations by stacking objects realistically



Various attributes, such as bounce and friction, can be edited on all dynamic objects, passive or active



Particle effects can be faked with recoil, but without true emitters, the process is rather clumsy

recoil

It adds rigid body dynamics to modo's toolset, says **Paul Beards**, but does recoil push Luxology's opus into the big league?

Luxology's road map for modo is a long and winding one. Many users expected modo 501 to be the big animation release, integrating dynamics and other bells and whistles that would make true character animation a reality. While this didn't come to pass, I for one applauded 501 for what it did provide. Now, several months on, we have recoil, a plug-in that gives modo some basic dynamics tools.

recoil is essentially a modo-specific retooling of the open-source Bullet physics engine, but only offers rigid body dynamics, at least for now. Installation is simple; once complete, recoil is accessed from a new menu that appears along the top of the main window. From here you have the option to assign recoil-specific parameters to your models, the most basic being active or passive rigid body. On top of this, various fall-offs, constraints and forces, as well as motor and spring parameters, can be used independently or combined for more complex animations. There are also caching options that enable you to bake out one or all of the elements in your scene to keyframes.

This all sounds like a fantastic addition to modo – and it is, to a degree – but there are a few issues that prevent it being essential. Firstly, in the time I've been testing recoil, it's proven to be quite crash-happy; on occasion, these crashes have caused recoil-enabled elements to become completely corrupt and uneditable. Even when it's running smoothly, the behaviour of certain dynamic objects has, at times, been just plain random.

In all, the reliability and stability of recoil is a little disappointing, especially when modo has been showing such great improvements in this area. The odd crash is forgivable, but using recoil's particular implementation of Bullet is more akin to playing Russian roulette.

Service packs and updates are no doubt planned, and these could improve the stability of the plug-in, but there's one other major issue that remains. I can understand that modo 501 shipped without dynamics, and there are many who'll be happy that recoil has appeared to add the beginnings of this functionality. However, I think releasing something as a plug-in that would benefit from heavy integration with the core app at a root level is not only risky, but also worrying for the future development of modo.

I can only hope that when modo 601 comes around, recoil is integrated into the main application, because the fragmentation of the code base when essential modules are released independent of the core app could prove catastrophic. I can't help but feel that recoil would be a lot more production-ready if it was as integrated a part of modo as the modeller or render engine. ●



recoil produces convincing simulations, so long as the scene isn't too complex



About the author
Paul Beards is a senior illustrator for Dyson, where he's been for the last six years, and a modo enthusiast. You can often find him posting on the Luxology forums under the user name Sumimasen
web.me.com/paul.beards

3D WORLD VERDICT

PROS
- Simple to use
- Nice rigid body simulation
- Useful caching options

CONS
- Stability is an issue
- Complex objects cause problems

recoil is a fun and ambitious add-on, but stability issues (possibly stemming from its plug-in status) prevent it from being wholeheartedly recommended

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Hardware
Workstation

PRICE
- £6,520 / $10,610 / €7,448

MAIN FEATURES
- 2 x 3.46GHz Intel Xeon X5690 CPUs, running at 4.5GHz
- 24GB DDR3-1600 SDRAM
- 4GB AMD FirePro V9800 graphics
- 240GB OCZ Vertex 3 solid-state disk
- 2 x 2TB Seagate Barracuda XT hard disks, configured as 4TB RAID 0
- Samsung SH-S233C 22x DVD rewriter
- Windows 7 Professional 64-bit
- Ports: 12 x USB 2.0, 2 x LAN, 3 x eSATA, microphone input, 7.1 surround audio output
- Warranty: three years RTB

MANUFACTURER
Cryo

WEBSITE
cryopc.co.uk



Inside its eye-catching red chassis, the Cryo offers an army of processing cores

Cryo Octane EDP-WS

This Xeon-based red devil from Cryo is quite simply the most powerful workstation we've ever tested, says **James Morris**

Pushing your workstation's processor clock speed above the recommended level used to be a recipe for an invalidated warranty. But over the last couple of years, the greater tolerance of CPU hardware has meant this kind of enhancement is now widely accepted – and indeed built into Intel's processors via its Turbo Boost function. Now even dual-CPU workstations are gaining the benefit. The Octane EDP-WS sports twin Intel Xeon X5690 CPUs that run at a nominal 3.46GHz, but Cryo has boosted them permanently to 4.5GHz.

The Xeons aren't just running at a high clock speed, either. They both have six physical cores, and Intel's Hyper-Threading technology subdivides these into two virtual cores for each physical one. So the Octane has 24 virtual cores on offer, partnered with 24GB of 1,600MHz DDR3 memory; these are arranged as two banks of three modules each to take advantage of the Xeon processors' triple-channel memory architecture. To keep the heat under control, Cryo installed a custom water-cooling system and the chassis is bristling with fans. It's not a particularly noisy machine, though: the fans are quite large, so don't rotate at a high frequency.

Cryo has taken a similarly high-end approach to the graphics acceleration, supplying an AMD FirePro V9800, which sports 1,600 stream processors and 4GB of frame buffer. Although it's been out for over a year now, this remains AMD's flagship OpenGL card, with support for DirectX 11, OpenGL 4.1 and Shader Model 5. It also incorporates no fewer than six mini DisplayPort connections, with support for ATI's EyeFinity, allowing truly whopping seamless monitor arrays, all with hardware OpenGL acceleration.



The main boot drive and repository for applications is a 240GB OCZ Vertex 3 solid-state disk, which offers rapid read and write performance. Twin 2TB Seagate Barracuda XT mechanical 7,200rpm disks provide general data storage, while a Samsung SH-S233C 22x DVD rewriter takes care of removable storage.

The Octane was always going to be an ace at rendering, but even we weren't expecting by how much. The Cinebench R11.5 rendering score of 22.76 is 50 per cent higher than anything we've seen before, although the OpenGL score of 82.38 is only just quicker than Workstation Specialists' WSX-6 (Reviews, 3D World 133). We also ran SPECviewperf 11, which shows the strengths and weaknesses of the AMD graphics. The lightwave-01 score of 67.47 is the highest we've ever recorded. The sw-02 score of 53.44 is only a fraction off the top slot, and results are generally impressive across the board.

Nvidia's latest generation is ahead of the FirePro V9800 in some areas, though, notably the Maya-derived maya-03 and Pro/Engineer-based proe-05. So, as a modelling workstation, the Cryo is best partnered with the graphics vendor most suitable for your chosen software. ■



About the author
James Morris has tracked the rise of every new development, from OpenGL accelerators to multi-processor workstations, over more than 15 years of testing 3D content creation hardware.

3D VERDICT

PROS
- Supremely quick rendering
- Plenty of OpenGL power
- Generous storage
- Three-year warranty

CONS
- Expensive
- AMD graphics aren't optimal for some applications

The Cryo Octane EDP-WS comes with a hefty price, but it's hard to put a cost on this level of performance

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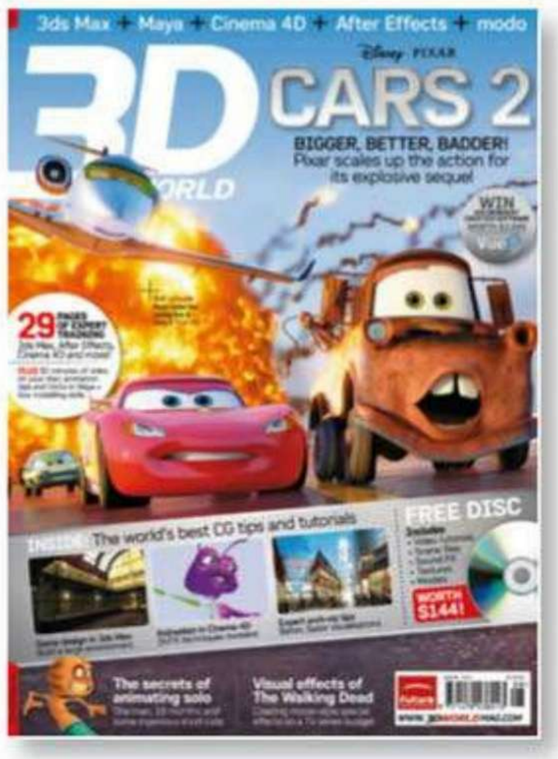
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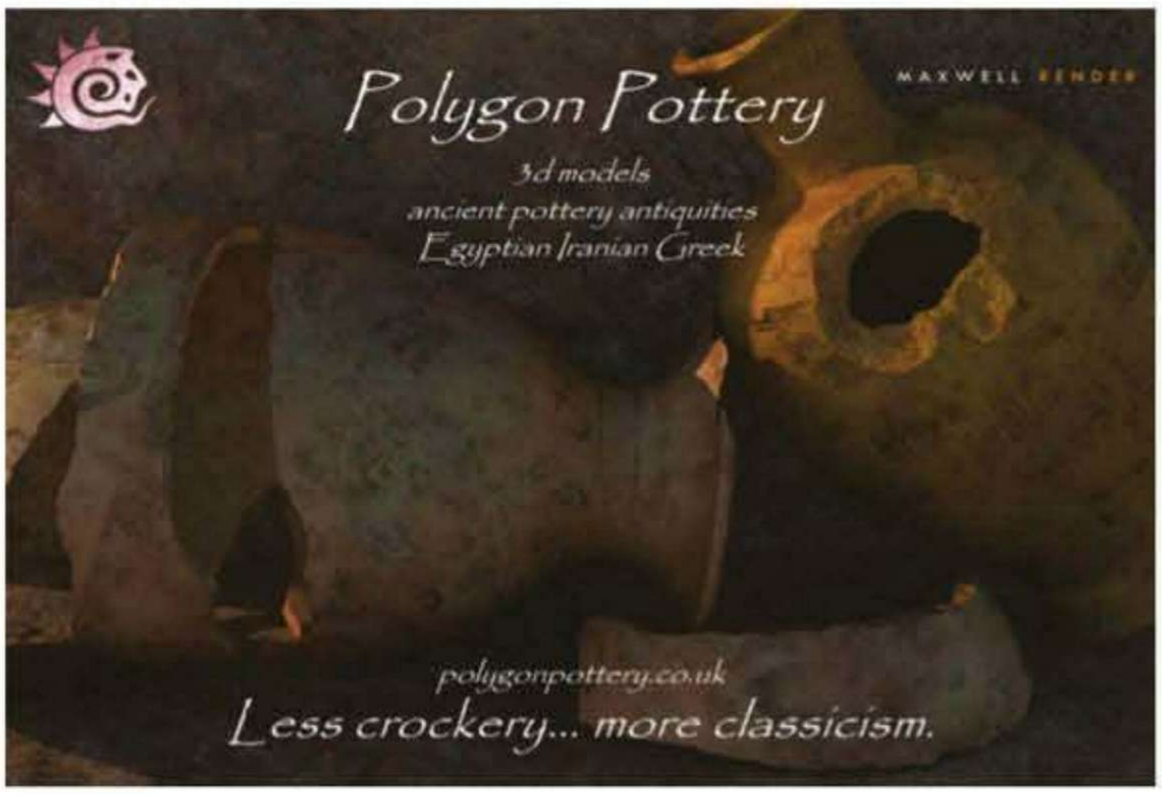
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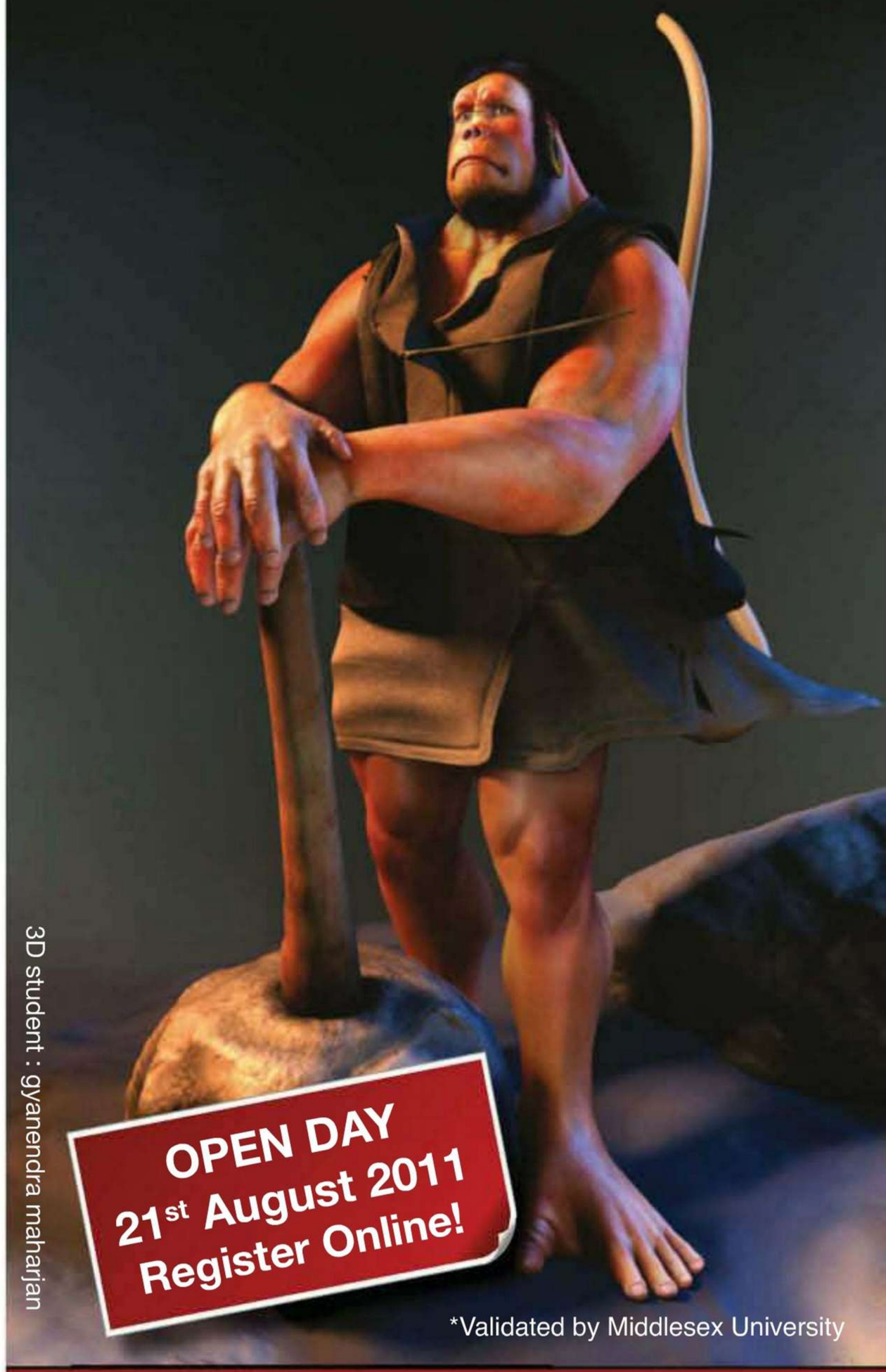
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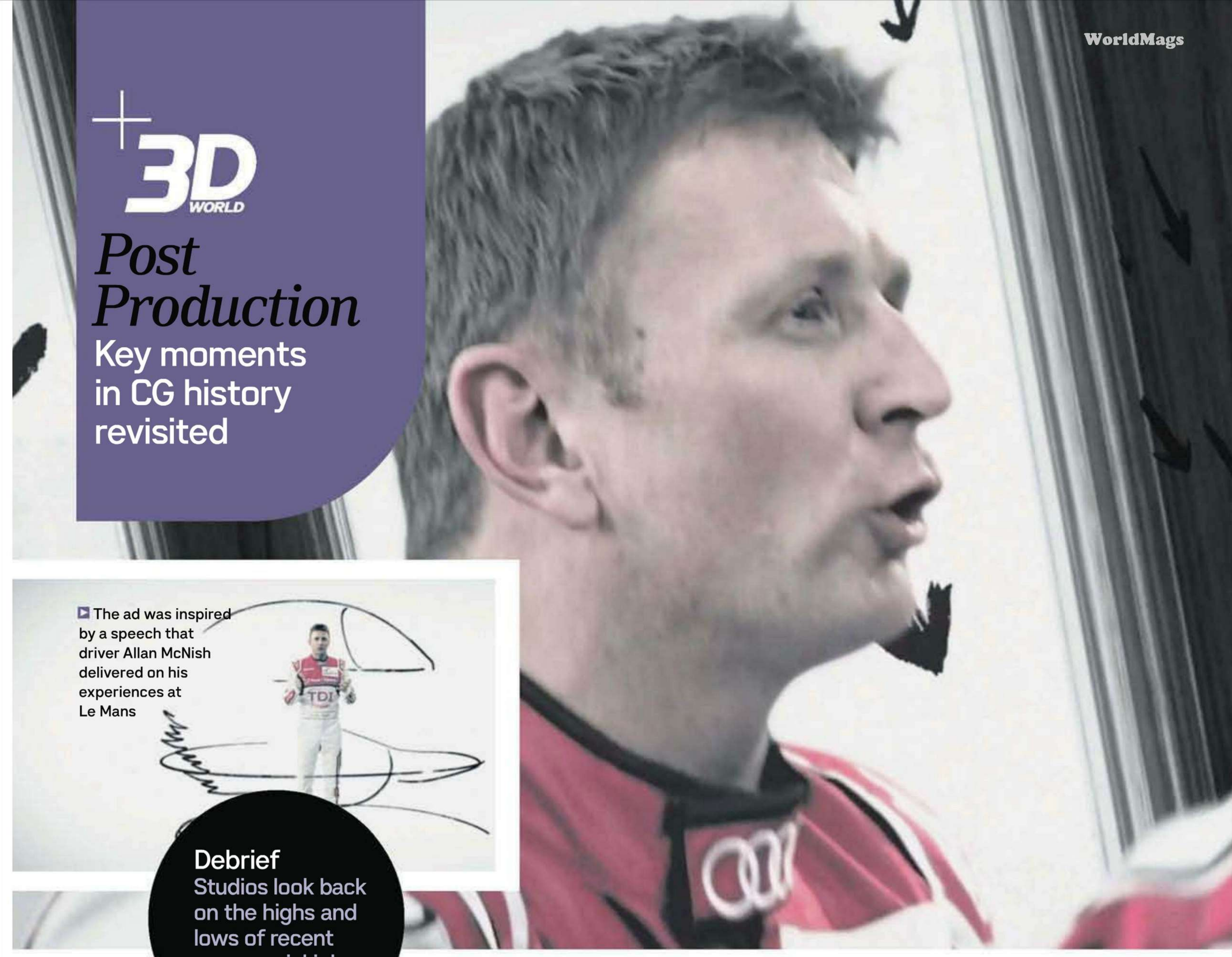
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The ad was inspired by a speech that driver Allan McNish delivered on his experiences at Le Mans

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

Pole position

Passion Pictures director Chris Hemming explains how a blockbuster stereo 3D commercial relied on meticulous preparation

VITAL STATISTICS
Studio: Passion Pictures
Format: Stereoscopic 3D cinema release
Client: BBH for Audi
Software used: Maya (pre-viz); Softimage (production); Nuke (compositing and keying); FrameCycler (playback)
Release date: May 2011

In Audi's new two-and-a-half-minute stereoscopic cinema advert, 'A Day in the Life of an Audi Driver', Le Mans-winning racing driver Allan McNish takes us round a lap of the world-famous Circuit de la Sarthe and the pressures he has to deal with in this intense 24-hour race, using stark graphic animation and live-action footage.

The idea started with an impromptu speech that Allan gave for Audi at a motor show last year. He described what it was like to race at Le Mans in such a visual and clear way that when BBH spotted this, it knew that his everyman delivery was a perfect way to raise people's awareness of Audi's dominance in motorsport – in particular at Le Mans, where it's won 10 times out of the last 12 years.

BBH asked Passion Pictures to present a concept and style frames to show how we could bring Allan's narration to life on a background of Audi's trademark 'world of white'. The direction was to give people a taste of the tough side of Le Mans, along with showing Audi's keen eye for precision and detail. The spot would use a combination of black-and-white hand-drawn graphics, mark-making and finely detailed treated CGI to visualise a dynamic world surrounding the live-action Allan McNish.

The spot had its premiere before the Champions League final, and was projected in 3D before the recently released Harry Potter and the Deathly Hallows: Part 2, which is the largest 3D stereo release of the year. Artwork frames from the spot were also used in the Sunday Times's first-ever iPad supplement and its augmented-reality Le Mans app, giving information to people following the race.

About the author
Chris Hemming trained in graphic design and animation. As an animator at Passion Pictures, he's worked on ads for Sony PlayStation and Gordon's Gin, among many others. Chris branched into directing at Passion a few years ago, with a number of TV and film titles and music videos for Cornershop, Paul Steel and The Winter Olympics – which he made independently, using facilities and crew from Passion
passion-pictures.com

WorldMags.net

The spot has also been featured in motorsport web and print magazines, as well as on motion graphics and advertising sites.

What we did right

1. We produced clear style frames

The use of stylised 2D illustrations is a new direction in 3D stereo, so crewing up for the next stage of the job with people who had done this kind of thing before wasn't an option for us. Instead, using the top talents in-house at Passion, the crew learned and developed as the job went along. It made it an exciting, if a little nerve-racking job for everyone on all levels to be part of. Having exact, clear style frames (by illustrator Tim Marrs) to refer to was essential to show the final look to everyone, from the client to the crew. People are more likely to get what you're after if you're using strong style frames.

2. We used pre-viz specialists

Extensive pre-vizing was crucial to work out cameras for the stereo live-action shoot, timing the animation and how they'd work together in stereoscopic before crewing up.

For the pre-viz, we used Nvizage, which specialises in this stage using Maya. The priority was to work out all the camera movements and lenses for the shoot; afterwards, Nvizage blocked and timed the animation. We also had to take the stereo issues into account, otherwise it would mean starting from scratch once our crew at Passion took over in Softimage and Nuke.

3. We got our facts straight

We nerded up about Le Mans and motorsport. Once you know the facts about what you're dealing with, you can make informed decisions on when to use artistic licence.

4. We defined our responsibilities well

Managing a large crew in a mixed-media job is like herding cats. Even with clear style frames, there are still plenty of creative distractions and technical pains. With a tight schedule, every hour of someone's time is precious. To help us, we created clear creative and technical teams, each with their own people to look after their sequences of the film. This way, they had much greater creative ownership over the work, and people knew the issues and goals that each section had.

5. We held an early screening

We made our own internal deadline a week earlier than it was due. That way, everyone could go to the cinema screening and see it as a whole film for the first time in a done

Using an innovative mix of 2D illustration and stereo 3D enabled Passion Pictures to put the viewer right into the heart of an adrenaline-fuelled race around the Circuit de la Sarthe

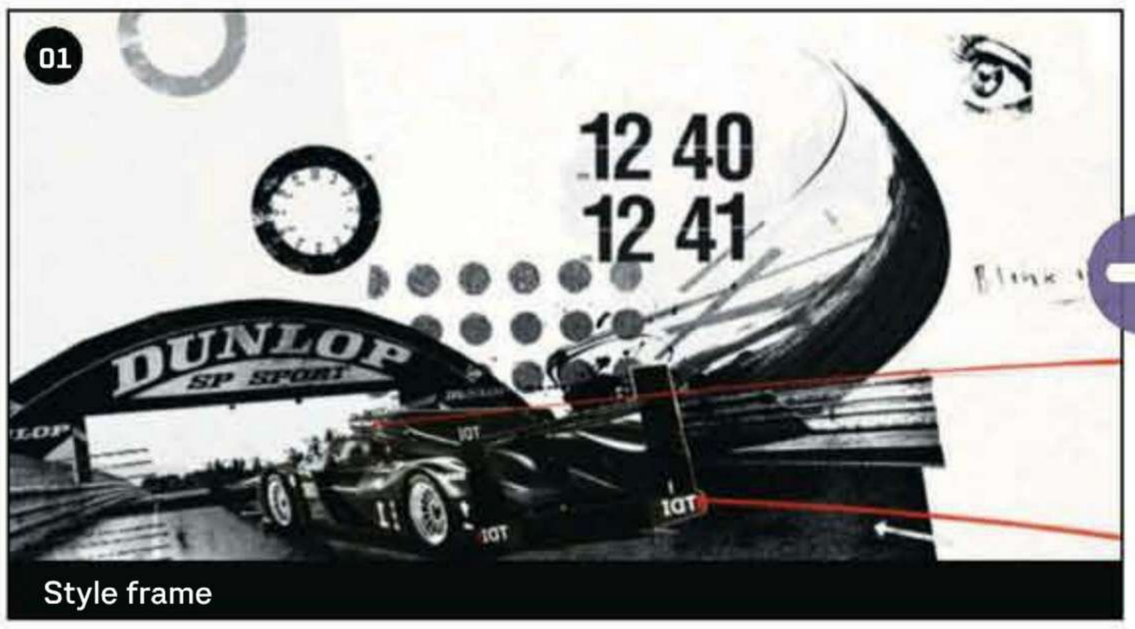




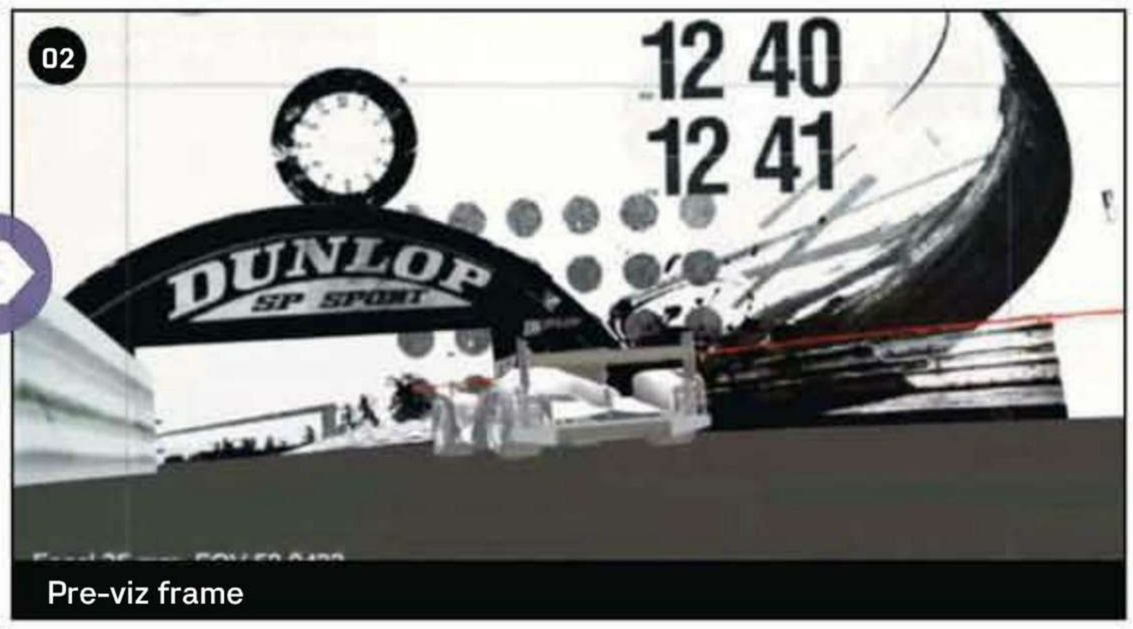
The limited colour palette echoes Audi's familiar 'world of white' and helps to make the spot instantly recognisable as part of the brand

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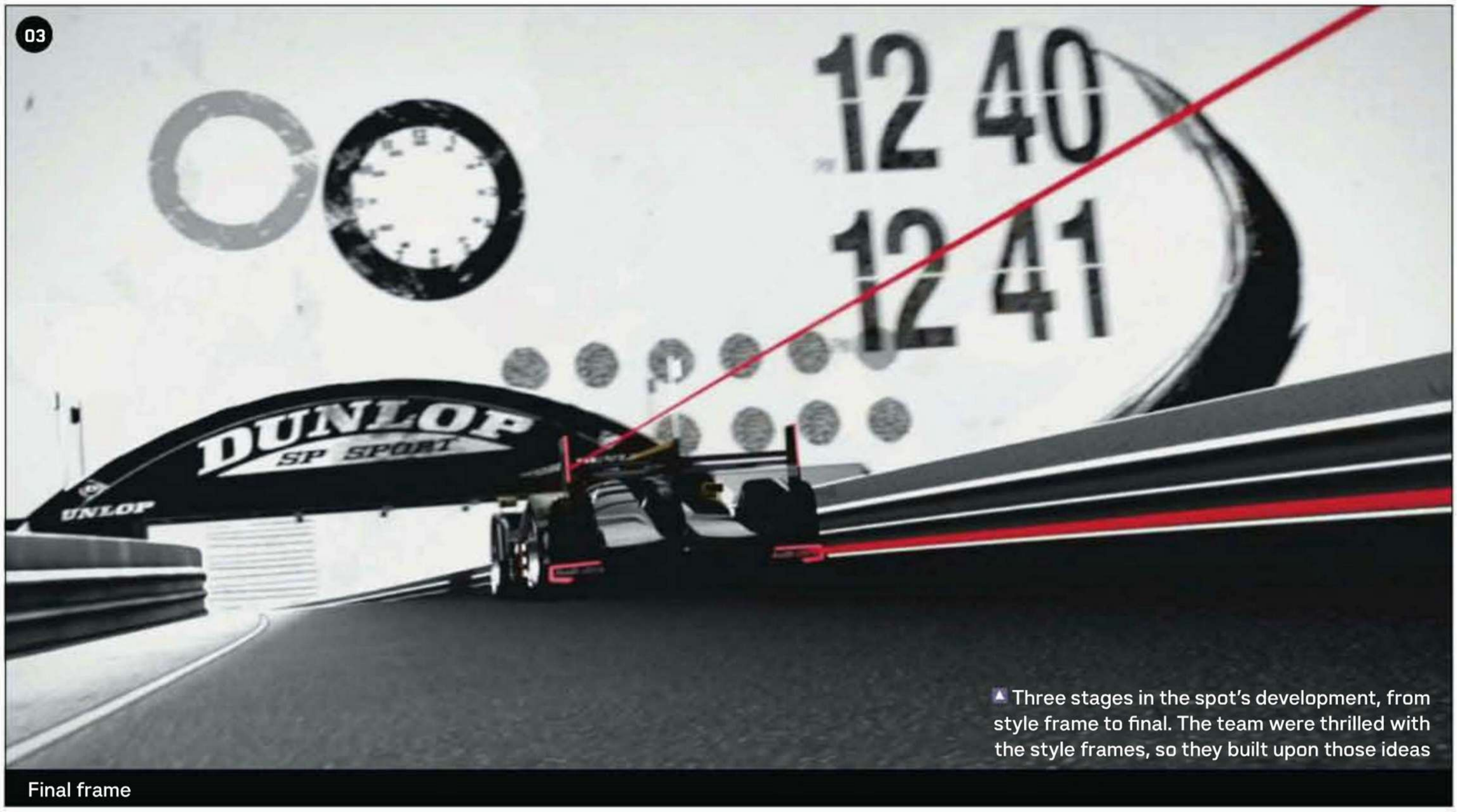
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Style frame



Pre-viz frame



Final frame

▲ Three stages in the spot's development, from style frame to final. The team were thrilled with the style frames, so they built upon those ideas

state. It was a big push for the crew to do, but it gave us the luxury of polishing, rather than just finishing, the commercial.

Twelve pages of notes came back from that screening, listing things that would make 'Audi Driver' better. This was vital to making the film special, where we could feel that we did the best we could do. With a normal delivery scenario, we would've had 12 mental pages of things we wished we'd done better.

What we did wrong

Not too much – except the car crash...

The stereo live-action shoot with Allan was done two months before the race at Le Mans. Allan unfortunately crashed his Audi R18 car at 150mph during the race itself. It was a horrific-looking accident, but really showed how strong Audi makes its cars: Allan walked out unhurt. The Audi team went on to win the race – by 13 seconds in the end, which is mind-blowing considering they were all racing full-on for 24 hours.

Lessons learned

I definitely want to push hard with what can be achieved in 3D stereo: the ideas, people's expectations and playing with the amazing creative opportunities animation gives us.

There were very few changes from the style frames. We were all so over the moon with them that everything progressed and developed for the better from these. However, we did find one constraint of working in stereo 3D with our compositions. When you look down on a plan of your scene, there's a triangular sweet spot, coming out from the camera to the screen, of what will be comfortable for people to view. The further you push an element out of the screen towards the theatre, the smaller and more centred the area has to be. This meant we had to adapt parts of scenes when working in the 3D positive, and make the centre of the screen the focus. This fed back to the rest of the shots, and to where we see Allan, so most of the action is symmetrical and centred.

Using mixed media can lead to some pretty messy – and, for the client, frightening – work-in-progress edits. Style frame placeholders, quickly keyed live-action and blocky greyscale pre-viz animation can make it hard to see where the film's going, and can also make for some nervous meetings.



▲ 'Audi Driver' had its premiere before the Champions League final, which was the most expensive media time Audi had ever bought

However, we gave the client and agency a heads-up that this would happen and they were really understanding.

The BBH creative directors Nick Kidney and Kev Stark have created fantastic ads for Audi in the past, each one creatively new and interesting while still feeling very much part of the brand. Working with them, you felt this crazy mixture of creative freedom and belief that they have in you, and sheer terror at making something that they'll like and will stand up with the rest. ●

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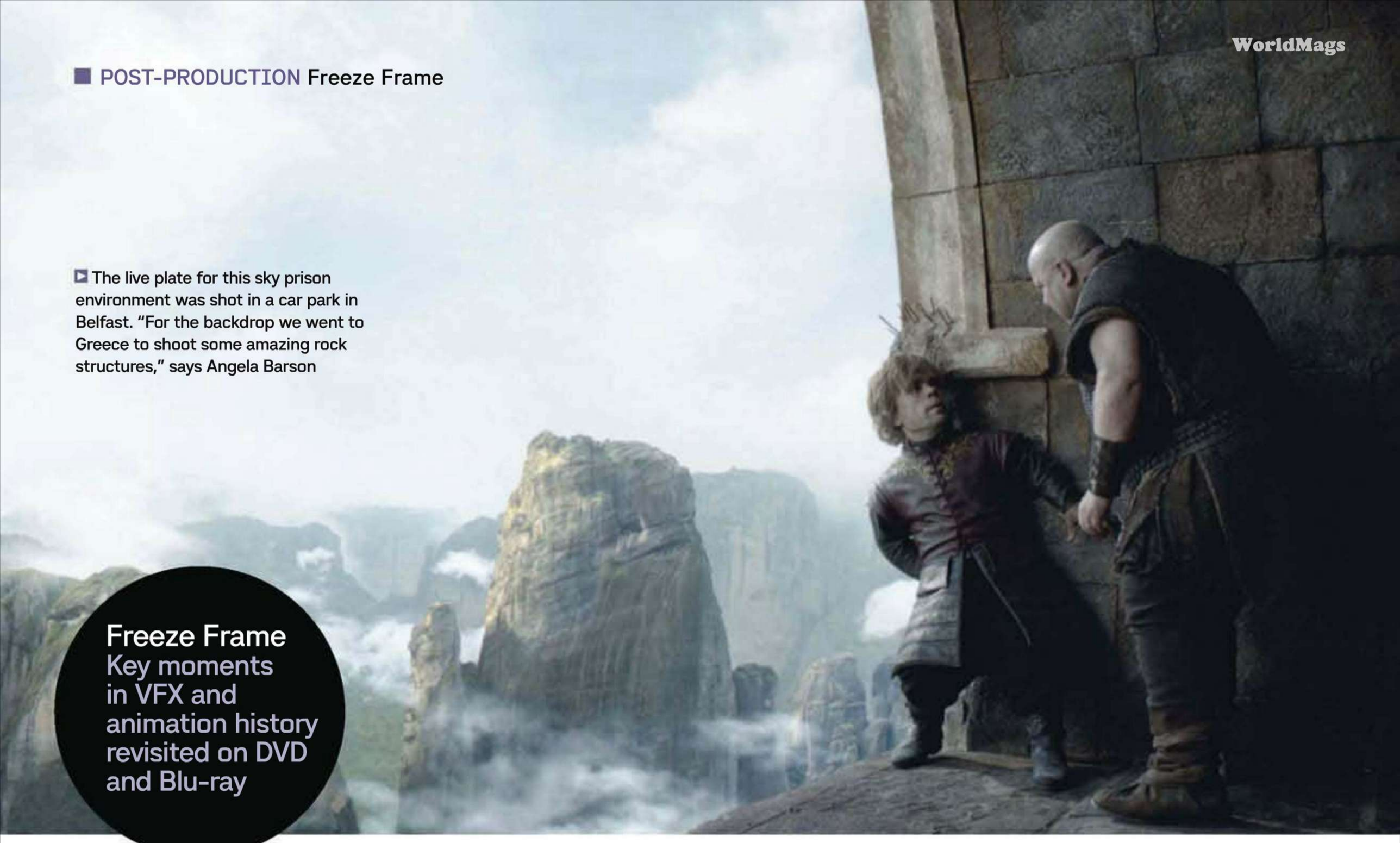
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The live plate for this sky prison environment was shot in a car park in Belfast. "For the backdrop we went to Greece to shoot some amazing rock structures," says Angela Barson

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

Might and magic

Game of Thrones brings credibility to the fantasy genre, with a cast of heavyweights, plenty of dark and complex plotting, and stunning visual effects from London-based BlueBolt. By Mark Ramshaw

It's no secret that the fantasy genre has struggled to be taken seriously beyond the confines of literature. It took Peter Jackson's epic retelling of The Lord of the Rings to legitimise it in the cinema – but even after that breakthrough, a credible take on swords and sorcery for television has remained elusive. Until now.

When Game of Thrones co-creator David Benioff half-jokingly referred to the HBO show as "The Sopranos in Middle-earth", he highlighted the real challenge being faced: to somehow fuse intelligent and adult storylines with a convincing depiction of the lands described in author George RR Martin's original A Song of Ice and Fire books. To bring the rugged, richly detailed fantasy world to life, HBO turned to a relative newcomer to the visual effects scene: London-based BlueBolt.

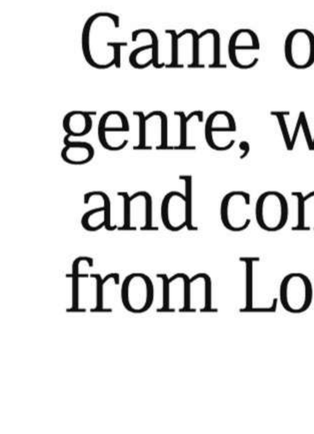
"Visual effects producer Lucy Ainsworth-Taylor, visual effects supervisor Chas Jarrett and myself formed the company less than two years ago, starting with nothing and slowly building up," recalls visual effects supervisor Angela Barson. "Our first job was for Prince of Persia, then Sherlock Holmes; and Burke and Hare was the first movie that we tackled all on our own. After that came Game of Thrones."

Barson notes that while the studio is new, the team are industry veterans, having worked at Moving Picture Company for 10 years prior to striking out on their own. Thus, they already had a relationship with the show's producer, who felt confident that they'd be right for the job. "Lucy was brought in by HBO as the main VFX producer, and we handled the bulk of the work, tackling around 300 shots for the series," says Barson. "We handled all the environments and the creature work – anything requiring a substantial build. And then a few other studios handled around 400 shots of things like wire removals, snow, blood and gore."

After winning the pitch in May 2010, Barson says they had to hit the ground running – heading out to Belfast and Malta that July. "At the same time, the team in the office had to get the pipeline in place. Thankfully, we'd set it up so that, even though it was small, it could be expanded very quickly. There was still an awful lot to do, though, including expanding the team with R&D, lighters and so on."

Barson says R&D work mostly involved making the pipeline as efficient as possible. A good amount of time upfront was also spent streamlining by building texture and modular asset libraries, and breaking down every shot to determine what would need to be 3D, 2.5D or could be achieved with 2D mattes – although the need for some flexibility was inevitable. The use of an ocean-facing cliff edge for one unexpected shot required all the water to be replaced by desert, for example. And in the case of Winterfell, one of the key locations in the show, BlueBolt decided that the original plan to use mattes might not give the filmmakers enough freedom further down the line, so opted for a full 3D build instead.

> *"Our strength lies in environment work and compositing, but it was great to show we're not scared to take on something different"*
> **Angela Barson, VFX supervisor, BlueBolt**

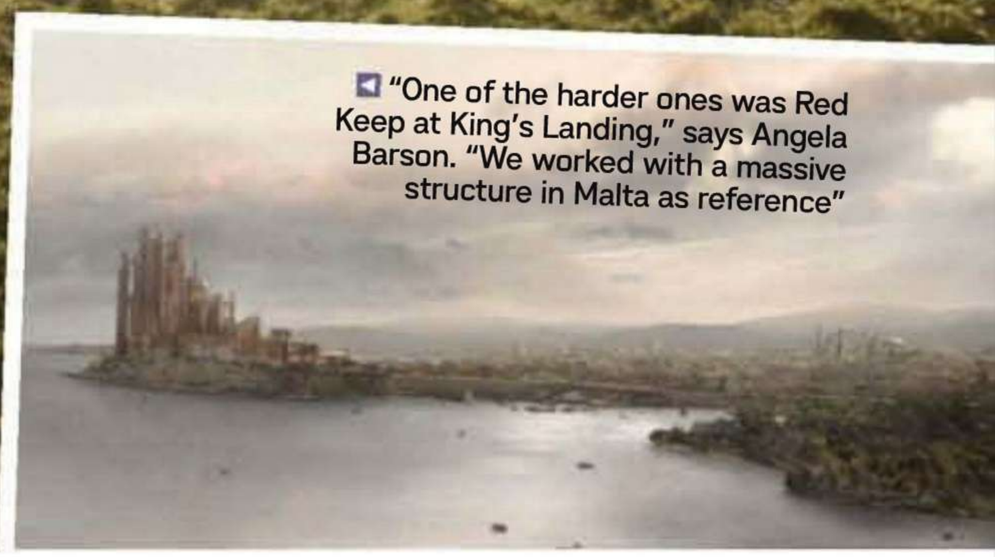


VITAL STATISTICS
Title Game of Thrones: The Complete First Season
Released TBC
Formats Blu-ray/DVD
Distributor Warner Home Video (UK), HBO Studios (USA)
Watch for... Castle Black and its environs, and those dragons

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"The Twins, a pair of fortresses, was one environment that wasn't pre-planned quite so much, but we knew it was going to be based on a castle in Scotland," says Angela Barson



"One of the harder ones was Red Keep at King's Landing," says Angela Barson. "We worked with a massive structure in Malta as reference"



KEY TECHNOLOGY

The appearance of the dragons provides a dramatic finale to the first series. They were modelled in Maya, with texturing in Photoshop and Mari, plus Mudbox for some additional displacements. "The dragon rigs were fairly complex, using inverse and forward kinematics," says Raf Morant, head of 3D at BlueBolt. "Layered on top of this, we used a combination of a muscle rig, painted skin weights and Maya nCloth to simulate the skin deformation over the body and wings, as well as blinking and breathing cycles.

"HDRI was used to generate an image-based lighting rig, which was adjusted and balanced further employing lighting reference spheres and Macbeth charts. This was combined with the more global light rig to contribute bounce light and shadows from the actress onto the dragons, and from the dragons onto her, to achieve full lighting integration."

Everything was carefully storyboarded, but Barson says pre-viz only really came into its own for the creature work – in a series-finale sequence featuring three baby dragons. "We worked with Destroy All Monsters to pre-viz that from the initial boards, and then pretty much precisely matched it," she says. "The sequence was filmed in Malta, over the course of three or four nights. We had only 45 minutes every evening, and of course the production team just wanted to get the thing shot, while we needed to get all our measurements, HDRI chrome ball data and so on, so we had to make sure they understood that it was necessary for the final shots to look good."

Top of their game

Having focused heavily on film work in the past, the BlueBolt team were surprised by the chain of command on the show. Rather than the episode directors, it was the writers who acted as showrunners and so were more closely involved with shot sign-off. "Very, very hands-on" is how Barson describes HBO's involvement with the effects work.

"There were a lot of layers of hierarchy involved, with approval to get anything finalled. At any stage you might get some notes, and if the person at the top asked for a change, you'd go right back to the beginning. They were especially hands-on with the CG dragons – it was the first time they'd done creatures, and so obviously were both excited and nervous. We had to make sure the results were just right. In the end, though, it actually worked out really well. Our strength lies in environment work and compositing, but it was great to get the opportunity to show we're not scared to take on something different." ■



"To give better shot flexibility, we ended up doing a full build [of Winterfell], with a base texture that could then be augmented with projections for wear and tear," notes Angela Barson

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It's a shame about Reyes

In a rare display of journalistic bravery, Roy enters the minefield that is the renderer market. His findings are truly shocking

Hands up anybody who has ever whined like a little girl about the crippling lack of choice and competition in the world of computer graphics software. Well, I hope you're happy now. Because we've gone from a virtual duopoly, with a couple of also-rans and niche vendors bringing up the rear, to a world when I just don't even know what the hell anybody is supposed to be running any more.

It used to be so simple: Maya, XSI or maybe 3ds Max for modelling and animation; and for rendering, RenderMan, mental ray or maybe 3ds Max's scanline option for those in the cheap seats. Now just thinking about the rendering end gives me the same sweaty palms and sense of panic I usually get only when walking into a Starbucks. And while the worst that can happen at the coffee shop is that you end up with an oversized cup of unappetising brown liquid carrying a price tag that suggests it's been made using those beans some poor bastard has fished out of civet poo, the consequences for choosing the wrong renderer can be truly dire – especially if you're the idiot who somehow convinced the studio to blow its precious time and rapidly dwindling supply of cash changing the entire pipeline over to a here-today-gone-tomorrow piece of bug-ridden crap.

Would it surprise you to learn that there are now more allegedly production-ready rendering packages available than there are visual effects studios in the whole world? I couldn't be bothered to do any proper research so I just made that statistic up, but it's probably true. Of course, there's still RenderMan, a program so universally admired despite its cost that you'd be forgiven for thinking the term PR Man actually referred to some supertalented Pixar marketing employee. That everybody still regards the studio as some kind of lovable uncle to the animation industry even after the Disney deal probably helps.

Then there's mental ray, now the most popular raytracer around despite a buyout by Nvidia. Must be that catchy name. After those, there are a few more old friends I still feel reasonably comfortable about: Brazil, V-Ray, Maxwell and – for those moments when you absolutely, positively must Houdini it – Mantra.

But then it just gets absurd, with an endless parade of newbies like MachStudio Pro, HyperShot, finalRender, 3Delight, Air, Indigo, fryrender and Octane all vying for attention. And that's before we even get to all the free-to-use renderers, like Pixie, LightUp, Shaderlight, LuxRender, RenderSpud, Agsis, POV-Ray and Kerkythea. If nothing else, that last one really rams home the fact that there are now so many renderers out there we don't have enough real words left in the English language to name them all, even when randomly conjoining them in ever more desperate ways. Or should that be DesperateReyes?

Faced with so much choice, the obvious thing to do is to panic, bury your head in the sand and stick with the render engine you currently have. You'd have to be mental to attempt any kind of rigorous comparison between them all. Of course, I *am* Mental. So, in the interests of science, I took one really big sheet of blank paper and started plotting a Venn diagram, with a series of circles that work a way through the minefield based on price, platform, and compatibility. Then I added one big intersecting circle at the upper left for all those RenderMan-compliant renderers, and another on the right for all those raytracers. Next came more overlapping areas based on whether each renderer is GPU-accelerated, offers real-time previewing, is biased or unbiased, comes with low-overhead and photoreal motion blur, has strong shader tools, and offers depth of field, caustics, and photon mapping. A few more variables, and hey presto! The answer to that burning question, just which renderer reigns supreme, was clear... clear as mud.

What I actually ended up with was a piece of paper with so much scrawl on it that the only discernible thing was an overall shape not unlike that of Mickey Mouse's head. Make of that what you will. Me? I couldn't possibly pass final judgement until Arnold makes it out of beta. After all, it has such an inviting name, we've only been waiting 10 years for it now, and they just used it on that really popular Green Lantern movie. What could possibly go wrong? ●



About the author
Mental Roy has been lurking on the fringes of the 3D industry for years – usually fringes that contain pubs. We could tell you his real name, but then we'd have to kill you
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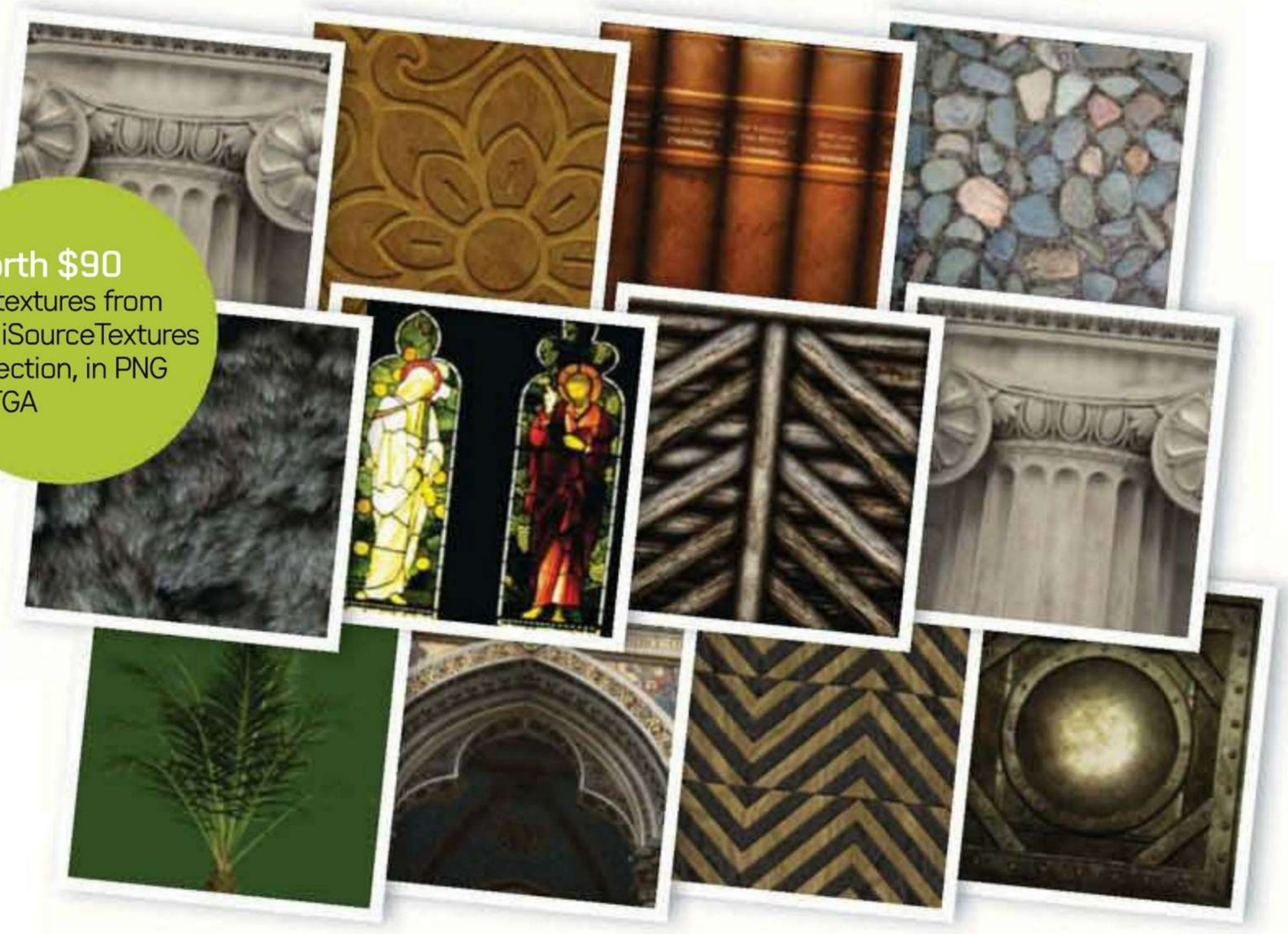
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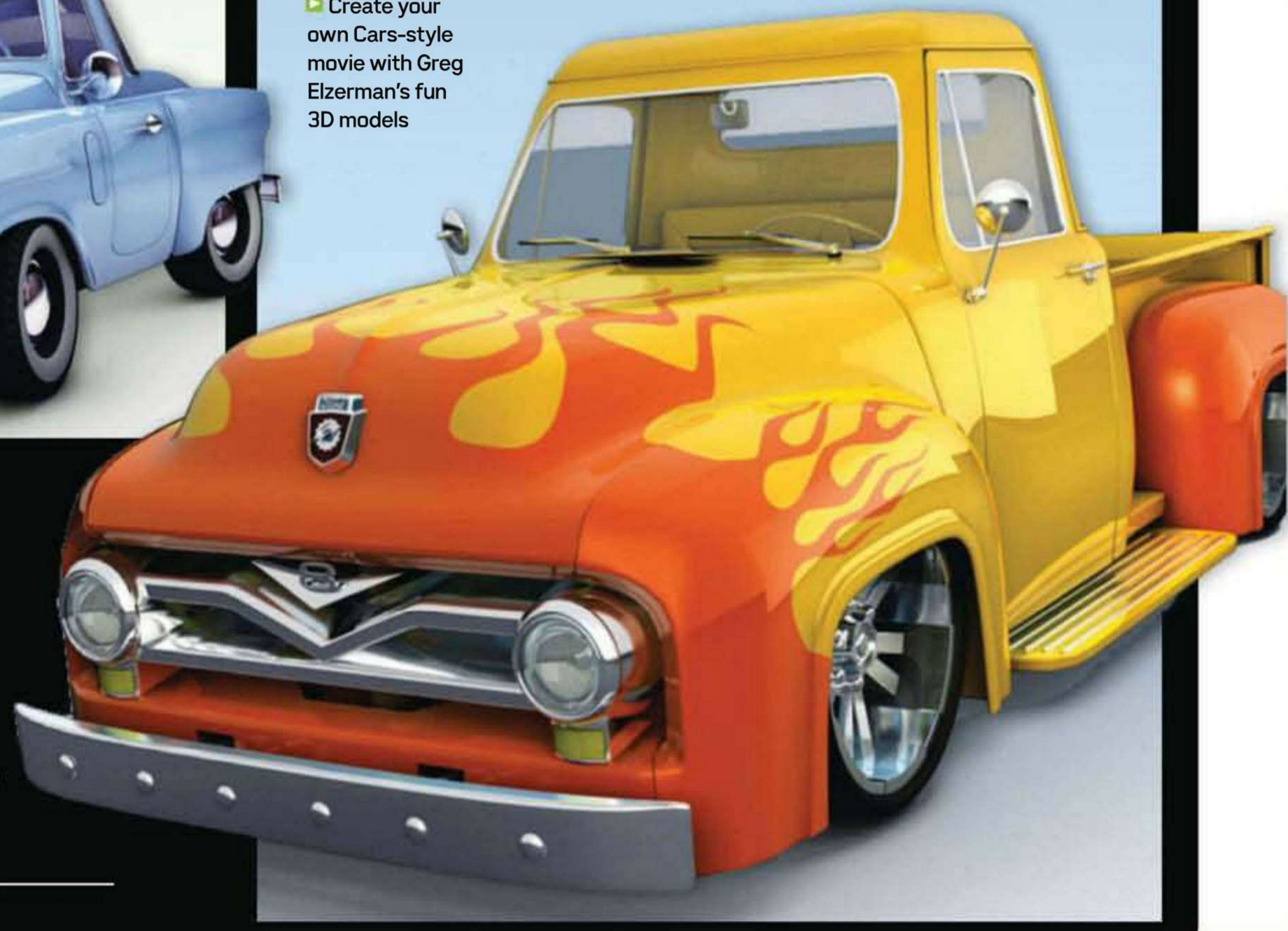
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