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3DArtist

55

Practical inspiration for the 3D community

25-PAGE SPECIAL BLENDER

- Create this incredible scene
- The future of open source
- 50 essential VFX secrets

NEXT-GEN GAMING

What new technology means for videogame artists

35 PAGES OF TUTORIALS

Stereoscopic imagery

Build 3D animations using this simple 3ds Max workflow

ENHANCED ANATOMY

Create a skeletal torso in this detailed sculpting tutorial

Autodesk 2014

Our industry expert explores the new retopology options in Mudbox

PERFECT WOODWORK

Follow this pro-tuition to create amazing timber-filled arch-vis scenes

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Get to grips with Luxology's new particles tech

ISSUE 055

IMAGINE PUBLISHING

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This is KeyShot 4.

Model by Simon Williamson
http://be.net/Row0

Find out more at:
www.keyshot.com

Ben Simonds

Personal portfolio site
www.bensimonds.com
Country UK
Software used
Blender, GIMP, Photoshop

You can create this very image by turning to page 50 and following our in-depth step-by-step tutorial. Thanks go out to the director of VFX studio Gecko Animation, Ben Simonds, for this excellent effort . If you want to learn more, then why not check out the review of his awesome book, Blender Master Class, *on page 99?*

With the Disc

Free with this issue

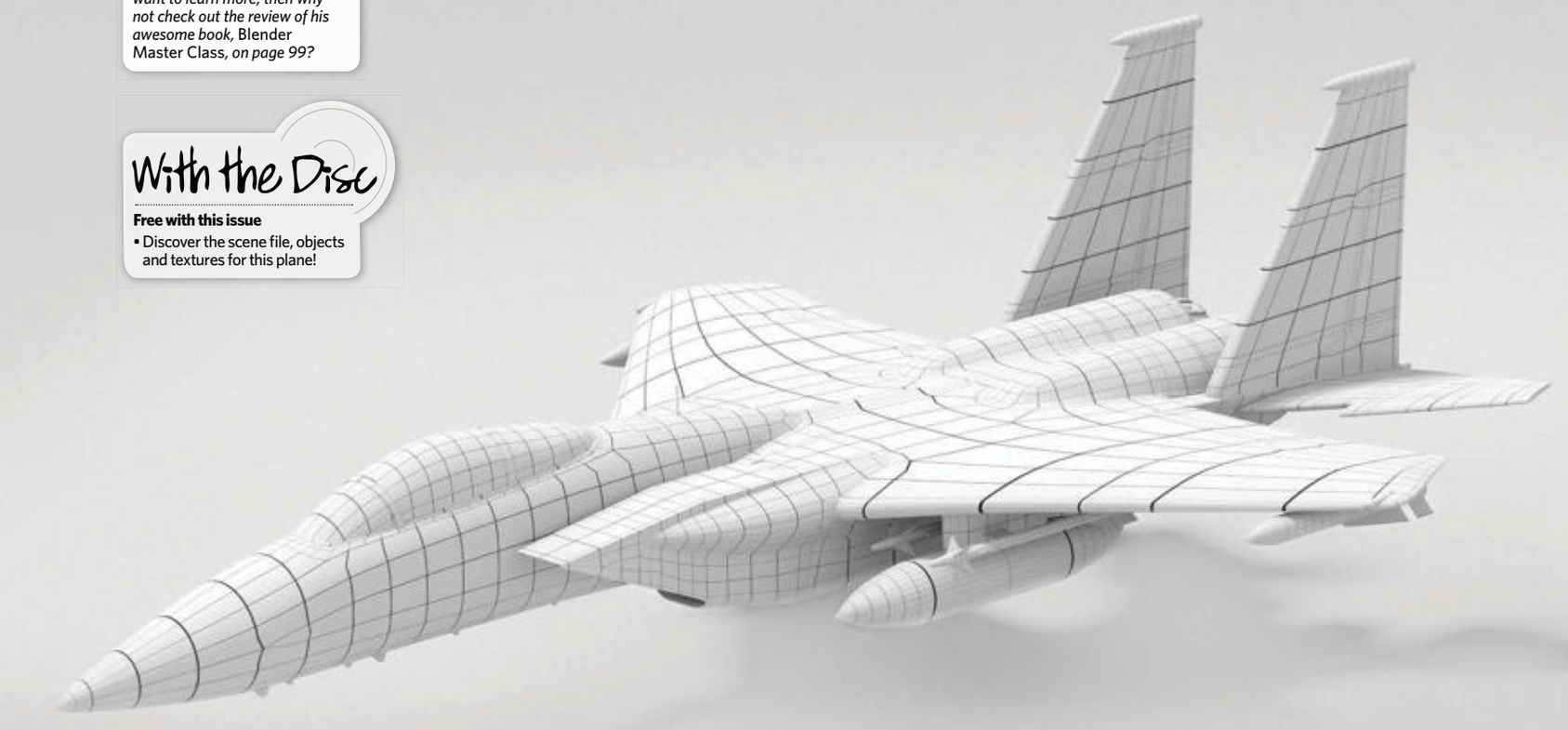
- Discover the scene file, objects and textures for this plane!

Back in 1995, when Blender was still an unknown in-house application at a Dutch animation studio, few could have imagined just how big the software would eventually become. Over the past 18 years the free and completely open-source tool has grown beyond all expectation, standing now as one of the most exciting and forward-thinking content-creation platforms out there.

For evidence of Blender's evolution, just check out the absolutely fantastic cover image created by Gecko Animation director Ben Simonds. Whether you want to create an insanely intense dogfight scene or a movie about a girl and her dragon, Blender has the capacity to deliver on your vision. The only limit now is your imagination.

Blender really is a tool created by artists, for artists. Not only is it free, but the whole program is malleable; changed and improved by the community itself. The Blender Foundation – established to oversee and cultivate the development of Blender – is one of the most reactive developers out there, ensuring every new release of the software comes with the alterations and additions requested by users.

It's for all of these reasons and more that we decided to swing the spotlight onto Blender for this bumper 25-page special. Within you'll find a look into the past, present and future of Blender (page 32), some vital tips and tricks for the software (page 42) and an in-depth tutorial that you can follow to create your own aircraft combat scene (page 50). So, what are you waiting for? Dive in and see what you can do with Blender today.



> "[Blender] is a great tool for small studios and freelancers. It's really flexible – you aren't locked into working just on animation or modelling. You can switch back and forth between different tasks very easily"

Ben Simonds shares his thoughts on the open-source platform **Page 32**

Create a fighter jet in Blender
page 50

Welcome

to the magazine and 116 pages of amazing 3D

Every issue you can count on...

1. **Exclusively commissioned art**
2. Behind-the-scenes guides to images and fantastic artwork
3. **A CD packed full of creative goodness**
4. Interviews with inspirational artists
5. **Tips for studying 3D or getting work in the industry**
6. The chance to see your art in the mag!

There are few tools out there today as exciting as Blender. With every update the software is growing more impressive, delivering advanced workflows into the hands of budding artists. What's more, it's completely free: the open-source project created by artists, for artists.

That's why we've gone all-out with this 25-page Blender special. We explore the past, present and future of the software (page 32), ask the top VFX artists for their best tips (page 42) and reveal how to make this issue's amazing fighter jet cover (page 50).

As ever, there's plenty of other CG content to whet your appetite too. So what are you waiting for? Let's get cracking!

Chris

This issue's team of expert artists...

Ben Simonds

To create the awesome cover this issue we brought Ben on board – director of London VFX studio Gecko Animation

Craig Barr

Our resident Autodesk expert Craig dives into the exciting new retopology features of Mudbox 2014

Ross Board

Ross follows up last issue's arch-vis glass tutorial with a focus on what you can do with wood. Turn to page 82 to see more

Craig A Clark

When it comes to LightWave, few artists know more than Craig. Here he explores what can be achieved with Sliders

Gavin Goulden

It just so happens that Gavin worked on *BioShock Infinite*'s Elizabeth, so his character-creation tips are a must-read

André Kutscherauer

André reveals the simple and effective workflow he created for stereoscopic imagery in 3ds Max. In-depth stuff!

Gustavo Åhlén

If you want to sharpen your anatomy skills, then Gustavo's tutorial on skeletal sculpting in ZBrush mustn't be missed

Andy Probst

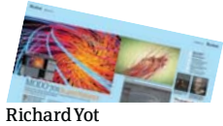
Interested in abstract design? Andy certainly is. He's created a fantastic image using MODO 701's new particles system

Buwaneka Saranga

After Effects pro Buwaneka reveals his top-grade compositing techniques in this simple but effective workflow tutorial

Gustav Melich

Gustav is a verified Houdini master, so who better to explore the new tools and options in Houdini 12.5 than him?



Richard Yot

This issue we let Richard get to grips with MODO 701. Check out his review of the software on page 94

David Scarborough

Videogame pundit David explores what the next generation of console hardware could mean for industry artists

Sign up, share your art and chat to other artists at www.3dartistonline.com

3DArtist

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What's in the magazine and where

News reviews & features

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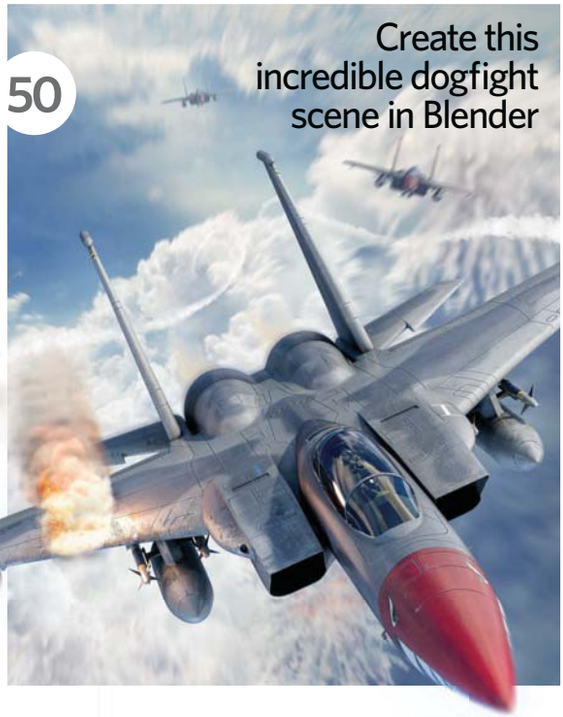
Blender special

"I could very easily foresee a future where companies choose to go with Blender, not just because it's cheap or open-source, but because it's the best tool for the job"

Ian Hubert discusses the future of this exciting tool in our 25-page software special



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Create this incredible dogfight scene in Blender

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Get to grips with particles in MODO 701

Turn to page 92 for details

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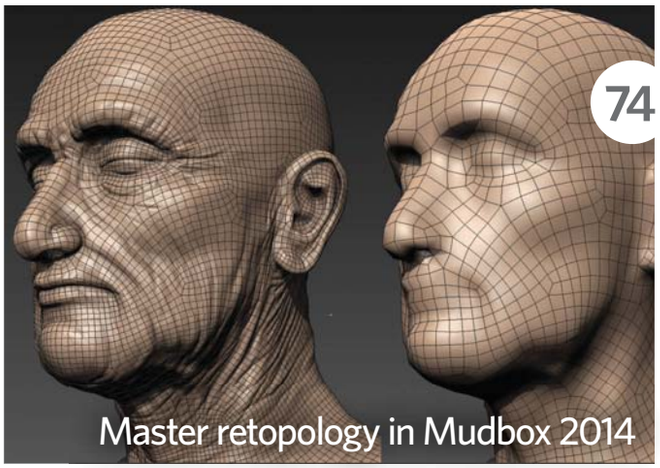
Factory Fifteen dips into the world of VFX



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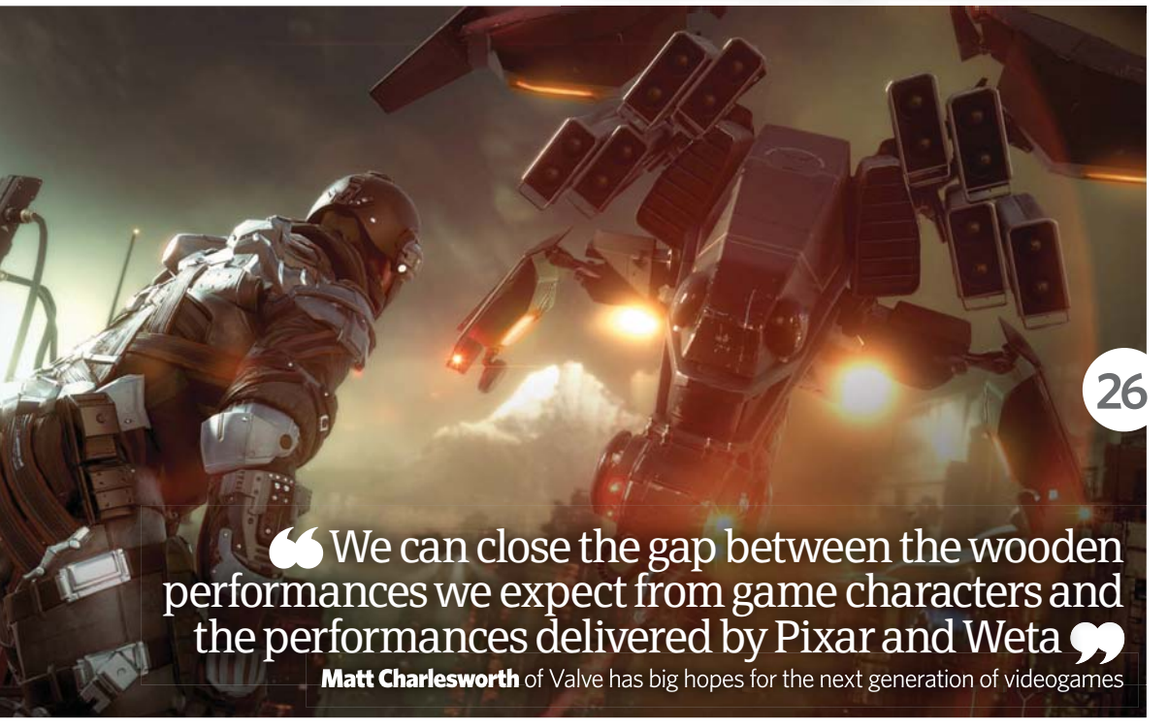
Master retopology in Mudbox 2014



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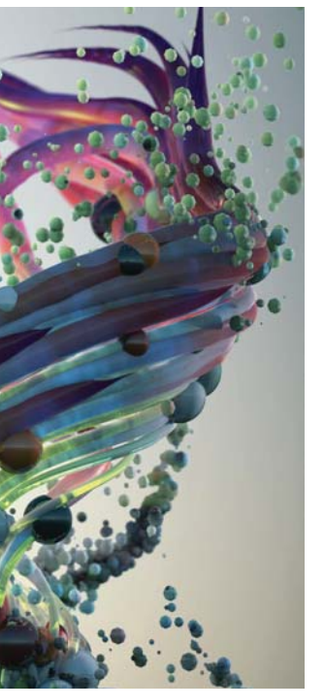
“We can close the gap between the wooden performances we expect from game characters and the performances delivered by Pixar and Weta”

Matt Charlesworth of Valve has big hopes for the next generation of videogames

The studio

Professional 3D advice, techniques and tutorials



The workshop

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With the Disc

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- Magazine tutorial files

Turn to page 112 for the complete list of the disc’s contents

WELCOME TO

THE GALLERY

Seven pages of great artwork from the 3D community

Images we love!

"The inspiration here was to create wasps that looked like they had a lot of bite to them. Originally this was a live project at Lightfarm Studios, but due to time constraints was very rushed. I had so much fun with the project, however, it would have been a waste not to develop it further. This is where I ended up"

Chris Chui, *Hymenoptera Apocrita,* 2012

3DArtist Loves

"There's a grim quality to this image, but we can't take our eyes of it. The textures and lighting are great!"

Chris Deputy Editor

Have an image you feel passionate about? Get your artwork featured in these pages

Create your gallery today at **www.3dartistonline.com**

Or get in touch... 3dartist@imagine-publishing.co.uk @3DArtist Facebook.com/3DArtistMagazine

Artist info

Chris Chui

Chris is a New Zealand-based CGI artist working in the print advertising industry

Personal portfolio site www.chuthefat.com

Country New Zealand

Software used 3ds Max, ZBrush, Photoshop, V-Ray

Work in progress...

Artist info

Rudy Massar

3DArtistonline

Username: rudymassar

Personal portfolio site
www.rudymassar.com

Country Netherlands

Software used ZBrush

Work in progress...

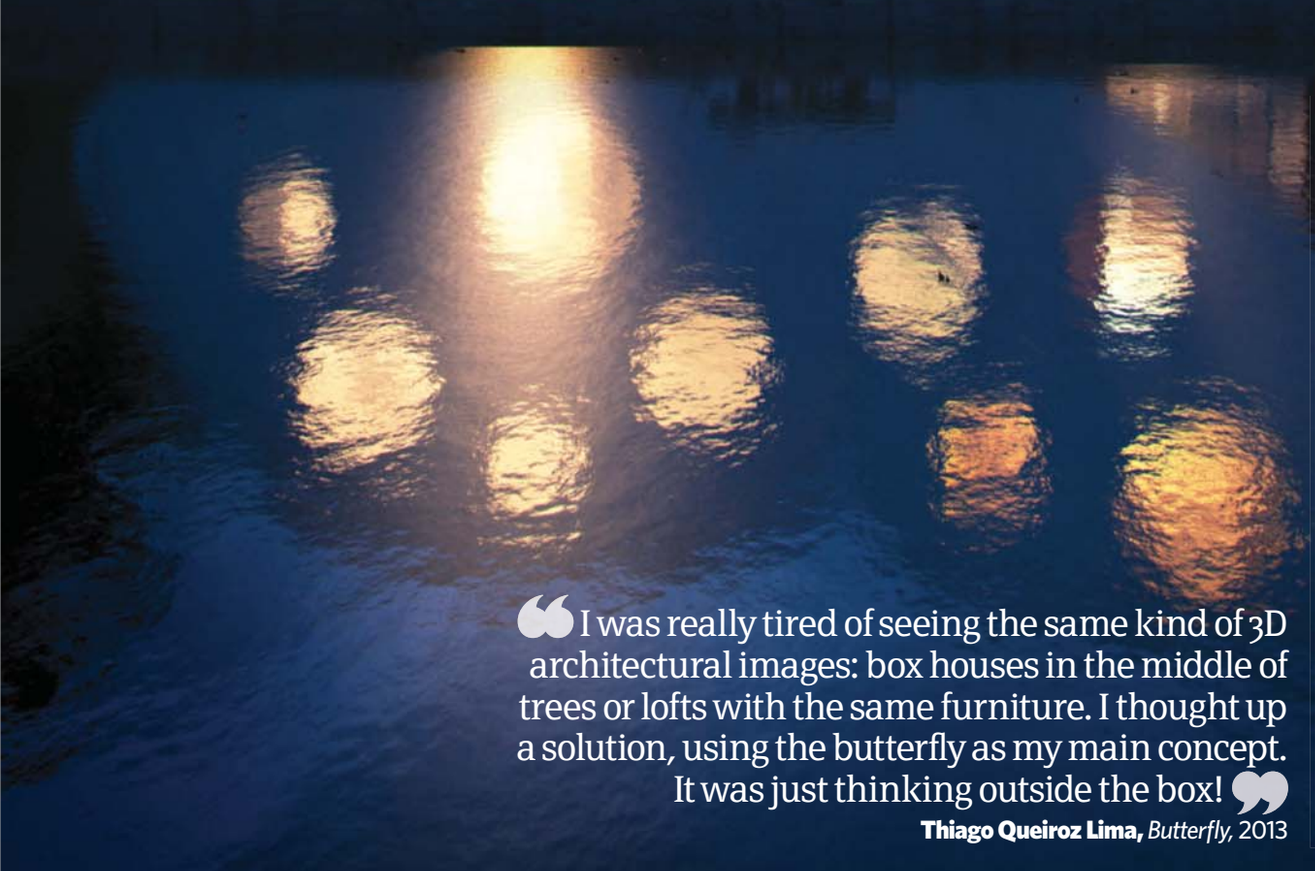
> I wanted to learn ZBrush and around the same time Zack Petroc started a workshop about character design principles, rhythms and gestures. Taking this class was a great [chance] to get familiar with ZBrush

Rudy Massar, *Portrait of a Miner,* 2009

3DArtist Loves

This is an immediately striking arch-vis image, thanks to the unique shape of the house and the warmth communicated by the soft lighting

Chris Senior Designer



"I was really tired of seeing the same kind of 3D architectural images: box houses in the middle of trees or lofts with the same furniture. I thought up a solution, using the butterfly as my main concept. It was just thinking outside the box!"

Thiago Queiroz Lima, *Butterfly,* 2013

Artist info

Thiago Queiroz Lima

3DArtist online

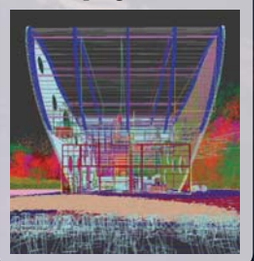
Username: thilima3d

Personal portfolio site
www.thilima3d.wordpress.com

Country Brazil

Software used
3ds Max, V-Ray, Photoshop

Work in progress...



Artist info

Matias Murad

Matias is a freelance illustrator and designer based in Sweden. He works in both 2D and 3D

Personal portfolio site
www.murad-design.com

Country Sweden

Software used
3ds Max, V-Ray, Photoshop

Work in progress...

3DArtist Loves

"At first this is an unsettling scene, but it's worth taking the time to also appreciate the detail that has gone into the elements surrounding the cyborg centrepiece"

Chris Senior Designer

> The main goal for *Traditional Hall* was to create a perfect place to relax and be calm. To achieve this, [I paid] attention to the materials and importantly the lighting, which is distinctly soft. The framed illustration was created by Theresa Lüe and the chair model (without textures) by Vargov Anton
>
> **Juan Manuel Alemán de la Vega,** *Traditional Hall,* 2013

Artist info

Juan Manuel Alemán de la Vega

3DArtist online

Username: moegdl

Personal portfolio site
www.moe.com.mx

Country Mexico

Software used
3ds Max, Photoshop

Work in progress...

3DArtist Loves

If Juan's goal was to create a relaxing image, then he's achieved it expertly in this soothing piece of minimalist arch-vis

Chris Deputy Editor

Artist info

Angel Navarro

Angel is a Spanish animation and character artist currently living in Sweden

Personal portfolio site
www.angelnacia.com

Country Sweden

Software used MODO, ZBrush, After Effects

Work in progress...

3DArtist Loves

"This is an absolutely fantastic character, and the lighting gives the piece a very soft and warm feel. Great work!"

Chris Deputy Editor

"For the lighting I placed one big square area light as the key light on one side of the character, then an oval big area light as the rim light behind him. [This] required lots of tweaking to get the nice thin cold rim light on the back"

Angel Navarro, *Mummy,* 2013

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All motion-capture moves and animation were created by Juul, but the backgrounds were derived from real-world locations

A one-man animation army

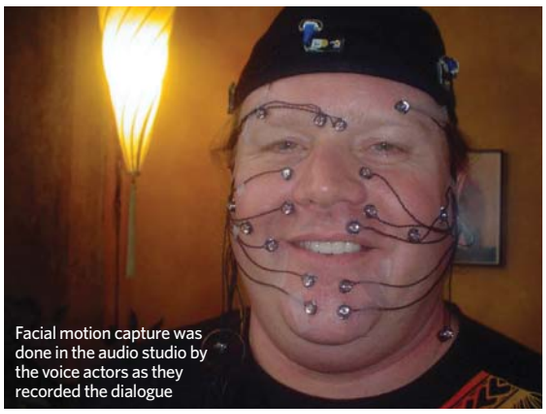
White Tiger Legend – the full-length film with an animation team of one

Making a full-length CG-animated feature film takes the long-term commitment of hundreds of people and millions of dollars. Kory Martin Juul should know this better than most, as he's worked on some of the biggest movies around, including *Avatar*, *The Hobbit* and *The Matrix*, among others.

Nevertheless, he's decided to create his own project, *White Tiger Legend*, virtually single-handedly. Ok, so he's not entirely alone – his production still requires voice actors, sound professionals and others – but this animated martial arts movie is written, directed and animated solely by Juul. He even stood in as a mocap artist.

Certainly, his experiences from working on other films have been a big help. "I was listening to a Jim Cameron conference call on *Avatar* and he kept referring to the pre-vis work. The whole film was pre-visualised down to the level of lighting direction. It was all there," Juul explains. "That really clicked for me, because here was a tool I could use to show how my film, *White Tiger Legend*, was different from every other martial arts film out there. More than just a script or storyboards, I could feasibly make a full film. So I just got to work doing every single job possible until it was done. It ended up taking two years of solid work to pre-vis the whole film."

The current plan is for the finished film to be ready early next year. At the moment Juul is looking for a producer to help finish the production, but if one doesn't come along he's not ruled out doing this job himself as well. After all, he's come this far.


Facial motion capture was done in the audio studio by the voice actors as they recorded the dialogue

"The trailer took two months to do 24 shots. This included modelling high-quality sets (or photomodelling), facial rigging, crowd sims, cloth sims, FX, lighting, rendering and compositing. It was basically two days per shot. I usually spend two weeks on a shot when working for a major studio," Juul concludes. You can view the trailer for this exciting one man martial arts flick by heading to www.whitetigerlegend.com.

> "I just got to work doing every single job possible until it was done" **Kory Martin Juul**

Motion capture

Motion capture is at the heart of White Tiger Legend, enabling eight out of nine fight scenes in the film to be essentially Juul fighting himself

"The PhaseSpace mocap system was definitely necessary in terms of making a one-man show even possible. I could run the system solo and the data was clean enough so it could be used straight away for pre-vis," says Juul. "The body capture took 20 weeks, recording one day a week. This was extremely difficult on the body – physically, as well as mentally exhausting. Trying to match your performance to the voice actors so they are in harmony takes a few tries. Plus you have to perform as every single character in a scene."

Capturing real locations took a lot of the stress out of background modelling and also meant that Juul got to trek around China

The scenery

White Tiger Legend's backgrounds mix traditional modelling with photogrammetry

For the backdrops, Juul took a trip through China, scouting real-life locations on which to base the fictional settings. "We used HDRI lighting (chrome balls) – which I first learned to capture on *The Matrix* films... [I then] photographed locations in ways that enabled the computer to calculate and extract 3D models from the photos – photogrammetry. It's a great process, but I may ultimately go for a more animated Pixar style. However, the Pixar aesthetic is one that can't be achieved by a single person – so without artists, that's yet to be determined."

Motion capture and photogrammetry streamlined production in a way that made the film possible

Artist spotlight

Low-res creativity

Majid Esmaeili explains how he combines several software to produce animation-ready models

Majid Esmaeili www.majid-smiley.cghub.com

Majid Esmaeili is a self-taught artist who started his career working in advertising. Having moved into 3D, he's had experience in cinematic, videogame and 3D-printed projects with styles ranging from cartoons to photorealism.

"I start by blocking the model and mesh in Maya and then sculpting in ZBrush to make the high-res result," Esmaeili says. "I then generate Normal and Cavity maps to use as a reference for texturing."

The following steps entirely depend on the client, as well as what the model will be used for. If it has to be animated and used in real-time there will be a polygon limit, so a low-res version with properly laid-out UVs will have to be created and painted (usually in Mudbox, ZBrush and Photoshop).

Esmaeili would like to be able to do all his work in one package, but right now the software just isn't there. "I'd like to see the 3D workflow made easier for artists, but I'm happy that real-time engines are starting to appear that make it easier to see the final result of your work with better shaders and lighting," he explains.

When a low-poly version is made, Normal and Cavity maps are applied as a reference for the texturing stage

High-poly models are blocked out in Maya before being transferred to ZBrush for detailed work

Making non-physical models

The method described here works for real physical models, but it's also a useful approach if you're creating characters for videogames or animation. Extra steps will be needed here to create low-resolution versions with baked maps, but the focus on anatomy keeps everything realistic from the start.

Keeping anatomy as the basis of a model enables Nickel to make fantasy characters more believable

Producing a figure for 3D printing comes with its own challenges

3D Sketchbook

Printed miniatures

How this artist is taking his work beyond the screen using 3D-printing methods

Jon Troy Nickel www.hazardousarts.com

Jon Troy Nickel is currently involved in making 12" desktop figurines as part of a freelance job. When creating a physical 3D character model, the finished product needs to look impressive from every possible angle, so everything about the character has to spring from its fundamental anatomy.

"At first I focus on anatomy, proportions and forms, even if I know they will be covered by clothes or armour," he says. "I then start to block out big shapes of armour or clothing. Ultimately this produces a high-polygon model that's unrefined, but contains all the right volumes and shapes I'm looking for.

"At this point I will retopologise any pieces that need further refinement using 3D-Coat and complete these. I will generally polish the high-polygon model at this stage until I'm happy with it," Nickel concludes.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KOR EcoLogic and Stratasys to produce a fuel-efficient and inexpensive vehicle

The eco-friendly vehicle, planned for production in 2015, has been christened the Urbee 2. Its bodywork will be comprised of 40 3D-printed parts, enabling the design of the Urbee to be tested and refined quickly and easily. The makers plan to test the finished car by driving from San Francisco to New York on just ten gallons of petrol. If successful, this will set a new World Record for fuel economy. You can follow the production of the Urbee online at www.urbee.net.

The car's makers have just been honoured with induction into the The International Green Industry Hall of Fame (IGIHOF) and presented with a Lifetime Achievement award

Texturer is full of useful textures and background images

Texturer

Looking for high-quality textures for your 3D objects? Try www.texturer.com

www.texturer.com provides a great range of high-resolution textures for use in your 3D scenes. As well as some great grungy textures and architectural material assets, there are also useful plant and animal shots and building fascias.

In addition, there are some handy sky and panoramic background shots. You can instantly download any image for royalty-free use in personal or commercial pieces.

inspiration corner

Make Something Unreal

Dead Shark Tripplepunch wins the annual Make Something Unreal Live contest with Epigenesis

Epic www.unrealengine.com

The competition, in which designers compete to create a videogame using the free version of Epic's Unreal Development Kit, took place at the Gadget Show Live in Birmingham.

The theme for this year's contest – Mendelian Inheritance: genetics and genomics – was set by the Wellcome Trust, which supported the competition and made four of its scientists available to the teams.

The winning team (from Blekinge Institute of Technology in Sweden) created a fast-paced ball game, in which players compete to plant seeds that later affect the course of the game. They will now be presented with a full Unreal licence, enabling them to release the game commercially.

The winning game's authors will now be able to release their game commercially

Epigenesis was developed using the free version of the Unreal Development Kit

behind the scenes

Rollin' safari

Animals battle for survival in these physics-defying shorts

www.fmx.de/media/1st-trailer-fmx-2013.html

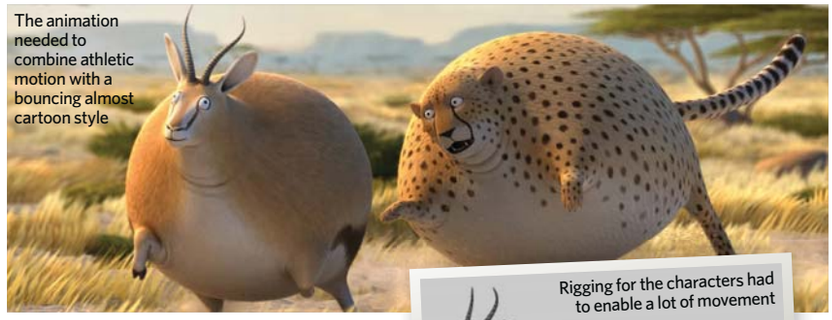
A series of trailers produced for animation conference FMX 2013 feature a cast of overweight animals locked in a fight for survival on the African savannah.

Spherical crocodiles fail to catch drinking zebra, while chubby cheetahs pursue rolling gazelle in this documentary-inspired series of sketches. The animations were created by current students of the Institute of Animation, Effects and Digital Postproduction at Filmakademie Baden-Wurttemberg.

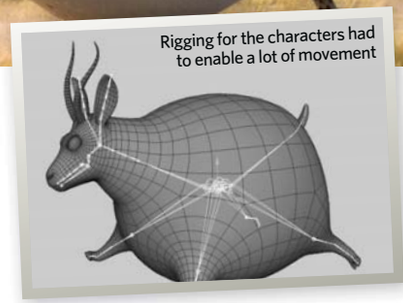
"Our clips were animated in Maya 2012. For modelling and texturing we used a mixture of ZBrush, Mudbox and Photoshop," says director Kyra Buschor. "All in all we had five technical directors helping us with rigging, shading, effects and rendering."

Flat-painted backdrops helped to simplify production and concentrate work on characterising the movement of the animals.

Rigging the rotund characters was a challenge for the team, as the limbs had to be flexible without allowing the spherical bodies to distort. In the end, the team opted for an unusual rig without a spine, so that the animals could be as balloon-like as possible.



The animation needed to combine athletic motion with a bouncing almost cartoon style



Rigging for the characters had to enable a lot of movement

© Filmakademie Baden-Wuerttemberg

Images of the month

These are the illustrations that have been awarded 'Image of the week' on 3DArtistOnline.com in the last month

A Turtle War

» Nicolas Delille

3DA username ModernAgeStudio

Nicolas says: "The battle of a young turtle on the battlefield. This could very well be the first picture of a series telling the story of this soldier's journey."

We say: *We're always surprised by the creativity we see on the 3DArtistOnline.com gallery. Turtles in a war? Why not? The texturing on the main character is fantastic and the smoke effects in the background feel voluminous and full.*

B Asiza

» Jarrod Hasenjager

3DA username Jarrod Hasenjager

Jarrod says: "*Asiza*, spirit of the forest, is an attempt to capture a memorable moment depicting the beauty and magic of nature. It was created using Maya, Mudbox and V-Ray."

We say: *Jarrod has certainly achieved his goals of capturing the beauty of nature in this impressive scene. The discarded bottle is turned from junk into something picturesque, thanks to the soft focus, the gentle lighting and the delicately modelled butterfly.*

C Happy Birthday Nana

» Dan Roarty

3DA username droarty

Dan says: "This image was inspired by my Nana who passed away a few years ago. I used Maya for modelling, Mudbox for sculpting/texturing and V-Ray for rendering. I did the hair using Shave And A Haircut and Spec/Gloss maps were created using Knald."

We say: *When it comes to ultimate realism, Dan Roarty really knows his stuff. This image could easily pass for a photograph thanks to the insane level of detail – right down to the fuzz on the character's nose.*

D Aventurine

» Victoria Passariello

3DA username vitrux

Victoria says: "The little silver princess, *Aventurine*, is inspired by the *Machinarium* universe – a videogame by Amanita Design. I created her after playing the game. I kept the simple design of *Machinarium* but added a little Steampunk style."

We say: *If you've played* Machinarium, *then you'll certainly recognise the similarities here, but Victoria has also made this image her own thanks to some very imaginative design.*

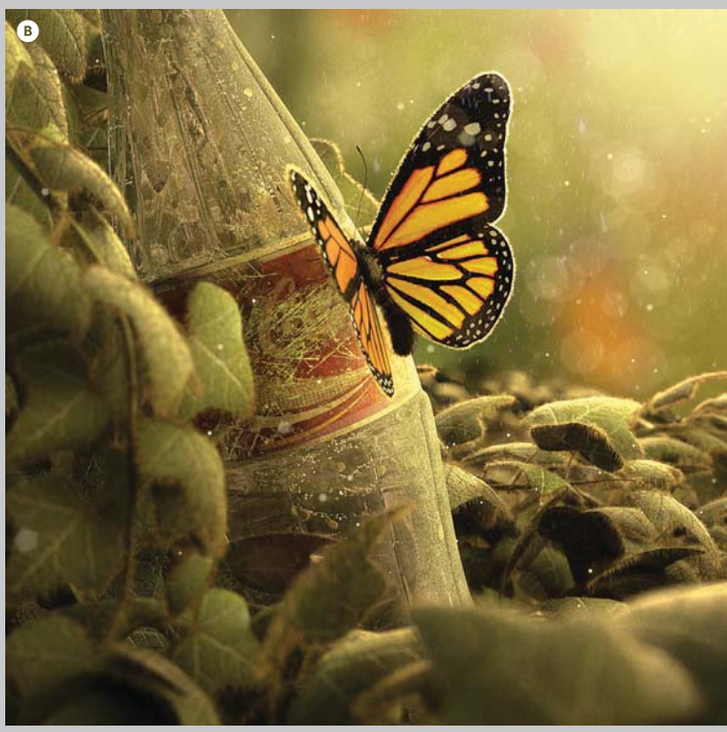


Image of the month

C

D

Studio 33

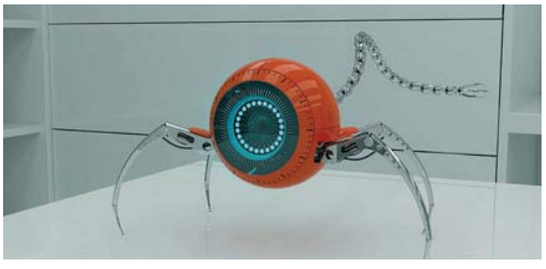
» **Mario Humberto Nogueira**
3DA username RIP3D
Mario says: "The main goal in creating this image was not to have an old loft/studio and simply furnish it. The goal was to have a new space constructed from scratch and give it an old loft appearance."
We say: *You know architectural visualisation has worked when you look at a space and feel you would like to live in it. The juxtaposition of the old and the new makes this studio feel like an inviting and open living space.*

A Little Slice

» **Paul McMahon**
3DA username Paul McMahon
Paul says: "A low-poly model created in CINEMA 4D, Corel Painter and Photoshop. I wanted to give the model an illustrated children's book style so I used very bright colours and hand-made textures created in Corel Painter."
We say: *Not all 3D work needs to be big and bombastic to make an impression. Paul has found great success recently in creating miniature worlds in CINEMA 4D. They're instantly compelling bite-sized works of art.*

Requiem

» **Ariane Sina Momeni**
3DA username Ariane Momeni
Ariane says: "I wanted to create a 3D scene that was emotional, old and overtaken by nature. I started to work on this piece while listening to Mozart's *Requiem*. I was very inspired by the music and ended up with this final result."
We say: *Majestic, compelling and grand, this piece of hidden architecture certainly embodies many of the characteristics of the music that inspired it.*



Decepticon

» **Nikola Djukic**
3DA username NPIX
Nikola says: "My first idea was simply to model a web camera, but I was inspired by the movie *Transformers*, so I turned my little web camera into a spy – a small, spider robot spy!"
We say: *We're always fond of interesting and unique characters and this little robot certainly qualifies. Incidental details – such as the hinge connecting the robot's leg to its body – instil a sense of realism.*

Have your say

Email, Tweet or get in touch with us on Facebook to share your thoughts, opinions and proudest projects

Top tweets

Get involved... @3DArtist

@StopMotionMan @3DArtist @lynetteclee All the best for the future Lynette! Your awesome mag opened my eyes to great 3D art!

@ReelineDesignP @3DArtist @lynetteclee all the best and thank you for inspiring those of us close to 50!

@derek_matthew Sexy date night with @maya2013 & @pixologic ZBrush! New @3DArtist mag too. Living large :P

@AimForSabir @GameTextures I got a bunch of your textures with the last issues of @3DArtist All good stuff!

You tell us

Digic Pictures has released its 2013 showreel. Check it out here: http://youtu.be/OASKtZLYNzA

Facebook.com/3DArtistMagazine

Isabel Rodrigues They sure know how to put together amazing trailers.

Steve Reeves Very awesome and emotive. Funny how you can feel attached to some of the characters you've played!

@3DArtist

@al29003 @3DArtist New Digic Pictures showreel? Holy mother of all consoles! My eyes are drooling :P

@Prabha3D So cool @3DArtist CG Student Awards! Amazing works!

digital-tutors

www.digital-tutors.com is a learning resource site boasting a library of 20,000 video-based CG lessons

THE AUTHORS OF THIS ISSUE'S STAR LETTER WINS A MONTH'S FREE SUBSCRIPTION TO DIGITAL-TUTORS WORTH $45

Star letter

Copyright can be a tricky area. If in doubt, make sure that anything you intend to use in a commercial capacity is completely your own work

Copyright blues

Hello, I'm writing to you because I'd like for you guys to publish something about copyright on 3D models, modified 3D models and models with trademark emblems.

I've been looking for information online and all I've gotten so far is from forums, but I'm not getting a sense of what's legal or what's accepted.

My copyright quest started because the company I work for asked me if they could sell some of the work I've completed for them. The only thing I know is that what I've created from scratch they can sell, but I've also done things from scratch but with logos. For example, I had to make a car with the Ford emblem, (the car was for a Ford project) but I don't know who owns that car; my company, the Ford company, or I? What if the emblem is removed, then who owns the model? Also, there are projects in which I've received assets that were high-poly and I had to remodel them low-poly. In this case who owns the low poly that I made from scratch, but is derived from a high-poly that was purchased from TurboSquid? This also brings the question of how much do I have to change a model to make it mine? Meaning if I purchase a model, re-texture it and modify the geometry, is it now my model?

Thanks for your help,

Christian, via email

Hi Christian, thanks for getting in touch! Copyright law can be quite a tricky subject, but as a general rule, any content that isn't yours will have a copyright attached to it.

If you intend to make money from your creations, the best bet is just to make sure the work is wholly yours and it's not a copy based on someone else's material. A general rule to follow is simply don't try to make money from anything that is not wholly a creation of your own. Hope this helps!

Hardware hardships

Hi there, I've been wondering if you get your guide prices provided to you from the manufacturers for your hardware reviews, and if so how reliable is this? So far every system that I have looked at comes out significantly more expensive than the prices listed in reviews (not just in your magazine, I would like to add). Are they giving you their top-spec machine to review and then giving you the price for their bottom spec one? Or is this simply to do with supply and demand having an effect on cost over the space of a couple of months? It seems pretty misleading to have a review of a system that does not correlate directly to its price, as surely the price contributes to the evaluation on the products' value for money and therefore its final score.

Matthew, via email

Hey Matthew, the prices quoted in the magazine are provided by the manufacturer at the time of writing and are double-checked for accuracy. However, hardware suppliers are within their rights to alter the price as and when they wish.

As ever, we will continue to bring you the most up-to-date and relevant information as we can at the time we go to print. Just be aware that between then and you reading the magazine, things can sometimes change!

Student work

My name is Shivam Chauhan, I'm in my first year of university and made this image during my second environment brief. I'm writing this email as I was hoping to get my work published. I really love how it's turned out and was hoping it would have a chance to be featured in one of your issues. Kind regards,

Shivam, via email

Here you go Shivam! You are now an internationally published artist. Enjoy! (Nice lighting work by the way).

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GAME GRAPHICS EVOLVED

David Scarborough takes a look at Sony's upcoming PlayStation 4 and the many challenges artists face when crafting the virtual worlds of the future

When Sony took to the world stage to reveal the PlayStation 4, the new console wasn't just judged on the litany of technical information or its innovative features, but quite simply on how the games looked. In this regard the presentation didn't disappoint. We were treated to vast futuristic worlds with shimmering vistas on a blockbuster scale; imaginative monsters compiled of rubble populating whimsical fantasy lands and locations; objects lifted straight from reality and replicated with startling parity in a vivid virtual world. This, as we were told, was a mere glimpse at the tremendous possibilities that a new generation of videogame technology was about to offer, not just gamers, but a new age of artists.

"The power of the hardware is phenomenal," enthuses Alex Perkins, technical art director at Evolution Studios – the developer behind the *MotorStorm* series and PlayStation 4's flagship racing game, *DriveClub*. "It's enabled us to produce cars that have ten-times more detail than any we were able to produce on PlayStation 3. The game worlds have broken all our records for the number of objects and levels of detail we've ever managed to achieve. Some of the object limits that were set by *MotorStorm: Apocalypse* were broken just by placing grass in the worlds, such is the density and level of detail involved."

Evolution Studios has played a big part in the development of the technology powering the PlayStation 4. Sony has been building the console since 2008 and sought to collaborate with Evolution in the UK (and other first-party Sony studios) to ensure that consumers would be delivered an unprecedented gaming experience. Not only this, it wanted to guarantee that the hardware would offer developers themselves an opportunity to drive videogame graphics and art beyond even today's lofty standards. For Perkins, it was clear early on that the PlayStation 4's unique technology would offer several key artistic advantages over Sony's current generation systems, mainly in terms of the architecture's flexibility.

"One of the drawbacks as an artist working on consoles is that they are static pieces of hardware," he says. "So while you get very good at certain techniques... you rarely get a chance to truly experiment beyond the first generation of games on a console's life span. With the vast improvements to the GPU on PlayStation 4 we can now access more of the raw power and can utilise it from a broader artistic standpoint. The basis of the new system will enable a wide range of on-going experiments and possible improvements throughout the console's life span as games, techniques and tools evolve within Sony."

In other words, this is just the beginning.

> THE MORE TECHNOLOGY ADVANCES, AND THE MORE OUR ART CAN RESEMBLE A PHOTOGRAPH OF REAL LIFE, THE CLOSER WE GET TO THE GRAPHICS IN FILM

Gavin Goulden, lead character artist, Irrational Games

INTERVIEWEES

Katon Callaway
Company: Senior staff character modeller, Sony Santa Monica
Location: US
Key projects: *God of War III, Spider-Man 3, Gamer*

Matt Charlesworth
Company: Artist, sculptor, Valve Corporation
Location: US
Key projects: *Portal 2, Left 4 Dead 2, Team Fortress 2*

Magdalena Dadela
Company: Senior character artist, Ubisoft Toronto
Location: Canada
Key projects: *Splinter Cell: Blacklist, Assassin's Creed III & Revelations*

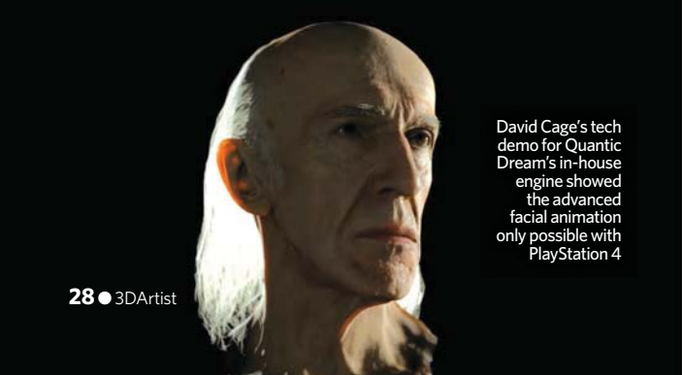
Gavin Goulden
Company: Lead character artist, Irrational Games
Location: US
Key projects: *BioShock Infinite, Dead Rising 2, Dragon Age: Origins*

Alex Perkins
Company: Technical art director, Evolution Studios
Location: UK
Key projects: *DriveClub, MotorStorm: Apocalypse, MotorStorm*

Game graphics evolved

> THE GAME WORLDS HAVE BROKEN ALL OUR RECORDS FOR THE NUMBER OF OBJECTS AND LEVELS OF DETAIL WE'VE EVER MANAGED TO ACHIEVE
>
> **Alex Perkins,** technical art director, Evolution Studios

"The view from inside the car is the most immersive way to experience the thrill of driving. In fact many members of the design team were sceptical about how much impact it would have," says Alex Perkins.



David Cage's tech demo for Quantic Dream's in-house engine showed the advanced facial animation only possible with PlayStation 4

THE PURSUIT OF REALISM

The Holy Grail for many software developers has been to create convincing photorealistic environments and textures. Evolution conceived the idea for *DriveClub* over a decade ago, but it's only now that the technology has progressed enough to enable the studio to craft its vision for a credible driving simulator. "Artists here at Evolution have been trying to work towards a filmic, more mature sensibility to games in everything we do for the last few years, not so much in content but in visual style and aesthetics," explains Perkins. "Keying our styles to get these sorts of influences across has required working in a more cinematic manner. Lighting and capturing scenes have had a greater concentration on photorealism, so we can approach the post and lens treatments we do in a similar workflow of focal depths, exposures, colour correction and grading."

However, not all developers agree that photorealism will be at the forefront of the next generation. Ubisoft Toronto's senior character artist, Magdalena Dadela, argues that the pursuit of photorealism hinders creativity. "I'm not sure it's really that important. Photorealism is only one way the art directors can decide to go. Technically it's a great achievement, but I don't think it makes the game any better and in some aspects it can even make it a bit disturbing. Also the problem with realism is that it often makes everything just look grey, brown, boring and too close to home. It's great to be able to make a skin shader that looks real, but if the character doesn't have a personality or a story arch, then the best of shaders won't make it an engaging character," she says.

However, Dadela, Perkins and other developers are in agreement that the attainment of photorealism will ultimately have wider benefits, by expanding the developers' toolsets, ultimately enabling a high cinematic standard across the board. "The more technology advances, and the more our art can resemble a photograph of real life, the closer we get to the graphics in film," Gavin Goulden, lead character artist at *BioShock Infinite* developer Irrational Games, suggests. "This means more immersion in the game world and possibly a stronger storytelling environment that a wider audience can relate to. Having more photorealistic graphics is also a solid benchmark that we can use to show what can be done. Mimicking real life is something we have tried to do for multiple generations and every time it gets closer. We all know what the real world looks like, so when we see something that can fool us the illusion becomes stronger."

Knack showcased how artists can use the PS4 technology to create more innovative fantasy worlds on a console platform

DEALING WITH HIGHER PRODUCTION VALUES

It seems that the advantages almost speak for themselves, but with new hardware also comes fresh technological hurdles that developers will have to overcome. Dadela predicts that production times will be severely affected. "It seems like the already long projects will become even longer," she says. "Better graphics capabilities mean more work to increase asset quality and possibly also more specialisations. If technology such as hair was to become part of the pipeline, I can also see a need for people just focusing on that aspect of character production.

"Cloth-simulation software like Marvelous Designer is also becoming integrated into the workflow – which for a lot of artists means learning new tools and managing additional skills. Texturing is also becoming more like film texturing than typical game work of the past. AO baking into the textures as well as lighting information in the map might become a thing of the past," she concludes.

Katon Callaway, character artist at Sony Santa Monica, agrees that the higher production values will raise new problems. "I think the triple-A game standards are getting crazy high," he states. "I think production will have to figure out how to keep up with the quality that the public expects, while trying to keep budgets under control. With games getting more expensive, they are also becoming more of a risk to make." However, Callaway doesn't expect a drastic shift in the methods behind how games are currently designed. "Software like 3ds Max and Maya will continue to be around, because they are the core to the development of games," he says. "We will continue to see new tools develop that improve our workflows. Just like the last generation, with introductions such as ZBrush, TopoGun, Mudbox and many more, we will continue to see software evolve for the better, helping workflows grow faster and freeing up the artist to concentrate on making great art."

Yet, there are a few areas he'd like to see improvements. When queried on what new tools he'd like to see, Callaway responded: "Anything that speeds up the retopology and UV process. These are the two things that for me are the least fun. I love the sculpting and texturing parts of my job, but I don't like creating low-poly assets."

Irrational Games' Gavin Goulden suggests that, much like the inclusion of normal mapping and sculpting introduced in the current era of PlayStation 3 and Xbox 360, the workflow will be laboured with several key additions. "I think the next generation of games is going to challenge our workflow more than anything," he says. "[This could entail] moving away from the typical painting of UV-mapped low-poly models: leaning more towards working on a high-poly source, as well as using more physically based shading methods for more-realistic materials.

"I can see any tool that enables artists to easily translate ideas from a high-poly source into a game asset becoming more popular," he continues. "[These will include] programs that make poly-painting easier or more intuitive, [as well as] programs that automatically add texture details based on masks for a physically based material setup (DDO)... Of course ZBrush [will become] more common and will form a direct link in the pipeline between what the artist is working on and what we see in-game."

"Even something as simple as having more triangles is great for us, as the illusion can easily be broken once you start crunching assets down," states Irrational Games' Gavin Goulden

MEDIA MOLECULE'S 3D SCULPTING VISION

One of the most impressive demonstrations of the PlayStation 4's capabilities to date came in the form of a short technical presentation from the UK-based developer of *LittleBigPlanet*, Media Molecule. Using PS Move (PlayStation 3's existing motion controller) in conjunction with the PlayStation 4, it promised a unique opportunity for budding 3D artists to utilise the technology to sketch, doodle and create 3D sculptures that come to life on the screen. While Media Molecule's Alex Evans only showcased a few of the internal designs that the studio has created, he said that it will make "3D sculpting easy for beginners and deep for advanced creators. Just hold your controller and click to assemble your dream".

Media Molecule's PlayStation 4 presentation revealed time-lapse footage of a 3D model being created, amended and iterated upon using PS Move

Game graphics evolved

Sony Santa Monica's Katon Callaway doesn't anticipate much change for artists working on PS4, just more power for improved rendering

LOOKING TO THE FUTURE

"I've always enjoyed trying to push the boundaries of character attachment and facial performance in the games I've worked on," explains Valve Corporation's Matt Charlesworth as he looks ahead to how his art could flourish with the new generation of console hardware. "This is something where I believe we can close the gap even further between the wooden, lifeless performances we grew up expecting from game characters and the believable, endearing performances delivered by Pixar, Weta and so on, while remaining focused on the benefits our medium affords us. Consoles are usually the minimum spec hardware that developers work to when making decisions regarding performance and this directly affects how ambitious we can be across all platforms. Having hardware as powerful as the PS4 as a baseline is just incredible and makes almost anything you can imagine viable."

For Evolution Studios, the realm of the impossible is quickly becoming attainable through the development of *DriveClub*. Using a whole raft of graphics features that weren't available to PlayStation 3 developers – such as texture arrays, hardware instancing, volume textures, tessellation and improved texture compression – the studio was able to create a driving simulator miles ahead of the competition. "*DriveClub* is the first racing game to truly attempt what we're affectionately calling 'First Person Racing'," reveals Perkins. "This essentially points towards the levels of detail we're adding to give authenticity to the experience that was completely impossible prior to PlayStation 4. The surface descriptions, as well as the real-time dynamic lighting solutions incorporated to add to this detail, backs up and adds to the coherency and solidity of everything on-screen."

Indeed, *DriveClub* is a game that lives both in the micro and macro levels of detail, ever in pursuit of emulating the immersive and transcendent visuals usually reserved for television and film. "Driving at 200mph, people usually think that you would miss the micro detail. However, it subconsciously adds details to the lighting and a sense of speed you will notice when it's not there," says Perkins. "The look and feel of the vistas, from the nearest pebble to the largest mountain – with a super-high-detail sports car parked in front – look like they're straight from the most expensive of car adverts. This feeds into every approach and process we make for *DriveClub*."

However, talking about creating a game is one thing and playing it is quite another. With unparalleled levels of detail and an immersive driving experience unlike anything available today, even Evolution struggles to succinctly summarise the blend of thrilling artistry within the game. "It's a difficult thing to try to sell in words; it really needs to be experienced to be appreciated," concludes Perkins. "Once you experience the sophisticated combination of the way the camera moves, the graphical animations of the driver and the cars as they experience G-forces, as well as the stunning level of detail inside and outside the cars, you'll understand why we're so excited about it."

> "I THINK PRODUCTION WILL HAVE TO FIGURE OUT HOW TO KEEP UP WITH THE QUALITY THAT THE PUBLIC EXPECTS, WHILE TRYING TO KEEP BUDGETS UNDER CONTROL"
>
> **Katon Callaway,** senior staff character modeller, Sony Santa Monica

The Media Molecule team demonstrating an innovative combination of the PS Move and PlayStation 4

CREATING DRIVECLUB

Evolution Studios' technical art director, Alex Perkins, discusses the tools that enabled the studio to realise its decade-long vision to create a realistic world in *DriveClub*.

"Maya is the bedrock of everything we do as artists here at Evolution. It's the basis of not only our modelling but also a great deal of our texture-generation and procedural techniques," he explains. "We add in extra tools to do specific tasks or write plug-ins that emulate processes we see in other packages or level-editors. As we go forward with generating assets for *DriveClub,* we're finding that more and more we're approaching our software and tools in a very similar fashion to films. We've written bespoke animation tools, shaders, plug-ins and developed unique lighting techniques specifically for our own engine. In some cases there are specific elements for individual surface types to ensure the most accurate representation of materials, from concrete to car paint, all generated and balanced to match our material capture methods."

However, Perkins does feel there's room to improve. "We quite often implement models and textures in a very similar way to the heavily micro-detailed production ethos of film. Finding a coherent way to expand this to a macro level is currently... a manual process. Getting this to be more automated would be the biggest thing to make our current job easier," he concludes.

Evolution Studios found that it implemented models and textures in the same way as VFX artists working on micro-detailed film effects

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> Since 2002 Blender's progress has been defined by a bottom-up approach. Things just don't happen if they don't get done. This means you need to work with what's being contributed and what people feel is important to work on first
>
> **TON ROOSENDAAL, Blender founder**

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THE RISE OF BLENDER

If pen and paper are (almost) free for the 2D artist, then 3D modelling and animation software should be free for the 3D artist. Thank goodness for Blender

Rewind ten years and Blender was still a nascent software. It wasn't quite fully-featured enough, certainly not if you wanted to use it to create something truly top-of-the-line. Yet today this couldn't be further from the truth. Professionals are now using Blender to achieve increasingly impressive results, the tool having grown in some very interesting directions.

Amazingly, Blender remains free, and completely open source. You can take the software and mould it, scripting to your heart's content, then work with the development team to suggest where the it should go next. The idea is that you're not merely an end-user or even the average customer, you're a fully-fledged member of the Blender community.

"For commercial software, development by definition goes top to bottom," explains the brains behind Blender, Ton Roosendaal. "[A commercial] company's vision and its targeted audience defines what it makes. Significant amounts of effort go into the eye candy, the evident whistles and bells, as well as lots of advertisement, PR and communication.

"Since 2002 Blender's progress has been defined by a bottom-up approach. Things just don't happen if they don't get done. What this means is you need to work with what's being contributed by the community and what people feel is important to work on first."

People consider different things to be more important, of course, meaning Blender is now extremely robust in a number of disciplines; from modelling to animation, VFX, and the texturing and rendering required for photoreal results.

For Ben Simonds, director of Gecko Animation (**www.geckoanimation.com**), Blender is simply "a great tool for small studios and freelancers. It's really flexible – you aren't locked into working just on animation or modelling. You can switch back and forth between different tasks very easily, which is really helpful when you're a generalist".

It's a sentiment that Roosendaal would be happy with, given that Blender's main goal is "to provide individual artists and small teams with a complete, free and open-source 3D-creation pipeline". So, turn the page to find out just what Blender can do for you.

The rise of Blender

'Elephants Dream' is now seven years old, but still looks impressive

BLENDER: A POTTED GUIDE

1995 Ton Roosendaal rewrites NeoGeo's in-house 3D software, turning it into Blender

2002 Blender is released as an open-source software

2005 Blender 2.40 features a massive overhaul to the animation possibilities, particularly in the area of rigging

2006 'Elephants Dream' is released as the first Blender film

2008 Blender 2.46 sees the addition of hair and fur and a particle system rewrite. All thanks to...

2008 ...'Big Buck Bunny'. The second project from the Blender Institute presents a warm and fluffy affair

2008 Blender releases an open source videogame, *YoFrankie!*

2009 A major UI overhaul, and Blender 2.5, commences

2010 An emotional story about a girl and her dragon, 'Sintel', is released, proving that Blender can handle props, backgrounds and humans in impressive detail

2012 'Tears of Steel' is the first live-action film from the Blender stable, proving it can handle VFX and meaty CG robotics

2012 Blender 2.64 is the first to boast the complete VFX pipeline that 'Tears of Steel' had developed

2012 The Blender Network is launched

2013 Blender 2.66a is launched with long-awaited features such as rigid-body physics simulations, dynamic topology-sculpting and matcap display

'Elephants Dream' is where it all began, but what will the next Blender movie look like? The possibilities are now limitless.

The history of Blender

Way back in 1988, Ton Roosendaal co-founded a Dutch animation studio called NeoGeo. Roosendaal was responsible for internal software-development, but when he decided the tech they currently had in-house wasn't up to scratch, he rewrote it. That was 1995 and Blender was born.

By 1998, Roosendaal realised he needed to devote more time to this new venture, so he founded another company called Not a Number (NaN). Unfortunately this enterprise didn't survive the economic climate, so in 2002 Roosendaal set up the non-profit Blender Foundation. In what was called the Free Blender campaign, Roosendaal raised €100,000 in just seven weeks and paid this to the NaN investors as a one-off fee that enabled him to make Blender an open-source software.

"Compared to how Blender progressed in the closed days, going open source was definitely the best thing that could have ever happened!" says Roosendaal. "Not only because of the huge potential of contributors, but because it gave a distinct focus for what was being worked on.

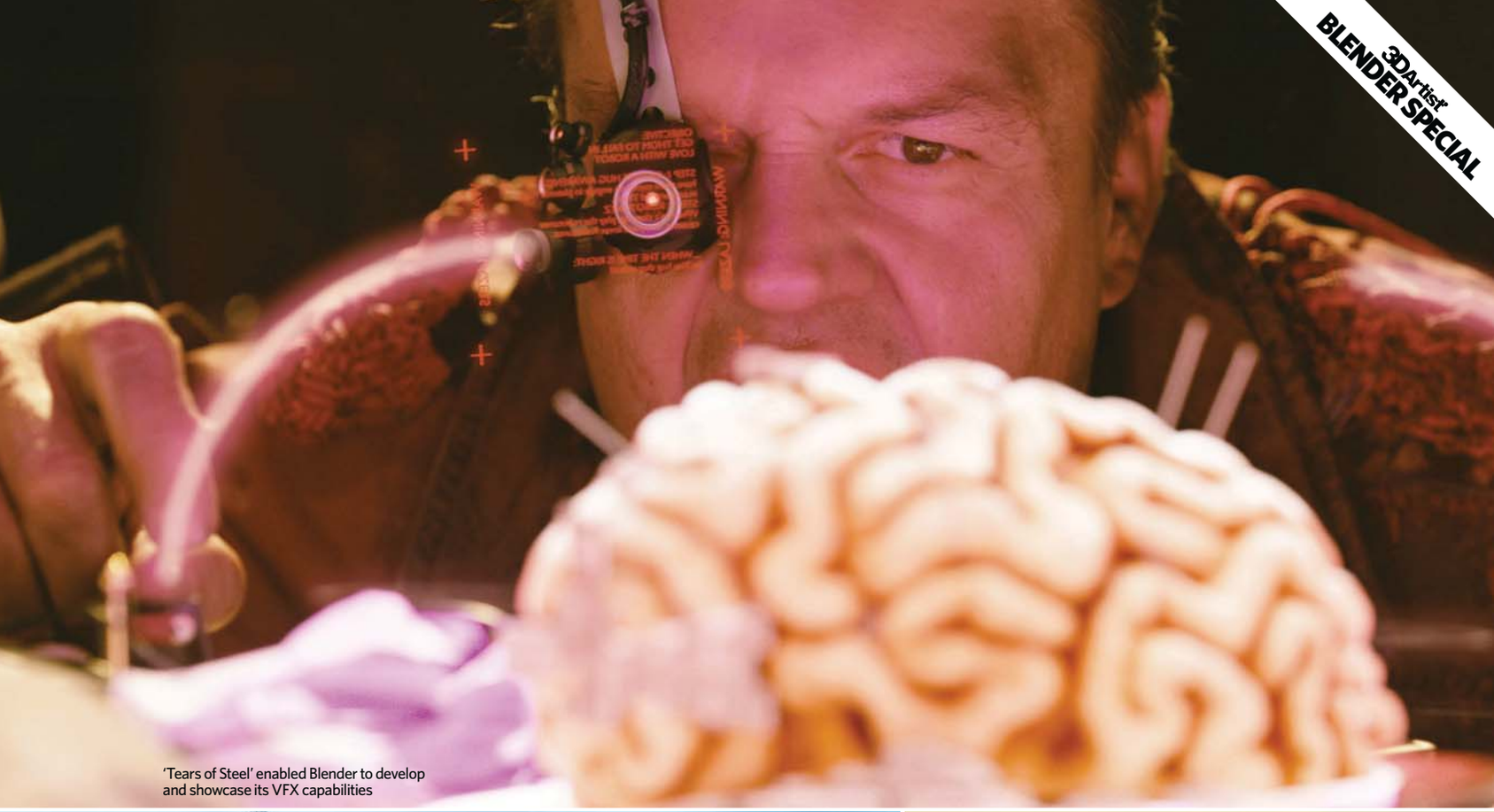
"A good example was Blender's modelling tools," adds Roosendaal. "This was one of the first bigger projects tackled after we became open source. Not because I decided so, but because people were motivated to work on it."

People were motivated to work on Roosendaal's next idea, too. Project Orange was the code name for the first Blender film, eventually titled 'Elephants Dream'. Marking out a new method of filmmaking, not only was it made purely with open-source tools, but it was released under the Creative Commons licence, which means it's as freely available as the software. It was a big success, both in PR terms, artistic terms and in the way it pushed the software onwards. As such, Roosendaal set up the Blender Institute in 2007. This became a base for the following projects: 'Big Buck Bunny', the game *YoFrankie!*, 'Sintel' and 'Tears of Steel'.

"Coupling development with [practical] cases always has been Blender's strength," says Roosendaal. "Not to forget, making CG is my real passion, the software is just the means to achieve that. This is how 'Elephants Dream' started, which at first was targeted as a showcase and development-acceleration project... By going open entirely (with all the asset files being freely available), it made the movies become an invaluable asset for everyone involved – for its users and developers but also for the industry in general."

Updates, patches and new features of all shapes and sizes have always come thick and fast with Blender, but one of the biggest overhauls was Blender 2.5. This was a major rearrangement of the UI, tool definitions, data access system, event handling and animation system. After all, Blender was originally developed in the mid-90s and a lot had changed in terms of interface and input since then.

However, while frequent updates are a sign of how alive Blender is, they can sometimes be a little bewildering. "Blender's strength is the speed at which it's improving," says CG generalist Mike Pan (**www.mikepan.com**). "However, it's evolving so fast that sometimes it's hard to



'Tears of Steel' enabled Blender to develop and showcase its VFX capabilities

"[In] a project where experimentation and over-the-top results were encouraged... the whole point was to push the boundaries of what our tools could do," says Ian Hubert on 'Tears of Steel'

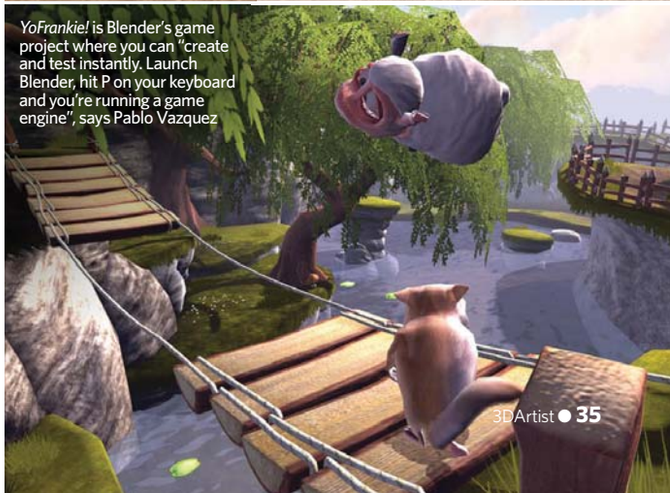
keep track of what's new." And there's the rub. As powerful as Blender is, people will only embrace that power if they know about it. Getting involved in the Blender community – either by posting on message boards, attending the Blender Conference, writing scripts or editing documentation for the next release – is the best way. Like most things, you get out what you put in.

This is why the latest addition to the house of Blender is the Blender Network (**www.blendernetwork.org**). Launched last year at SIGGRAPH, this project will "help studios, artists and developers to collaborate", according to Sebastian König, one of the 'ToS' team. "It's a website where people can search for Blender artists, developers or studios. You can post your profile and portfolio to present yourself and your skills, connect to one another and find job opportunities. As a studio you can find artists to work for you." Simply put, it's an invaluable resource for everyone.

Roosendaal knows that Blender needs to keep on upping its game, as he explains: "The Blender Network initiative will be as important for Blender's future as the open movies and the videogame we made over the past five years... To keep growing and investing in quality, we need to build a community of professionals based on their own requirements."

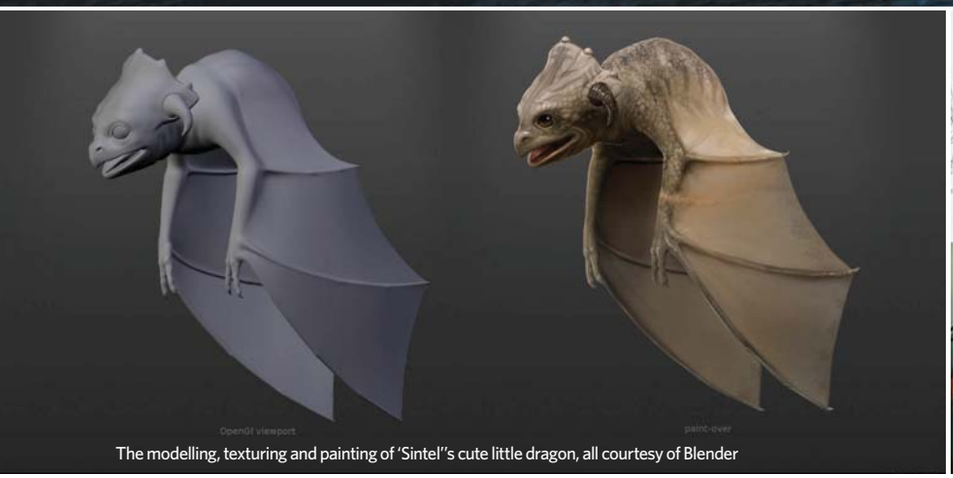
> "Blender's strength is the speed at which it's improving... However, it's evolving so fast that sometimes it's hard to keep track of what's new" **MIKE PAN, CG generalist**

Pablo Vazquez's latest film is called 'Caminandes', featuring a llama named Koro and a dwarf armadillo called Pichin

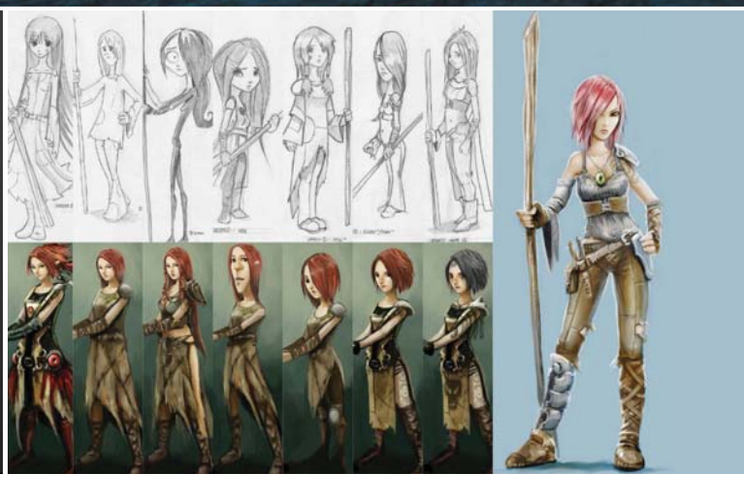


YoFrankie! is Blender's game project where you can "create and test instantly. Launch Blender, hit P on your keyboard and you're running a game engine", says Pablo Vazquez

The rise of Blender



The modelling, texturing and painting of 'Sintel''s cute little dragon, all courtesy of Blender



Adventures in animation

"'Elephants Dream' was a completely blank slate..." explains art director Andy Goralczyk (**www.artificial3d.com**), who would also go on to work on 'Big Buck Bunny' and 'Tears of Steel'. "Ton Roosendaal's idea was to create a short animated movie with a small team to re-evaluate Blender as a production tool and adapt it to the current needs of its users. He had previously shared his ideas with Bassam Kurdali and I on a few occasions. Eventually he asked us both to become members of the core team who would ultimately select the other artists and start developing the concept."

This collaborative process is part of what has made the Blender open movies so unique. Colin Levy, director of 'Sintel', adds: "The point of these projects wasn't to make money, it was to get a bunch of Blenderheads together to make something cool and to push the software forward. The open movie projects serve to put Blender through its paces in a production environment. They also spearhead development targets for Blender tools and features and serve as a promotional tool for Blender... The hope is that a small studio in Argentina, for example, might come across 'Sintel' and say: 'Wow, look what can be done with open-source software. Let's give Blender a shot.'"

So far each project has boasted a distinct style and concept, as well as a particular area of work to focus on. Goralczyk elaborates: "It was so much fun to wake up every day, work together, learn and live the project (since we were more or less sharing apartments). There was never a point where it got boring or tedious. I felt we all had a chance to grow as artists by completing these monumental tasks."

'Big Buck Bunny' (or Project Peach, as all the Blender movie's have fruit code names) has the impressive feel of a feature-length, and much more expensive, animated movie

'Sintel' made big waves beyond the Blender community. Not only did it look great, but it told a compelling story too

> "The open movie projects serve to put Blender through its paces in a production environment, to spearhead development targets for Blender's tools and features"
>
> **COLIN LEVY, director, 'Sintel'**

COLIN LEVY AND CONCEPT ARTIST DAVID REVOY TALK US THROUGH THEIR WORK ON FANTASY FILM 'SINTEL'

What was the concepting process for 'Sintel' like?
David Revoy: My general memories are mostly about a friendly, collaborative environment. I worked full-time in Amsterdam from August to November 2009 on concept art, while Colin worked with Esther Wouda (screenplay writer). Spending a lot of time trying to stick to the story-writing process also caused a lot of rejected artworks (around 60 drawings), which is normal in each production, but can be discouraging when working alone...

How did you approach the art direction?
DR: 'Sintel' was my first project as an art director. I tried to learn a lot from the other artists in the team. I wanted to understand what they wanted to do in the pre-production and be as flexible as I possibly could. I studied many styles for the main character, tried to consider the opinion of everyone around and held meetings about it with presentations. All the input of the team was precious.

What appealed to you about getting involved in 'Sintel'?
Colin Levy: I've been a Blender fan and user for years. When I became interested in 3D animation in high school I spent hours tinkering around with Blender and making little movies. I watched from the sidelines as 'Elephants Dream' and 'Big Buck Bunny' came together, so getting the chance to work on the third Blender open movie project – as the director – was really a dream come true.

What were the major technical challenges?
CL: At the time 'Sintel' was going into production, Blender 2.5 was in Alpha. As much as I loved Blender 2.4x it looked like it was from the 80s. It was hacky and lacked flexibility, so I was excited to dive into 2.5 and experience the new vision for what Blender should be. It was brand-spanking-new; a complete overhaul of Blender. At first, it was buggy as hell; the animation system would corrupt work and it would crash ten times a day. But after the kinks were worked out we were able to just blast through our work.

DIRECTOR SACHA GOEDEGEBURE AND ANIMATOR NATHAN VEGDAHL TALK 'BIG BUCK BUNNY'

What was the intention with 'Big Buck Bunny'?
Sacha Goedegebure: When Project Peach was announced, we knew the main focus for Blender's development would be on creating hair, fur and grass, simply because Blender's hair at that time was poor. After 'Elephants Dream', Ton also wanted something more mainstream... 'funny and furry', as Ton would say.

Which elements of the project were most challenging?
SG: There was one particular shot, where the fat rabbit hides behind a tree and goes through several emotions in a few seconds. Nothing worked. However, after a few months of struggling with this shot, Jan Morgenstern delivered the music for the scene. Instead of using animation as reference for the music, I applied the flow of the music to guide the animation and suddenly it worked perfectly.

What impressed you about Blender at the time?
Nathan Vegdahl: One of my favourite things about Blender, both then and now from an animation and rigging perspective, is its fantastic support for quaternion rotations. Most other 3D packages sort of pretend that quaternions are Eulers when the user is interacting with them, I guess because they think that makes them more comprehensible. But it actually mucks things up pretty badly. Blender just gives them to you straight, which gives you the opportunity to understand them properly.

Was there anything you found particularly challenging?
NV: Having an animation director... I'd never worked under a director before. Having instructors in school is really different, because although they give you critiques and help improve your animation, the animations you're doing are still your own and it's your vision. When you have a director, not only is the quality of the animation up for critique, but also how closely the animation matches their vision for the shot.

VFX in action

After three animated shorts, the time had come for both Blender and the next Blender open movie (Project Mango) to tackle live-action and VFX. Writer and director Ian Hubert (**www.robotsoup.com**) recalls that Roosendaal immediately "recognised the incontrovertible truth: if you're going to make a VFX film, you really ought to make it about robots, explosions and other awesome things. He got in touch with me back in 2010 and we started brainstorming."

Sebastian König, one of the artists on the project, explains that the goal "was not only to produce a fun sci-fi short film, but also to improve and develop the tools to create visual effects in Blender, such as tracking, rendering and compositing.

"To a certain extent it was always possible to use [Blender] as a tool to create visual effects," König continues. "For example, we did have a node-based compositor for quite a while, as well as a video sequence editor, support for OpenEXR images, particle and smoke simulations and lots more. Especially in combination with other tools such as SynthEyes for matchmoving or After Effects for keying, masking and compositing, you could do a lot with it... However, it wasn't really possible to produce a complete visual effects project."

So, while the creative team prepared the storyboards and an animatic – as well as beginning to model and texture the robots, props and environments – the development team were hard at work giving Blender the new features it needed. As Hubert points out, it's an odd but exciting position to be in, when "many of the pipeline tools we needed to pull off 'Tears of Steel' didn't even exist when we started."

The rise of Blender

With a little help from his Blender friends, Scott Hill used Cycles to speed up his rendering process

FEEDBACK: WHAT MAKES BLENDER SPECIAL

While most software manufacturers are distant and deal only with their larger clients, the Blender community reaches out to anyone and everyone

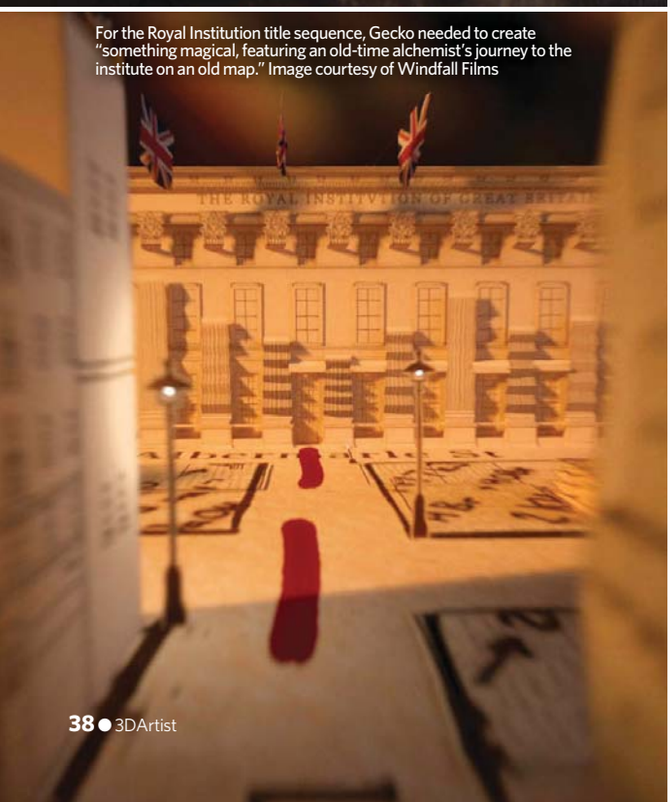
Milwaukee-based Blender user Scott Hill (**www.lightboxfx.com**) recently did some work for Matrix Fitness Equipment through Aurum Design. His task was to create animations of the kit that would be intercut with live studio footage and he needed it to match perfectly. He got the look he wanted, but then he encountered some problems.

"The renders were running far too long and the project timeline was tight," Hill says. He tried RenderWeb and **www.renderfarm.fi**, but nothing was going to work. "Right at that time a pre-release of Blender with Cycles came out, so I converted the project to Cycles, rebuilding the shaders in the Node Editor." With all this help, it looked like he would hit his deadline.

However, then he had a problem with bad Alphas. "I hit the Blender Developer message board with questions and the problem was confirmed. I got around it by rendering un-lit master passes of the machine parts themselves over stark white backgrounds... [I then] reversed those images out, converted to black and white and used them as Alphas," he says. Cycles, GPU rendering and the Blender community had saved the day.

In this spot by Gecko and 3angrymen, Simonds "built a sort of two-and-a-half-D rig for the CGI skin." Image courtesy of 3angrymen Productions

Tracking, compositing and photoreal rendering were three of the key challenges for the artists working on 'Tears of Steel'



For the Royal Institution title sequence, Gecko needed to create "something magical, featuring an old-time alchemist's journey to the institute on an old map." Image courtesy of Windfall Films

The movie was shot over four days in May 2012, giving the team three months to finish 134 shots. "Many of them had greenscreen, camera and object tracks, some full-CG shots and some with up to nine robots that had to be animated," says König. "It was quite a bit of work for a rather small team of seven artists... We were lucky to finish just in time for the premiere in Amsterdam at the end of August 2012."

Although the new tracking, photoreal rendering and compositing features are impressive, the real bonus for Blender is having so many different features packed into one tool and available in one place. König explains: "Even though Blender has a really strong tracker that enables you to track and solve even the most difficult shots, there are apps out there that are more feature-complete and have better and more-specialised tools for motion-tracking than Blender. But again having these tools right there, without the need for importing or exporting, makes it a much more interesting tracking tool for Blender users than PFTrack or PFhoe, for example."

With "arms to replace, plasma guns to insert and heads to be tracked", there was a lot of tracking required for 'ToS', continues König. "It can track even the fuzziest and blurriest features, such as hair or skin and can easily handle focal shifts and motion blur. So even if it's not as automatic as other trackers, it's very fast and accurate. It has a built-in Refinement tool that can figure out focal length and lens distortion. The Distortion values can be used to generate on-the-fly undistorted images for the viewport camera and are automatically available in the compositor... Here you can use them for either a distortion- or undistortion-based lens workflow."

The team also found compositing to be a crucial factor in bringing the live-action and

Photoreal rendering was an important part of the Tears of Steel project

> "Blender can only really grow if people use it in production... [They can] report bugs or problems, then find ways to improve the tools, as well as discover new solutions and workflows"
>
> **SEBASTIAN KÖNIG, Blender freelancer**

3D robots together. König explains that "multilayered rotomasks can be edited and animated in the Movie Clip Editor, where you can also use tracking markers to automatically drive the masks. Each mask element can have a Feather Control curve that can be animated independently to mask away out-of-focus areas, motion blur, or hair. Since 'Tears of Steel' is a VFX movie that was mainly shot against greenscreen, having decent keying and rotoscoping tools in Blender was indispensable".

With all these new tools in the box, isn't it time Blender took on Hollywood? Roosendaal says he has "an ambivalent relationship with this Hollywood topic... On the one hand it's of course the coolest place on earth to be a CG artist or developer, but on the other hand it's just a happy few, a fraction of a percentage of people who work in the CG industry. Instead of getting Blender in Hollywood, I would much rather get Hollywood in Blender. This means that we focus more on working for all the other people who love to make 3D and provide them with a similar in-house experience, with an open-source creation pipeline".

Hubert reveals that he's learnt a lot from his Blender experience: "Working hand-in-hand with the developers as they worked on new features was definitely an interesting experience. Being able to give immediate feedback on new tools, then see instant changes from that feedback, really drove home that we weren't just making a fun film, we were also making a tool that thousands of people would use."

Of course, you don't have to be working on one of the official Blender projects to help the software develop, you just have to be an active member of the community at large. This collaborative approach is fundamental to it's very existence. "Blender can only really grow if people use it in production," says König. "[They can] report bugs or problems, then find ways to improve the tools, as well as discover new solutions and workflows. Some occasional financial support for the Blender Foundation probably wouldn't hurt either."

BLENDER BANGS FOR YOUR BUCK

London studio Gecko (www.geckoanimation.com) has been doing a lot of its recent VFX work in Blender. Director Ben Simonds (**www.bensimonds.com**) explains it's "definitely our workhorse, we do about 90 per cent of our work in it."

Gecko was tasked with completing some VFX work for *Red Dwarf X*. "The producers had some trouble with some of the model shots they originally planned to use," explains Simonds. "We said we could make some elements in CG to combine with the live-action footage. We had to make sure we matched *Red Dwarf*'s iconic models, so we worked hard to create CG counterparts that had the right feel..."

"We also used Blender's camera-tracking and compositing tools for one of the fx shots, which featured the annihilator ships doing a run over Red Dwarf and firing missiles at it. We tracked the shot and then reconstructed some of the geometry for Red Dwarf to match the footage so we could add in some lighting from the explosions."

For more Blender tips you can read our review of Simonds' book, *Blender Master Class*, on page 99 or follow his step-by-step tutorial for creating a fighter jet solely in Blender on page 50.

Image courtesy of Grant Naylor Productions

Simonds believes that Blender is "a really fast tool to model in. The keyboard shortcuts make it possible to really get into the zone when you're modelling, rather than having to muck around with lots of sub-menus just to complete a bevel"

The rise of Blender

"Photorealism is obviously a goal," says Bruno Borgiani. "But I am far from obtaining truly photorealistic works. I've always been more interested in reproducing reality (or plausible elements) than creating abstract or stylised works, even when I draw by hand"

Back to reality

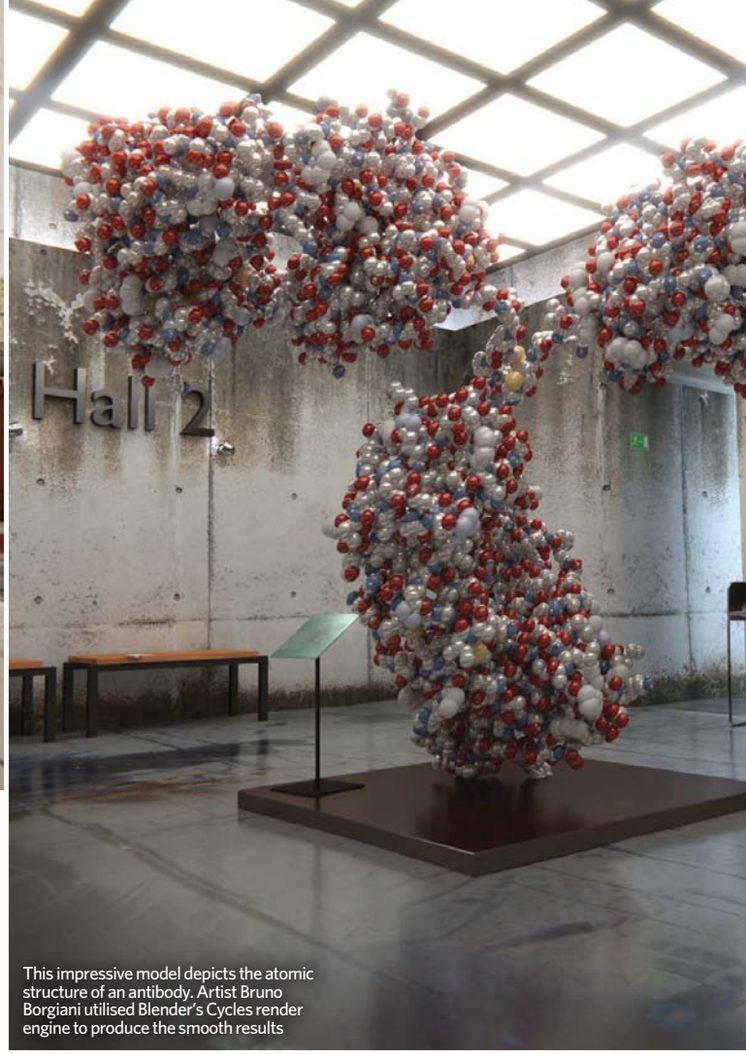
While Blender's ability to complete rigging, animation and VFX tasks from the same interface is what makes it loved by many, there's no reason why it can't be used for straightforward modelling purposes. Freelance Blender artist Bruno Borgiani (**www.renderingedisegno.blogspot.co.uk**) says that Blender "offers the perfect solution for people like me who are strangers in the field of CG (I'm a bio-medical researcher!) but want to learn".

Luckily this learning can be more beautiful and enjoyable than ever before. König explains that "another important development target for Project Mango was to get photorealistic rendering in Blender. While the old Scanline-based Blender render engine was also capable of some raytracing, and in the right hands it could achieve stunning results, for 'Tears of Steel' we needed [to develop a] full Global Illumination renderer".

Brecht van Lommel, one of the core developers of Blender, created Cycles, a full Global Illumination pathtracer with a flexible node-based shader system. "It supports a very fine-tuned control of light paths and bounces," notes König. "It can render in multiple layers, separate render passes and most importantly it features GPU-based live viewport-rendering, which makes it possible to get photorealistic results with immediate feedback. During the project a lot of tweaks and improvements were made and it's still being developed and improved. In the last few months, hair and fur rendering has been implemented, as well as better non-progressive rendering, subsurface scattering and Open Shading Language support, so you can write your own shaders."

Mike Pan also strives for a high level of photorealism. "I have to admit, I don't see myself as an extraordinarily creative type," he reveals. "I feel I imitate better than I can create. This is why a lot of my [portfolio consists of] photorealistic scenes. It's also a great way to push Blender to see if it can accomplish exactly what the artist wants. As a photographer, my personal goal is to make my photos look as surreal as possible and my CG work to be as believable as possible." For Daniel Kreuter (**www.danielkreuter.wordpress.com**), photorealism is "not my only goal but it's definitely one of them. Actually, what I want to do is not really to copy reality. Rather, I'd like to come up with things more beautiful or exciting than reality and make it look as lifelike as possible". Jonathan Lampel (**www.blenderhd.wordpress.com**) agrees, saying that his "main goal is not necessarily photorealism, but I always strive for believability".

Of course, whatever look you want to achieve, the software can do it for you. Pan notes that "photorealism is more about lighting than materials or modelling. Learning photography is a very good way to develop an eye for lighting and composition". If you really want to push yourself, photoreal people and especially faces are the thing to tackle, as Kreuter has discovered. For his image *I'll Kill You* he "modelled the entire head from the front and side view reference", but still found lots of problems when it came to the rendering: "I had lots of trouble making the eyes look realistic. The shadows didn't look too good [and neither did the] materials and details. I played around with it a lot and figured out that there was a very simple thing that could solve almost everything. I added a simple gradient over the eye area, basically a black plane on the top and transparent at the bottom, then put this in front of the eyes."



This impressive model depicts the atomic structure of an antibody. Artist Bruno Borgiani utilised Blender's Cycles render engine to produce the smooth results

KEEPING IT REAL

Jonathan Lampel has only been using Blender since version 2.5, but his images are already earning him a lot of praise online.

"My *Cabin in the Woods* scene is probably the best render I've made so far," he says. "I have always loved nature and I wanted to see if I was able to create something that could look real. I started out looking for references of cabins, cottages and forest clearings. I modelled pretty much everything right off the bat (except for the cabin itself, which I created later on). The hardest part was tweaking the materials and compositing to make the scene look natural."

"[Another big challenge] I faced in making this image was my old computer," says Lampel. "It was slow and never meant for real 3D work. This combined with the fact that Blender's viewport isn't all that great at high poly counts meant the project could have been frustrating. Thankfully, Blender has a great layering system, so I could view only what I needed to work on at a time."

Lampel says this image "didn't start out very realistic at all, but with some good old hard work and awesome critiques by the Blender community, I was able to improve it drastically"

I'll Kill You is the title of this astonishingly lifelike image by Daniel Kreuter

Being a bio-medical researcher by day obviously helped Bruno Borgiani get this image of a lab accurate. The gloves are particularly impressive

Jonathan Lampel has given himself a blizzard of challenges – textures, lighting, perspective – in this Christmassy image

Blender into the future

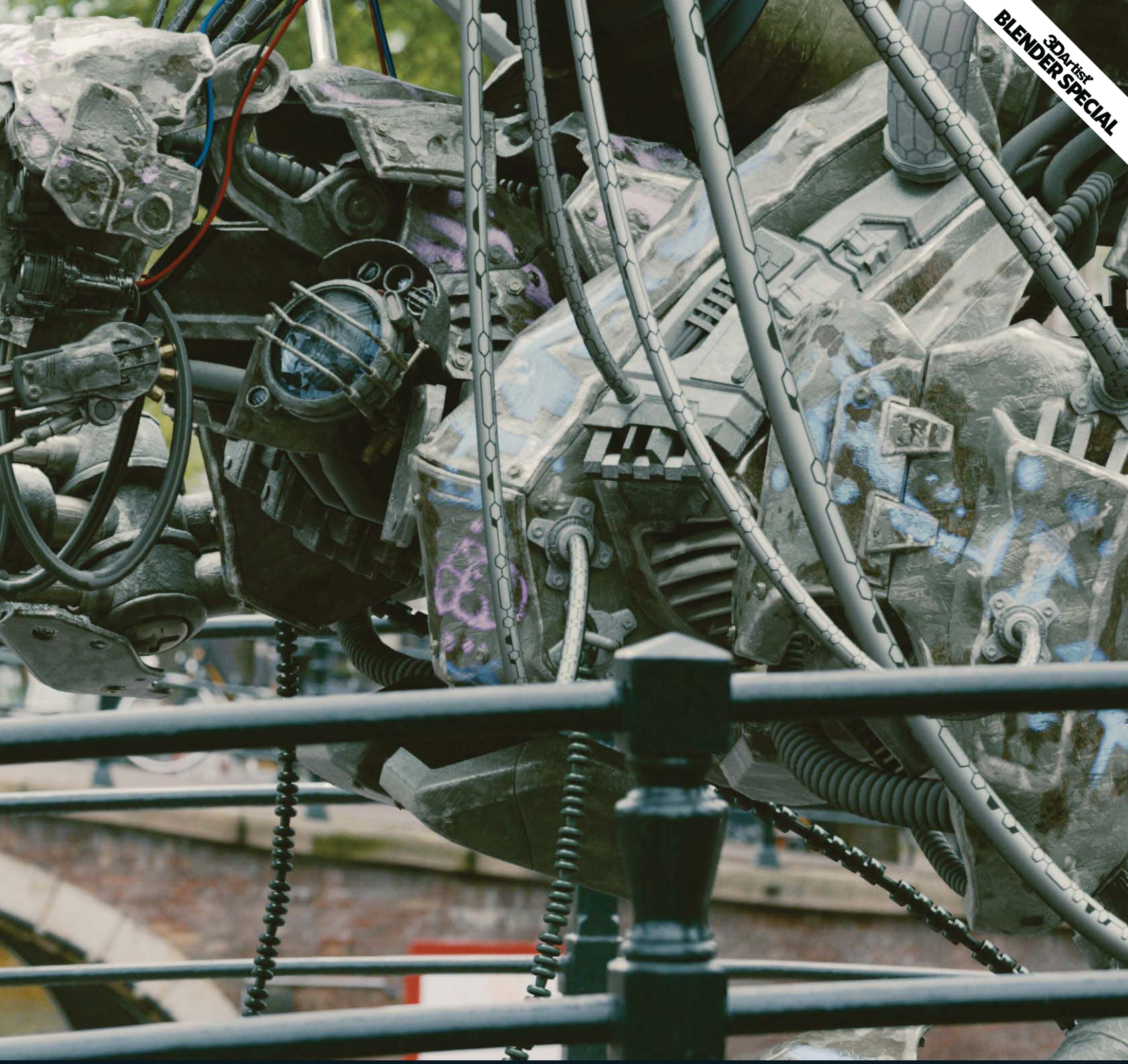
In the 11 years since Blender went open source, it's gone from strength to strength both in features and reputation. While Roosendaal might be ambivalent about whether or not Hollywood takes it up, the truth is that there's little doubt that it will be, or even already is. This is compounded by the fact that Blender can be utilised and altered to flexibly meet any demands, making it an invaluable resource. Ian Hubert certainly agrees: "There are already several studios that make good use of Blender. While major FX houses already have their entire pipeline set up around different software and tools they developed in-house, I suspect that a well-rounded free 3D tool could be an appealing package for smaller start-up companies getting on their feet. The thing about Blender is that it's always evolving and becoming more powerful, so I could very easily foresee a future where companies choose to go with Blender, not just because it's cheap or open source, but because it's the best tool for the job."

The real question is, what's next for Blender? The answer lies in what Roosendaal calls the Dependency Graph project. "It's a collection of features related to having animation systems update perfectly; integrated well with simulation systems; being fully reusable; linkable with local overrides; ready for massive duplication and last but not least it will be fully threadbare," he explains. "Just like the Blender 2.5 project – which was a myth for something like three to four years – the DepsGraph is also getting a mythical status here. We've survived such huge projects before, so I'm eager to get this mythical quest started very soon..."

> "Blender is always evolving and becoming more powerful, so I could very easily foresee a future where companies choose to go with Blender, not just because it's cheap or open source, but because it's the best tool for the job"
>
> **IAN HUBERT, director, 'Tears of Steel'**

50 TOP BLENDER VFX TIPS

How you can use this open-source software to produce industry-standard results



Whether you've been using Blender for years, or just suddenly feel inspired to pick it up today, there are millions of tricks and tweaks to the 3D process that will improve both your workflow and the finished result.

That's why we've gathered together a group of Blender VFX masters to reveal their tips on everything from modelling to matchmoving. As you'll find, there's always a way to do something a little better, easier, or simply quicker. So, read on as our roster of experts discuss how they produce 3D effects – the Blender way.

JEREMY DAVIDSON
Website: www.jezdavo.blogspot.com.au
Area of expertise: Environment art

ROB TUYTEL
Website: www.blenderpedia.com
Area of expertise: Environment art

KJARTAN TYSDAL
Website: www.kjartantysdal.com
Area of expertise: Modelling, texturing and lighting

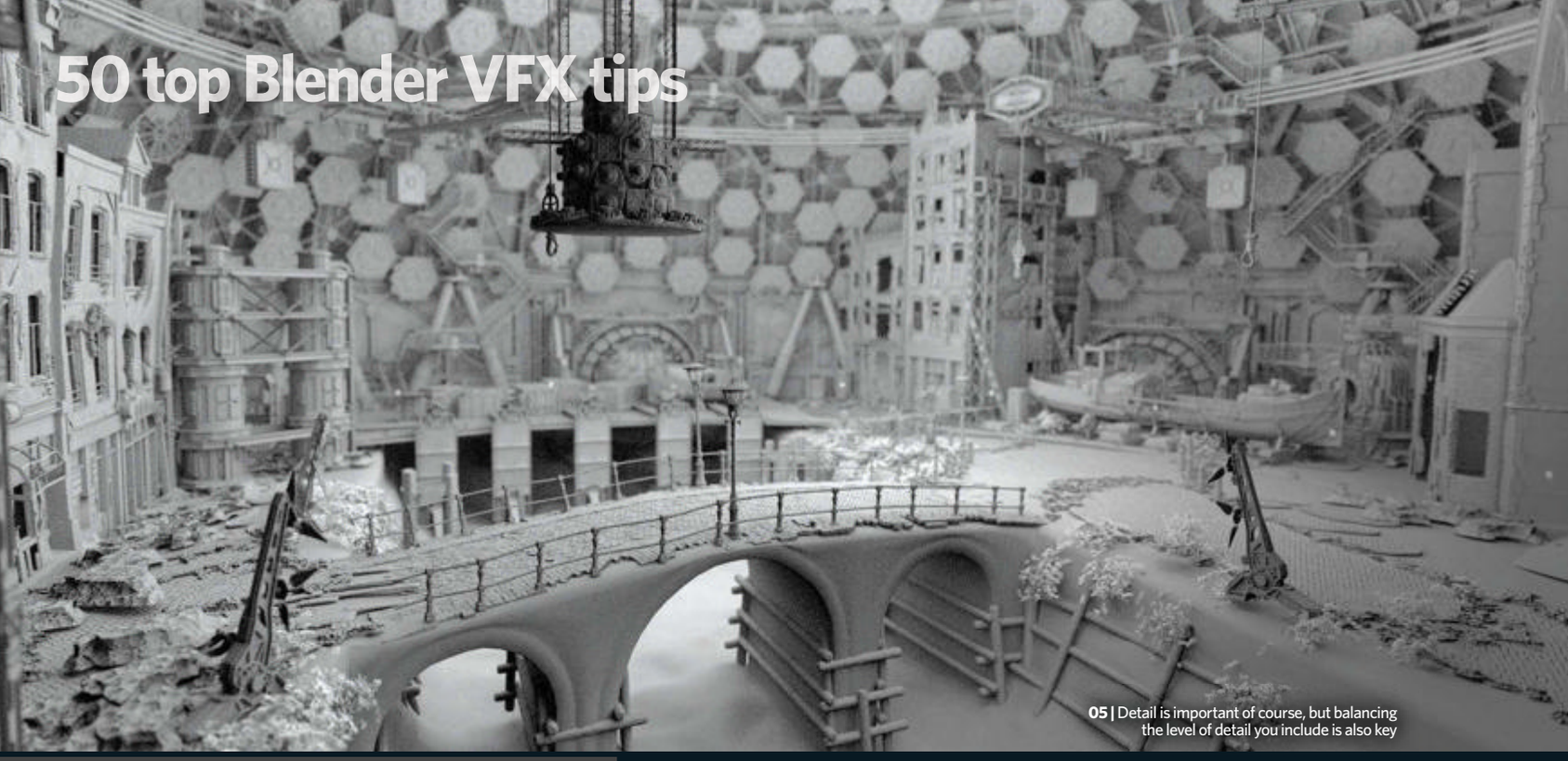
NICOLÒ ZUBBINI
Website: www.nizuvault.wordpress.com
Area of expertise: Environment art

SEBASTIAN KÖNIG
Website: www.3dzentrale.com
Area of expertise: Modelling, matchmoving and compositing

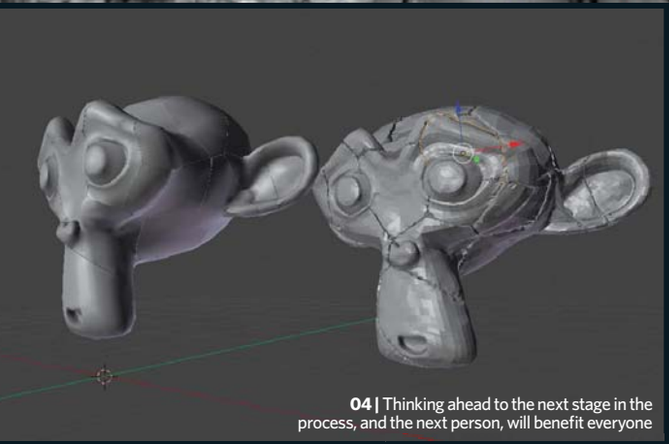
FRANCESCO SIDDI
Website: www.fsiddi.com
Area of expertise: Layout and animation

MANUEL PETER
Website: www.manuel-peter.com
Area of expertise: Modelling and texturing

50 top Blender VFX tips



05 | Detail is important of course, but balancing the level of detail you include is also key



04 | Thinking ahead to the next stage in the process, and the next person, will benefit everyone

06 | Dirt maps can make an image, but they are a lot of needless work if you don't end up using them

07 | Manuel Peter used a graphics tablet to help him create this chameleon

MODELLING AND PREPARING ASSETS

01 "Work at the right scale level. At the beginning of a production the basic measurement unit is established. In Blender the convention usually used is 1m = 1 Blender Unit." **Francesco Siddi**

02 "Determine the importance and cost of everything. When that's not possible, keep everything flexible and divide objects smartly. Avoid making textures and Dirt maps that need redoing from scratch if some piece of the environment is moved." **Nicolò Zubbini**

03 "Work together with the layout department to decide the best approach for producing assets for challenging shots. In a full city skyline shot, consider how many buildings actually need to be 3D and how many can be a matte painting, for example." **Francesco Siddi**

04 "Making complicated models for animation can be tricky, so start simple, stay organised and try to consider the stages that come after the modelling. Make sure that the rigger and texturing artists are involved in the modelling decisions." **Kjartan Tysdal**

05 "Equalise your textures and materials (set a standard for Brightness, Contrast, Min/Max values) otherwise shaders are unpredictable, unreliable and the lighting phase will be a mess. Good equalisation is mainly objective, but it also depends on preferences and the lighting setup, so discuss this with your team and agree in advance." **Nicolò Zubbini**

06 "Work at the correct level of detail. Depending on the importance of each prop, set or environment, more or less work will be required. Often multiple levels of detail are required for each object to speed up render times and decrease scene complexity." **Francesco Siddi**

07 "Try using a graphics tablet for modelling organic forms within Sculpt mode. Especially since Dynamic Topology is available in Sculpt mode, a tablet can lead to a much better workflow." **Manuel Peter**

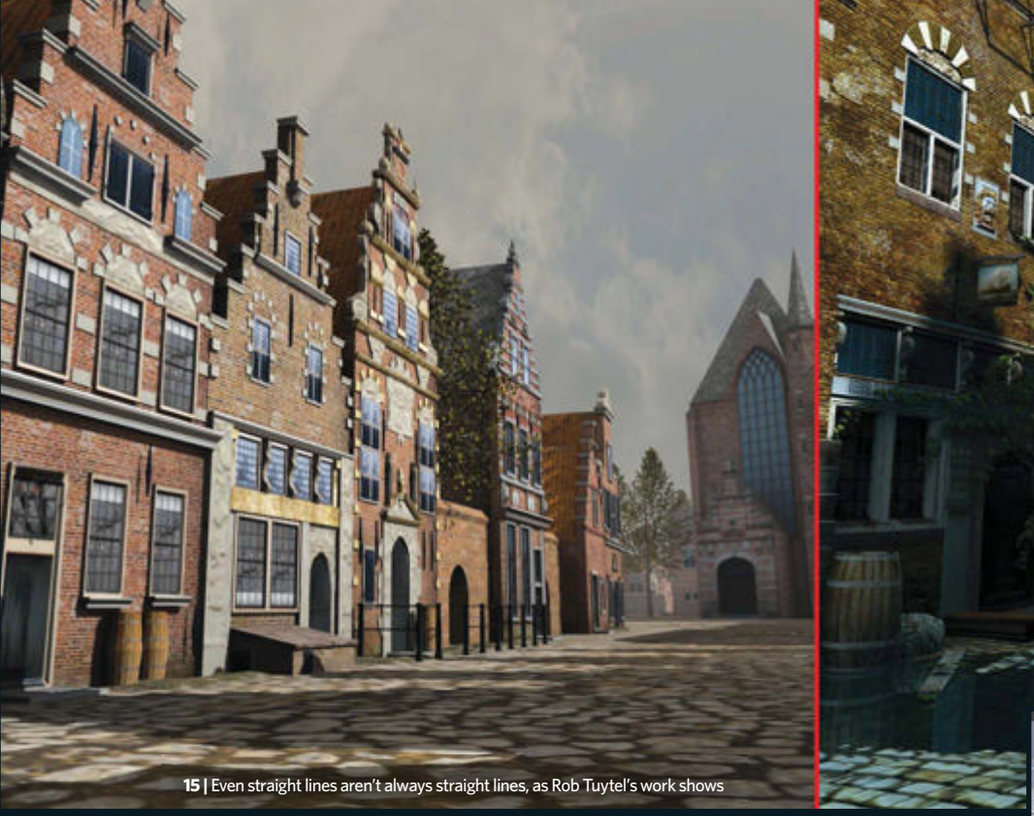
08 "Make sure you grasp and master the Library Linking tools. Understand the concept of proxies: in Blender you can link objects or groups in a scene and override some of their components locally." **Francesco Siddi**

09 "Keep linked sets clear of transformations and avoid scaling, rotating or moving linked sets or props unless really necessary. This makes the work of environment artists much easier. In fact, in the environment-creation file, they can link the camera from any shot and see what's visible through it." **Francesco Siddi**

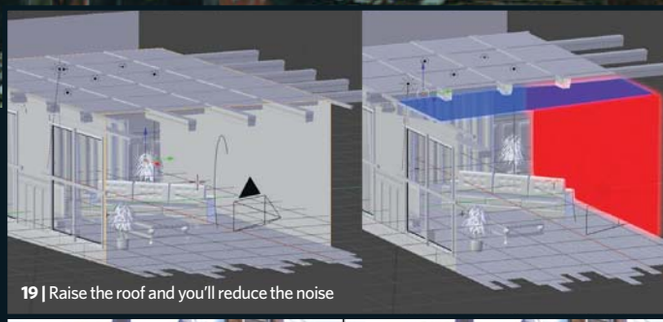
10 "Add a global parent for cameras with motion-tracking data in order to modify them and place them correctly in the sets." **Francesco Siddi**

11 "Adopt and follow a proper naming convention for assets and groups in the scenes." **Francesco Siddi**

12 "The layout system in Blender is basic, but can be enhanced with



15 | Even straight lines aren't always straight lines, as Rob Tuytel's work shows



19 | Raise the roof and you'll reduce the noise

22 | It's the incidental details that often make the biggest impression

some scripts. These will ensure you're using assets at the right level of detail in different parts of the scene. For example, assets can be made at different resolutions to render faster if they're in the background or out of focus." **Francesco Siddi**

CREATING ENVIRONMENTS

13 "When working on an exterior scene, start with a schedule, because making a scene with buildings and environments takes a lot of time. If you're unorganised you'll lose the overview and end with an incomplete scene." **Rob Tuytel**

14 "Modelling environment scenes starts outside, not behind your computer. Observing objects and analysing them is the first thing to do when you start working on a new scene." **Rob Tuytel**

15 "If you've been working on a scene for weeks, you've used the right textures and details, but it still doesn't look realistic, then avoid straight objects. Nothing in nature is perfectly straight." **Rob Tuytel**

16 "It's so important to use good textures. The model you created can look stunning, but if you haven't used the right textures, it will never look realistic. If you're just starting out, buy a good camera and begin making your own textures. You will need these but you won't find them on the internet." **Rob Tuytel**

17 "Try using one light source as sunlight and a bit of environmental skylight (360 HDR images come recommended for the skylight). Thanks to the Cycles render engine it's possible to create photorealistic scenes with these settings." **Rob Tuytel**

18 "With VFX, interiors must be convincing. Take a look at a random room. What do you see besides the wall, floor and roof? Interior design is a complex area, so study a room before modelling it." **Rob Tuytel**

19 "I often see artists designing a complete room, then closing the scene by adding walls everywhere, even the areas that aren't visible to the camera. This increases noise! Sometimes I even remove the roof, which helps a lot." **Rob Tuytel**

20 "For interior shots, remove a window's glass so there's an empty hole in the room out of sight. Next, add a light source outside the room. This will blur the edges of the scene. You could also achieve this with the compositor." **Rob Tuytel**

21 "Even with a high sample rate, you'll find there's still noise in the scene and it may be tricky to remove. There is a function in Blender called Clamp, so try experimenting with this to reduce a lot of the noise." **Rob Tuytel**

22 "Try to work with Normal, Specular and Occlusion maps. This is extra work, but the result is visible most of the time. Any tiles on a floor without extra tweaking will look flat and unrealistic, for instance. Adding some Bump and Specular will show a very nice surface." **Rob Tuytel**

Blender dos and don'ts

DO:

"Take photos of every structure you see that looks interesting and use these photos as textures. This will help you understand and create realistic materials." **Manuel Peter**

"Make sure that the models you share with the team are clean and always usable." **Francesco Siddi**

"Learn hotkeys to massively speed up your workflow." **Jonathan Lampel**

"Know your budget for detail. If you're doing background detail, don't prepare a translucent or SSS shader." **Nicolò Zubbini**

DON'T:

"Do not use the num-pad to switch between side views when navigating 3D space. Instead, use the Opt/Alt key while rotating the view to snap to view to the closest axis." **Daniel Kreuter**

"Don't avoid the Node Editor. It looks confusing at first, but you'll come across it often and it'll help you a lot to improve your work in many ways." **Daniel Kreuter**

"Don't be lazy. More flexibility in assets will ultimately cost you less time and ensure a higher quality finished product." **Nicolò Zubbini**

50 top Blender VFX tips

RIGGING AND ANIMATING

23 "Try to think of the animators as children: when given a new toy, they're likely to break it. Have a go first and if you can't break it, they'll have no chance." **Jeremy Davidson**

24 "Don't forget physics. Ignore them a little, but don't forget. Balance, weight and momentum are three things an animator must understand." **Jeremy Davidson**

25 "Don't rely on pre-made rigs. When making a rig for a character, ensure you're building it for that specific character. A pre-built rig will work to a point, but even the most generic biped will need some degree of customisation, let alone worrying about extra limbs, tails, pistons, jackets, heads or lampposts growing out of who knows where." **Jeremy Davidson**

26 "Save as much time as you can, wherever you can. Some studios can afford to have one animator working on three seconds for eight months, in others you have to do the best you can. Learn tricks that save time but won't diminish quality. In small team/huge deadline scenarios, it doesn't have to *be* perfect, it just has to *look* perfect." **Jeremy Davidson**

27 "Always get another pair of eyes on your work. Animator or not, having another person look at your work at various stages will help highlight things you've been blinded to from scrubbing the timeline for hours. Take the criticism, constructive or not, and filter out the tweaks you need to make and make them. Your work will be all the better for it." **Jeremy Davidson**

28 "Don't be afraid to start from scratch. Sometimes spending hours on a shot trying to fix something you can't seem to get right is just a waste of time. Start over and try again, the movement will still be fresh in your mind and you'll be cleaner in your posing." **Jeremy Davidson**

ON-SET AND TRACKING

29 "Use the actors' performances when and where you can. On 'Tears of Steel', a few shots featuring holographic humanoids were animated with the filmed shot as a viewport background. We matched up the camera and then the key poses of the actors. With a bit of polishing afterwards, we had animation sequences that could be used in the completely CG environments very quickly, such as the jump cut in the starting sequence that reveals the couple on the bridge are projections." **Jeremy Davidson**

30 "Tell your actors where the CG elements will be (when you can). The more you can line up CG elements with the eye-line of the actors, the more you can convincingly tie the real and virtual footage together. You've got to think backwards a little bit. Adding moving pieces to where they're focusing their attention will give them something to draw their attention to, if that makes sense." **Jeremy Davidson**

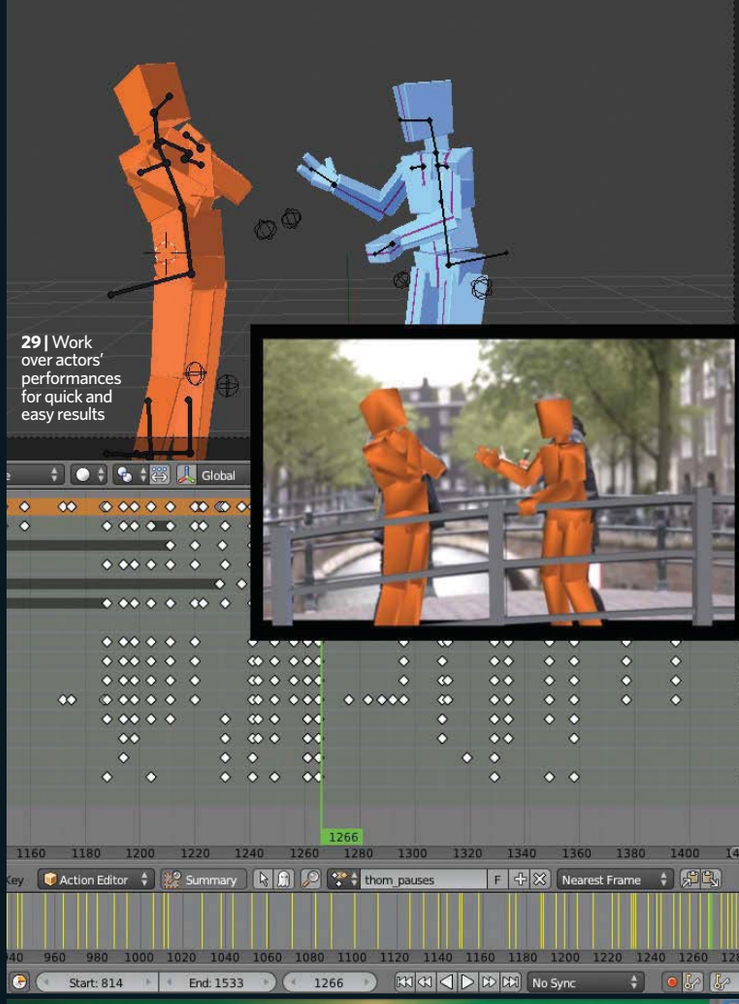
31 "Conversely, tell your CG characters where the actors are. If the actors are touching the characters, make them react. The more you can tie the footage world to the CG world, the more believable your world will become, thanks to seamless VFX footage." **Jeremy Davidson**

32 "When an actor is interacting with any CG elements you can animate the CG to react to them, but it's more difficult to animate the actor. In 'ToS', there's a shot... [with] old Thom hugging the robot's head. We worked out the size of the head from the model file, made a wooden box, painted it green and then gave it to Ton Roosendaal to hold while Derek hugged it." **Jeremy Davidson**

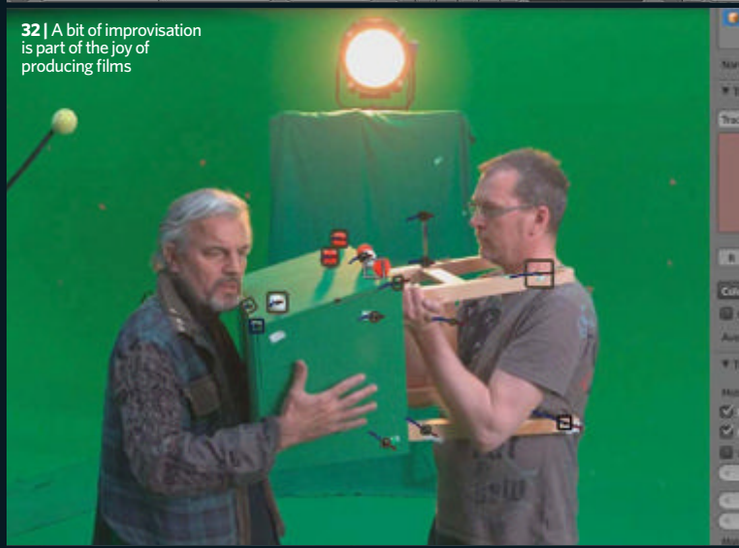
33 "Use tracking markers. There were countless shots in 'ToS' where a robotic hand was grabbing Thom's face while talking. Creating tracking objects in the scene and then IK'ing each of the fingers to them gave me a very solid animation base to work with... This saved me days of work. We were lucky to have crisp 4K footage to work with... but sometimes it's good to have a bit of foresight when filming and placing tracking markers where you'll need them." **Jeremy Davidson**

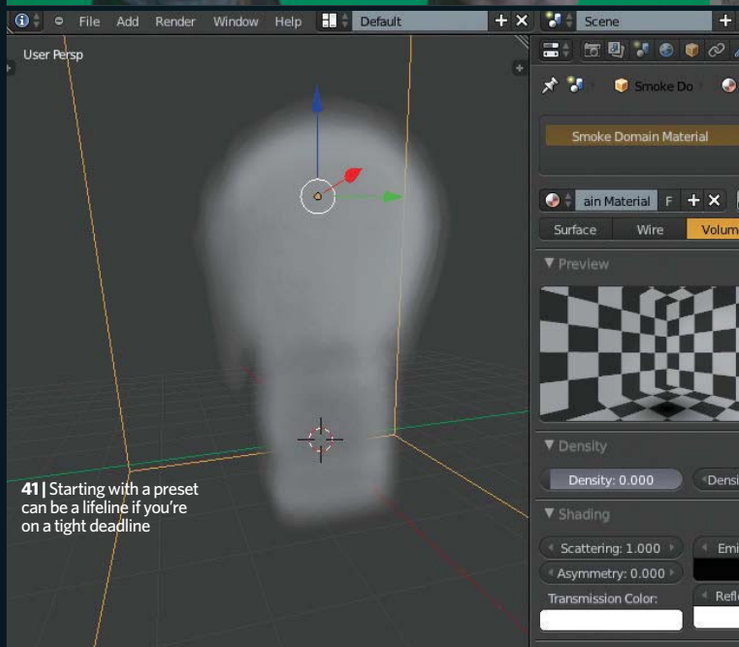
34 "Most packages use automatic feature-detection and track a lot of different feature points simultaneously... Blender's approach to matchmoving is supervised tracking. Track one marker at a time to make sure it doesn't jump or slide away. You can centre the view to it by hitting L on the keyboard. The longer and the more accurate your tracks, the better the result. Often you don't need more than 10 to 15 markers for a solid track." **Sebastian König**

35 "To solve a 3D camera, the tracker needs as much perspective



29 | Work over actors' performances for quick and easy results


32 | A bit of improvisation is part of the joy of producing films



41 | Starting with a preset can be a lifeline if you're on a tight deadline

25 | Custom-built rigs will always result in better animation for your creations

information as possible. Try to cover the foreground, midground and background with your tracks, as well as all areas of the frame. If you have markers that leave the frame, for example in a long dolly shot, ensure that you don't have multiple markers leaving the frame at the same time." **Sebastian König**

36 "To get the most accurate tracks, in some cases you can try to use Affine Tracking with a larger pattern area. Even though this is a little bit slower than regular point-based tracking, this so-called planar tracking is capable of tracking even the biggest and fuzziest features and is extremely accurate." **Sebastian König**

COMPOSITING

37 "Even though Blender's compositor has improved a lot in the past year, it can still take a lot of resources and CPU power to edit 4k composites with multiple layers and effects. To speed things up you can disable all the little thumbnail previews and collapse or disconnect the composite output during editing." **Sebastian König**

38 "Node trees can grow very large. To ensure they remain organised and legible you should use Frame nodes to create visual groups and give them names. Insert Reroute nodes to make the direction of the node connections easier to understand and maintain a tidy node tree layout." **Sebastian König**

39 "Don't overdo it with effects like lens distortion, dispersion, glare or vignetting. While they can work really well in some cases, they are often rather distracting and can easily look cheap and amateur. Often it's not the big effect but the subtle use of visual ingredients that make a convincing and interesting composite." **Sebastian König**

40 "To blend a scene with its sky background, make an Alpha mask of the scene and blur that out, or use the Glare node to blend things together. It's also possible with mist, but again be careful not to overdo this." **Rob Tuytel**

EFFECTS

41 "Using Quick Smoke can greatly speed up the setup time when creating smoke FX. Select your Emitter object, then hit Spacebar and type 'quick smoke'. This will create a flow for your Emitter, a Smoke domain and a Volume material with Voxel data texture. This makes a fantastic starting point for tweaking your smoke effect further." **Kjartan Tysdal**

42 "Adding generic smoke elements can add a lot of subtle atmosphere and life to a shot. Render image sequences of slow smoke with simple lighting and a proper Alpha in Blender, then use them as smoke plates. You can put the pre-rendered smoke plates onto planes in your scene, render them separately on their own render layer and throw them into the composite." **Kjartan Tysdal**

43 "The Cell Fracture add-on can achieve a great destruction effect, but the edges of the fractured objects may look too clean. To enhance this look we can add a few SubSurf, Smooth and Displacement modifiers. Use a Subsurf, set to Simple with 2-3 subdivisions, add a Smooth on top of that, then place a subtle Displacement with a procedural texture to randomise the vertices." **Kjartan Tysdal**

Rob Tuytel talks compositing in this Dutch Windmills scene

01 One of the most important things when you start compositing is to have a solid 3D scene and models. You can't make something nice when you don't have a good foundation.

02 Before you even touch the compositor, you need to know what kind of mood you're aiming for in your final scene (also shown). This makes your work much easier than if you're just guessing which handles to pull.

03 Start with some mist by adding a Map value node. Use the Z buffer (indicating the depth in the scene), combine this with a Mix node and put the original image in the mix.

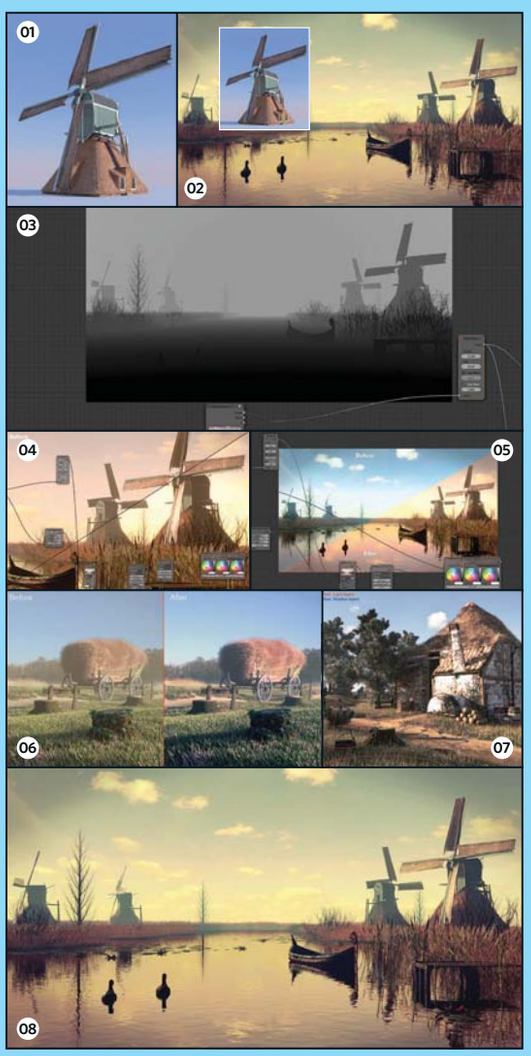
04 To blend the sky and scene together, you can use a Glare node and select Fog Glow. Pull the threshold down to put some glow in the scene, but use this gently.

05 Add a Color Balance node. This will generate the mood of the image: cold, warm, happy or sad.

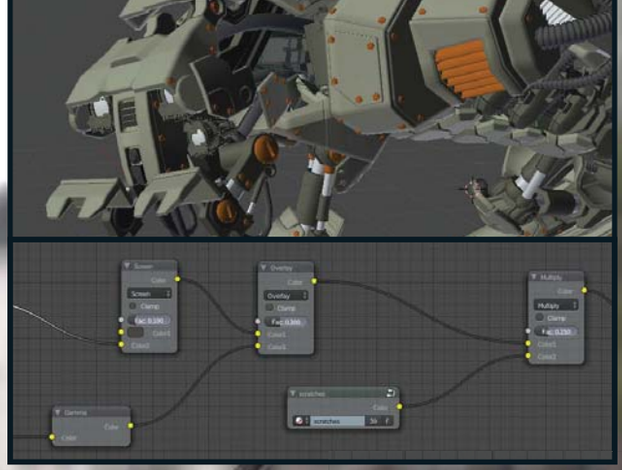
06 As you can see in this alternative rural image, understanding colour management – so you can work with RGB curves and the Color Balance node – will get you exactly the feel you're after.

07 Bring depth into the scene by adding light layers. In this cottage example you can see it's a good way to create the illusion of depth in the scene. Try it by highlighting an element in the foreground, midground and background.

08 To finalise the scene, enable Defocus in the camera and change it to f/stop with a value of 5.6.



50 top Blender VFX tip



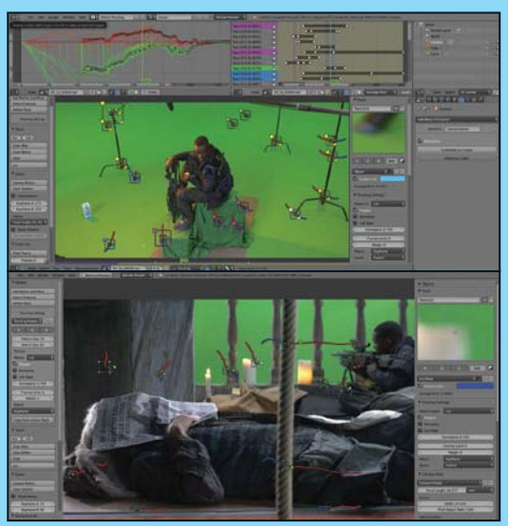
48 | If you want to reuse certain parts of your Cycles material, then group those nodes together and copy/paste that group into other materials

Sebastian König's guide to the matchmoving process

"Open Blender and switch to the Motion Tracking Screen layout. Bring the cursor into the main window and hit Opt/Alt+O. This brings up the File menu, where you can choose and load the footage that you want to track.

"Hit Cmd/Ctrl and select LMB to place a marker. Choose a point with enough contrast for a good track. If you need to, you can hit S to scale the marker. Hit Cmd/Ctrl+T to track forward or hold Opt/Alt and the arrow keys to track frame by frame. You need at least eight continuous tracks to solve the camera.

"For a good solution, you have to have two initial frames to provide the perspective information, the so-called keyframes: A and B. You can set these on the current frame with the hotkeys Q and E. Blender also needs the camera data, mainly the sensor size and focal length. Now you can hit Shift+S to solve the camera. If you have a good solution with an Average Solve Error below 1, select three markers on the floor of your scene and choose Set Floor in the Reconstruction menu. Back in the Default screen layout, select the Camera object, go to the Constraints panel and add the Camera Solver constraint. Now you should see the 3D markers in the 3D viewport. Press 0 to look through the camera and Opt/Alt+A for playback. If all goes well, the camera will now be moving according to your footage, which you can display by activating Background Images."



44 "Rendering two or more overlapping smoke volumes is not supported in Blender and will produce artefacts. However, you can create a separate Master Volume specifically for rendering. This master box will have a Normal Volume material, but it will also have one voxel data texture per smoke domain. The trick is to make sure the mapping co-ordinates for the voxel data texture are set to Object and assigned to the Domain object." **Kjartan Tysdal**

45 "A single BLEND file can contain multiple scenes, which means you can do all your FX work separately... Each scene can contain its own objects, but you can also link objects from other scenes to have the same objects instantiated into two or more scenes... You can bring single objects over from one scene to another by hitting Cmd/Ctrl+L and selecting Make Links/Object to scene." **Kjartan Tysdal**

SCRIPTING, RENDERING AND MORE

46 "Take advantage of Blender's powerful Python API and extend its functionality by merging tools together. This enables you to automate repetitive tasks, integrate it with other tools in the pipeline or even work around technical issues." **Francesco Siddi**

47 "Use a tool like Blender Aid (**www.atmind.nl**) to keep a project free from conflict, outdated or broken library links." **Francesco Siddi**

48 "You can render multiple scenes by using the node-based compositor. This makes it possible to render with multiple rendering engines. You can, for example, use Cycles for your main scene and then render FX with Blender Internal in a separate scene. Go into Blender's node-based compositor, add a Render Layer node by hitting Shift+A and selecting Input>Render Layer, then change it to something other than your current scene. Now if you hit f12, Blender will render both your current scene and the scene you assigned in your Render Layer node." **Kjartan Tysdal**

49 "The Attributes node is useful if you want to assign specific UVs or Vertex Colors inside of your Cycles material. If you want a texture in Cycles to use the UV co-ordinates from a specific UV map, go to the Node Editor, add it by hitting Shift+A then selecting Input>Attribute. Write the name of the UV map you want to use and plug the blue Vector Output into the Vector Input of your texture. If you want to assign vertex colours, make sure your object has them painted, write the name of the colour into the Attributes node) and then plug the yellow Color Output into the Color Input of your shader." **Kjartan Tysdal**

50 "Blender is constantly evolving. If you run into a problem and Blender just doesn't do what it should, or even crashes, try to simplify your scene until you get to the core of the issue. If you can redo the problem with a simple example file or even find a way to make Blender crash every time, congratulations, you have found a bug! Now you should go to the Blender Bug tracker **www.blender.org/development/report-a-bug** and see if others have already reported it. If not, it's time for your first Bug Report. Briefly describe the problem so that developers can reproduce it." **Sebastian König**


"HANDS DOWN MY MOST USED FEATURE WAS DYNAMESH. I ALSO USED QREMESHER, THE AWESOME POSING TOOLS, TRANSPOSE MASTER AND GOZ A LOT."
-DAN ULRICH
IMAGE CREATED IN
ZBRUSH 4R5®
Image Courtesy of Dan Ulrich
Pixologic.com
ZClassroom.com
ZBrushCentral.com

Step by step
Easy-to-follow guides take you from concept to the final render

Artist info

Ben Simonds

Personal portfolio site
www.bensimonds.com
Location London
Software used
Blender, GIMP, Photoshop
Expertise Modeller, 3D generalist and VFX artist using a range of software

Expert modelling in Blender

Aerial Pursuit 2013

"Learn how to build a dramatic scene featuring a realistic fighter jet being hotly pursued by the enemy"

Ben Simonds is a 3D artist at Gecko Animation

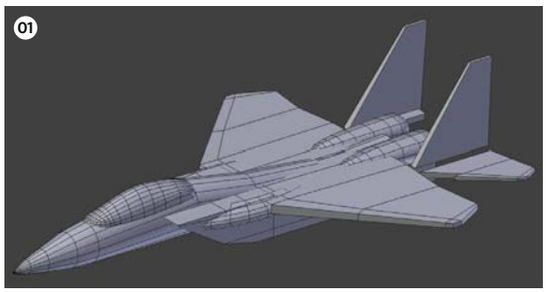
Here you'll learn how to model a fighter jet from scratch, then construct a dramatic scene featuring a dogfight high above the clouds. Throughout we'll be using Blender for modelling and rendering the 3D elements, GIMP for painting textures and Photoshop for the final composite. We'll cover blocking out the model from references, before creating the details with a mix of retopology and modelling methods.

Next we'll move to making materials for the fighter jet, with a view to rendering a final image with Blender's Cycles renderer. We'll focus on mixing procedural techniques with hand-painted maps while using Blender's node materials.

After finishing up the jet itself we'll move on to creating the final image, adding two pursuing jets into the background along with other exciting features such as explosions, contrails and clouds.

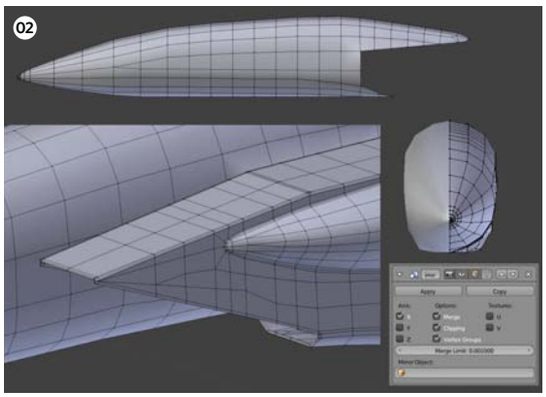
Begin modelling

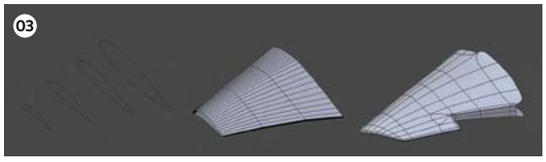
Block out the fighter jet with simple placeholder geometry



01 Start simple Begin with basic primitives, such as cylinders, spheres and cubes, to input modifications (extruding and scaling to capture the overall shape of each major component of the model). This gives an early idea of where the challenges will lie when building the model and also acts as a starting point for creating more-complex meshes.

02 Build the fuselage With the model blocked out, you can start from the front and begin shaping the fuselage (the main body of the jet). Use the blocked-in model as a guide alongside your reference. Keep the poly count relatively low at this stage, as we'll be applying a Subdivision Surface modifier later. It's best to use a Mirror modifier to model symmetrically. After finishing the fuselage, move on to the air intakes. These are relatively box-like in shape, so start out with a cube, then gradually manipulate it into shape. Now insert edge loops and extrusions to produce geometry that will maintain its sharp edges when subdivided.





03 Shape the wings You'll need to find some reference for the cross-section of a fighter jet's wing to get the aerofoil shape right. Model these with curves, convert them to meshes, then space them out and loft them together with the Bridge Two Edge Loops operator in Edit mode. This provides us with a wing shape that we can then use as a guide to construct the wings. Apply the same process to produce the horizontal stabilisers (the rear wings) and the rudders.

Snapping surfaces

Throughout the modelling process I made use of Blender's surface-snapping tools to create new topology over the surface of existing objects. For example, when modelling the wing as shown in Step 3, you can turn on Snap with the magnet icon in the header of the 3D viewport, then set the Snap Target to Face and turn on Snap Projection. These options make it much easier to model surfaces with holes and other details in them. You can also keep the overall surface smoother by using a simpler shape for the guide.

01 The jet blocked out with simple geometry

02 Using a Mirror modifier to model the fuselage. Edge loops are added around hard edges to retain sharpness

03 To construct the wings, first create curves for the cross-sections, then loft these to make a wing shape and then model the actual wing

With the Disc

Tutorial files:

- FighterJet_Scene.blend
- FighterJet.blend
- Textures

Learn how to

- ☑ Quickly and easily block in a complex model
- ☑ Model hard-surface features
- ☑ Work better with Blender's material nodes
- ☑ Make good use of the Cycles render preview
- ☑ Build textures in GIMP

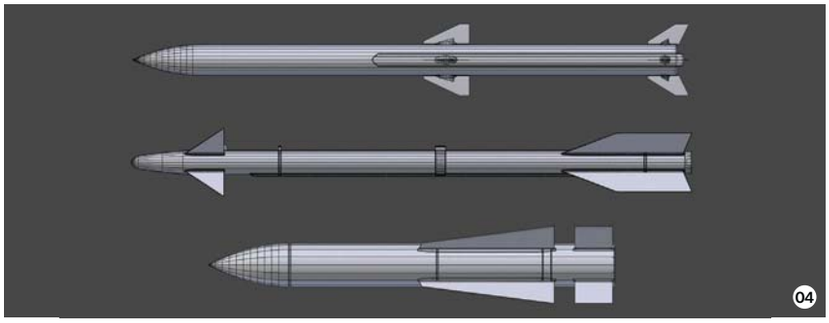
Concept

A modern fighter jet bursts out of the page, pursued by enemy jets, as a missile streaks by in the foreground and explosions punctuate the distant sky.

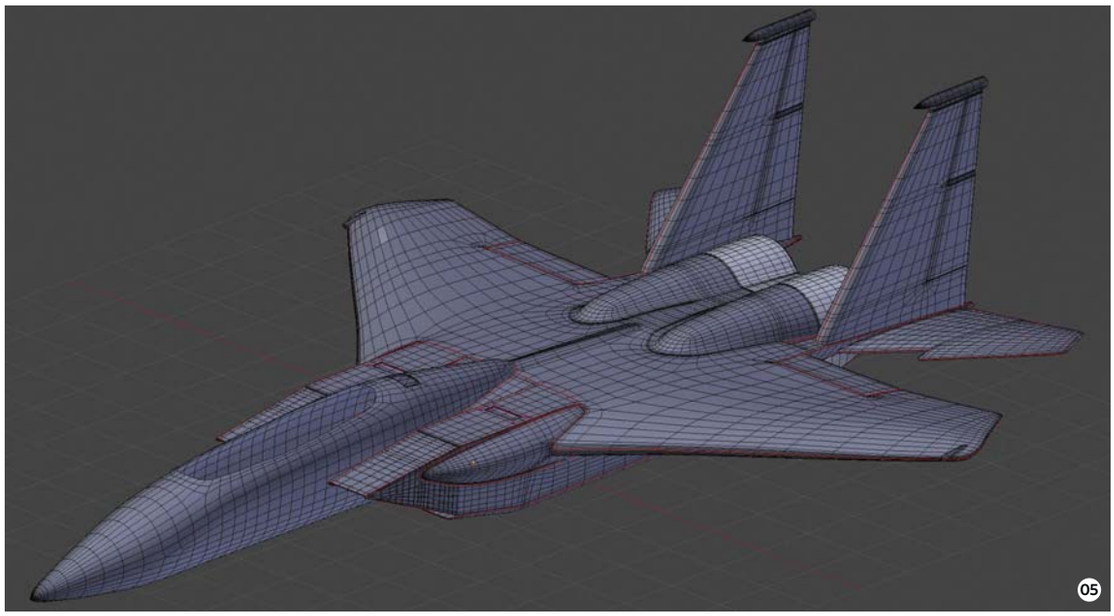
Detail and texture

Now the main forms are established, we can start to layer on details

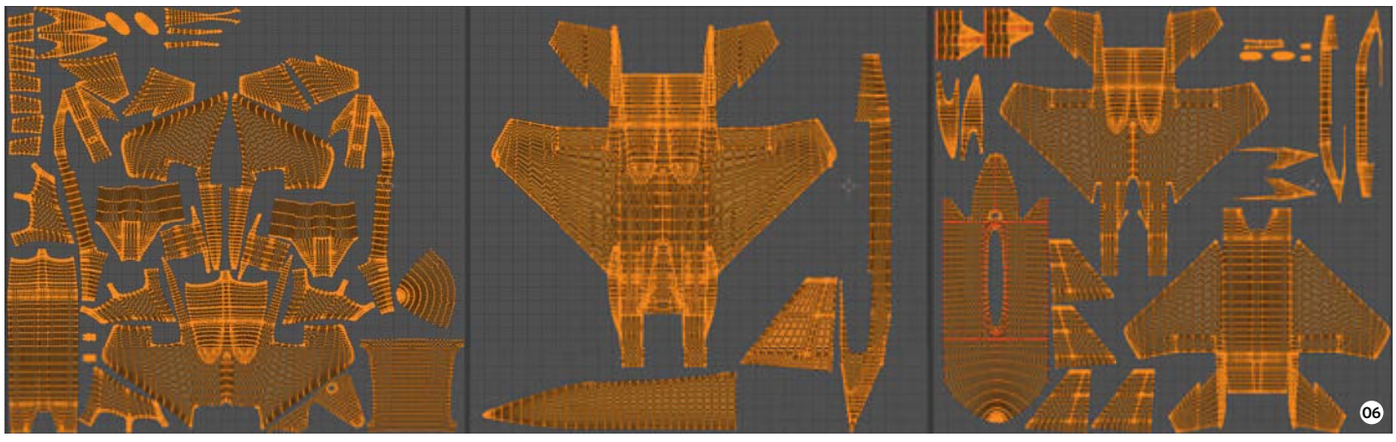
04 Model the missiles Adding details to the jet will mostly consist of examining reference material and modelling elements, such as individual panels on the body of the jet, the interior of the cockpit and the exterior areas of the jet engine at the rear. Of course, no fighter jet is complete without an arsenal of explosive weaponry strapped to it's belly, so try building three different kinds of missile based on real-world references, using the same techniques as those to build the fighter jet itself. These are mainly cylinders with some simple geometry added on for the fins, with a few extra details here and there.



05 UV unwrapping It's now time to UV unwrap your jet's elements. Thankfully, Blender has a great set of tools for UV unwrapping, so start by adding seams around the main sections of the fuselage. These include the nose, as well as the upper and lower surfaces of the wings. You also need to unwrap the different parts of the underside of the jet. You can use Blender's default Unwrap operator to unwrap these pieces and pack them into a single UV grid. You'll find this grid will be very helpful later on when you begin to bake your textures.



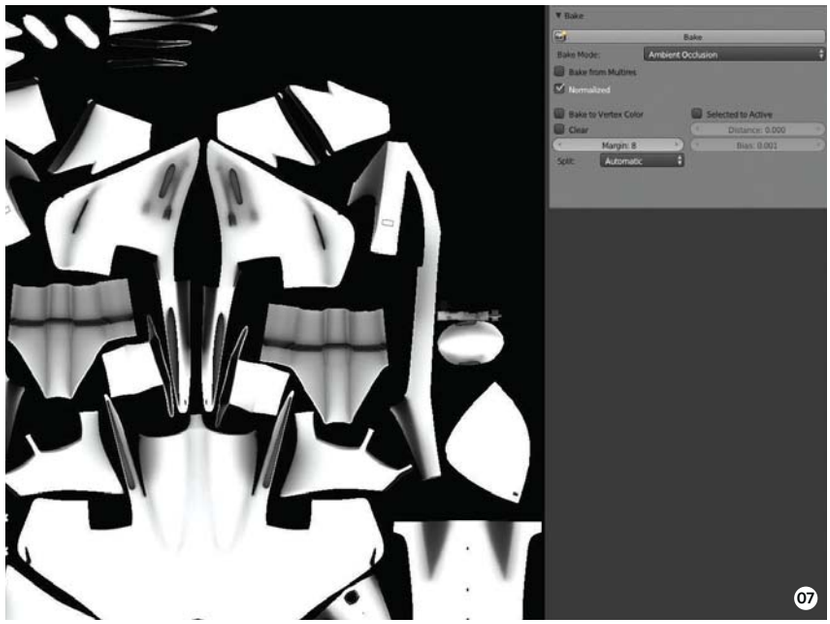
06 Multiple UV maps Because we'll want to add decals to the model later, at this stage it's helpful to create a couple of extra UV sets. In addition to a standard unwrap, which gives each piece of the model it's own unique bit of UV space, we can create two other UV co-ordinate sets. Project large chunks of the model from key angles for the first (mainly from the top or the side). This provides a very simple UV set that we can use to paint broad textures, such as the large camouflage pattern on the wings and the shark's mouth design on the nose cone. Try projecting specific sections of the model from the most relevant Orthographic perspective – the top for the upper surface of the wings, the bottom for the belly of the jet and the left or right for the sides of the rudders. This provides a UV map that we can use for painting decals and other details, such as panelling on the model, without worrying too much about them becoming distorted.



04 The missiles for the fighter jet are modelled with simple cylinders, extrusions and extra parts for the fins

05 Mark seams for UV unwrapping the fighter jet

06 Creating various UV sets is a bit of extra work at this stage, but it makes texturing tasks much easier later on



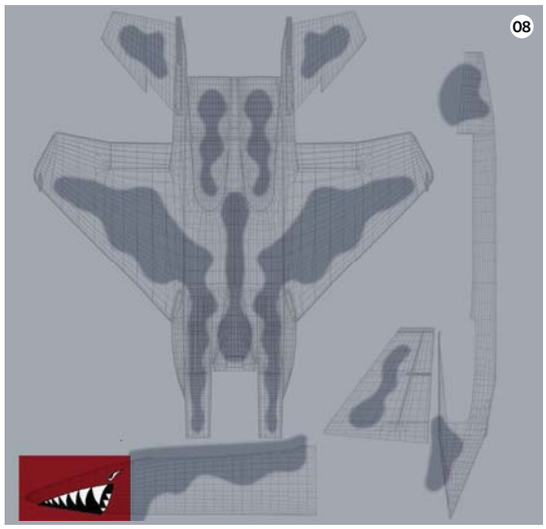
07 Bake textures Once we have the fighter jet unwrapped, we can add an Ambient Occlusion map for the whole model using the baking tools in Blender's Render tab (note: you have to set the renderer to Blender Internal for this, as Cycles doesn't currently support texture-baking). Now bake your AO map to the first UV set you created.

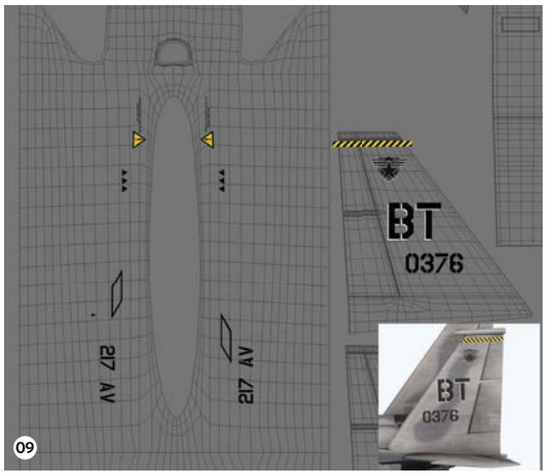
08 Paint a camouflage pattern Here we've gathered various textures for the fighter jet as separate images, which can be combined in Blender when making materials. Begin by defining an overall base colour for each part of the jet with a camouflage pattern and, for extra character, also paint in the shark's mouth design for the nose cone of the jet on this texture. To act as a guide, export the UV layout created as an image, use the UVs>Export UV Layout operator in Blender's UV Image Editor and open this up as a layer in GIMP.

09 Attach decals to the jet Now paint the decals for the jet on a separate texture with an Alpha channel, then build a couple of military-style designs as well as some random pieces of text and numbers. Place these appropriately on the wings, rudders and the fuselage of the jet.

Drawing textures in Blender

To create the impression of complex panels and rivets over the surface of the jet, I partly used a Displacement map. Rather than laboriously painting this in GIMP, I opted to model the outlines of the panels with curves in Blender. I used the exported UV co-ordinates I created earlier as a guide and laid out the scene from a top-down perspective. I used an Orthographic camera to render a texture that perfectly matched up with the jet's UV co-ordinates. This could later be combined with my other textures.





07 Baking an AO map. Make sure you have the renderer set to Blender Internal and turn up the Samples settings for your Ambient Occlusion

08 Paint the camouflage pattern for the body in GIMP

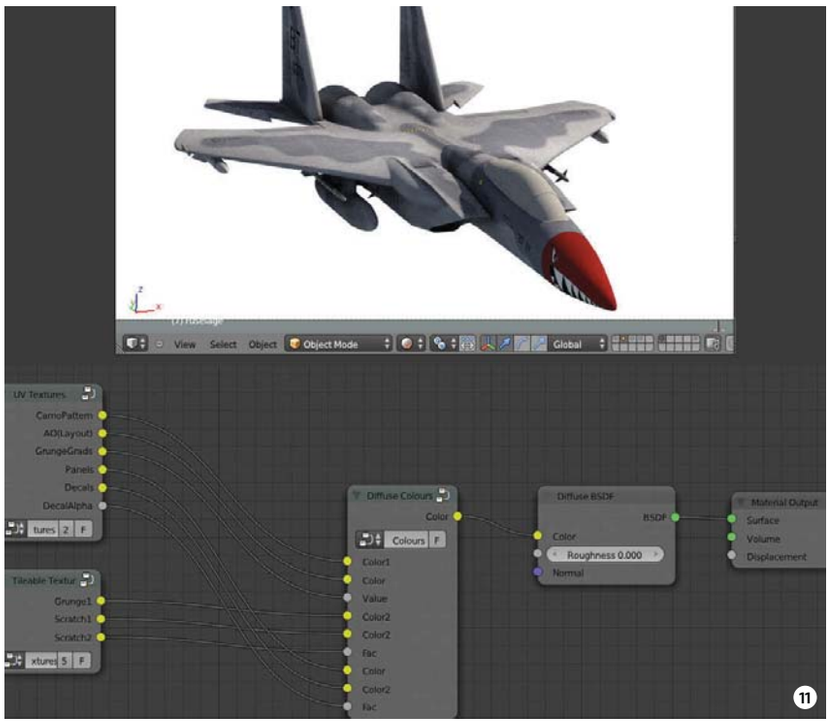
09 Some of decals on the jet

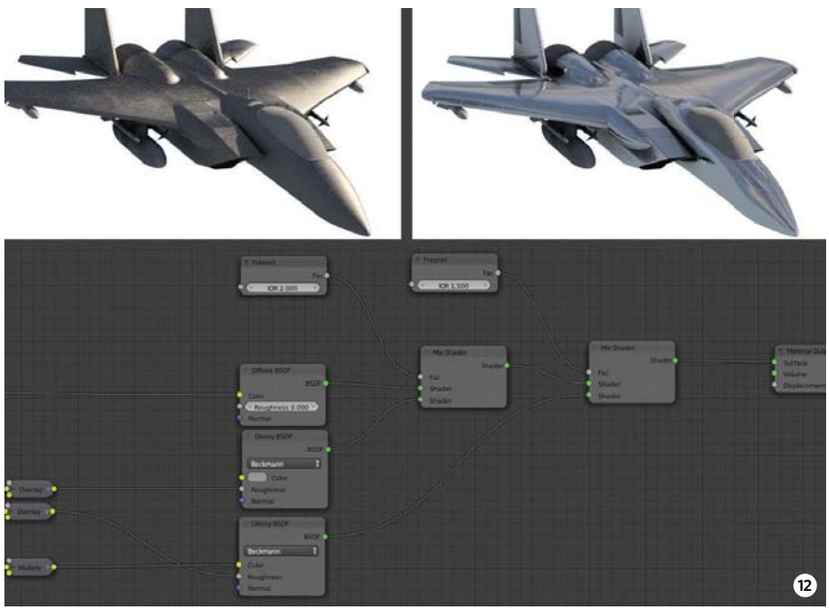
10 Take a square selection of your base texture, offset the image to position the seams in the middle, then apply the Resynthesise filter on the model's boundaries

10 Make grunge and scratch textures Now build up a few different seamless textures for dirt and scratches to be used in various materials covering the jet. To make a texture seamless, first offset it in GIMP and place the boundaries of the image in the middle of the canvas. Select the seams and use the Resynthesise filter to fill them with a continuous texture. This should produce a smooth result.

Realistic surfaces

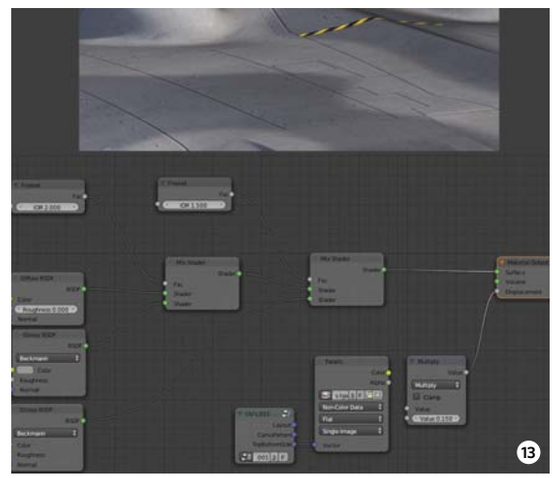
Apply Blender's node materials ready for rendering





11 Construct a Diffuse shader Initially make a Diffuse shader for the body of the fighter jet, then take the Diffuse BSDF shader and begin incorporating your textures. Combine these with Color Mix nodes before plugging them into the Diffuse Shader node. Join the camouflage texture with the decals texture, then add in some further details using the seamless grunge textures. Because the different textures use various UV co-ordinate sets, you can include some Attribute nodes (into which you can enter the name of the UV set you wish to use). Plug the Vector Output of these into the Vector Input of the image textures to let them know the correct UV co-ordinates to use. For the seamless textures, use the Image Texture node's blended box-mapping feature to apply the textures without the need for UV co-ordinates.

12 Apply glossy reflections Now you can combine the Diffuse shader with a couple of Glossy BSDF shader nodes using Mix Shader nodes. You can also reuse some of your textures to affect the Color and Roughness inputs for the Glossy shaders, to provide a bit of variation in the glossy reflections. Apply two Glossy shaders: one for broad soft highlights over the shape of the jet and the other to give some sharp reflections on top. This isn't physically correct, but it gives extra control over the look of your material. Use a couple of Layer Weight nodes to control the mixing of the shaders.



13 Displace elements The Cycles renderer supports a couple of methods for defining surface texture for your materials. Here we opted to plug the panels texture into the Displacement Input of the Material Output node. This provides some fake displacement for the material and highlights the panels that were drawn in. We also used a Multiply Math node to tone down the intensity of this displacement.

The Cycles render preview

The new Cycles render engine has a fantastic live preview for getting instant feedback on your materials and lighting. You can enable this in the 3D viewport if you have the renderer set to Cycles and it will constantly update with a rendered preview. I used this when creating my materials to get an idea of how they looked under some simple lighting, then again later when making my final scene to tweak lights, World settings and render options. It's best to split off a smaller 3D viewport in your window layout and use this as your preview render while you work in another 3D viewport. This will give you a rendered preview that updates quickly, all while keeping it simple to select and edit an object in your main 3D viewport.

11 By creating a Diffuse shader for the jet, you can use node groups to keep your material nodes organised

12 The two Glossy shaders shown on their own, plus the overall node setup incorporating both diffuse and glossy reflections

13 Some displacement brings detail to the surface of the wings and fuselage

14 Linking the jet into the final BLEND file as a linked library. This keeps the scene live if you need to go back

15 Rendering the volumetric smoke and trails in the scene as separate scenes

Develop the scene

Build a dramatic environment

14 Link the jet into a new BLEND File To create the final image, start a new BLEND file to work on lighting and to render the jet in. To link the jet into this new file, assign all of the objects making up the jet into a single group, then link this group into the new BLEND file. This enables us to go back and modify the jet in it's original file and have the final scene update automatically when we reload it. It also enables us to create a couple of duplicates of the jet to act as the other fighters in the scene.

15 Build up smoke trails To add some extra intensity to the image, you can include some smoke trails created with Blender's smoke-simulator tools. These have to be rendered with Blender's older render engine – Blender Internal – which supports volumetric materials. Render these effects in separate scenes, then link in objects like the jet to act as masks (using the Mask Layers options when rendering).

Artist Showcase

Ben Simonds

Ben Simonds is a 3D artist and a director of Gecko Animation Ltd, a small VFX and animation studio based in London. He's been using Blender for about seven years. He also produces tutorials and articles for his website, www.bensimonds.com, and is the author of *Blender Master Class*, a book all about creating 3D art using Blender. Read our review on p99.

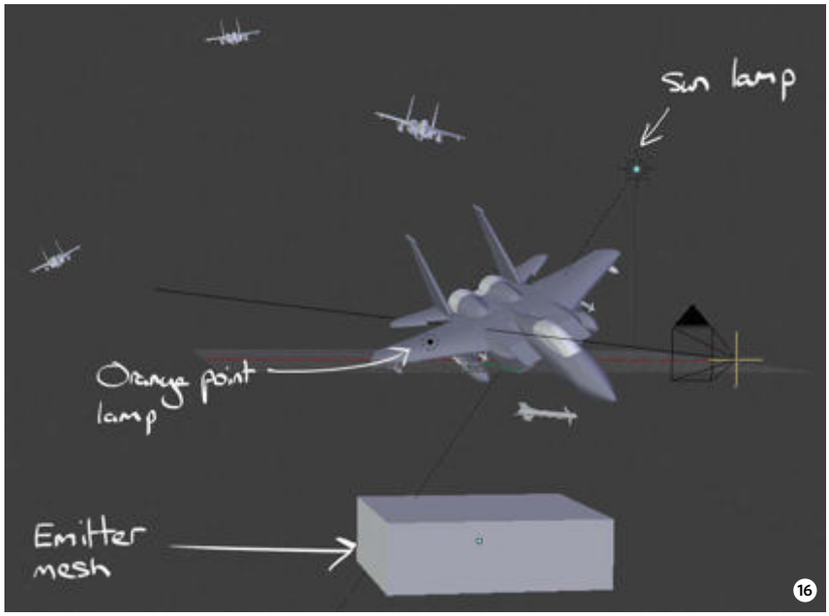
Pirate Captain **Blender, GIMP (2010)**
This scurvy sea dog was created a few years ago for a portrait competition. At the time, subsurface scattering in Blender was relatively new and I wanted to create an interesting but lifelike character in the software

Abandoned Warehouse **Blender, GIMP (2011)**
An abandoned warehouse full of rubble. Modelling was completed in Blender, textures in GIMP and rendering in V-Ray

Fourarmed II **ZBrush, Blender (2010)**
Ben has created a vast amount of Blender work over the years that straddles everything from believable human likenesses to spaceships and captivating soft-body sculpts such as this detailed creature!

Post-production

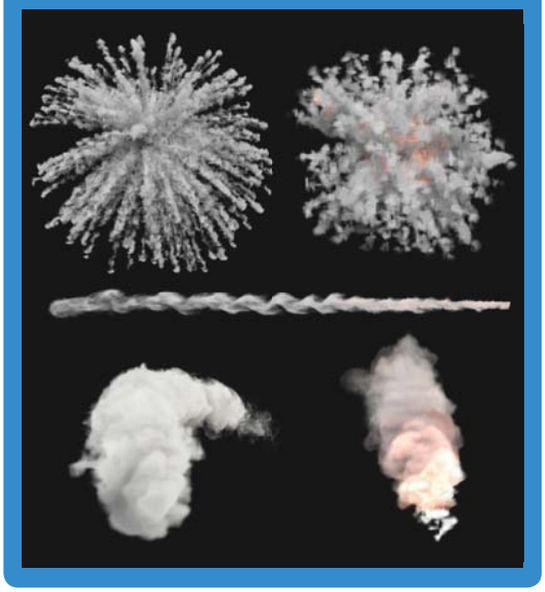
Refine the lighting and render settings



16 Position the lights The lighting in this scene is pretty simple. We used a HDR sky map to provide some global illumination lighting and a sun lamp for the main directional lighting. We also added a large flat cube below the jet (out of shot on final image) and assigned a light-blue Emission material to it. This provides some lighting from below to mimic reflected light from the clouds. You can also try adding a bright-orange point light on the damaged wing, just where the smoke is supposed to be pouring out, to create an orange glow on that side of the jet.

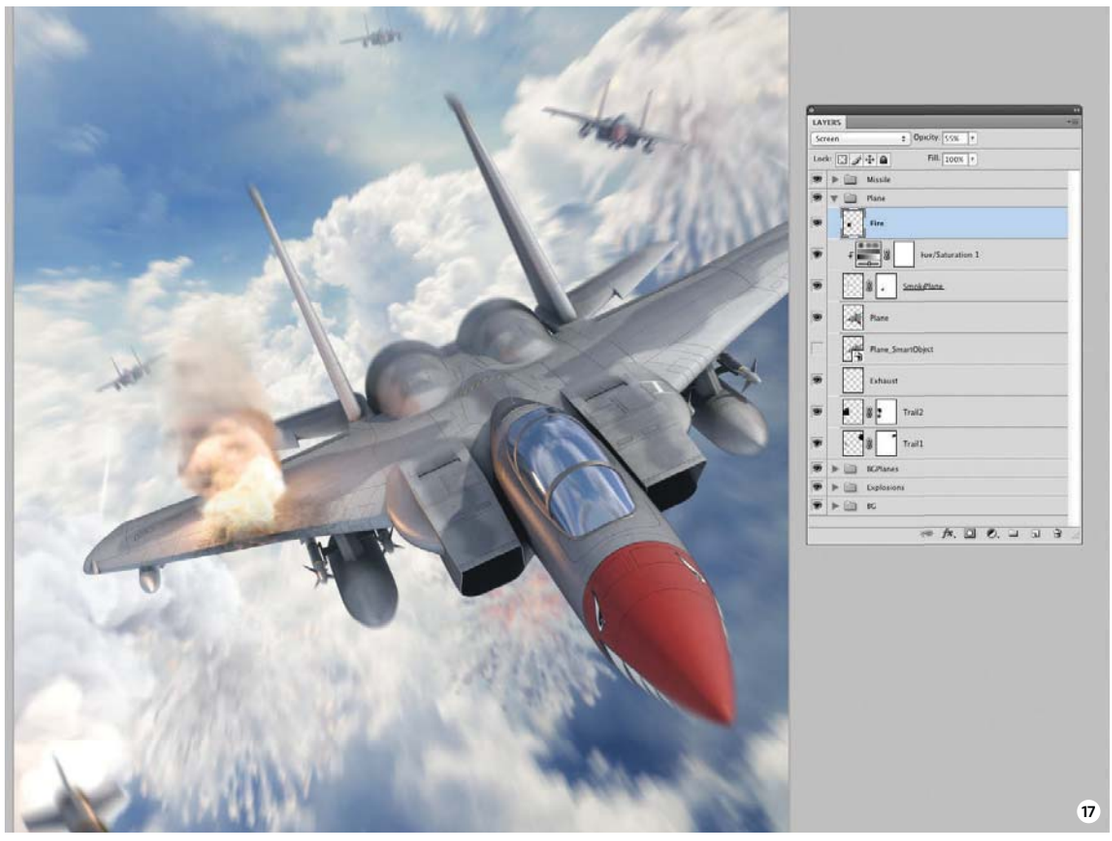
Simulating explosions

For my final scene I wanted the jet to be pursued by other fighters, among explosions and missiles. To create some explosions and missile trails I used Blender's smoke-simulation tools. I made a couple of separate files with different smoke simulations in – one for a fast-moving missile with a trail of smoke behind it, another for some smoke erupting from the wing of the jet and another for full-on explosions. The smoke-simulation tools can be pretty fiddly, so creating these in separate files will enable you to concentrate on these elements in isolation. After you're happy with the result you can combine them with the other pieces of the final scene.



17 Rendering and final composition

This final composite was completed in Photoshop. GIMP is preferred for painting textures, but Photoshop has flexible layer-management for making multilayered images. We rendered out each of the elements for the image as separate passes, while completing a small amount of compositing in Blender. We then opened all the passes as layers in Photoshop. At this point you can add aerial perspective (fading distant objects), as well as some extra motion blur. You can also tweak the colours of the various cloud and smoke layers.



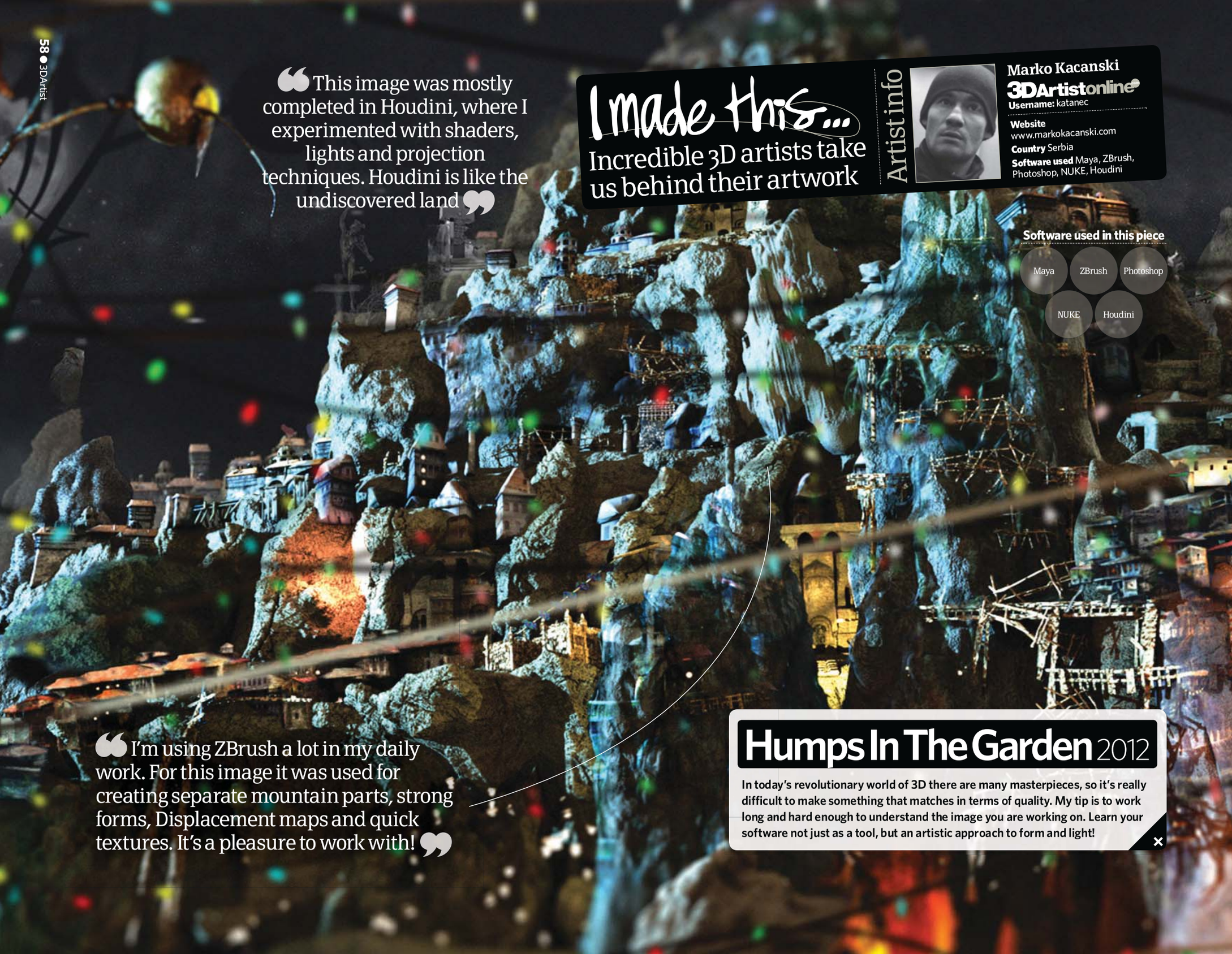
16 The lighting setup, showing the Emitter mesh below the jet, the sun lamp above and the small orange point lamp on the wing

17 Compositing the final image in Photoshop

• **DID YOU KNOW?** • All tutorial files can also be downloaded from: www.3dartistonline.com/files

I made this...

Incredible 3D artists take us behind their artwork



> This image was mostly completed in Houdini, where I experimented with shaders, lights and projection techniques. Houdini is like the undiscovered land

> I'm using ZBrush a lot in my daily work. For this image it was used for creating separate mountain parts, strong forms, Displacement maps and quick textures. It's a pleasure to work with!

Artist info

Marko Kacanski
3DArtistonline
Username: katanec
Website www.markokacanski.com
Country Serbia
Software used Maya, ZBrush, Photoshop, NUKE, Houdini

Software used in this piece

Maya · ZBrush · Photoshop · NUKE · Houdini

Humps In The Garden 2012

In today's revolutionary world of 3D there are many masterpieces, so it's really difficult to make something that matches in terms of quality. My tip is to work long and hard enough to understand the image you are working on. Learn your software not just as a tool, but an artistic approach to form and light!

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Artist info

Andy Probst

Personal portfolio site
www.meilenstein-digital.de
Country Germany
Software used
MODO 701
Expertise Lighting, rendering, rigging and animation, specialising in MODO

Master particles in MODO 701

Tutticle 2013

"Here you'll learn how to use MODO 701's new particles technology to create exciting abstract imagery"

Andy Probst CEO and TD at Meilenstein Digital

Set up your simulation

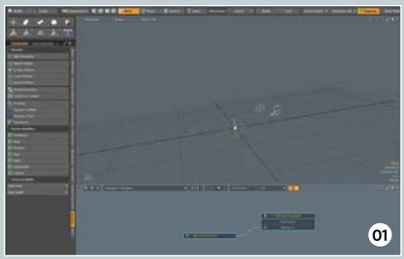
Generate and control particles

Here I'm going to show you how to create abstract art with MODO 701's new particle system, instead of using it for traditional effects like fire or smoke. These abstract shapes are all formed by the particles' movement, without the need for special modelling techniques. This makes for a very flexible and unique workflow.

A pleasing side-effect of this method is that each shape is truly individual because of the fractal nature of the particle system. MODO's node-based Schematic Editor, along with the tight integration of the particles, makes the whole process intuitive and fun to experiment with.

You can create dozens of different shapes in no time by simply adding more nodes to the Particle Simulation item and watching the result. This is a great process for creating captivating abstract art.

Since version 601 it's been possible to render curves directly, but in 701 this function has been much improved. Luxology has added a new option to render curves as polygons, including UV maps that can then be used for texturing. By applying a simple procedural texture modelling a rope is not a problem anymore, for instance. MODO generates the polygons at render time, which keeps our scene slick and fast.



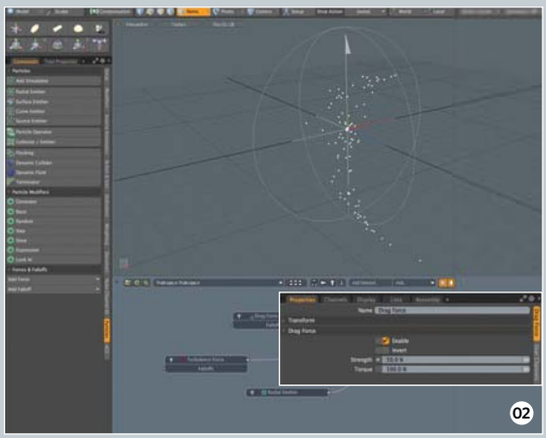
01 The Radial Emitter and the Particle Simulation in the Node view of the Schematic Editor

02 The Drag force is reduced to 50% to slow the simulation down

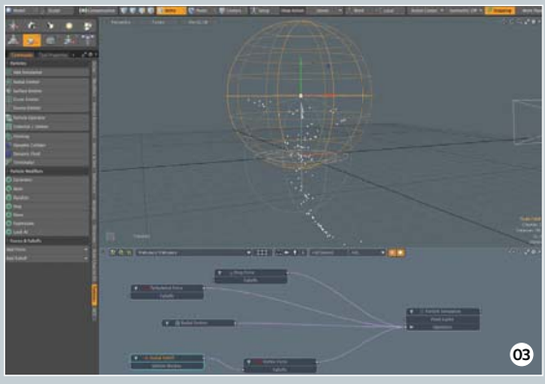
03 A Radial Falloff is added to the Vortex force to limit and control the effect

01 Create the basic system To begin we need to make a Particle Simulation item, first by going to the Setup tab. On the left side of the UI you'll find various tabs, so locate Particles and select Radial Emitter. MODO automatically adds an item called Particle Simulation to the scene, which is necessary for the simulation to work properly. Select the middle of the three green Simulation Playback buttons at the bottom of the window to run the simulation and see what happens.

02 Add forces to the simulation Feel free to use your own settings or forces, as the following is just an example. The first force we're adding is a Turbulence Field from the Forces & Falloffs section of the Particles tab. Click and hold on the Add Force button on the left and choose Turbulence. We've changed the settings of the Turbulence force to make it a bit less aggressive, as you can see in the screenshot. Again, hit the middle green Playback button to see what you get. If the Turbulence field has too much influence over the simulation, add a Drag force to slow things down.



03 Apply Falloffs Now add a Vortex field to the simulation, but ensure it only affects the region you want to define. To add a Falloff, click and hold in the Particles tab on the left, select Add Falloff and choose Radial. You'll now see the Falloff in the Item list, so connect this to the Vortex field by dragging both items into the Schematic Editor. The Falloff will take effect when its Output is connected to the Falloff Input of the Vortex. Click and hold on the small dot on the upper-right in the Falloff node and pipe it into the Vortex Falloff input.



With the Disc

Tutorial files:

- A video tutorial
- MODO scene files
- An example of a rendered abstract image

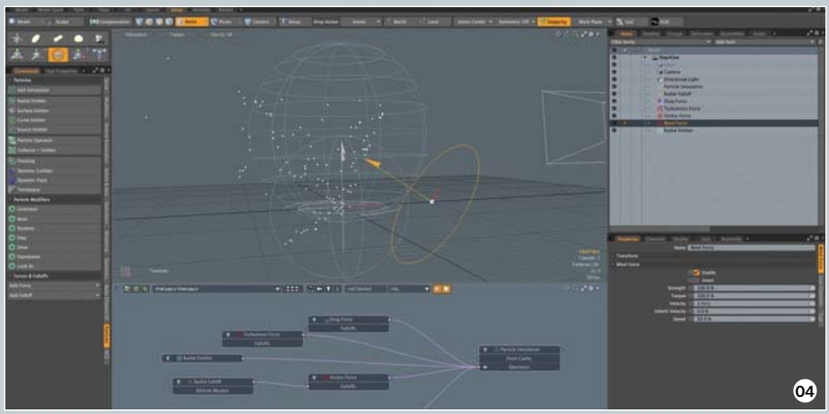
Concept

Since MODO 701 offers a particle system and the option to freeze the particles' movement into curves, my idea was to create something abstract with it. The promotional image used by Luxology for the release of MODO 701 was one of my first attempts at using this very technique.

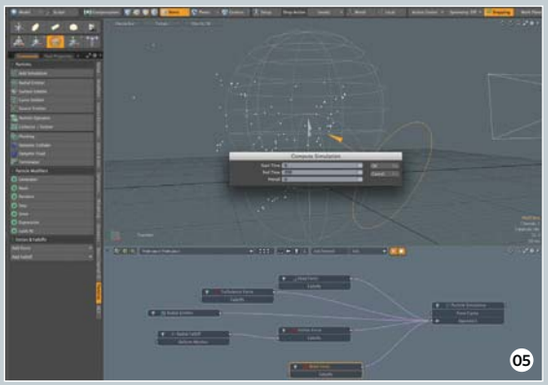
Refine your simulation

Convert the particles to curves to develop the effect

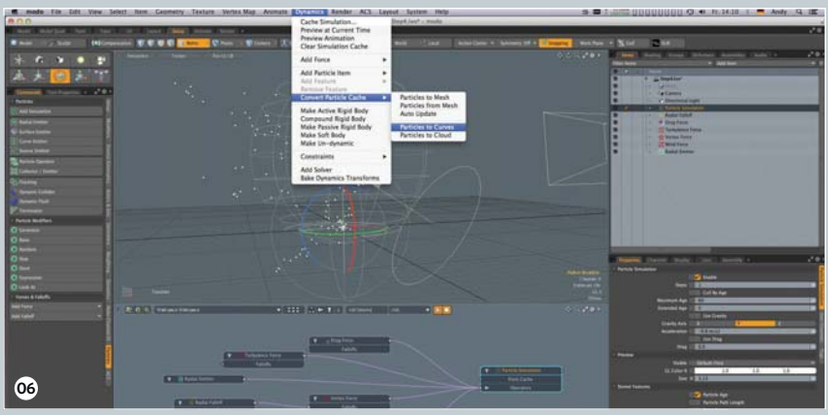
04 Enhance the particle simulation How your simulation plays out is up to you. You can add more forces and Falloffs in the Schematic Editor to get your own unique simulation. In the Item view you can activate Gravity in the Particle Simulation solver to achieve some extra movement. You can also use a Wind force instead to push the particles where you want them to be. The difference between the Wind force and the Gravity function is that you can use a Falloff to limit its effect to the area where you need it. Gravity, on the other hand, works more globally.



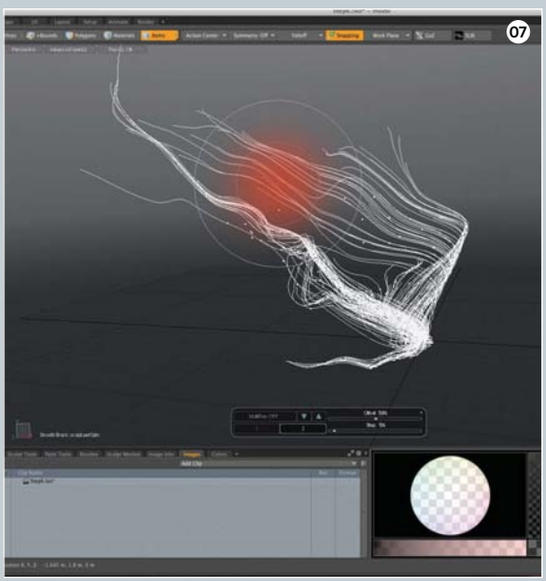
05 Cache the simulation Now that we're done with the simulation, we need to convert the particles' movement into curves. First the simulation must be stored into a Cache file, which can be used by the converter. To do this, click on the Cache Sim button that's to the right of the three green buttons in the lower-right of the interface, below the timeline. Now choose how many frames you want, here we've cached the simulation from frames 0 to 200.



06 Convert the Particle Cache Now we have a cached particle simulation that can be converted. Select the Particle Simulation item in Item Tree and choose Convert Particles Cache from the Dynamics dropdown in the top navigation bar. The option Particles to Curves is the one we need. Depending on how many particles you have running in your sim, it takes just a few seconds or a couple of minutes to generate the curves. When the converter is done, you'll see the new curves in the 3D view. If you don't like the shape, just delete it from the Item view, rearrange your simulation and convert it again. Don't forget to cache the sim first or any new conversion will fail. It usually takes several attempts to get a shape that's satisfactory, so just keep experimenting until you're happy with the result.



07 Sculpt the curves The converted curves are standard MODO Mesh items, which means that you can change their shape using MODO's modelling tools. However, there's also a special sculpting mode for the curves that makes changing the shape an easy and creative task. If you'd like to try the sculpting tools, just hop over to Paint and select the Particle Tools tab to let the sculpting party start. Remember, changing the shape with these tools will offset the curves from the original particle simulation that's still there.



Sculpting particles

MODO 701 offers an option to directly define the particles' movement before you convert them to curves. You'll find this option in the Particle Tools tab under Paint. This function is called Particle to Mesh, which converts the particles' movement to polylines that can then be sculpted. Next you have to convert the polylines back to real particle movement with the Particles from Mesh function.

04 Here the Wind force is being added to the simulation

05 The Particle Cache can be converted to curves over a defined frame range

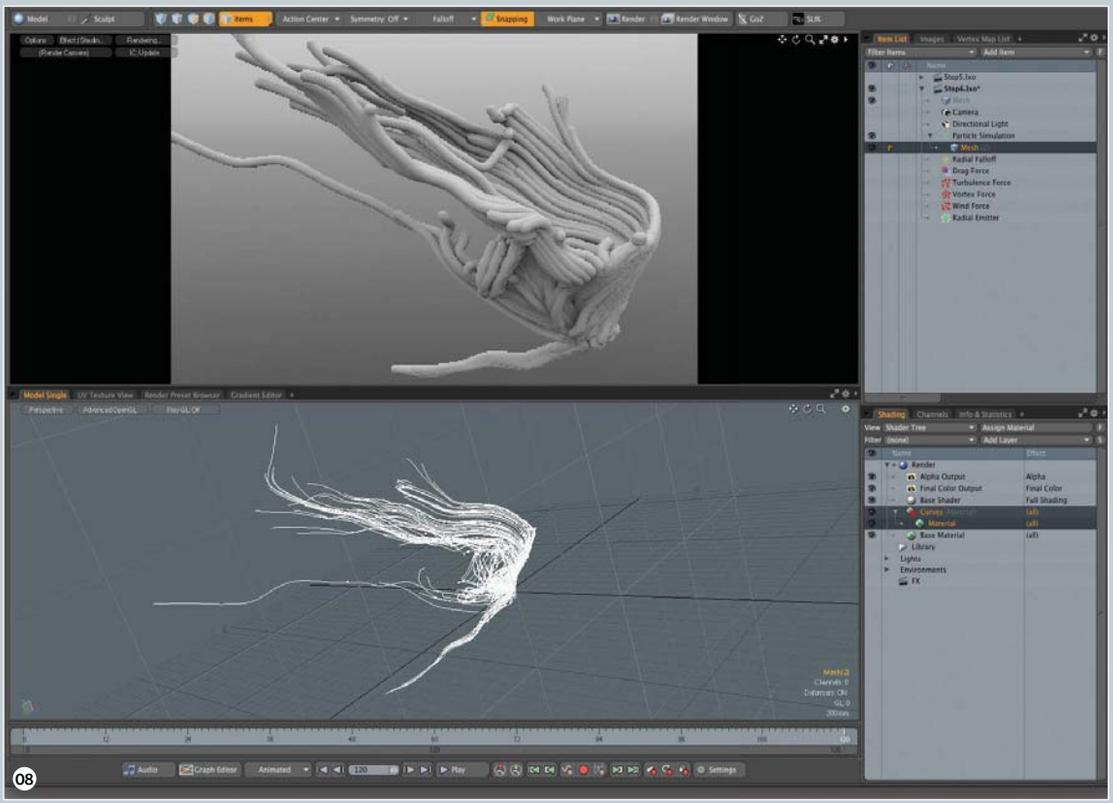
06 The Particle to Curves function converts the Particle Cache into curves

07 Curves can be sculpted in Paint with the particle tools

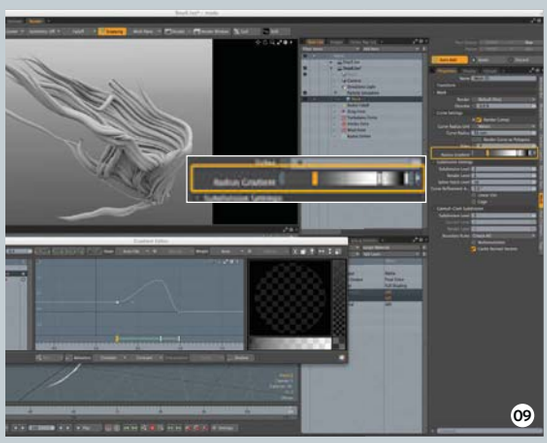
Begin to render

Quickly render your curves without extra modelling

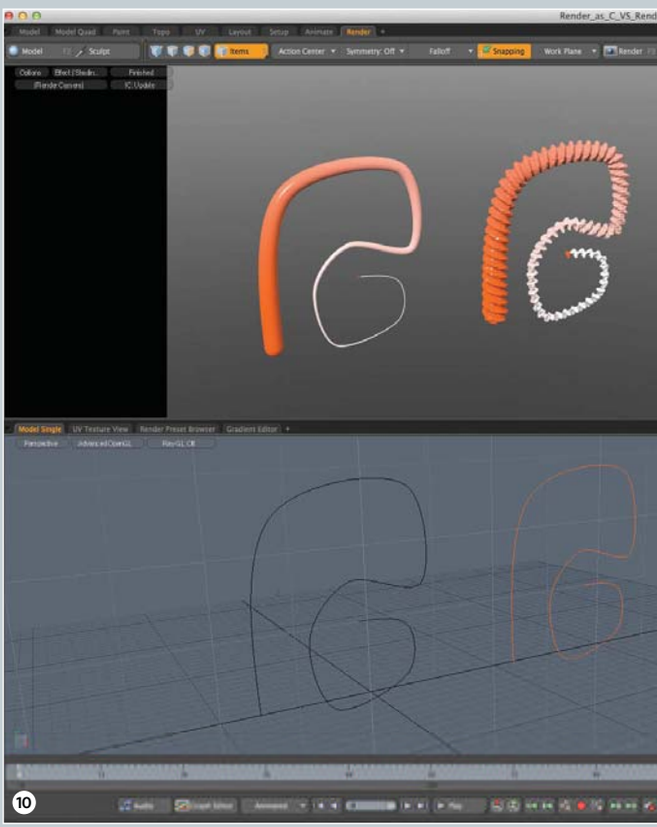
08 Render curves Now that we have the curves, we need to tell MODO that we want to render them. In the Item or 3D view, click on the curves in Item Selection mode to select them. On the right side of the Properties panel, you just have to activate the Render Curves option to see them appear in your preview. Now you can choose if you want to render the curves as polygons or not. If they're rendered as polygons you'll be able to apply some displacement. If you don't need displacements in you render, just render the curves normally. To shade them with a material of your choice you have to create a material tag. To do this, select the curves and hit M. This will create a new material for them.



09 Control the radius One of the cool new features for rendering curves, besides the Render Curve as Polygons option, is Radius Gradient. This function enables you to control the radius of any curve at a defined position. You'll find this option in the Mesh properties>Curve Settings of your item. To edit the gradient, just click on the small white arrow on the right of the Radius Gradient and a new window will open. The Radius Gradient works like any other gradient in MODO. You can create more keyframes using the third mouse button, the Y-axis defines the size of the radius and the X-axis dictates the position. In this example we have kept these curves small in the beginning, bigger in the middle and then small at the end again.



10 Convert to polys The difference between having the Render Curve as Polygons option activated or not is the way you have to map the textures. When Render Curve as Polygons isn't activated, you can take Implicit UV as the texture-mapping process and use the V-axis for the vertically flowing texture on the curve. Activating this option requires an empty UV map for proper texturing and uses the U-axis to have a texture or gradient applied in the same way. Next we'll be using both methods for texturing the curves.



08 The rendered curves as seen in the preview

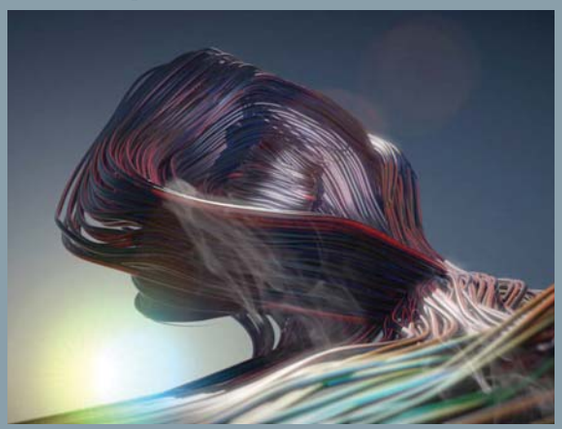
09 Controlling the radius of the curves in the Gradient Editor

10 The same curve rendered with the poly function on the right and without on the left

Artist Showcase

Andy Probst

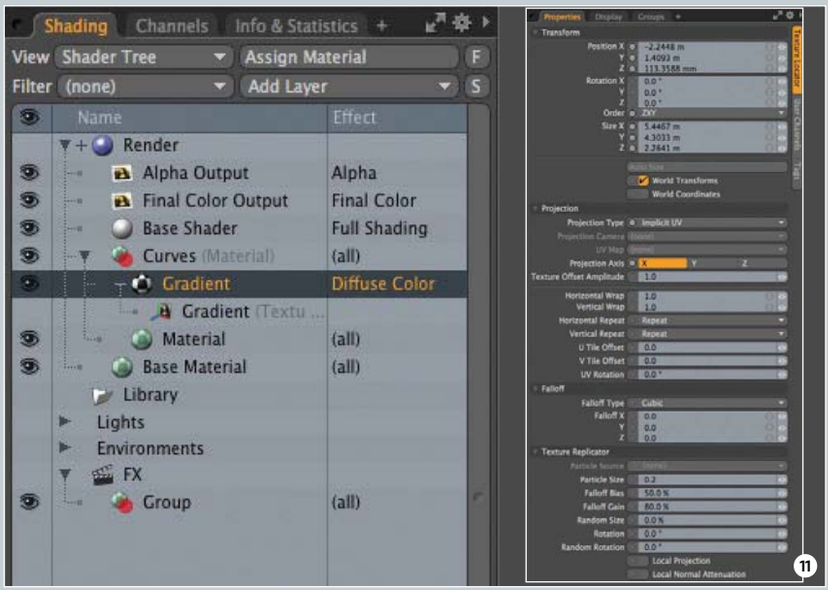
Andy has been working in the CG industry for over 14 years. Like many artists of his generation he started on the Amiga system and later switched to TDI Explore and Maya on SGI-Workstations. He's now CEO and technical director at Meilenstein Digital in Germany. Besides this he also teaches MODO and Maya in on-site workshops all over Europe.



Curve Head **MODO 701, NUKE 7 (2013)**
This image wasn't entirely planned, I only had a rough idea in my head. Using and accepting the randomness of a particle system was inspiring on one side and gave me place for more ideas on the other

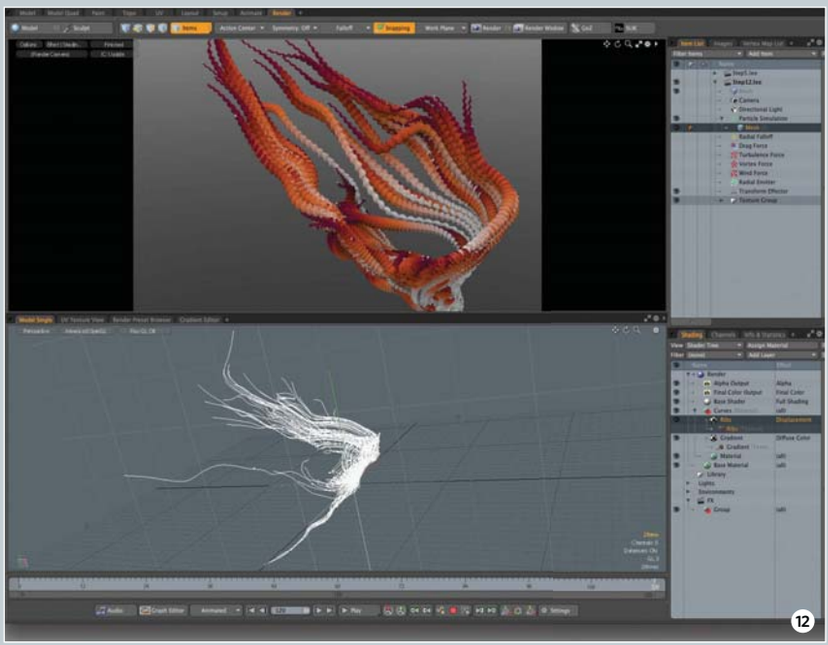
Particle Flower **MODO 701 (2013)**
This shape is a prime example of the different types of effects you can achieve using MODO 701's particles. The most fun part of this process is playing with the settings – so be sure to experiment!

11 **Add shadow with textures** Now select your curves' material and add a new gradient to the Diffuse channel. Grab the gradient in the Shader Tree and switch over to its Properties panel. Here you should change the Input parameter of the gradient to Texture V. Now hop over to the Texture Locator of your gradient and change the Projection Type to Implicit UV.



Final adjustments

Unify your elements and render

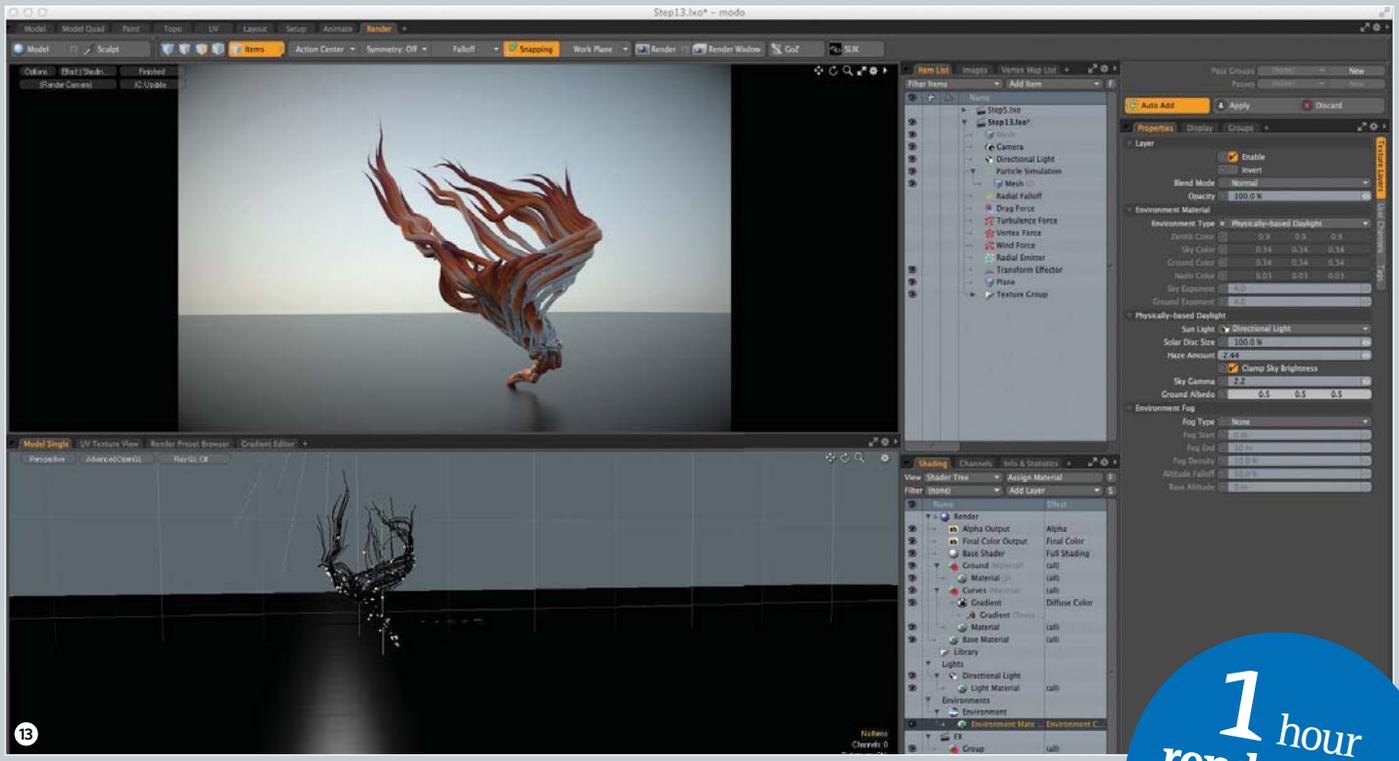


12 **Render with or without polygons** If you want to use the Render Curve as Polygons option, you have to make a UV for the curves first. Create a new UV in the UV section, go to the Lists tab on the right side, then add a new one by selecting the small black arrow on the left of the UV Maps option. Leave this as its default name (Texture) and go back to the preview, as we just need an empty UV texture and don't need to unwrap anything. In the Shader Tree you now have to change the Input parameter of the Gradient from Texture-V to Texture-U and the Projection Type from Implicit-UV to UV-Map. Don't forget to select the correct UV texture.

13 Build the environment and set up the lights In this example we won't use the Render Curve as Polygons option for the final scene because we don't need any displacement and the render will be a faster without it. For the lighting, add the newly upgraded Physical Sky and Physical Sun options by selecting your standard Directional Light and activating the Physical Sun button. Do the same in your standard Environment by changing the Environment Type to Physically-based Daylight. You can also activate the new Vignette effect in the Final Color Render Output (495%) to get a more pleasing result. For the ground you can use a simple plane with a black tone and blurry reflections.

Rendering as polys

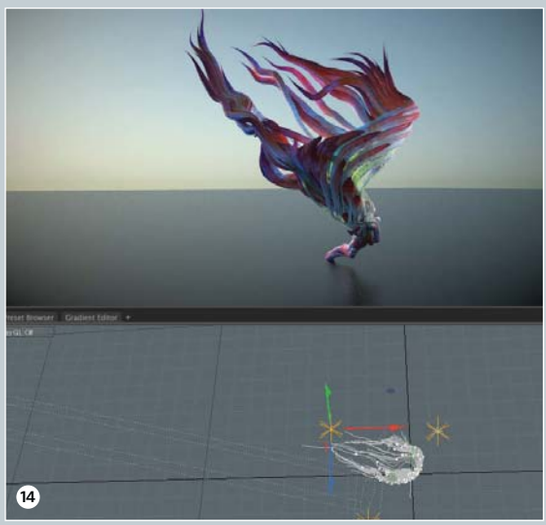
Render Curve as Polygons is a great function to enhance curve renders even more, but keep in mind that this function takes some extra rendering time and memory on complex scenes with many curves. In fact, MODO's renderer has to deal with quite a lot of data, so I only activate this function if I really need displacements at the end.

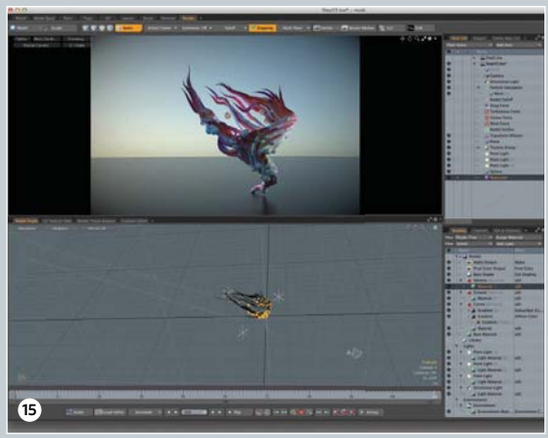


14 Add more lights to the scene Now include three more Point lights to better highlight the shape and use subsurface scattering on the curves material to get a more organic look. Another gradient to control the subsurface tone can be added in the Shader Tree. You can reduce the Specular amount on the ground plane's material, as we don't want any highlights on the ground. If the curves look rough in the render, increase the quality by making the Curve Refinement Angle lower than the original 5 degrees.

15 Particles and replicators are your friends To finish, apply some replicated items to the scene using the Particle Simulation item that's still available. For this we need something to replicate, so just use a sphere. Change to Setup and drag your replicator into the Schematic Editor. Connect the Output (the small dot on the upper-right corner of the Particle Simulation node) to the Particle Source of your new replicator. Drag your sphere into Schematic Editor and connect it to the Prototype slot of the replicator. Now you can render an Animation or choose a frame you like. Once you've adjusted the replicator's setting to your needs, you've finished your abstract render!

1 hour render time
Resolution: 6,000 x 3,500





11 Implicit UV and Texture V as the Input for the gradient

12 The Render Curves as Polygon function in action, with a procedural disaplacement texture added

13 Physical Sky and Physical Sun to light the scene

14 A render with the additional lights and the enhanced material on the curves

15 You can add a replicator directly in the Schematic Editor without leaving it

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Artist info

Marco Di Lucca

Website www.facebook.com/marcodilucca

Country US

Software used Maya, Mudbox, KeyShot

Bio Born in Italy, Marko is currently working at ILM in San Francisco

Software used in this piece

Maya | Mudbox | KeyShot

Self Portrait 2013

This image wasn't intentionally planned. I was testing skin rendering in KeyShot for the past few months and I found myself modelling my own head. Eventually, even though I never thought of taking it this far, I ended up texturing it, adding facial hair and rendering it in all different sorts of lighting environments.

> The most important components in skin-shading are the diffuse, specular reflections and the subsurface scattering, which effectively simulate the actual translucency of the skin

3ds Max | ZBrush | Photoshop | CrazyBump | xNormal

Step by step

Easy-to-follow guides take you from concept to the final render

Artist info

Gavin Goulden

Personal portfolio site www.gavimage.com

Country USA

Software used 3ds Max, ZBrush, Photoshop, CrazyBump, xNormal

Expertise Gavin's main focus is on character art (modelling, texturing and rigging) for all videogame platforms

Build props for game characters

Spacegirl 2013

"Combine a range of 3D software to create a game-resolution asset, then apply it to a fully rigged videogame character"

Gavin Goulden was the lead character artist on *BioShock Infinite* and has contributed art assets in the past to titles such as *Dead Rising 2*, *The Bigs 2*, *Dragon Age: Origins*, *F.E.A.R. 2* and *Damnation*

Over the next few steps you'll learn all of the essential techniques for creating static mesh props for your in-game characters.

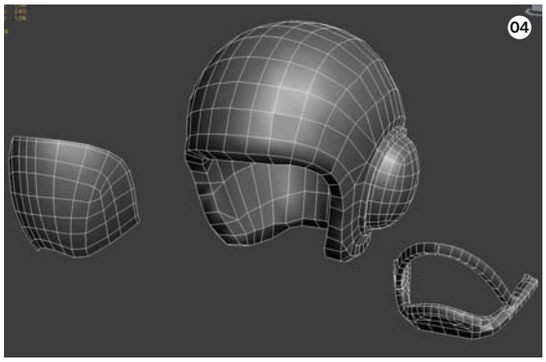
In modern videogames props are often used to help break up repeated assets and are applied as attachments to build a modular character. They can also be included in the game to communicate a potential change in a hero character. Here, by following a quick overview of my process, you'll be able to walk away with a helmet asset that could be used to give your final renders personality. You will find the texture maps used for this tutorial, as well as ZTL and FBX files, supplied with this issue, so you can follow the steps.

Initial modelling

Move from the base to a high-res result

01 Establish a base mesh To begin, load up the rigged character that this prop will belong to. Here we have a battle-experienced space explorer (created in issue 53) and she needs a helmet! Using her head and face to guide the detail, we can start modelling in the larger forms, using the Edge Extrusion method in 3ds Max. Generally I work with Symmetry activated, merging the two halves and then adding asymmetrical detail if required.

02 Get a high-poly model Now bring the helmet model into ZBrush and subdivide it a few times. This asset is pretty straightforward, as it has elements of a WWII fighter pilot and relies a lot on surface detail. With this in mind, sculpt in a few vents and smaller details that hint at helmet functionality. Features like bolts, clasps and seams that indicate manufacturing all add to the aesthetic.



01 Don't get hung up on details, a good base mesh is about clean topology and a strong starting point

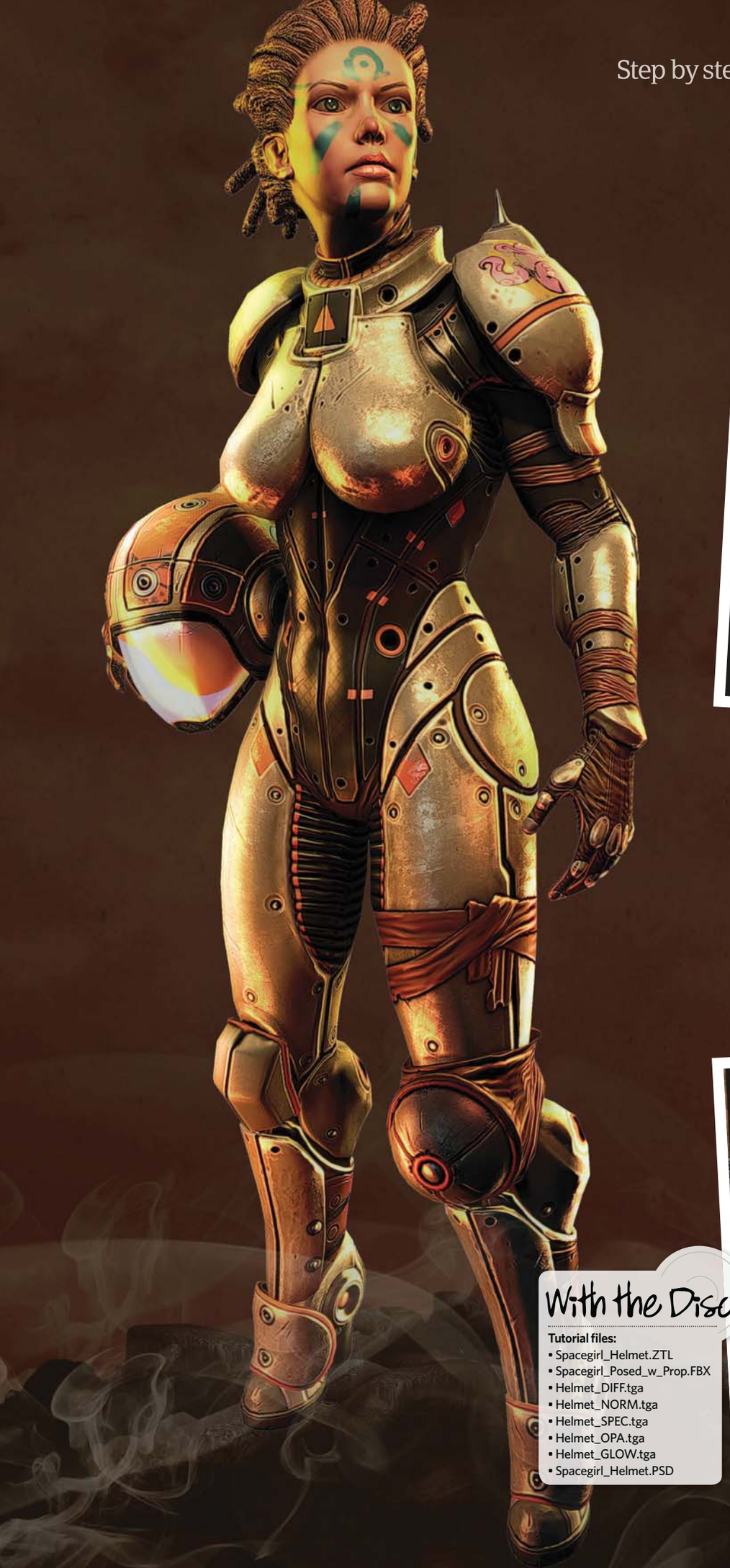
02 For this high-res model, a lot of the details will just be on the surface level – not a lot of big shapes will be added

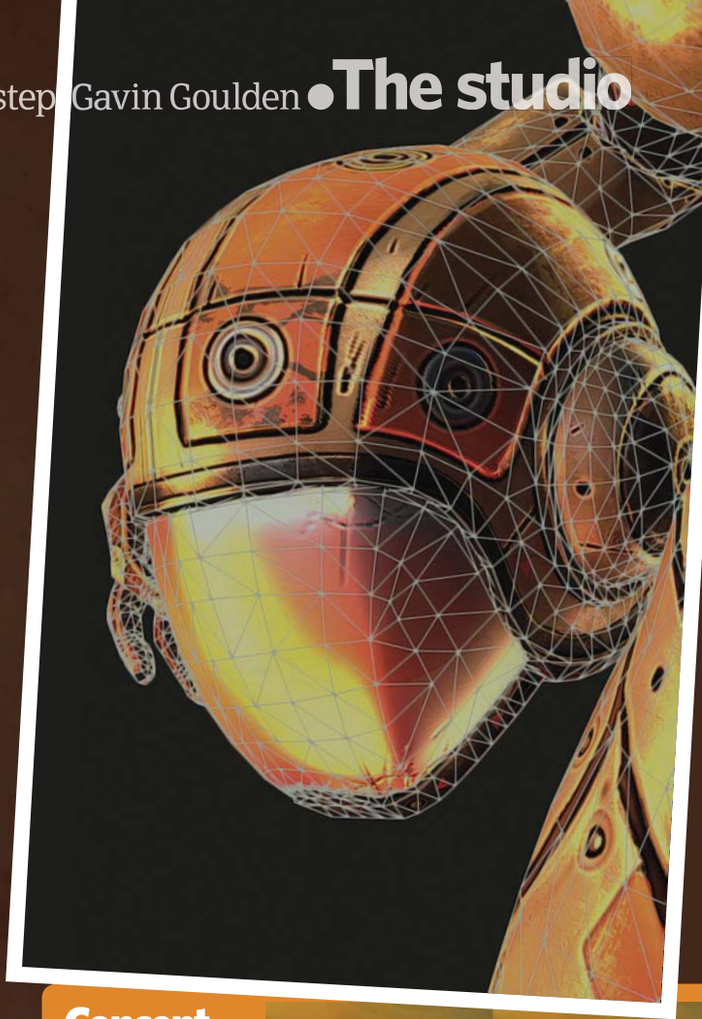
03 Applying small details like scratches and scrapes can give a boring surface some points of interest

04 This version of the model will be the final asset seen on the character, try to keep the mesh as light as possible

03 Include wear and tear Once you're happy with the high-resolution model, create a new layer in ZBrush and begin adding small scratches and dents in the surface. This helps break up flat surfaces, informs materials and gives the model some character. Here I've added some cracks to the glass and any other damage the character may have received.

04 Achieve game-quality resolution After adding some finer surface details, export a lower subdivision version to 3ds Max and begin building over the top of it for the game-resolution version. The main rule here is to follow the shape of your high-resolution model while intelligently laying down edges so as to not create an insanely dense mesh. Here I'm reusing a lot of my base mesh with some final tweaks. However, I'm still keeping the visor separate, as I'll need to hide and reveal it to view what is underneath.





Concept

This concept created by Jorge Lacera (@jlacera and www.lacera.blogspot.co.uk) helped depict different takes on what a helmet for the Spacegirl character could look like. I went for the first option. You can find an explanation of Jorge's process in issue 53, page 52 of 3D Artist.

With the Disc

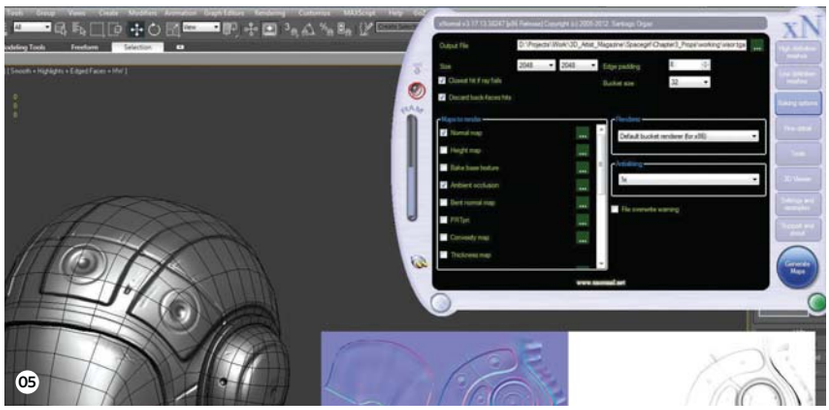
Tutorial files:

- Spacegirl_Helmet.ZTL
- Spacegirl_Posed_w_Prop.FBX
- Helmet_DIFF.tga
- Helmet_NORM.tga
- Helmet_SPEC.tga
- Helmet_OPA.tga
- Helmet_GLOW.tga
- Spacegirl_Helmet.PSD

Apply textures

Build maps to bring your asset to life

05 Bake out the textures Now that the low-res model is done, it's time to transfer information from the high-resolution version to the lower one. I prefer to generate Ambient Occlusion and Normal maps using xNormal. Simply navigate to the High Definition tab, load the models you wish to use as targets, then navigate to the Low Definition tab and select the low-poly models you need to generate textures for. You can set the Raycast limit – which is the maximum distance the program will search for high-resolution detail – and what type of edge information you would like (preserving smoothing groups or not). Once everything is ready, navigate to the Baking Options tab, select the type of maps you need, the size and the destination for the saved files. Click Generate Maps and your chosen textures will be generated quickly.



06 Block in colours When painting textures in Photoshop I like to start with broad strokes and refine as I go along. The first step is to identify major materials and paint them in while using different tones. Generally I keep this as a separate layer at the beginning of my PSD to help create masks or quick selections in the future. A major element in making a model interesting is breaking up the material – even if it's made of the same substance, such as metal in this case. Adding paint or an unfinished version of the metal can make a world of difference to detail.

Tell a story with details

Everything should be a choice when creating a videogame character, so you should be asking yourself questions about details every step of the way. Where has this character been? What do they do? For this Spacegirl, I needed to keep in mind that she has been through a lot. Her armour isn't factory new and she has certainly seen battle. Knowing this information helped inform my texture work when adding battle damage like scars and field medical treatment. These small details tell a story and subtly inform the viewer about your character. Before applying wear and tear to the model, or haphazardly adding decals and logos, ask yourself if these details align with your character's history and personality.

05 xNormal is a very light program that can generate useful maps in seconds

06 Block out colours of different materials early on to help with quick masks

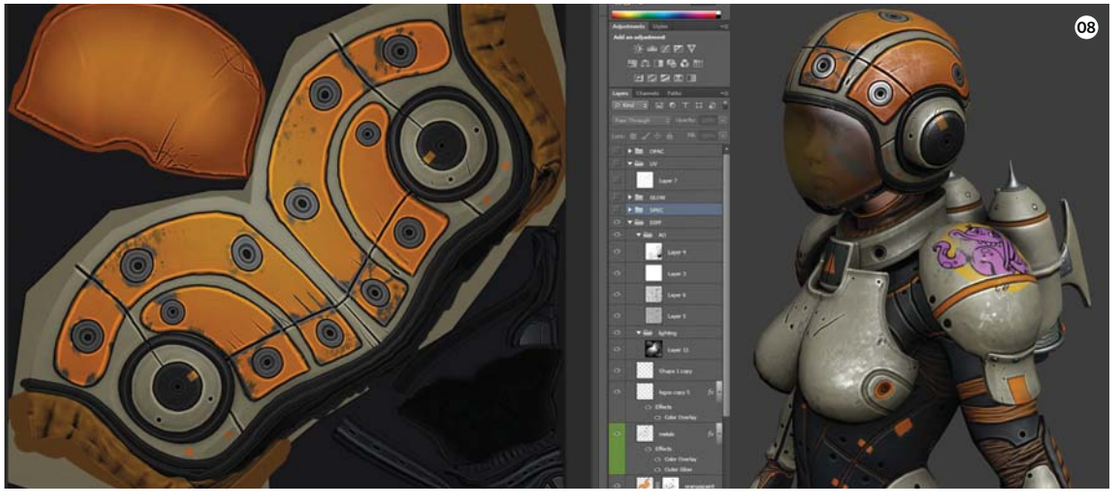
07 Add Cavity and Lighting maps to break up surfaces and ground the texture

08 Use masks rather than erasing information to help save time during iterations

09 Apply specular information to show surface-breakup in your materials, don't just rely on diffuse information

07 Lighting and Cavity maps I like to generate a few extra maps to assist with texturing. From 3ds Max I like to create a Directional Lighting map, which is essentially a Normal-mapped low-poly model with a ring of Omni lights above it. The resulting texture from Max's RTT will be lighting information on the surface. Overlay this texture on your Diffuse map to help pop out bigger shapes with broad highlights. From CrazyBump I like to create tight Cavity and Specular maps that will help black out creases and pop out finer edges.

08 Layer on damage Next make the paint layer that will give this helmet its personality. By beating it up a little, the asset will really start to show its age. Rather than fully committing to the damage, you can tackle it using a layer mask. This means that, rather than erasing information and painting it back in if a mistake is made, the mask can control the visibility. This can also come in handy during production if you ever need a cleaned-up version of the asset that's unplanned.

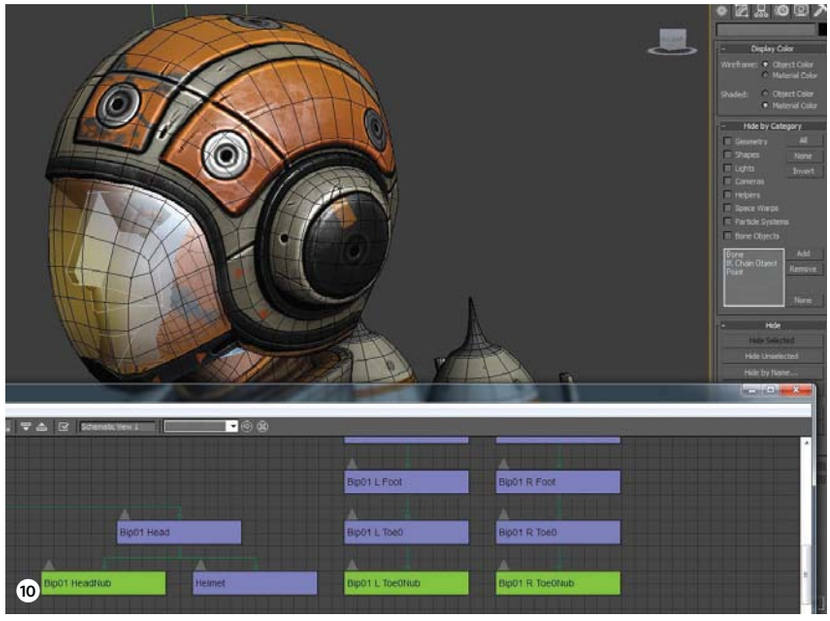


09 Create a Specular map

A Specular map tells the surface which parts are matte and which are fully reflective – with every note in between. For this material you'll want to give the paint and base metal slightly different properties, while creating a range of spec values to indicate grime and age. Obviously a helmet that has either been with this character or lying around from a fallen soldier shouldn't be factory new and totally clean. As such, without adding tons of dirt in the diffuse, specular variation can break up the surface and indicate smaller details that affect light, such as smudges, grease and scratches.

Finish with rendering

Incorporate your prop into a final scene with your character

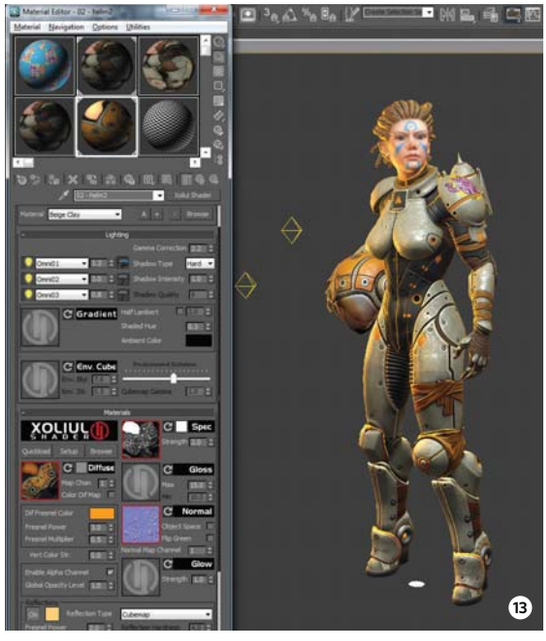


10 Rig props to the character In most cases you will want to bind your prop to the character you have created it for. This can be handled in different ways for various game engines, but for this example we can just grab the head and skin it to the character's head bone using the 3ds Max Skin modifier. Alternatively, to mimic a true static mesh attachment, you can grab the helmet and Link it to the head bone – or palm if you want the character to carry it.

11 Set up materials using viewport shaders To view my textures in the 3ds Max viewport, I like to use the Xoliul shader (**www.viewportshader.com**). It's free, easy-to-use and mimics all of the features a game engine may have pretty accurately. After you have installed it, navigate to the Material Editor and change the Material Type (most likely from Standard) to Xoliul. From here it's as easy as plugging your textures into the appropriate slots and assigning the material to your assets. In this example, I've included one shader for the character and another one for the helmet.

12 Pose your character Once your materials have been set up, it's time to pose out the character. Since you bound the props to the model's rig, everything should follow along with it. The final pose is totally up to you, though an important thing to keep in mind is readability and whether or not the pose is within character. Most of the time I prefer to pick something neutral. In this case I made a few examples of ways this prop could be incorporated into the rig.

13 Set up your lights To take your materials further, the Xoliul shader can detect up to three lights in your scene – all of which can be individually tweaked. Simply place three omni lights and – in the Xoliul shader you have created – select the lights in the dropdown menus. You can then tweak these within the material itself to reach your desired effect. Generally, I use a key light, two fill lights and the fresnel built within the shader to mimic some backlighting.



Economical props

It's common in today's games to use props to achieve cheap variation among NPCs and the general population. A crowd can easily be broken up and the illusion of unique models created by randomising attachments on a character. Things like armour plates, helmets (such as in this tutorial) and backpacks can be an easy and affordable way to quickly turn one character into an army.

Generally these assets are quicker to create and are lighter on memory for the game to load. For example, rather than loading 5MB of skeletal meshes to get a few different enemy models, you could create one base model and add attachment sets for half of the memory cost and possibly more variation – especially when combined with texture changes.

10 You can either Bind or Link props to bones or locators within your character for posing and animation

11 The Xoliul shader is a great tool for quickly setting up materials to accurately mimic game engines

12 When selecting a pose, make sure that your props can be properly aligned to the character model

13 Try applying a simple three-point lighting setup to help bring real personality to your result

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Artist info

Bogi Piroth
3DArtistonline
Username: mikkamakka
Website www.mikkamakka.com
Country Hungary
Software used Maya, ZBrush

Software used in this piece

Maya ZBrush

"Along with good reference, it's a good idea to try the pose yourself before starting to work. Find the centre of gravity to balance the pose, try to feel how your bones and muscles move, flex and bend. Use what you learn on the sculpture"

"For the fur I used the Slash tools because they make nice undercut forms, which is good for defining independent strands. I also use the SnakeHook tool here and there for the spiky strands"

Roaring Bear 2013

As I have become very familiar with human anatomy in my professional work, I decided to set myself a new challenge and study animal anatomy in my spare time – which I find extremely beautiful. In the case of this bear, my goal was to create an image where I captured not only the subject's outer appearance, but also its character and essence.

Mudbox mental ray

With the Disc

Tutorial files:
- Tutorial screenshots

Concept

This bust was created in Mudbox 2014 from a very simple base mesh (a modified default Basic Head). By exploring Mudbox 2014's various retopology tools, we can produce impressive meshes with animation-ready edge flow.

Step by step

Easy-to-follow guides take you from concept to the final render

Artist info

Craig Barr

Personal portfolio site www.area.autodesk.com/blogs/craig

Country Canada

Software used Mudbox and mental ray for Maya

Expertise Modelling, sculpting and texturing

Retopology in Mudbox

Old Man Bust 2013

"This simple bust of an elderly man was created to illustrate the benefits of Mudbox's new options"

Craig Barr is a technical specialist for Autodesk – Modelling and Animation

Autodesk Mudbox 2014 provides a powerful and easy-to-use retopology solution. It's now easier than ever to create freely without worrying about the underlying topology or structure of the geometry. You simply sculpt, refine and generate a new retopologised mesh.

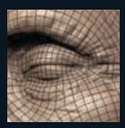
Here we'll examine how easy it is to create a mesh retopology with Mudbox. This workflow enables a very fast and simple automatic retopology solution, as well as a curve-guided approach to define a specific edge flow for a mesh.

In this specific example we'll look at the different options available to produce the mesh retopology of a bust; in this case that of an elderly man.

01 Use the Marking menus in the Mudbox viewport to greatly speed up your workflow

02 The default settings for automatic retopology

03 A new model output with automatic retopology (Left: top subdivision Level 5; right: base Level 0)



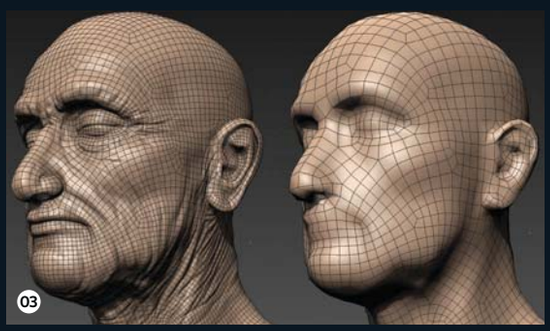
Automatic functions

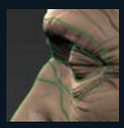
Begin with the default settings

01 Select your mesh In Mudbox the mesh that's currently active is considered selected for most operations you can complete. You can activate a mesh by simply Ctrl/right-clicking over it. Inversely, you can Ctrl/right-click and pick Select Model (or swipe down in the Marking menu) to select the current model. You'll find this is a useful operation if you're working with several objects at once in the viewport.

02 Set a Target Base Face Count Go to Mesh>Retopologize>New Operation. By default Use Curves... is selected, but this will be ignored if no curves are associated with the mesh. Set a desired Target Base Face Count (in this example we're using the default of 3,000) and hit Retopologize. The process is quite fast and, depending on the density and complexity of the mesh (as well as the hardware you're using), you should have your result within a few minutes.

03 Examine the results By default, the Sculpted Detail option will be toggled on and transferred to this new mesh. The result is a quadrangulated mesh with subdivision all the way up to the top level, so step down to Level 0 with the Page Down key. You can also hit the W key to see the wireframe of the base retopologised mesh.

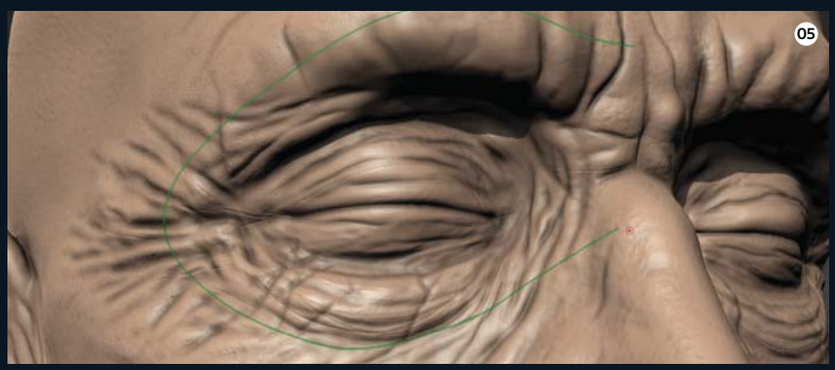




Manual adjustments

Achieve unique deformation for animation

04 Use Mudbox's Create Curve
As part of a computed retopology operation, you can draw curves as constraints to make a mesh more ideal for deformation. Go to the Curve Tools tray and select the Create Curve tool. Draw on the original mesh to see how the curvature follows the surface and becomes live (these curves will follow additional sculpting).



05 Capture more details The Create Curve brush's Size value matches the density of the curve. For finite details (wrinkles, scales and so on), use a very small, tight brush. Hard Constraint curves will follow details at the highest level of subdivision. Holding down Cmd/Ctrl triggers the Erase Curve tool, which will cut and create new curve segments, while Shift accesses the Smooth Curve tool. This is useful for cleaning up unwanted jiggles or the overall curvature.

06 Mirroring and attaching curves Now turn Mirroring on to create symmetrical curves. This is useful for outlining the eyes as well as joining large features like the eye mask and mouth. Start drawing at the top of the large features and, as you near the line of symmetry, an orange line will appear previewing a connection. Simply let go and the curves will join. Now Ctrl/right-click on the curve and select Close Curve.

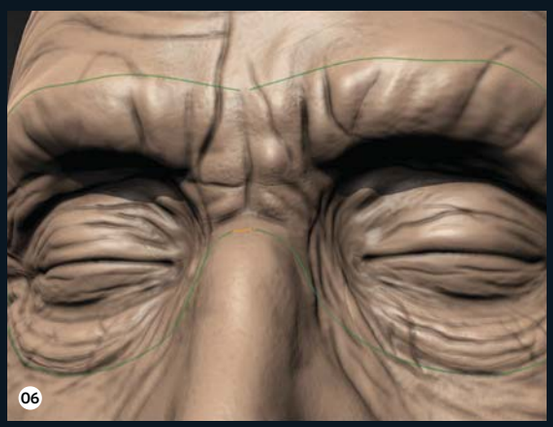
07 Review your progress Define the loops within the eye sockets with Mirroring on, then add a simple mask around the eyes and a generic loop to help define the nasolabial fold. Form a shape around the mouth, draw a curve around the outer edge of the face and use the orange preview line for connecting. Also define lines at the corners of the mouth and eyes to establish edges for deformation.

Use curves to create edges

If you have a specific area where you require defined edges, you can easily draw and define a curve as a Hard Constraint. Curves do not need to be closed loops and can sit anywhere on the mesh. Intersecting other curves is a great idea for areas like the corners of the mouth or eyes, as it can help define good edge flow for animation. Placing open curves as Hard Constraints with a very small brush is an excellent way to define features such as wrinkles!

Repairing bad geometry

When using data from scans or other sources, the geometry can be low quality. Mixed topology and unwanted holes and artefacts are a few issues that are traditionally time-consuming to clean up. Luckily Mudbox provides simple tools to deal with bad geometry. Under the Mesh menu you'll find a very efficient solution. Reduce Mesh provides clean mesh reduction, while preserving the volume of the mesh accurately. Hit the Delete key to remove faces and pick the Patch tool to fill unwanted holes. Other tools such as Fair Selection (which relaxes a selection based on surrounding faces) and Tighten Selection (which flattens the faces) are quick ways of keeping the mesh clean.



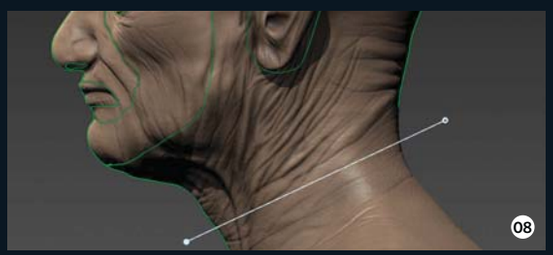
04 The Steady Stroke tool helps create smooth curves

05 Use a small brush size to capture more finite surface detail for guided retopology

06 The orange highlight previews the attached curves

07 Make a layout strategy to help define the edge flow

08 Use Curve Loops to define a centre line and the neck. Go to View Cube>Right and select Orthographic to freely place the neck curve



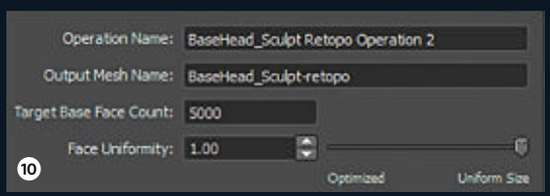
08 Apply Curve Loops Now select Curve Loops In the Curve Tools tray. This tool is very handy for creating curves that flow across the surface with a single click. They can be applied by snapping to axes planes, or by slicing freely across the surface. You can use these curves to define straight edges, lines of symmetry or for the quick creation of repeated Curve Loops.

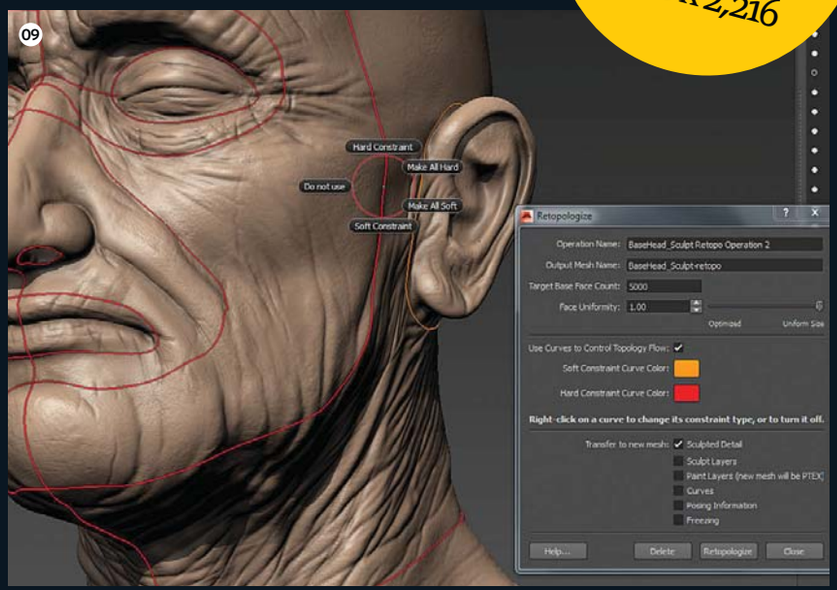
Refine the flow

Finish with constraints and further details

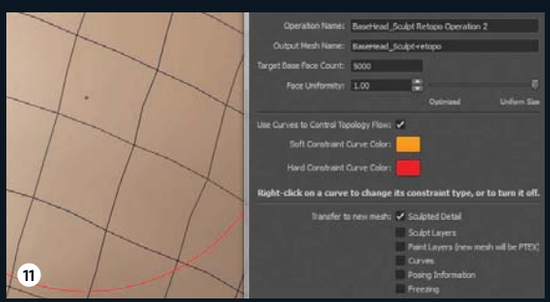
3 minutes render time
Resolution: 1,800 x 2,216

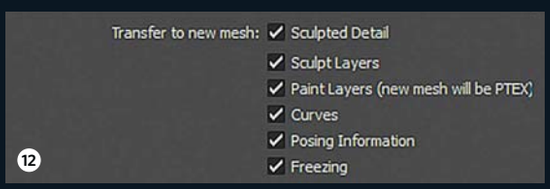
09 Control the topology flow Now go to Mesh> Retopologize and select New Operation. Mudbox enables us to define curves as topology constraints: Hard Constraints (red curves) are used to define areas where specific edges are required, while Soft Constraints (orange) are used for suggesting the direction of the edge flow. By default the curves will appear as orange Soft Constraints, but in the viewport you can Ctrl/right-click on one to define its Constraint type. Ctrl/right-clicking on a curve also enables all curves on the mesh to be defined as a Constraint type (select Make All...) or to be excluded from the operation completely (select Do Not Use). For this example, we're defining most curves as Hard Constraints.





10 Target Base Face Count Now we can set the target resolution of the new mesh. Mudbox can output very low base meshes, so feel free to explore different Face Counts. The program can also handle very dense meshes, so there's no need to reduce beforehand. For the guided retopology output of this bust, we're using a Target Base Face Count of 5,000.





11 Tweak Face Uniformity By default Mudbox retopology will output a mesh with uniform quads. Adjusting the Face Uniformity slider enables you to influence how much the face size will vary across the generated mesh. The more the slider is adjusted towards Optimized (or 0), the more accurate the reproduction of the shape of the output mesh, but with non-uniform faces. This is especially useful for models that have plenty of finite detail, like wrinkles, warts, spikes, scales and so on.

12 Transfer the details The checkboxes at the bottom of the dialog box specify details that can be transferred from the original sculpted mesh to the newly generated mesh. By default, Sculpted Detail is toggled on. This setting will subdivide the new mesh to the top level of subdivision in order to preserve sculpted detail. Turning this toggle off will only generate the base mesh. The Sculpt Layers option from the original mesh can also be toggled. Turning on Paint Layers will transfer all of these per-channel to the new mesh. The new mesh will be prepared as PTEX and the textures converted accordingly. Other options to consider include: Posing Information – to bring all stored poses over; Freezing – to bring over areas defined as Frozen for additional sculpt adjustments; and Curves, which is very useful for painting and sculpting on the new mesh.

Powerful 3D painting

Mudbox is a powerful and easy way to paint on ultra-high-res and detailed meshes, with or without UVs. Impressively, if you sculpt up a mesh without any UVs, you can take advantage of UV-free painting with PTEX. The great thing about this workflow is that all of your paint is accurately transferred to your newly created retopo-mesh. It's always easier to lay out UVs on a lower resolution mesh. So, feel free to sculpt and paint to your heart's content and worry about UVs later. Moving paint layers to a UV version of your mesh is as simple as a couple of clicks in the Extract Texture Maps window.

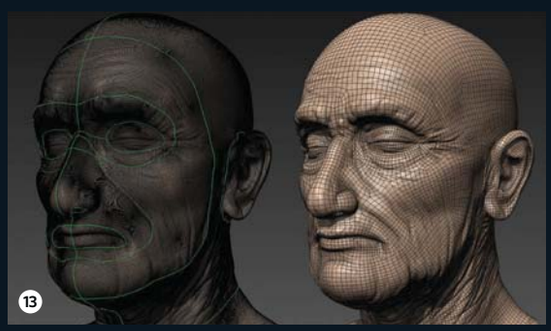
09 Curves are defined as Hard and Soft Constraints for guided retopology

10 Mudbox can output very low or dense meshes based on the Target Base Face Count

11 Mesh retopology output with uniform faces

12 Mudbox retopology also allows for the transfer of specific data

13 The new retopology using curves as guides



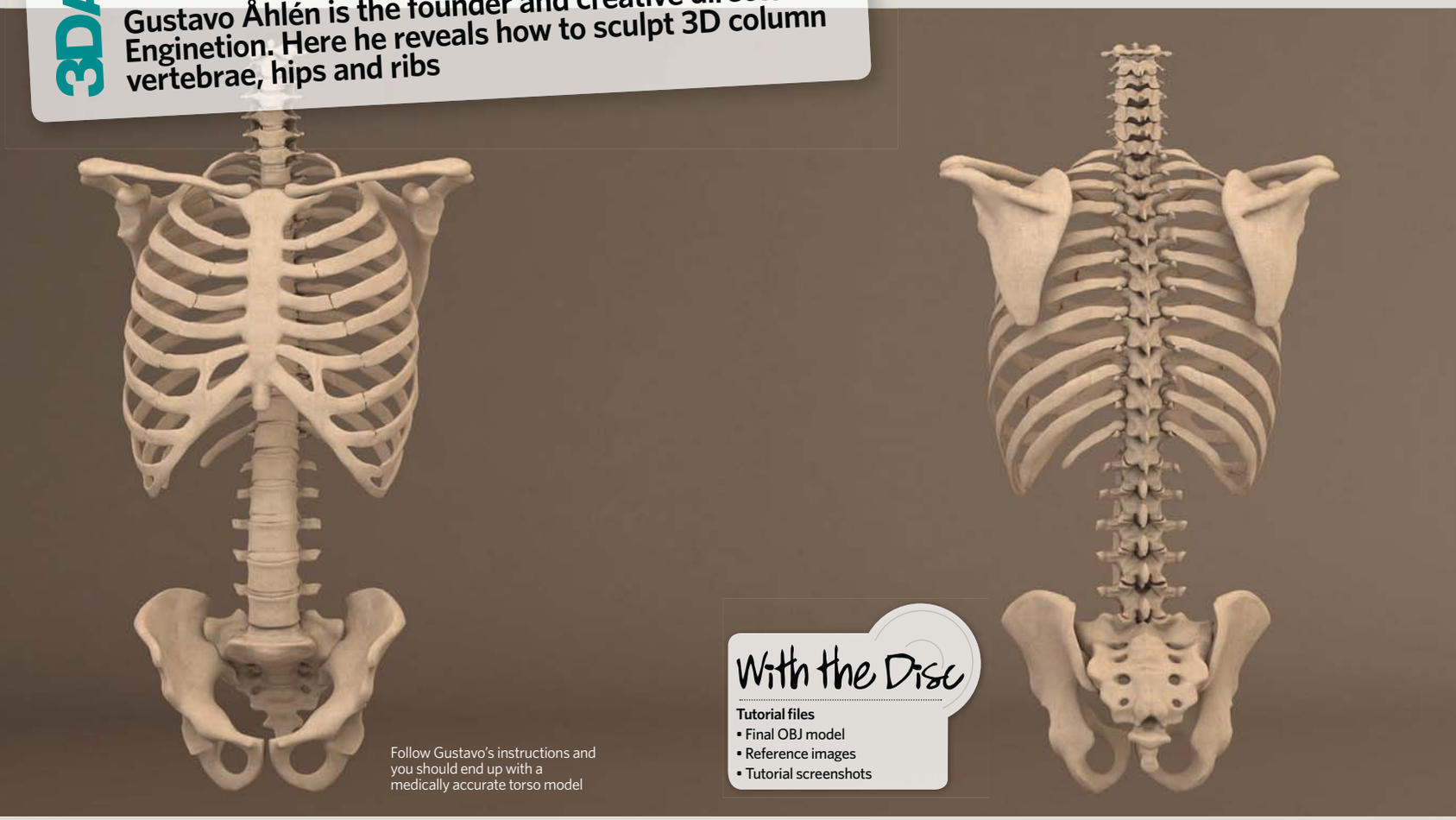
13 Final retopology When editing in Mudbox, the original mesh is not affected and an entirely new model is created. The new model is displayed for examination once the operation is completed. Under the Object List tab, you will find all operations saved for further adjustment and use. As the operation is fast and your operation settings are stored, you can adjust, remove or add more curves to the mesh, change constraint types and run a retopology operation again with different settings. The Target Base Face Count and Constraint settings will provide the biggest difference in retopology results.

• **DID YOU KNOW?** • All tutorial files can also be downloaded from: **www.3dartistonline.com/files**

3DArtist

Masterclass

Gustavo Åhlén is the founder and creative director at Enginetion. Here he reveals how to sculpt 3D column vertebrae, hips and ribs



Follow Gustavo's instructions and you should end up with a medically accurate torso model

With the Disc

Tutorial files
- Final OBJ model
- Reference images
- Tutorial screenshots

Sculpt the skeletal torso

"The anatomical master Gustavo Åhlén reveals his simple guide to sculpting a human vertebrae, hips and ribs in ZBrush"

The following is a process that will help artists, sculptors, designers and those without knowledge of the topic to sculpt the column vertebrae, ribs and hips of a human skeletal structure.

As always, I recommend reading books on human anatomy to perfect your skills, but for now I'll clarify the key anatomical elements. These technical details always help us to better understand how joints work when embarking on a sculpt like this.

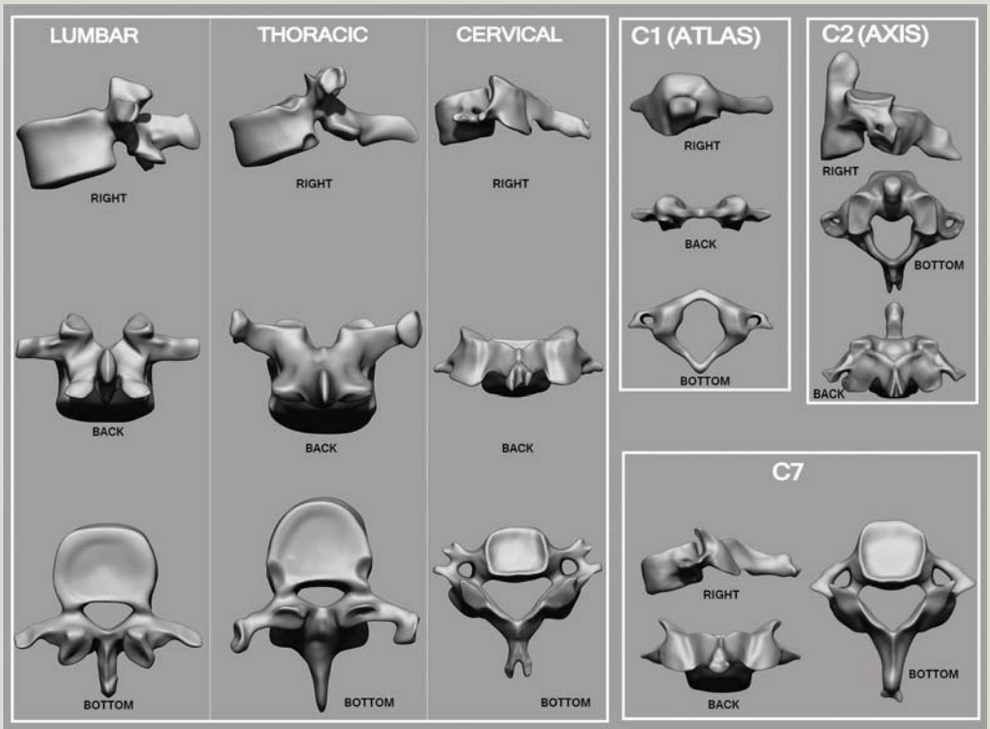
The spine is composed of various hinged parts connected together called vertebrae. The column is separated into five regions: cervical (seven vertebrae, C1-C7), dorsal region (12 vertebrae T1-T12), Lumbar (five vertebrae, L1-L5), sacral region (five vertebrae S1-S5) and coccygeal (four vertebrae, unstable).

While most of the spine is separated by intervertebral discs, the sacral region – which occurs in the bottom of the spine within the pelvic cavity – consists of five fused bones without any intervertebral discs between each. Similarly, the coccygeal region consists of four vertebrae also has no discs. If you refer to the reference images you will see this unique section of the spine without separations at the base.

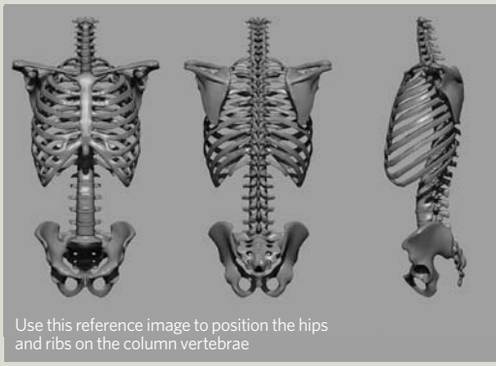
With regards to the ribs, they are classified in four distinct sections: the cervical rib, which is located at the top of the torso; the true ribs, which are the first seven ribs attached to the vertebral column and, through the intervention of the costal cartridges, with the sternum; the false ribs, which are the five sets of ribs below the true ribs; and finally the floating ribs, which occur at the bottom of the torso and are not attached to the sternum. Understanding such anatomical connections is key to following this tutorial.

It's also important that you also pay close attention to the boxouts throughout these pages, as here I will offer details on the processes utilised. Before you begin the tutorial I also highly recommend practising with primitives in ZBrush. This way you'll be able to grasp the correct use of ZBrush's tools and increase your knowledge with regards to sculpting the clay into different angles. This is especially vital when working with complex models like skeletons.

If necessary you can find good websites with 3D models of vertebrae to guide you through the steps. Hopefully after following this process, you'll have all the skills you need to build your own skeleton torso.



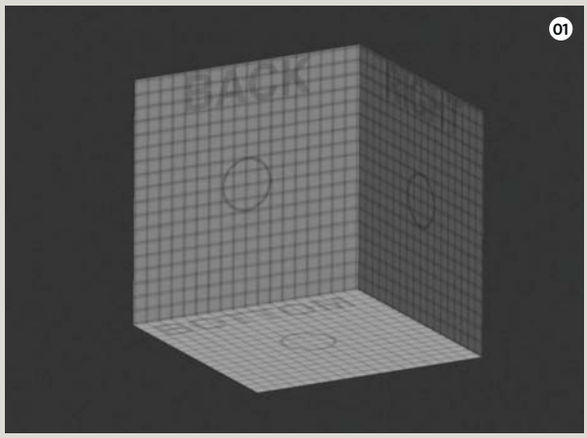
This image can be used as a reference guide to the creation of the column vertebrae. You can find it in high-res on the disc

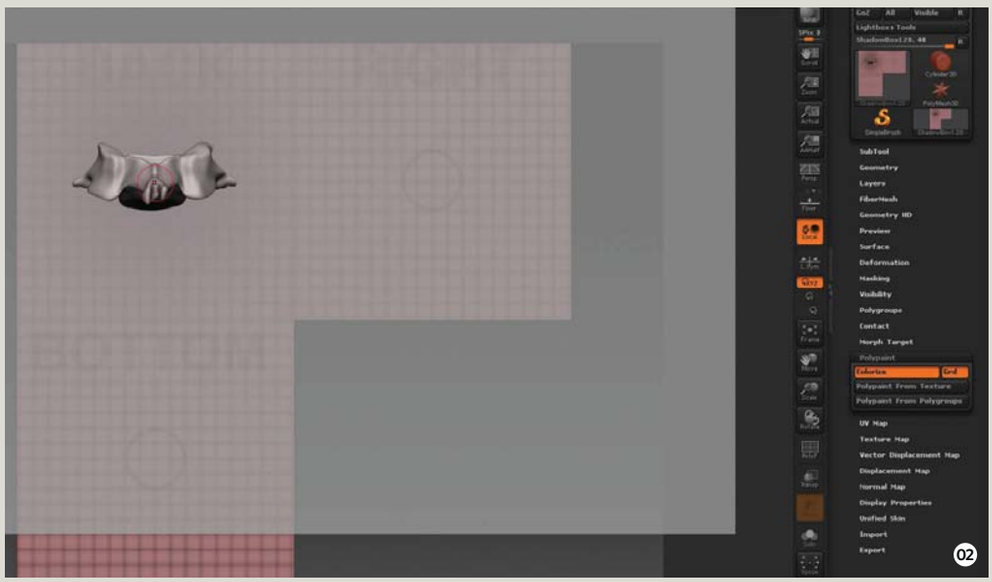


Use this reference image to position the hips and ribs on the column vertebrae

Explore the human spinal column

The process of recognising the different parts of the spinal column is fundamental to understanding the various connections between them. Usually I would suggest checking the angles of each vertebra to get a correct fit, because when we create the complete spine we need to separately account for the position of each vertebra. These separations will be fixed with the vertebral discs. Always keep in mind that these discs are compressed and expanded according to the movement generated by the human body. Also, remember that not all spines are identical and we can find small variations in each vertebra. However, in this tutorial we'll be working with a general example, just for the sake of simplicity.





01 ShadowBox is a useful tool when sculpting from reference images

02 ZBrush's SpotLight helps us to transfer images to ShadowBox

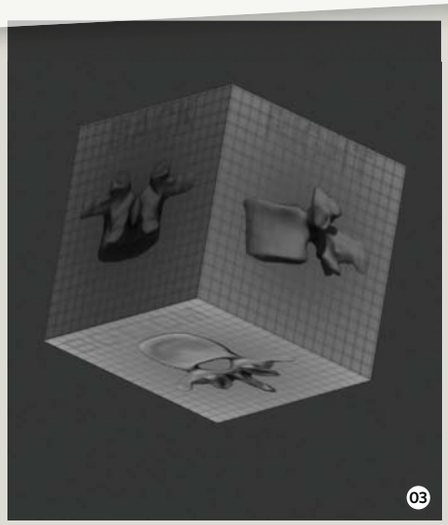
Find your way around the human spine

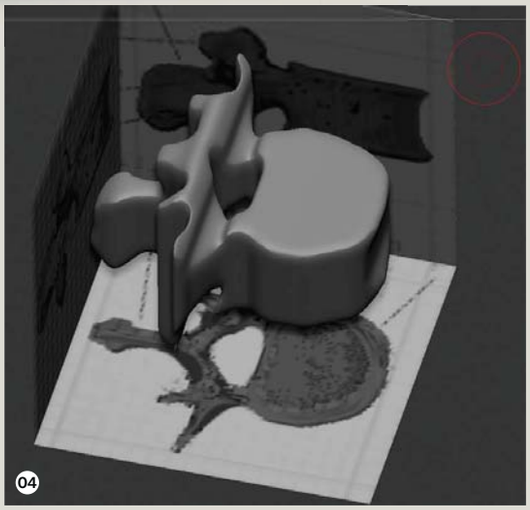
01 Start with ShadowBox

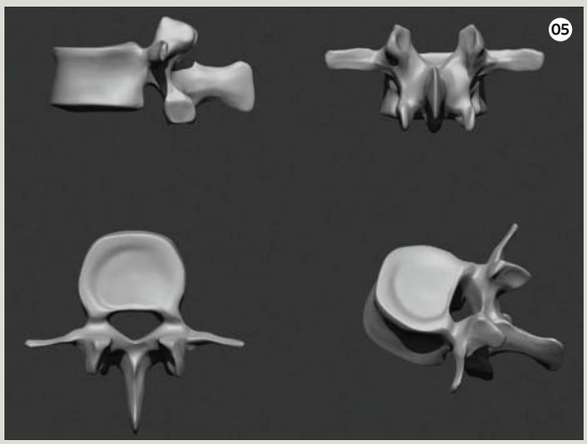
This first few steps are really important to grasp, as we will repeat the method detailed with slight variations throughout the tutorial. Go to Lightbox>Tool, select Shadowbox128 and select Edit to make an editable piece. ShadowBox enables us to view reference images from different angles and then use these images to create a quick and easy rough sculpt.

02 Utilise ZBrush's SpotLight feature

Here we will use ZBrush's SpotLight feature to add in our selected reference images. Navigate to Texture>Import, then load any of the skeletal reference images you've chosen. You can import different images in one step, then go to UV Map and hit Morph UV. This enables us to paint the textures over ShadowBox. Next go to Texture, select the desired texture and choose Add to SpotLight. You can then position the texture over the desired plane. Use the options in SpotLight to resize the image as you wish.







03 Paint some textures on the ShadowBox

This step is key in the creation of each vertebra. After positioning the selected texture on ShadowBox in the correct position for the back, right or bottom view, we need to deactivate Zadd, Zsub and activate RGB. Select the Standard brush with Stroke set to DragRect. Now go to the Polypaint tab and select Polypaint From Texture. After this, hit Z to hide the options for SpotLight, then drag and drop in the middle of the texture to paint the textures over the ShadowBox. Keep editing until you achieve a similar result to the screenshot.

04 Get the 3D shapes

After painting each texture on the ShadowBox's three planes (back, right and bottom), go to Brush and select Lasso Mask. Try to position any plane in a perfect frontal view, then activate Symmetry while keeping in mind the correct axis of the symmetry (z, x, y) according to your selected side. Now hold Cmd/Ctrl and try to cut the shapes following the edges of the textures above any plane. You can delete areas by holding the Opt/Alt key while you're applying the Lasso Mask.

05 Redefine the shapes

Deactivate ShadowBox by going to Geometry>ShadowBox. We must now smooth and refine our current vertebra. Use different brushes for this – such as Standard, Clay Buildup and Move – with Stroke Freehand active. Refine the edges of the vertebra and try to get a result similar to the screenshot. The Move and Move Topological brushes are useful for this. Use Clay Buildup to get an approximate shape and then use Smooth to clean up the model. Always keep in mind the intensity of each brush throughout the process.

06 Sculpt the cervical vertebrae section

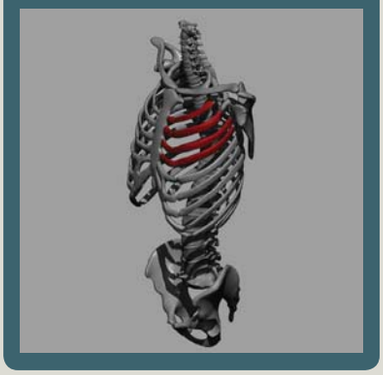
For the cervical vertebrae we need to make two holes – as indicated by the red circle in the accompanying screenshot. Do this by selecting Insert Cylinder and using the DragRect Stroke. Hold Opt/Alt and add the cylinder in the shape that you want to make a hole. Align this second shape to the correct position. Now hold Cmd/Ctrl, click, drag and drop your model into an empty space without 3D models. You need to drag and drop twice and the second shape will be subtracted from the main shape. We will now follow this same process in the next few steps.

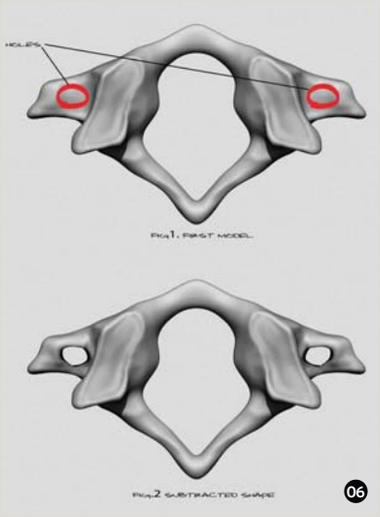
07 Model more vertebrae and duplicate them

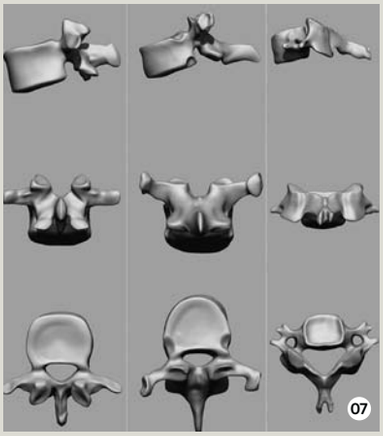
Now we need to create the lumbar vertebra (five copies), the thoracic vertebra (12 copies), the cervical vertebra (c3, c4, c5, c6), c1 (Atlas), c2 (Axis) and c7. Check out the vertebra reference images to get a good idea of where to sculpt and align each vertebra accordingly. Note that you can sculpt just one vertebra for the lumbar, one for thoracic and one for c3, c4, c5 and c6. Use Duplicate in SubTools to make more copies of each one.

Flatten forms with Trim Dynamic

Sometimes we need to flatten rounded shapes and a very useful tool for this is the Trim brush set to Dynamic. Apply this to flatten the ribs after creating them with ZSphere. After using the Smooth tool we can get rounded shapes that make us lose our desired sculpting. The Trim brush set to Dynamic can be used again to flatten these forms. Remember to change the Intensity values to get a flattened shape without losing what you're looking for. The Intensity setting enables us to make changes while keeping the original form.







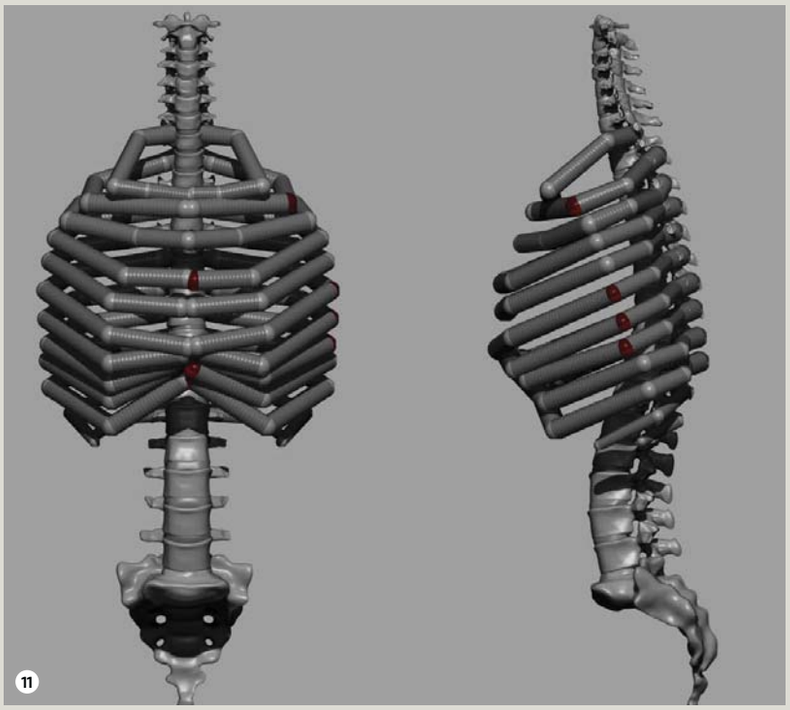
03 SpotLight and ShadowBox are commonly used tools in the digital sculpting process

04 Using Lasso Mask and ShadowBox enables us to create 3D shapes from relatively simple textures

05 Get refined forms from primitive shapes using Smooth tools

06 It's a good idea to subtract – rather than add – shapes to achieve the result you want

07 You should use SubTools to duplicate each vertebra and streamline the whole process



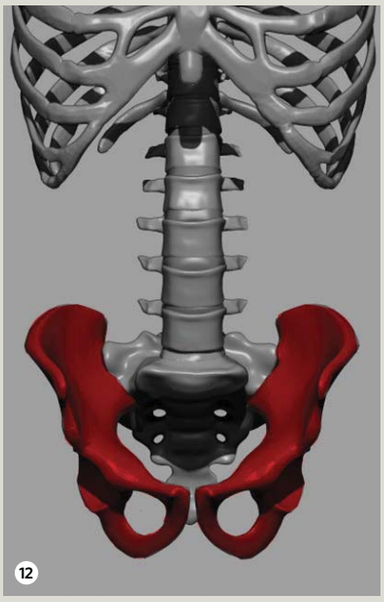
08 Sculpt in the vertebral discs using the axis (red shape) as a vertebral guide

09 Aligning each vertebra enables us to get a good final angle

10 Sculpt the centre to create the joints between each vertebra

11 ZSphere enables us to get floating forms without having to rely on other SubTools

12 In this step we need to use ShadowBox and position the hips over the sacrum



Symmetries adjacent to the spine

When modelling the spine, take into account the angle of the ribs and hips to the spine to keep an appropriate ratio. These may vary depending on the age of the person and their bone structure. There isn't a perfect symmetric measure, so we can only work with approximations. The angles pictured here will help us find common symmetries in our work, which are important to keep a correct proportion. They also enable us to understand the precise joining between the ribs and the hips over the spine. However, if aiming for realism, remember that actual skeletons aren't perfectly symmetrical.

08 Create the column

Now we can sculpt the sacrum using ShadowBox and the same processes mentioned through Steps 2 to 5. After this, create the centre of the column using ZSphere. Go to SubTool>Insert and add a new ZSphere. Position this in the middle of the sacrum, activate Symmetry, then Draw and apply over the ZSphere. You'll see how a small red ball begins to protrude over the ZSphere. Now we need to use Move with a small Draw size to drag this new red ball, following the shape of the spine in the accompanying image.

09 Align the vertebrae

After achieving an approximate model of the spine using ZSphere in the previous step, go to Adaptive Skin and increase the Density value to get a smooth shape. Now select Make Adaptive Skin to create a new 3D mesh where we can select primitives. Go to SubTool, delete the current SubTool created with ZSphere and insert the new 3D mesh with a high subdivision level. After this we need to use the reference image 'Reference Column single.jpg' supplied to centre each vertebra as a SubTool.

10 Sculpt the vertebral discs

After centring each vertebra according to the reference image, try to adjust each one while considering the different angles, then begin to sculpt the vertebral discs by using the ZSphere as an axis. In the first instance, activate Symmetry and then apply the Move brush to get an approximate model. Rotate the column using the frontal and side views as guides. By applying different brushes, we need to get an under relief (vertebral discs) below the level of each vertebra. Check out the red paint in the accompanying image to use as a guide, as these are the vertebral discs.

11 Build the ribs

Go to SubTool>Insert, select ZSphere and change its position to over the first thoracic vertebra, below the c7. Use the same process as in the first seven steps and don't forget to activate Symmetry. I recommend inserting 12 ZSpheres and carrying out the same process for each one. After this, we need to make an Adaptive Skin, delete the current SubTool and insert (SubTool>Insert) the new 3D mesh with a high subdivision level. By using various brushes as in step 5 we can create a convincing sculpt of the ribs. Using SubTool>Merge Down, we can also merge all the SubTools.

12 Shape the hips

The easiest way to build up the hips is to use ShadowBox and follow the same processes previously mentioned. Apply the Move brush and then subtract shapes by inserting a cylinder (you can review this process in Step 6). This way you can drill holes in the bottom. I also recommend grabbing the Move Topological and Clay Buildup to add new clay, get an approximate shape and then apply Smooth to the hips. By hitting Opt/Alt we can add or subtract clay. Position the hips over the sacrum and try to attach the bone structures by adding and subtracting clay.

• **DID YOU KNOW?** • All tutorial files can also be downloaded from: **www.3dartistonline.com/files**

3DArtist

Back to basics

Produce realistic shaders and construct an interior scene using 3ds Max, V-Ray and Photoshop

3ds Max, V-Ray, Photoshop

Wooden arch-vis interiors

With the Disc

Tutorial files:

- Tutorial screenshots

“Discover the techniques and resources behind establishing a simple neo-classical interior”

Last issue we detailed an efficient production-ready workflow for applying glass to an architectural image. Here we'll use the same techniques to build convincing timber in an interior scene.

During the course of this tutorial we'll discuss the processes and helpful tips for modelling, texturing, lighting, rendering and post-production. As always, the intention is to create an image in a manner that's timely and production-proven, enabling changes along the way should the need arise. Typically professionals can expect to go from a concept sketch to a completed image in less than one day.

Initially, we will start with a reference image, which is a core part of the arch-vis process. Reference can be found, taken or drawn, but in an ideal world it should reflect the colour, style and composition of the intended outcome. This is possibly the most important tool when trying to achieve photorealism; without a real-life reference

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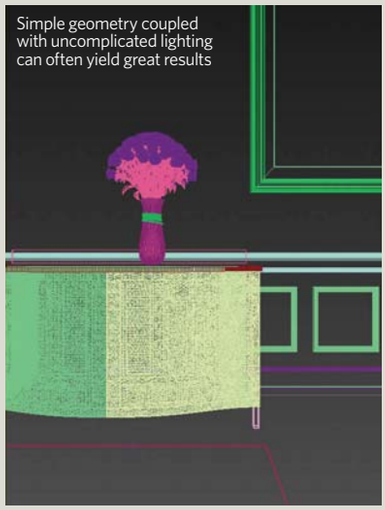

Simple geometry coupled with uncomplicated lighting can often yield great results


The techniques used in the creation of this image are both simple and production-ready

it's hard to understand the nuances of materials and how colours might blend.

We'll be aiming towards a wealthy neo-classical interior, drawing reference from an image created on behalf of property tycoon Candy & Candy (see below). This image is particularly warm and utilises a one-point-perspective composition – something that's very common in architectural imagery owing to its strong and simple lines.

So as to experiment with timber materials effectively, we'll be using a custom-designed and hand-modelled armoire cabinet. This features a panelled and curved front, enabling all manner of configurations. The curved face is equally useful for achieving graduated lighting and to further accentuate reflections.

Detailed high-resolution textures are key here, so we recommend shopping for purpose-made imagery (supplied with Bump or Specular maps) from the likes of Arroway, TRU Textures or Turbosquid (www.arroway.de, www.texturesrus.net and www.turbosquid.com respectively). These make a big difference and exceed anything just found randomly.

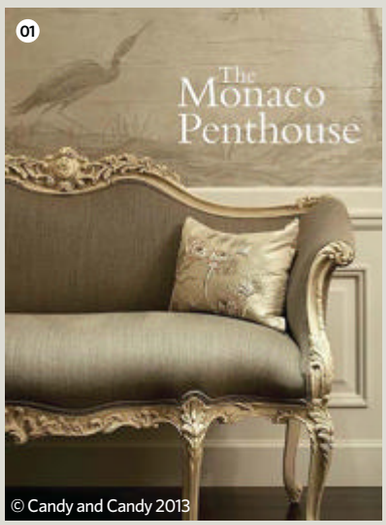
Another option is www.vray-materials.de, which offers free preconfigured shaders. However, while this method is convenient, it affords little understanding of the principles behind creating shaders. As such, in these steps we'll be constructing all our shaders manually in V-Ray, utilising various raw texture maps along the way.

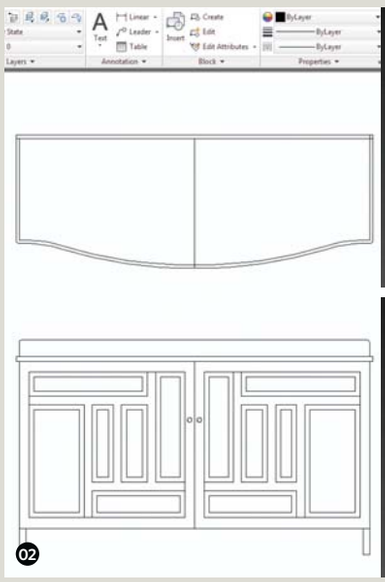
Technical requirements behind this tutorial are relatively standardised: 3ds Max, V-Ray and Photoshop. There should be no vast hardware demand, providing the setup is correct, so an i5 processor with 4GB of RAM is more than sufficient. Also, the principles discussed are largely universal and can no doubt be applied to any 3D package and renderer.

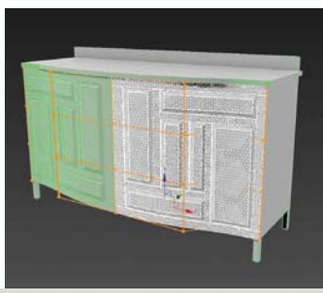
Making a scene

01 Find reference images and make sketches

When creating a photorealistic architectural image, it's paramount that you first find a suitable reference. This should roughly reflect the intended style, colouring and composition of your desired outcome and will provide valuable insight into how certain materials and lights should look when combined in a real-life scenario. It's also important to have a rough composition in mind before beginning any image. A simple sketch is more than sufficient as a guide to work from. Lack of direction at this stage will stifle the entire image and cause no end of frustration. Put simply, don't begin until you are nearly certain of this step's completion.







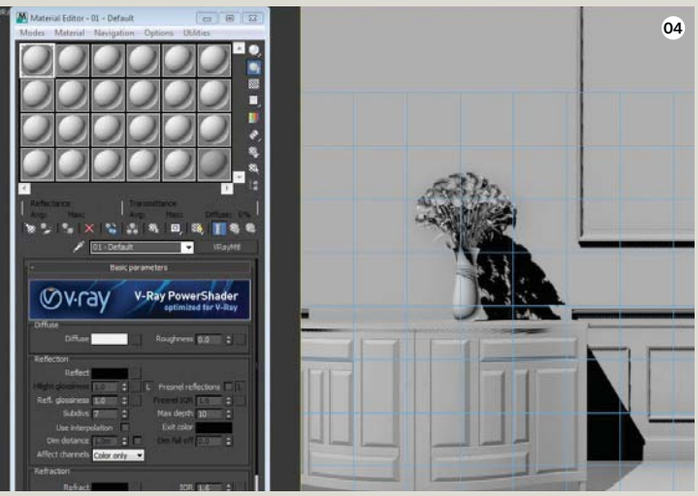
02 Model the individual elements of your scene

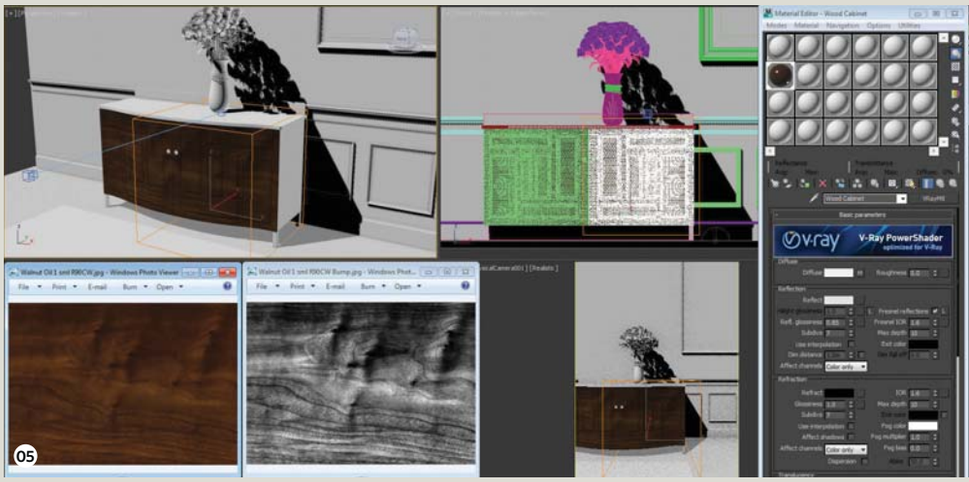
The scene has been designed to accentuate the qualities of timber and so will incorporate a custom-designed armoire cabinet, complete with a curved front element to create interesting responses to light cast across it. First sketch this and then simply draw it in AutoCAD for dimensional accuracy. Now export a DWG to 3ds Max and begin modelling. The front door elements are created by modelling in a flat plane, then merging the pieces into one editable poly object. Apply a Subdivision modifier and finally an FFD 4 x 4 x 4 modifier so as to bend the object to shape. This is perhaps unorthodox, but it gives a very quick and believable result.

01 Find an decent reference image and combine it with simple sketches to set the groundwork

02 Loosely draw the cabinet in AutoCAD, model it in 3ds Max, then apply Subdivision and FFD modifiers to bend it to shape

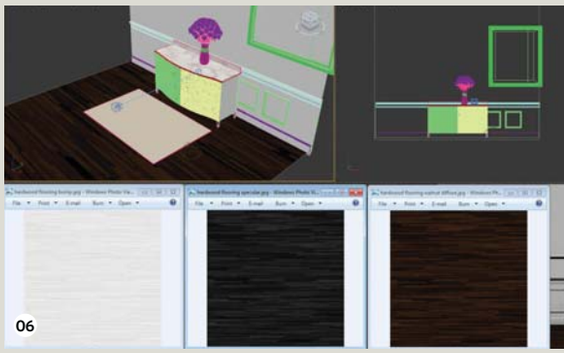
Back to basics

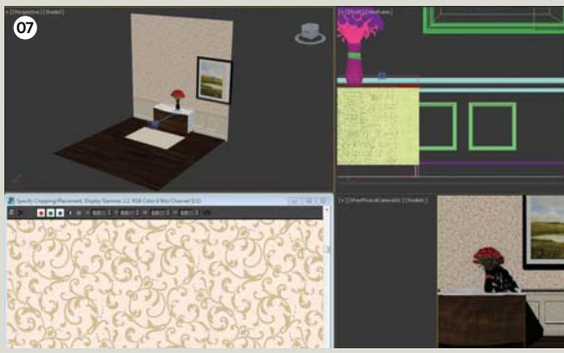




Geometry vs textures

A vast amount can be achieved using textures, from reflectivity-mapping to full geometric-displacement, which negates the need for overly complicated models. Should absolute detail be the name of the game, there may come a time when modelling individual planks in a timber floor is the best route, but detail should be relative to time and distance; don't spend hours modelling minute details that can't be seen or appreciated by the viewer.





03 Set a VRay PhysicalCamera, block in modelled elements and then gradually refine details as the direction of the scene becomes more clear

04 Activate V-Ray and apply a standard grey material to all the scene objects

05 Find suitable textures and apply them as maps in a new VRayMtl

06 Create a new shader for the timber floor, using Diffuse, Specular and Bump maps

07 Repeat the process for the rest of the elements and reduce the Blur values to bring sharpness to all the textures

03 Model the scene

With the cabinet done, begin assembling the elements required for a complete scene. Start by establishing a VRayPhysicalCamera and positioning it in relation to the walls, floor and cabinet. Remember to always model loosely at first, blocking in larger elements and refining details as the scene develops. For ornate profile details, such as the skirting and wall panelling, we can't recommend the free Sweep Profile script highly enough. This brings several useful architectural profiles to your fingertips at the click of a button (www.3d-kstudio.com). The flower model used can be purchased from CGAxis (www.cgaxis.com).

04 Engage V-Ray

Now move to V-Ray by selecting it as the Production Renderer from the Render Settings dialog box. Subsequently open the Materials palette (keyboard shortcut: M) and add a new VRayMtl. Apply this default material to all objects in the scene. This should act as a clean base on which to begin constructing shaders and ensures that no mental ray or Standard materials will confuse the rendering process. 3ds Max's Compact Material Editor can be used as opposed to the newer Slate Material Editor, simply on the basis of its ease of use.

05 Make the cabinet shader

Find an appropriate wood texture, grouped ideally as Diffusion, Specular and Bump maps. Once textures have been sourced, create a new VRayMtl slot in the Material Editor and name this appropriately. Apply the Diffuse texture as a map within the Diffuse slot, enable Fresnel Reflections (true-to-life reflections) and set the Reflective Glossiness to around 0.85 (higher will result in more reflectivity). Now add the Bump texture into the Bump channel and set the value to around 3-5. We won't be using a Reflectivity map in this case, as the desired material outcome is very smooth (varnished). Now apply a UVW Map modifier to scale the texture.

06 Add a timber shader

Repeat this process for the timber floor element, combining Diffuse, Specular and Bump maps in the appropriate channels so as to create a convincing shader. Here we've also used a ColourCorrect layer between the Diffuse map and the texture, enabling the hue, saturation, brightness and contrast to be tweaked flexibly. This isn't essential, but provides an extra layer of control that's particularly useful for those who prefer to minimise any time spent in post-production. Apply a UVW Map modifier again to scale the texture appropriately.

07 Complete the textures

Repeat the process of creating shaders for any remaining scene elements, then focus on adding believability where possible by including features such as subtle reflections (every real-life object reflects light to some extent, so ensure your 3D objects follow suit). Not all textures (such as the wallpaper) require detailed Specular maps, although these can be made by hand with a degree of Photoshop knowledge. 3ds Max automatically blurs all the textures so as to avoid problems when rendering animations. To retain sharpness, open up each bitmap channel and set the Blur value to 0.01 (as opposed to 1).

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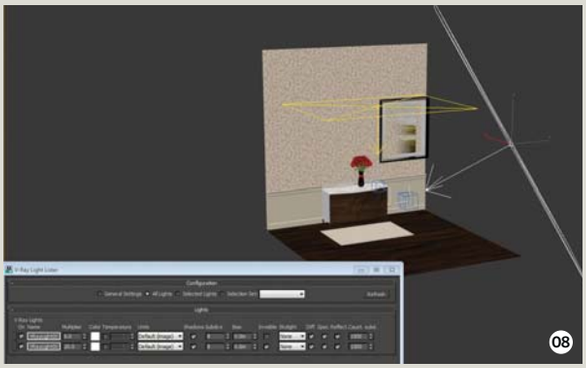

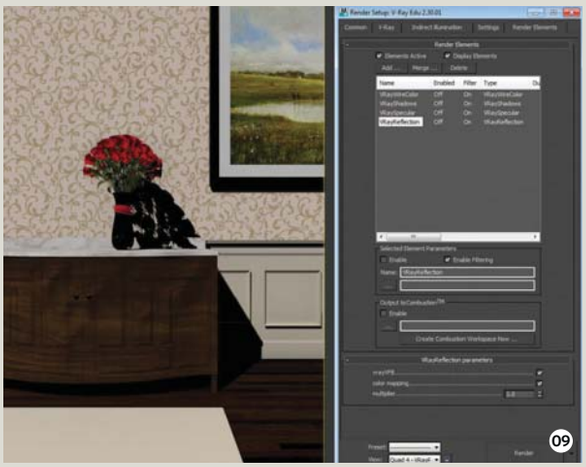

Simple lighting

There are no doubt thousands of ways to light a scene using 3ds Max and V-Ray, from High Dynamic Range Imagery (HDRI) to IES lights – but the key is simplicity. Understand how your scene should look. Should the lights be focused? Should they be coloured? Should they appear in reflections? All of the best images can typically be created with less than five lights.

08 Light the scene

Once again speed and simplicity are king, so begin to light the scene using strategically placed VRayLights (set to Plane mode). Here we've only used two lights, one of which is placed directly above the scene's elements and another at 45 degrees from the camera, angled slightly down so as to cast a shadow as if from a nearby window. The window's light has a modified Directional value so as to cast a harder and more-precise shadow. This creates a stronger overall feel when compared to soft shadows. Balance the light's Power values and tweak the VRayPhysicalCamera's Exposure settings where required.

09 Prepare for rendering

Open the Render Settings dialog box and set the Render parameters as per your preference. Here we've used a rather typical Light Cache/Irradiance Map setup, combined with Catmull Rom antialiasing and Reinhard colour-mapping, set with a Burn value of 0.85. Now add key post-production components to the Render Elements tab, namely VRayWireColor, VRayShadows, VRaySpecular and VRayReflection passes. Set an appropriate resolution, hit Render and save each pass as a full-resolution TIFF or JPEG.

10 Begin post-production work in Photoshop

With all the rendering (and inevitable tweaks) complete, open each of your passes in Photoshop and create a sensible layering/grouping convention. Here we've produced a stack with crops and helpers at the top, filtering down to global effects, colour-corrections, patches, passes and renders at the bottom. Doing this at the start of every image will inevitably save masses of time and help you identify different stages of post-production. Now apply passes to the base render to enhance aspects as you please. Screening the VRayReflection pass will accentuate highlights, for example.

11 Patch things up

When in Photoshop, continue to refine the raw render by correcting errors in the Patches group. This is used for chopping out elements that simply don't look right, such as the image and reflections in the photo frame. We've also applied a crop to the image at this stage, having decided upon a more effective composition. This is quite simply a black layer hiding elements that are no longer required. Rendering at higher resolutions can be very helpful once you arrive at this step.

12 Make final adjustments

Now begin to make large colour-correction adjustments, taking direction from your original reference image. Try to match the tonality and materials as best as possible, then subsequently utilise the VRayWireColor pass to select elements and begin to add adjustment layers to suit. Once you're totally satisfied with the outcome, you can add more effects to the Global group, such as vignettes and overall colour/contrast layer adjustments.

08 Use simple lighting and change directional parameters for stronger shadows

09 Set up the render and add in key post-production elements as render passes

10 Open the rendered passes in Photoshop and organise the layer/group structure

11 Patch up surplus elements and experiment with some cropping to enhance the result

12 Apply some final colour adjustment layers and tweak the effects in your Global group

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Buwaneka Saranga
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Buwaneka is a self-taught 3D artist and compositor. He works in a range of formats including motion graphics, modelling, animation and photography

LightWave
Craig A. Clark
www.scorpiocgi.co.uk

Craig is a hard-surface modeller with over ten years of industry experience in film, TV, music videos and videogames. His portfolio sports a vast array of shiny objects

ESTIMATED TIME TO COMPLETE THE TUTORIAL
10 MINS

After Effects

Dramatic lighting in After Effects

"How can I blend my foreground elements against a very bright background in a realistic manner?"

Compositing keyed-out footage or CG elements into a scene can be problematic, especially when you're working with a bright background. You will often notice that something's not right and that your subject looks somehow darker. A good way to rememedy this is by using a light wrap.

Light wrapping is a technique used to spill colour and luminance information from the background over to the edges of the foreground. In the real world this actually happens due to the light from the environment getting scattered on the edges of a surface. We're naturally used to seeing this in reality, which is why we instinctively know if something's not quite right in a digital result.

Light wrapping is more directly available in advanced compositing applications such as NUKE, and is achievable by simply connecting a node. However, the method of achieving it in After Effects is not so straightforward. There are plug-ins available should you wish to buy them, but they're expensive. Instead I'm going to teach you one of the easiest two ways to create the effect right inside After Effects without the use of any third-party software.

The trick is to duplicate your Background layer over your Foreground layer and copy the inverted Alpha channel from your Foreground to the Background (which is now on top). You can then blur the top Background layer to spill some of the pixels off the edge and then matte it again with the Foreground Alpha channel. This will create a spill of colours over your Foreground layer, which is what we term the light wrap. You can composite this with a Screen or an Add blending mode to suit your needs. You can take the effect further by making duplicates of it and tweaking its Blur values to create an exponential spread.

Another quick way to achieve this effect is by using the Silhouette Alpha and Stencil Alpha blending modes, which I'll cover in the latter part of this tutorial.

The main image here is a style frame I created for a short sci-fi film called 'The Beacon', which is being produced by Neumann Films. The astronaut was shot using a Red EPIC device and the environment was created with CG elements. Stay tuned to the film's Facebook page for updates: www.facebook.com/NeumannFilms.

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3ds Max

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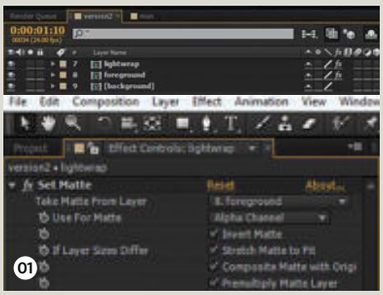
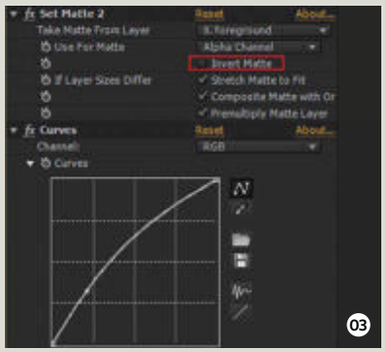


01 Grab the Alpha

Let's pre-compose all our foreground and background elements into two distinct layers. Duplicate the background layer, move it on top of the foreground layer and name it 'light wrap'. Now let's extract the Alpha channel from the foreground onto our light wrap layer. Select this layer and go to Effect>Channel>Set Matte. In the Set Matte attributes on your Effects Controls panel, select your foreground layer from the dropdown list under Take Matte From Layer. Select Alpha Channel from the dropdown list under Use For Matte and click the Invert Matte box.

02 Spill pixels off the matte

Now Solo your light wrap layer and make sure that it looks similar to the top screenshot. Making a layer Solo means you will only the selected layer. Now we can apply a Fast Blur effect on the light wrap layer, which will soften the matte and spread the pixels in terms of blur. After all, real-world light scattering is blurry as well. Set a Blurriness value of 30 pixels and check the Repeat Edge Pixels box.

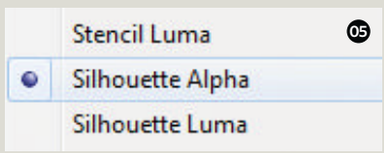


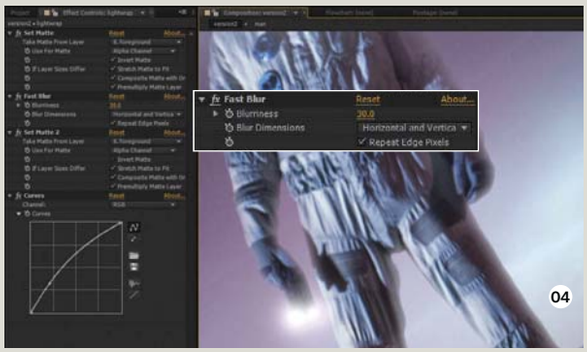
03 Create the wrap

Now our blur is applied, let's add another Set Matte effect onto the light wrap layer. This time uncheck the Invert Matte option and make sure the matte is taken from your foreground layer. Also add a quick Curves adjustment by going to Effect>Color Correction>Curves and give it a slight lift as shown to brighten the light wrap.

Wrap lights around darker areas

Light wrapping only works against a bright background, as a dark one won't look realistic. You can always mask out the unrealistic results of the light wrap that occur in the darker areas of the image. Here, for instance, I've masked out the light wrap below the astronaut's knee. You can also use the Linear Wipe effect (found under Effect>Transition) to cut off the darker areas of the light wrap.





04 Reveal your effect

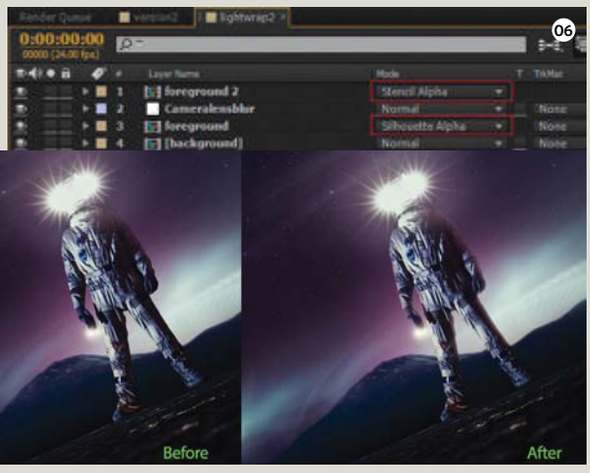
Turn off Solo for your wrap layer to see its effect on the foreground. You can increase or decrease the Blurriness value to make this effect spread more or less and adjust the Curves to change the brightness. You can also change the blending mode to Screen or Add.

05 Try an alternative

Alternatively, duplicate your foreground and background layers, then pre-compose these via Cmd/Ctrl+Shift+C. Name the comp 'light wrap' and select Move all Attributes to a New Composition. When this opens, change the blending mode of your foreground layer to Silhouette Alpha as shown. Now add an adjustment layer above it and apply a blur effect, using a Camera Lens instead of a Fast blur.

06 Wrap it up

Apply a Blur Radius of 25 pixels, crank up the Gain a bit and then reduce the Threshold. This will boost the bright areas and make the light wrap effect more intense (use it carefully). Now duplicate the foreground layer again, add it over the adjustment layer and change its blending mode to Stencil Alpha. You will see the light wrap inside a pre-comp, so go back to your main comp and change its blending mode to Screen or Add. You can quickly compare the effect of the light wrap with some colour grading in the image below.



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With the Disc

Tutorial files:
Included is the demo scene used in Craig's steps, including the surface with all the nodes set up for the controlling Nulls

LightWave

Use LightWave Sliders

"Is there an easy way to control, animate and change hard-body models in a scene?"

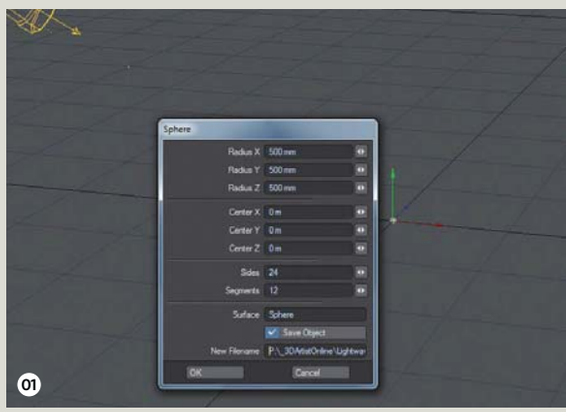
I've long been an advocate of LightWave's slider facility. It's an accessible system that makes frequent changes to elements within a scene very simple, not to mention more intuitive to animate.

There's a wide range of areas that can be controlled with sliders, but the most common task I've used them for is controlling the animated elements of models. This covers elements like steering, doors and suspension on vehicle models. You can achieve this, for example, by keyframing a door to go from a closed to an open position over a range of frames, such as frames 0 to 10. You can then add a Null to act as the controller. On the layer of the model with the door, you can add the Follower Motion modifier and specify the range of frames to be followed (0-10 in this case). You can also add the object being followed (the Control Null that was added); which aspect of this Null will be followed, such as the heading; and the range of movement that will equate to the 0-10 frames of animation on the door. With the slider controls added, you can then manually control the replaying of the animated frames.

The beauty and power of this process is that you're not just restricted to controlling animation. You can also manipulate more specific attributes of the model. For example, with the application of the Node Editor you can control colour inputs to the paint shader.

For instance, a vehicle model in my web store (Veyron GT) features a slider setup that controls steering, doors and motorised aerofoils, but it also has sliders that change the colour of the paintwork on the car. This includes the painted surfaces of the wheels. At the same time, the interior of the car is changed to the same tone, but Mixer nodes water down the shade to a paler palette. A second colour slider bank then enables body stripes to be made visible, invisible, or a different colour. All of this can be done without going into the Surface Editor. Should it be useful, the colours can also be keyframed to enable the car to be a different colour in each frame of a sequence.

These sliders are very powerful, easy to use and crucially are simple to set up in the first place. In this example we will use the node editor to control two colour inputs to the car paint shader.



01

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01 Set the ground work

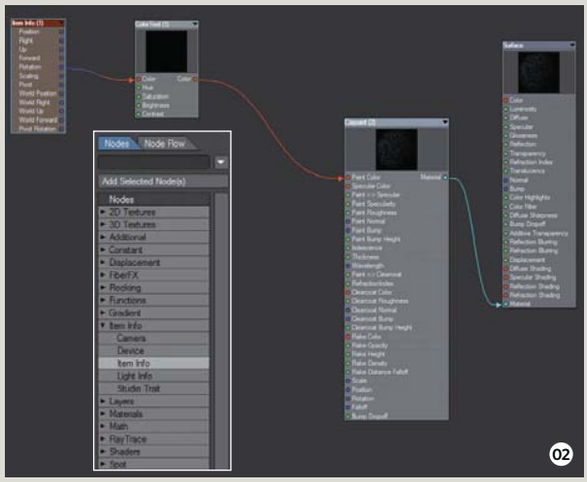
First add a ground plane in Layout, then create a sphere that will be the item our slider will be affecting. Now add a Null called 'COLOUR' to control the changes of the sphere and be driven by the sliders. These steps highlight how you can quickly create good test objects without actually needing to use Modeller.

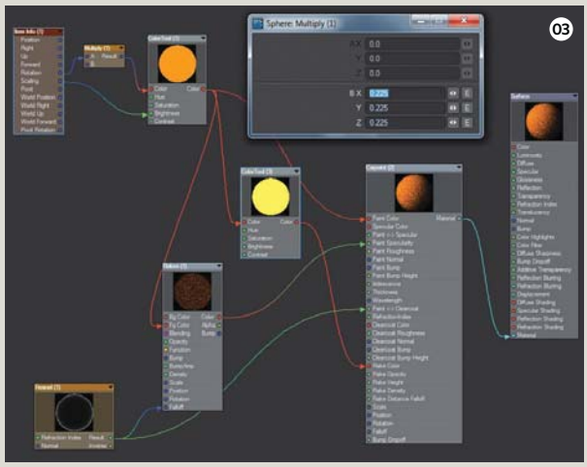
02 Go Nodal

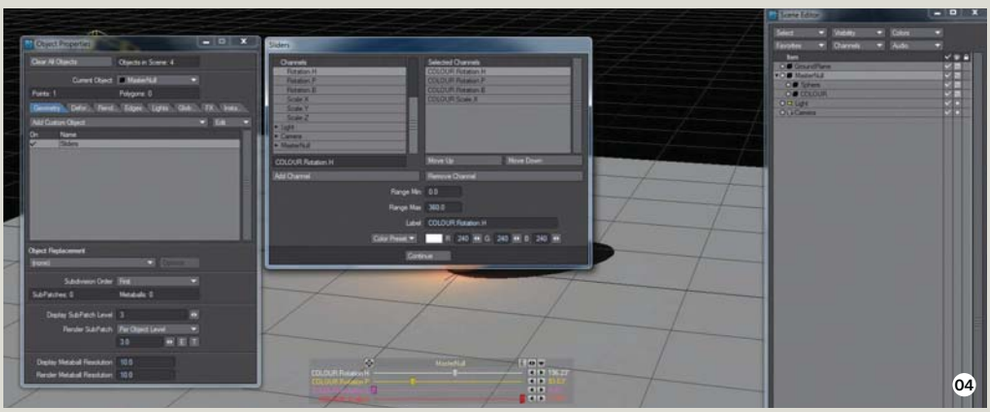
Now add the Item Info node to the sphere. All the node needs is the Null added to be selected from the dropdown menu. Connect the Rotation output to a ColorTool node and this can then connect to the required colour input (in this case we're using the Carpaint node). Heading, Pitch and Bank correspond to Red, Green and Blue respectively.

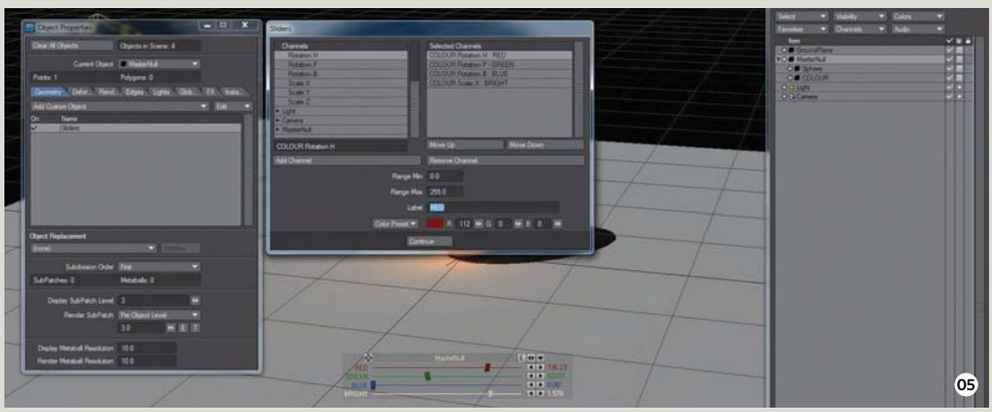
03 Make connections

The powerful thing about LightWave, as you can see in this screenshot, is that we can take multiple outputs from the Item Info node and control several aspects of the shader at once. By tweaking Position, Rotation, Scale and other values, you can drive a large number of parameters from a single Control Null. Sliders make it very easy to complete the relevant adjustments. Also add a Math Multiplier to convert 0-100 into more-useful 0-255 for the sliders.









Working with sliders

So we get that sliders are awesome, but isn't it a pain having them all over the screen? Thankfully there are ways to handle this. If you have a few sliders, you can group them by functionality by setting them up on multiple Nulls. For example, car doors and steering on one Null, but paint colours on another. Now select the Nulls you have sliders on and set them to be hidden. The sliders will appear when the Null is selected and disappear when no longer selected. If you aren't using them, you won't see them. It's that simple!

04 Adjust the sliders

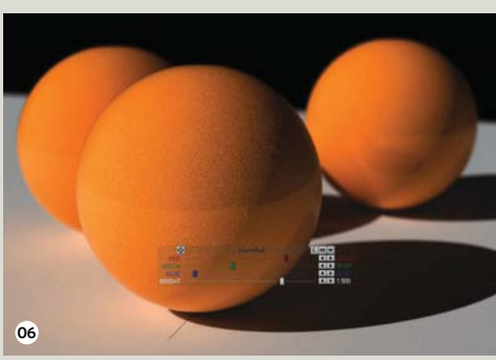
Now we'll add the sliders to control our Null. It's best to always have a Master Null for objects such as cars and all the geometry. The Control Nulls must be children of this Master Null. Sliders can then be created on this Null by adding a custom Sliders object. Select the Heading, Pitch and Bank in turn to add a slider, followed by Scale. This enables you to control the colour and brightness.

05 Gain clarity

Each slider is given a generic name based on the host item and the channel being used. The slider's colour is also arbitrarily assigned. As such it's good practise to edit the label's name to be a little more intuitive. We've changed ours to Red, Green, Blue and Bright. We've also altered the colour of each slider to reflect the function and edited the numeric range covered by the slider.

06 Finish with tests

If your version of LightWave has Viewport Preview Rendering (VPR), you can switch to this mode to test out the sliders. You'll notice that you can't see the sliders when VPR is running, so to make them visible, select OpenGL Overlay in the Viewport options. Now if you adjust the three colour sliders you'll see the surface colour change and the Brightness slider will increase or decrease the intensity. With VPR active, all the changes to the controlled channels will occur in real-time.



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1 HOUR

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Tutorial files:
- Tutorial screenshots

3ds Max, After Effects

Stereoscopic 3D animation

"How can I quickly create a convincing 3D scene within a production?"

During the production of my new short film, 'Selfillumination' (watch it on www.ak3d.de), I discovered a very helpful stereo 3D workflow. Here I'll reveal this workflow and show you how to get a high-quality 3D effect in the most intuitive way.

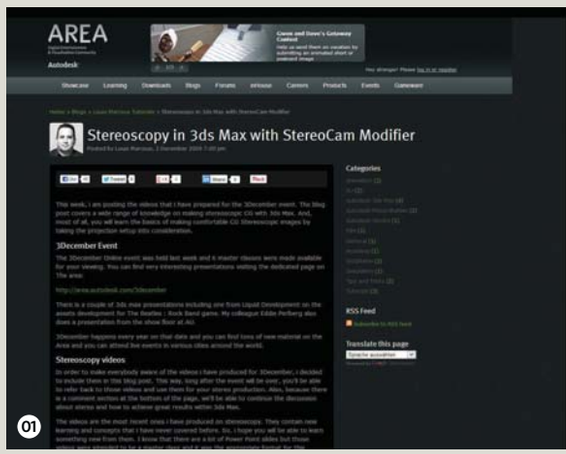
In essence, stereographic 3D content is two complete movies viewed from two different perspectives. This produces one film for the right eye and one for the left, which may sound easy to achieve in 3D, but there are some rules that we need to follow to accurately achieve the effect.

Firstly, we need to think about the target point of our camera while creating the scene. This is because, in reality, both of our eyes are constantly focusing on the same point in space. If an object is near to us, our eyes are rolling towards each other, but on distant objects they're rolling on a parallel level. You can test this by moving your finger from far away up to the tip of your nose. By focusing your eyes on the finger, you'll see how its background is dividing more and more. In stereo 3D we need to achieve this focus properly, as we also need to consider the space before and behind the screen. The depth point where both images are the same is the convergence point or plane. All objects in that depth are easily watchable, so this is where our story should occur.

We also have to think about the scene's scale and the final screen sizes. Louis Marcoux has produced some very good tutorials about this and I would highly recommend that you watch these as they explain a lot about stereoscopy and how to achieve the effect in 3ds Max. He also wrote the StereoCam modifier that we'll be using here, but with some additional tricks. Follow this link to discover more: www.tinyurl.com/LouisMarcoux3DA.

Please watch these video guides, as they'll help you understand the basics of a good stereo 3D scene. We'll use the StereoCam plug-in as it is, but with some small scripts to make the keyframing phase easier and even more intuitive.

To finish off this project, I'll present you with a short insight into working in After Effects and how you can go about testing your 3D output.



01 The StereoCam modifier

To begin we'll download and install the StereoCam script. The best way to do this is to download the script and copy it to your \3dsmax\scripts\startup folder. This tool makes a lot of steps easier, as it makes the 3D convergence plane visible in the viewport. In the modifier's settings we can set up the final screen size, the eye distance and a lot of other features.

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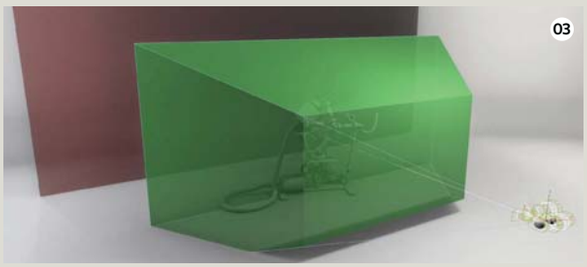

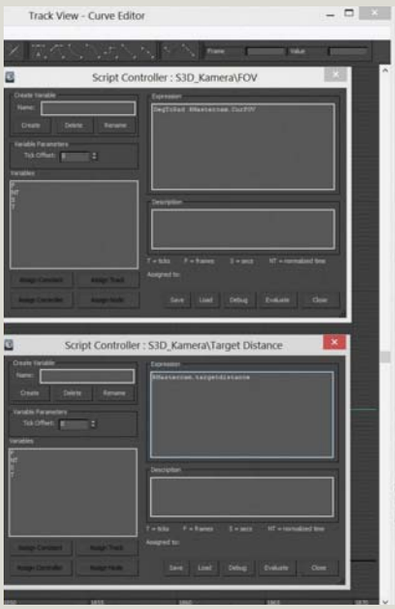

02 Set up a free camera

The StereoCam modifier is created for use on a Free Camera. However, as most of us are more accustomed with animating a Target Camera, I'll describe how to set up a scene for creating an easy workflow using a Target Camera. Firstly, create a new Free Camera and name it 'S3D_Camera'. With this selected, go to the Modifier panel and choose the StereoCam modifier. This will create two new cameras that we'll use for the rendering stage later.

03 Advanced camera settings

For easier camera animation, add a new Target Camera and name this 'Mastercam'. This camera is the only one we'll be animating. The aim of the workflow is that we only animate this camera and camera target, while any 3D camera follows it properly and gets the correct values for the important Target Distance and Field of View. For this, we have to link the S3D_Camera to the Mastercam and align both cameras to the same position.

04 The first script

For forwarding the correct values from the Target Camera Mastercam to the Free S3D_Camera, we have to set up three little scripted controllers. Select the S3D_Camera and open the Graph Editors menu. Unfold all the values of the S3D_Camera, right-click on Projection Distance, choose Assign Controller and then the Float Script controller. In the next screen, insert the script: 'Cam.Target_distance/(Cam.modifiers[#StereoCamera].StereoScale/100.0)'.

05 Add more scripts

Now repeat these previous steps for two further values. For the Field of View, enter: 'DegToRad $Mastercam.CurFOV'. For the Target Distance, enter: '$Mastercam.targetdistance'. These three little scripts force the Free Camera to take all values from the Target Camera. We are now able to completely hide the S3D_Camera and only work with the Mastercam. This can now be animated like any normal camera, but keep in mind that the convergence plane (the screen) is always on the depth of the camera target. This way we can easily decide which parts of the scene should be in front of or inside the screen.

06 Achieve a stereo effect

Finally we can create an animation using the Mastercam and its target. When it comes to rendering, we have to remember to render out only the S3D_Camera_StereoLeft and S3D_Camera_StereoRight cameras that were created by the StereoCam modifier. In After Effects, we can import these two animations into one composition, with the left movie above the right movie. Place an adjustment layer onto these two movies and add the effect 3D Glasses onto that. After setting up this effect correctly, we can choose which 3D format we would like to render out.

The best 3D viewing experience

For checking the 3D stereo effect, it's best to have a 3D monitor that's compatible with NVIDIA 3D Vision. If you don't have this, simple red/cyan glasses also work. For the final output on a 3D flat TV with shutter glasses, the format side-by-side is good. For the best quality, encode two full-HD streams onto a 3D Blu-ray. Studios use Sony Vegas Pro for encoding the frame, packing full-HD streams onto a 24p 3D Blu-rays. Stereo 3D may be a hyped technology at the moment, but as soon as 3D screens without glasses are available at lower prices, it could become a new standard for 3D production, just like HD.

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US readers turn to page 109

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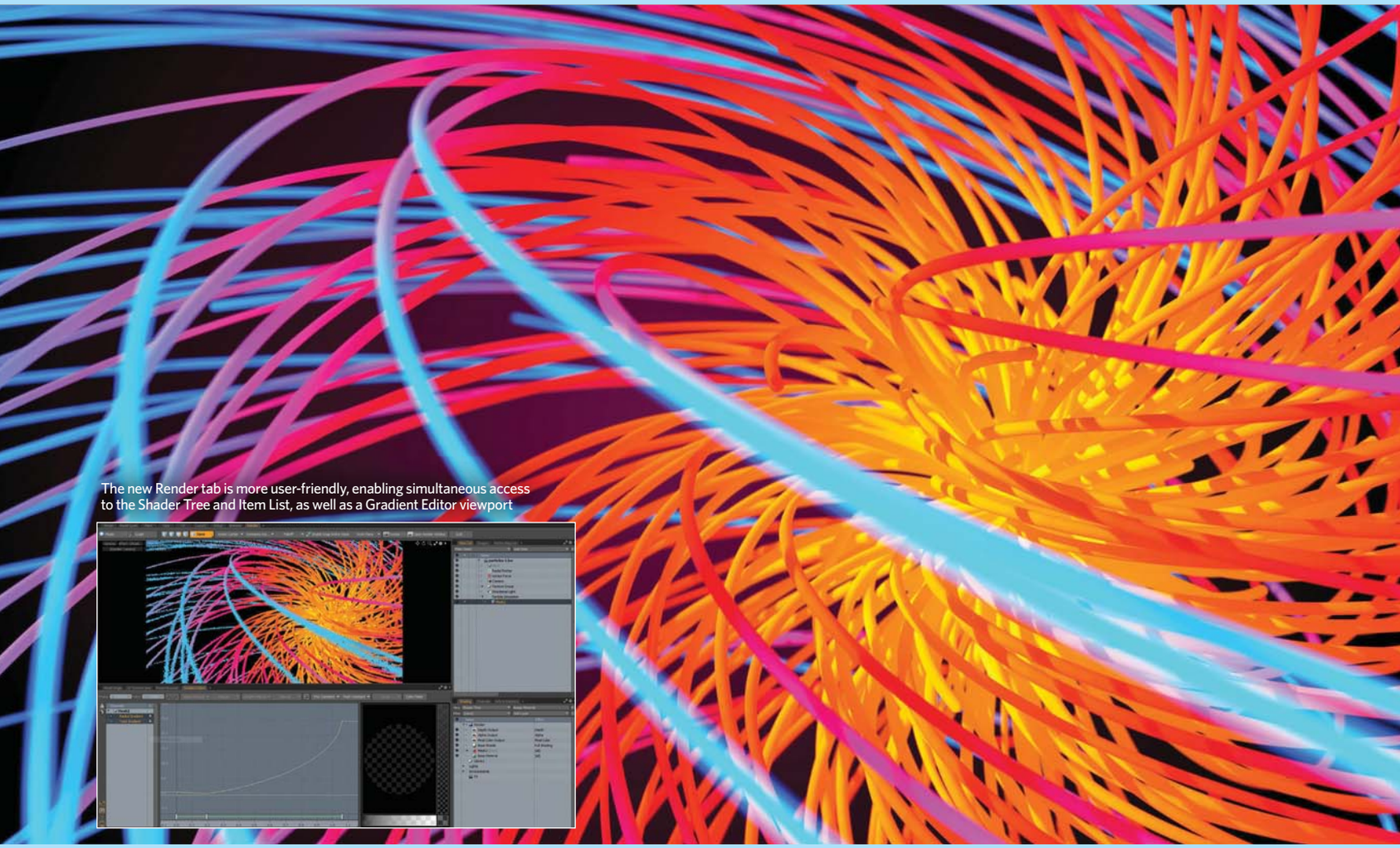


The new Render tab is more user-friendly, enabling simultaneous access to the Shader Tree and Item List, as well as a Gradient Editor viewport

MODO 701 $1,495 US (£975*)

MODO's latest release brings particles and improved dynamics, as well as some rendering and animation improvements

REVIEW BY Richard Yot, digital illustrator, UK

Last year MODO 601 made big advances in terms of new features, with the addition of character animation and deformers. This left only one major component missing for MODO to be considered a full 3D package: particles. Enter MODO 701 and Luxology has delivered another impressive update. As expected, particles are at the forefront of this release, the software featuting dynamic particles based on a nodal architecture. These can be saved out as presets for users to share and reuse – combining accessibility with very powerful programmable functionality.

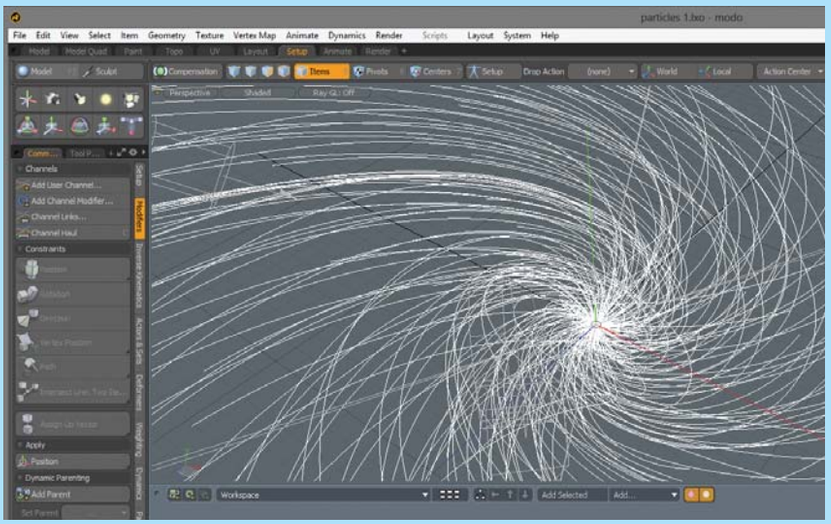
Particle simulations can be exported as curves or polygons, then edited with the modelling tools and converted back to particle paths. Mixing procedural and manual methods in this manner enables a great degree of control over particle movement.

Aside from particles, the Dynamic engine in MODO has been completely rewritten to improve performance and the difference is dramatic. Gone is the recoil plug-in and dynamics are now fully integrated into the core package. This means that simulations are much faster, more stable and more reliable than ever before. One unfortunate side-effect is that a few features (such as Ropes) have been dropped for now, but these should reappear in time once they've been integrated into the new Dynamics system. In the meantime users can still run recoil inside 701 if they need simulations that were created in earlier versions of MODO.

Performance as a whole has been vastly improved in 701, with scene management, viewport performance and Preview now running faster. MODO's Render Preview was already one of the fastest interactive renderers available, but in 701 it has become faster still and makes tasks such as lighting and texturing very enjoyable and quick.

There have also been some modelling improvements in this release, such as the Contiguous Bridge tool – which can quickly fill entire patches of geometry – and the new options in the Bevel tool, which can bevel complex geometry while preserving good topology. The topology tools have also been enhanced, with the additions like the Contour tool, which creates cylindrical topology in a few easy strokes. Sculpting performance is

Particle trails can be created at the click of a button, edited with the modelling and sculpting tools and then baked back into particle paths



Particle simulations and dynamics can be created and edited in the Setup tab. Particles now interact with the full Dynamics system in MODO 701

also vastly superior to previous versions, especially with multi-resolution meshes.

In terms of rendering, MODO 701 introduces Environment Importance Sampling, a feature that enables scenes to be lit solely from HDR images while still preserving sharp shadows from small light sources. This is something that produces very detailed and attractive lighting with far greater variation than traditional HDR lighting. The physical sky has also been updated and now produces much more realistic and pleasing results than ever before.

Rigging and animation have also seen enhancements. There's a new UI for animation that presents a very clean interface, with panels available at the click of a button. Dynamic parenting can now be completed in the viewport with drag-and-drop operation and there are a host of new modifiers available to enable procedural control of animations. Audio support is also now built-in to the application.

Overall, MODO still feels like a young application, despite being originally released in 2004 and Luxology having taken seven iterations to create what can finally be considered a complete package. However, now the groundwork has finally been laid Luxology can stop playing catch-up and concentrate on refinement and workflow, which are the true strengths of MODO. There are definitely many areas of the package that still need improvement, but Luxology has a history of listening to its customers, so this bodes well for the future of the software.

Essential info

Price: $1,495 US
(approx £975)*

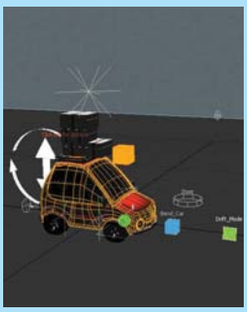
www.luxology.com

OPERATING SYSTEMS

- Windows XP, Vista, 7 and 8 (only 64-bit)
- OS X 10.6.8 or later (only 64-bit)
- Linux 5.4 or later (only 64-bit)

MINIMUM SYSTEM REQUIREMENTS

- 2GB available hard disk space
- 2GB RAM
- Intel Core 2 Duo processor or higher
- OpenGL 2.0 accelerated graphics



The Animate tab has had a major overhaul, offering a much more streamlined interface

Sculpting performance has been considerably improved, and MODO can now comfortably handle large polygon counts in the viewport

The good & the bad

- ✓ The new particles system is a welcome addition
- ✓ Massive improvements to the overall performance
- ✓ Render Preview is the best on the market
- ✓ Both a great modelling and rendering application
- ✗ Snapping needs to be improved slightly
- ✗ Deformers can still be a little slow
- ✗ The referencing system needs an overhaul

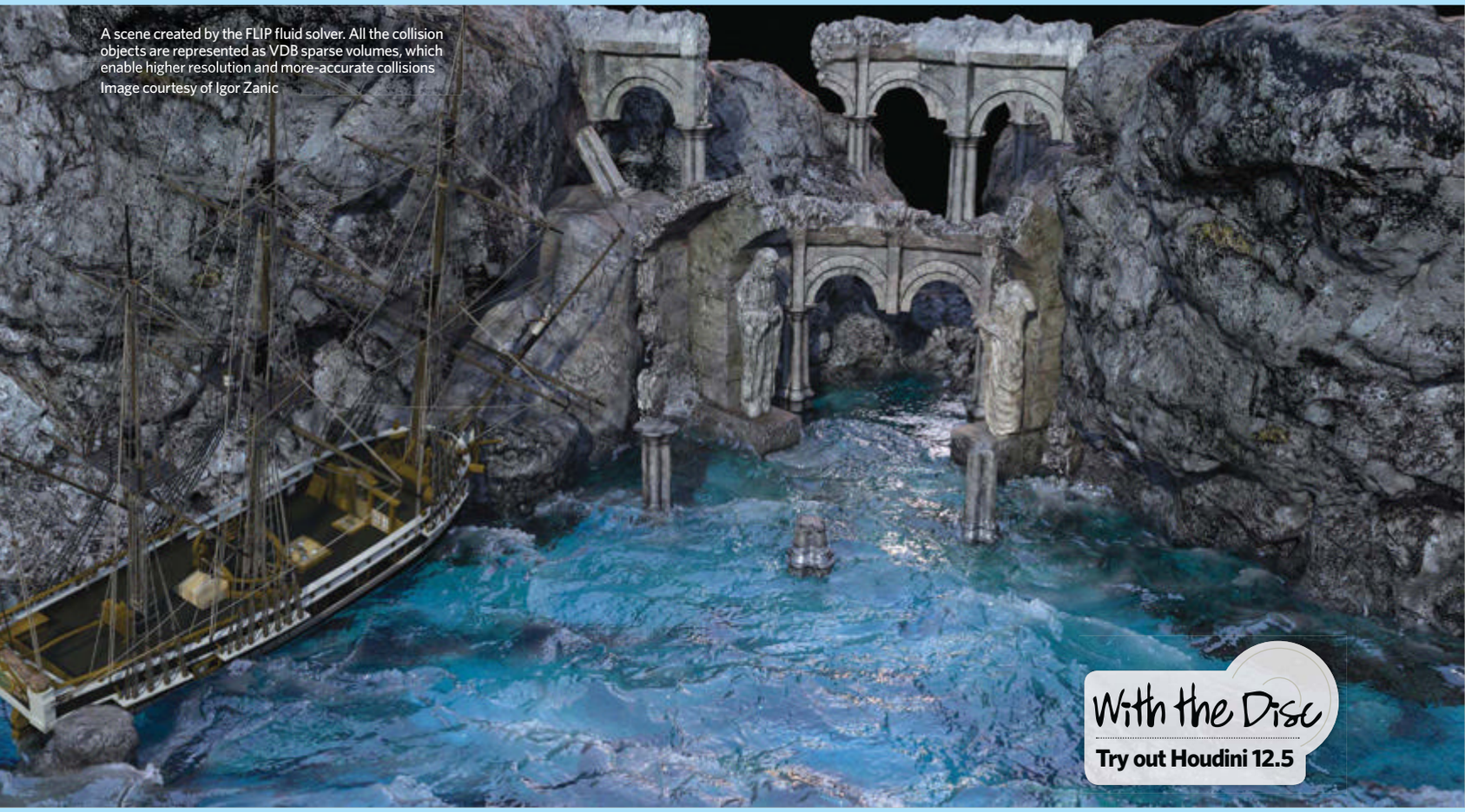
Our verdict

Features	7/10
Ease of use	7/10
Value for money	9/10
Quality of results	9/10

> "MODO is now a great all-round package and offers amazing value for money compared to the competition"

Final Score 8/10

*Price conversion correct at time of printing



A scene created by the FLIP fluid solver. All the collision objects are represented as VDB sparse volumes, which enable higher resolution and more-accurate collisions
Image courtesy of Igor Zanic

With the Disc
Try out Houdini 12.5

Houdini 12.5 $1,995 US / £1,308*

Gustav unpacks the latest version of Side Effects' procedural animation package, which offers an array of new features and performance enhancements

REVIEW BY Gustav Melich, FX technical director, USA

Side Effects Software recently released the latest version of its 3D animation and VFX package, complete with a wealth of new and enhanced features.

To kick off I found the new Cloud FX tools to be truly intuitive for sculpting and rendering impressive cloud formations. This workflow utilises sparse volume-sculpting tools created as part of DreamWorks Animations' OpenVDB open-source initiative. OpenVDB 1.0 is now fully integrated into Houdini, enabling access to more than a dozen VDB geometry nodes to create, manipulate and convert VDB volumes. I was also pleased to find native viewport and Mantra render support for the VDB volume primitives.

Many will be glad to hear that the FLIP fluid solver is now faster, more scalable and can handle animated density and viscosity as well as animated timescales. Even better, the FLIP fluids can also use OpenVDB to generate the surface of the fluid and use uniform volumes when rendering.

The latest iteration also includes an Ocean Waves tool, which can deform geometry into animated ocean vistas using the new Ocean Spectrum and Ocean Evaluate SOP nodes. These can be used to generate ocean surface, volume and point outputs. You can visualise your results in the viewport and then either render the geometry as is or export an animated texture as a Displacement map.

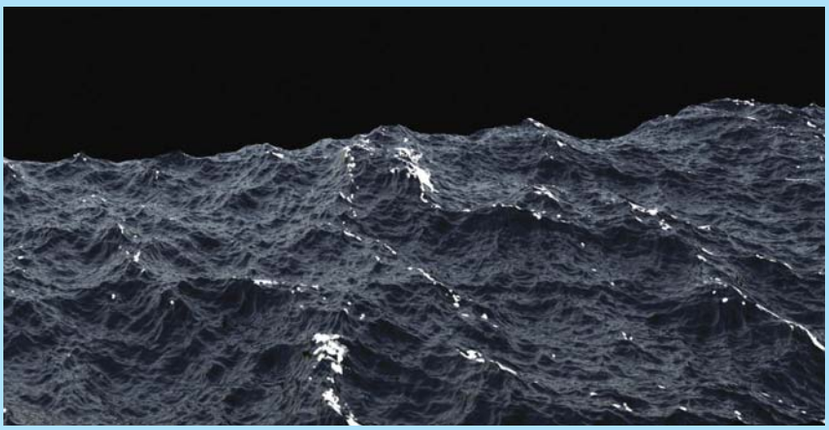
The Ocean FX Wave Tank tool takes results even further, enabling users to generate a FLIP fluid simulation derived from an animated ocean surface. If you want to achieve even more realism, a unified WhiteWater solver is now available to create impressive spray, foam and churn effects based on your underlying simulation. This can then be enhanced with the new Mist tool.

Complementing these additions is Houdini's Bullet solver, which now has many new Constraint types for rag-doll simulation. It can now handle more complex scenarios with reliable behaviour and improved performance. It also supports interpenetrating geometry and has the ability to toggle Collision Detection between objects, making for much more impressive results.

As for the Cloth solver, the tool now supports a panel workflow and provides even better performance and collision support than previous versions. The per-vertex multiplier attributes, in addition to per-point attributes, offer a greater degree of freedom when controlling the behaviour of different elements of the cloth.

The lighting and rendering pipeline in Houdini 12.5 has also been significantly enhanced, with relighting options and optimisations in IPR [Interactive Photorealistic

The Cloud FX tools are built using the new OpenVDB sparse volume tools. These make the creation and manipulation of volumes fast, intuitive and easy



An ocean surface created using the new Ocean FX tools, which can generate elements like splash, foam or mist

Rendering]. Thankfully, primitive support for file types such as Alembic now eliminates the need to bake Alembic data into Houdini geometry. This results in much lighter data passing through the system, either to the viewport or the Mantra renderer. As such Alembic data loads faster. These enhancements turn Houdini into an even more robust solution when working with huge data sets, making for a far more efficient workflow.

Overall I found the viewport's performance has greatly improved, as it now features GL3-accelerated component-picking. Also, a new viewport option enables volumes to be displayed as point clouds in Wireframe mode. Native viewport and Mantra support for Alembic primitives means you can also display Alembic primitives as proxy data such as a bounding box or point cloud.

Houdini 12.5 also presents new Primitive and Group types, as well as continued SOP optimisation. This includes more multi-threading, which takes advantage of the new geometry architecture introduced in the previous version. Some of the newly introduced geometry nodes also now provide the ability to build clean triangle meshes from non-manifold surfaces.

Overall, Houdini 12.5 stands as an impressively streamlined version of one of the industry's core VFX packages. The new environmental tools open up some interesting options, but it's the smaller tweaks that make this such an exciting piece of kit.

The new Cloud FX tools enable the easier creation beautiful cloud formations

Essential info

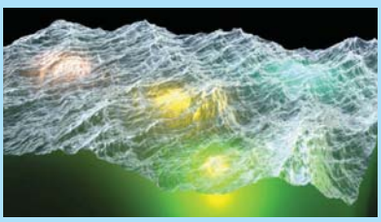
Prices: Houdini: $1,995 US
Houdini FX: $4,495 US
Houdini Apprentice HD: $99 US/year
Houdini Apprentice Edition: Free
www.sidefx.com

OPERATING SYSTEMS

- Windows 7 or 8 (32- or 64-bit)
- Mac OS X 10.6 or higher (64-bit)
- Linux (32- or 64-bit)

OPTIMAL SYSTEM REQUIREMENTS

- Recent-generation 32- or 64-bit AMD or Intel processor (64-bit strongly recommended)
- Minimum 4GB RAM. 8GB is recommended for fluid simulations
- Minimum 1GB disk space for installation
- Three-button mouse required



This surface was generated by using the Ocean Spectrum and Ocean Evaluate SOP nodes. You can choose to either use the displaced geometry or export it as a Displacement map to be applied at render time

The good & the bad

- ✓ Sparse volumes are welcome and OpenVDB 1.0 is fully integrated
- ✓ Over a dozen VDB geometry nodes to create, manipulate and convert VDB volumes
- ✓ Native viewport and Mantra support for VDB
- ✓ New Ocean FX toolset to easily create ocean surfaces
- ✓ New Cloud FX tools
- ✗ Very few documentation or example files for a system so complex.

Our verdict

Features	9/10
Ease of use	7/10
Value for money	9/10
Quality of results	9/10

"With the tons of new features and improvements in this release, artists can take their work to the next level"

Final Score 9/10

*Price conversion correct at time of printing

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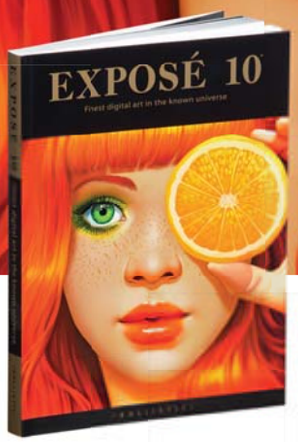
Image courtesy: Daniela Uhlig, GERMANY Red Orange



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/ B A L L I S T I C /

Blender Master Class

This fast and practical introduction to creating 3D models in Blender provides a solid foundation for future projects

REVIEW BY Paul Champion, 3D and VFX demonstrator, UK

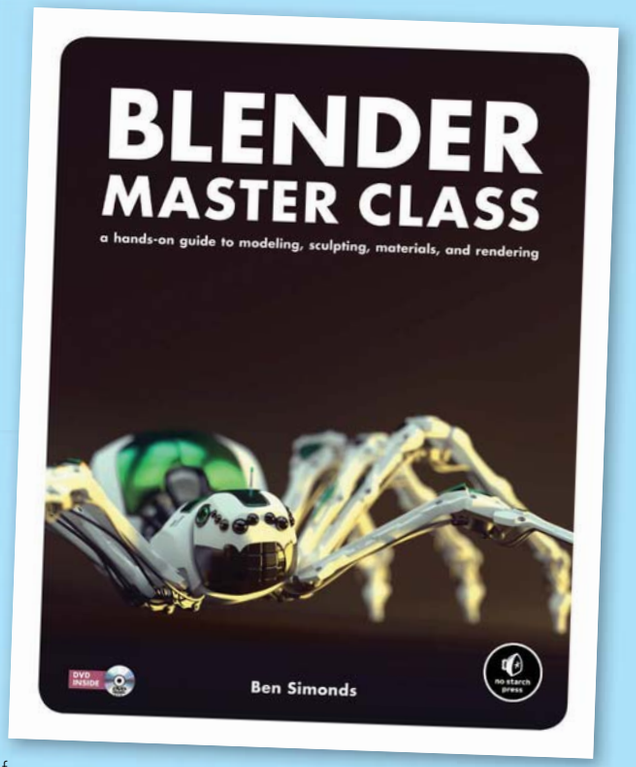
Taking a project-centric approach to its teaching methods, Ben Simonds' *Blender Master Class* is a training resource suitable for those who have dabbled with Blender in the past or casual users struggling to get to grips with the application, rather than outirght beginners.

There are three asset-creation projects to complete, with the scope of each being mostly limited to modelling, texturing and rendering. However, each presents a varied set of challenges that eventually impart a broad overall understanding of Blender's workflow and toolsets.

The Jungle Temple project demonstrates how to create an ancient ruins scene and then composite the final render onto a background image made using GIMP. The Bat Creature project, meanwhile, focuses on modelling an organic humanoid with bat-like features, such as wings and fur. Finally the Spider Bot project deals with constructing a mechanical spider, creating each of its parts with hard-surface modelling techniques.

The assorted selection of models, as opposed to characters that are more fitting to the jungle temple environment, certainly makes things interesting. However, it also comes across as a missed opportunity to produce a final render that includes all of the elements in one shot.

Chapters begin with an introductory explanation of the tools and techniques used. This information is then applied to each of the projects in turn for the remainder of the chapter. The projects are written in a production-report style, with the author retrospectively explaining his methods at every stage of the process. Plenty of helpful advice is also given for tackling your own projects, should you decide to go off on a tangent. Each chapter then concludes with a helpful review of what you've learned. This layout works well when reading chapter by chapter, but when you're working through one of the projects specifically, it could be made more obvious where one project tutorial ends and the next begins.



The Spider Bot project will teach you essential hard-surface modelling techniques

An open-source pipeline is used throughout the book, with GIMP employed for asset-texturing and a few other 2D tasks, such as preparing reference images. MeshLab is also implemented as an alternative to Blender's Decimate modifier.

Overall, this is a useful and worthwhile resource. Although Blender is a tool that requires considerable time to master, you'll find a wealth of insight into the general processes behind asset-production throughout the pages of this book. Also, you really can't turn your nose up at the fact that the print version of *Blender Master Class* includes a free eBook copy and a DVD containing all the scene files, textures and brushes for the projects. Even better, the physical edition isn't much more expensive than the eBook-only price.

Essential info

Price: $50 US (approx £33*)
Print book and free eBook

$40 (approx £26*)
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www.nostarch.com

AUTHOR Ben Simonds
PUBLISHER no starch press
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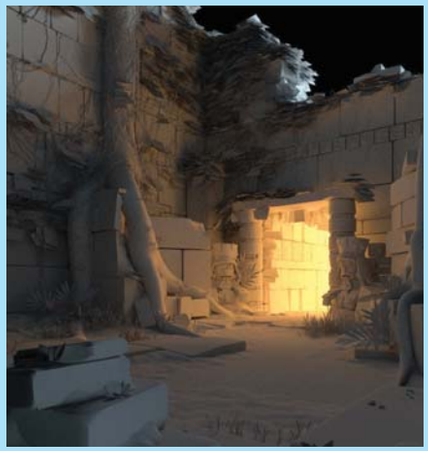

This work-in-progress render of the Jungle Temple project shows how lighting can make a big difference to the feel of your shot

The Bat Creature project imparts organic modelling techniques, effective use of subsurface scattering, fur and hair rendering and dramatic lighting setups

Our verdict

Quality	9/10
Ease of use	8/10
Value for money	7/10
Overall usefulness	9/10

"An excellent resource that's suitable for 3D artists looking to advance their existing Blender skills"

Final Score 8/10

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> “Our work is not solely aesthetic, but supports and adds to the narrative of a project in a very visual way”

Factory Fifteen's Jonathan Gales discusses the studio's work on the vibrant and exciting 'Jonah'. Page 106

'Jonah'
Factory Fifteen
Factory Fifteen reveals the work behind its latest short

Autodesk has coupled its new wave of software versions with a total branding overhaul

Autodesk ushers in 2014 releases

Maya, MotionBuilder, Softimage, Mudbox and 3ds Max each receive a digital makeover

Autodesk has recently unveiled the new features for the 2014 Entertainment Creation Suite, along with a snazzy, company-wide origami rebranding.

Built on digitalRasters' NEX toolset technology, Maya has gained more modelling tools and promises accelerated workflows designed to streamline common tasks such as retopology. Managing large and complex worlds has also been simplified for layout artists with the addition of Scene Assembly tools, a File Path Editor and URI (Uniform Resource Identifier). Other changes include updates to the Node Editor, Paint Effects tools and a new Grease Pencil.

The main addition to 3ds Max is the Populate feature, which is a crowd-animation toolset that lets you add characters into scenes. The virtual people can then be simulated to follow pathways, animate various behaviours or stand and complete tasks in user-designated idle areas. Pflow's mParticles system is also fully integrated to aid this new system.

Softimage has received a range of bug fixes this time around and the new Camera Sequencer tool will be most useful for pre-vis work. CrowdFX has also been overhauled, enabling artists to control sub-groups of characters within simulations.

MotionBuilder now has new mocap workflow options that enable markers to be assigned directly for driving a character's joints and also an improved IK solver. Studios can now integrate their own viewport renderers using the Custom Renderer API.

Mudbox's Advanced Retopology tools enable artists to sculpt without any prior concern for the underlying structure. Plus, the mesh of the finished model can be retopologised manually or automatically.

Maya 2014 and 3ds Max 2014 each cost £3,200. More details, including all pricing options, can be found at www.tinyurl.com/3DA-Autodeskprices.


Maya 2014 gains a DirectX 11-based viewport display

Maya and 3ds Max DirectX 11

DirectX 11 is now supported in 3ds Max and Maya, which is an upgrade for 3ds Max and a change from OpenGL for Maya. This is ideal for game development as it provides artists with a high-quality real-time environment that closely matches final output in a DirectX 11 game engine.

From left to right: Maya, Max, MotionBuilder, Softimage, Mudbox

Autodesk rebrands with origami style

Autodesk has announced the launch of its new branding and product logos. The new look signifies an origami theme, showing colour, movement and 3D that's part of a company-wide revamp. Origami seems to be a popular motif this year, as Google and Allegorithmic are sporting a similar style.

● **HAVE YOU HEARD?** • OpenEXR 2.0 has officially been released, adding support for deep compositing workflows

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LucasArts closes

Disney dissolves the classic videogame studio

A mere 154 days after acquiring LucasArts as part of its larger four-billion-dollar acquisition of Lucasfilm, Disney has laid off the staff of LucasArts and cancelled all current projects. A small team will remain to handle licensing partnerships, but all in-house development has been halted, including its much-anticipated title *Star Wars 1313*. A statement declared: "After evaluating our position in the games market, we've decided to shift LucasArts from an internal development to a licensing model, minimising the company's risk while achieving a broader portfolio of quality *Star Wars* games. As a result of this change, we've had layoffs across the organisation. We are incredibly appreciative and proud of the talented teams who have been developing our new titles." The announcement of the closure of LucasArts, with the loss of around 150 jobs, is likely to anger fans of the movie series after Disney cancelled the hit cartoon show, *Star Wars: The Clone Wars*.

The closure of LucasArts means that anticipated titles such as *Star Wars 1313* may not see the light of day

Rhythm & Hues sold

Prana Studios Inc. takes on the foundering VFX studio

After a long and very public bankruptcy process, a holding company associated with Prana Studios has officially acquired Rhythm & Hues via auction.

Jeffrey Okun, Prana's senior vice president of visual effects commented: "Our partnership will allow R&H to continue the business of creating world-class digital imagery. R&H, which recently won the visual-effects Oscar for *Life of Pi*, will remain a standalone company." Prana is an artist-driven, full-service 3D animation and visual effects studio, with offices in Los Angeles and Mumbai. Currently the studio is working on Disney's upcoming feature, *Planes*.

The potential closure of R&H has been the source of much consternation in the VFX community as of late

Finding Nemo sequel

Pixar has announced Finding Nemo's long-awaited sequel: Finding Dory

Finding Dory will be released in cinemas in 2015. We can't wait!

Pixar is set to take audiences back to the extraordinary underwater world created in 2003's *Finding Nemo*. According to director and Pixar veteran Andrew Stanton, *Finding Dory* takes place about a year after the first film and features returning favourites Marlin, Nemo and the Tank Gang.

Partly set along the California coastline, the story also welcomes a host of new characters, including a few who will prove to be a very important part of Dory's life.

Software shorts

Bringing you the lowdown on product updates and launches

messiahStudio 6

The latest version of pmG's rigging, animation and rendering package boasts over 65 improvements. Highlights include hair system refinements, which enable greater control over styling and placement. The rendering system supports 64-bit PNGs and optimised stereo rendering. Metamation Multi Mesh enables you to up-res a rigged mesh to include displacements and soft bodies. Learn more at www.projectmessiah.com.

XrayCAT Survival Toolkit for 3ds Max

XrayCAT ST 1.0 by Raylight is a plug-in specifically tailored to augment the main aspects of CAT in 3ds Max, offering improvements in speed, ease-of-use and real-time options. It includes a handy Pose Manager to quickly copy and paste poses and mirror rigs. There are also utilities for importing mocap data. A single licence costs $40 and you can learn more at www.raylightgames.com.

Substance Designer 3.5

Released as a free upgrade for version 3.x, Substance Designer 3.5 brings several new features such as resource-monitoring, import and live link with PSD files, tessellation and multi-material support in the 3D view, a profiler and optimised performances. The package costs $590 US for a commercial release. Visit www.allegorithmic.com.

Maxon and Adobe form alliance

The next version of After Effects includes closer integration with CINEMA 4D

The next release of After Effects will include two MAXON technologies: Cineware and CINEMA 4D Lite. The Cineware live pipeline will let you bring a CINEMA 4D scene directly into After Effects CS7 to composite and render. This streamlines workflow by removing the need to pre-render passes. Artists will be able to make adjustments to scenes in CINEMA 4D, which will automatically update in After Effects.

The changes to After Effects will result in a much simplified workflow for artists.

● **DID YOU KNOW?** ▪ The Foundry has announced the release of the latest version of HIERO and HIEROPLAYER

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Course Focus

Animation Apprentice

A fast-track animation masterclass that you can complete at home

Course name
Animation Apprentice

Course length 30 weeks

Fees £3,000 / $4,500 US

Student requirements A strong desire to learn character and creature animation

Website
www.animationapprentice.org

The Animation Apprentice course's main aim is to offer the best-quality online course possible for a reasonable price. It's tailored towards the student; as it's online, they work on it in their own time and can do as much or as little as they please. Naturally, the more time that's put into the course, the better the results.

The program is divided into five modules over 30 weeks, covering all the key elements of animation. Each week starts with a project brief telling students the exercise they need to complete, as well as suggesting videos to watch in a certain order. Once the exercise is complete the file is sent over to the tutor and the student will receive a video critique shortly afterwards. This critique is completely personal and tailored to show each student what was right and wrong with their animation and, more specifically, how to improve the shot. An improved version is included within the video to show students what they need to do and offer advice for when they're working on similar work in the future.

Starting the course off in groups, students work in a team to build a sense of community. By the end of the course each student works alone and the final four weeks are dedicated to putting together a top-quality demo reel to show to potential employers when they go out looking for a job.

If you haven't had training in 3D software, the course includes a four-week module on Maya, although this can be skipped if you already know the program. By the end of the 30 weeks, students will come out with full training and a quality portfolio to help them get their first job in animation.

> "Thanks to Animation Apprentice I could refine my showreel and be ready to work in ambitious CG companies"
>
> **Giuseppe Candido,** Animation Apprentice student

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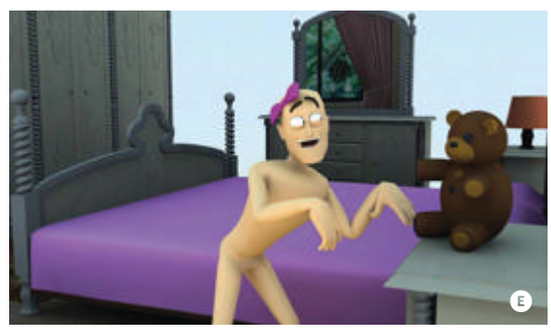
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Details

Animation Apprentice

This online course was founded by Alex Williams, an animator with 25 years of experience in the industry. Williams has worked as an animator, artist and storyboard designer on more than 20 feature films, including *The Lion King* and the last three *Harry Potter* films. He has also taught animation courses at CalArts, Gnomon, The Animation Workshop and Escape Studios. Working from home, students will receive weekly feedback and advice from Williams. They can also share advice and thoughts with other students through the AA Facebook page.

A *Wild Fish*
» Alexi Balian
Character animation is a big part of the course. Students will learn how to work with moving characters in environments they also create themselves

B *Morpheus Jump*
» Greg Gordon
Making characters move naturally is a huge challenge for any artist, but with weekly training videos students can regularly improve their work

C *Bouncing Ball*
» Greg Gordon
The course also covers animation in physics-based settings such as this Rune Goldberg machine, with realistic shadows playing an important part

D *Animation Apprentice*
» Amanda Tan
As part of developing a varied portfolio, the course encourages students to create a range of interesting and varied characters.

E *Untitled*
» Marc Godfrey
What students make on the course is up to them, as long as they stick to the weekly brief. This strange creation came from the mind of Marc Godfrey

Studio Access

Factory Fifteen

The young design studio discusses the transition from arch-vis to film VFX in 'Jonah'

FACTORY FIFTEEN

Factory Fifteen is a UK-based film and animation studio, led by directors Jonathan Gales, Paul Nicholls and Kibwe Tavares. Their backgrounds range from architecture and 3D visualisation, to engineering, animation and photography. The teams translate all this experience to a multi-disciplinary approach to filmmaking.

www.factoryfifteen.com

Project 'Jonah'
Description 'Jonah' is a short film about a sighting of the world's largest jumping fish in an east-African town. The film portrays the effects of social change on both the protagonist and the town, instigated by tourism and the protagonist's temporal fame.
Country UK
Software used 3ds Max, V-Ray

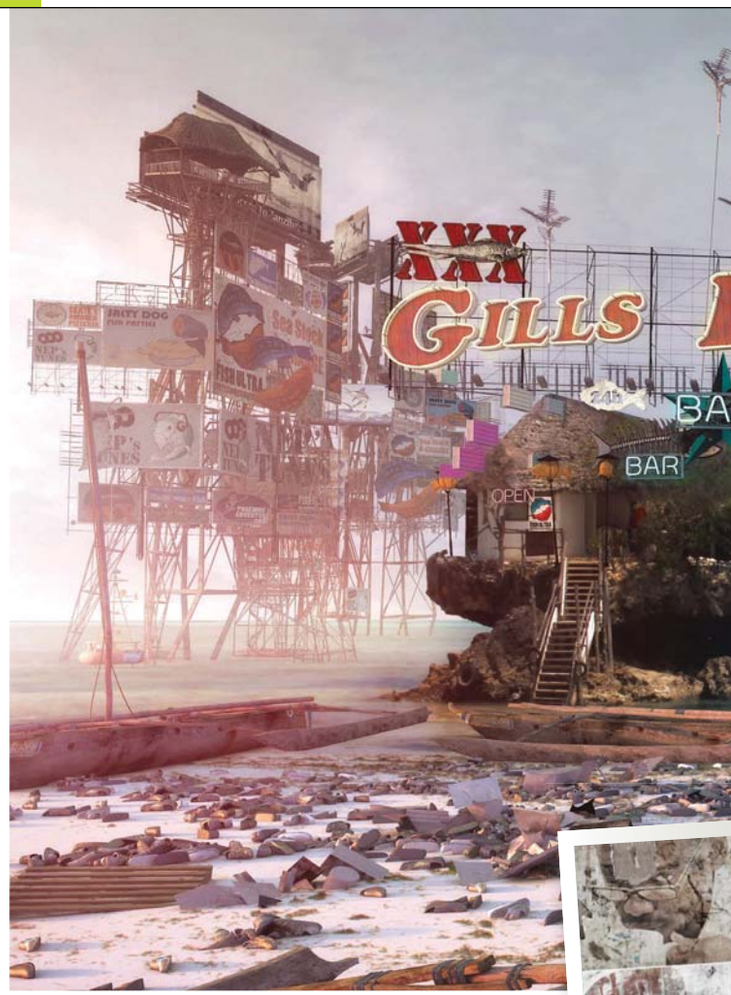
This is a real turning point in the development of the studio's direction," states Jonathan Gales, co-director of Factory Fifteen, a creative studio perhaps better known for its arch-vis work. Until now, that is. "'Jonah' as a project was incubated in our studio [all the way] from its inception point, through to its design, then the production of the film and post effects," continues Gales. "As a project it gave us huge scope and creativity to take the design of the film where we wanted, but to also situate it in a character narrative, which is something we had done little of previously."

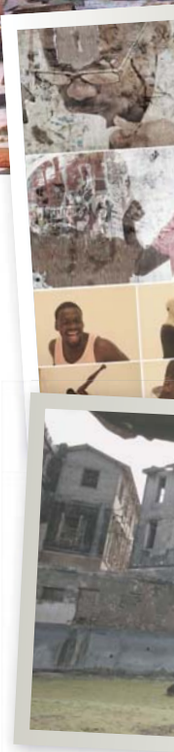
Filmed on location in eastern Africa, 'Jonah' has unquestionably been the most ambitious venture for the fledgling arch-vis, creative animation and film outfit to-date, marking its first significant leap into the world of VFX.

Formed just a few years ago by three students undertaking Masters degrees at Bartlett School of Architecture, Factory Fifteen's three co-founders – Jonathan Gales, Paul Nicholls and Kibwe Tavares – gained crucial early recognition from their peers through submitting animations to festivals during their time studying.

"Our Masters tutor, Nic Clear, really pushed us to put our work out in the public eye," remembers Gales. "He made us keep production blogs and submit our work to exhibitions and festivals. Our work was getting picked up even before we finished our course, so I would be a big advocate of getting work out there early. It pushes you to improve, take criticism and have friendly competition with your peers."

> "We like to think that our work is not solely aesthetic, but supports and adds to the narrative of a project in a visual way"
> **Jonathan Gales, co-director, production designer**





Since the establishment of Factory Fifteen, the studio has primarily supplied arch-vis for prominent architecture firms, amassing a remarkable portfolio of progressive conceptual design. "A lot of architecture is designed and developed from concepts that are sometimes abstract, but integral to the representation of the finished result," says Gales. "Every project is different; we don't keep presets or lighting rigs that we whack on any new work. We like to build each scene up from scratch, ensuring the images develop in terms of their mood and atmosphere specific to the design..."

However, working in architectural visualisation enabled the team to gain a multitude of transferable skills that would prove invaluable when it came to branching out into VFX. Texturing, lighting and populating environments – all vital components of arch-vis compositions – would prove equally essential for Factory Fifteen's short films 'Robots of Brixton' and the upcoming 'Jonah' . "We like to think

Contributors

Jonathan Gales
Director, production designer

Paul Nicholls
Director, production designer

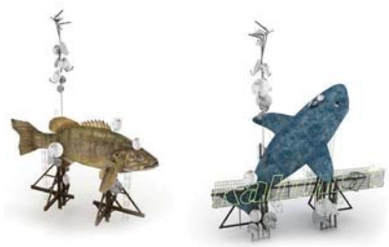
Kibwe Tavares
Director, film director

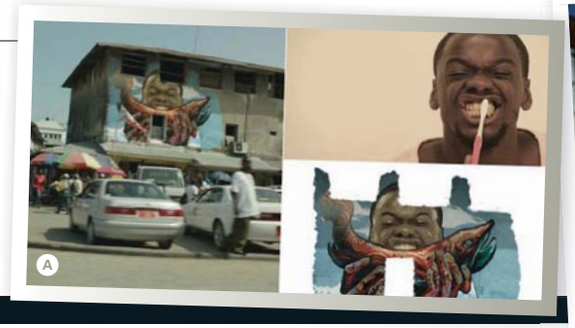
Matt Townsend
Visualisation manager, 3D artist

Portfolio highlights

Here are some of the major projects Factory Fifteen has worked on:

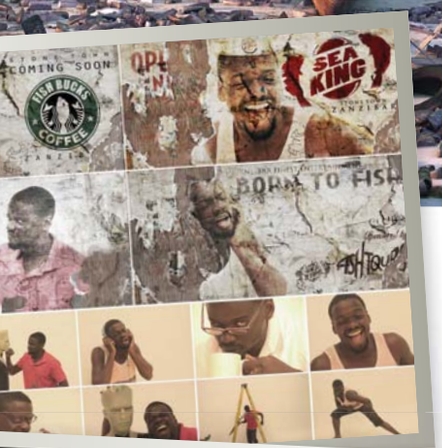
2013 *Xavier*
2013 *'Jonah'*
2012 *Rio Olympics Visualisations*
2012 *20K*
2012 *'Gamma'*
2011 *'Robots of Brixton'*
2011 *'Megalomania'*
2011 *The Golden Age*

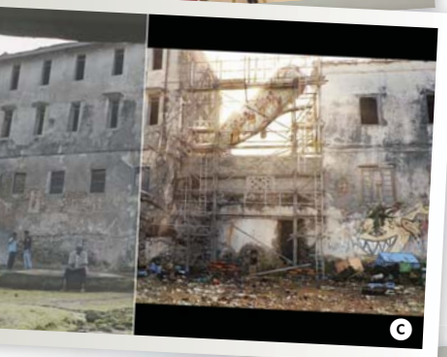




workspace[3D]

To submit your project to the **workspace**[3D] please contact Chris McMahon at **chris.mcmahon@imagine-publishing.co.uk**





Maximus power

Jonathan Gales discusses Factory Fifteen's partnership with tech company NVIDIA

Factory Fifteen has recently entered into a partnership with NIVIDA, using its new Maximus graphics architecture on two separate jobs. "Essentially the system is a dual-GPU setup using the Tesla K20 compute card solely for compute tasks and the Quadro graphics card for visual performance," says Gales. "What this enables is a lag-free modelling environment in 3ds Max while using V-Ray RT. With Maximus I can have V-Ray open almost all of the time without viewport lag."

Factory Fifteen has adopted the tech as a powerful solution for setting up textures and lighting with dynamic feedback on both 'Jonah' and for its arch-vis job for Wilkinson Eyre on the Rio 2016 Olympics. "In both cases, having instant feedback for materials and lighting at the design and set-up stage really sped up a process that would usually have consisted of several hours of rendering through the CPU. I look forward to when some of the software catches up to these hardware innovations so I can use V-Ray for all production work too."

that our work is not solely aesthetic, but supports and adds to the narrative of a project in a visual way," explains Gales. "One main challenge for ['Jonah'] was integrating our 3D work with the live-action footage; we evolved our workflow and really had to step up on tracking and compositing to produce the film.

"Early on during the design- and narrative-development, we created an animatic and pre-visualisation in line with the script. This really helped plan the extent of the shots and animation we had to produce in post-production."

The studio prefers to work predominantly in 3ds Max and V-Ray over Maya or CINEMA 4D, achieving a high standard in large expansive designs for cities and landscapes. "3ds Max is pretty good for architectural stuff and really accessible for plug-ins and scripts that enable you to extend the standard tools for specific jobs," says Gales. "MultiScatter is one of our favourite plug-ins, as it lets us distribute an array of proxies in a really controlled way. In terms of

A The studio had to alter much of the live-action footage filmed on location in Tanzania. Billboards and buildings were transformed into garish murals of the boy and the fish at the heart of the story

B "We've got a number of projects in development at the moment," reveals Gales. "For the past two years we've found it interesting falling into film/design/animation worlds while still working with architects"

C The studio filmed all of the live-action footage on location in Tanzania, before returning to the UK for post-production. It's been one of the biggest undertakings for Factory Fifteen since the studio first opened

D "'Jonah' was initially a great design challenge," says Gales. "It presented us with the challenge of taking our designs from the concept-development stage through to the final post-production"

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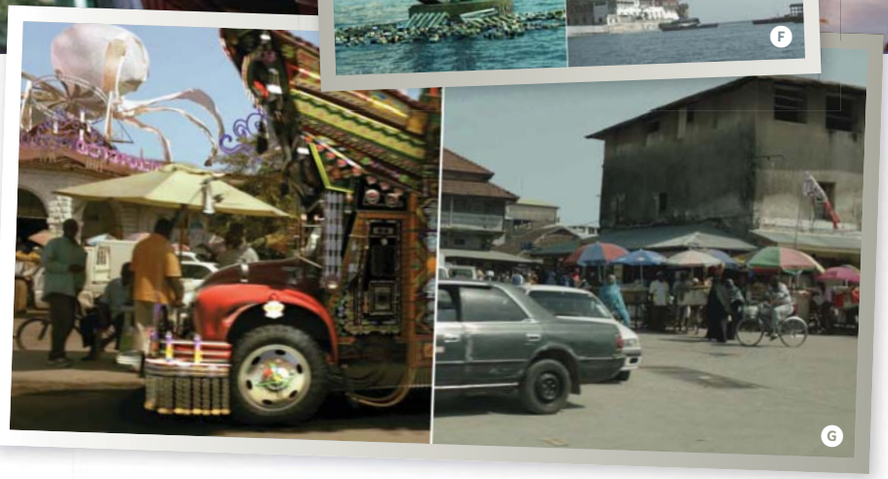


G

hardware, we have four 3D-specific workstations that all consist of Intel i7 chips, 24-32Gb RAM and 4-6GB NVIDIA graphics cards. We've also been building a small render farm over the past two years, which at the moment has 192 effective cores."

Factory Fifteen is currently working on an extensive production design and artwork set for an unnamed science-fiction project. It's also continuing to build on the success of its arch-vis designs, which includes recent visualisations for the upcoming 2016 Olympic Games in Rio. However, that's not before the release of 'Jonah' later in the year. "Working on 'Jonah' taught us a lot of things, not only in terms of the production of film work but also about the industry, funding and how larger pipelines work," reflects Gales. "Internally we have a lot of knowledge that we can now apply to all our projects – namely, how to structure, plan and execute them as a team. Technically, of course, there were a lot of lessons learnt, especially in terms of compositing, which we are looking forward to taking to the next level on upcoming projects."

> "'Jonah' taught us a lot of things, not only in terms of the production of film work but also about the industry, funding and how larger pipelines work"
>
> **Jonathan Gales,** co-director, production designer

H

E "'Jonah' is rich in the narrative of architecture, and how a town can develop, affecting the characters or the story," says Gales. "It gave us huge scope and creativity [for] the design of the film"

F "We don't keep presets or lighting rigs that we whack on any new work," says Gales. "We like to build each scene up from scratch, ensuring the images develop in terms of their mood and atmosphere"

G The studio founders' experiences at university inform the studio's principles. "Factory Fifteen has been a natural progression of what we were doing [at university]," says Gales

H The Factory Fifteen team found the experience and skills gained from working with arch-vis projects – particularly with texturing and lighting – invaluable when working on its shorts

Artist info

RenPeng Dong

Personal portfolio site
www.oldrhyme.cgsociety.org

Country China

Software used
3ds Max, Maya, ZBrush, Mudbox, Photoshop, V-Ray

"I saw an image on a website that was like a kind of transparent man blending with his background, which brought me this great idea... [I] decided to show the feeling of part drying paint, part real, part plaster"

Non-US readers turn to page 92

Industry insider

Inspiring simulations

Vahid Tehrani, technical and creative director

We talk with Vahid Tehrani about the complexities of CGI, fluid simulations and more

About the insider

Job 3D and 2D FX fluids generalist, technical and creative director

Education BA in Computer Animation at Ravensbourne

Website www.vahid3d.com

Biography Tehrani is a self-taught 3D artist from Düsseldorf, who moved to London to study in 2003 and liked it so much that he ended up staying. He enjoys all aspects of 3D and 2D animation, particularly FX and fluid dynamics, as well as 2D and 3D compositing.

If there's one aspect of CGI and VFX development that perhaps gets less attention than it deserves, it's fluids, simulations and dynamics.

These more-complex elements of the VFX mix, entrenched as much in mathematics as they are in art, are integral in bringing together the spectacular and destructive imagery we see in the likes of *Avatar* and *Life of Pi*. Yet audiences often accept them on face value, unaware of the expertise required to achieve such stunning effects on the silver screen.

One artist working in this hidden-in-plain-view CG discipline is Vahid Tehrani, who has worked on animation projects from an early age. His research and dedication to the ever-changing field of simulation ensures he keeps up-to-date with the latest developments and can deliver some incredibly impressive work.

Tehrani explains: "I studied animation from a young age, and had 2D graphics software on an Amiga 500, which could do simple animation. However, I first saw a cloth simulation in the movie *Spawn*, where they had his cape simulated. Those cloth-simulation shots awakened my interest in simulation-based animations, and I started to do some research."

Tehrani has gone on to create some remarkable work in fluids, dynamics and particles, evidenced across these pages. We sat down with him to discuss the various steps that he believes must be mastered before achieving such results, as well as the essential skills required of any artist aspiring to join the industry.

You've held many roles in the past. What are the most important lessons you've learned in the complex field of CG and VFX?

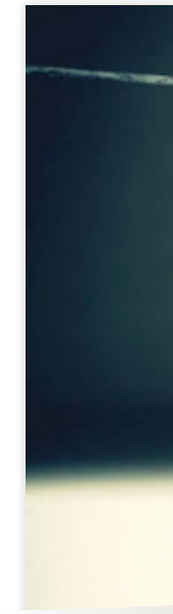
Keep studying all aspects of CG and VFX if you want to stay in the industry all your life. Also, don't stick to your usual techniques, constantly change and improve them. Understand the different roles and disciplines if you work in a large company, as it will make it easier for you to communicate with colleagues and adapt your language accordingly when explaining potential problems. Be efficient and don't be distracted by other things around the studio or office. Above all, finish the task at hand before doing anything else.

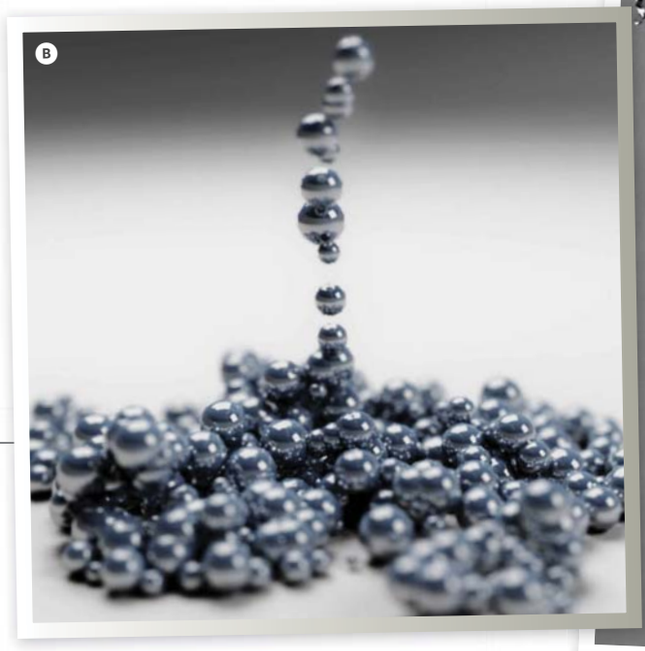
Your most impressive work is in fluids, dynamics and particles. How did you get into this aspect of CG work? What tools or software do you find are best for the different aspects of your work?

The software you use is not important. Instead, it is important that you have an understanding of how fluid-based simulation works. You don't necessarily have to know how to program a fluid solver, but you should know the basics of vector-calculation and have an understanding of how voxel- and particle-based simulations solve their data. Maya, 3ds Max, XSI, LightWave, CINEMA 4D or Blender have their own particle simulators or fluid solvers and all of them work well. It just depends on which one you like to use.

Can you offer any words of advice when it comes to breaking into the field of fluids, dynamics and particles? What skills do you need to start with?

Only get into this field if you absolutely love it, as you'll need to be very patient when it comes to 3D simulations. You'll also need to learn modelling, texturing, keyframe animation and lighting before you get into simulation. You'll need them sooner or later when creating simulation-based animations.





Portfolio highlights

Some recent features that Vahid Tehrani has worked on:

2013 *Vampire hunter*
2012 *Cloth dance*
2012 *Cube tornado*
2012 *MagneticSpheres*
2012 *Spline copter*
2011 *Underwater ink*
2007 *Rainmobile*

All images © Vahid Tehrani

Get out of your comfort zone

Tehrani explains how he manages to stay up-to-date with the latest CGI techniques

"I search the web for news and updates about new CGI techniques almost every day. Once I see something interesting and useful for my work, I learn and implant it into my next project. It's important not to get too comfortable with the techniques you know already. Try to experiment with your skills all the time."

Your work with cloth simulation is particularly impressive. Could you explain your approach to tasks like these and how you go about achieving such fantastic results?

I use nCloth inside Maya or Cloth inside 3ds Max and both are awesome. A successful cloth simulation works well when the polygons' topology is right. You should keep the polygon count to a minimum and only have higher polygon counts around the areas where the cloth needs to bend. Avoid cloth collisions with sharp edges of rigid-body objects. Also, point cache the cloth to an external file once the simulation is done and you are happy with it. This will speed up your workflow and the simulation won't need to be saved inside the scene file every time you save the scene.

> "The software you use is not important. Instead, it is important that you have an understanding of how fluid-based simulation works"

A In this short the shape of the car is translated into particles, which are then violently torn apart. The particles then slowly and gracefully rebuild the vehicle.

B Once you get to grips with simulation you can achieve great effects. Here sticky particles are emitted then collide realistically with one another.

C Tehrani's work is incredibly diverse, covering all manner of particle and fluid simulation. You can see his impressive showreel through his portfolio at **www.vahid3d.com**

D This still is from a short demo in which animated water behaves like flames. You can find this and more of Tehrani's work at **www.vimeo.com/45168668**

E With this spline particle technique, particles are emitted inside an object's shape – in this case a helicopter – and leave a spline trail in their wake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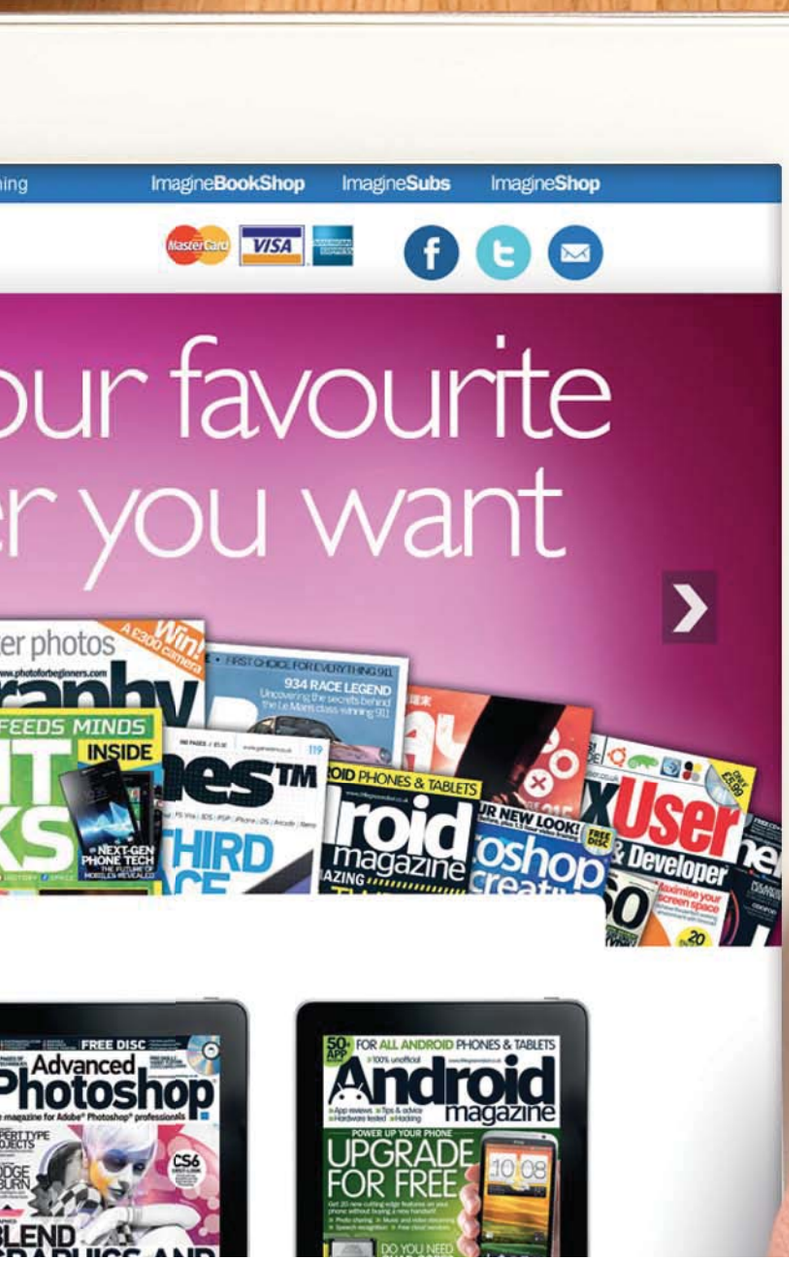

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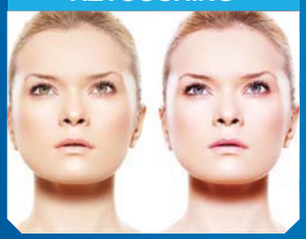

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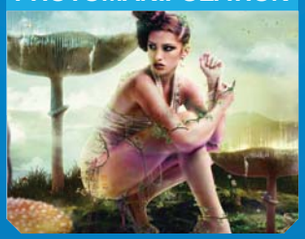
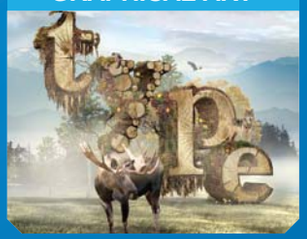


GRAPHICAL ART



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DAVE SCHOOL

The Digital Animation & Visual Effects School

James McDonald
Student at the DAVE School

James, how long were you at the DAVE school before you created this sculpture?
"This was modeled and textured in my first 10 weeks of training here at the school."

What do you like best about the school
"The thing that I like best about the school is the range of real world work experience you get. In the time that I have been here, I have worked on 3 separate real world productions. This is experience that would be very difficult to come across without the DAVE school."

What are some key skills you have learned at the DAVE school that let you create such a beautiful model?
"The main skill that the DAVE school taught me, which I used to create this model was the Lightwave to ZBrush pipeline. Skills like being able to easily model and UV the object in Lightwave then send it to ZBrush for sculpting, texturing and map generation, then back to Lightwave for lighting and rendering. Learning all this ensured that the model was delivered at the highest quality, and within the deadline."

The DAVE School
Is located on
the backlot of
UNIVERSAL STUDIOS®
in Orlando, Florida!

www.DaveSchool.com

This render was based on original concept art by Alex Legg.
See more of Alex's work at Alexlegg.co.nz