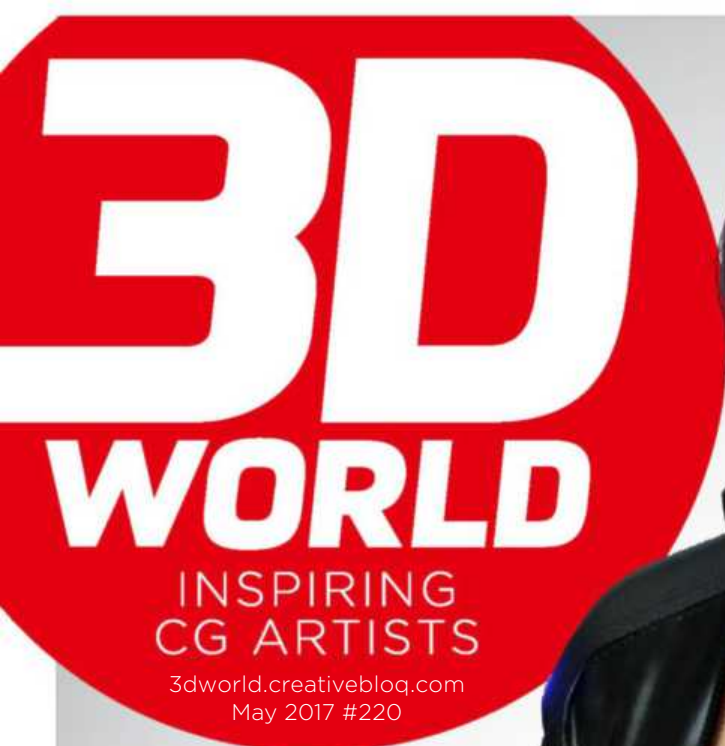


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Amy

Amy Hennessey, Editor in Chief
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SPOTLIGHT ON OUR CONTRIBUTORS



Dan Roarty

Dan is a lead character artist for the Gears of War franchise at The Coalition in Vancouver. On page 46 he reveals how to improve your character renders.
www.danroarty.com



Guillaume Rocheron

Guillaume is visual effects supervisor on Ghost in the Shell, and has brought his considerable expertise to the pages of 3D World in our feature on page 18.
www.bit.ly/ghosttrailer



Krystal Sae Eua

Krystal is modelling and texturing lead at The Mill in Los Angeles. On page 66 she shows off her recent Gnomon Anatomy Lab project.
www.artstation.com/artist/iamsadpanda



Arik Newman

Arik is a freelance artist that has worked in 3D for ten years, specialising in creatures and characters. On page 54 he shows you how to create great sculpts based on existing concept art.
www.bit.ly/ariknewman



Matthias Develtere

Matthias is a 3D artist at MachineGames, the game developer behind Wolfenstein: The New Order. On page 60 he takes you through his expert texturing workflow.
www.bit.ly/mdeveltere



Cirstyn Bech-Yagher

Cirstyn is a freelance 3D artist and educator with over 15 years of experience in the field. Over on page 40, she's on hand to guide you through the tricky task of UV mapping.
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CONTENTS

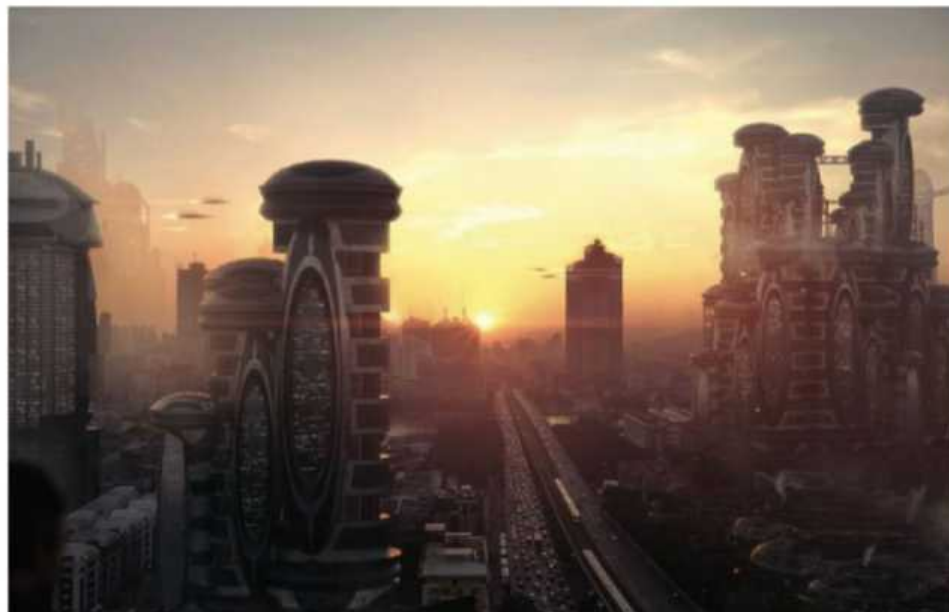
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course on page 83:
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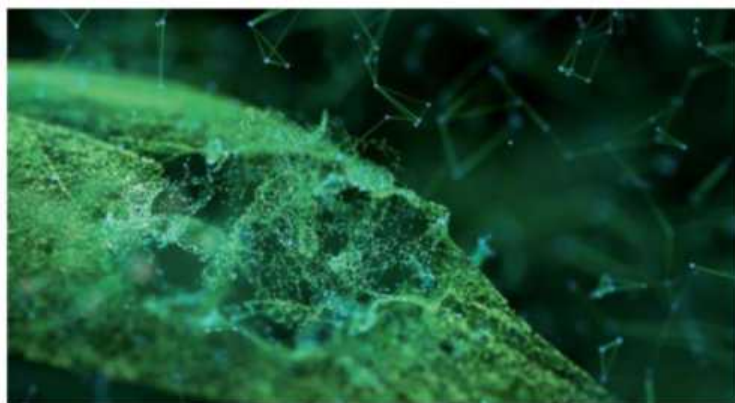
18 GHOST IN THE SHELL

We discover how VFX supervisor Guillaume Rocheron created a cyber universe for this futuristic new sci-fi film



24 EXPLORE A NEW WORKFLOW

Whether you're new to CG art or a seasoned pro, we all need to freshen our outlook. Find out how to shake up your workflow with our advice from experienced artists



32 TOP TIPS FOR CYCLES 4D

Rob Redman shares his expert advice on making the most of the unbiased render engine, which can now be used in Cinema 4D

TUTORIALS

Practical tips and tutorials from pro artists to improve your CG skills



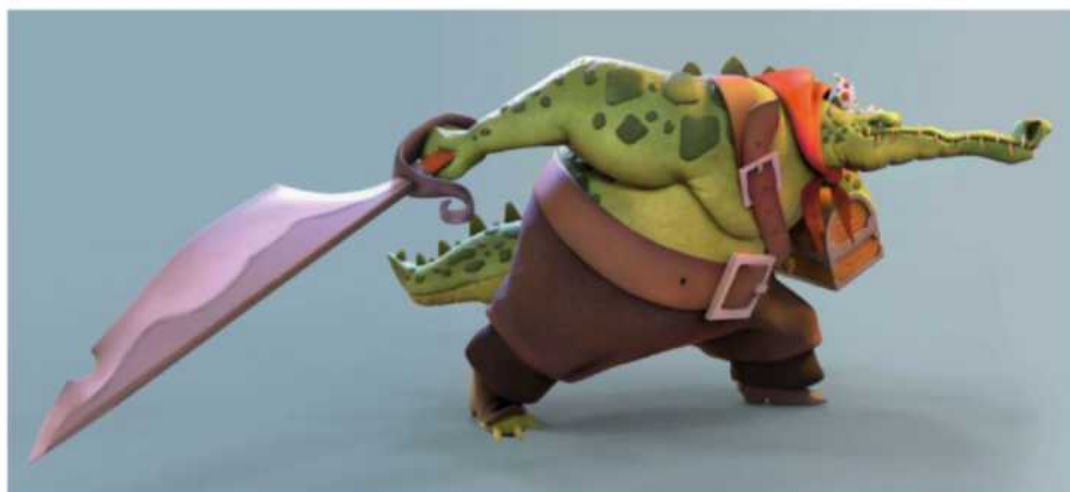
46 HONE YOUR CHARACTER WORKFLOW

Dan Roarty shares how to make a character from Ghost in the Shell using a mixture of software and techniques



40 HARD-EDGED UV MAPPING

Cirstyn Bech-Yagher explains the fundamentals of the critical task of UV mapping



54 LEARN HOW TO SCULPT FROM CONCEPT ART

Arik Newman shares his complete process for recreating a complex character in ZBrush

TUTORIALS

60 DISCOVER HOW TO TEXTURE A HIGH-POLY VEHICLE

Matthias Develtere shares how to texture an armoured vehicle

66 MASTER CREATURE SCULPTING IN ZBRUSH

How to speed sculpt a stunning ibex using ZBrush

ARTIST Q&A

72 YOUR CG PROBLEMS SOLVED

How to model organic shapes, create a hot burning effect for metal and eliminate seams

REVIEWS

94 HP ZBOOK 15U G4

The new, super-slim mobile workstation has a lot to offer at an affordable price

95 GEOGLYPH 2.0

Cirstyn Bech-Yagher shares her favourite new features of GeoGlyph 2.0

96 LENOVO THINKSTATION P410

This single socket workstation is oriented towards modelling, but what else can it do?

97 SINI FORENSIC

A scene checker and repair tool, this free plug-in for 3ds Max could save you time

REGULARS

38 SUBSCRIPTIONS

Save up to 83% by signing up!

83 FREE PLURALSIGHT COURSE

Learn how to create your first character in Maya

100 FREE DOWNLOADS

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INSIGHT

News and views from around the international CG industry



84 THE FUTURE OF CG

We discover the future of the CG industry at 2017's VFX Festival



88 CROWNING GLORY

How One of Us made invisible VFX for Netflix series The Crown



90 THE GREAT WALL

How ILM created epic battle scenes for this exciting new movie

ISSUE 221

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PRINTED IN THE UK BY:

William Gibbons & Sons Ltd on behalf of Future.

DISTRIBUTED BY: Distributed in the U.K by Marketforce, 2nd Floor, 5 Churchill Place, Canary Wharf, London, E14 5HU

OVERSEAS DISTRIBUTION BY:

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CHROME CITY



ARTIST

Mike Johnson

SOFTWARE

3ds Max, V-Ray,
Photoshop

“What inspires me as an artist are beautiful worlds in film and television, and concepts,” explains Mike Johnson, a full-time lead scene assembler at Blur Studio. “I really love the feeling when you see an image or film that takes you out of your day-to-day life, and for a second you forget where you are.”

Fortunately for Mike, his day job means he has plenty of opportunity to play with shading, lighting and compositing. In fact, creating the atmosphere for Chrome City was his favourite part of the project.

To make the image, Mike created the silhouettes for the buildings and filled them in. “Once I defined a style, I started replicating buildings and creating new silhouettes,” he reveals. “Then, I established the composition and lighting direction; I failed a million times and kept trying until something cool started to form!”

● www.michaeljohnsoncg.com





AYA THE HIPPIE QUEEN



ARTIST

Rakan Khamash

SOFTWARE

Modo, ZBrush, Photoshop,
Marvelous Designer

Rakan Khamash is a freelance 3D artist currently looking for a full-time job, but if his Aya the Hippie Queen artwork is anything to go by, it shouldn't be long until he's snapped up by an employer.

With a variety of textures and lights on display, this image shows Rakan's diverse skill set. "I pretty much do everything, including modelling, texturing, sculpting, compositing and basic matte painting," he explains.

Created in just a week, this image aims to capture the cute and soft feel of a female character with a peaceful personality. This was the first time Rakan used ZModeler to create props such as the bag. He started by creating basic shapes and slowly built up the level of details and complexity. He also used inspirational images to "keep the creative juices flowing."

● www.behance.net/Rakan



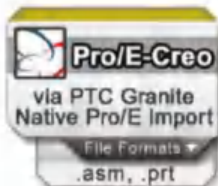
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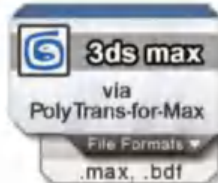
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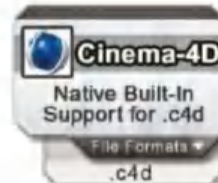
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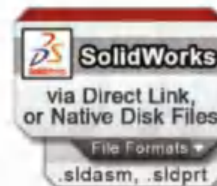
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via
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.max, .bdf



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.c4d



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or Native Disk Files
File Formats
.sldasm, .sldprt



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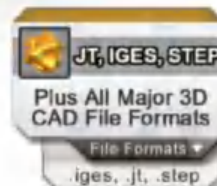
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FBX file format
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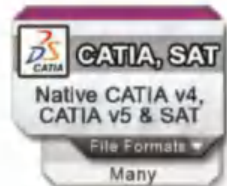
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MAGICIAN



ARTIST

Ruiheng Liu

SOFTWARE

Maya, ZBrush, Mari, Substance
Painter, Arnold, Photoshop

When he's not working at Shenye CG Studio in Wuhan, China, Ruiheng Liu is busy working on his own projects like *Magician*. With its realistic textures, excellent use of light and considered composition, this piece showcases Ruiheng's many talents as a 3D artist.

The project took four months to complete, with a lot of work going into the face in particular. "I considered a lot of factors, like his experience and feelings," Ruiheng reveals. "I wanted an image where people could read a story from his face. I did several different versions and picked the one I liked the most."

Working on *Magician* taught Ruiheng a little about animation and visual effects, too, and he hopes to do more of this sort of work in the future. "I hope I'll be one of the top CG artists one day," he says.

● www.artstation.com/artist/kiwiriver

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Image by Matthew Harris, MA Concept Art

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DARK FOREST



ARTIST

Jakub Javora

SOFTWARE

Maya, Redshift,
Photoshop

Jakub Javora's surreal Dark Forest scene, with its glowing doorway contrasting with the natural scene, perfectly sums up the artist's eclectic and eccentric interests. "I'm mostly inspired by weird phenomena like chaos theory, sexual selection and various religious practices," explains the Canadian concept artist, who works for creative studio, Volta.

The haunting Dark Forest started out as an experiment in composition, camera angles and lighting, and took just four days to complete.

Unusually for Jakub, this scene was a pure 3D composition with no 2D techniques involved. "Some people are using the same tools and workflow without changing," he says. "I am always trying to do something extra to keep my creative spirit going and enjoy the work. My philosophy is: let these Turing machines do what they do best – compute, because you have to do the important stuff: win the war," he explains.

● www.javoraj.com

PURGARE



ARTIST

David de la Orden

SOFTWARE

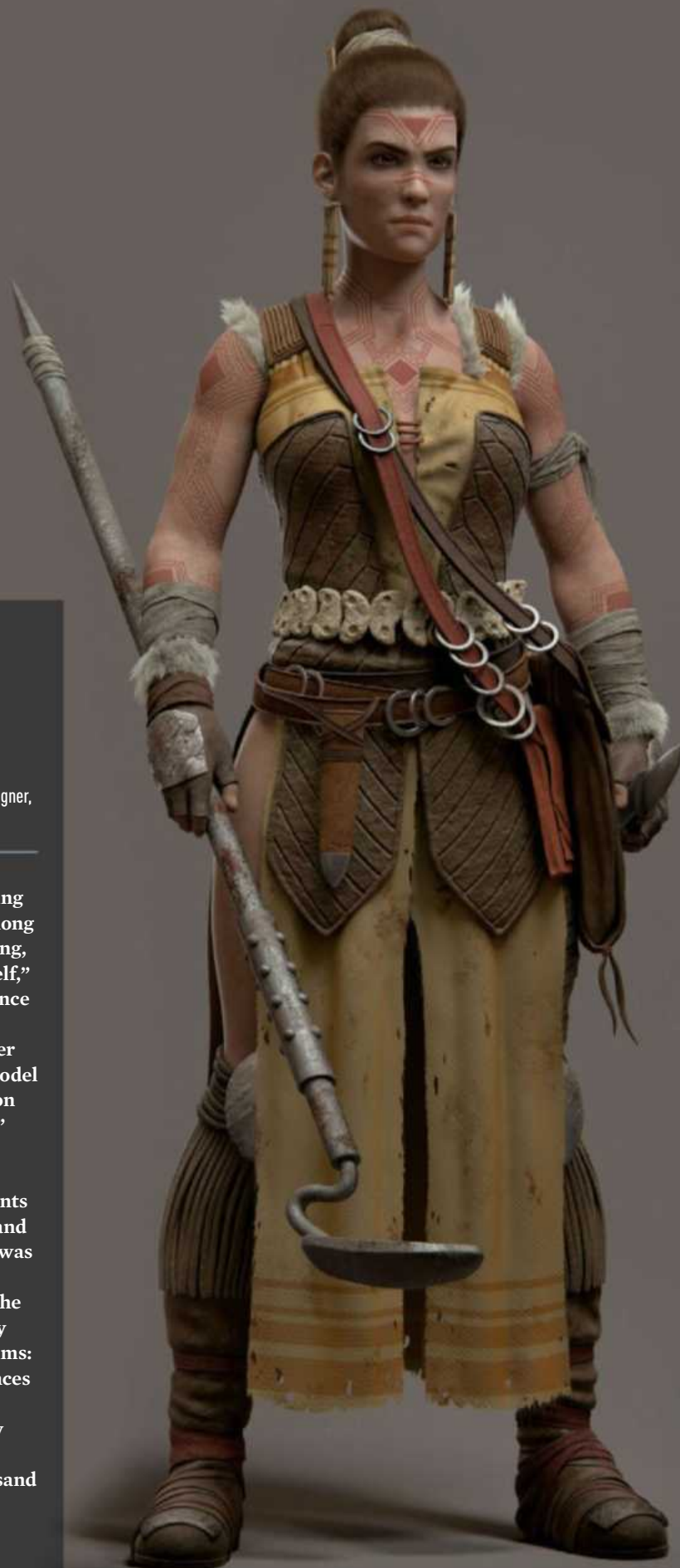
ZBrush, Maya, Marvelous Designer,
Mudbox, Photoshop, V-Ray

“What I most enjoy when I’m creating an image is learning and evolving along the way. From modelling to rendering, I’m always trying to challenge myself,” explains David de la Orden, a freelance character artist from Miami. “This was especially true for this character because I wanted to do a realistic model that would allow me to test myself on a variety of materials and textures.”

Purgare was an opportunity for David to create a realistic dress in Marvelous Designer, with refinements made in ZBrush. The realistic hair and fur around the arms and shoulders was put together using Maya.

Realism and authenticity are at the heart of David’s work, who typically takes inspiration from books and films: “I always start by gathering references for everything that makes up the character,” he explains. “I generally use Pinterest for this, but I also use Facebook groups such as Ten Thousand Hours and Pixologic.”

www.artstation.com/artist/daviddelaorden





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– Vladimir 'Vlado' Koylazov

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GHOST IN THE SHELL

Trevor Hogg speaks to VFX supervisor **Guillaume Rocheron** about creating an immersive and futuristic cyber universe

Under the direction of Rupert Sanders (Snow White and the Huntsman) and benefiting from the Oscar-winning visual effects expertise of Guillaume Rocheron (Life of Pi), anime classic Ghost in the Shell gets a live-action upgrade. “In total we had 1,200 shots,” states Guillaume, who had four months of post-production to complete the visual effects. “MPC did 900, Atomic Fiction was responsible for 70, and MPC Creative in London [the graphic design branch of MPC] did a lot of the holographic work. It has been a great film with a reduced post-production time.”

Ghost in the Shell revolves around covert law enforcement cyborg (Scarlett Johansson) hunting an internet terrorist (Michael Pitt) in futuristic New Port City, where inhabitants are cyber-enhanced. “One of the big design elements of the original is Hong Kong at some point in

the future,” remarks Guillaume. “When we shot there for three weeks it was more like guerrilla-style filmmaking. I don’t think I put up a single green screen in Hong Kong. The assumption was that we would replace everything in the shot except the main actor, but it gave us a great canvas to work from. We also had a team of photographers go through for six weeks to enable us to recreate the contemporary city. On top of that, we added all of our modern architecture, elevated highways and futuristic traffic.”

Colouring the details

“In terms of the aesthetic, we wanted to pay homage to the source material as much as we could,” says Guillaume. “We did a lot of that with the colours. Jess Hall, the DP, had a brilliant idea. He lit the entire movie with LEDs. The great thing with LED lights is that you can have a lighting board and pre-program colours. During pre-production, Jess went through

the original Ghost in the Shell and Ghost in the Shell: Innocence, and sampled colours from them. He then came up with a palette of 32 colours that he would use to light the entire film and these were maintained down the line in the visual effects,” he adds.

Today’s technology does not make an appearance. “The original was made in 1995, and at that time Wi-Fi didn’t exist, so our movie is filled with cables and people plugging in at neck ports.”

An emphasis was placed upon shooting practical effects, with Weta Workshop building a 1:1 scale skeleton of Major (Scarlett Johansson) and a 1.5 scaled skeletal head with a brain. “We spent ten days with the second unit and the team at Weta Workshop with blue screen sets smoked up to do dry for wet and puppeteered the animatronics for the Shelling Sequence,” reveals Guillaume. “It evolved into a more organic body, fluid motions and wide shots resulting in >

GHOST IN THE SHELL

DIRECTOR
Rupert Sanders

VFX STUDIOS
MPC, Atomic Fiction, MPC Creative, Weta Workshop, Halon Entertainment, The Mill

PHOTOGRAPHY
LOCATIONS
Hong Kong, New Zealand, Shanghai

WEB
www.ghostinthe shell.tumblr.com





Top: Scarlett Johansson inhabits a vibrant and futuristic world inspired by Hong Kong

Above: Director Rupert Sanders prepares for a shot while out on location

➤ us transitioning to CG, which is better at doing that than animatronics.” Miniatures were constructed of the buildings. “What is complicated is shooting them. You need to light them, have enough of them and have a motion control rig. Our approach was to kitbash. We would walk in with Rupert and Jan Roelfs [production designer], look at them, make some quick iterations, and when they were happy with the design, the miniatures were then shot by a huge photogrammetry rig with 150 DSLRs. The photogrammetry was sent to MPC, who built digital replicas,” he explains.

Storyboarding

By modern standards, previz was not extensive, with the focus placed upon the Shelling Sequence, Deep Dive, Tank Battle and a deleted scene. “We previz’d the Deep Dive, where Major navigates the memories of one of the robot geishas because it was surreal,” remarks Guillaume. “The Tank Battle was previz as we needed to make sure it was a piece of storytelling. When we came back to Los Angeles, we had Halon Entertainment do some postviz on the Tank Battle to reassemble the whole thing based on our previz and what we had shot. We didn’t do previz for the Hotel Fight as it was precisely storyboarded. We used more traditional ways, and for a couple of scenes we did

a lot of stuntviz with Guy Norris [supervising stunt coordinator and second unit director].”

Principal photography took place in New Zealand, with green screen sets being built on backlots. “We did shoot an action scene in downtown Wellington, but not a lot of exteriors.” The opening scene features Major diving off of a high-rise building and crashing into a banquet room being attacked by armed terrorists. “We shot most of the elements on green screen and had a small set section,” says Guillaume. Weta Workshop manufactured a practical version of the thermoptic suit that allows Major to go invisible out of modern silicone. “We replaced the thermoptic suit with a digital version to make it even thinner,



IN TERMS OF THE AESTHETIC, WE WANTED TO PAY HOMAGE TO THE ORIGINAL AS MUCH AS WE COULD

Guillaume Rocheron, VFX supervisor, Ghost in the Shell



wrinkle-free and iridescent.” Extensive R&D was conducted on the transparency effect. “We played with that idea of the camera being cyber-enhanced so the thermoptic suit works like camouflage and can bend the light waves. It glitches the perception of your cyber eyes.”

Making a splash

“The Water Fight was a cool scene to recreate because it’s an invisible person fighting in water in front of a Hong Kong cityscape that is impossible to shoot!” says Guillaume. “We ended up building a 60x60ft water pond with 180

degrees of green screen around it. The idea was what we needed to capture water interaction and the reactions of Skinny Man [Daniel Henshall], who is the opponent of the [invisible and digitally created] Major. The whole fight is only beautiful and interesting if you see a water arc and suddenly, boom! It becomes a punch or a kick to the chest. We did a lot of shots with the Phantom 4K and at 600fps so you get water droplets and can speed ramp things in and out. I did the reference pass with Daniel fighting against the stunt person. Then we did the empty pass with Daniel on his own

■ MAKING A GHOST CAM

GUILLAUME ROCHERON ON CREATING THE CONCEPT OF THE GHOST CAM

When they first met to talk about *Ghost in the Shell*, filmmaker Rupert Sanders, cinematographer Jess Hall and visual effects supervisor Guillaume Rocheron explored the concept of the Ghost Cam.

“The idea for each Ghost Cam came from discussing the ins and outs and finding interesting vantage points in the city,” explains Guillaume. “For this I used some Google Earth screenshots to show Rupert a couple of options of where the camera would go. Then I did the previz myself on all of Ghost Cams because I wanted a specific quality to the speed and float on the camera. For example, the one in the red-light district was inspired by falling leaves, where the camera drops, spins and drags in an organic way. I then passed over the scene files to MPC, where the architecture got refined and solograms positioned, which dictated slight camera timing adjustments to read them.”

The opening Ghost Cam shot encapsulates the entire creative journey. “As a piece of storytelling, it incorporates all of the challenges and shows the unique vision for the visuals of *Ghost in the Shell*, which is great.”

remaking the punches or kicks that he received. It was a great element to get for the water splashes and the design of the scene. The scene was cut together using the two passes allowing the choreography to be reviewed and approved before doing our effects.”

The art of memory

Major plugs into a robot geisha to investigate her memories. “People reconstruct memories based on a point of view that is influenced by the interest and emotion that certain individuals inspire in you,” explains Guillaume. “Major walks into the room containing 25 people who are in mid-action and recreated in CG. We amped up our photogrammetry rig with additional Canon 5DS cameras to capture super high-resolution faces and clean scans. We created a map of where everyone needed to be and shot the whole scene empty with just Scarlett walking through the place mimicking what she was going to do. Then I took all of the actors who were in that scene and brought them into the photogrammetry rig. I said, ‘You

Top left: The geisha masks were modelled on actress Rila Fukushima

Left: Scarlett Johansson wears a thermoptic suit made by New Zealand studio Weta Workshop



Solograms the size of buildings populate the film's cityscape

■ DEVELOPING SOLOGRAMS

HOW GIANT ADS WORKED AS A NEW FORM OF HOLOGRAM IN GHOST IN THE SHELL

Technology has evolved to the point where 3D volumetric human beings can be projected onto city streets and made as big as skyscrapers. Ash Thorpe developed the original ideas for the 'solograms', and in post-production the art department at MPC used movie shots to further the concepts for what amounted to 60 different ads lit by the surrounding environment.

"I got in touch with Dayton Taylor at Digital Air, who designs bullet-time camera rigs, and asked him if we could create a dome of video cameras to capture the actor's movement and run animated photogrammetry on a frame by frame basis," reveals Ghost in the Shell visual effects supervisor, Guillaume Rocheron. "The challenge is that you can't just use a Canon 7D or a DSLR because if a camera is a quarter of a frame off, you can't reconstruct the 3D model. We did a few months of R&D and worked out a perfectly synchronised system that had 80 cameras at 2.5K, which created 24 cyber scans a second to produce a moving model with baked in textures. We processed the 'voxelation' to recreate volumetric footage of our actors that was then used to make the advertising," says Guillaume.

► were sitting on the chair and pointing your finger like this'. I recreated some basic lighting on them and made a frozen version of them. It would become a cyber scan. Back in post, I positioned all of those cyber scans. We started to cut people in half. This guy has one side of his face reconstructed but not the other side. That was the first layer of what is our POV. Then there's the proximity, which

because there's a moment where Major rips off the lid and, like in the anime, her arm explodes and she loses her body," remarks Guillaume. "Other than that, the tank is a digital vehicle, which was an interesting animation challenge because it needed to look heavy and move fast enough. We went back and forth as to how the tank was operated as a device in the story. Do you want something

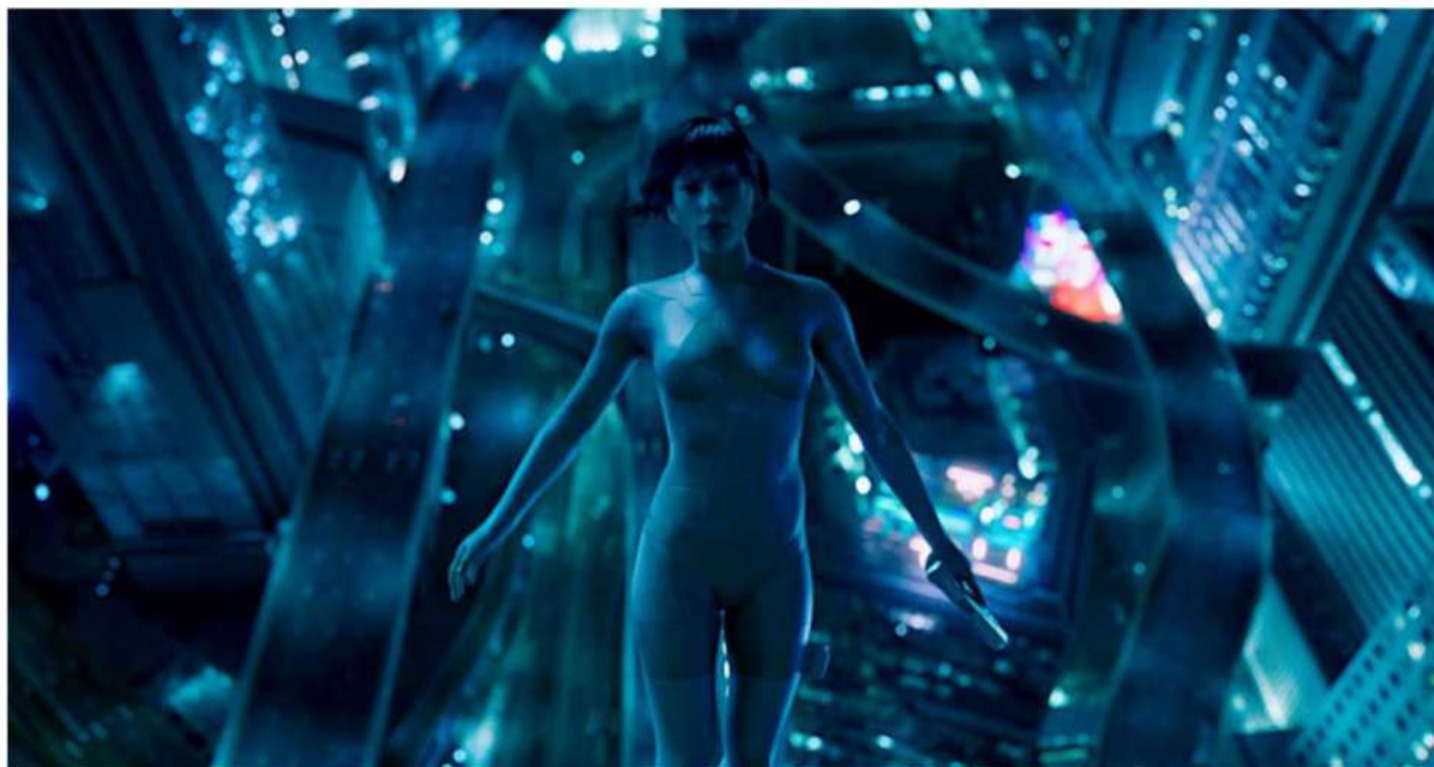
THE TANK WAS AN INTERESTING ANIMATION CHALLENGE BECAUSE IT NEEDED TO LOOK HEAVY AND MOVE FAST

Guillaume Rocheron, VFX supervisor, Ghost in the Shell

is going to define how well it is going to be reconstructed. That's when Rupert had the idea that memories degrade, so faces would disintegrate and melt into sand.

"A small section of the Spider Tank was built on a gimbal

like AI with lots of personality or is it controlled by someone? The digital double animation was also a challenge because you can't hide too much. You have to be good with the physics and poses. Luckily, we had an amazing stunt



Above: The iconic High-Rise Dive scene opens the movie



Left: Major held captive by Kuze in his lair

team on the film that always gave me reference even on shots we knew would have digital doubles.”

Undoubtedly, *Ghost in the Shell* will be compared to a sci-fi classic about a government-sanctioned assassin executing renegade androids. “*Blade Runner* is a landmark of a dystopian vision,” acknowledges Guillaume. “Hong Kong is a vibrant, colourful city and since it was our blueprint, we didn’t want to put rain, smoke and steam in every shot. Our world is more about cyber enhancements and how technology has become invasive to the point that you have cyber-enhanced eyes, nails, and brains.” *Ghost in the Shell* is

defined by genre, not by its place of origin. “Even though there is a Japanese aesthetic it is still sci-fi.” The production was a collaborative effort determined to capture interesting shots and elements. “Scarlett knows what it takes to do these types of films. Michael wanted to understand what I was going to do to his character, which was great. As a team, Rupert, Jess, Jan and I were on board with the vision and the visual style with the agreement that we would try to make *Ghost in the Shell* in a way that gave it an organic feeling, and in that we succeeded.”

FYI Watch the trailer here: www.bit.ly/ghosttrailer

■ ASSEMBLING THE CYBORG KUZE

HOW CYBORG KUZE WAS CREATED USING A MIXTURE OF TECHNIQUES

A discarded cyborg portrayed by Michael Pitt serves as the film’s antagonist, and is a seamless hybrid of digital augmentation and live-action photography.

“Kuze escaped Hanka Robotics just being a skeleton and a brain; he disappeared into the underworld and reassembled himself with spare parts,” states *Ghost in the Shell* visual effects supervisor Guillaume Rocheron. “Kuze has a partial face made out of different panels and his whole upper body is exposed translucent muscle with some patches of photo-real skin. We put some markers on the face of Michael and had him wear green sleeves knowing that they would be replaced later, but at least we captured the real performance. It involved precise roto animation. We kept Michael’s eyes, mouth, pieces of his nose, and sometimes used his real hair. We didn’t make our lives easier by adding panel lines on his face but ultimately, Kuze doesn’t look like a human face on a digital body.”



Final composite
from the Nuke
for After Effects
Users course on
Pluralsight.com



Left: Substance Painter includes several Yebis post-processing effects that can add that extra bit of visual appeal to your final renders

EXPLORE A NEW WORKFLOW

Whether you're new to CG or a seasoned pro, we all need to freshen our outlook. Find out how with advice from experienced artists...

There's always something new to learn in 3D art, no matter how experienced you are. You might want to experiment with new ways of working, or perhaps discover new software and tools. We can all get in a rut, even without realising it, and often choosing to break away from your usual workflow to try new things will reap many rewards.

This issue, we asked experienced industry artists for their advice on how to freshen

up ways of working. Whether it's revamping your tired portfolio by embracing Substance Suite for a more current, modern mix of work, or discovering a new way to rig in Maya, there's always something you can do to push your workflow and your art to the next level.

Even something as simple as exploring how to better use your Wacom tablet – tweaking your setting and configurations to find a new way to work – can benefit your productivity and creativity.

The artists over the following pages include co-founder of Digital-

Tutors (now part of Pluralsight), Kyle Green; visual effects lecturer Laura Hawk; and former Sony Imageworks animator and modeller Justin Marshall.

Their approach to CG art varies – some are primarily modellers, others are rigging artists, composers or texture artists – but their desire to find new ways of working and share these ways with you will hopefully spur you on to develop your skills and workflow. In turn, you'll also broaden your field of expertise and have fun experimenting with your work.



When rendering with Iray, you have several HDRI options for lighting, including several that are great for creating neutral or studio lighting

CREATING A PORTFOLIO WITH SUBSTANCE

For new 3D artists, the road to obtaining that dream job in the film or games industry is a bumpy one. The landscape of technology alone used in these industries changes rapidly. Artists can often find themselves faced with difficult decisions early in their education. Sometimes these decisions are as simple as which software to learn first. Other times, the software they decide to learn is influenced by cost factors. Think for just a moment about the investment that a student might make both in terms of time to learn an application in addition to money. Now multiply that by five different software packages. A primary 3D package, a sculpting application, a dedicated texturing

application, a premium rendering plug-in and, of course, Adobe Photoshop. That barrier to entry really is extremely high!

A new artist's time will be better spent mastering a smaller number of applications so that they can create amazing results quicker. If the goal is to be a character or environment artist, individuals should spend as much time as possible mastering their craft, not learning different software. For this reason, Substance Painter can be viewed not just as a texture painting application, but also as a great finishing application for use in portfolio projects.

New rays of light

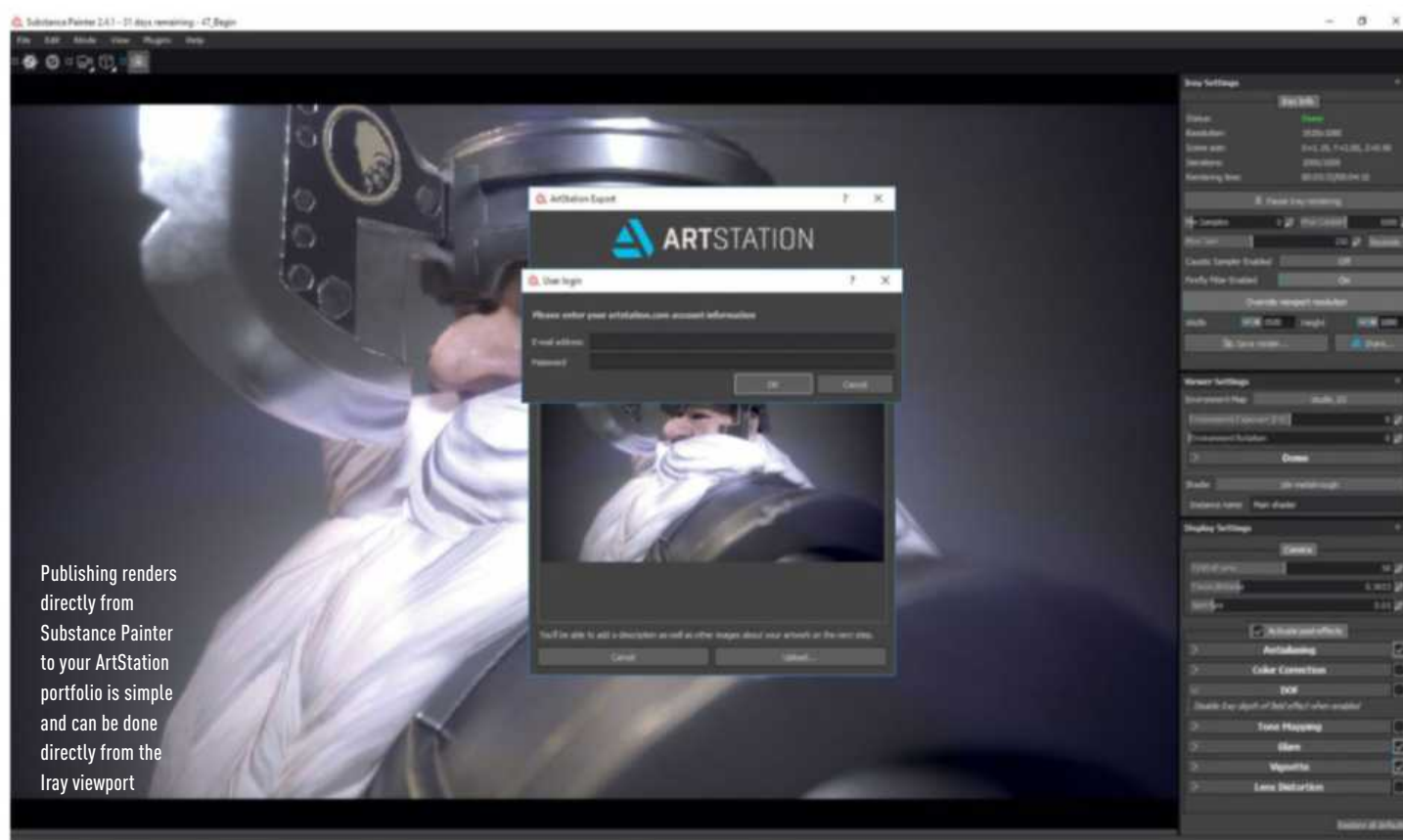
With Substance Painter 2, Allegorithmic has added the

powerful physically unbiased and GPU accelerated renderer Iray into the application. This renderer is all an artist needs to produce portfolio-quality images that can showcase both their models as well as textures. Not only do renders occur progressively once you've switched to Substance Painter's Iray viewport, but you have a tremendous amount of control over the image that's rendered. From general settings that control quality and image size to more in-depth camera settings, Iray strikes the balance between ease of use and number of features.

Once you've got that perfect camera angle and render quality set, you may find yourself looking to add a bit more spice to your final image. Before you reach for



Left: You can publish quickly and easily from Substance Painter to Sketchfab from the Iray viewport



Publishing renders directly from Substance Painter to your ArtStation portfolio is simple and can be done directly from the Iray viewport

Photoshop to add that flare or vignette, you should really look to the Yebis post-processing effects that are available right inside the Iray viewport. Using Yebis, you can easily add things like colour correction, depth of field, tone mapping, glares, vignettes or even lens distortion. These types of effects are often exactly what are needed to give your final render extra emotion or visual appeal.

Sharing your work

Artists love to show off their hard work and get feedback on it, and Substance Painter makes it simple to get your final image to the most popular art community for 3D artists, ArtStation. Directly from the Iray viewport, you can share your render to the ArtStation community by simply clicking a button. After logging in, your render can find its new home

in whichever portfolio project you like. If you prefer more of an enhanced viewing experience for your 3D asset, Substance Painter supports export to Sketchfab.

Once your project has been uploaded, you can then link to it in the same project on ArtStation, providing viewers with a complete, 3D viewing experience of the asset.

Being able to show off your work is an important part of being an artist in the film and games industries. Not only does your portfolio validate your skills, but it also provides potential employers with a glimpse into what they can expect if they were to hire you. Thanks to some amazing features in Substance Painter 2, Allegorithmic has made this process much easier for artists.



AUTHOR

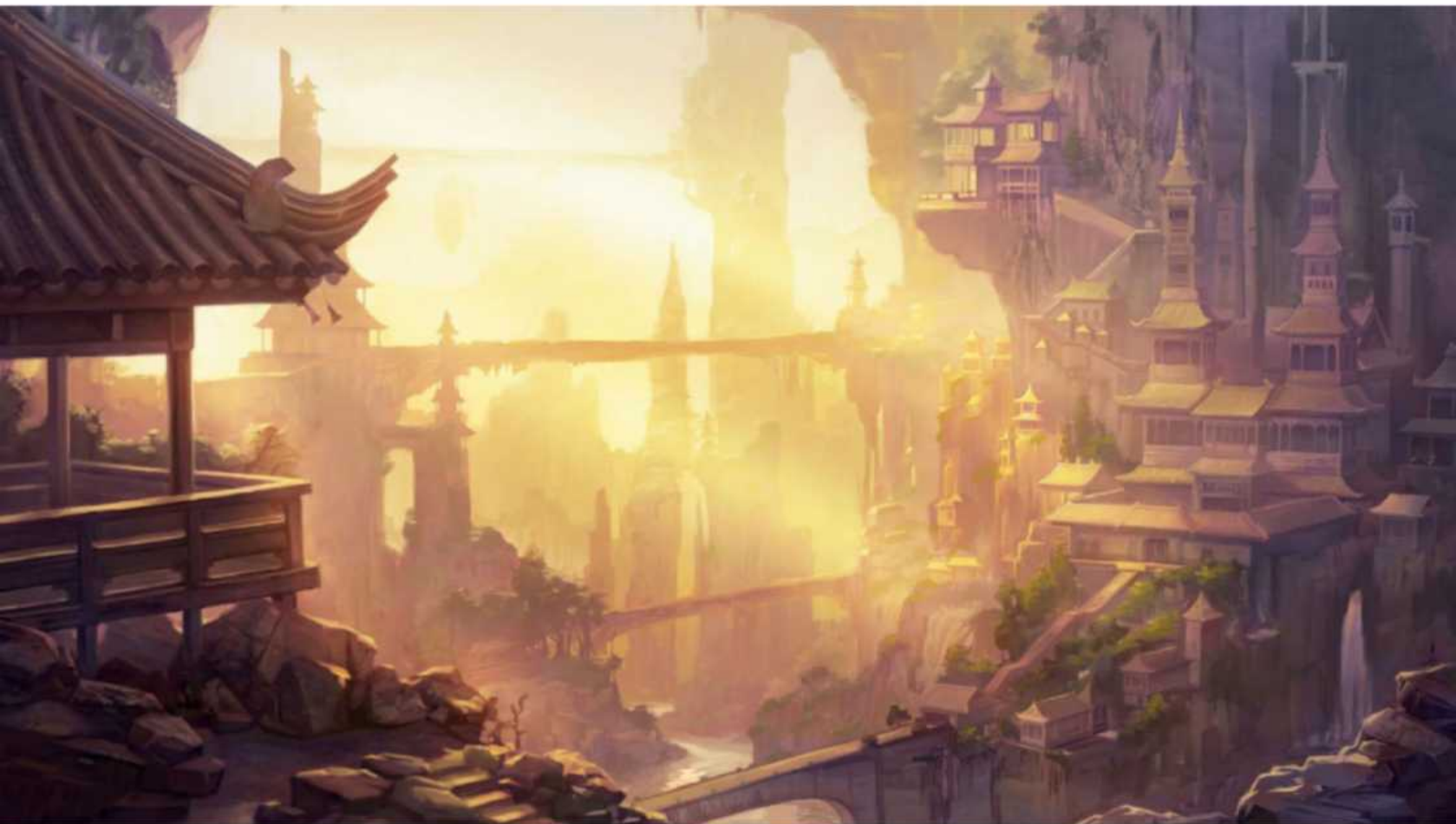
Eddie Russell

Eddie is the dedicated Pluralsight texturing and rendering curriculum manager. He has been with Pluralsight since 2010, teaching creative artists to expand their knowledge. www.bit.ly/eddierrussell

SUBSTANCE PAINTER MAKES IT SIMPLE TO GET YOUR FINAL IMAGE TO ARTSTATION WITH JUST ONE CLICK

Eddie Russell, curriculum manager, Pluralsight

SWITCH TO A TABLET AND FORGET YOUR MOUSE



While a mouse is widely considered the 'default' mode of interacting with your computer, that doesn't necessarily mean it's the most efficient or the most natural. The truth is, your mouse is hurting you – both in the figurative and the literal sense. Many of us work at a computer for long periods of time and have experienced pain or discomfort in our hands, wrists or forearms at some point while working, but may not have stopped to consider why. Your forearm is made of two bones – the ulna and the radius. The natural resting orientation for these bones is achieved when your palm is held sideways, like you're making a thumbs-up gesture, or reaching

out to shake someone's hand. When you place your hand on a mouse, you are orienting your hand palm down, which leaves the ulna and radius in their 'prone' or twisted positions. Maintaining this orientation for long periods of time can put stress on the muscles, tendons and nerves of your lower arm, which could eventually lead to discomfort or even serious pain. When working with a stylus pen, you are holding your wrist and forearm in a much more neutral orientation, which can make a difference when working at the computer for long days.

Customisable keys

Beyond the ergonomic benefits, one of the most compelling reasons for switching to a digital

drawing tablet is the sheer level of workflow customisations and shortcuts that you suddenly have at your fingertips. While there are several makers of digital drawing tablets, we use Wacom devices in our offices, so this piece talks specifically about the features and functionality found in Wacom's products. Most of the Wacom Intuos and Cintiq lines of hardware come with a set of physical ExpressKey buttons built into the device, which can be used to mimic standard modifier keys like Ctrl, Alt and Shift, but they can also be completely customised for easy access to the tools and shortcuts you use most frequently. Holding a stylus in your hand at all times makes it a bit more challenging to execute

Above: A digital drawing tablet allows you to work with a level of control, precision, and comfort that is simply not possible with a mouse alone

POSING CHARACTERS WITH THE QUICK RIG TOOL

Anyone working as a character artist will know how incredibly rewarding it is to see your creations brought to life through movement, even if it's just a static pose that conveys some sense of character and personality. Posing a character has typically been a cumbersome process, but thanks to a growing number of tools, it is now easier than ever to bring your characters out of their default sculpted stance.

Posing problems

When sculpting characters for production, you'll normally create a 'blank-canvas' version. Your character will be in an 'M' or 'T' pose, with arms out to the side and a neutral facial expression. The practical reason for this is to make the character as easy to rig as possible. When it comes to presenting your work, however, a portfolio full of expressionless characters preparing for a TSA pat-down can be on the boring side.

There are methods of posing in ZBrush and Mudbox, but the built-in posing tools aren't always the easiest to work with. They involve a lot of special masking and one-off rotations, although there are ways to create more complex rigs. These methods can work well in many cases, but they can take a lot of time. If you have a character that is just begging to get out of that



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Below: A character in a default pose isn't a great way to showcase a character's design or personality

Below right: Maya's Quick Rig Tool will allow you to create a fully rigged and bound character with a few clicks

restrictive T pose, try using Maya's Quick Rig Tool (added in Maya 2016 Ext 2) to rig and pose your model quickly and easily.

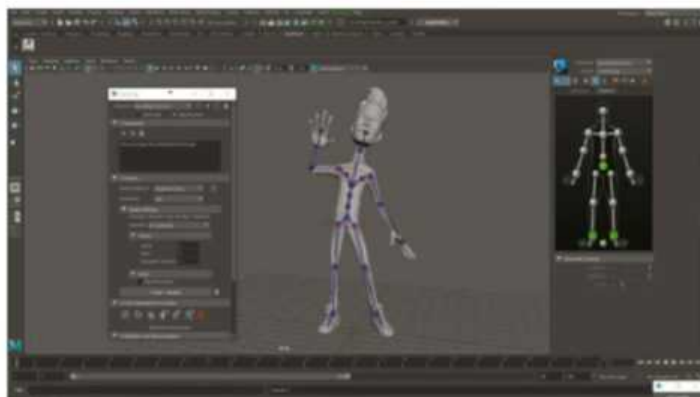
Click to pose

First, transfer your mesh from your selected sculpting program using GoZ or Send To. In Maya, select the Quick Rig Tool from Rigging>Skeleton, the Rigging Shelf, or the Character Tools interface. There are two options here. Step-by-Step will give you fine control over the process, while One-Click does everything automatically. If you selected One-Click, use that precious click on the Auto-Rig button. You'll see that your character suddenly has bones and controls, and the mesh has been bound. If your joints don't come in at the right spots, you can use the Step-by-Step method and move your guides into place before creating the bones. Keep in mind that, as of right now, this process is meant for bipedal characters, so for a more complex creature you'll need a different solution.

Once it's rigged, simply pose your model and send the new mesh back to your sculpting app to update it with the high-resolution detail. You can use the Quick Rig Tool early in the process, posing your base mesh for further refinement in ZBrush. If you've already sculpted your model and it's insanely detailed with lots of subtools, you can use the same workflow with just one extra step. In ZBrush, go to the Transpose Master plug-in from the Zplugin menu. Push the T Pose Mesh button in Transpose Master to create a single low-resolution mesh with a connection to your multi-subtool object. Instead of using the masking and posing tools in ZBrush, send this low-resolution Transpose Master mesh over to Maya via GoZ. Now you can use the Quick Rig Tool to rig and pose the model. Then, send the mesh back to ZBrush, transfer the new pose to the subtools via T Pose Mesh>SubT in Transpose Master and your character is ready to jump off the screen!

IF YOU HAVE A CHARACTER THAT IS JUST BEGGING TO GET OUT OF A T POSE, TRY USING MAYA'S QUICK RIG TOOL

Justin Marshall, lead modelling author, Pluralsight



WHY YOU NEED AN OPEN RELATIONSHIP

There I was, staring at After Effects, willing it to please just let this comp work. I'd tried everything I could think of and nothing was working. AE is truly my first love, but it just wouldn't cooperate with me in my compositing dilemma. Rather than break up entirely, After Effects and I had to have a talk about an open relationship.

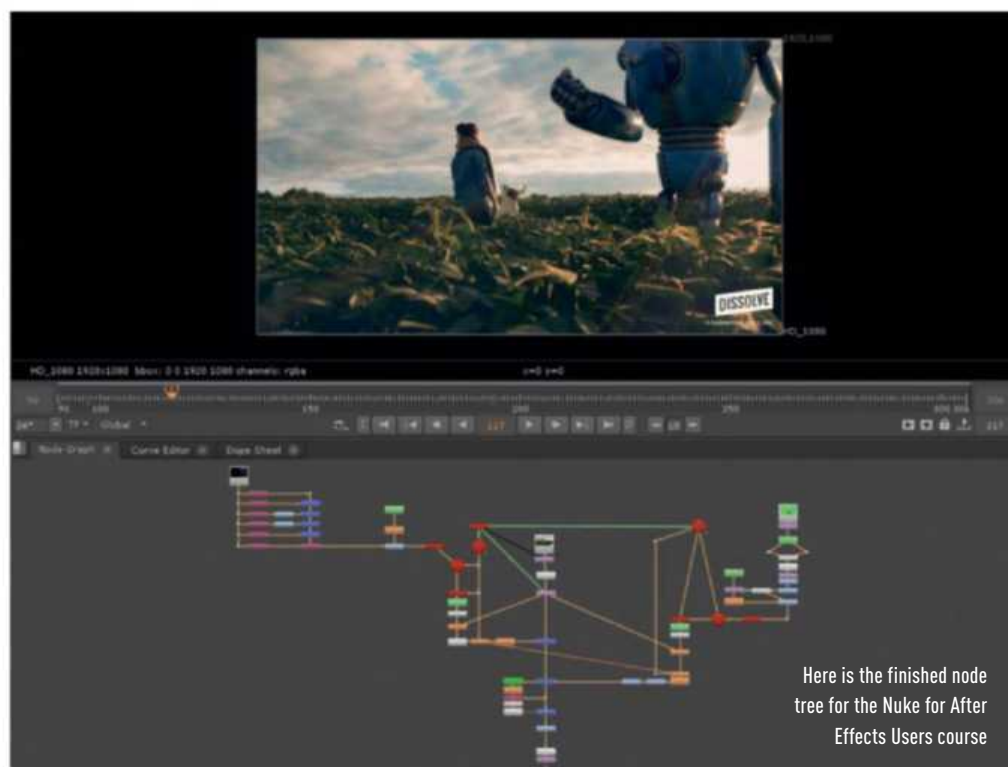
As much as I'd love for that story to be 100 per cent true, the spirit of it is where I found myself at the end of my layer-based compositing rope. That's when I met Nuke – a true charmer.

The biggest difference between Nuke and After Effects is the node- versus layer-based organisation. Node-based organisation makes a more bird's eye view of your composite possible. When you have a huge project, sometimes this is just too much of a headache to do in a layer-based software.

New nodes

Let's first talk a little bit about the terminology differences between layer- and node-based compositing. In AE, all your footage and information about the footage is stored in your project panel. This is the hub of where you go to look at comps, footage and any other media you have. In Nuke, the composite tree is the library. (Nuke Studio is an exception to this rule. You do have a media Library in Nuke Studio when you're on the timeline.) The information about footage is stored right there on the Read Node. A Read Node is the equivalent to an After Effects layer, and Read Nodes are how you view footage and data in Nuke.

So when is a good time to use Nuke over AE? Nuke is best for working on a single shot that requires a lot of effects and tweaks to get it perfect. Maybe you need to have camera tracking, particle simulation, colour correction, and



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Laura Hawk

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some keyed green screen footage all meshing together into a single shot. These are the moments Nuke lives for, and where it truly shines. Keeping these things straight in a series of nested precomps in After Effects simply isn't practical. If you find yourself working on shots like this often, it's time to take the leap and start learning Nuke.

Time to transition

However, so many die-hard AE fans are intimidated by transitioning to Nuke. I won't lie; it can be a disorienting change at first, and things that Adobe takes care of in the background for you, such as alpha channels, will take on a new significance in Nuke. You'll need to understand how things work and what maths is affecting the union of two images, but in the end, it's worth it. I won't say that you'll never look back though: AE is still king of motion graphics and will be for a long time because there really is no

comparison between the timeline and Nuke's Dope Sheet.

If you're still wondering where to start the journey of adding Nuke to your arsenal of tools, check out my tutorial Nuke for After Effects Users at www.pluralsight.com. It's full of comparisons of what you're familiar with in After Effects and how it all works in Nuke. Another great reason to learn Nuke is that in the last few years, the Foundry (the maker of Nuke) has made a totally free non-commercial version of the software. That effectively makes learning Nuke cheaper than After Effects for new users.

So don't worry, an open relationship with your software isn't wrong, it's just the next step in your relationship of creating great work together. After Effects will understand. Like any great partner, it's committed to helping you get the job done no matter what.

FYI Head to www.pluralsight.com for more tutorials

TOP TIPS FOR CYCLES 4D

Rob Redman shares his expert advice on making the most of the unbiased render engine, which can now be used in Cinema 4D

Cycles is a much loved render engine for Blender by the Blender Foundation and, although it's an open source piece of software, it hasn't been seen elsewhere. Until now. Insydium – developer of the hugely popular X-Particles for Cinema 4D – has created a bridge for Cinema 4D users to get the most from Cycles within Cinema 4D, and it works incredibly well. It contains all of the original features, plus a few extras, and now supports elements of Cinema 4D such as X-Particles and TurbulenceFD, amongst others.

There are a few major differences between Cycles 4D and the standard Cinema 4D renderers, including the node-based material editor and the interactive preview render, which, with the help of my tips, you'll have no trouble getting to grips with at all.

Cycles 4D is a very comprehensive render engine. Not only does it cover setting up cameras and environments and has a fantastic node-based material editor, but it also supports Cinema 4D's hair system and, more importantly to a lot of users, fully >

INSYDIUM HAS CREATED A BRIDGE FOR CINEMA 4D USERS TO GET THE MOST FROM CYCLES 4D, AND IT WORKS

Rob Redman, creative director, Pariah Studios



AUTHOR

Rob Redman
Rob is creative director at a boutique VFX and animation studio, Pariah Studios, and works across TV, film and the web.
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Tight integration with X-Particles is offered for effects and simulation work

Cycles gives users access to all particle attributes for powerful capabilities



ONE OF THE MOST USEFUL AND FUN ELEMENTS OF CYCLES 4D IS THE REAL-TIME PREVIEW, BUT THE DEFAULT SETTINGS MIGHT NOT WORK

Rob Redman, creative director, Pariah Studios

► supports X-Particles. This means that it's easier than ever to produce the most beautiful simulation, FX and motion graphics work. It's more than can be covered here, but check out the Particle Info node. It grants access to every aspect of

a particle system, so you can use things like velocity and age to drive any other aspect of your node tree. Very powerful indeed.

01 INTEGRATOR SAMPLES

The Integrator samples are what make your render clean and attractive. The final figure you need here will depend on your scene, but the default sample rate of 4 will never get the results you want, so try something like 30-40 and work from there. Remember that the higher the number, the longer the render will take, so when testing make increases of tens and then refine accordingly. Transparent materials will require using higher numbers.

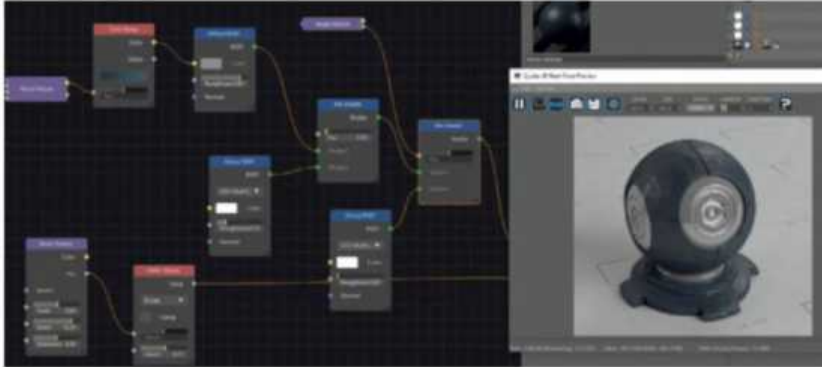
02 MIX SHADER IS KING

The Mix Shader is your friend. It allows you to combine the outputs of any two nodes and control how and where they are mixed with a factor input. A good example is a stone material with some shine added. You can control the amount of shine or add a Fresnel falloff using the factor input – this is much easier than trying to use a Glossy Shader alone.

It's also really good for mixing materials, as it can be used to mix shader chains at any point, so you could build a stone material, then a copper material, adding them both to a mix node and then using a third node as the mask. A gradient with a harsh white line (with



01



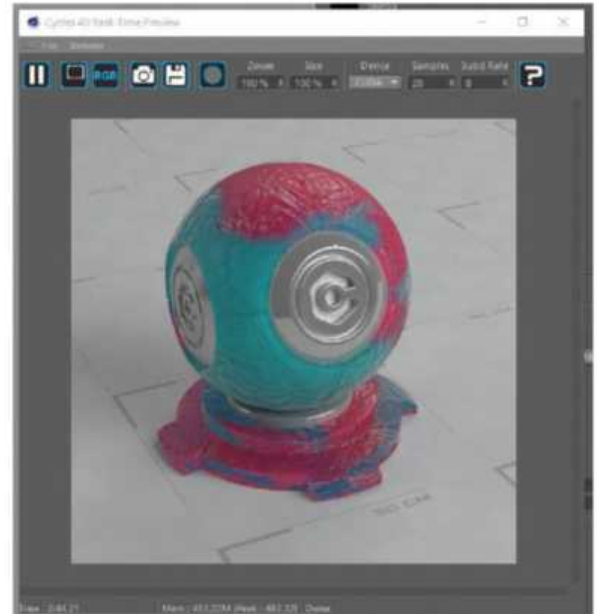
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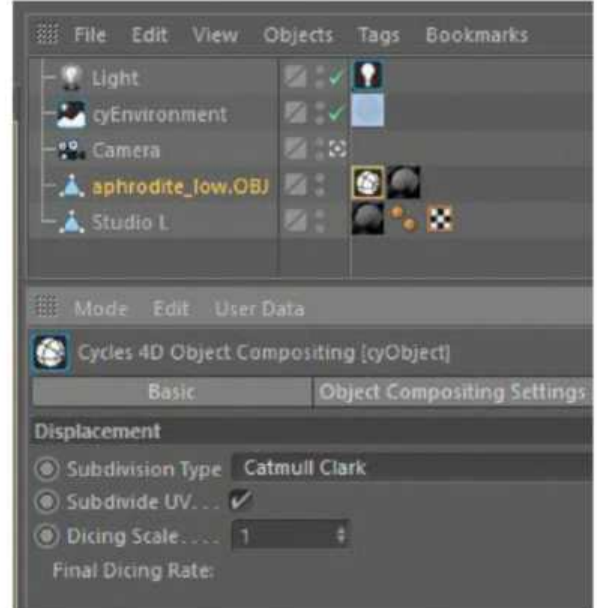
04a



04b



03



05

turbulence for organic movement) would work to create a seam of ore in a rock, for example.

03 BETTER PREVIEWS

One of the most useful (and fun) elements of Cycles 4D is the real-time preview, but the defaults might not be best for you or your system. Use the Device drop-down menu to choose your fastest GPU, and then increase the sample count. Something around 20 looks good and doesn't take too long to render, allowing you to see changes in near real time.

Not only can you pick a device, but multiples will show in the list, so if you have a pair of GTX cards, for example, you can choose

one or both, making the preview extremely versatile and balancing between speed and any other priorities you might have.

04 CYCLES ENVIRONMENT

If you want to get a head start on lighting your scene, add a cycles environment to your scene. This adds the object and creates a material, which you can easily add an HDRI to, using an image texture node plugged into the input of the background node. This saves a few clicks on adding the pieces manually.

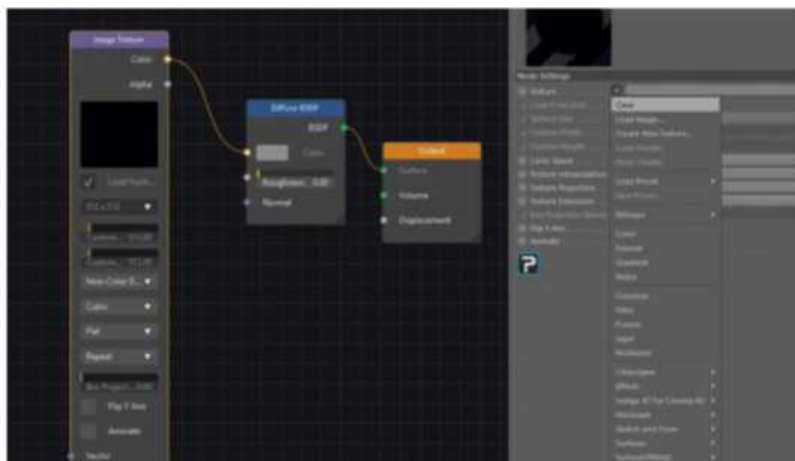
Of course, you can take this a whole lot further, as you aren't restricted to using just HDRIs. You can plug any node chain into it,

so why not encapsulate your scene in a custom-made, shader-based background? You can use math nodes to balance various nodes and create nebulas or star clusters, for night sky or sci-fi projects, or simple gradients if you can't find a sky image that suits your needs.

05 DISPLACEMENT

If you have displacement materials that don't appear to work, it's probably down to a missing tag. Right click the object in the hierarchy and add a Cycles 4D/cyObject tag. In the tags attributes, head to the Displacement tab and you will find the Type is set to None. Catmull Clark usually works best, so

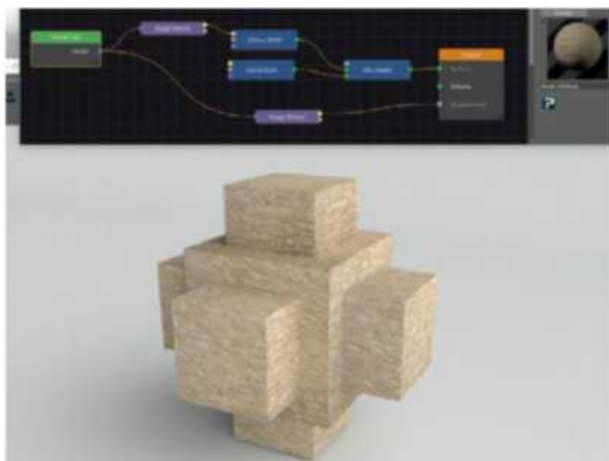
Set-up for lighting is very fast with the environment object



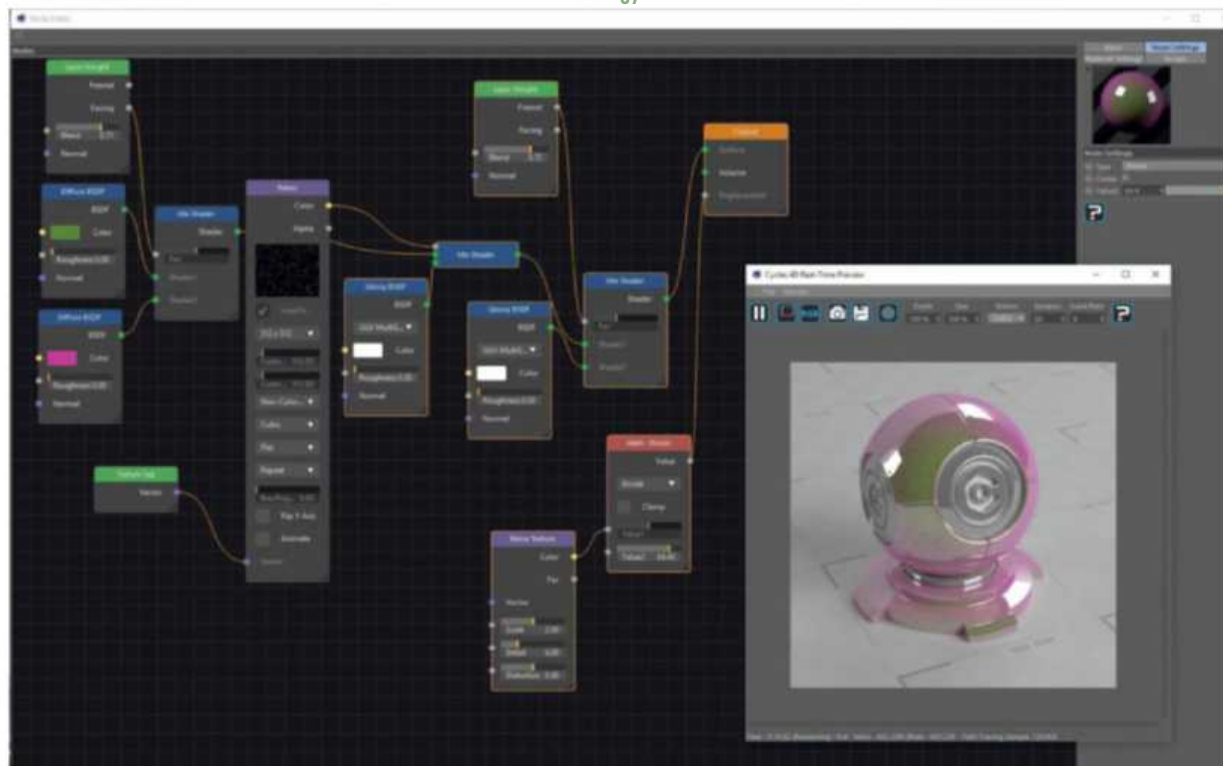
06

For traditional C4D users there's a texture tag node, eliminating the need for UVs

Mixing node chains is easy and controllable with layer weight nodes



07



08

THE CLAY MODE DOESN'T
ALTER THE COLOUR OF YOUR
LIGHTING, SO YOU CAN
REALLY NAIL ITS BALANCE
WITHOUT DISTRACTIONS

Rob Redman, creative director, Pariah Studios

- choose that, and your material should work as expected.

One thing to remember here is that you will have two ways of subdividing your geometry. You can use the Cycles method above, or you can use the traditional

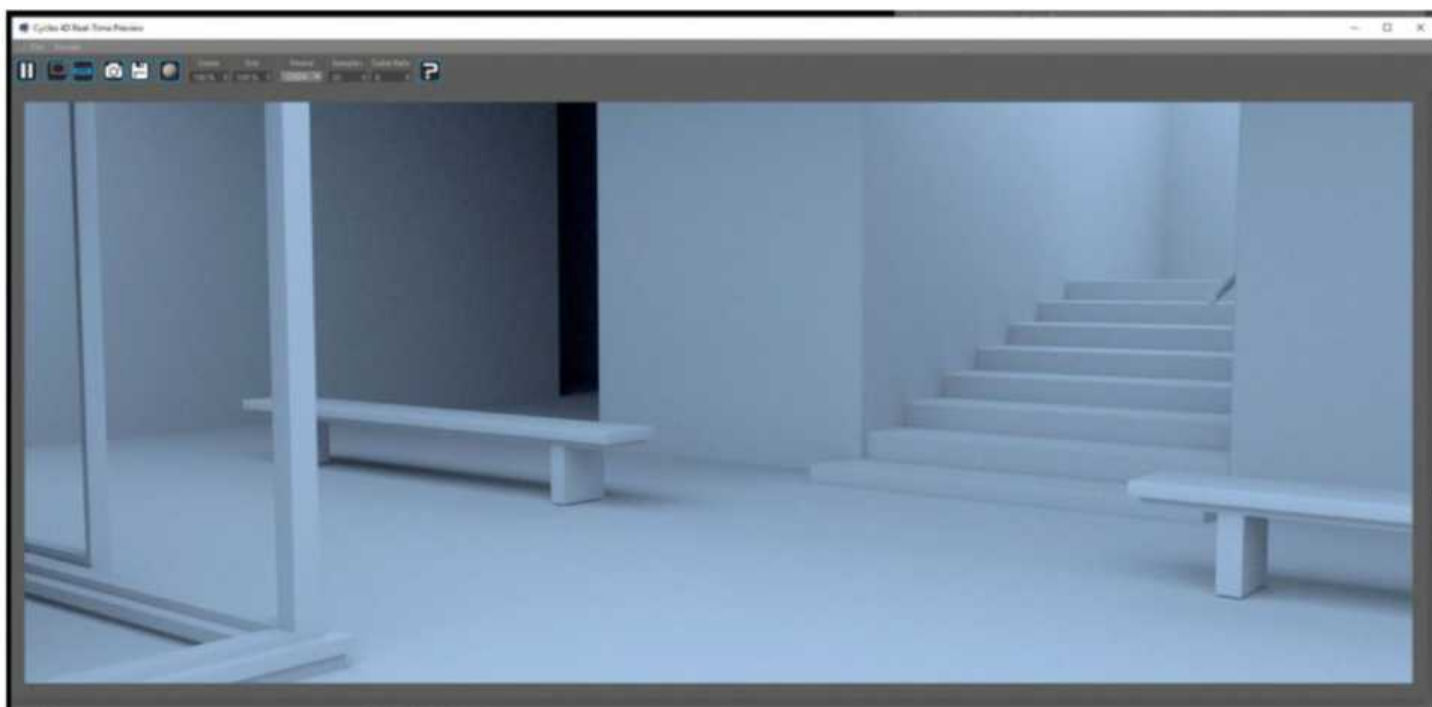
Cinema 4D method. The Cinema 4D way involves either dividing your actual geometry or adding a subdivision surface object as a parent. Both have their place, but beware, adding geometry lets you more clearly see what you are working with but does increase scene file size and polygon count. The Cycles method is less clear but ultimately far more efficient.

06 ACCESS THE STANDARD C4D SHADERS

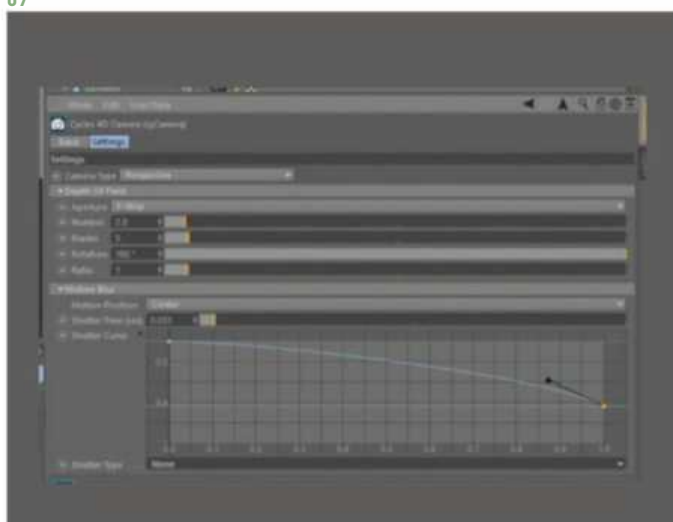
The biggest trick that Cycles has is the Image Texture Node. As well as being the method of importing textures, it also allows you access to every one of the standard built-in Cinema 4D shaders, so if

you are used to using the Fresnel or gradients and don't want to change, then this is the way to do it. This is without doubt a hugely useful feature for every user.

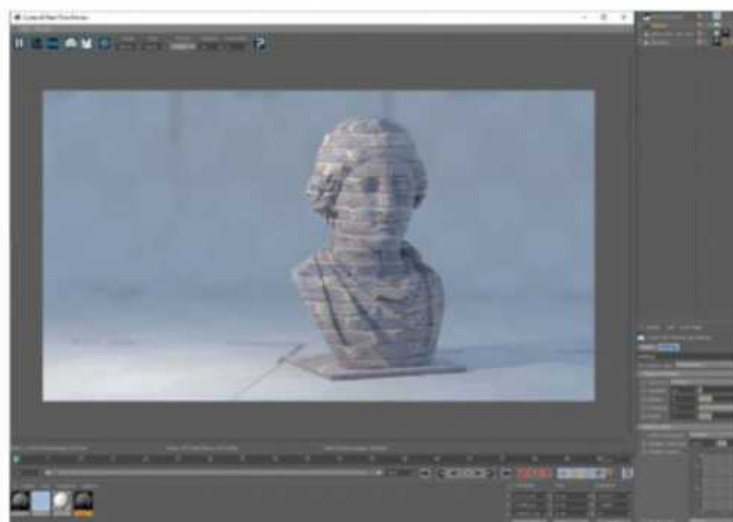
There are so many uses for this that it's hard to shortlist them, but the tile shader is very useful for all manner of surfaces and can be plugged into your Diffuse or Glossy Shaders, or into the bump, using the grout width to create pattern textured materials. The big one is the Noise Shader, which goes far further than the Cycles inbuilt noise, with many different noise types and greater control over scaling, animation and placement. Having this inside Cycles is a huge plus and can save hours.



09



10a



10b

07 GETTING AROUND UVS

Many artists are put off UVing their models for various reasons and stick to using default projection types, such as Cubic or Shrink Wrap. Insyidium has noted this and added a special node to allow for Texture Tags to define material placement. This is a boon for every user and can really help you save some time.

08 LAYER WEIGHTS

Although the name might sound misleading, Layer Weights is a very useful node. If you want a falloff, where one input is more apparent at higher glancing angles to the camera, this is the best tool. Although there is a Fresnel shader,

this gives you more control and you can choose Fresnel or facing, using the slider as a global mixer. This has many uses but is particularly useful for controlling the Fac value of a Mix Shader.

09 CHECKING LIGHTING

When it comes to setting up lights, materials can often get in the way. Luckily, Cycles 4D has a one-click solution. Open the real-time preview render and click the black icon with the circle in it. This activates Clay Mode, rendering everything flat grey, so you can then concentrate fully on light and shadow.

Better still, the clay mode doesn't alter the colour of your

lighting, so you can really nail the balance between the intensity and warmth of your lighting without any distractions.

10 PHYSICAL CAMERAS

You can use Cinema 4D cameras with Cycles 4D, or you can use the Cycles camera, but they are in actual fact the same, just with an added tag. This means that converting old scenes or using existing animated cameras can benefit from Cycles attributes like f-stops by simply adding the tag and defining the details. This approach is easy and so powerful.

FYI You can get a free 30-day demo of Cycles 4D at www.insyidium.uk/cycles4d

One-click material overrides are included for fast lighting checks. Physical camera attributes are supported via tags

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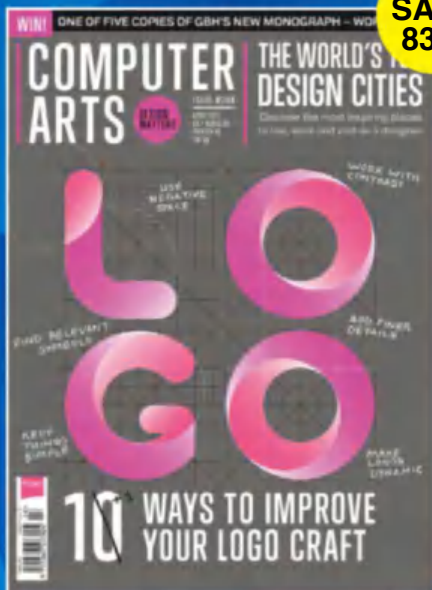


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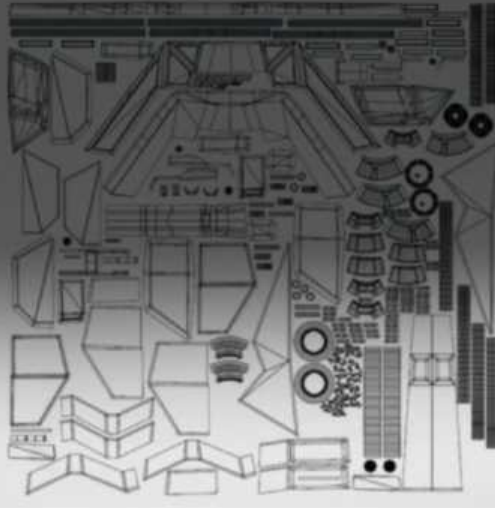
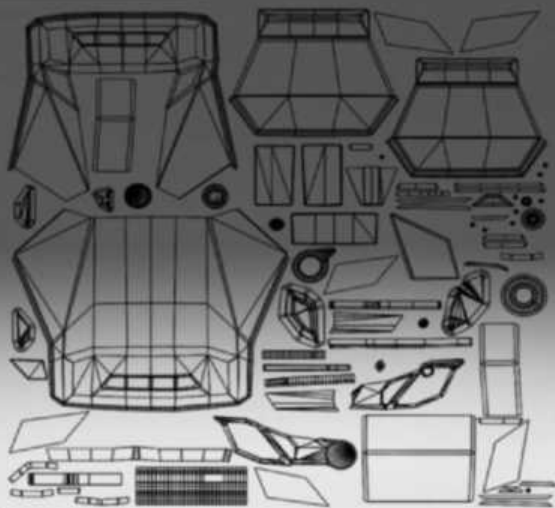
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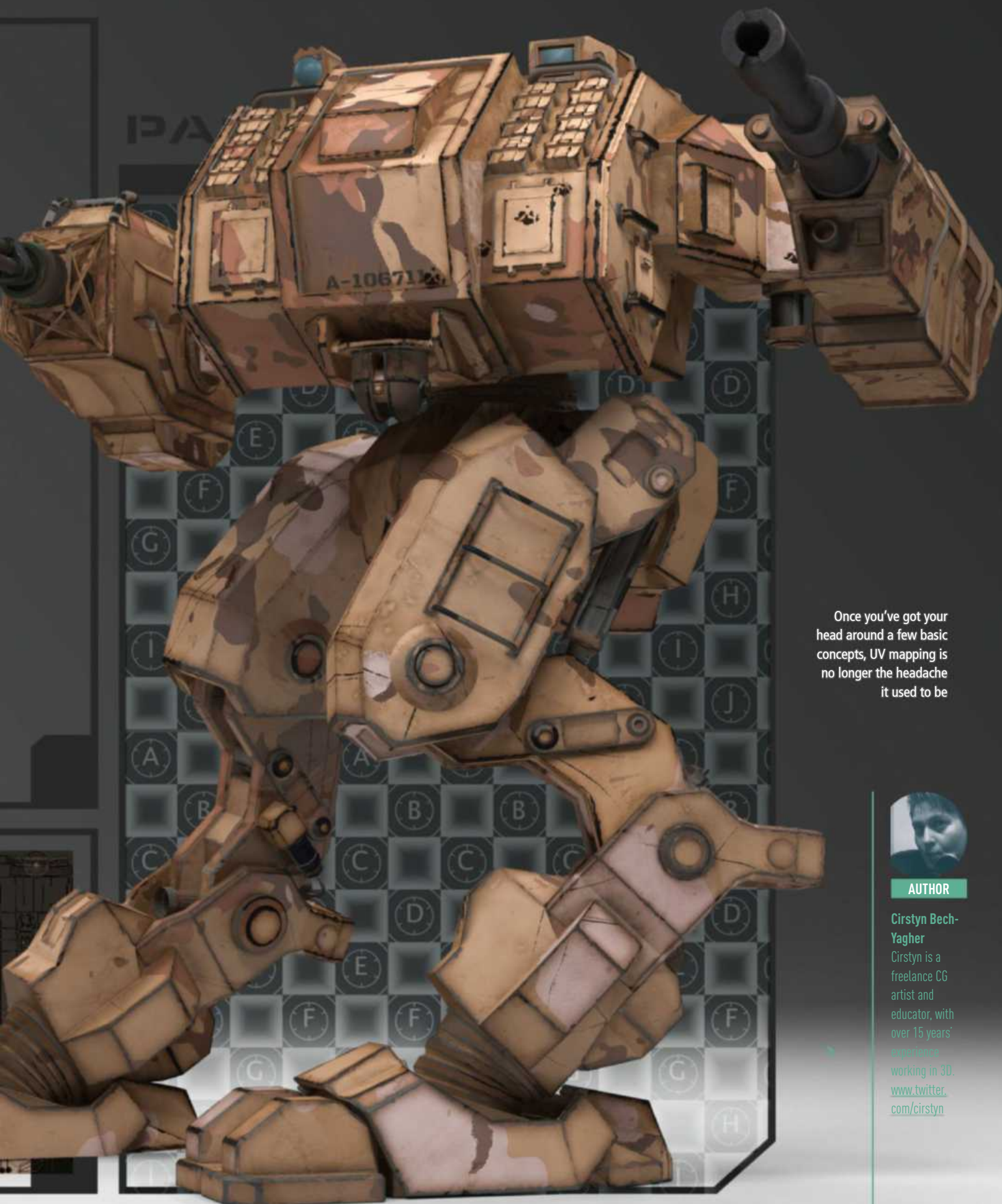
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HARD EDGED UV MAPPING FOR BEGINNERS

Cirstyn Bech-Yagher takes you through the fundamentals of the critical task of UV mapping





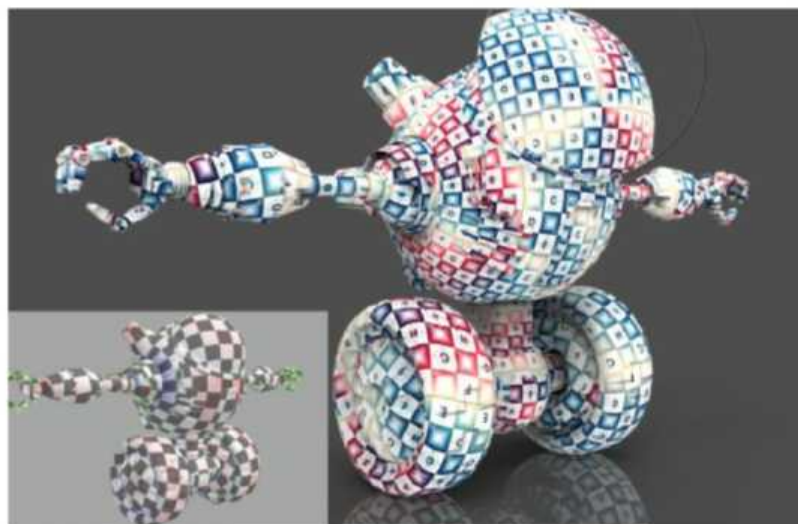
Once you've got your head around a few basic concepts, UV mapping is no longer the headache it used to be



AUTHOR

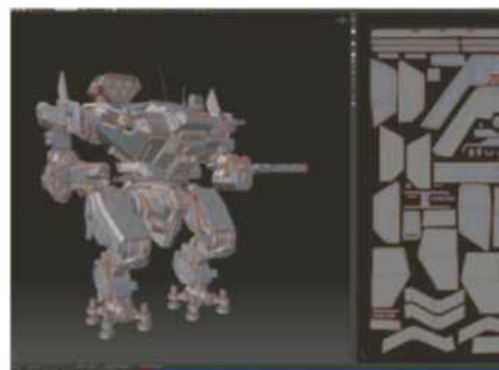
Cirstyn Bech-Yagher

Cirstyn is a freelance CG artist and educator, with over 15 years' experience working in 3D. www.twitter.com/cirstyn



Left: Try using a UV grid rather than a checker map – a UV grid will show a lot more issues, such as flipped polys

Right: Make sure your mapped UV groups have sufficient gutters. Look for the Spacing settings in your UV mapper



Known as the most tedious task in 3D, especially for beginners, UV mapping is also the glue that binds models, bakes and textures together. It's a necessary task, too, as a bad set of UVs and their resulting output can make a really good model look really bad. Whether you love or hate UVs, there's no escaping them – they are essential to understand.

Some of the most common problems that novices run into when starting out with UV mapping is finding the whole process an incomprehensible soup of terms and concepts, as well as never quite knowing where to begin, especially when working on hard-edged models. However, if you get into the habit of doing a little prep and find a UV mapping tool you click with, it's not quite the tedium it used to be.

UV space fundamentals

The reason a UV map is the glue between model and textures is that it's not only the flattened and mapped topology of your model,

it's also the basis for your map bakes. This means you need to take your mapping into consideration as you model – bad UVs give bad bakes. You can always tweak bad curvature, height or occlusion maps in Photoshop in a pinch, but bad normal or similar map output can be a real pain to fix if you don't keep them in mind from the get-go.

This means the first thing you need to know about UV mapping is what UV space is. Based on a 0 to 1 grid, with 0.5 as the middle coordinates, a UV map consists of your 3D model's XYZ coordinates flattened into 2D UVW space – or tile, as it's called.

Depending on your modeller and mapper, 3D's horizontal X-axis equals U in 2D space, vertical Y equals V, and the depth coordinate Z equals W. There is no madness to the letters, only method: 2D's UVW is used solely to avoid confusion with 3D's X, Y and Z. This equalling of coordinates is – to put it simply – how 3D space translates into flattened 2D space.

You may be wondering why 2D space also has a depth coordinate. This is to make sure that no matter how you choose to map, flip or stack your UV'd bits and pieces – called islands or shells – the depth coordinate will ensure they show correctly in 3D no matter their mapping. It's also vital that all your model's flattened polys need to be inside the UV tile in order to provide your baker and renderer with accurate texture information.

Some renderers and texturing applications take this a step further by also providing support

for something called UDIM – U-Dimension. In simple terms, UDIM makes UV mapping and texturing easier by enabling you to create multiple UV grids for the same model by allowing you to have 10 tiles on the U-axis, and an (almost) infinite amount on the V-axis. As with a normal UV tile, you can't have polys outside of the UDIM tiles' boundaries either, but we'll get to that later.

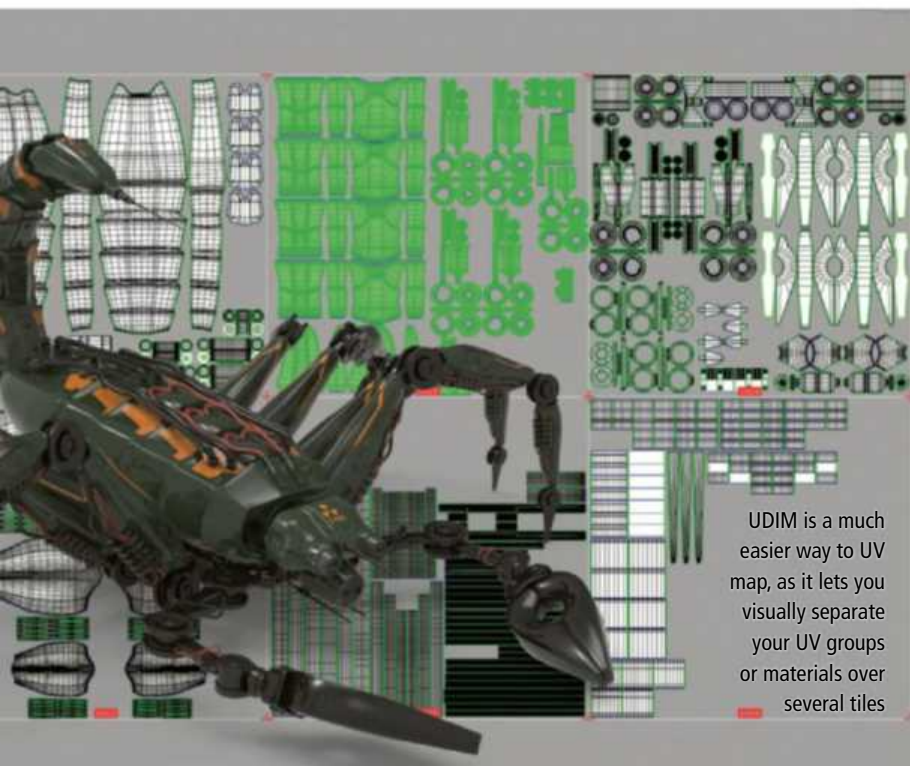
Pre-modelling considerations

Now you know what UV space is, we can move on to the few fundamental concepts that apply to UV mapping no matter your model, UV mapper, or whether you're using a single-tile UV map or UDIM. First and foremost, a UV map needs to be as distortion-free as possible. This means that a texture won't

MAKE SURE YOU BUILD
PROPER GEOMETRY, AND
KEEP IN MIND THAT YOUR
INTENDED END RESULT
CAN IMPACT YOUR UV
MAP AND ITS LAYOUT



Be careful not to go overboard with your groups and textures. As well as heavy game engine load, they'll also slow performance in, for example, Substance Painter



UDIM is a much easier way to UV map, as it lets you visually separate your UV groups or materials over several tiles

look stretched or pinched when applied onto the model. It also needs to maintain scale. Textures applied onto a model should not show disproportionately to each other. For example, the head of your mech shouldn't have a much smaller scale and details than its torso, and even worse if the arms have even larger details. You can of course work around this by using triplanar mapping when working in apps such as Substance, for example, but the best thing is to get it right straight out of the gate.

As well as no distortion, a good UV map also has borders and padding. Avoid seam trouble on the tile's edges by adding a three-to-four-pixel border, and get into the habit of creating enough space between your UV islands to handle edge padding and gutters to head

off trouble at the pass. Even two to three pixels is often enough to avoid texture bleed and normal mapping artefacts when baking, and almost all UV mappers have functionality for this. Use it.

It also pays to keep your layout tidy and economical, with similar items arranged together, or stacked on top of each other where possible to save space. This will allow more room for the items needing finer detailing or with higher visibility; the larger the item on a UV map, the larger the texel density, meaning the more space it gets for painting and detailing.

When you start modelling, make sure you build proper geometry, and keep in mind your intended end result can impact your UV map and its layout. If you're creating a game model, for example, you'll

■ ESSENTIAL TERMS FOR UV MAPPING AND TEXTURING

IF YOU'RE NEW TO UV MAPPING, THIS GLOSSARY WILL HELP TO DEMYSTIFY SOME COMMON TECHNICAL TERMS

BAKING

In this context, baking means prerendering the maps you can incorporate in your model's texturing process, such as ambient occlusion, normal, curvature and position maps.

COMPRESSION

This type of distortion is caused by a large texture area being applied to a small part of the mesh. Like Stretching, it's fixed via tweaking manually or a Relax function.

CUT

After you've defined (selected) the edge across which you want a seam to run, most applications, whether they're stand-alone or native, will have a cut command, enabling you to cut islands on your map.

FLATTEN

To generate a non-distorted surface for the texturer to paint on via UV mapping.

FLIPPED UVS

You get flipped UVs if something got turned the wrong way, either when modelling or during your mapping process.

NORMALS

The polygons in a mesh can face inwards or outwards. Their direction decides whether a texture displays facing the back or the front. They're bakeable.

MULTIPLE UV MAPS

Your UV map can be spread over several images, to facilitate extra detailing space, or component swapping, demanding you use multiple UV maps for your object.

OVERLAP

Overlap is when you can see that you've got two or more faces on your map, which are partially or wholly overlaying each other. This means they will share the same bit of texture, potentially showing up as distorts.

PROJECTION PAINTING

Projection painting is a method of painting directly on your mesh, calculating UV coordinates on the fly. This is very handy for tricky seams.

RELAXING

Relaxing parts of your map means you're minimising distortion via modifying the spacing between the map's coordinates.

SEAM

A seam in UV space is pretty much the same as a clothing seam, and unless you're working on a flat plane, you'll have at least one seam in your map.

SHELLS/ISLANDS

A shell/island is a piece of map that you've cut – a collection of connected UV faces, with outer borders (seams) that connect to other islands.



You can avoid some normal and potential flipping issues by using the binormal tangent export option when exporting .fbx files from your modeller

Right: It's easy to forget that normals are more than a normal map basis – they also control the direction of a surface and smoothing groups



Far right: Smoothing groups need hard edges. In the gun's case, the body has two smoothing groups, meaning it needs a hard edge where the mesh hard edges intersect

► need to be very aware not only of your high-res mesh's detailing so the lower-poly mesh can hold it, but also how you cut your UV seams, as every cut means a doubled vertice count in-engine. Neither Unreal or Unity support UDIMs natively at the time of writing, which means your map needs to fit on a single tile.

And it's never too late to start thinking about normals and smoothing groups. A lot of artists seem to think of a normal map as a glorified bump map. This is not entirely correct, as it has a few more uses than height or depth maps. In a nutshell, normals are the directional pointers for a polygon (face) or group of polygons.

The direction they face defines the direction of smoothing, and the side or direction your materials display on. For example, if you're creating a scene inside a box, it would be natural to have the texture on the box's inner walls face inward, not outward, so you can see it. You define this by setting the direction of your normals. Most modellers have a function that enables you to see the direction they're facing in – usually that little pointer in the middle of a polygon pointing in or outwards.

In addition to the above, and as they are items you can hand paint details on, normals also control smoothing groups. A smoothing group's function is to make your model appear smoother without adding polys to the mesh. It's a sort of pseudo-subdivision surface where if two or more polygons share an edge and are members of the same smoothing group, they will render as a smooth surface. If not, a hard edge is created. This will render as a corner or an edge, and this edge will need to be separated when UV mapping to avoid baking artefacts. This means that even a simple thing like

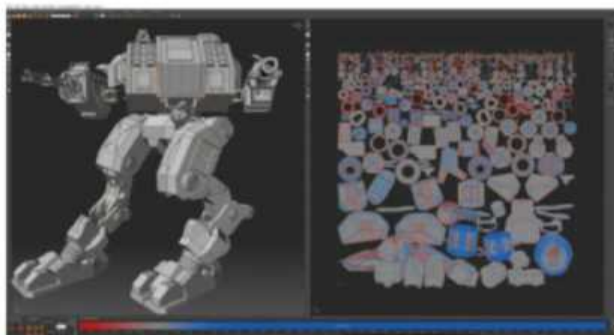
tidying your mesh as you go can yield baking, time saving and UV mapping benefits, as it'll steer you clear of tasks such as leftover poly clean up, too many deleted poly fixes, and tidying unclean edges, which often only become visible (and a potential clean up time sink) when you start the process of UV mapping or baking.

If you're UV mapping a hard-edged model, be a bit wary of flipping islands and stacking them, especially if you're mapping on a single UV tile rather than UDIM. Even though it can really speed up your workflow and save you UV mapping time to only map half of your figure before copying, flipping, welding or stacking your shells, you run the risk of ending up with weird lighting and lighting seams. A workaround for this is to use an .fbx export with tangents and binormals checked, but it also helps to use multiple, non-flipped UV maps or sets, at the cost of load and the convenience of having everything in one map.

Hard-edged UV maps

Now you know your space and are aware of some of the basic workflow

IF YOU'RE ABSOLUTELY STUMPED AS TO WHERE TO EVEN BEGIN UNWRAPPING, LOOK AT YOUR MODEL, AND DIVIDE IT INTO GROUPS OR MATERIAL GROUPS



Unless you want a whole lot of islands to clean up, UV map as you model, and create groups and/or materials before auto unwrapping



Some programs don't respect welds, so check your export settings before unwrapping externally to save yourself an ocean of poly islands

considerations, it's time to start mapping for real. Bring a UV grid, elbow grease, and patience. The UV grid should have letters and shapes on it – the plain black, checkered map is not good for spotting errors like flipped polys and smaller distortions, even if your UV mapper shows stretch (blue) or pinch (red) in the model view. The patience is because UV mapping can be time-consuming. Despite the wonders of the various auto unwrap buttons littering the UV mapping landscape, keep an eye on the auto unwrap results, as an auto unwrap function by itself has no concept of what the important and non-important areas of your texture will be.

If you're absolutely stumped as to where to begin unwrapping, look at your model, and, if you haven't already, divide it into groups or material groups. Then go for the largest, or most complex items first. These areas are often the most visible and time-consuming parts of your UV map and texturing, and it's here you'll have the least leeway when it comes to time and errors. A half-visible screw unwrapping a little stretchy is less of an issue than a big, detailed mech-chest full of distortions and artefacts.

This brings us to cutting and seams, which is where the main difference between UV mapping

organic and hard-edged models lies. The reason for this is that because a mech has more edges, than, say, a fantasy archer, they tend to need more seams in order to reduce distortion, but also because of normals, baking and error prevention.

In addition to high-poly details and smoothing, normals also facilitate better shading. In order to make use of this on a hard-edged model, you'll need to take some precautions when cutting your UV seams. As mentioned, if you have a smoothing group or polygon ending and another one starting, a hard edge is created, and that edge is going to need to be cut and get some padding (never less than two pixels). This gives room for error reducing tangent twisting and avoids issues such as gradients, black lines or LOD issues down the normal baking line.

Take care with where you put your seams and how many you cut. A cut on a hard edge can't be avoided, but as far as the rest are concerned, try cutting your mesh in places that aren't so obvious or visible. You can also try cutting these maps approximating the way they'd be separated in real life for a good result and ease of texturing.

Staying on track

Once you've started getting into your UV mapping groove, keep

ESSENTIAL TERMS FOR UV MAPPING AND TEXTURING (CONTINUED)

SMOOTHING GROUP

A collection of polygons you can define. Together, they render as a seamless smooth surface. You see a hard edge where one group stops and another begins.

STACKING

Stacking in a UV map means placing similar islands/shells on top of each other to save space.

STRETCHING

Stretching is caused by a small texture area being applied to large parts of the mesh. It's fixed by tweaking the area on the map it's been applied to.

TOPOLOGY

The topology can be thought of as the terrain of the model. And just like with real maps, a UV map consists of the terrain of the mesh.

UDIM

Most renderers still read UV space as a single tile with a 0.1 coordinate set. UDIM is a recent format which enables you to group your UVs in tiles, rather than stacking them on top of each other and then separating them by group or material.

UV SPACE

The grid you have in your UV mapping application contains UV coordinates (0 to 1). You can work outside the grid when working, but you need to have your final map inside of the grid.

WELD

This refers to welding or sewing bits of a map together. It's often easier to unwrap into smaller pieces and then put them back together again than deal with individual parts in isolation.

an eye on your straight lines. Be careful when using the Relax function. It's a godsend for many organic maps, but can really skew your lines on a mechanical mesh if you don't use your UV mapper's pinning or constraint function properly. Test it thoroughly.

Make sure to keep your lines as straight as you can, as hard-edged models often show distortion more, and are more subject to being textured with decals and straight-lined items, which will look skewed if the UV map is skewed.

Once you're getting near the finish line, run a final check with a different UV grid and a set of generic textures, just to check everything is mapped. Once you're done, it's ready, set, bake!

FYI Discover more about UVs at www.bit.ly/UVwrap

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HONE YOUR WORKFLOW FOR BETTER CHARACTERS

Dan Roarty shares how to use a mix
of techniques and software to make a
lifelike character from *Ghost in the Shell*



AUTHOR

Dan Roarty

Dan works at The Coalition as a lead character artist on the *Gears of War* franchise. He has also worked for Midway, Activision and Lucasfilm.
www.danroarty.com

This tutorial is based on the film *Ghost in the Shell*. I've been wanting to outline my entire process for creating a human character for a while and I'm excited to share the process with all of you! In this tutorial I'll describe each step I went through in creating the character. We will start off by going through my process of utilising reference and a quick proxy mesh. From there, I'll describe how I used a female base mesh as a starting point for my clothing and accessories.

I'll go into the process I used for creating the clothing in ZBrush and outline how I use Dynamesh and ZRemesher from start to finish. I'll also show you how I sculpt and detail her head in Mudbox. I'll give insight on texturing the head and show some tips and tricks I use every day. I'll outline the process for texturing the clothing and utilising masks. We will also use Maya and V-Ray to build the shaders for the head, eyes and clothing. I'll then show my lighting set-up and finally the render and post. Thanks for taking the time to go through this process with me. ➤



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02

01 FINDING REFERENCE

The first thing to do is find reference for what we want to create. It's very important to have not just reference but a clear direction and purpose to what you are creating. I'm gathering some general images that I find both inspirational and serve well as reference for the overall character I am going to build. Putting together a reference sheet is a great way of helping to flesh out the look and feel of your character.

02 CREATING A PROXY

With my reference gathered, I sculpt a really rough proxy of

the character design in Maya and ZBrush. By creating a proxy, I can flesh out my character in 3D before I need to start building any high-res assets. This helps me find areas of the design that might not work well together and it's also great for blocking out general proportions of my character. I'm using an older female base mesh I created previously as a guide for my character's proportions.

03 SCULPTING THE BODY

For her suit, I start with the female base mesh I have. I start by Dynameshing it to a lower resolution

The importance of a proxy

Creating a proxy of your character is a really easy, quick and effective way of fleshing out your character. It can save you from redoing high-res assets later.

and getting rid of the arms as I won't need them. I start to quickly sculpt in my general clothing lines and patterns for the eventual material breaks I have. At this stage, I'm also moving around some of her proportions a little bit using my reference to check the details.

04 ADD FABRIC DETAILS

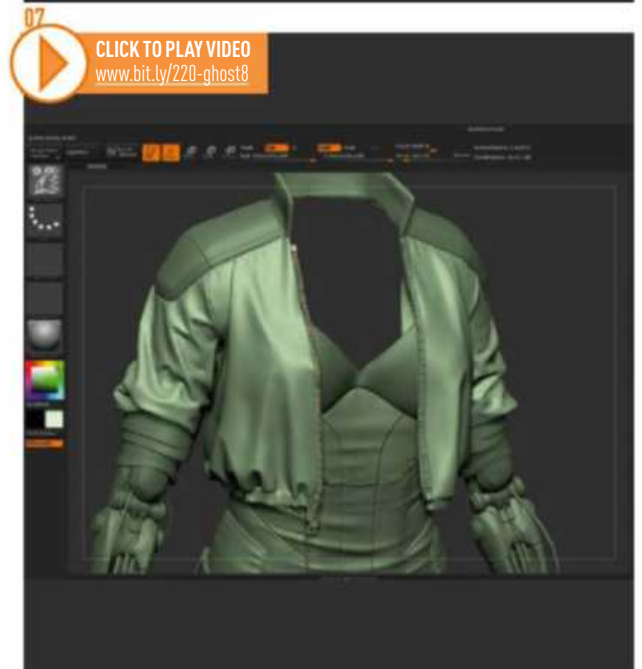
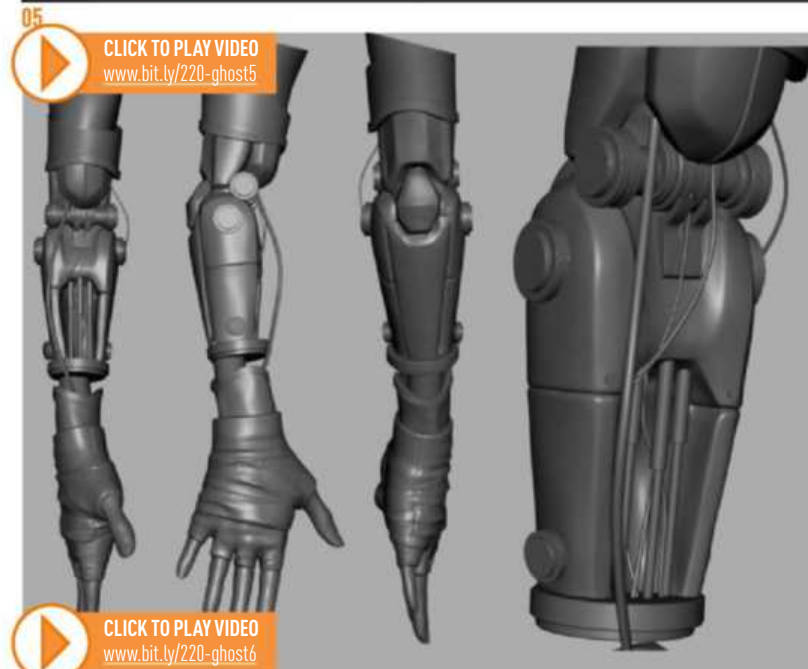
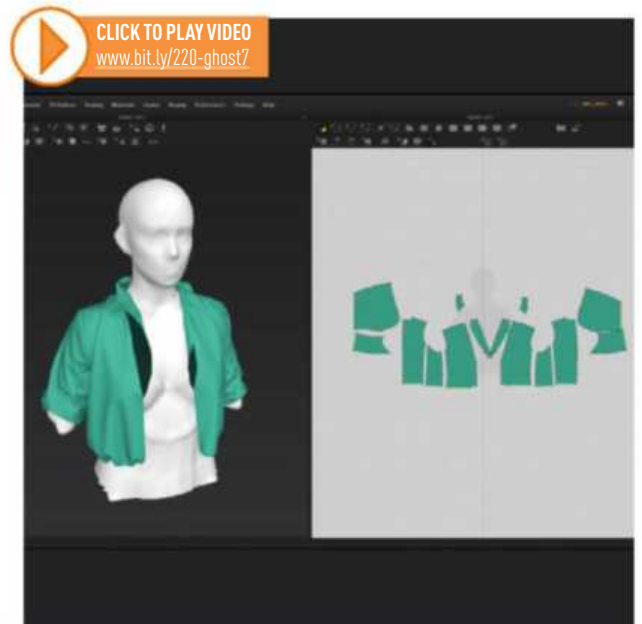
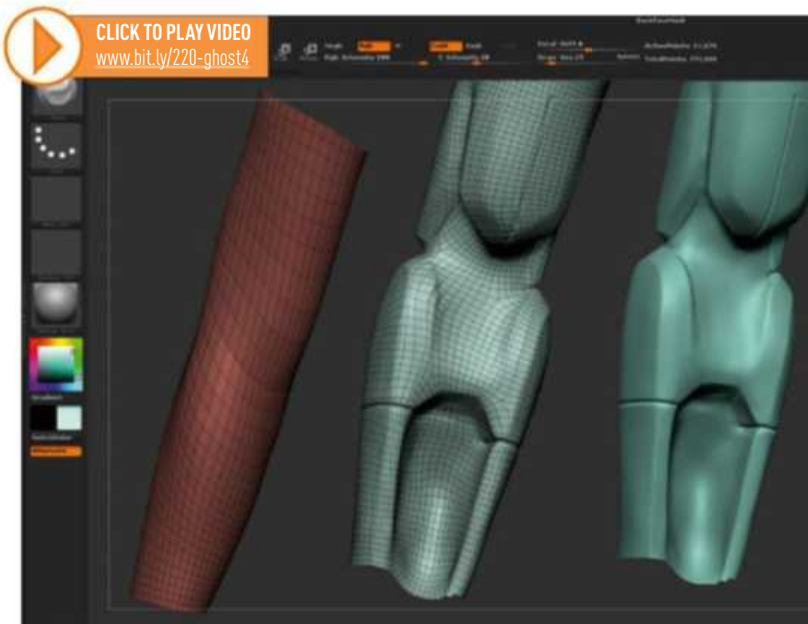
With my general fabric separation sculpted in, I delete the head section and do a ZRemesh of the body so it conforms better topology-wise to her fabric breaks. Once I've done a remesh, I can subdivide and sculpt in the details further. For the stitching, I'm using some stitch brushes I purchased from Gumroad. I decide to just do the wrinkles by hand while looking at various references.



03



04



05 BUILDING ARMS

For the arms, I take the same approach as for the body. I start with the female base mesh, delete parts of the arm I don't want and sculpt and Dynamesh it. Because I want to become more familiar with the sculpt brushes in ZBrush, I decide not to build the hard surface objects in Maya. With my general shape complete, I then ZRemesh it, subdivide and further refine the shapes – mostly with the Dam_ standard and Pinch brushes.

06 MAKING THE GLOVES

For the gloves, I Dynamesh my hand geo, sculpt that version and ZRemesh. To make the little

knobs, bolts and wires, I just do a quick Maya cylinder extruded and adjusted to be a little more interesting. All the little pieces I do with Maya poly modelling. For the hand, I use a scanned one that I got from www.ten24.info.

07 BUILDING THE JACKET

I'm going to use Marvelous Designer for her jacket. I start with a basic jacket template I had previously and adjust it to feel shorter along the arms and length. For the avatar, I'm just using a quick low-res version of the female base mesh to ensure it fits on her overall proportions. I'm starting with the D_Leather template for fabric and

Don't subdivide too early

I find a lot of beginner 3D artists tend to subdivide too early before their base forms and proportions are in check. Skip the details until your forms are correct.

turn the Particle Distance to 5. Once complete, I export as an .obj with Unified UV coordinates and Weld selected for the mesh.

08 MAKE JACKET STITCHING

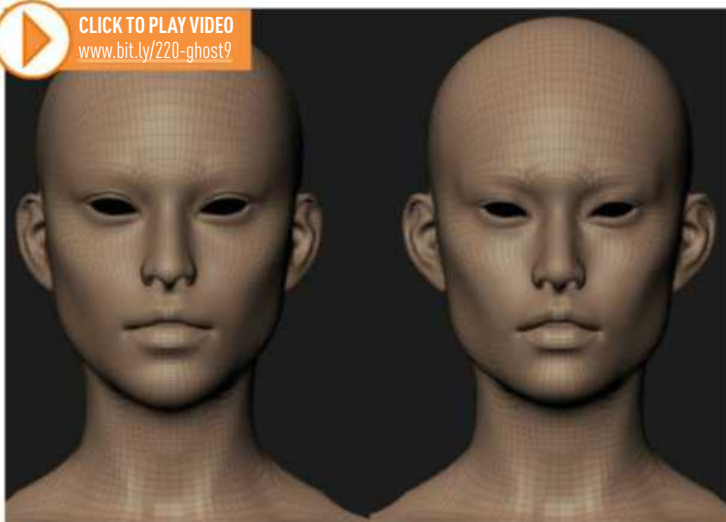
With my exported Marvelous Designer jacket, I bring it into ZBrush to do the stitching. I'm using the Stitch brushes I used for the clothing. I also create some very basic poly shoulder pads in Maya and bring them into ZBrush and subdivide as well. I use the Zipper brush in ZBrush and add it to both sides of the open jacket. For the jacket, I keep the geology the same and don't worry about re-meshing.

TUTORIALS

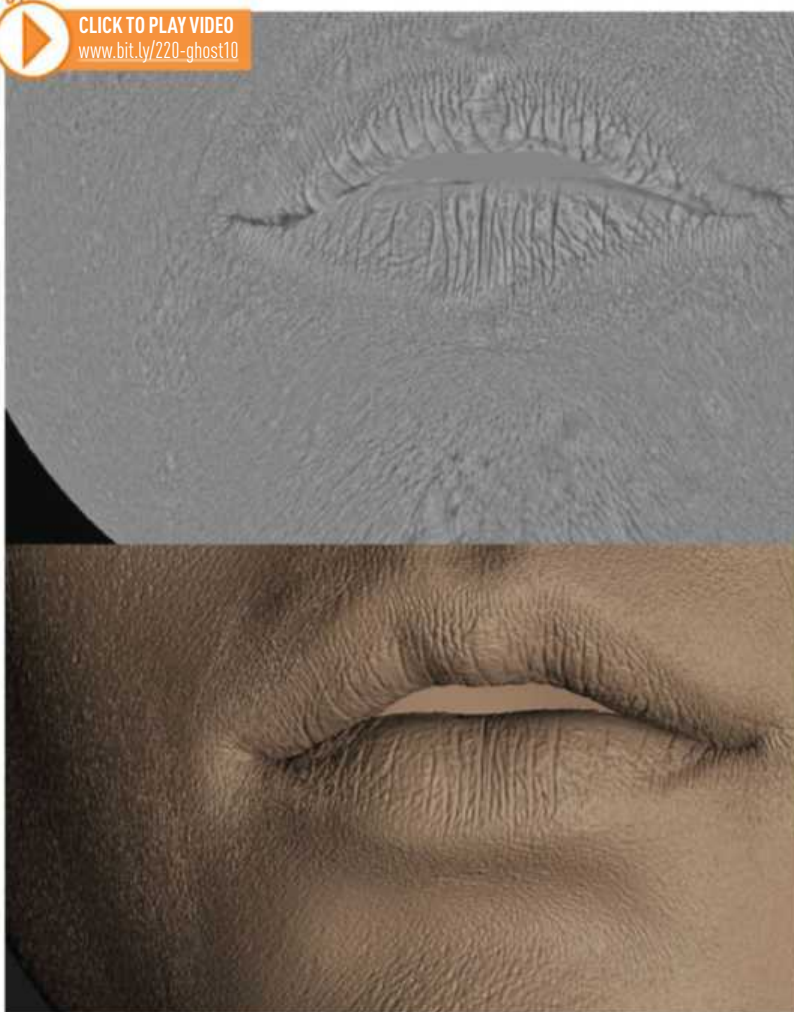
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ZBrush or Mudbox

Remember that they are just tools and using one or another won't make or break your career. Find whatever tool works for you and don't be scared to try new software.



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10

09 SCULPTING THE HEAD

It's time to sculpt the head. I start from my female base again and delete the areas I don't need. I never change the topology on my heads as I always use the same one. I use Mudbox for sculpting my head with Tao Okamoto as reference (but not for likeness). I check the visuals by eye as much as possible and for

my camera I have my FOV set to 10. This ensures very little perspective and distortion on the model while sculpting. I check the different angles in Mudbox as well to see how the light reacts to the shape.

10 DETAILING THE HEAD

Detailing the head is really important. I use TexturingXYZ maps

Use reference!

I know a lot of artists like to use their imagination, but having lots of reference at hand is critical. When working on heads and bodies especially, always have reference handy.

11

for this process, using a variation of maps from the website. I paint all the maps in RGB as a colour, then export out the texture and separate the RGB values and apply as a displacement as a different layer.

11 EXTRACTING THE MAPS

I now need to create a displacement map. In Mudbox,



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12

select your head mesh, then go to UVs & Maps>Extract Texture Maps>New Operation and select Displacement. Because you are using the same head mesh with different resolution you can select Method>Subdivision. Ensure that you are creating a 32-bit FP. I use 32-bit Tiff files for my displacements. Once you're ready, extract.

12 TEXTURING THE HEAD

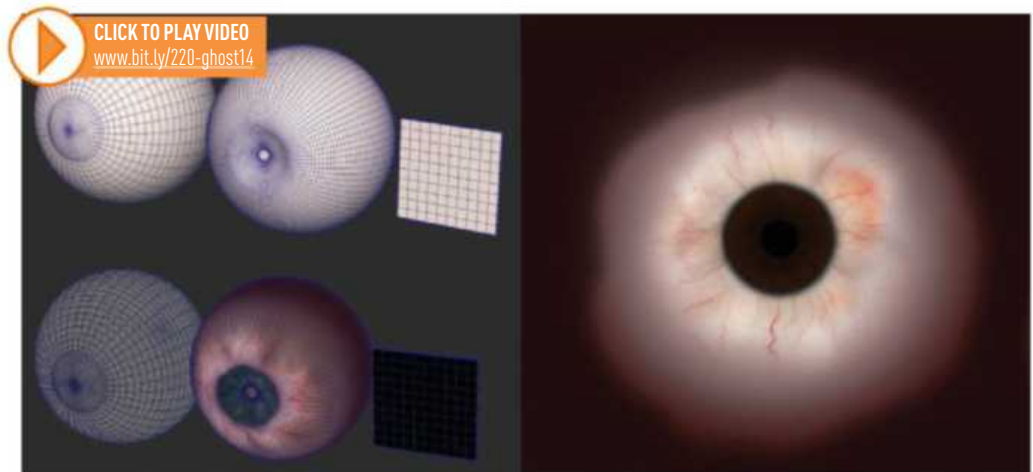
To texture the head, I use some textures from **www.3D.sk**. I first need to select a model with the general skin tone and complexion that I am looking for. I choose to use Elvira from the library, I am texturing on a 4K map for the diffuse. From here, I project the image onto my character's face. I move the face so it aligns with the texture to ensure that it has been applied correctly.

13 CLEAN UP THE HEAD

Once the head has the base texture on it, I need to get rid of the specular as well as remove blemishes. To remove the specular, I start by using the Clone brush in areas that the skin colour/details are the same. For areas of specular that I will need to cover up, I create a Darken layer on my texture and select a colour in the area that is darker than the spec and paint over the top. This should remove a good amount of the specular.

14 EYE GEOLOGY

For the eyes, I decide to take a very simplistic approach to



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www.bit.ly/220-ghost14

14

building them. I break down the eyes into three separate parts, which are the lens, sclera and the pupil. For the lens, I create a sphere and ensure there is a bulge outwards that mimics a real eyeball. The sclera will just be a concave sphere with the centre hole cut out for the pupil. The pupil itself is just a standard plane that sits directly behind the sclera and is all black.

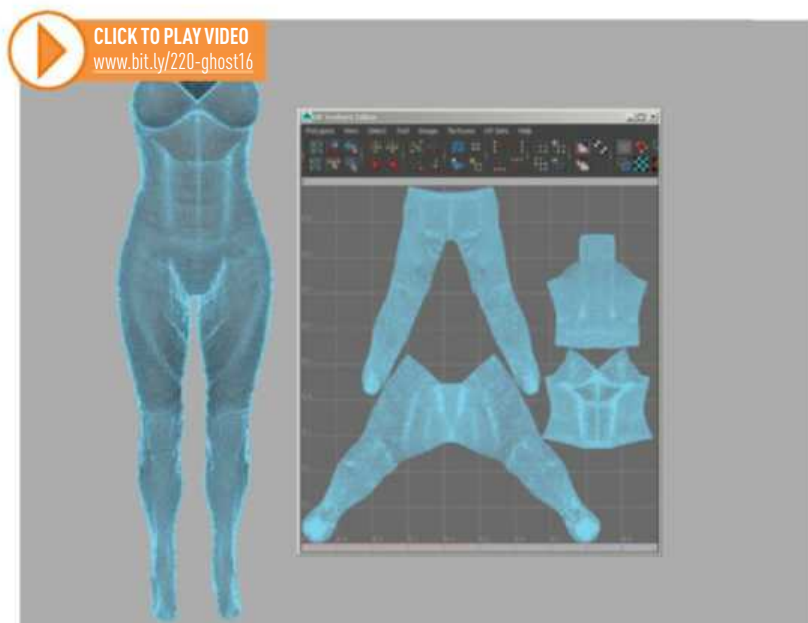
15 EYE SHADER

For my eye shader, I am using a VrayMtl for my lens mesh and a VrayFastSSS2 for my sclera. I want my lens to have only reflection and refraction and my sclera to have a bit of subsurface scattering. To create this, I turn my Reflection color on my lens to white and my amount to .325. Both of these can be controlled depending on the amount of reflection you want. I also turn my Refraction Color to white and have it set to 1.0. I find that the Refraction IOR looks best when set to 1.60.



CLICK TO PLAY VIDEO
www.bit.ly/220-ghost15

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16

16 UV THE BODY

I am going to UV my body using Maya. First I go down to my lowest subdivision of my body mesh from ZBrush. From here, I export it out as an .obj and import it into Maya (I am using Maya 2015). With my mesh selected, I do a basic front-on projection. Next, I select the edging on the side of the mesh that will have the UV break and separate the UVs from the UV editor. Then in your UV texture editor, go to Polygons>Unfold – this will give you a nice separation that is undistorted.

17 TEXTURING THE BODY

To texture the body, I generate some masks in Mudbox. I have several base diffuse textures of leathers and cloth I want to use as a base. The masks I am creating will act for layering multiple materials within Maya and V-Ray. To start, I create a basic mask for my leather section and another for my cloth. I create 4K textures for these as well.

18 LAYER MASKS

With the separation of my leather and cloth complete, I want to create another leather layer mask. This layer mask will be my worn layer for my general layer. I create a new texture layer, and add a layer mask by right-clicking on the texture layer and selecting New Layer Mask. The next step is to flood the layer black so it has no information on it. After that, I use various brushes to create my layer along the edging.

19 SHADERS FOR THE BODY

With our exported masks, I need to set them up with a proper shader in Maya or V-Ray. For the clothing, I use a VRayBlendMtl. I create some basic VRayMtl Materials for the cloth, leather and worn leather. I need to ensure that I plug in the masks I created for the blend amount for each. Pay close attention to the reflections. They may need to be adjusted once you have added your lights.

20 SHADERS ON THE HEAD

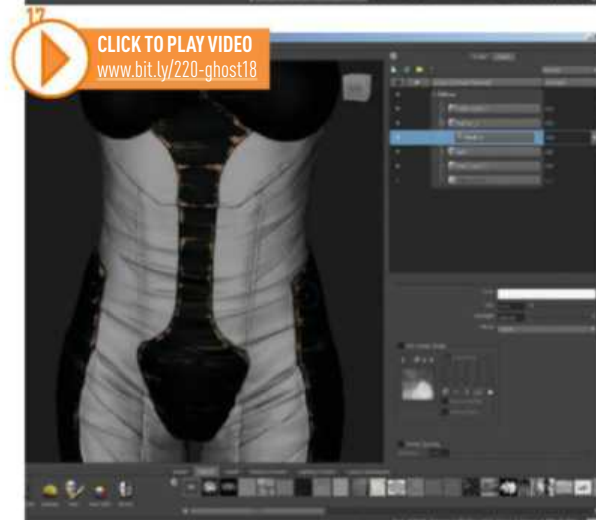
To create my head shader, I grab another layered shader. Next, I create the skin. For the skin shader, I use the FastSSS2 shader in V-Ray – I use prepass for this to speed up the render time. I now create a reflection material that I can add as an additive to give a little more punch. Be sure to plug in your colour to the overall colour slot.

21 CREATING HAIR

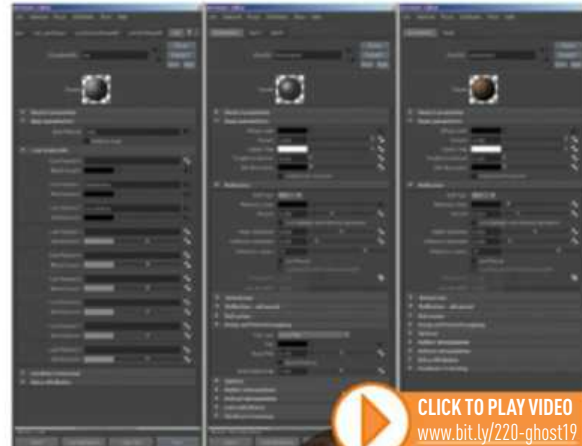
I tend to use Shave and a Haircut for most projects I work on



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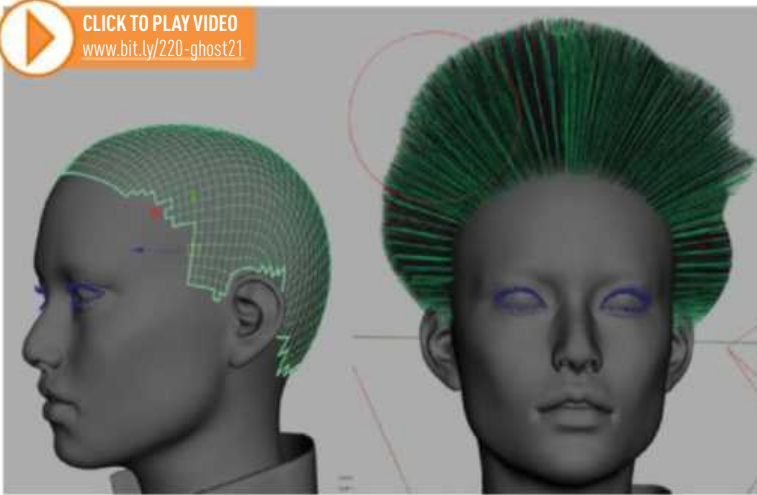


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21

and I'll be doing the same here. To start off with, I'm going to extract a portion of her head that will serve as a hair cap geology. With this hair cap geology, I then create a hair system by selecting the hair cap geology and selecting Create New Hair from the Shave drop-down menu. This means I can then use the standard default hair to begin with.

22 SCULPTING HAIR

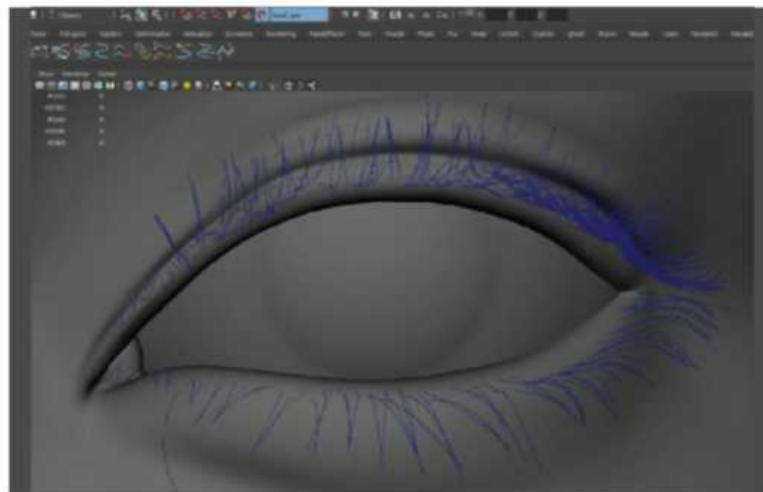
The next step is to groom the hair. Looking at some general reference, I start styling the hair appropriately. This task can be fairly time-consuming but you will need to take your time with the styling. I create the eyelashes by hand using Curves. To do this, make your head geology live by pressing the magnet at the top. Next select Curves>EP Curve tool to create your curves. Then select the curves and follow the same method for creating the hair system as we did the cap.

23 SET UP LIGHTING

I prefer to keep the lighting set-up fairly simple for this character. I first create a V-Ray Dome light to act as my HDRI reflection for the scene. I am using an HDRI that you can download for free at www.hdrilabs.com (I'm using Old Industrial Hall). I now set up a key light using V-Ray Rectangle Light for my shadow caster. I also set up some some back lights and rim lights with a V-Ray Rectangle Light as well.

24 RENDER SETTINGS

This is a setting you can play around with quite a bit. I turn the adaptive Min and Max to 5 to ensure

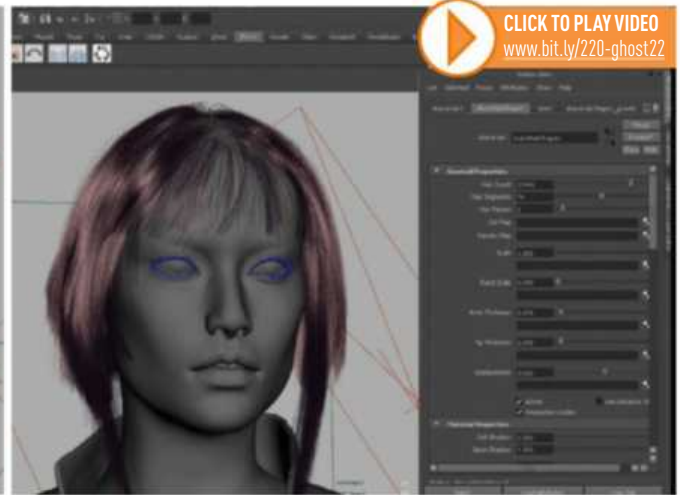


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decent quality for the hair rendering. I am also turning on a bunch of render elements just in case I want to use them in post. With that said, I try to ensure my overall image looks correct and I really don't like to focus too much on any post work.

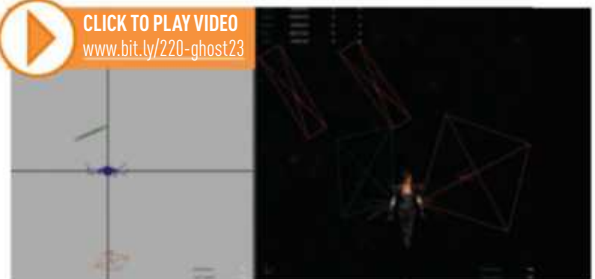
25 RENDER AND POST

Let's render! I recommend rendering a small section first to ensure that that render is what you are expecting. With the render complete, bring the final image into Photoshop and start playing with the render layers. In general, I am happy enough with the overall render. The area that I think I may want to push is some of the reflection on the eyes and maybe the hair. I take the render layers I did as a separate pass and use the Reflection as a screen layer. Next, I create a Color Adjustment layer and make the image a little more blue overall. In general I don't try to do that much post if possible. •

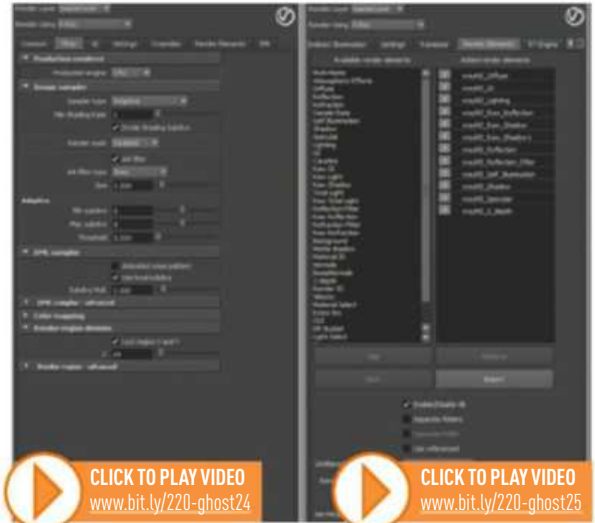


Ask for feedback

When you are working on any piece of art, it's always good to get feedback from others. Use social media and ask friends and family for their opinion on something you are building. Get a thick skin in the process. You will need it!



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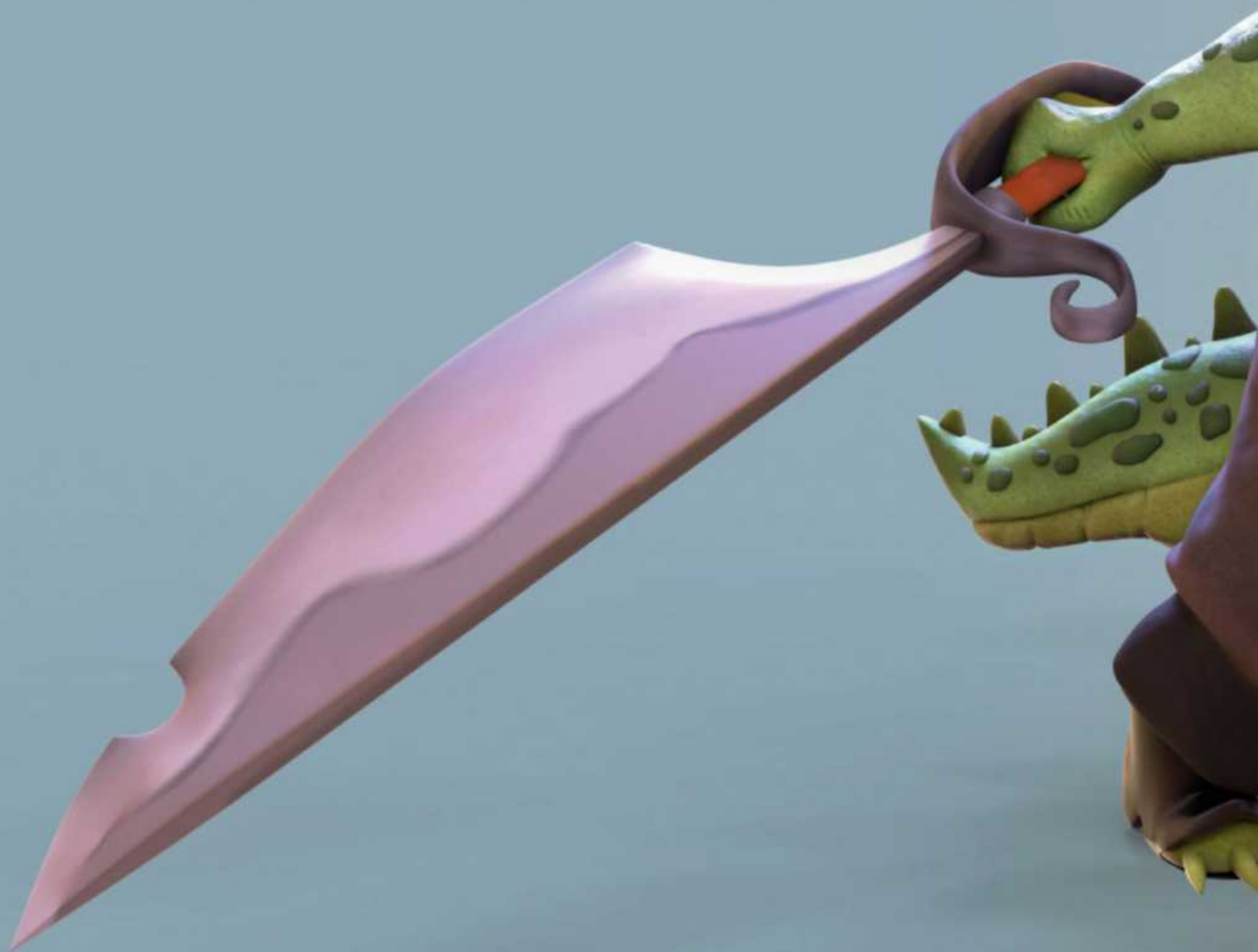


24

ZBRUSH | KEYSHOT | PHOTOSHOP

LEARN HOW TO SCULPT FROM CONCEPT ART

Arik Newman shares his complete process for recreating a complex character in ZBrush





AUTHOR

Arik Newman

Arik is a freelance 3D artist who has worked in the industry for 10 years. His focus is on character and creature design. www.bit.ly/ariknewman

This enjoyable project first came to life when I was searching on the internet for inspiration for my next project. While I was exploring DeviantArt I came across the profile of Justin Rodrigues, who works as a character designer and visual developer. I was instantly blown away by his amazing art and knew I had found my inspiration.

The crocodile pirate certainly looks very cool. It also has a great backstory, as well as a terrific pose, so I decided to take it on as my next personal project. I thought it would provide me

with a great opportunity to sharpen my skills in sculpting from concept art, using just a single image. It would also give me the chance to work on texturing, shading, lighting and compositing. However, above all, it would help me learn how to produce beautiful images to display in galleries.

ZBrush really is the best tool for artists today, while KeyShot is built to work with ZBrush and has an amazing Bridge plug-in that saves time. I like the simplicity of how I can build shaders quickly, add lighting and HDRIs, and update my model as I wish.

The process was difficult to complete; the pose is very dynamic compared to a T pose. The crocodile has a huge torso and I needed to make a lot of adjustments and use references for the areas I couldn't see.

I was really pleased with the end result and I think I will continue to use this process, and software, in future.

**DOWNLOAD YOUR RESOURCES**

For all the tutorial assets head to:
www.bit.ly/vault-220-ghost



The pose of the crocodile pirate was the trickiest part for Arik to master



01 GETTING STARTED

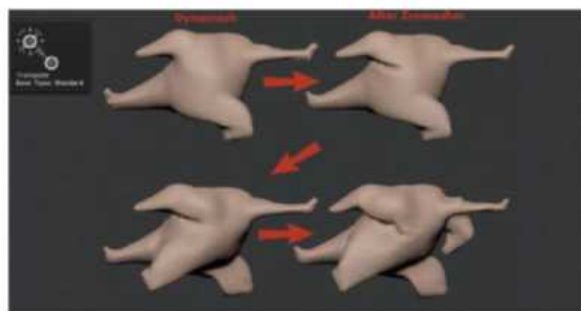
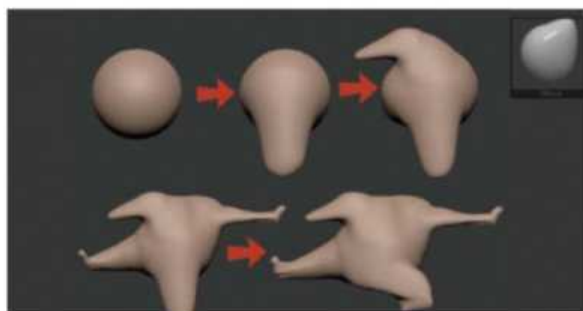
For me, the most important thing when working with concept art is the original concept that I use for inspiration. Sometimes you work on the same concept for days on end, so whatever you choose has to be exciting enough to keep you engaged and motivated to finish your sculpt. I chose some amazing concept art by Justin Rodrigues as I found his work really appealing; the characters he creates have a lot of personality, especially his Croc Pirate.

02 ANALYSE THE CONCEPT

Make sure you understand the concept itself before you begin to sculpt. Ensure you look carefully at the silhouette, main shapes, gestures and physical pose. I try to break the character into individual, smaller pieces so I can understand it better and get a clear idea of the proportions before I start sculpting.

Perfect symmetry

I highly recommend you try to keep your sculpt in symmetry mode and manipulate the big shapes as much as possible before breaking the symmetry. It will save you a lot of time and effort later on.

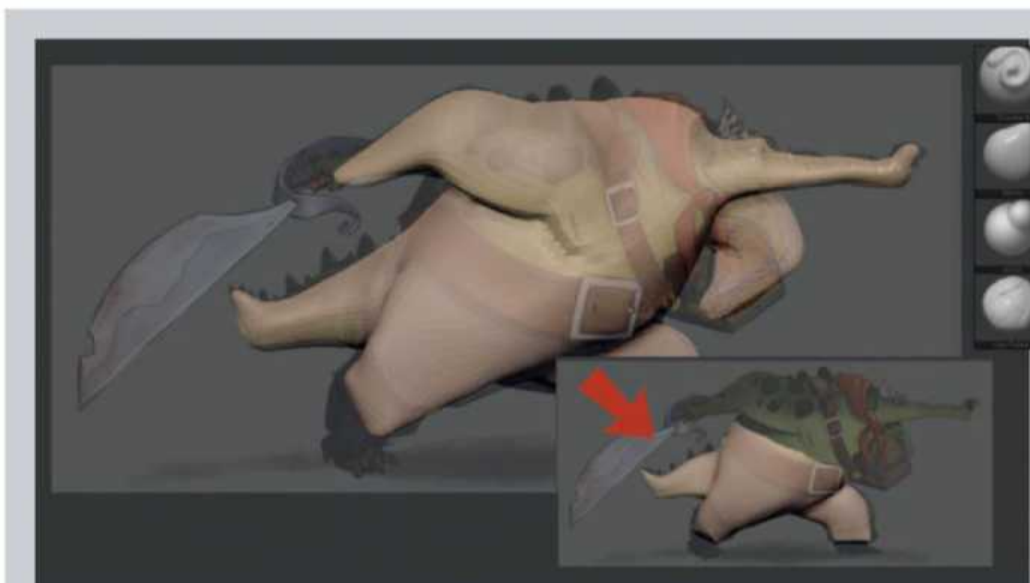


03 CREATE YOUR SHAPE FROM SCRATCH

With this particular project I start my sculpt with a sphere, and just like you would with traditional clay sculpting, manipulated the shape by pushing and pulling, mostly using the Move brush. You should try to challenge yourself as much as possible, so don't begin with a premade model or shapes. Adapting a concept like this Croc Pirate is something I've never attempted before.

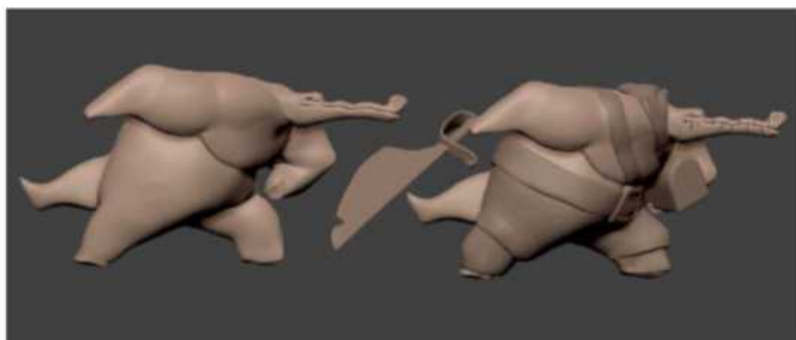
04 EVALUATE AND MANIPULATE YOUR MODEL

In ZBrush, I like to use the SpotLight function in order to add the concept to the canvas. Doing it this way means that I can easily evaluate and manipulate my model on the fly, based on what I can see directly in front of me. For this part of the sculpting process, I mainly use the Move brush and Transpose, masking the area that I want to move and manipulate when I need to.



05 REFINE THE MODEL

After pushing and pulling the main shape based on the original concept, I'm starting to achieve the right balance for the finished model. The torso shape starts to look like the concept silhouette. Now it's time to refine the shapes and get everything in the correct place. You can see that at some point I bring the concept behind my model so I can see the correct placement for the legs, arms and head. This character is pretty complex overall, so I always use the concept as a guide while I sculpt and manipulate.



06 ADD THE CLOTHES

While sculpting, I try to keep in mind my overall shape as I add more parts to the model. I start adding the critical parts like the trousers, belt, knife, chest and cape. Until now I haven't added any detailed parts; I used to start detailing very quickly, but with this model I try to refine the shape first – it's much easier to manipulate large forms without details. Larger forms with the right balance and curvature are better than a detailed model with deformities.

07 MAKE YOUR SCULPTING EFFECTIVE

This project made me realise that some parts of your model can be squashed and stretched when they're manipulated during the exploration of the main shapes. So my advice is to place a cylinder in areas such as the limbs and a sphere in rounded areas like the head, pelvis and chest to ensure you have round shapes. This will give you a more accurate sculpt in a short amount of time.



08 ADD SECONDARY ACCESSORIES

After I've finished refining my main shape and added the main clothes, I start to add the last parts: hands, shoes, buckle, knife, eyes and teeth. For the hands, I use ZSphere and then DynaMesh the body. For the knife, shoes and buckles I use ShadowBox, which gives me the right shape really quickly. I then mask the area where the teeth are located on top of the mouth and use Extract, Refine and ZRemesher.



09 ADD DETAILS

After adding all of the secondary parts, I start to refine them individually, with some parts needing substantially more refinement than others. This mainly depends on their size. After this, I start adding some of the finer details to the character, such as the scales – which were masked off and extracted – and the fins that are on the croc's back. By now you can see the sculpt coming together in a bit more detail.

Create shapes

One of the easiest ways to create a new shape in ZBrush is using the Extract function under the SubTool palette. The extracted mesh can be very blobby, depending on the geometry it's extracted from, so smooth the new mesh using the Polish function in the Deformation palette. ZRemesher will organise your mesh before you do final tweaks and detailing.

10 FINAL TWEAKS

Now most of my accessories are placed, it's time to make final adjustments to each part, especially the intersection between parts such as the hand and knife, hand and treasure chest, main body and belt, and the cape and shoes. I'm adding the final details to his face to make the croc more interesting and to show more of his personality. I also add more detail to the tail, like in the concept, and also work on the skin pores.





11 MASTER TEXTURES

When I'm texturing, I think about my character and what his skin looks like in terms of colours, and how it reflects and absorbs light. I often see amazing texture work with average modelling or sculpting getting lots of exposure in galleries. Therefore the texturing part is very important and can really upgrade your work from relatively average to top notch.



13 ADD COLOUR VARIATION

I add more colour variation to the different parts of the character; big spots to the main body and more colour tones to the belt, cape and pants. Areas such as the armpit, under the neck and the nostrils will be darker than areas that stand out, such as the top of the head and cape. I try to accentuate the shapes with the texture tones; this way the accessories will be more noticeable and interesting.



12 PAINT BASE COLOUR MAPS

As I was working from concept art that featured a colour version of the character, it was understandably very easy for me to pick the right colours for my model – this will often be the case when working from someone else's concept art, although if you're creating your own characters then you'll need to choose the colours carefully. I begin my texture work by sampling my colours from the concept and painting on top of my model. The skin has two main colours: darker green on the top and back, and a lighter green on the front.



14 BLUR COLOUR SPOTS

Here I start to blur the colour I created in the earlier steps. With the Smooth brush in ZBrush I can easily blur my colour so that it will fade and create a nice gradient for the character's body. I keep adding more colour tones and darker colours in the creases and fold areas that are usually covered, such as the armpit, or areas that almost don't see the sun. I add lighter colours to areas that see more sun. This step can take some time so it's nice to experiment with colour variation.



15 DETAIL THE DIFFUSE MAP

Approaching the final render, the next step is to start adding details to the Diffuse map. I use the Inflate or Standard brush in ZBrush with detailed textures and DragRect an alpha with a rounded shape and blur border, such as Alpha 01, 41, 49 and 50. I use the Polypaint Mode to achieve darker or brighter tones, making the most of the different modes like Multiply and Lighten. You can use an RGB intensity of 10 to 20, depending on how strong you want the texture detail to be on your finished model.



16 OPTIMISE THE MODEL

I use a diffuse map and send my decimated model from ZBrush to KeyShot with the large detail forms such as skin folds, wrinkles and skin pores. When I begin texturing I think about my diffuse map, bump/normal map and specular map, and how they interact and affect each other. I decide to make more solid and clean cartoon textures, not realistic ones. My final model (with accessories) is reduced from 53 million to 3.5 million polygons. This way I can work in KeyShot with interactive lighting, HDRI, texture maps and shaders.

17 MOVE TO KEYSHOT

After moving to KeyShot, I usually brighten my texture maps. Most of the time my textures come up very dark, so I go to the Texture tab and increase the value of the Brightness and Contrast. I then start to add lighting; I go to Edit>Add Geometry and then choose Disc or Plane and start moving them in the scene to get nice light from different angles. This can take some time.



18 KEYSHOT BASIC SETUP

Once my model is ready for shading and lights, I like to experiment in KeyShot with camera angles, lighting and composition. I wanted a hard rim light on the croc's back and then a key light from the front to be my main light source. I also use a third light from the top to enhance my rim light and create a nice shadow at the bottom and back of the character.

19 MATERIAL TWEAKS AND LIGHTING

Next I test the textures I created earlier with different materials and settings. Usually for parts such as the skin, scales, teeth and eyes, I use materials with sub-surface scattering options, such as Human Skin 1 and Human Skin 2 in KeyShot. For other parts like the belt and buckles I use a plastic material, and for the shoes I use a black leather material. For the trousers, I use black cloth weave and for the eyes a white glass reflection. Finally, to get nice, soft shadows I use an HDRI map with colour to get warm lighting overall with no black.



20 FINAL RENDER AND COMPOSITION

Usually I aim for the minimum amount of tweaks in Photoshop. I use the software to add effects and to do some colour correction on my render output. I use an Ambient Occlusion pass at 50% and paint on the mask with black and white where I want the AO effect to be darker or brighter. After looking at my final image, I realised I wanted more contrast between the green in the back and more yellow on the front of the croc, so in Photoshop I used Hue/Saturation and painted where I wanted more yellow areas. Finally, I added blue tone on the left to create a nice gradient effect. With that, my croc creature was complete. Why not try it out for yourself? ●



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3DS MAX | QUIXEL | PHOTOSHOP | KEYSHOT

TEXTURING A HIGH-POLY VEHICLE

Follow **Matthias Develtere's** guide to texture an armoured vehicle for your own sci-fi universe



AUTHOR

Matthias Develtere

Matthias is a 3D artist at MachineGames, who specialises in hard-surface design and modelling. He also has a burning passion for combining history with art.
www.bit.ly/mdeveltere

Over the course of this tutorial, I'll demonstrate how to go about texturing a high-poly vehicle for a sci-fi scene. Here, I hope you'll find techniques and ideas that will help you to avoid drowning in the big game asset you may be tasked with creating. In this

industry, you don't always get the time to show off your high-poly because of time constraints, and so it's important to know what steps you can take to improve your creation process. With this workflow, we will come up with a quick pipeline to show off your subdivided model with tileable textures – without any UVing.

We will be using 3ds Max for quick material set up and it'll also be used as the export plug-in.

This tutorial comes with a super easy script and explanation of how to make quick tracks for your tank. I will also go through some quick tips on how to best texture your model using KeyShot.

I'll be covering how to set up the unwrap of your model and how

to make some tileable textures for it. For these steps we will use Quixel combined with Photoshop. Rendering will happen in KeyShot.

I will also be talking you through some best-practice tips and tricks that you should always be applying to your model.

We will finish by carrying out some post-production work to make sure we isolate the high points from the low points on a surface texture, using ambient occlusion and cavity maps. ➤

DOWNLOAD YOUR RESOURCES

For all the assets you need go to
www.bit.ly/vault-220-ghost



SIMPLICITY IS KEY

Keeping shapes
simple and empty
can be a good thing.
It gives the eyes
time to rest

01 RESEARCH MATERIALS

Whenever you're designing anything, it's really important to gather references and do some research on the materials you're going to use. With our tank, for example, it's really important to nail the tank tracks or the sand-casted base layer. After that, you want to know what's underneath those materials, so it's easy to scratch away pieces. The same rule applies for discolouration on the corners; the more little details you can add like this, the better.

02 MAX'S MATERIAL LIBRARY

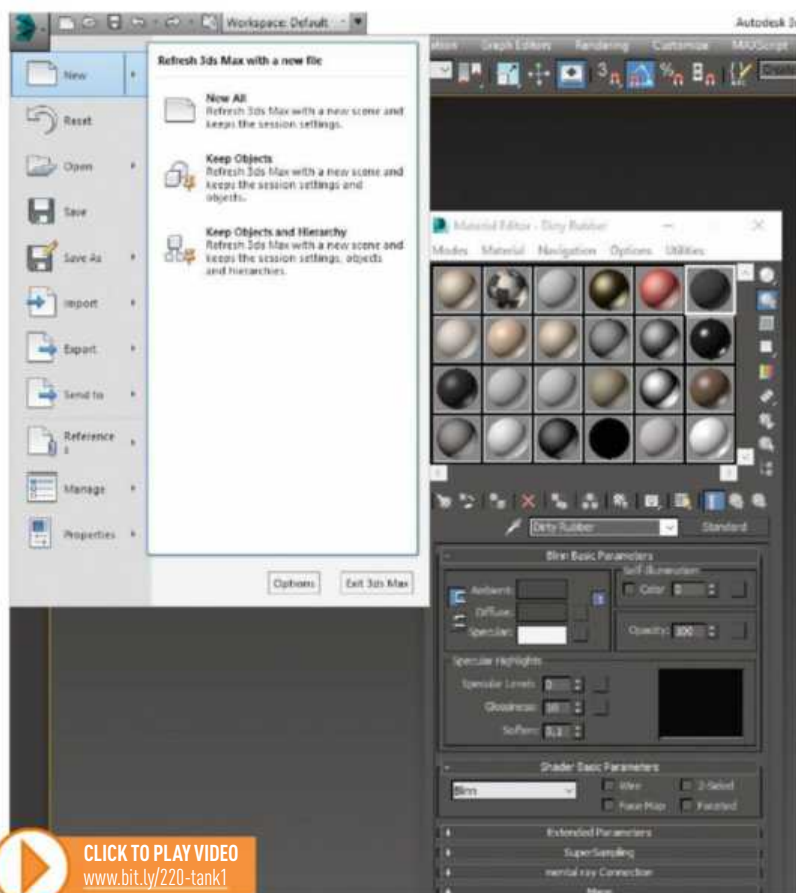
Using materials in 3ds Max can help a lot with readability. I make the same materials for my projects: bare metal, shiny metal, anodized metal, painted metal (base paint), painted metal (accent colour), copper, glass, rubber and plastic. As I already have these materials in an old project, I simply open it and press New Project in 3ds Max. Doing this means everything gets wiped except the materials, and you can start afresh. Export your model with materials as a KeyShot .bip file. This will mean it exports the materials as well, with the correct spec and gloss values.

03 NORMAL MAPS

Sometimes having the correct spec and gloss values is not enough to make something look believable – that's why the bump/height map exists. Let's just think about cloth for a minute: without the stitching/fabric pattern, every piece of cloth would look the same. Remember, you don't want your bump map to be too noisy or repetitive. Bump maps are also great to give some extra

Contrasting colours

The idea is simple: pick one colour and go to the opposite side of the colour wheel to find another colour. These are two extremes of course, but they work well together.



02

CLICK TO PLAY VIDEO
www.bit.ly/220-tank1

lighting information to your models (for example, in cracks). Later on we can convert that lighting information into an ambient occlusion map, and convert that into a colour mask.

04 MAKING A NORMAL MAP

You can make your own bump maps in the same way you make normal maps: bake them from a high-poly model to a low-poly model. However, in our case, you bake them to a plane. You could sculpt something in ZBrush and then bake it down to a flat polygon. This is a really effective method

because you determine how much detail you put into it yourself. You can also use CrazyBump to create normal maps from a texture, and you can preview your model in real time. Alternatively, you can use Knald to generate the textures.

05 CONVERTING IMAGES TO NORMALS

I tend to use Quixel's NDO to create simple but effective normal maps because it's really easy to use. This software converts images to normal/height/bump maps. The nice thing about this software package is that you have a lot of



03



04



sliders to control the intensity of the details. Next to this you can also control how far the conversion goes: do you only want big surfaces or small speckles? NDO also has a conversion template, so it can easily recognise the sort of material the image consists of.

06 APPLY NORMAL MAPS Now that we have our relief information, you can begin to experiment with texture depth. You can adjust the bump height for your textures, but remember that you don't want these adjustments to be sudden or you'll end up overdoing it. Make sure when you combine this with diffuse textures that both values match – the size of the textures and the depth of the normals. If you are using normal maps instead of height/bump maps, make sure that you enable the Normal tab at the bottom of the bump texture options.

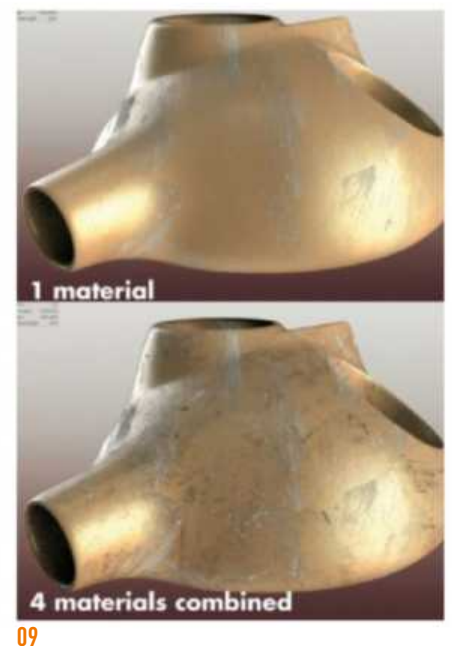
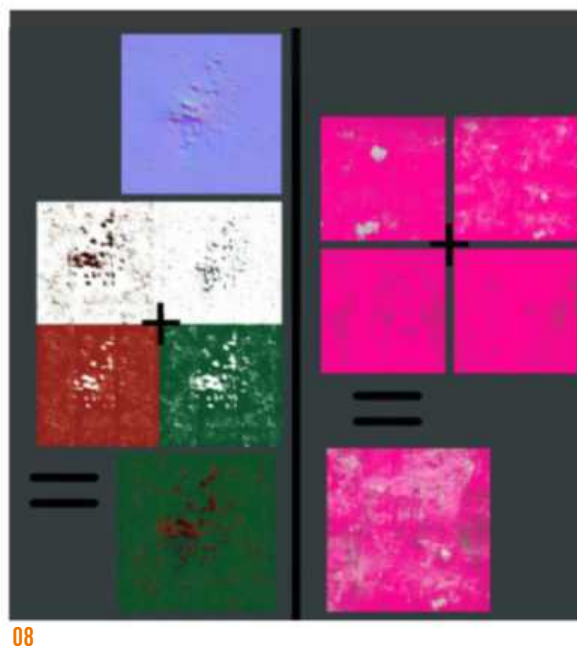
07 BOX MAPPING AND TILING IN KEYSHOT I never unwrap my models manually, instead I like to rely on the Box Map tool in KeyShot. While it's not perfect – it can create some ugly seams – by using tileable layers on top of each other, you can get away with it. To add textures to your model just add them as labels, change the type to Boxmapping and play with the Scale slider until you are happy with the repetitiveness. Another thing you can do is duplicate a label multiple times, rotate your labels

Preventing tunnel vision
It's a good idea to render at the end of your model session and then do some paint overs – just marking what is wrong or things you're not 100% convinced of. This could help a lot with your next model session, as you can start by tackling 'old' problems before adding more stuff.

separately and blend them with the Intensity and Contrast sliders.

08 TILEABLE TEXTURES Let's start creating textures. Quixel has a lot of presets that have separate layers for every material. You just need a normal map and a mask to get started and the mask can just be one flat colour. The information for creating the texture should come from the normal map. Just like all texture programs, Quixel bases its mask information on normal map information – scratches on the edges and dirt in the cavities. So plug your normal map into the correct slot, and maybe a colour ID too. If you don't have this just add a flat, one-colour image.

09 COMBINING TEXTURES Making one tileable texture is nice, but combining them is when the really interesting results happen. Just think about real-life materials; everything is built up out of layers. Take our tank, for example; first there's bare metal, then a basecoat, a paint primer, dried up dirt, and then last but not least a layer of fresh mud. It's a good idea to use the same normal map when you're making these textures, so that all the damage and dirt are located around the same area – you don't want to have them scattered over the whole vehicle. Save all the dirt, scratch, rust and/or paint layers separately so that you can





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blend them into each other later. Ensure that you save them as .png.

10 CREATING A CAVITY MAP

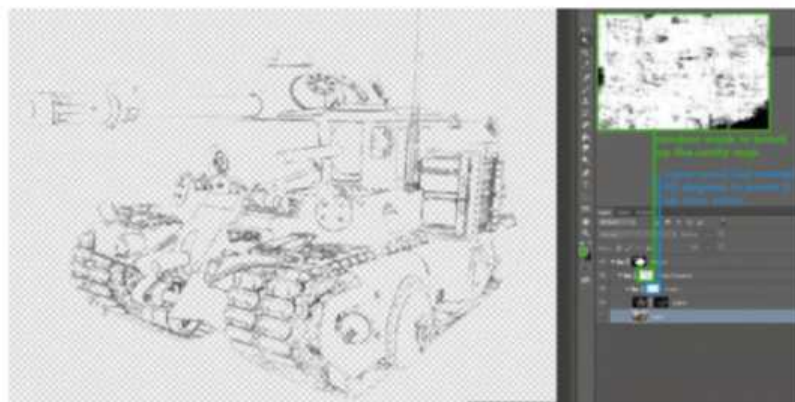
Now that our model is covered in a tileable texture, you want to break up this noisy pattern. This method is used in every texture software package, for example Quixel and Substance, to calculate wear and tear. Of course these packages are not able to handle high-poly models so we have to do it manually in KeyShot. To do this, I use the Toon shader. You can switch the colours to black and white so that when you render it out it looks like a mask. You could also change the contour angle, width and quality to make bigger areas.

11 CAVITY MAP IN PHOTOSHOP

Like you can see above with image 10, there are white lines all over the model. You could break this up with a random cloud mask on top of the cavity map, or you could use a scratch mask to add random flecks to it. This cavity method works great with painted metal. Put the metal on the first layer, followed by the paint that

Background image advice

The main focus should be your model. Don't go too noisy in your background. If your design and render is good, then a flat colour or gradient should be enough.



11

includes the inverted cavity mask. That way you get metal scratches underneath the paint.

12 SETTING UP AO

Ambient occlusion maps are very important for your final image. They can be used as simple multipliers or as a shadow mask for big areas. The problem with KeyShot is that you have to set them up yourself. To do this, open Photoshop and make a new project with a 2:1 pixel ratio, for example 6000x3000 at 300dpi resolution and a 32-bit channel, so it has a white alpha. Save this project as an HDR map in your environment folder in KeyShot.

13 MERGING MATERIALS

Drag your white background and merge all the materials on your model. Change the material to Diffuse and go for white. This way it doesn't catch any spec or gloss, just flat shadows. Then go to the settings and change the Gamma from 2 to 1.3, so that you get more contrast. Also turn on Ground Illumination so you get bouncing shadows from the ground up. If you

have time on your side, turn the Shadow Quality to 2.

14 APPLY AO IN PHOTOSHOP

I now use my AO as a mask for spec and reflection because I don't want to have reflections in shadowy places. We can push this further and use the ambient occlusion mask as a colour variation. If you want to go even further you can use an AO for random colour and an inverted AO for another colour. I add a cold purple to my shadowy area and a warm orange to the white areas. You can play with the AO levels even more to get more contrast in the shadows. There is no golden rule as to how to do this, it's just a case of trial and error.

15 CREATE CONTRAST

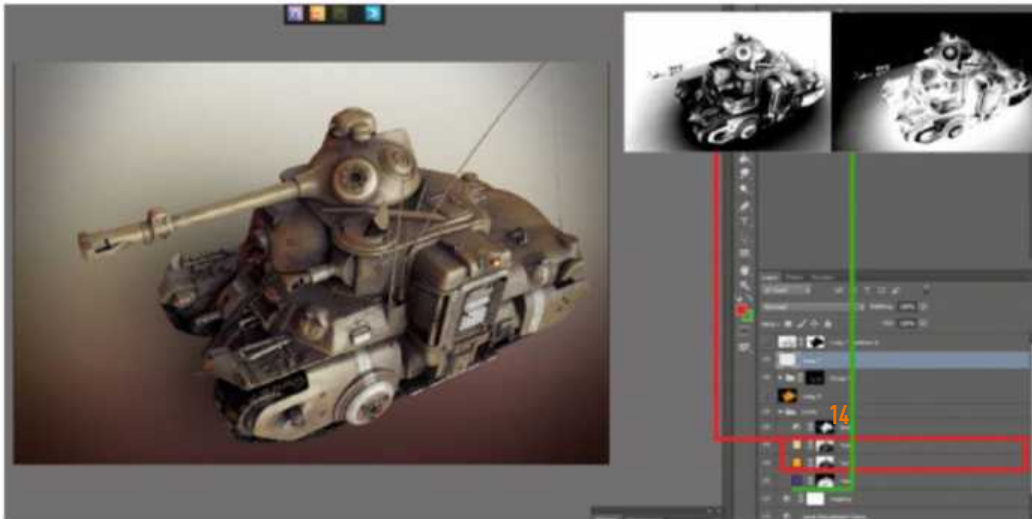
Using a metal pass as an overlay for some pieces can make the materials stand out even more. For example, you can overlay a metal pass on top of chrome but not on bare metal, that way the contrast becomes even bigger. Something that also helps is having an incoming light, for example the light at the bottom, so you get the feeling



12



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that there is something happening around the model. Adding this light to the bottom is a good idea. Once your final image is done you can tweak the RGB levels separately from each other. This way you get more control over the final look.

16 LIMIT YOUR COLOURS

When you texture your vehicle, avoid too many materials or colours. For example, you don't want eight different tinted metals all with different gloss values. You want to give the viewer's eyes a rest; the materials should blend into the

Save some time

If you don't want to waste much time on patterns, you can always rely on Photoshop and ZBrush. Just search for a non-perspective texture, convert it to a bump texture and use it as an alpha mask in ZBrush. Now apply that texture as an alpha with a DragRect brush in ZBrush.

design and nothing should stand out too much, which is why it's a good idea to go for one standard paint colour and one accent colour. This way you can draw the attention to specific areas with a small stripe of colour. A good colour check is to zoom out from the image and check if the model is too noisy, and if there is any colour other than the base paint dominating the image.

17 TANK TRACK SCRIPTS

There's a script unique to 3ds Max that's useful when modelling tanks – TrainMaker. Be sure to make



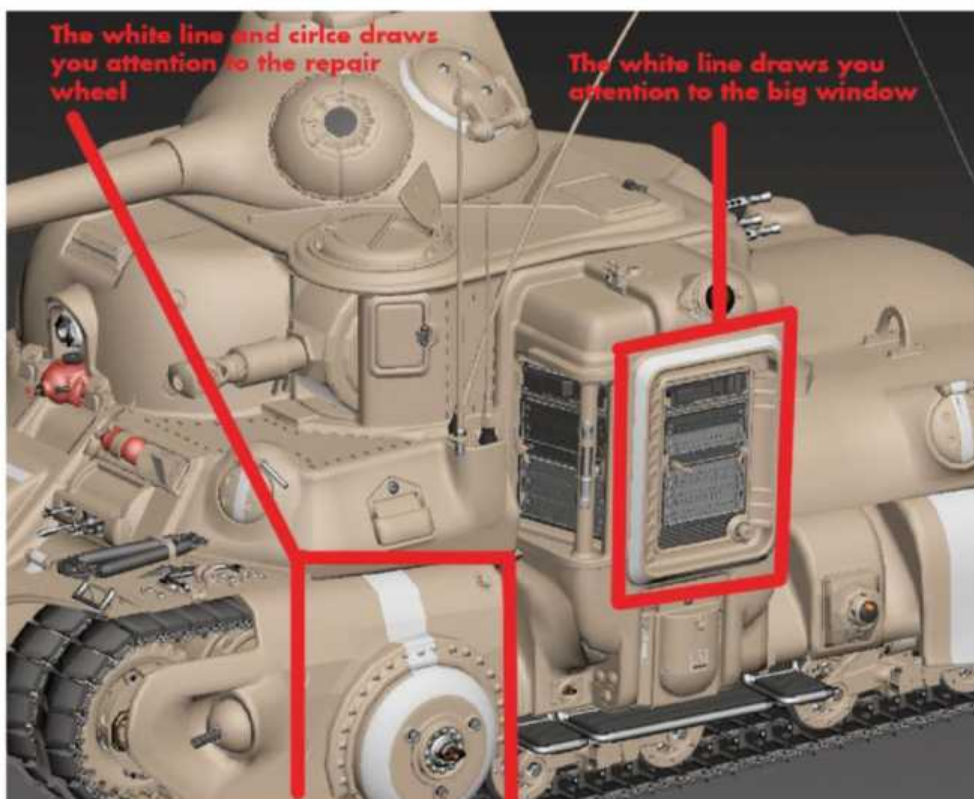
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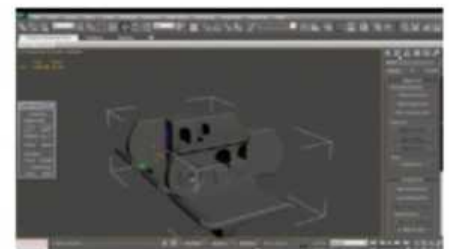
15b

one piece of the complete track set and put the pivot at the back or at the front. Therefore when it rotates, it rotates around the connection point for the next track.

Use the Spline tool to make a closed line. The idea is that the tracks will move on this spline. Make sure you work with Bezier Curves to keep it clean. Plug in the TrainMaker script and select your track by clicking Get Track and using your spline as the path. If they are inverted, change the orientation in the properties. You can also change the amount of tracks. ●



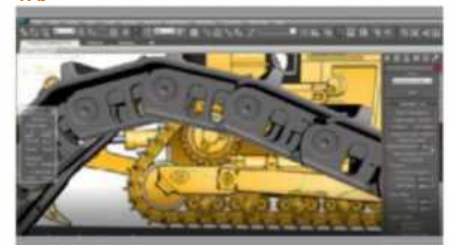
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17a



17b



17c

TUTORIALS

Master creature sculpting

SPEEDY SCULPTING

This stunningly realistic ibex was created in ZBrush in just one hour



About Gnomon

Gnomon School of Visual Effects, Games and Animation, specialises in computer graphics education for careers in the entertainment industry. The school recently launched its first accredited baccalaureate degree, a four-year BFA in Digital Production, designed to produce production-ready artists who are versed in general academic knowledge, foundational arts and production skills.

www.gnomon.edu



ZBRUSH

MASTER CREATURE SCULPTING

Krystal Sae Eua reveals her workflow for speed sculpting animals in ZBrush



AUTHOR

Krystal Sae Eua

Krystal is modelling and texturing lead at The Mill in Los Angeles and the instructor in character modelling and sculpting at Gnomon School of Visual Effects, Games and Animation.

www.artstation.com/artist/iamsadpanda

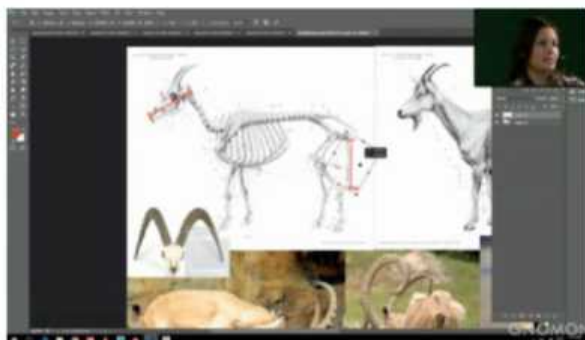
Sculpting a really detailed creature takes days – but it's still amazing how far you can get in an hour. In this tutorial, I'll explain the ZBrush workflow I use in my professional work as I run through the process of sculpting a realistic animal: in this case a Nubian ibex – a desert dwelling, goat-like animal.

We'll begin by creating an underlying skeleton for the model using ZSpheres, matching the proportions of a real ibex's skeleton. Once this is done, we'll use ZBrush's Adaptive Skin system to turn the ZSphere object into a normal mesh, which we can then begin to sculpt using some of the standard brushes.

Along the way, I'll explain some of the techniques I use to mark out the anatomical landmarks of the sculpt, artistic principles such as focusing on the major forms before the fine details, and practical considerations such as when to stop sculpting symmetrically and move the ibex into its final pose.

The sculpt itself was one I created during a one-hour masterclass for Anatomy Lab, a live event held at Gnomon School of Visual Effects, Games and Animation in Los Angeles last year. You can download my actual ZBrush sculpt from the Vault via the link below. In this article, I'm only providing a brief overview of the process, but if you want to see everything I did, you can watch the recording of the event on Gnomon's Livestream channel at www.bit.ly/anatomylab.

Gnomon holds masterclasses and speaker events most weeks, and they're usually free, so if you want more training like this, it's worth keeping an eye on the Events section of the website: www.gnomon.edu.



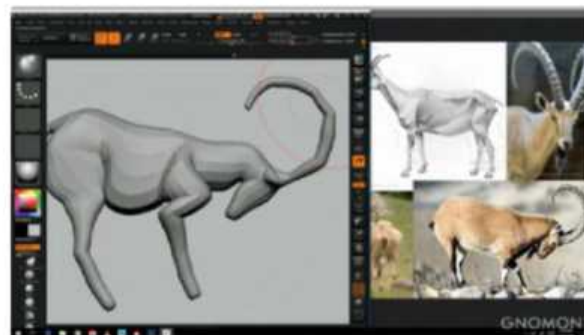
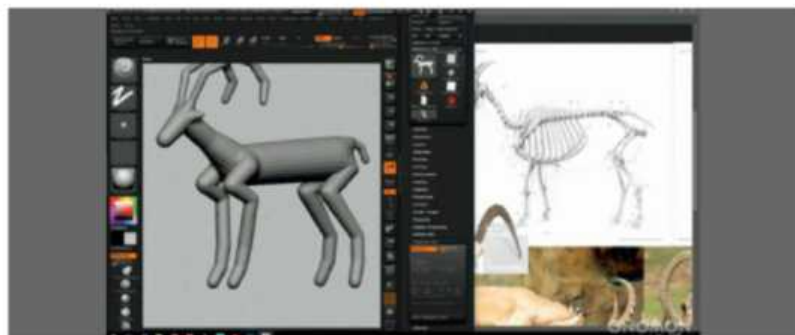
01 COLLECT SKELETAL REFERENCE

Good reference images are vital – I'm addicted to Pinterest for this. Find a range of poses and a skeletal diagram: the skeleton is the most important part. In particular, the skull is a great indicator of how the animal's face is structured. You can also plot out your skeleton in head lengths. The back of the pelvis to the top of the heel is around one head length, for example.



02 MAKE A ZSPHERE SKELETON

Create a ZSphere skeleton following the proportions of the reference image. Turn on Symmetry and use the See-through slider so that you can see the image through the UI. The skeleton doesn't have to be perfect, it's just to give you an idea of where the joints are located. In both humans and quadrupeds, the skull, ribcage, pelvis and scapula are the most important forms. You can also place the horns, ears and tail. Once the proportions are correct, pose the skeleton to match the image you're trying to recreate.



03 USE ADAPTIVE SKIN

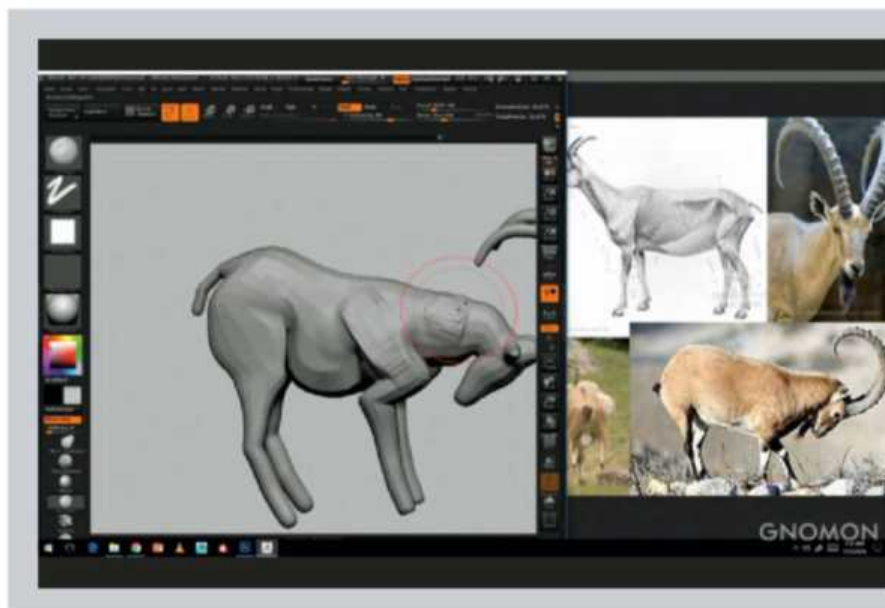
Once you're ready to start sculpting directly on the mesh, go to Adaptive Skin, then select Preview, set Density to 2 and click on Make Adaptive Skin. Personally, I have handy hotkeys set up for the Move Topological, ClayTubes, Displace and Standard brushes to speed up my workflow. For the Displace brush, I always turn on AccuCurve (Brush>Curve>AccuCurve), for the Standard brush, I use Alpha 46 and roll distance (Stroke>Modifiers>Roll Dist) set to 3.

04 CREATE BASIC FORMS

Keeping Symmetry turned on, and using those key brushes that I highlighted before, begin to adjust the model to match the reference image. Match the basic forms first, such as the belly and the neck, using big movements. Use the Inflate brush to thicken the legs and horns. Don't worry at this stage if the mesh looks messy, or if you see stretching.

Check from different views

Keep switching between front and side views of your sculpt to check that the proportions match the reference image. I don't use Perspective camera modes as they can be confusing.



05 USE DYNAMESH

Once the major anatomical forms are in place, increasing the resolution of the mesh makes it easier to add details. Go to Geometry>DynaMesh and turn on DynaMesh in the default settings. Use the Clay and ClayTubes brushes to build up the model. I like using ClayTubes at this point as it creates a lot of nice volume. Use the Smooth brush to smooth the 'clay' once you've added it.



06 PLACE LANDMARKS

Still using the ClayTubes brush to build up forms, mark the position of the pelvis and the spot where the front leg bone connects to the scapula (shoulder blade). You always need to know where these marks are, although the forms can be fairly loose at this stage. I also use Move Topological a lot – it's great for pulling out the mesh to create the creature's hooves.



07 SCRIBE MARKS

With a roll distance of 3, the Standard brush makes really harsh grooves in the sculpt. It's good for plotting in muscle groups, such as the triceps, and for making marks to show which parts of the sculpt you have to come back to later – the ankle, the elbow, the top of the pelvis, and so on. I also scribe a centre line down the back and belly; it helps me plot a lot of other forms. Keep sculpting and plotting away, making sure you're hitting the major anatomical landmarks, refining the sculpt as you go.



08 PLOT THE SKULL

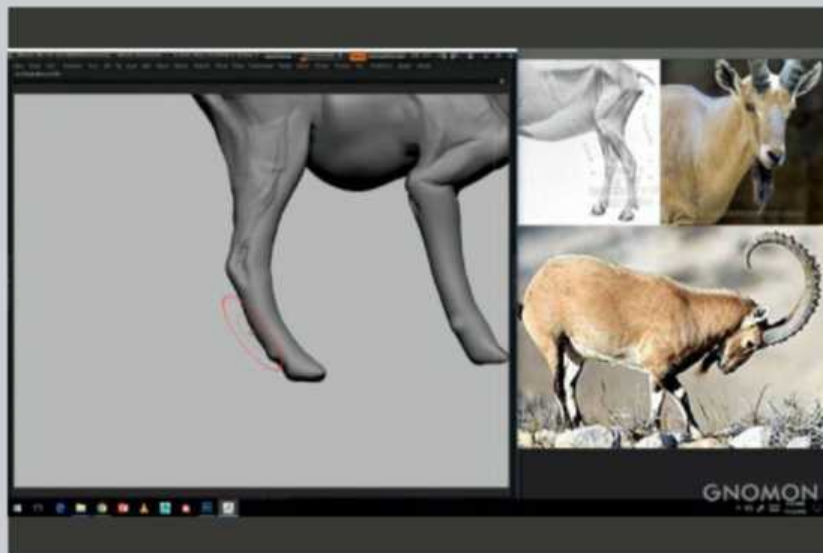
Once you've worked on the body, start plotting out the skull. Hollow out eye sockets, sculpt the brows and shape the ears. Looking at the ibex from the front, make sure the skull is wide enough to match your reference images. At this stage you don't have to be super accurate, you're just trying to nail the biggest shapes. I also scribe in a temporary nose and mouth. I'm not going to keep all of the marks I create at this stage for the final sculpt, I'm just making notes for myself on where these features are supposed to go.

09 CREATE THE EYES

Next, create the eyeballs. Use SubTool>Insert>Sphere3D to create a sphere primitive. Use Scale mode to adjust its size and position it in the socket you created earlier. Go to ZPlugin>SubTool Master>Mirror and accept the default settings (Merge into one SubTool, X Axis). You now have two eyes; use Symmetry to place them. Once they are in place, it's easier to sculpt around the eye.

10 LINES OF ACTION

Continue to refine the head and body. Try to stay loose; you'll end up changing anything you create later once all of the forms are in place. Study your reference images to work out what makes them beautiful, in this case the swooping lines of action and the wavy curves of the legs. It's easy to forget that with ZBrush, just as with drawing, it's the lines that are important. It's not so much about the detail in your sculpture as it is about creating the silhouette.



Shaping the hooves

One nice little trick I like to do is to use Move mode to flatten the underside of the hooves. You can see how to do this at 00:36:40 in the video.

11 BREAKING SYMMETRY

When you're sculpting a new animal, I'd recommend keeping the model symmetrical for a long time. Turning Symmetry off lets you create a more dynamic sculpt, but only do it once you're comfortable with the basic forms. The eyeballs are a separate SubTool, and you don't want to move them separately to the body, so select Zplugin>Transpose Master>TPoseMesh. Now pose the sculpt by masking out parts of the body, softening the edges of the mask and using the Transpose tool. Once you're happy with the pose, go to ZPlugin>Transpose Master>TPose-SubT to realign the eyes and body.



12 USING LIGHT

Start shaping the sculpt with light. In the Light tool, set the light direction to match your reference image. Even if you aren't familiar with animal anatomy, you can get a long way by studying where the shadows fall, and trying to match them. If something feels wrong, check the proportions of the skeleton: that's probably where the problem is. When in doubt, zoom out.

13 DETAIL THE HORNS

Use the Pinch brush to narrow the tips of the horns and the Standard brush to add the concentric ridges. Use the Displace brush for the ridge that runs along the length of the horn. You need a steady hand, so turning on LazyMouse in your Stroke settings helps. There are a lot of nice flat planes in the horns, for which you can use one of the Trim or Polish brushes. It might have been better to do some of this work before turning off Symmetry, but that was just the way things worked out in this demo!

More info

Gnomon has run several other Anatomy Lab events over the years. You can watch them on the school's Livestream channel: www.livestream.com/gnomon.



14 KEEP REFINING

Continue refining the sculpt using the techniques set out earlier. Although this is pretty good for 50 minutes' work, when you come back to a sculpt the next day, you'll always see things you need to fix. Often, I'll think that I'm ready to release a piece, but then I'll work on it for another couple of hours and realise just how off I was. Try to be excited when this happens – when you're aware that your own work needs to be fixed, it means that your eye is developing well. •

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Rafael Duffie

Rafael is a designer, digital sculptor and a CG generalist with over 15 years' experience. He specialises in design and modelling.
www.rafaelduffie.com



Rob Redman

Rob is a 3D artist and creative director working across TV, film and print. He also presents at events such as Siggraph and FMX.
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Syawish A Rehman

A motion graphics and VFX artist from Pakistan with nine years' experience, Syawish loves motion graphics and making video tutorials.
www.facebook.com/theredpineapplearts



Paul Hatton

Paul leads a studio of visualisers based in the UK. He delivers a host of projects, including video and interactive environments.
www.cadesignservices.co.uk

GET IN TOUCH

EMAIL YOUR QUESTIONS TO
emma-lily.pendleton@futurenet.com

EXPERT TIP

SUBTOOL MANAGEMENT

With this workflow you will create a very heavy amount of subtools. An easy way to navigate your subtools in ZBrush is with the keyboard shortcut [N] instead of going to the subtool menu every time, as well as [Ctrl]+[Alt]-clicking on a particular subtool.

SOFTWARE: ZBRUSH | KEYSHOT

HOW CAN I IMPROVE MY HARD SURFACE MODELLING?

Ricky Smolliere, UK

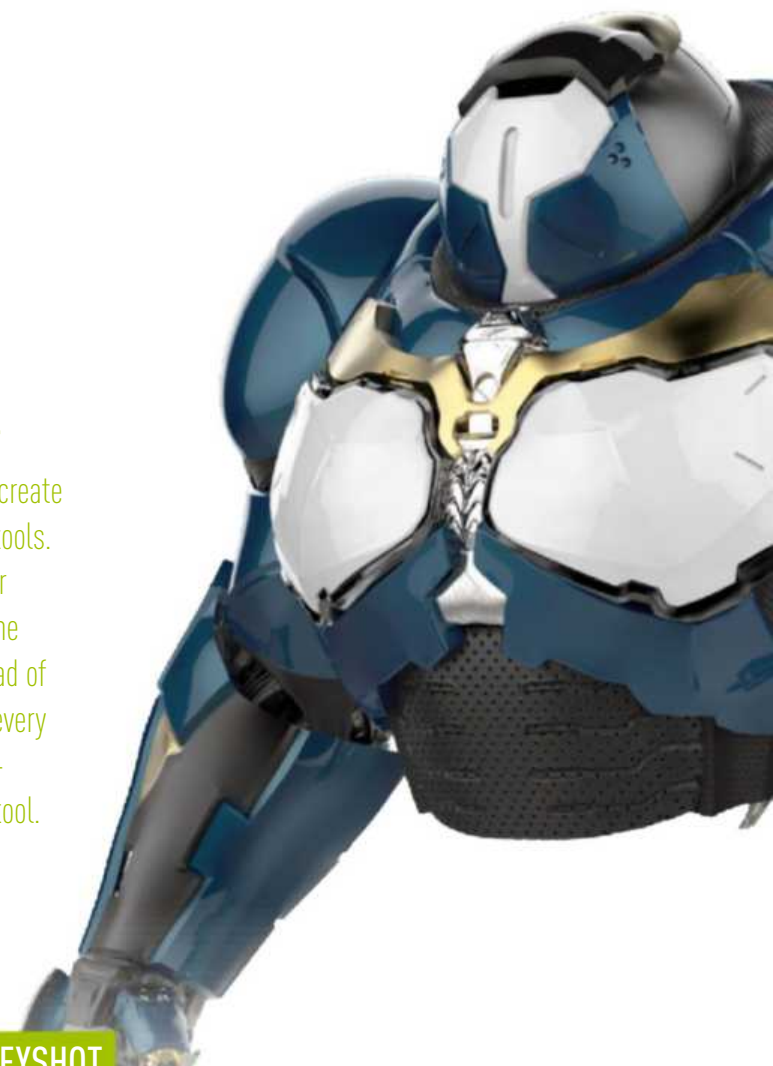


Rafael Duffie replies

Hard surface robots have been a struggle for me over the years. So I spent a fair bit of time gathering my skills and getting better. One of the most basic forms of conceptualising your design is by starting with a drawing or a concept. I start by creating a character concept in Photoshop, which is the first step to really visualising the character and the vibe I want to create for the character. I spend a lot of time working out the detail and the tiny bits of information that I want in the final piece. Doing a 2D concept gives you a good visual representation of where to start, but it is limited in its nature. That is why when you get into 3D there are heaps of other problems that arise and that have to be resolved because of the extra dimension that is added, but in my opinion

it is hands down the best method in getting you where you need to go and establishing a direction for your piece. There are some things that kind of come together at the end, but here is the process.

In regard to the physical mesh that is created, all of the sculpting is done entirely in ZBrush without ever leaving the program to retopologise any of the mesh, as well as two phases or levels of completion – the concept sculpt and the final hard-surface sculpted detail. The latter of the two eluded me for quite some time. ZBrush is well capable of providing a totally clean, animation-friendly mesh right within the software, with the ZRemesher function. It is just in the way that you use the tool that makes all of the difference. It takes a couple of reductions for the ZRemesher function to work properly.





What I tend to do is click on the Adaptive button and also click on Half resolution and ZRemesh it down slowly so the software can carry out a proper level of mesh reduction.

The approach is to start with large parts to block out the initial form of the 2D concept in 3D concept format. I tend to work large to small, cutting pieces as I go, and creating and refining levels of detail as I get deeper into the mesh. I use DynaMesh to quickly build shapes with minimal effort, but having said that, I do spend a fair amount of time refining the shapes later on.

After the initial process is complete, I move on to making selections and digging deeper into the detail. So, let's start with a breakdown of the concept.

STEP-BY-STEP MAKING AN ARMoured MECH



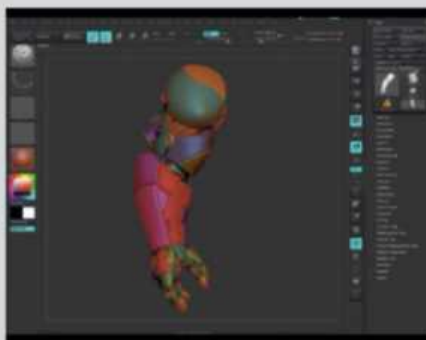
01 CREATE A CONCEPT SCULPT

I usually don't take too long – maybe a few hours – to come up with the 3D translation, especially when working from either my own art or from another artist's initial concept. The main focus here is to create a solid base sculpt to pull data from so that the faces can be reconstructed with Group Loops and Panel Loops. The data created in this process is the most important data, which is precisely why I ensure I spend a fair amount of time sculpting the base of the character.



02 MAKE SELECTIONS

After the base sculpt is completed and an inventory is taken, the next step is to organise the data into selections (or polygroups). For the first part of the hard surface workflow, I have to make it easy for myself to stay organised by grouping out all of the parts that I want to make into separate pieces. The key is to work large and shrink to the details. I do this by copying the mesh, masking out selections, group splitting them into separate subtools and then finally deleting the hidden parts of the mesh.



03 WORK ON THE MESHES

I select polygons and Polygroup them, and then I isolate that selection and delete the hidden polygons. Then I'll group the loop. ZRemesh this selection in steps: try to get the mesh as low as possible while retaining the initial shape; somewhere in the region of 100 to 200 polygons. Be sure to set your panel loops with three levels so that the parts match up, set your maximum angle tolerance to 30 and group by normals to give you separate groups to play with. Subdivide and poly by features.



04 GET KITBASH IMM BRUSH SETS AND ALPHAS

I love using alphas to create detail. There are plenty of alpha references online and in the ZBrush community floating around, but I think the best thing is to create your own alphas that are unique and one of a kind. IMM Kitbash sets are handy tools to have in your arsenal to help create finer detail, and they help take your sculpt to a very high level of detail and refinement. I have my own set that I have made to aid in this process, as well as a ton of purchased sets from other artists.

This isn't a complicated method, but it doesn't need to be – a combination of simple tools and a little art direction can go a long way



SOFTWARE: CINEMA 4D

HOW DO I MAKE STYLISTED PROPS AND SETS IN 3D?

Jennifer Rushoose, US



Rob Redman replies

This question is really more about concept and art direction, as the tools used to create the models, along with associated materials, are just the same as if you are working on a photorealistic project. Remember that no matter what software you are using, or what names that software might give a specific tool, an extrude is still an extrude and bevelling an edge will have the same result pretty much anywhere you choose to bevel it.

Sometimes thinking about the visual language you use is far more important,

so really try to forget about the technical elements and think about developing the style. Immerse yourself in the world you are creating and think about some of those details; that will help your audience lose themselves in your story.

That said, there are some neat tricks you can use to help you achieve the look you want more efficiently and there is no harm in making sure that your skills are there and are complete enough to help support your narrative.

Let's begin by thinking about an example, in this case an exterior set. We

will look at making a tree that might be more suited to a simple, illustrative style. This means using different geometry and therefore modelling or set-up tools than you might otherwise choose.

Rather than modelling a tree based on reference, start by breaking the shapes down into the simplest forms you can. A tree can be seen as a column and a ball. While that is very simplistic and not overly accurate, it works for our needs as a starting point.

Using a simple cylinder for a trunk is one approach, or you could draw a spline

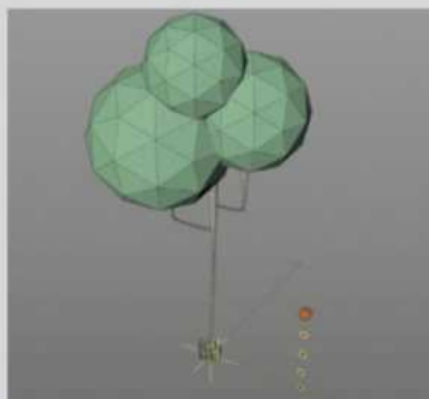


EXPERT TIP

ART DIRECTION

Try to keep your art direction consistent. Using similar forms can help the overall result. The rope on the swing in my image follows a similar spline growth as the tree trunk, helping the whole scene gel together more naturally.

STEP BY STEP CREATE A STYLISED TREE



01 WORK OUT YOUR STYLE

The first thing that you should do is decide on the style that you're trying to achieve and then assemble the parts you need. For this tree, I used three merged splines inside a sweep, using the detail graph to make the sweep large at the top (end growth). Three merged spheres make the canopy and then I added varying materials to four discs and a platonic (to later become the fruit).

02 SELECT THE LEAVES AND FRUIT

Select your leaves and fruit in the object manager, hold [Alt] and add a cloner to the scene (which makes the objects a child of the cloner). Now in the Cloner's attributes, set the type to Object and drag the Canopy into the Object field, as in the image. By default you will have clones attached to the canopy, grown at each vertex of the underlying geometry.



03 ADJUSTING THE COMPOSITION

While I'm happy with the placement, (you could try setting the Distribution to surface for more coverage) I think it would be better to have the fruit hanging nearer the bottom of the canopy, so in the Object tab of the Clone, change the Clones dropdown menu so it says Blend. This works on the hierarchy of your nested clones, so make sure the fruit is at the bottom of the stack.

04 FURTHER TREES

Trees are rarely on their own, so when you build more, follow the same guide, varying the canopy spheres and moving points on the trunk spline. Adding the completed tree to a cloner, with a random effector set to scale and rotation can let you build a wood very quickly. Nested cloners can be very useful. You could also add specific props, like the swing hanging from the branches in my example.



for a little added extra, as I have. For the canopy, a good method is to use simple geometry to define the volume and then use a cloner to add leaves. Using a few discs as clones, with slightly different colours applied, makes for a nice stylised tree, however, you will need to look at how to orient them and maybe add some extra organic chaos with the use of a random effector.

For slightly more realistic but still stylised results, you could use simple leaf shapes instead, painting on veins if you feel they need the boost in texture.

SOFTWARE: CINEMA 4D

HOW DO I MODEL ORGANIC SHAPES SUCH AS FACES?

Sky Dermot, UK



Rob Redman replies

As is the case with many tasks we have to undertake as 3D artists, there are numerous methods to reach a desired result. Organic modelling like this offers a good selection of choices and the decision you make about which method you choose will likely be made based on your personal preferences.

The first option is box modelling: in this situation, you start with a cube, then add cuts, refining the position of the new polygons. You add loops to create new geometry, moving, rotating and scaling as you go. It's a nice method when working on the fly, as it enables you to quickly

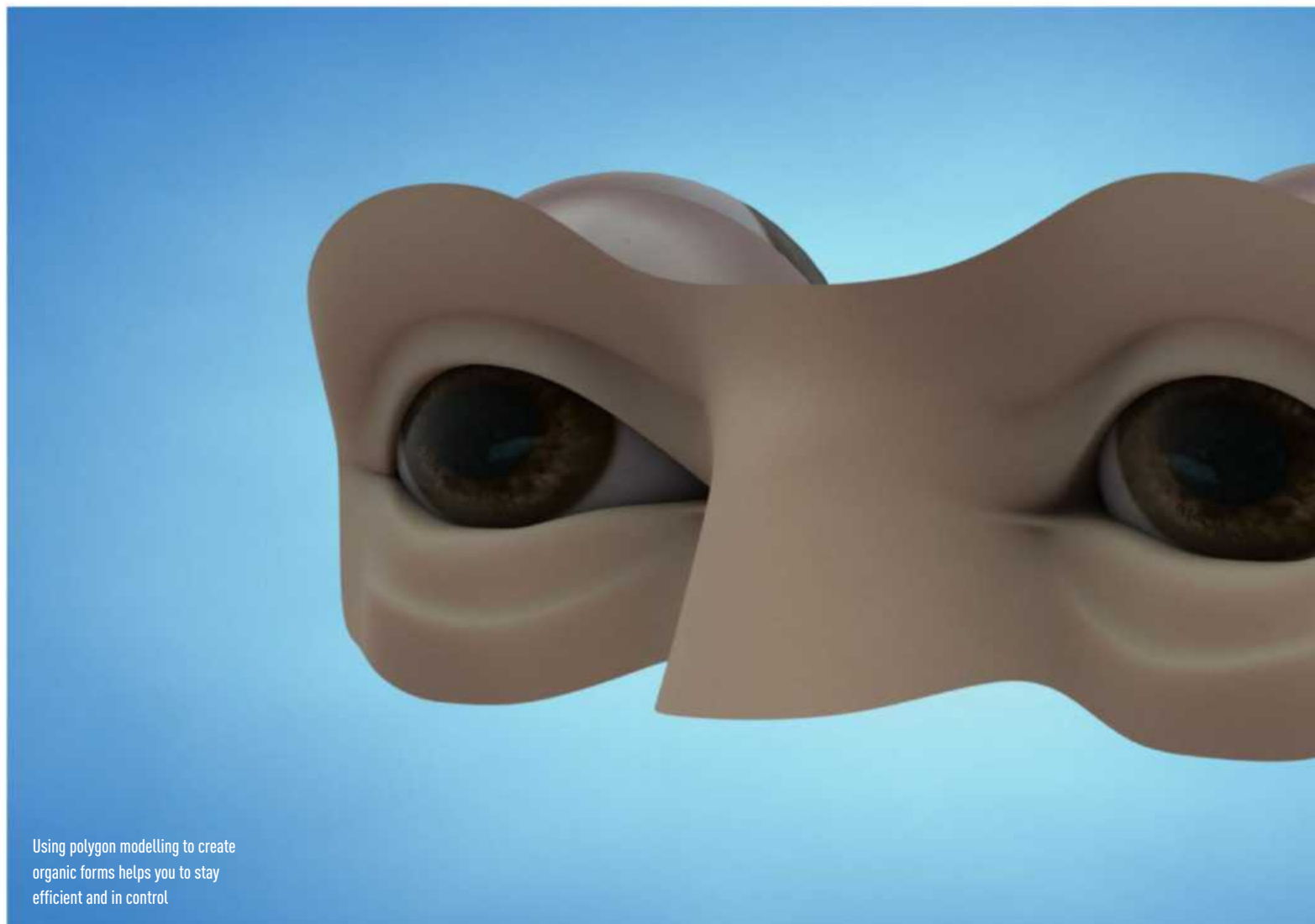
block out overall forms and silhouettes. You can work symmetrically this way too, halving the amount of time you spend modelling, while seeing the full head. The downside of this is that when you start cutting for one area of your mesh, you can end up with extra faces elsewhere, which aren't necessarily needed.

Another method is to plot your forms out with splines and then patch or loft them to create a surface. Some artists prefer this method, but it can be harder to visualise your end result.

The most common method is to use straight polygon modelling. It's handy

for using references in the background, allows for using symmetry and, like many artists, I find that it is a good way to stay efficient, as you only add polygons where you absolutely need to.

The most important factor when doing this kind of work is the end geometry; creating usable edge loops, that will deform properly when animated. Even for stills work, having these loops in place is good, as having points where five edges meet can result in odd artefacts in the final render. These can be unavoidable, but as you're building a mesh polygon by polygon it means you get to dictate



Using polygon modelling to create organic forms helps you to stay efficient and in control

EXPERT TIP

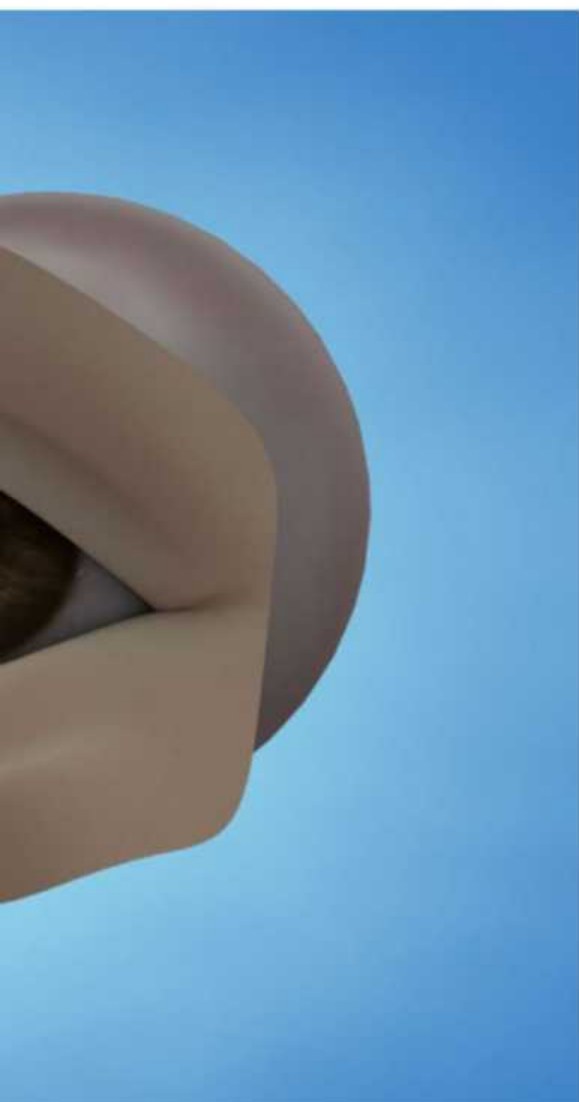
ACCESS ALL AREAS

You can access any tool in Cinema 4D without needing the keyboard shortcut. Simply hit [Shift]+[C] and start typing the command. See it in the list and click it. This works for commands as well as tools, and can save a fair bit of time on a long project.

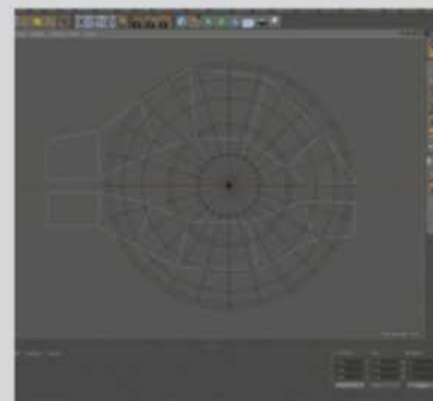
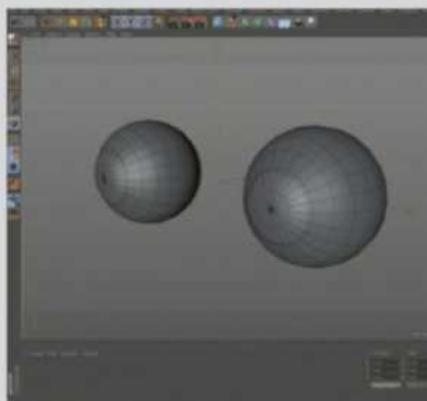
where they are more easily and can hide them under hair or behind an ear.

For the step by step, I'll concentrate on the eye, as it's a complex shape and shows the method well, and as we don't have room to model a whole head. If you follow these steps you'll be able to model nearly any organic shape you can think of.

A final note on smoothing. You can use a subdivision surface object to see the smoothed results of your model, but try to turn it off while you are modelling. You will get better, more usable results if your low-poly mesh looks good and works well, even before you smooth it.



STEP BY STEP MODELLING AN ORGANIC FORM

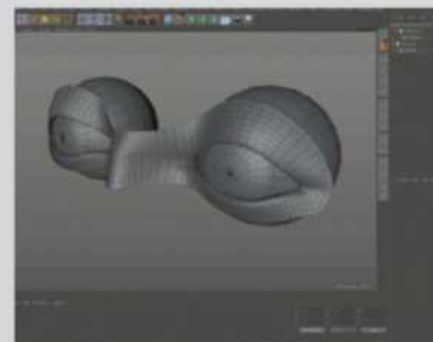
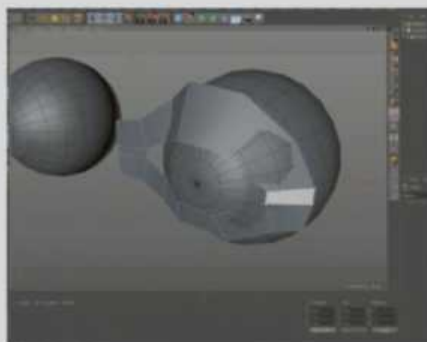


01 ADD A SPHERE

To begin, add a sphere as a child of a symmetry object, so that you have a reference to work around. This is a useful technique to adopt even for non-human creatures, as it helps define the shapes correctly early on in the process. Once you finally have your eyeballs firmly in place, go to a front view and activate the polygon pen.

02 WORK ON THE DETAILS

Using the polygon pen, change its mode to quad strip in the attributes, then plot out the curve of the upper eyelid, click for each point of your four-sided polygons. This is a fast method for laying out quick shapes. Do the same for the bottom eyelid, leaving a gap between the two. Try to make the faces fairly even.



03 BRING POLYGONS FORWARD

The next thing you'll want to do is bring the polygons forward from world center so they are in the right place and then select the centre polygons and move them forward, so that they sit around the shape of the eyeball. You can do them one at a time or alternatively use soft selections to help you achieve a smooth falloff. Once you are happy with what you've created, use the bridge tool to connect the upper and lower eyelids.

04 FINAL TOUCHES

From here on in it's all about refining. Start by adding a loop all round the eye, so you can curve the eyelids over the sphere. Putting the mesh into a subD is good idea, so you can switch the smoothing to check progress. Once you are happy with the lids, you can select the outer edges and extrude new faces to turn into cheeks and forehead, and so on. Don't forget to add it to a symmetry object to refine your proportions.

SOFTWARE: 3DS MAX

HOW CAN I ELIMINATE SEAMS APPEARING IN MY TEXTURES?

Devashish Sarkark, India



Paul Hatton replies

Autodesk has come up with a genius mapping type that is well worth exploring if you are fed up with hard abrupt seams appearing in your textures. We've all been there haven't we? This is a particular problem if your UV mapping skills are not quite up to scratch. Thankfully, Blended Box map is here to help to 'hide' those abrupt seams.

For most simple objects, you'll no doubt make use of the UVW Box map. This is a brilliantly simple and easy-to-implement map. The problem comes when your object is more complex in terms of geometry and you don't have the UV mapping skills to fix it. The Blended Box map works similarly to box mapping apart from the fact that it blends together the textures located at the seams. This creates a smoother falloff rather than hard edges.

Let's delve a bit deeper and see how it works. Start by creating a standard material and plugging the Blended Box map into the diffuse slot. If you open the properties

for the Blended Box map, you'll see some rollouts. You'll probably spend most of your time in the Parameters rollout of which the first setting is the Blend Amount. This controls the distance of blending that occurs between two projections at the seams. The higher this number, the greater the blend. You can also add a Blend map to control how the blend is mapped. For example, you could add a Noise map so that the blending has a random variation applied to it.

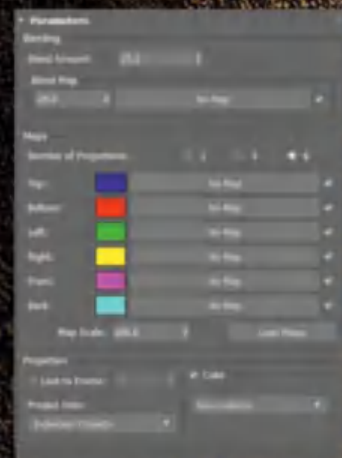
You will then want to set the number of projections: 1 will project the same texture on all six sides; 3 will utilise three textures and 6 will ensure that each projection side has a different texture. You can load either a colour or a map into these projection texture slots. There are also controls for customising the Projection so they are worth experimenting with.

For now, getting your head around the basics of how the map works would definitely be time well spent.

EXPERT TIP

PROJECTION ONTO ANIMATING OBJECTS

Inside the map parameters you can select the Lock to Frame check box to lock the projection onto the object at the frame number you specify. The benefit of doing this is that it prevents the projection from skewing when the object is animated.



It's worthwhile spending some time getting to grips with the controls for customising the Projection

3ds Max's Blended Box map
gives you an easy-to-use
solution to 'hiding'
abrupt seams



The subtle transition from cool to hot metal in this logo has been achieved using V-Ray materials



SOFTWARE: V-RAY

HOW CAN I MAKE A HOT BURNING METAL EFFECT WITH TEXTURES?

Jean-Philippe Ramessian, UK



Syawish A Rehman replies

There are multiple ways to make a burning metal effect, and here I'll be showing you how to create this using V-Ray. As you can see in the image above, I've used my personal logo and made a hot metal effect similar to all the promotional material for Batman: Arkham Knight. When iron is at its hottest, it actually glows bright yellow – so bright it's almost white – and when it gets a bit cooler it goes red, so basically you've got a transition from bright desaturated yellow to a dark red. You can achieve this by using

a ramp texture or something similar to the falloff texture that 3ds Max offers; it gets you from the bright yellow outer part of your model to a dark red bit inside. V-Ray Blend Material is the best material to do this with. Essentially, you make a material that serves as the base metal and then add the scratches, as well as the hot glow. I put scratches on the model's textures to add some realism. Choose whatever approach you like to add some rough details.

After you've made the base metal material, you can make a new V-Ray

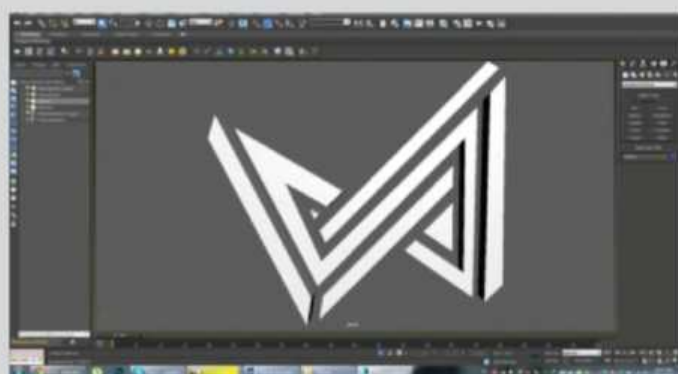
material for the scratches and use the same scratches as an alpha for the second coat, which is a V-Ray light material with a falloff set from yellow to red. This gives beautiful results. I used a texture for the diffuse colour slot, too, as I prefer a more texture-based approach. Don't try to get it perfect because sometimes to get perfection in the glow you'll have to add light intensity to it, which tends to mess with things. Too much light might damage your scene and will change the overall look, so be careful not to overdo it.

EXPERT TIP

BUILD UP ON TOP OF THINGS!

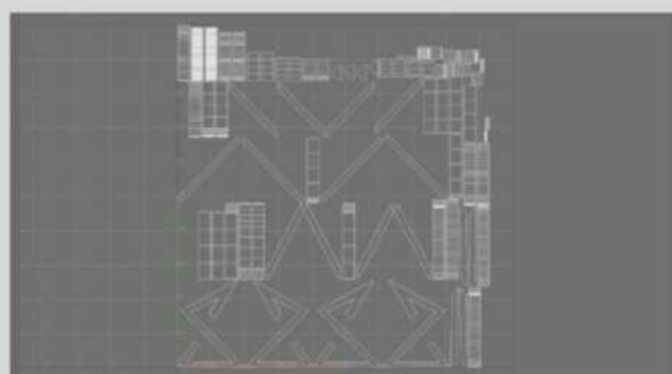
The V-Ray Blend Material is not just for blending two different materials, and it can be used in much more creative ways, so don't be afraid of piling on the layers. Adding layers adds detail to the overall material, which makes it seem more realistic and really enhances the beauty of your final render.

STEP BY STEP MAKING A MOLTEN METAL LOGO



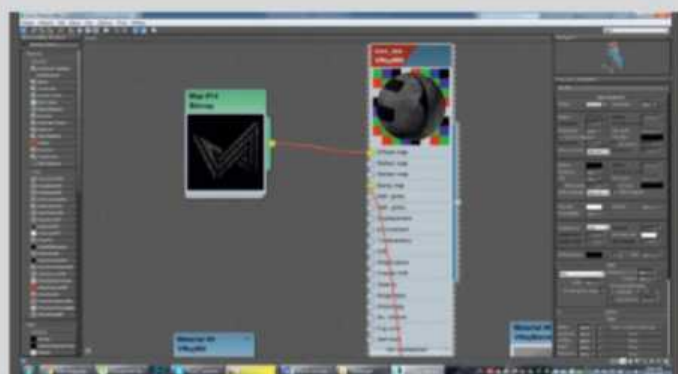
01 PREPARE THE MODEL

I made a path vector in Adobe Illustrator and took it to 3ds Max to extrude it and set the model up. I wasn't very happy working in 3ds Max as the latest versions have some issues with texturing – it uses real-world measurements, which is not what I'm used to. Also, I kept the logo quite thin, because thicker models tend to create some unexplainable artefacts.



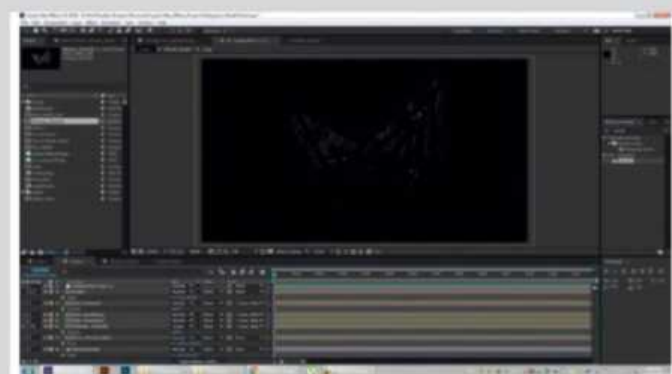
02 UV MAPPING

Once you have a model, you should remap it in a way that the faces parallel to the Z-axis carry the last line of texture, meaning that the yellow part on the outer side of the model is also carried by those faces to get a realistic feel to it. Try not to thin out the model too much – if you do, the light spreads in a weird, undesirable way, which is not at all pretty.



03 MAKE A BASE METAL MATERIAL

Use VRayMtl to make a base metal material, which is what the model will be made of. I used a free texture. You can find free textures on the internet at www.textures.com, for example. You can get a large number of free tutorials about making a metal material as well. I cut the texture, then I turned on Fresnel reflection and added some reflection with 0.7 gloss value, but this will depend on what kind of metal you're after.



04 ADD A SCRATCH COAT

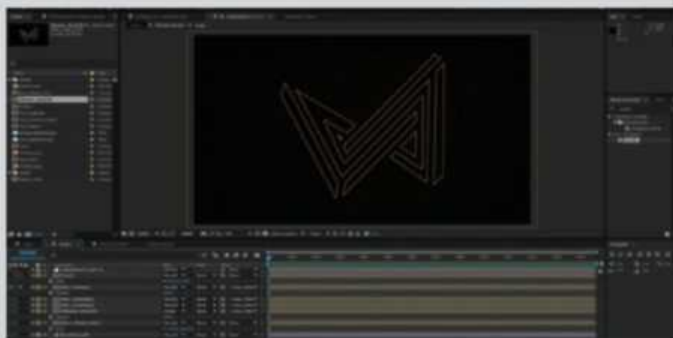
Adding scratches to the texture is important because we're trying to make it look as if it was cut or torn. Use a transparent texture to make the scratches on the metal. Put it into a new VRayMtl. I tend to make a new stainless steel material and use the scratches from that to add to the base metal. This method is effective as it makes it look as if the upper paint was scratched, revealing the stainless steel underneath.

STEP BY STEP MAKING A MOLTEN METAL LOGO



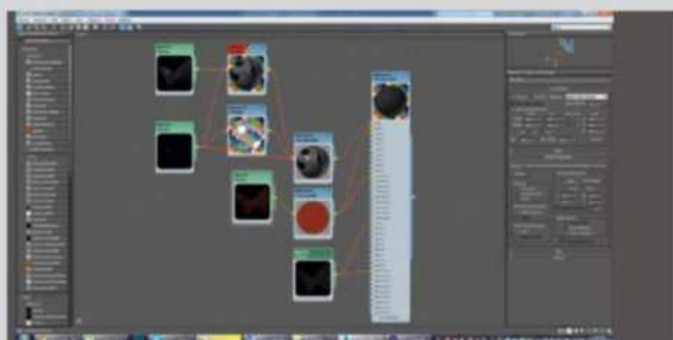
05 MAKE THE STAINLESS STEEL MATERIAL

Take a new V-RayMtl and make it diffuse black. Turn off the Fresnel reflections and bring the reflections value up to max. This will result in a chrome look. All you have to do now is take the glossiness value to about 0.3. Then, you plug this into a blend material with the metal material as the base, stainless steel as the first coat and the scratches as the blend alpha.



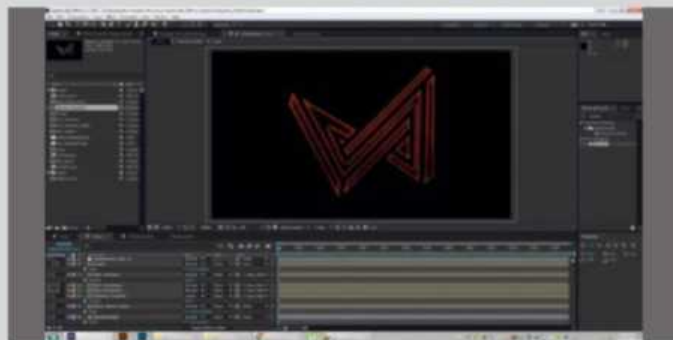
07 CREATE AN OUTER BRIGHT YELLOW GLOW

Take the same scratches and fill with a yellow desaturated bright colour. Select the alpha, feather as before, but this time make a light material with scratches as the alpha and diffuse set to the yellow colour. Take both textures and blend them by putting the yellow one on top of the red one, or if you're using light materials, use a V-Ray blend material with a ramp as your alpha.



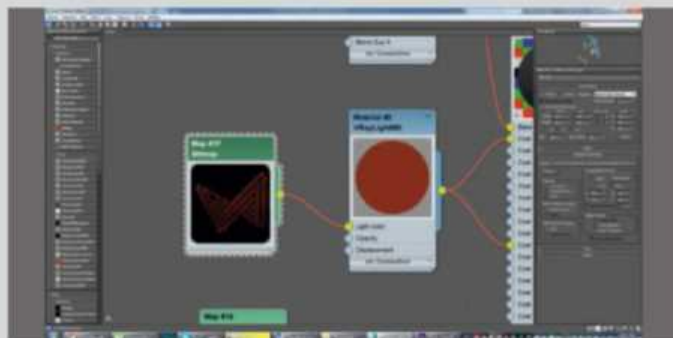
09 BLENDING BASE AND COATS

Take a new V-Ray Blend Material. Put the metal material as the base. Add a coat of stainless steel, use the scratches as your blend alpha. Then add the light material as the second coat and, this time, use a desaturated version of the diffuse map you used for texturing the light to use as a blend alpha, and you've got your materials! Apply it to the model and render.



06 CREATE A HOT RED TEXTURE

Take the scratches texture, select the alpha (which in this case is the logo), feather it and remove the insides as shown in the picture, and fill the rest with a dark red colour. This is your inner red glow texture. There are other ways to do this but I chose this one; you could use the scratches as the alpha and make a red light material in 3ds Max, for example.



08 ADD A LIGHT MATERIAL

The light material does a pretty good job of making the glow effect, but if the glow isn't to your liking you might be tempted to add to the light in your scene. You shouldn't – remember that the light material is actually a light and will act like a light and light up your scene. Instead, you should add more light at the final composition stage.



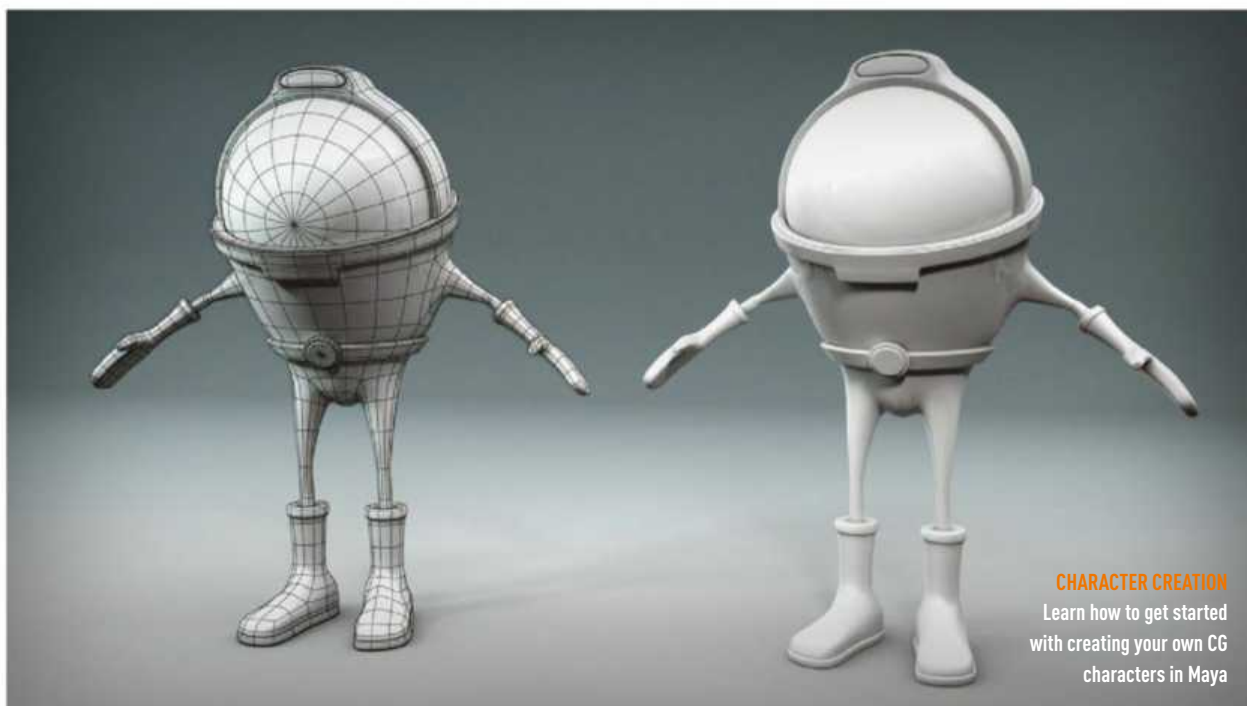
10 COMPOSITION

Finally, use the texture you've just created as the diffuse channel of a light material. Whether you were using a texture or a blend material, you'll still be able to use it as the diffuse source for your Light Material. Another way to do this is to place this texture as the Self Illumination diffuse in the metal iron material; while it won't produce as good a result as this one, it still works.

FREE PLURALSIGHT COURSE!

MAYA CHARACTERS

A free video course to help you create your first character



This issue, we've joined forces with Pluralsight (formerly known as Digital-Tutors) to offer you a comprehensive video training course that you can download from our online Vault – for free! Simply visit our online content downloads page at www.bit.ly/vault-220-ghost for the files.

Characters are a critical part of any movie or games pipeline and are a really popular area of study for artists. Character creation can be a tricky thing to pick up early in your 3D career, and modelling will be your first step on the way to doing so before adding flair with posing and textures later on.

In this easy-to-follow guide from Justin at Pluralsight, you can learn how to create your very first character from scratch in Maya. Head to the Vault now to download the course and get to grips with modelling with deformers; building the head, arms, legs, boots and gloves for your character; and discover how to add detail for smoothing and accessories.

FYI To find more high-quality video training, visit Pluralsight at www.pluralsight.com

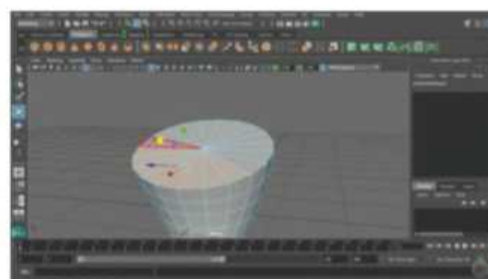
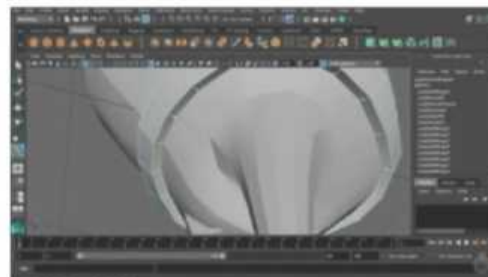


AUTHOR

Justin Marshall

Justin thrives as a lead modelling author at Pluralsight. Growing up, Justin found a deep interest for the computer graphics industry after watching movies like Jurassic Park, Toy Story and The Abyss. His ambition led him to work at Sony Imageworks.

www.bit.ly/220jmarshall



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INSIGHT

News and views from around the international CG community

INDUSTRY INSIGHT

THE FUTURE OF THE CG INDUSTRY

Kerrie Hughes speaks to leading artists about the major challenges facing VFX studios in 2017, from Brexit to beating the competition

Most people would agree that 2016 was a pretty turbulent year; David Bowie, Prince, Alan Rickman and Harper Lee died (among many others), and Brexit and the election of Donald Trump were among the biggest news stories in a year that many have dubbed the worst for quite some time. But how did the events of 2016 affect the VFX industry? And where are we now? We recently attended Escape Studios' annual VFX Festival and spoke to a number of leading designers about the major challenges they face in 2017.

Hidden talents

One of the biggest and most recurring subjects that came up was recruitment. Simply finding work-ready talent is an issue

Blue Zoo co-founder and director Tom Box readily admits he's all too familiar with.

"We're very fortunate that the UK VFX scene is a booming industry at the moment, a lot of which is down to tax incentives that bring the work to this country," says Tom. "This means that we're now a hub that talent comes to. However, we've noticed that there is a talent shortage in the respect that when we recruit, it's hard to find people who have skills of the right level. We get lots of people applying to the studio, but only a small percentage have the talent that we need for them to work straight away. So that's one of the biggest challenges we face."

And adding to this issue is Brexit. With the future still very much uncertain when it comes to Brexit and how it may affect visas and working restrictions for people

Escape Studios' 2017
VFX Festival was held at
Rich Mix, East London's
independent arts venue



INDUSTRY

Industry interview

Short film *No More Stuff* is one of many in-house projects created by London-based animation studio, Blue Zoo



Below: Blue Zoo is focusing on owning IP across the industry, which includes its show *Digby Dragon*

Right: The Blue Zoo team says Brexit will undoubtedly place limitations on who will be able to work at the studio



outside of the UK, many studios are wary that this will only make recruitment harder. As Blue Zoo is based in London, Tom is sure this will have an impact.

“About 30 to 40 per cent of our studio is from outside of the UK and it is very likely with Brexit that there will be limitations on who we can ask to come to work here,” he adds. “Our preference is always to recruit people without having to ask them to relocate but at the end of the day, it’s all about getting the talent – our company is made of our artists. Without them, it’s nothing, so we’ve also got to try and work around that.”

Joint head of 3D at London-based VFX studio MPC, Carsten Keller, agrees. “A lot of talent comes from mainland Europe and keeping that talent and continuing to bring it in is going to be a major challenge.” When asked if the UK has the talent pool to fill the gap, the answer was clear. “Not at the

moment,” says Carsten. “There’s no doubt about the UK getting there, but not at the moment. So we have to continue to bring the talent in, and we will continue to bring it in because we are dependent on it.”



THE VFX INDUSTRY HAS ALWAYS BEEN COMPETITIVE WHEN IT COMES TO WORK, AND THERE ARE A LOT OF CHALLENGES, WHAT WITH SOFTWARE GETTING CHEAPER AND MANY ARTISTS GOING SOLO

Carsten Keller, joint head of 3D, MPC London

The competition

But while UK studios are struggling to recruit talent, there’s no certainly no shortage of it around the globe, which in turn is presenting its own challenges.

“The VFX industry has always been extremely competitive when it comes to

work, and there are a lot of challenges, what with software getting cheaper and so many talented artists out there who are technically able to set up their own studios,” says Carsten. “We often find ourselves up

against smaller boutique-type studios for smaller commercials. However, if it’s a really big project, we’re pretty confident because if you are an agency or production company, you want to make sure the company you are using has the infrastructure to handle it when things go south.”

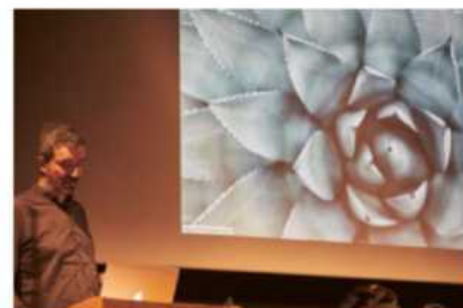


Left: Festival attendees delight in trying out the latest and greatest hardware

Below: The VFX Festival saw leading experts speak out on the major challenges facing the VFX industry this year



Despite the many challenges it faces, the VFX industry is currently booming



While competition within the VFX industry has been, and will probably always be, a challenge, the Blue Zoo studio team also finds that location can make a huge difference when it comes to securing work. "What always makes it very hard for us is that we compete internationally with animation studios in places like Canada and Ireland, for example, where the living costs are much cheaper than in London. We have to compete with the same budgets in a location where the living costs are extremely high, which makes it really hard for us to try and find work within those restrictions. So we have to find ways to be efficient – working faster but without any reduction in quality."

So is playing the numbers game the answer? Tom doesn't think so. "We've got a very strong feeling that we want to make work that we're proud of, we're not going to just take on projects to churn them out for a

quick buck," he says. "Our ethos, for all our productions, is to have them made in our studio, with everyone in the same room. This makes for a great atmosphere and brings teams together, which, I think when you have that environment, makes better work. If people are enjoying the work they're doing, they're going to make a better product, which will therefore attract more work."

What's next?

So with all this uncertainty and competition, what's the future for the VFX industry? Is it about being bigger and better, changing recruitment practice or focusing on new emerging technology to lure in new clients?

"VR has to prove that it makes money," says Carsten. "Everyone loves it and it is exciting, but at the moment it's more like a PC from the '80s, not like an iPhone for 90 per cent of the population. We have people

working with that technology at MPC, of course, but we're not putting all our eggs into that basket," he explains.

For Blue Zoo, owning IP across the industry is a focus to help drive the business. "A lot of the animation studios that were traditionally doing commercials are now making their own TV shows, just because it's getting harder and harder to stay afloat when you're just working on a project month by month and there's no long-term contracts coming in," Tom comments. "There definitely seems to be a general trend of people making their own shows now and we're transitioning into making features as well. For years, there were no animated features being made in the UK and now there's a few happening. It's fantastic seeing the industry coming back to London."

FYI Read Kerrie's round up of advice from the Festival at www.bit.ly/220vfx



INDUSTRY INSIGHT

CROWNING GLORY

Kulsoom Middleton discovers the invisible VFX provided by One of Us that made Netflix series *The Crown* all the more authentic

One of Us, a boutique film production company based in Soho, was responsible for the visual effects work on Netflix's historical ten-part series about Queen Elizabeth II's reign, *The Crown*. The show tells the inside story of two of the most famous addresses in the world – Buckingham Palace and 10 Downing Street – and the intrigues, love lives and machinations behind the great events that shaped the second half of the 20th century. Given the nature of the show, the challenge for One of Us was to create invisible yet effective VFX.

Using life-size replicas of Buckingham Palace and Downing Street, *The Crown* is one of the most lavish TV dramas ever made. One of Us worked in 4K on all 428 visual effects shots for this project, with an experienced team including Ben Turner as VFX supervisor and VFX producers Standish Millennas and Kim Phelan.

The events in *The Crown* may have taken place 60 years ago, but because of the iconic locations and imagery involved, they still feel current, meaning that attention to detail was vital for the VFX team. "For me there wasn't one big stand out challenge on *The Crown*, it was more about nailing the believability across the show as a whole," says Ben. "We were dealing with subjects, locations and images that millions of people are already very familiar with. So making sure they didn't question them was something that we really worked very hard at."

One of Us enhanced the locations and sets on *The Crown* with scale and authenticity, ensuring the VFX sat comfortably on

screen. The team produced a variety of work for a number of different scenes, but key sequences such as the Royal Wedding, the funeral of King George VI and the coronation of Queen Elizabeth II, all demanded a new way of working.

Nuke pipeline

One of Us developed a tool within Nuke to populate large areas with specifically-shot crowd elements, helping to fill out big expansive shots with people. The scale and grandeur of the subject was something the team was striving to achieve, and the crowd tool really helped to achieve this. "This involved shooting specific crowd elements



THERE WASN'T ONE BIG STAND OUT CHALLENGE ON THE CROWN, IT WAS MORE ABOUT NAILING THE BELIEVABILITY ACROSS THE SHOW

Ben Turner, VFX supervisor, *The Crown*



"The work included photoreal digital set extensions, environments and crowd replication across many scenes, including numerous political and royal comings and goings from Buckingham Palace and Downing Street," says VFX supervisor, Ben Turner



on set against green screen and then feeding them into the Nuke tool," explains Ben. "It gave artists the ability to create huge numbers of crowd for their shots just in comp, they could dial in the percentage of people who were cheering or clapping or waving and mix them all up. This meant we could work quite efficiently and create the scale each scene required without the need for big CG crowd renders. It also really helps to have real people in real costumes to help sell the period," he continues.

The fact that many viewers wondered how One of Us got permission to film at Buckingham Palace is testament to the wonderful job the VFX company did. "When we were working up the first shots of cars arriving at Buckingham Palace, I did breathe a sigh of relief. You could tell that our approach was going to work and that the set and the extension fit together perfectly. I think the biggest compliments I've received have been people asking what we did on the show. Since the launch, the production company Leftbank have been getting calls demanding to know how they got permission to film at Buckingham Palace, I'll take that!"

FYI Find out more about One of Us's work:
www.bit.ly/220-the-crown

One of Us used Envii photogrammetry software and Maya to create Buckingham Palace and a CG replica of the Douglas DC-4 aeroplane used on location in South Africa



A film of epic proportions,
The Great Wall combines Chinese
and Western ideas and aesthetics
with incredible results



VFX INSIGHT

CONSTRUCTING THE GREAT WALL

Trevor Hogg speaks to The Great Wall's VFX supervisor, **Phil Brennan**, on the creation of epic battle scenes, a fearsome monster and an ancient army

Hollywood heads to the Middle Kingdom to produce a blockbuster helmed by internationally acclaimed Chinese filmmaker Zhang Yimou, who has previously dazzled audience members with colourful action sequences in *Hero* and *House of Flying Daggers*.

With the assistance of Western cinematic talent such as visual effects supervisor Phil Brennan (*Snow White and the Huntsman*), *The Great Wall* brings to life a vicious and ravenous Chinese monster that is fended off by the iconic ancient structure and a 12th-century army standing guard to protect humanity. "In the mythology, the Tao Tei has eyes in its armpits," explains Phil, when discussing the antagonist that represents greed and gluttony. "We have them in the shoulders, which is still weird but worked better for the story," he continues.

Motion cues were taken from cheetahs and gorillas while the hard skin was inspired by elephants, rhinos and reptiles. "The Tao Tei are a little bigger than a grizzly bear and have a hive mentality. They are controlled by a Queen that is 25- to 30-feet-long. There are also the Paladins, which are about the same size as an elephant. They have these big fan-like shields that are extended and form a circle around the Queen to cover her if there is any danger. There's a particular pattern that for the Chinese people represents the Tao Tei, which is embedded into the foreheads that links them all together."

Stunt work

Hundreds, not thousands of extras were present during the principal photography. "We had to do a ton of motion capture for the armies," states Phil. "There are five

different colours of soldiers and they all do different jobs. The red guys are the archers. The blue ones leap off and do their Cirque du Soleil-style aerial ballet as they stab the creatures [with spears]." There was extensive wirework. "Stunts had some complicated rigs to work out. We were able to use large parts of it as practical elements. Then on the bigger shots we would have to take over the practical and turn to CG." The primary colour palette is a trademark for Zhang Yimou. "He likes the colours to be vibrant and beautiful, but when it comes to something like creatures and green screen, you have to be careful to make things believable," says Phil. The set for the Great Wall of China covered an area of a couple of football fields and was surrounded by a 40-foot tall container wall covered in green screen. "The only thing that we were able to



BATTLE READY

Extensive previz, postviz and techviz was done by previz supervisor Patrick Smith and postviz supervisor Heather Flynn from The Third Floor

The central task for The Third Floor was envisioning the three epic battle sequences featuring the Tao Tei. Patrick Smith, the previz supervisor on location in Beijing, explains why it was so important to be there: "It allowed us to benefit from a level of inflection and raw passion that would have been lost through telecommuting into Beijing. We had entire heads of department meetings in our offices, working out responsibilities in a very fluid manner. Previz became a non-stop request line for different departments, where we would drop in and help mock up staging set-ups and lighting passes, define green screen locations and execute quick techviz requests, as well as our regular tasks in representing the action sequences."

Each battle incorporated several long 'oners' that needed to be worked out to the finest detail. "Whenever you approach a long single take in previz, you know it's going to go through many different iterations and ideas," says Patrick. "Being technically fluid enough to switch gears while retaining some aspects of a previous idea is no easy task. You have to approach your scene files in a way that allows you flexibility... You have to be skilled creatively to be able to sell the visual aesthetic of new and fluid ideas through proper lighting, animation and FX so the visualised shot works not only technically, but also looks great and executes the vision."

The way the crowds of Tao Tei needed to move in patterns was another challenge. "To achieve the look, we took cached animation cycles and instanced them to crawl on top of geometry and curves," says Heather Flynn. "The creatures' eyes are on their shoulders so we needed other ways to show expressions. We produced more emotion in their bodies and got creative with the composition to highlight the eye more than the face."

use the real one for was texture reference," remarks Phil. "We had two wall sets. One which was taller that was used for stunt work and one which was low to the ground but had all sorts of equipment and could be populated with extras. It was definitely extended in different directions."

Preparing for battle

A vast assortment of atmospherics needed to be produced to integrate the practical and CG elements. "The director was adamant that the movie would be full of black thick oily smoke, which is toxic so you can't use it around people. It meant that a lot of those battle scenes were shot relatively clean."

third battle takes place in a city. There's the jeopardy of the civilians getting eaten. Those were the ways that we used to make each of the main battle sequences feel unique." ILM was the primary vendor, with most of work being based out of Singapore. The visual effects company in turn subcontracted Base FX, Animal Logic, Ghost VFX and Hybride. "There are around about 1,200 visual effects shots, which is over two thirds of the film," says Phil, who had 14 weeks of pre-production time, but still had to adapt to the needs of Zhang Yimou. "We learned quickly that he wasn't going to shoot the previz, so we had to design shots and techniques to give him as much flexibility as possible on



WHENEVER YOU APPROACH A LONG SINGLE TAKE IN PREVIZ, YOU KNOW IT'S GOING TO GO THROUGH MANY ITERATIONS AND IDEAS

Patrick Smith, previz supervisor, The Great Wall

Three battles take place against the Tao Tei, who invade from a fully digital volcanic landscape gouged out by a meteor thousands of years ago. "The first time you see hundreds of thousands of them out in the open at daytime," states Phil. "The second time it's much more creepy and intimate... it's much more a one-on-one kind of fight. Everything moves in and out of the fog. The

the day." The \$150-million project, produced by Legendary Entertainment and distributed by Universal Pictures, crosses a cultural divide: "The biggest challenge was trying to combine Western and Chinese ideas and aesthetics to make something that satisfied audiences in China and the rest of the world."

FYI To find out more about The Great Wall, see www.thegreatwallmovie.com



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CONTENTS

REVIEWS

We test the latest new software
and hardware for CG artists

OUR AWARDS



BEST IN CLASS

Awarded to products
that excel in their class.



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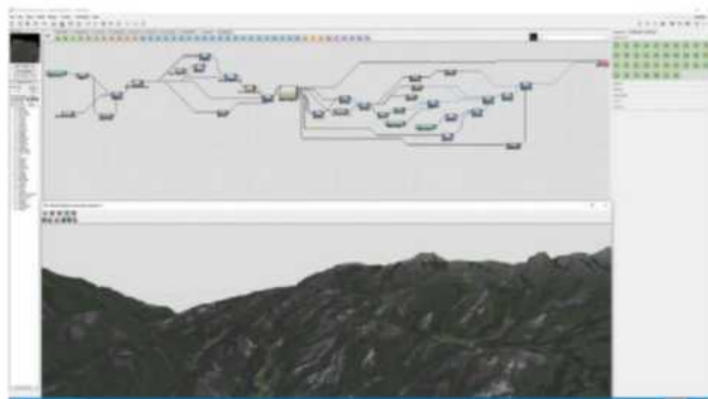
94 HP ZBOOK 15U G4

The new, super-slim mobile workstation offers excellent performance at an affordable price. We give a rundown of the most useful features for 3D artists



96 LENOVO THINKSTATION P410

This single-socket workstation is oriented towards modelling. James Morris decides if its up to scratch



95 GEOGLYPH 2.0

Cirstyn Bech-Yagher shares her favourite new features of GeoGlyph 2.0, including a handy tool to retrieve past settings



97 SINI FORENSIC

This free plug-in for 3ds Max is a scene checker and repair tool that could save you loads of time, especially when working with AutoCAD files



AUTHOR PROFILE

Joseph Herman

Joseph Herman is an animator, filmmaker and visual effects artist from New York City and operates his own studio, Legend Animation. www.legendanimation.com

FEATURES

65 Watt AC Adapter

Windows 10 PRO 64-bit

Core i7-7600U
(Kaby Lake)

Camera

LCD 15.6 LED FHD
touchscreen

16GB (32 GB Maximum)
of memory

512GB PCIe (NVMe) MLC
of internal M.2 Storage

HARDWARE REVIEW

HP ZBook 15u G4 Mobile Workstation



PRICE From \$1,029 | COMPANY HP | WEBSITE www8.hp.com

For 3D production and post, not many machines compare to HP's powerful Z series of workstations. This includes HP's line of ZBook mobile workstations that offer walloping power on the go.

While the ZBook 17 and 15 are the most expandable in the ZBook family, there are thinner and lighter options, namely the premium ZBook Studio and HP's super slim entry-level workstation ultrabook, the HP ZBook 15u G4 (Generation 4), which has just been released.

As soon as I pulled the ZBook 15u G4 out of the box, I was impressed by how slim it was: it's just 4.18 lbs and 19.9mm wide. The machine handled 3D modelling, painting and video editing challenges nicely, thanks to the new state-of-the-art 7th generation (Kaby Lake)

Core i7-7600U CPU at its heart. The ZBook 15u supports up to an impressive amount of 32GB of DDR4 memory.

GRAPHIC GOODNESS

For discrete graphics, the 15u has an ISV-certified AMD FirePro W4190M, a professional graphics card with 2GB of memory, which scored a very respectable 49.16 fps on Cinebench for the GPU test. The CPU test was also impressive at 369, and Cinema 4D users will appreciate the use of AMD FirePro now that Maxon is incorporating AMD's Radeon ProRender rendering engine natively into C4D R19.

For storage, the 15u came with a 512GB Z Turbo Drive G2, a super fast NVMe SSD that connects directly to the PCIe bus via an M.2 port. It scored

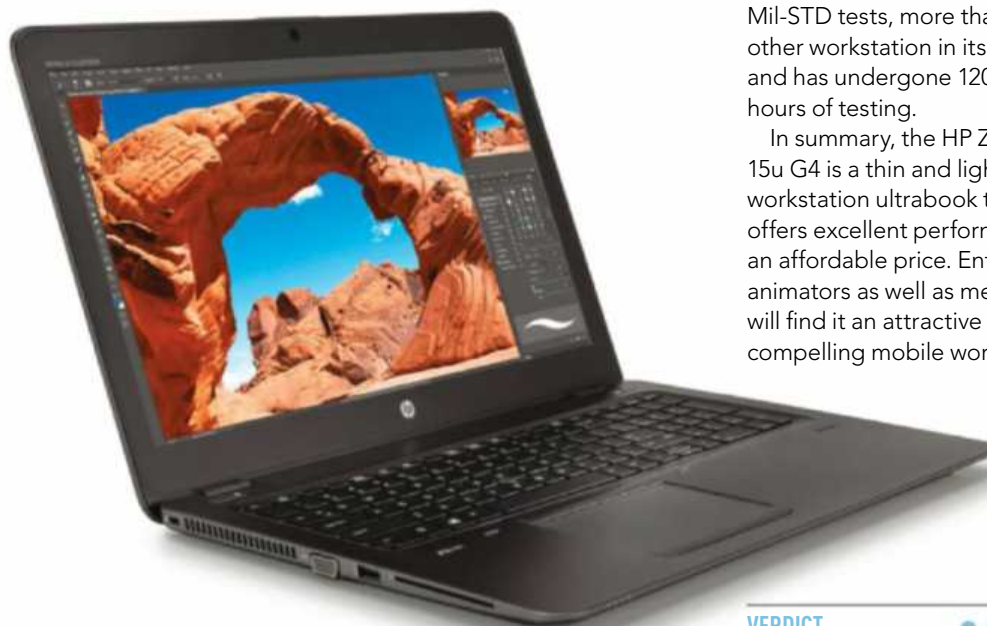
incredibly fast transfer speeds of 2,590 MB/s Read and 1,410 MB/s Write, multiple times faster than SATA SSDs. This ZBook comes with an internal 2.5 inch bay for a SATA HDD. Total storage capacity is 2TB.

I/O ports include USB 3.1 Gen 1, USB 3.0 and DisplayPort 1.2 for connection to high-resolution external displays. There's also an SD slot and a VGA port. Audio sounds great thanks to the built-in Bang & Olufsen speakers.

LIGHT WORK

For the display, you have the option of FHD (available with touchscreen) or UHD. Battery life is long thanks to the 51 Whr battery with HP Fast Charge, which provides up to 50 per cent battery life after just 30 minutes. Being a professional workstation, the 15u passes 14 Mil-STD tests, more than any other workstation in its class, and has undergone 120,000 hours of testing.

In summary, the HP ZBook 15u G4 is a thin and light workstation ultrabook that offers excellent performance at an affordable price. Entry-level animators as well as media pros will find it an attractive and compelling mobile workstation.



VERDICT



SOFTWARE REVIEW

GeoGlyph 2.0



AUTHOR PROFILE

Cirstyn Bech-Yagher

Cirstyn is a freelance CG artist and educator, with over 15 years' experience in 3D. Her clients have ranged from AMD to Daz 3D and Future. She is currently collaborating with AMD as technical artist for Radeon ProRender for 3ds Max. www.twitter.com/cirstyn

PRICE Free to \$180 | **COMPANY** QuadSpinner | **WEBSITE** www.quadspinner.com

Users familiar with terrain creation software World Machine (WM) know that there's no World Machine without GeoGlyph, the plug-in that extends WM's functionality, and then some. This hasn't changed in GeoGlyph 2.0, making it the only thing in the new version that hasn't had a revamp.

IMPROVED WORKFLOW

Supporting WM2 and the fledgling 3, GeoGlyph 2 sports a sleek, new UI to boost your creative speed whether you work solo or in a pipeline. And its new functionality is massive. As well as the new UI, new features include new Erosion devices, Geological Effects and GeoColor, as well as the custom-developed, external engine facilitating all this, called Terrenderer. Together they kick the entire WM/GeoGlyph workflow up a notch. While the seven new

Erosion devices and the huge device library provide users fast and good-looking starts and tweaks to their projects, the new Geological Effects functionality is one of the major standouts. A cross between a Filter and an Erosion device, a Geological Effect added to your graph allows you to change or fine-tune your output with a simple UI, rather than extra node upon node to gain the same result. Another innovative feature is GeoColor – plugging this into your graph makes the generation of colour and detail maps for your terrain a lot easier, as it enables users to pick and use colours and patterns from a photo, and provides a better gradient editor to work with them.

GOING BACK IN TIME

A humbler feature worth mentioning is the Build Stack. Enabled by Terrenderer, it provides you with a history

of terrain builds, with build statistics and a post-build analysis, with a 3D view for each of them. This is handy when you're working on a project and want to go back, or want to roll back to earlier settings.

All in all, GeoGlyph 2 puts a lot of fun and ease back into working with WM, especially compared to World Creator, which is still heavily in beta. There are some niggles, such as the Build Stack sometimes generating over 60 message pop-ups when running, or the occasional WM crash or hang when moving around in the UI, or the example terrains from the GeoGlyph main screen not loading. However, compared to the other, flawlessly working functionality, these really are small fry. If you're going to invest in terrain generation software, it's hard to go wrong by picking this combo.

VERDICT



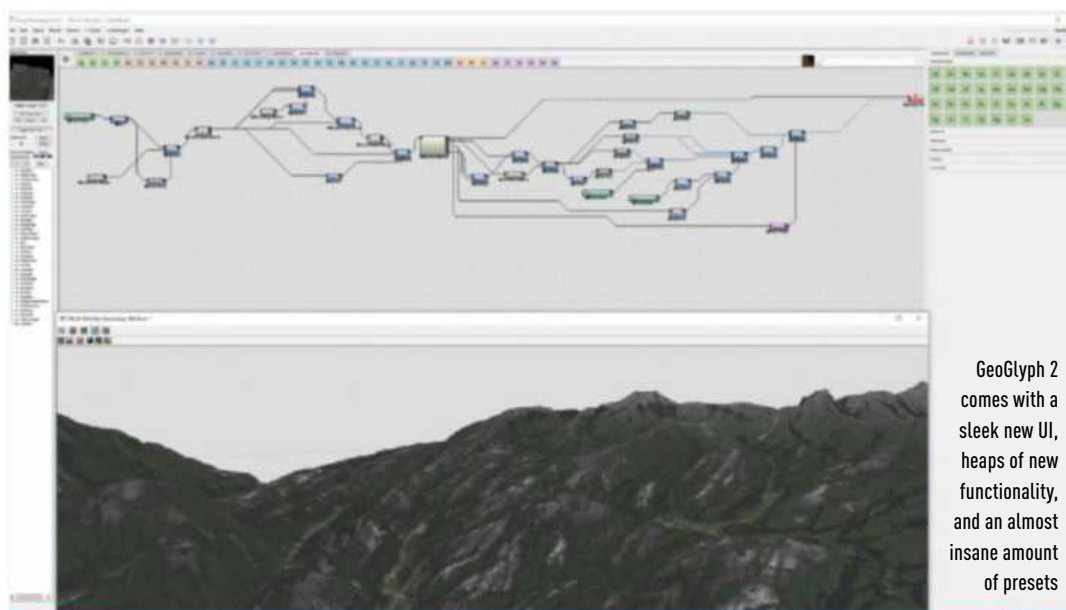
FEATURES

New IDE wrapper gives massive functionality boost

Geological Effects

Seven new Erosion devices

Over 40 new preset devices



GeoGlyph 2 comes with a sleek new UI, heaps of new functionality, and an almost insane amount of presets



AUTHOR PROFILE

James Morris

James has been writing about technology for two decades, focusing on content creation hardware and software. He was editor of PC Pro magazine for five years. www.tzero.co.uk

FEATURES

3.6GHz Intel Xeon E5
1650 v4

32GB 2,400MHz DDR4
SDRAM

NVIDIA Quadro M4000
with 8GB GDDR5 memory

512GB Samsung SM951
NVMe M.2 solid state disk
2TB HGST Ultrastar
7K4000 SATA 7,200rpm
hard disk
DVD rewriter

Warranty: 3 years on-site

HARDWARE REVIEW

Lenovo ThinkStation P410



PRICE £3,329 Inc VAT | COMPANY Lenovo | WEBSITE www.lenovo.com

Lenovo acquired IBM's personal computer business in 2005, and the company's ThinkStation workstations still show the design heritage. The P410 is a single socket workstation. It may not have quite the custom design of Lenovo's higher-end models, but components in the expansion slots and drive bays can readily be replaced by pressing a few plastic buttons. Our P410 sample came with an Intel Xeon E5 from the middle of the 1600 Series range. The E5-1650 v4 is a six core processor with a base 3.6GHz clock speed and a 4GHz Turbo

mode. Hyper-threading is available, so the six real cores are shown as 12 virtual ones.

PROCESSING POWER

The processor is backed by a healthy 32GB of 2,400MHz DDR4 SDRAM. This comes as four modules, which take up all four DIMM slots, so upgrades will necessitate replacement, but also take advantage of the processor's quad-channel memory controller for maximum bandwidth.

This ThinkStation model supports up to NVIDIA Quadro M5000 graphics, but our sample came with the M4000,

which boasts 1,664 CUDA cores and 8GB of GDDR5 memory on a 256-bit bus, offering 192GB/sec bandwidth. It can drive a 4K screen at 60Hz and incorporates four DisplayPort 1.2 connections.

PLENTY OF ROOM

Storage is the familiar combination of solid state and conventional hard disks. The SSD supplied is the fastest NVMe M.2 variety, in the shape of a 512GB Samsung SM951 installed in a PCI Express slot. The hard disk is a 7,200rpm 4TB HGST Ultrastar 7K4000. A DVD rewriter and memory card reader are also installed, and there's room for another 3.5 inch drive if you like.

The P410 is a decent all round workstation in terms of performance, but more oriented towards modelling. The rendering score in Maxon Cinebench R15 is 1,143, which is reasonable for a single socket system, but 10-core and multi-socket alternatives go beyond this. The Cinebench R15 OpenGL result of 143.13 is again decent, but not outstanding. Turning to SPECviewperf 12.1, results are as expected.

Overall, the balance of components suits this application well, although the six core processor makes a decent stab at rendering, too. There's generous storage and a standard three year warranty. All this means the P410 is a solid professional 3D workhorse.



VERDICT



SOFTWARE REVIEW

SiNi Forensic



AUTHOR PROFILE

Paul Hatton

Paul leads a UK-based studio of visualisers. He delivers a whole host of projects including video and interactive environments.
www.cadesignservices.co.uk/services/3d-studio

FEATURES

Constant updates

Easily checks scene files

Performs quick repairs to scene problems

TIMESAVER

THIRD-PARTY MODELS

This plug-in will be particularly useful for artists who are working from other people's base data. Cleaning these files up can be time-consuming and laborious, which is where Forensic comes in.

PRICE Free | **COMPANY** SiNi Software | **WEBSITE** www.sinisoftware.com

Working with other people's files, especially if they're from a third party and made with a different piece of software to 3ds Max, can be a real pain. Crashes and slowdowns are common when working in this sort of multi-disciplinary environment. That's where Forensic comes in.

SiNi Forensic is a scene-checker and repair tool. It basically runs a scan on the scene and reports back a load of information. This information can then be selected, repaired or fixed. The plug-in is a utility plug-in, so it's easily accessible from the Utilities panel of the Max interface. The actual Forensic interface is tidy and informative. There are no unnecessary rollouts and the key parts are split into two main tabs: Scene Info and Modifiers. Also, when the plug-in is performing the scan, there's a progress bar at the bottom that provides feedback. This is really helpful, especially on more complex scenes.

For a free plug-in, Forensic is incredible and I wish I'd had access to it years ago! For me, this plug-in truly comes into its own when working with AutoCAD files that have been imported into 3ds Max. I feel I've spent what seems like years of my life cleaning up AutoCAD files so that they can be imported into 3ds Max without crashing my system. This plug-in would have made my life an absolute breeze.

NEAT AND NIFTY

The interface is split up into multiple sections, including Scene Information, Problematic Items, Scene Contents, AutoCAD Items and Unused items. Each of these is incredibly useful. The AutoCAD Items enable you to repair CAD blocks and xRef scenes and objects. The repairing is quick, easy and stable – the complete opposite of trying to do it inside of AutoCAD.

The Problematic Items section is more geared up

to 3D objects and lights that you've created or have obtained from a third party. It enables you to delete empty objects, repair scaling issues as well as identify lights that are in the scene but don't match the current renderer. This is particularly useful if you're working on large scenes and regularly switching renderers.

PLAIN SAILING

If you want to avoid workflow problems, crashing and prolonged simulation times then this plug-in will most definitely help. It takes five minutes at the start of the project but will ensure headaches are avoided. Using it prior to rendering or even part-way through a project will help to keep your project working and as lightweight as possible. It's free as well, which is incredibly generous. And the good news is the developer has promised to keep it that way.

VERDICT



The free plug-in, SiNi Forensic, makes working with large scenes imported from outside of 3ds Max quicker and easier

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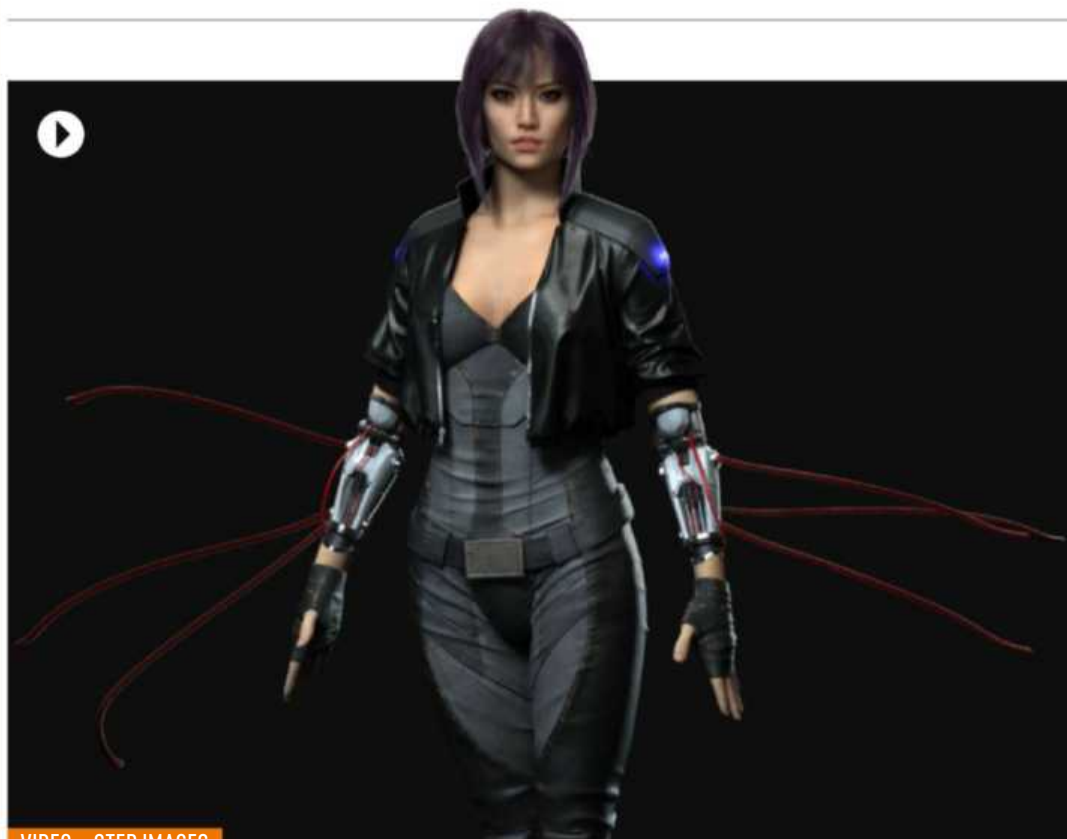
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