THE FINAL ISSUE 3D WORLD: 2000-2024

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The Wild Robot
#318

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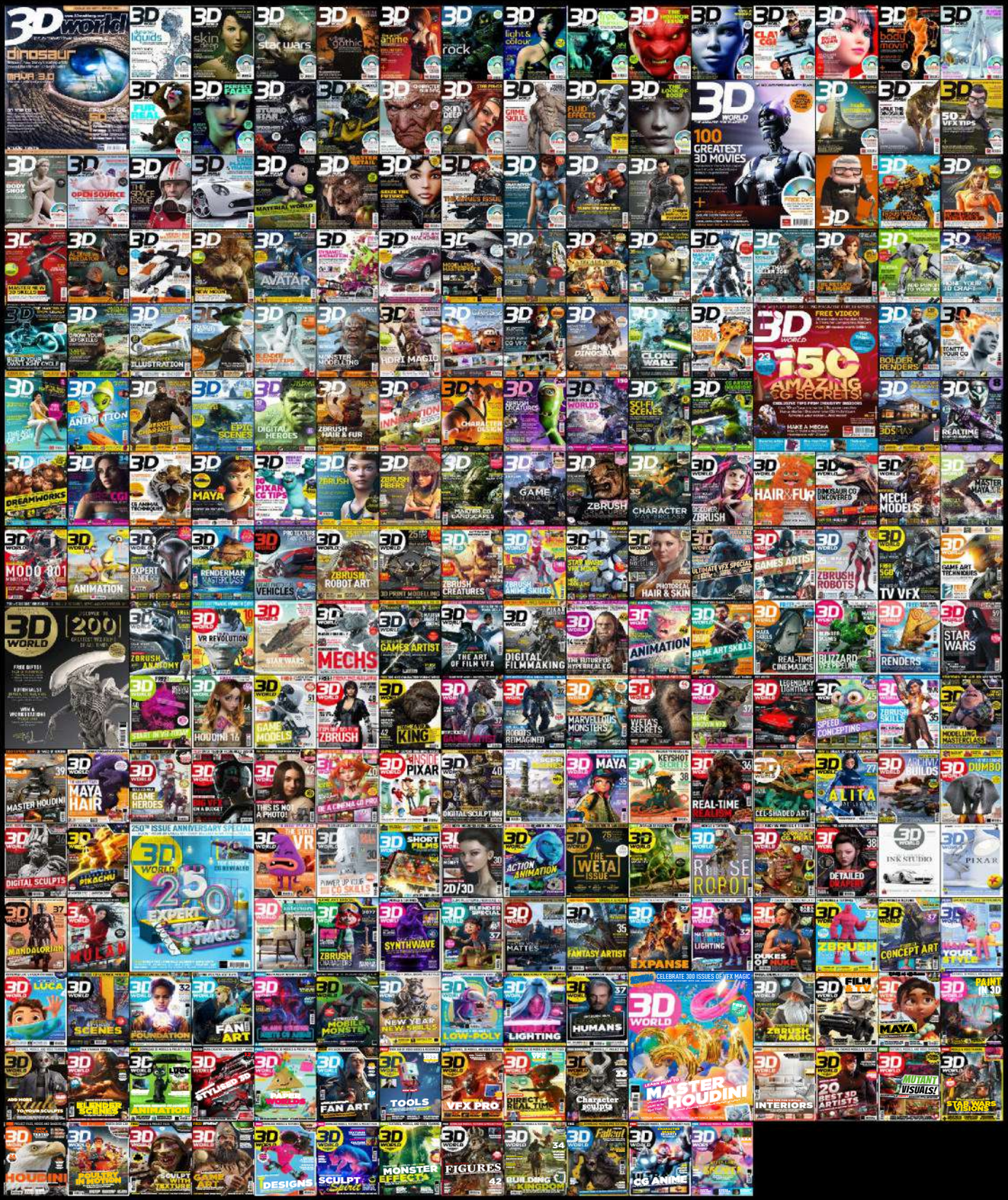

This issue is somewhat bittersweet, as it will be our last. We've spent over two decades helping artists hone their craft, discover inspirational projects and more. But that won't end, as you can still find plenty of content to drive your passions with features, training and reviews at **creativebloq.com**. If you're a subscriber, our team will be in touch to arrange any refunds.

I want to take this opportunity to thank you all for being part of this journey. Thanks also to our wonderful contributors who have made **3D World** the industry's favourite magazine for 3D artists all over the planet. Working with such talented writers, artists and studios has been a real pleasure and I wish there was space to thank everybody properly. Enjoy the issue.

Rob

Rob Redman, Editor
rob.redman@futurenet.com

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The best digital art from the CG community

GRIFFIN SLAYING

BASED ON A CONCEPT BY T.B. CHOI (artstation.com/artwork/3XgeE)

ARTIST
Ivan Gubarev
SOFTWARE
ZBrush, Marmoset Toolbag, Photoshop

"I recently came across the amazing work of Blizzard concept artist T.B. Choi and decided to recreate one of her fantastic sketches in 3D. I was hooked by the awesome dynamics and intrigued by the fact that she'd only used two colours.

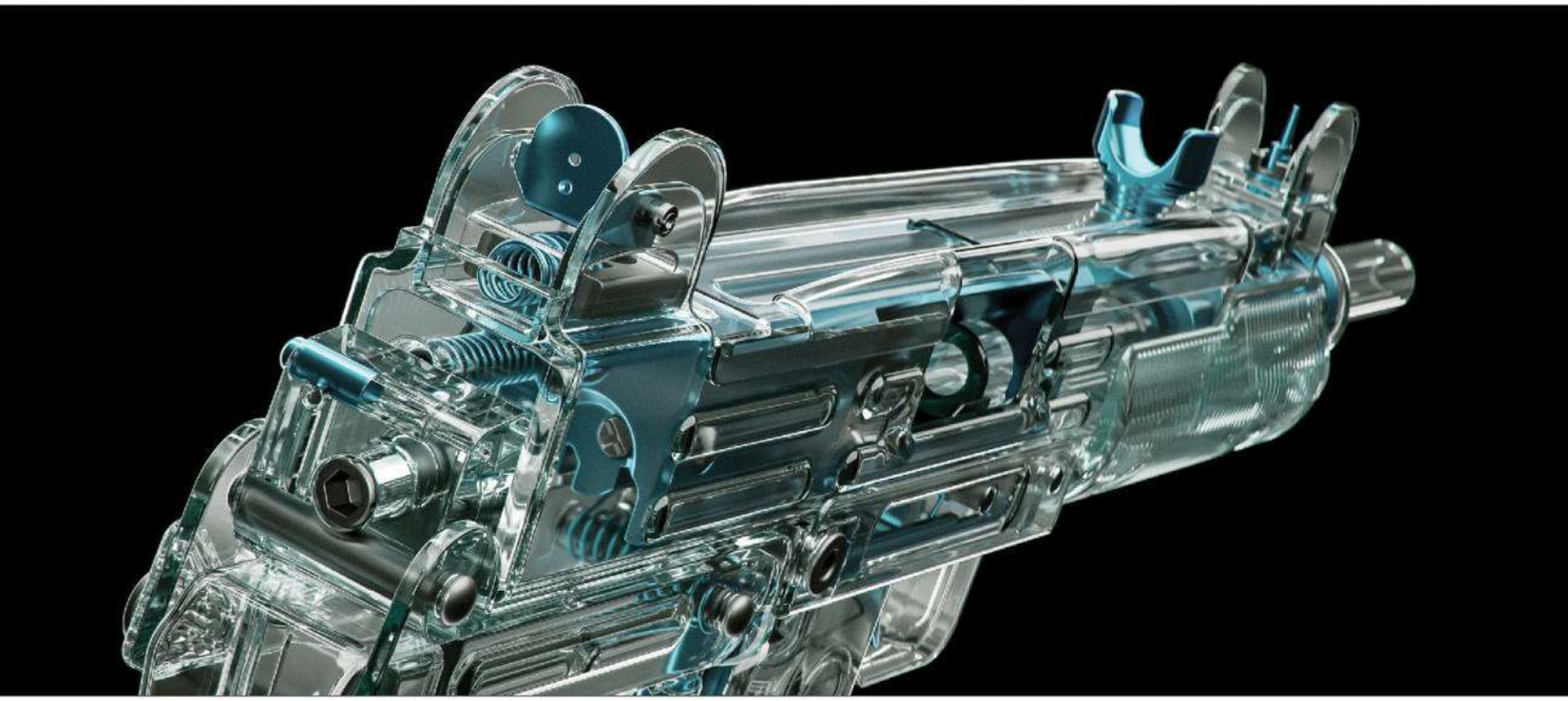
I used ZBrush to create the piece and then rendered in Marmoset. In general, the work wasn't technically too hard, for example the gloves are mostly made up of primitives, as much as the silhouette, the direction of the lines, and the overall flow I was trying to convey, which are often much more important than the detail.

Working on these types of sketch concepts in 3D can be quite difficult, but on the other hand it gives us a lot of freedom. Different artists can look at the artwork in completely different ways, and we have to add a little individuality. This is what helps us to develop our creative skills."

artstation.com/ghosternight

"I THINK MY WORK IS PROOF THAT PRESENTATION IS ONE OF THE MOST IMPORTANT ASPECTS OF ART"

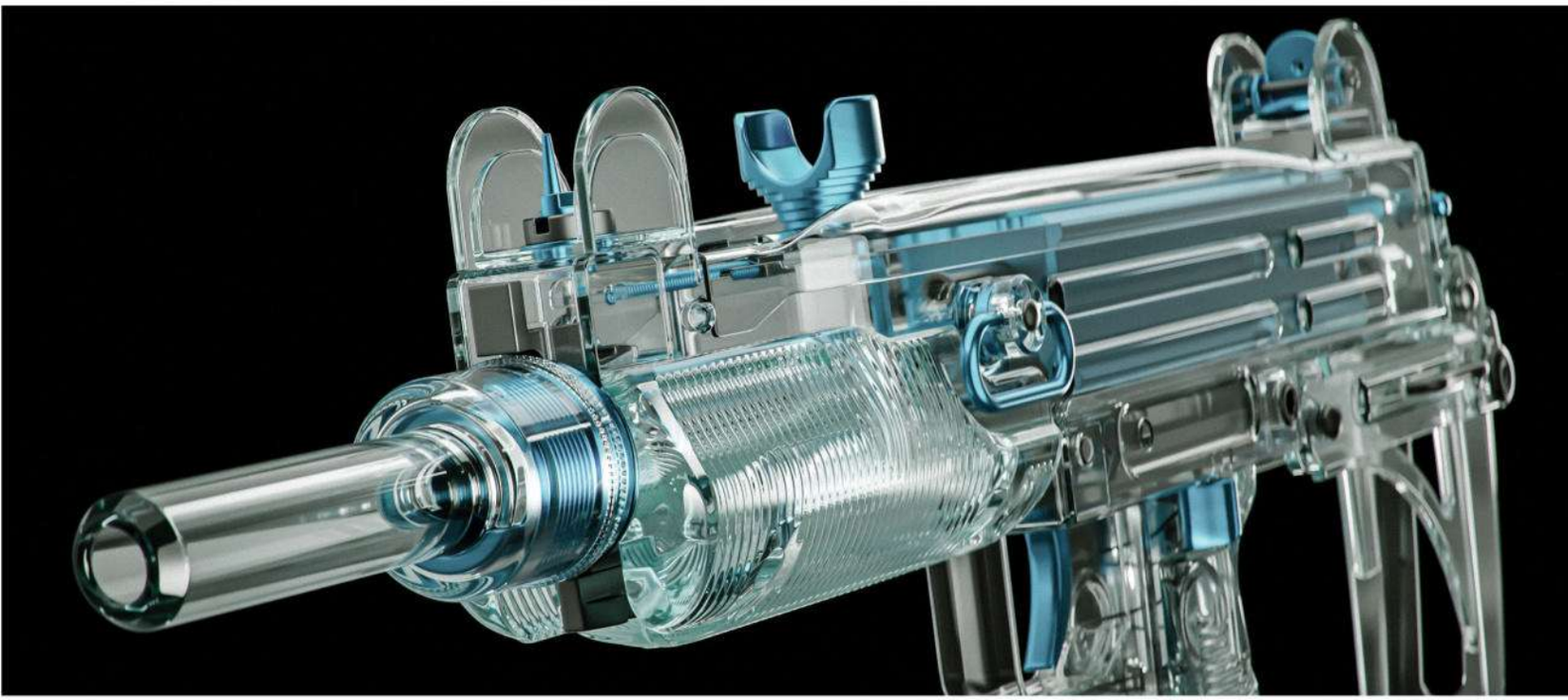
ARTIST
Dmitrii Solomka
SOFTWARE
Plasticity, Blender, ZBrush, Marmoset Toolbag, Photoshop Camera Raw



THE GLASS CANNON

When I created this project, I planned to make a fully game-ready weapon with dynamic animations for presentations. Instead, I made a kind of work-in-progress presentation because the project had already taken me seven months. I was inspired by Egor Kapashylov and his MP5 to post my design before it was complete. During the work I relied on xNURBS, which was recently added to Plasticity. I went all-in on the renders, which after a lot of iterations and reworks were developed to a state that I was satisfied with. In the artist community there used to be a lot of debate about the importance of different elements of work on ArtStation. I think my work is practical proof that presentation is one of the most important aspects.

artstation.com/johnny2jackets



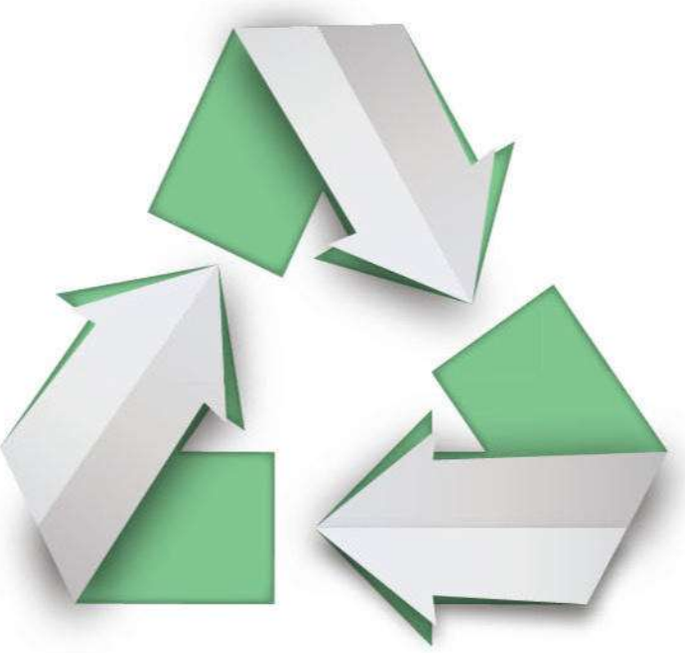
THE SEER

ARTIST
Kateryna Hrytsyshyna
SOFTWARE
ZBrush, Marmoset Toolbag

"This was a personal project created in ZBrush and rendered in Marmoset Toolbag, with my focus on capturing the fine details of the face and clothing in the sculpt. The piece was designed specifically for 3D printing, so I carefully considered the structure and geometry to ensure it would print cleanly and maintain all the details. The main task was to make sure features like the headdress, ornaments and facial wrinkles would all translate well into a physical model, avoiding any thin areas or overhangs that could cause me issues during printing.

The character was inspired by shamanic traditions and ancient myths, which I wanted to reflect through the design's blending of realism and fantasy. My goal was to create a piece that not only looks visually compelling on screen, but also comes to life as a nice bust for painting with the same level of detail, personality and mystical vibes."

artstation.com/kategricishina



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MOTHER REIMAGINED
CASTLE GATE GUARDS

"I began by limiting my reference pool, using a very simple sprite taken from the *MOTHER* video games as the main reference for the entire design process. My inspiration was taken from traditional ceremonial French armour from the 16th century, along with not-so-traditional armour such as those from *Elden Ring*.

While sculpting, I kept my subdivision levels and baked the Normal maps pre-emptively. That way I could maintain high-quality details along with a low-poly mesh that could easily be modified. After the texturing, I brought the model into Character Creator, where I used the magic of AccuRIG to get a basic rig for the model. I then finalised my project by making a few keyframes and used Blender's EEVEE Next to get a fast render before switching over to Photoshop for the final touches.

When it comes to the creative process, I believe in the value of balancing aesthetic beauty with functionality. I use shapes, colours and silhouettes to get the design how I want it, but also keep a keen eye on the purpose of the design choices taken."

pietro_boldetti.artstation.com

ARTIST
Pietro Boldetti
SOFTWARE
ZBrush, Blender, Substance 3D Painter, Photoshop, Character Creator

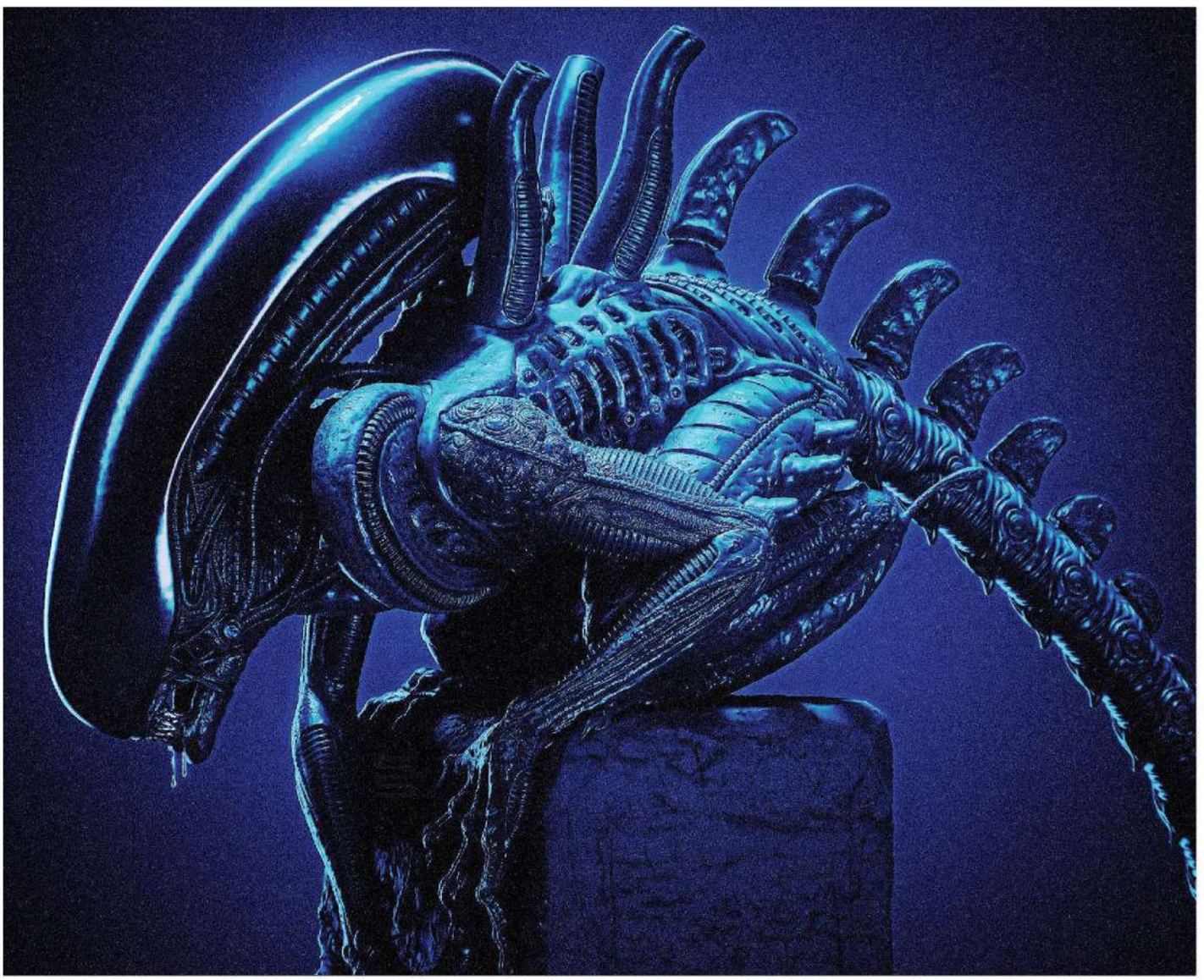

"I BELIEVE IN THE VALUE OF BALANCING AESTHETIC BEAUTY AND FUNCTIONALITY"

ALIEN

ARTIST
Kevin C. Sepúlveda Márquez
SOFTWARE
ZBrush, Marmoset Toolbag, Photoshop

While I wanted to sculpt an alien with ZBrush, I felt that I could create something more than just another static character. That's why I decided to pose it and create a composition. Using simple SubTools I built a blockout for the pose, as well as the column. At first I applied the golden spiral vertically, but realised the column was too long and diminished the xenomorph's importance. I then duplicated and arranged the spirals horizontally, which worked perfectly. After that, I gradually sculpted the creature, brought it into Marmoset Toolbag for lighting, and finally used Photoshop to enhance the renders and give them more personality. Marmoset is an incredibly powerful tool for showcasing your characters, even if they aren't real-time. If you combine it with good post-production in Photoshop, it's a guaranteed win for you.

sepulsalvaje.artstation.com



KEEPERS OF THE TRASH

BASED ON A CONCEPT BY OLEKSANDR KAYDA (artstation.com/artwork/VyY668)

"For creating this scene, I used PureRef to collect references, ZBrush for sculpting and colourising, and Blender to make a cool, juicy render through the lighting. I thoroughly enjoyed the entire process, but my favourite part was the painting. It was a whole lot of fun, as I used the Vertex Color technique in ZBrush for the characters. This method helped me to make characters look stylised, but still kept them believable and real."

ARTIST
Denis Kildyushev

SOFTWARE
ZBrush, Blender, PureRef

artstation.com/ken1s

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NEEDLE KNIGHT LEDA

ARTIST
Razvan Smaranda
SOFTWARE
ZBrush, Marvelous Designer

"It was a pleasure to work on Leda, a project proposed by the Bulkamancer 3D art team that initially seemed daunting due to its complexity. Nevertheless, I decided to take on the challenge and learned a lot in the process. This was a tough project for the entire team, from sculpting to cutting, and supporting it was likely the hardest part for everyone involved, but they did an amazing job! I'm incredibly grateful to Bulkamancer for the opportunity to work on this character and for their efforts in making it printable.

I used Marvelous Designer for the fabric simulation and ZBrush for sculpting and detailing. The most difficult aspect was applying the pattern to the cloak and dress. Replicating the concept's pattern required UV warping and creating the alpha design, followed by using the CurveFlatSnap brush to create a 3D mesh on top of the alpha, with the alpha serving as a guide.

As well as that, I loved creating the ornamental elements. I used alphas and then masked each of them manually, before employing alphas again to fill out the empty space. After that I used mesh ornaments on top of the alphas to create additional layers."

artstation.com/totenn0

FORGOTTEN

ARTIST
Gannon Faust Jaspering

SOFTWARE
Unreal Engine, Quixel Megascans, ZBrush, Substance 3D Painter, Blender, 3ds Max

I based this piece on the ancient Roman statue known as Sleeping Hermaphroditus, who is the offspring of Hermes and Aphrodite, and where the term hermaphrodite originally derives from. The original statue is thought to have been carved in the second century AD, and many copies have been rediscovered over hundreds of years. I wanted to create a fantastical portrayal of a pilgrim who has just found a copy of the statue abandoned deep in a forest. The piece is meant to evoke a sense of loneliness that many queer people feel. The foliage assets are from Quixel Megascans but I created the statue, pots, pilgrim and moss clumps. I used Blender nodes to scatter Quixel foliage cards onto the moss meshes; that's how I got them so fluffy!

artstation.com/gforgannon

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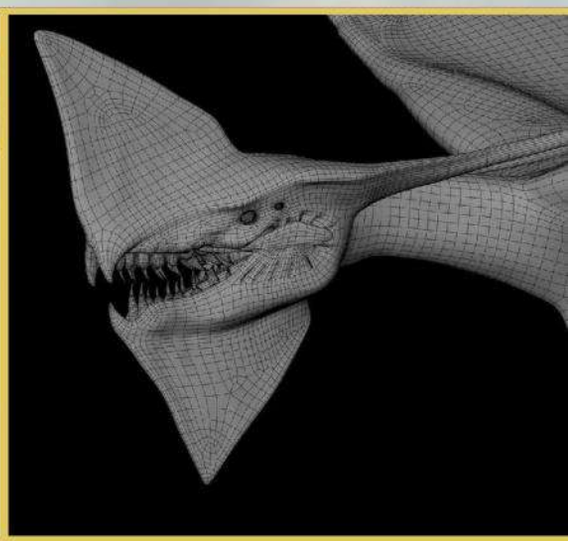
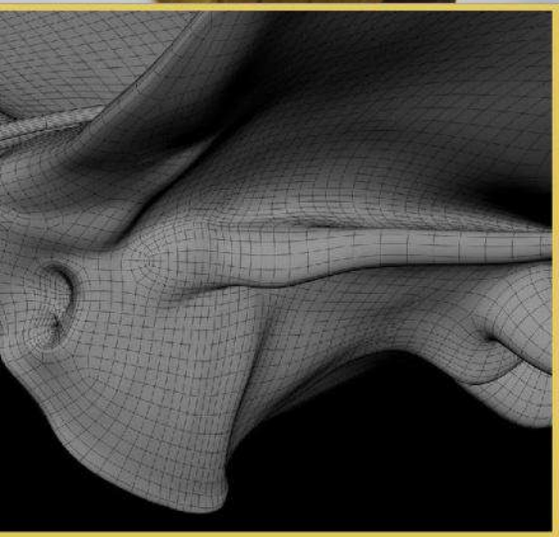
TORUK
THE GREAT LEONOPTERYX

SOFTWARE Maya, Substance 3D Painter, ZBrush, Blender
YEAR CREATED 2023

ARTIST Elisa Drique **LOCATION** France
Texture artist Elisa studied 3D animation at ESMA Toulouse and worked on *Swing to the Moon* as her graduation movie.
www.therookies.co/u/ElisaDrique

James Cameron's *Avatar* is one of my favourite movies. I love the universe and the creatures, particularly Toruk the Great Leonopteryx, its colours, and how terrifying it looks. That's why I wanted to challenge myself to recreate a Toruk as a personal project! The lighting of this shot was done by Vincent Levrero.





IMPRESSIONISTIC REALISM

Trevor Hogg learns how the artisan aesthetic came to be for *The Wild Robot*

Undoubtedly it's easier for animation studios to have an in-house style, but this isn't the path DreamWorks Animation decided to take when adapting the illustrated children's novel ***The Wild Robot*** by Peter Brown, where a ROZZUM unit 7134 robot gets stranded on an isolated island teeming with wildlife. "The magic is in how every aspect of this movie, we altered the animation process to fit the style and story that we're trying to tell," states Chris Sanders, the film's writer and director.

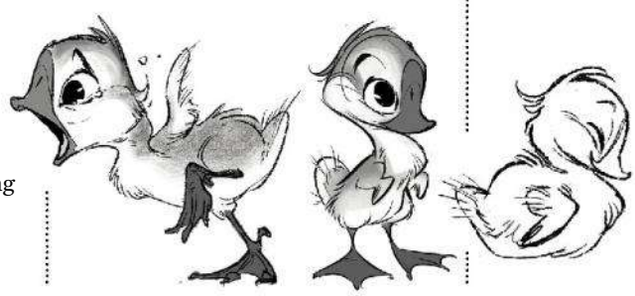
"Our animators worked closely with the rigging department. It's something we've become much better at in letting the animators take the lead as far as what they need for these characters and what expressions are required."

Being open-minded is a vital part of being a director. "I talk to animators predominantly like actors," Sanders explains. "I'll say, 'This is what the scene or moment is about.' Then their job is to solve that. I made a decision a long time ago that if somebody does something in a way that's different than what I saw in my head, but it checks all of the boxes and gets everything that we needed, then we're finished."

The technology and techniques were built on top of what was achieved in *The Bad Guys* and *Puss in Boots: The Last Wish*. "For the day-to-day of animation, I'm there usually to help develop and make sure that the rig and character is working, and that we're able to hit the poses and facial expressions, combined with the way that the fur is rendering looks right," says production designer Raymond Zibach.

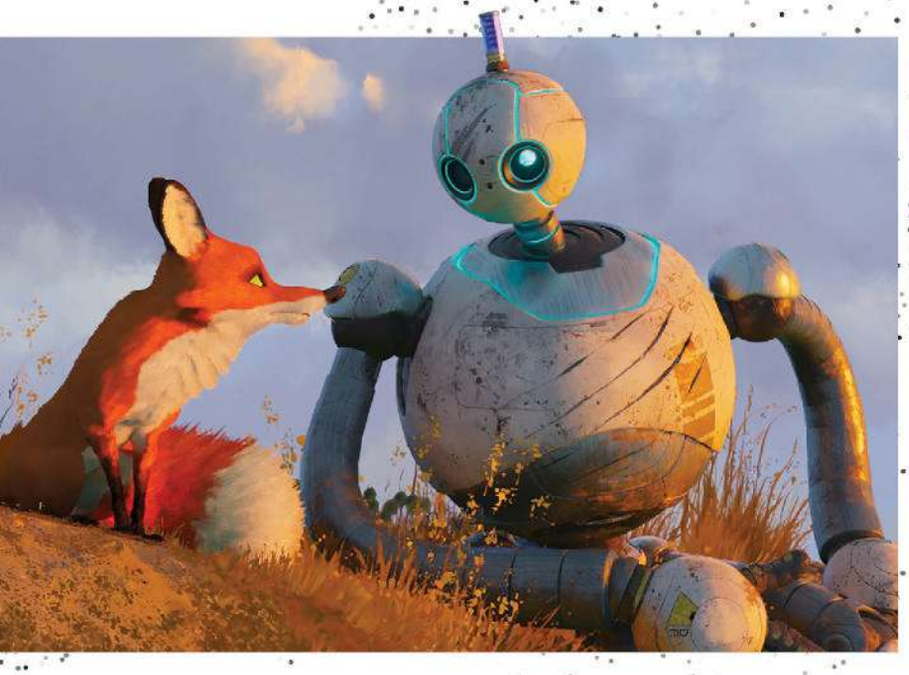
"You've seen those other movies where they look like an oil painting being repainted every frame and it's distracting. They let the properties of light change certain things about them. A lot of what painting is, is deciding how much you're going to cheat where the detail is and isn't, and how much can you let a brushstroke show or whether you need to replace that with something tighter. All of that is built into the way we surfaced our world and characters."

The film's shape language is recognisable. "We didn't want to go too stylised with our natural world," Zibach adds. "We wanted it to be a homage to a plein air [French for outdoors] painting, but a digital impressionistic version of that. When you see a



Above: Central to the narrative is the parental relationship between Roz and gosling Brightbill

Below: Concept art exploration for Brightbill's character design



painting of nature, you can feel that love of nature. Someone is studying and trying to depict it in a way that captures the essence; that's why this style felt like the right approach for this movie."

Animation is too time-consuming and expensive to have unnecessary scenes end up on the cutting room floor, which is why the narrative structure and shot design is figured out at the storyboarding stage. "My job is to translate how that book felt, as well as the actual things that happened, and we had to adjust those things," notes Sanders. "There were certain parts of the story that we had to clean up and make simpler and smaller, while other parts we had to expand and make more of a meal of them.

Top: The high-tech slickness of Roz contrasts to the roughness and randomness of the island's wildlife

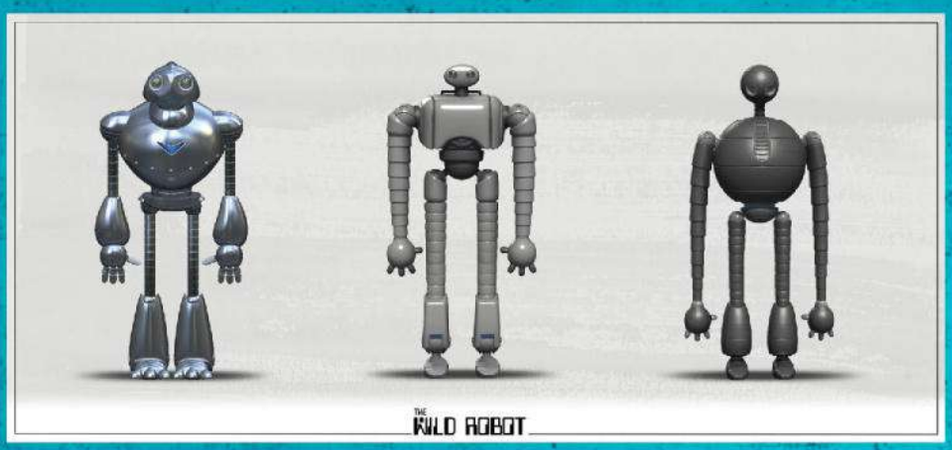
Below: The crowd simulations were worked hard for the migration scene

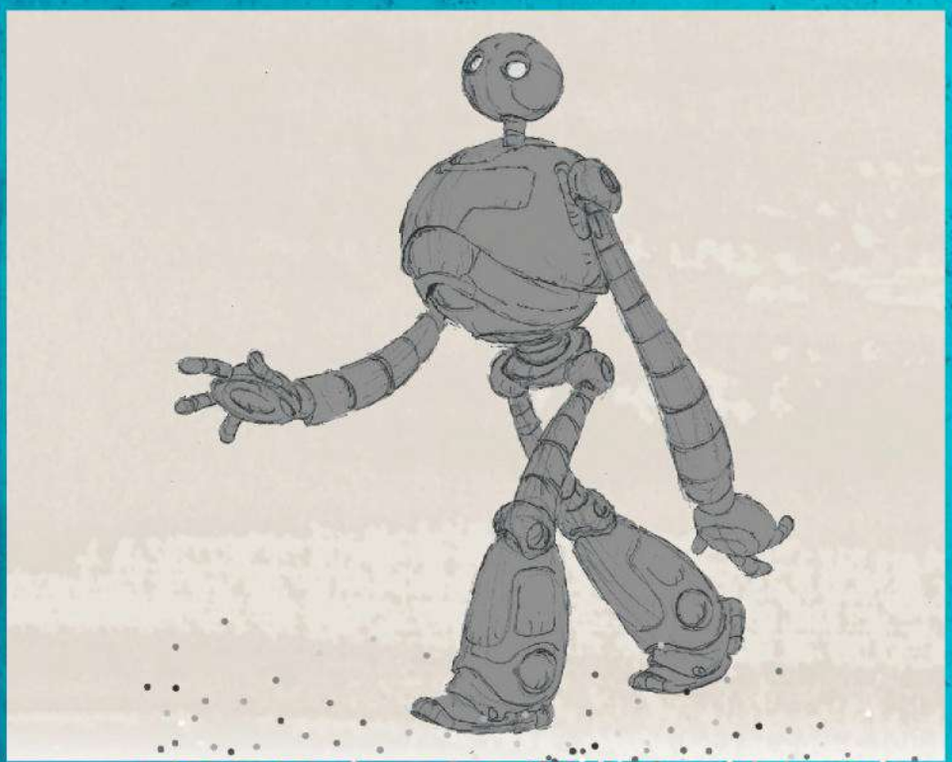
"THERE WERE CERTAIN PARTS OF THE STORY WE HAD TO CLEAN UP, AND OTHERS WE HAD TO EXPAND"

Chris Sanders, writer and director, The Wild Robot

"The way that she builds relationships with the animals in the book is a bit simpler. In the film, we had to earn those relationships. There's a scene I added called the Robot Graveyard. I realised that in the book there were a number of robots that had arrived and were destroyed. Roz's crate was lucky. It was put up onto a rock by a wave and accidentally avoided destruction.

"I knew there were pieces of at least five more robots floating around in the tide pools around that island. I wanted to have Roz find those bits, assemble a robot, and communicate with it to try to figure out what's going on. I





Shaping Roz's robotic concept

The main character's design had to go through the most iterations

"We started with a retrofuture look to Roz and she was more complicated," reveals Zibach. "However, early on a modeller said, 'I have an idea.' And he tried this thing with more circular designs that were based off something that character designer Nico Marlet did, but different because he was talking about how her body could be like a Rubik's Cube. That idea affected how we looked at her design, because until then we were looking at her as a humanoid, but that little bit of exploration showed a lot of potential to how she'll change. What she can do with her body pays a lot of dividends throughout the film. We took that initial concept of design, worked on top of that and that became Roz. Before that we looked at every robot ever done, all of our favourites. It was daunting to think how we were going to top them."

Centre: Experimenting with different shape languages for the character design

Left: An animation storyboard that explores how Roz moves

Above: Concept art for the pivotal sequence where Roz aids Brightbill in joining a flock of migrating geese

used elements from the book to build into the movie and that gave us a less linear path. It changes the way that she sees her situation and evolves the story."

Easing the reliance on compositing was important. "It doesn't make sense to create a realistic bush or tree and try to hammer it in compositing to make it look painterly," notes visual effect supervisor Jeff Budsberg. "If you want a stylised-looking plant, you should draw the plant. We put in a lot of effort more upstream in the asset construction so that all the modellers and look development artists could draw their assets in 3D, which you could move and place in space.

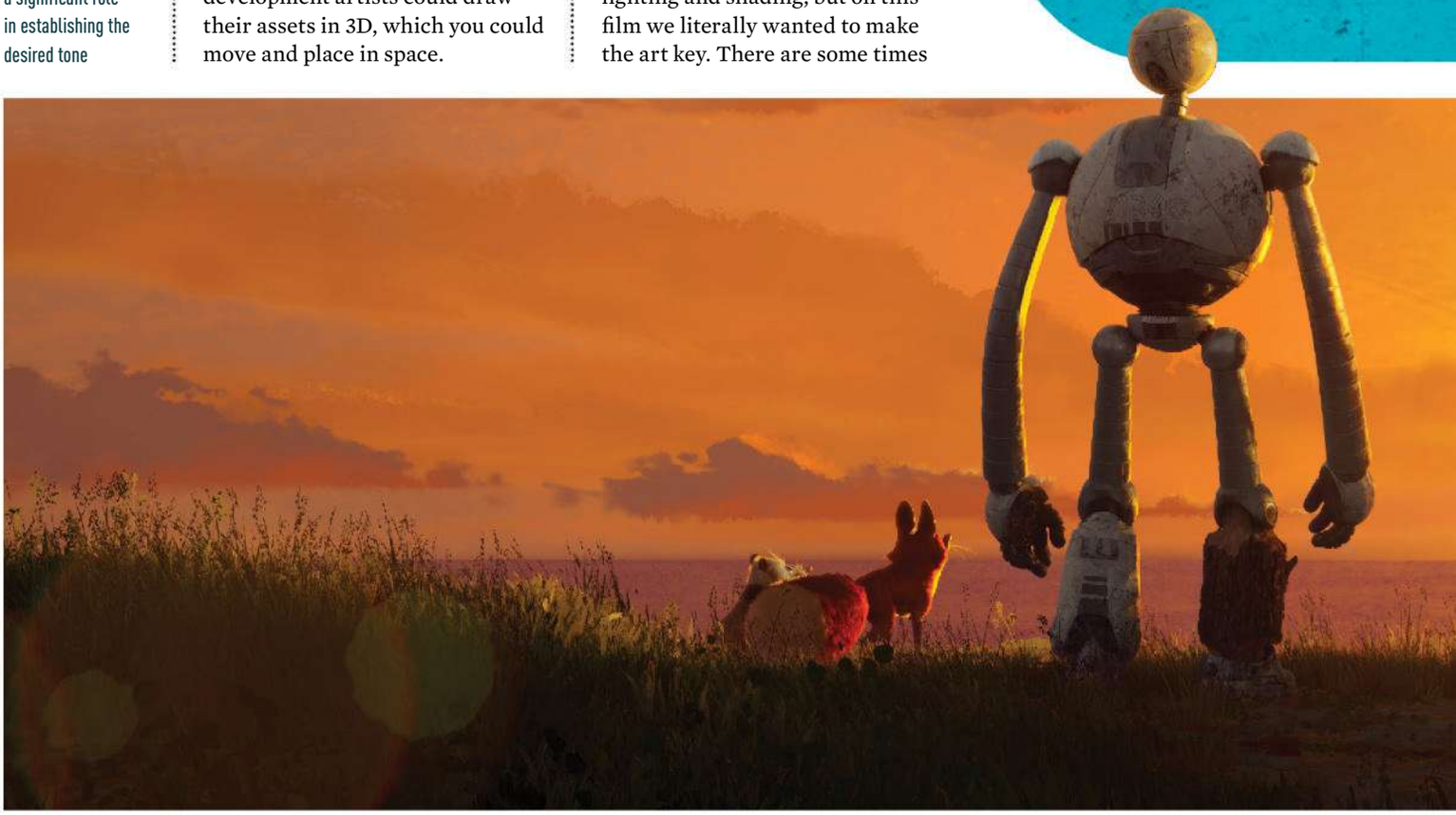
"That was also important because we wanted a dynamic camera that was more handheld and nature photography or documentary style. We wanted to be able to rig and deform the assets, even though perhaps the leaves or flowers didn't need to connect with sticks or branches because a painter doesn't care about whether something is physically accurate. They want it to be believable."

Concept art was not only used as a reference for the shot design. Budsberg adds: "Historically the art keys are an inspiration for the lighting and shading, but on this film we literally wanted to make the art key. There are some times

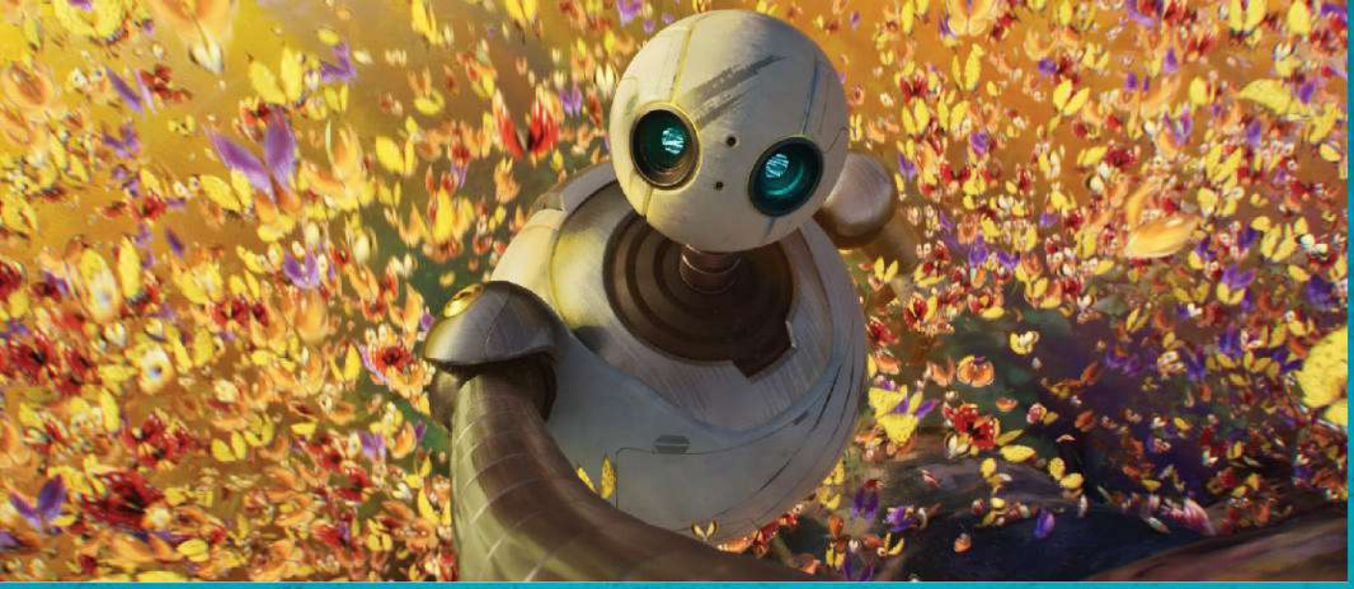
The wall of butterflies

Roz's introduction to the island's forest went through many different iterations in search of the right tone

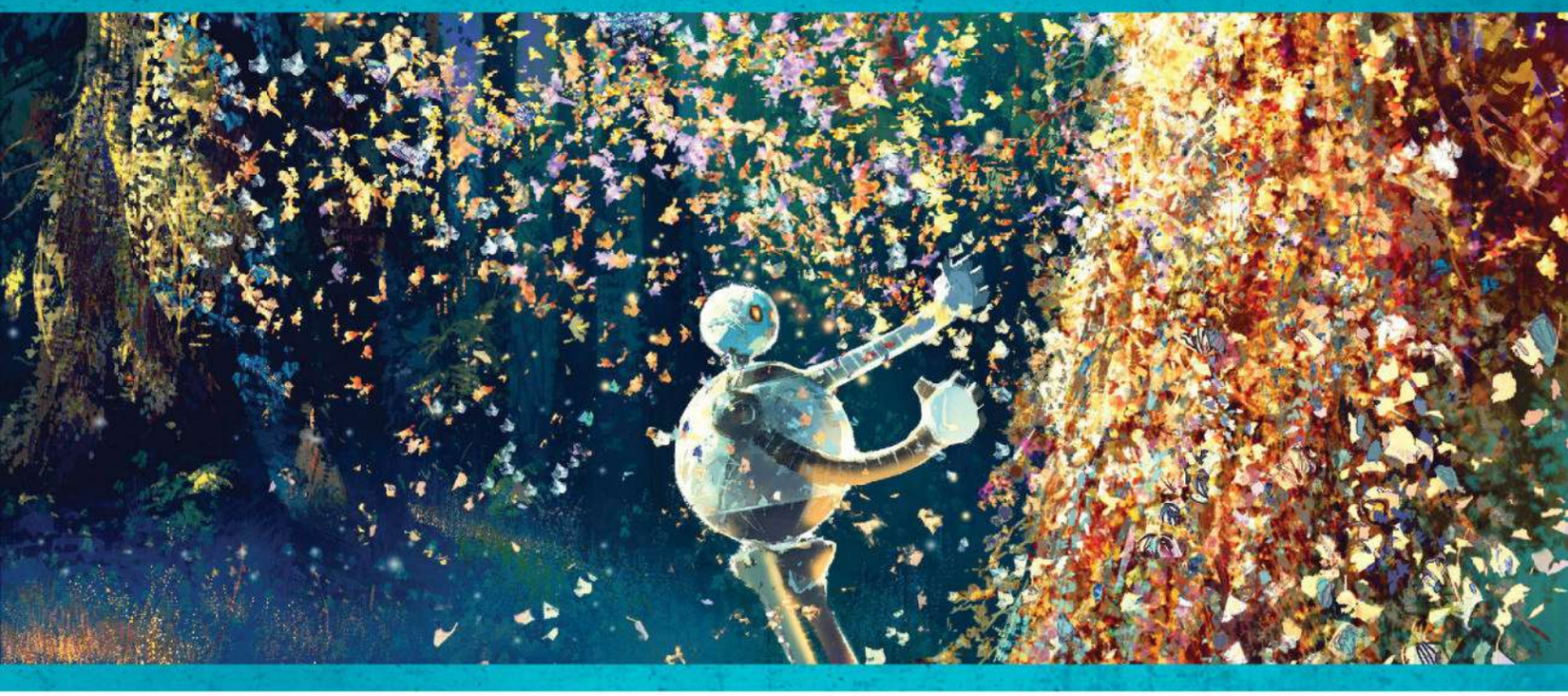
"We went back and forth between how funny this needed to be, how scary for her, or how hard it would be," explains Zibach. "Then we started throwing in these moments of beauty to break it up, and the wonder that the robot would have. Roz was designed for a world that's almost prefab and perfect, and here she is in a location that isn't that, but is beautiful and wondrous. There are all of these natural things going on around her and the butterfly moment captured that. When that was storyboarded we saw the potential for it; it's poetic too. This robot is being dazzled by a natural event that's so beautiful. We knew we had something special in that and it helped us to unlock what that sequence should be, as you can't be comedy all the time."



Below: Skies play a significant role in establishing the desired tone



Left: The aim of the visuals was to create the warmth associated with handcrafted art rather than photorealism



we put a frame up in dailies and I'm not quite sure if that's the art or the rendered frame."

Atmospherics are everywhere to provide separation, depth and scale. "You look at the god rays in some of the shots or depth-based atmosphere, it's not only the volume," remarks Budsberg. "It actually has brushstrokes inside it, so you'll see that we modulate the volume quite a bit with some sort of stroked texture or directionality. Those brushstrokes might affect the smoke or the atmosphere that's there.

"In all of those they try to follow the principal curvature of the direction of the flow, because if you have this waterfall, you wouldn't paint the strokes horizontally. You want them to be flowing with the volume so the curvature of the stroke will be following the flow of the

Above: The forest environment was inspired by animation legend Hayao Miyazaki

Left: A wide shot of the island where Roz is stranded

Below: Concept art of Roz and Fink attempting to survive a brutal snowstorm, which served as a visual template for the painterly animation

Thinking practically with the camera

The crew's goal was to bring a visceral sensibility to the filmmaking

"We looked at stuff like *Saving Private Ryan*; the storming of the beach footage," states head of layout Chris Stover. "There was also *The Revenant*, where there's a lot of action happening in front of the camera and the camera's reacting to it. We have a lot of tools on the backend of production for bringing that to fruition. We have Cartoni heads that can do pan and tilt type of stuff against the live performance once animation is finished. We also have camera shoulder rig systems that can capture the shoulder rig sensibility against live performance. We took an integrated approach between keyframe animation and at the same time leaning into practical rigs we could use to do the final camera to ground that camera language.

"As for lensing, you look at a lot of documentary footage and its long lens. We wanted to bring some extremely long lenses into the shooting space, and that requires big sets so you can actually put a camera a quarter-mile away. Wide lenses like 16mm and 18mm offer a big field of view that can bring the environment into the moment and immerse the character. It's a combination of finding these big, epic cinematic moments and then intermixing them with a documentary style."

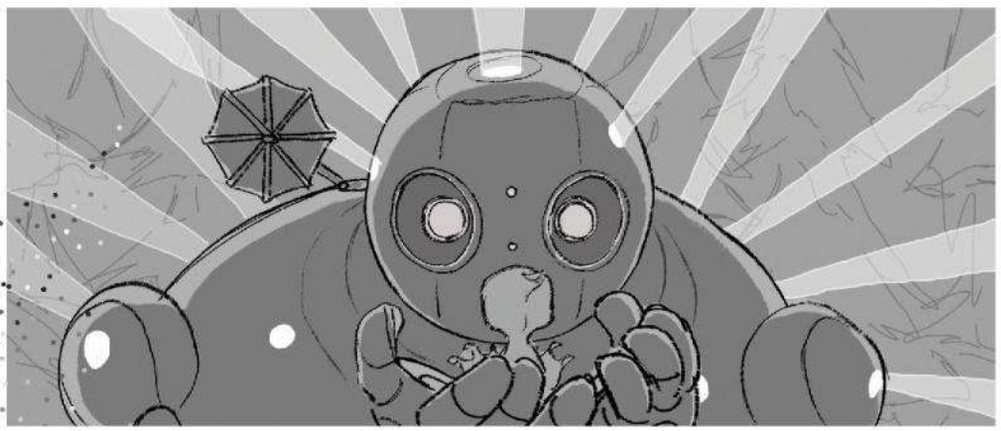
"THE DESIGN OF ROZ WAS FASCINATING... WE LEANT INTO HER LIMITATIONS"

Jeff Budsberg, visual effect supervisor, The Wild Robot

billowing smoke or atmospheric. It comes back to putting a lot of thought into how these things are constructed and then modulating those traditional CG types of elements in ways that resemble what an illustrator would do."

Representing how Roz views the world is a heads-up display (HUD). "The design of Roz was fascinating because we wanted to lean into the limitations of this robot," Budsberg explains. "She doesn't have a mouth and has limited facial structures. We wanted her design to feel futuristic but believable. That's critical because you need to know that she can be damaged. Just watching the world through those eyes and seeing the mechanics of something like a DSLR lens, the audience recognises that it's a mechanical thing. Even some of the outlandish things she can do with her body are based in some sort of physicality. We wanted her to feel like something that could be manufactured."

Above: Eliminating facial articulation was an important part in making Roz a believable and endearing robot



Below: Storyboard depicting the interaction of Roz and Brightbill

There are no throwaway elements in the frame. "It has been more so than any other film that I've worked on the entire image," observes Jakob Jensen, the head of character animation. "The background characters play such a huge part with the emotional impact, especially in the migration scene. This is when Roz sees Brightbill off like a mother sending her child off to college; that's the sort of emotional analogue.

"The number of characters in those shots is insane. It's not just having flocks of birds flying, but it's also the behaviour in the background. We generated so many different bird cycles of interesting behaviour so that you could have something alive in the background that doesn't upstage, but it still aids in getting a grounded performance."

The performance demands influenced the character designs as well as modelling and rigging. "How do you make a quadruped also be a bipedal in some ways?" Jensen adds. "You have to choose your moments and then you have to make additional controls in an arm to bend the wrist in a way you wouldn't typically see in a dog.

"Fink, the fox, is quite emotive and is anthropomorphised to a degree. We have a possum who moves around with seven babies

on her back constantly, which was another challenge, as I'm sure you can imagine."

Simulations had an impact on the character animation. "At times when you finally realise how everything looks rendered in a furry creature like the bear, you go, 'Oh my god! That doesn't read,'" remarks Jensen. "The silhouette or pose that you created will take on an entirely different read when fully clothed or furred. We have access to the fur in our software so we can turn it on. Obviously, it makes the rig heavy when turning on all of that data, but we can see it in our software and get a good idea of how it reads.

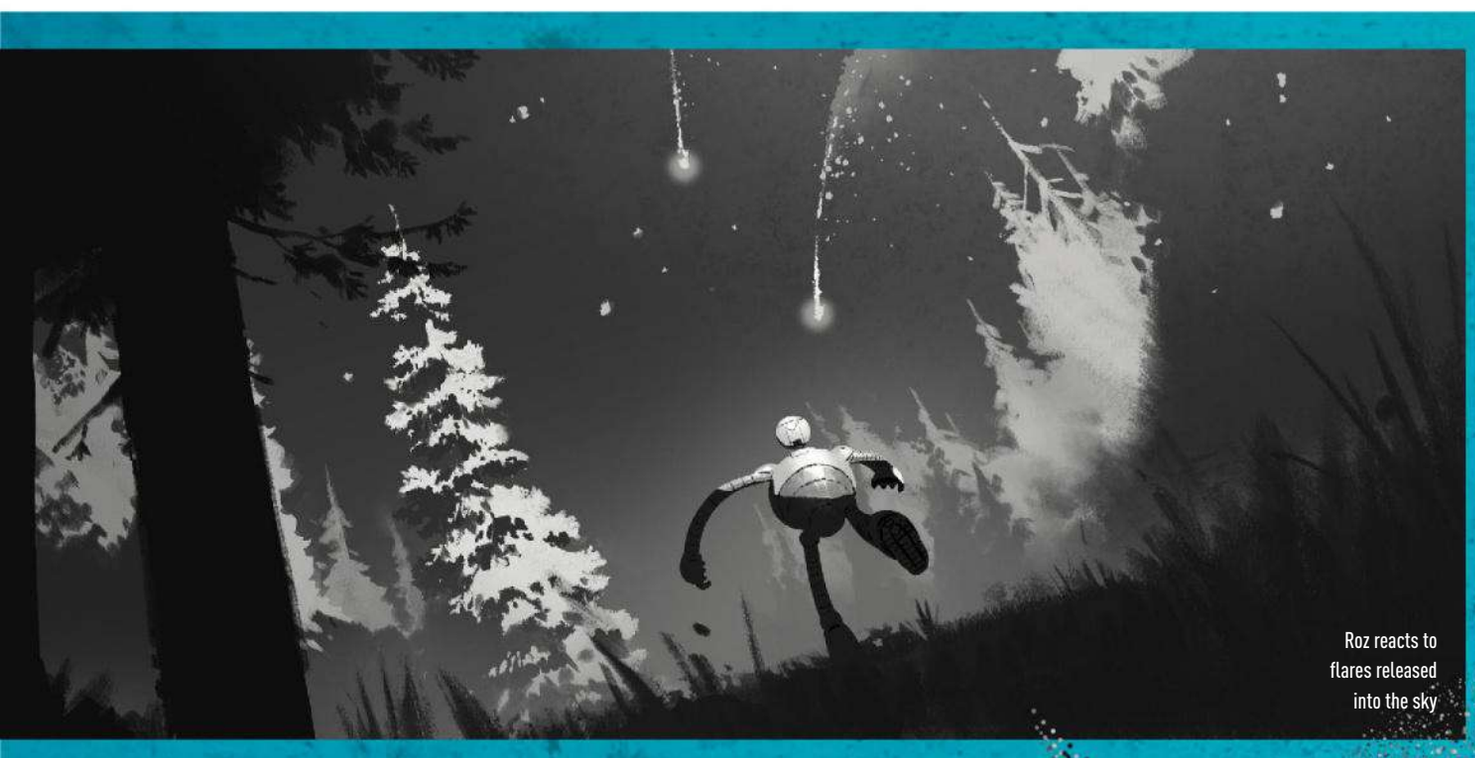
"However, then we have the added complexity of our painterly rendering style, which made it tricky to make fur feel like fur, but at the same time feel as though it's real. This was a journey of figuring out how we do something that's quite impressionistic.

"When we were reviewing things with Chris Sanders and getting closer to that look, he kept saying, 'It looks even more real than if you were to approach it in a photoreal way.' That's the same goal that the impressionists had when they were painting, so you get a glimpse into how they see the world and how it feels. That's vastly different from photorealism."

As the story progresses, the visual aesthetic of Roz becomes less slick and more like the rugged environment

"THIS WAS A JOURNEY OF FIGURING OUT HOW WE DO SOMETHING THAT'S QUITE IMPRESSIONISTIC"

Jakob Jensen, head of character animation, The Wild Robot



Roz reacts to flares released into the sky

Forest flames

Adding to the sense of peril is the surreal treatment of the raging fire that threatens the wildlife

"For the fire, we wanted it to be something that would be so foreign to these animals," explains Budsberg. "It's an homage to *Bambi* in that it feels different and threatening, and we wanted to lean into something different than the stereotypically burnt orange-red style of fire. We wanted something that felt unnatural. You get this visceral reaction from the audience when you see that pink-red fire because you're going, 'Oh god, this isn't good.' It's jarring. You want to almost feel it from the animals' point of view that this is something they've never seen before. That's where we leaned into this high contrast and saturation palette."

Goodbye SAIGON

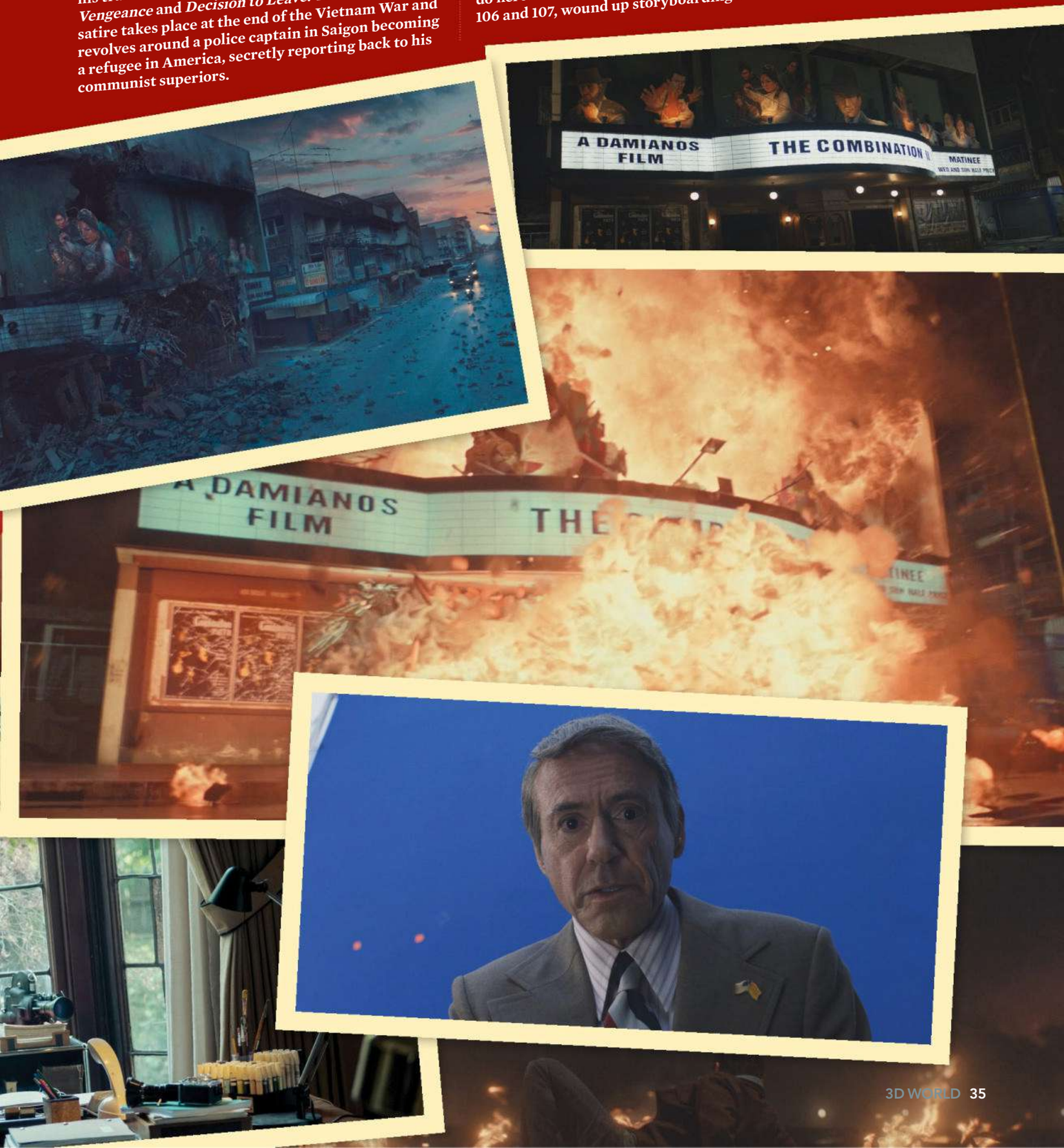
Trevor Hogg gets held captive by multiple versions of Robert Downey Jr. while uncovering the visual effects of HBO's spy series *The Sympathizer*

At first the idea of Robert Downey Jr. playing five different characters known as the Priest, Auteur, Congressman, Professor, and CIA spy Claude seems rather outrageous. However, given that Park Chan-wook is the co-showrunner, director and writer for *The Sympathizer* it becomes less so, as making bold, non-conventional choices has become his trademark, demonstrated by *Sympathy for Lady Vengeance* and *Decision to Leave*. This latest dark satire takes place at the end of the Vietnam War and revolves around a police captain in Saigon becoming a refugee in America, secretly reporting back to his communist superiors.

Park directed Episodes 101, 102 and 103 while Marc Munden and Fernando Meirelles handled the remaining four episodes. "On his own episodes there is a ton of planning," says visual effects supervisor Chad Wanstreet, who was collaborating with the acclaimed Korean filmmaker for the first time. "When we got into planning out the tarmac scene, which was tons of storyboards, we took that into animatics and previs. Director Park doesn't always get the opportunity to previs, which we were able to do here. Marc Munden, who directed Episodes 105, 106 and 107, wound up storyboarding a lot as well."

Below: Buildings had to be altered and removed in order to accurately recreate Saigon in 1975

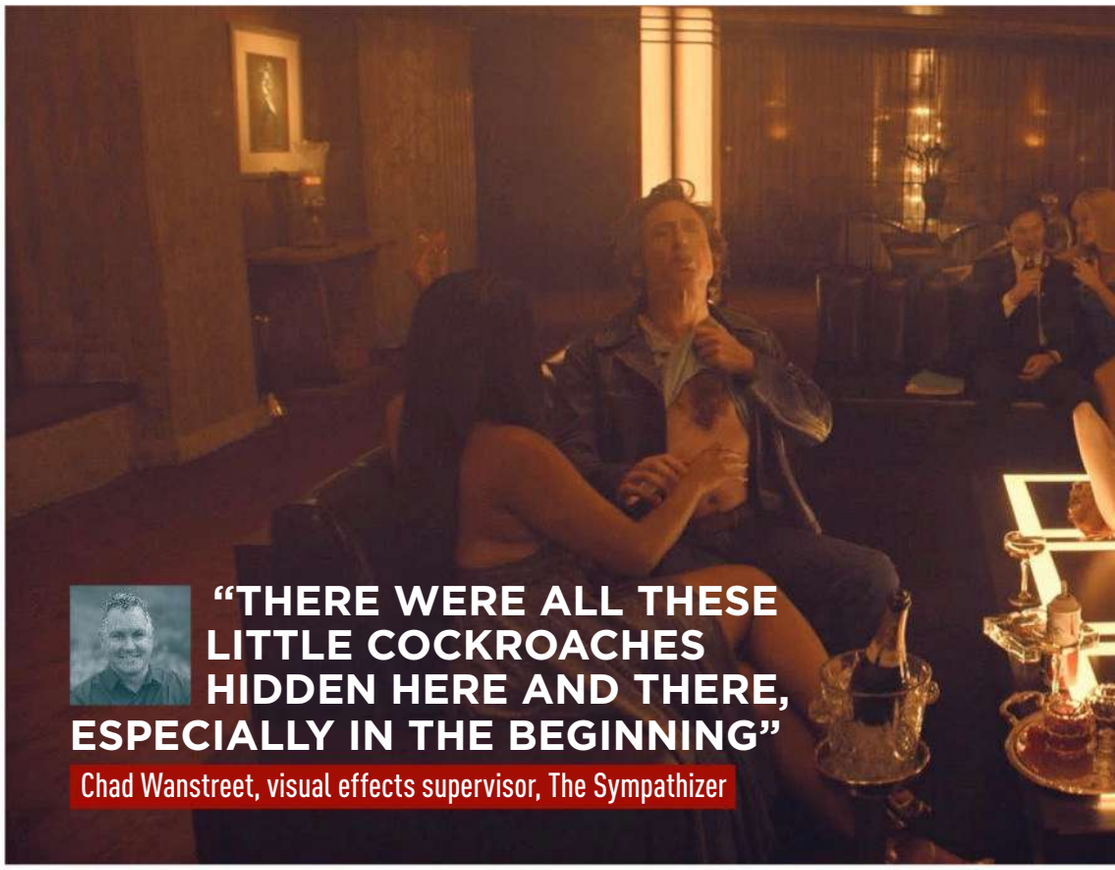
A personal favourite scene for Chad Wanstreet was the theatre explosion



Insects are used as a frequent visual motif by Park. "There are cockroaches running around the floor [of the refugee camp]," says Wanstreet. "We did the cockroach that the General stomps on. Director Park loved that so much that he started adding cockroaches in everywhere. At one point we were calling him the Oprah of cockroaches! There were all these little cockroaches hidden here and there, especially in the beginning because we wanted to set this world up and establish that where Bon and Captain are living is dirty and not nice."

Scene transitions are a critical part of the series' visual language, such as when Captain is crossing the names off the evacuation list. "I love that one," laughs Wanstreet. "All these transitions were fun to work on because he's so deliberate. Director Park knows he's going to do this transition when we're filming.

"He'd talked about it months ago when we were in LA where he said, 'This is going to be a transition.' Then we're on the tarmac in the middle of the night at 4am and he said, 'Remember when I told you about this transition and it was going to be this? This is the B side of that.' It was like, 'Oh my god. That was six months ago! You had already imagined this in your head.' He's playing the long game. There were a lot of those."

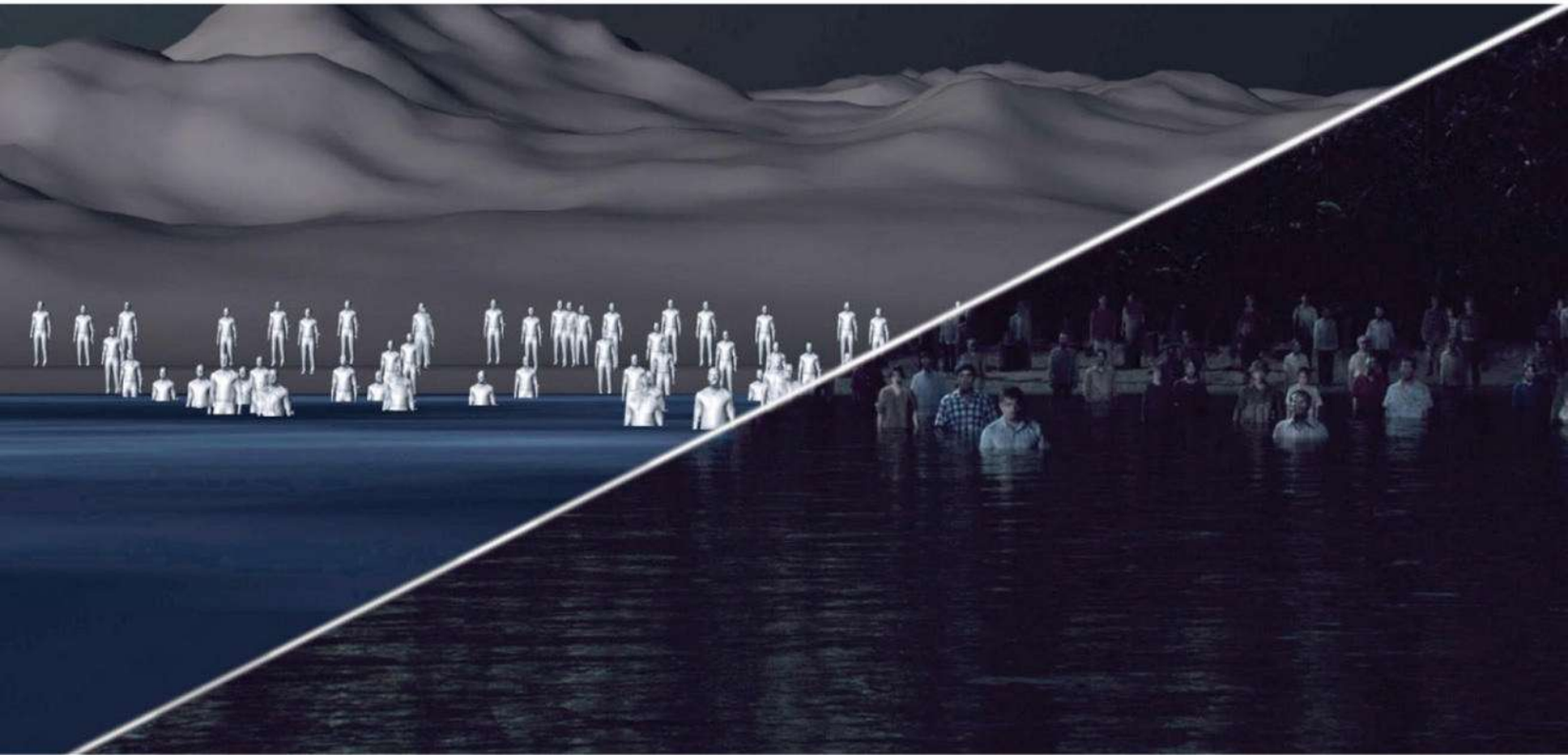


"THERE WERE ALL THESE LITTLE COCKROACHES HIDDEN HERE AND THERE, ESPECIALLY IN THE BEGINNING"

Chad Wanstreet, visual effects supervisor, The Sympathizer

Above: A combination of body doubles and head replacements were used for the drug-infused lounge gathering of the Auteur, Congressman, Professor and CIA spy Claude

Right: A remote-control alligator head was replaced by a CG version created by Ingenuity Studios



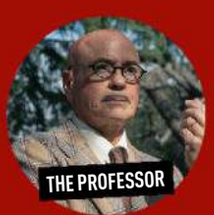
This specific transition leads into one of the most complicated scenes to execute. "This would be the moment when the Captain and Bon finally get on the plane in the Saigon airport escape sequence," says Park Chan-wook. "The actual filming had to be done with a fake aeroplane that only had the tail reproduced, and Chad and his team not only drew the entire plane, but had it take off. This was how we created what is probably the most important moment of the entire show, that could never have actually been shot due to issues of costs, time and cast safety."

Footage is literally rewound to illustrate that the recollection of a particular memory has been altered. "We originally were going to do that in visual effects, but our editor Vikash Patel came up with a treatment," says Wanstreet. "He was the editor for Episodes 101 and 102. We were happy not to have to do that! Any shot that was VFX, we'd deliver back to Company 3 and they had the treatment as set up by Vik and the rest of our editorial team, and they'd apply that onto the visual effects shots. There were drop frames and mixing in all sorts of fun stuff."

Another non-visual effect was the Happy Burger sign. "It was so cool," Wanstreet adds. "There was talk that, 'Maybe you're going to help with that.' But I showed

FACING OFF

Because of the interaction required between the Congressman, Claude, the Auteur and the Professor, the lounge scene required body doubles and face replacements



"Robert Downey Jr. would get into his one prosthetic and we'd scan him right before he showed up to set, because we were setting up for the lounge, which is when you've got four different escorts and Roberts, and Captain as well," Wanstreet explains. "Two days before we went into the lounge with the body doubles and matched hair as much as we could. That was one of the big things we talked about with hair and makeup: getting hair and everything around the collars to match as much as possible as we wanted a minimal footprint.

"The thing we didn't anticipate and talk about in a concept or production meeting was that director Park would ask us to have one of the Roberts with a face replacement lick whipped cream off of one of the escorts. Then they also wanted one of the escorts to be rubbing the bald head of the Professor. We're used to seeing face replacements and it's always this bespoke thing. Someone comes in and it's a face replacement. You know it. Granted, by doing it this way, having her rub her hand all over, there's all of the roto and mess that made for a more difficult shot, but that helped us to blend it more."

Above: The rotating Happy Burger sign was done practically

Right (L-R): Certain signature landmarks were digitally inserted for the farewell tour passing through downtown Saigon

Bluescreens were pivotal in being able to achieve the desired environmental scope

Getting the proper reflections for the fireworks was a complex task

up that night to film and there it is, sitting there spinning and I'm like, 'No way!' Donald Burt, our production designer, and his whole team crushed it."

Upping the ante was not only having Robert Downey Jr. portray five characters alone, but the two scenes where they all interact with one another. Split screens and table markers were favoured for the steakhouse scene that essentially takes place inside a booth. "The booth was just split screens," remarks Wanstreet. "We filmed the one, he would do his lines, then he'd go away and we'd set up for the next one. We'd do a pan and scan essentially between."

Backgrounds were shot to make sure there was always movement in the image. Wanstreet adds: "We might track with a waiter who was behind them, whereas with a conventional split screen you'd divide it and nothing is going on in the background, but we wanted them to be more elaborate."

Because the story takes place in Saigon and Los Angeles, a lot of research went into what the Hollywood Sign looked like at that time. "There was this PDF I found that had all the specifics and walked through the entire thing," explains Wanstreet. "We wanted to try to match neighbourhoods and historical elements. The sign repeats again and again.

"As far as Saigon, that was a lot of small augmentations to plates that we'd shot in Thailand. You saw power lines and a lot of cables in photography from Saigon in 1975, but it's not like the internet stuff right now that are wound into these tight balls everywhere. Even when we were augmenting and adding, one or two building colours had to be changed because there's a different stylistic vernacular from the French-colonised Vietnam and Saigon versus Bangkok. We tried to film as much as we could in locations that looked more French, but even within that we wound up with tiny tweaks all over the place."

For flashback scenes between childhood friends Captain, Bon and Man, California doubled for Vietnam. "There were little visual effects in that," states Wanstreet. "The rain and plants we filmed were practical, then the hamlet where it was being filmed at, that actually wound up in Santa Clarita. We had the good fortune that it rained and rained and then it snowed, which caused us to shut down for a day. But the end result was that it was uber green, which looks more Vietnamese than what you'd traditionally see in Santa Clarita. A lot of that, fortunately, with specific camera direction played as is, with some minor augmentation and whatnot. Don Burt brought in palm trees and all sorts of crazy stuff out there."

Making things difficult was the Covid pandemic, which caused post-production to last longer

REFLECTION OF TROUBLE

Complicating the Saigon escape sequence even further was the thematic importance of reflections

"The predominant thing in this show was reflections and wetdowns," reveals Wanstreet. "We see it every time we shot at night. It's always wet, they're always playing low camera angles, and there's always all of these reflections. Then we took that after we'd filmed and that became a dominant element when we got into the tarmac scene in Episode 101, because when we shot it, it was a dry tarmac. We couldn't possibly wet down that entire thing, not without a lot of time that we didn't have. Time wasn't our friend. When we started back up in post that became the dominant element we wanted to work out: how do we add a wetdown that doesn't exist to seven minutes of visual effects shots so that we could see these flares, people reflecting on the ground, and it retains the same visual language as the rest of the show?"

EXPLOSIVE AUTHENTICITY

Spectacular effects can't be avoided when depicting war

Above: The most complex visual effects sequence was the tarmac escape that occurs in Episode 101

Below: Practical explosions were incorporated into digital ones, but for safety and art direction, explosions close to the actors were made digitally

"When we went to the premiere and watched Episode 101, Hoa Xuande was there with his mum," states Wanstreet. "At the end she goes to him, 'Honey, how are you safe with all of those explosions going off around you?' He says, 'Mum, that's all visual effects, none of that happened. They'd never let me near that.'

"There were a lot of simulations we did setting stuff up, so we had a variety and were able to place and set dress with explosions. Normally we set dress with boxes and debris, but this scene's dominant elements are explosions, dust and debris. You're placing them all over the environment all the time. That was something we had to establish the look of. We wanted them to be as authentic to 1975 as possible in that there's more fire than typical for a mortar. Whereas the explosion in Episode 104 is more traditional propane poppers, and we'd done practical elements that were used as reference and even stuffed them into the CG explosions."

"WE HAD THE GOOD FORTUNE IT RAINED... THE END RESULT WAS THAT IT WAS UBER GREEN"

Chad Wanstreet, visual effects supervisor, The Sympathizer

than originally intended to produce the 1,200 visual effects shots by Ingenuity Studios, Zoic Studios, Barnstorm VFX, Yannix, Incessant Rain Studios, BOT VFX, Mr. Wolf, Pidantic VFX and Van Dyke VFX. "There's a lot of casting," remarks Wanstreet. "For the tarmac, we wanted only one vendor working on that and it to be its own bespoke thing.

"We bookended the series so one vendor was working heavily at the beginning and another heavily at the end. Ingenuity Studios did the beginning to the middle, and Barnstorm VFX picked up the finale and into the middle as well. Barnstorm did some of the explosions in Episodes 104 and 105 with Hoa Xuande flying through the air. Then the explosions in the beginning were Ingenuity, as well as the theatre blowing up. All of our creatures or little characters like alligators were Ingenuity; they did a great job of that stuff."

The egg shot was fun. "When Claude picks it up and eats it, that's one of my favourite subtle shots," admits Wanstreet. "There's a ton of detail and people won't look at that and think, 'That's a visual effect.' Putting it into the guy's throat, adding it in there, and he spits it out and it comes flying across. All the little details and getting it to wobble correctly. I thought the animation was great. Barnstorm VFX did a great job. It has that off-balance look and effect that was wonderful."

Images courtesy of HBO

The Pipeline

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

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TURN A 2D CONCEPT INTO AN INCREDIBLE 3D-PRINTED FIGURE

Concept artist **Emily Chapman** shares her process for sculpting, printing and painting an outstanding model to put on display

AUTHOR

Emily Chapman
Emily is a freelance concept artist and illustrator specialising in creature and character design. She works in a range of mediums such as digital painting, 3D and traditional pencil drawing.
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Working as a freelance creature and character concept artist, my main passion is bringing imaginative sci-fi and fantasy designs to life through 3D sculpting, sketching, and digital painting. I'm excited to share my hands-on learning experience, which blends all of these skills into an intriguing and interactive compilation.

In this tutorial, we'll explore the journey of turning a 2D concept illustration into a fully realised 3D figure. My starting point was a bust that I'd previously sculpted as a standalone piece before realising the potential to push it further, envisioning a more intricate and larger-scale artwork. This decision set the stage for our workshop, where I'll expand on how to create a more complex and aesthetically pleasing statue.

First we'll delve into sculpting. I'll walk you through my brief-but-useful process for refining and detailing the sculpt, showcasing techniques that enhance realism and depth. We'll touch up on various tools in ZBrush that I enjoy using to shape our sculpture with precision and creativity.

Next, we'll move on to 3D printing, where the digital design becomes tangible reality. We'll explore the use of both clear and grey resins, discussing their properties and how they impact the final outcome of the 3D print. You'll gain insight into my printing process, including how to prepare a model and troubleshoot any issues that you may run into to improve the success of your print.

Once we have our printed pieces, I'll show you how I like to paint 3D prints. I'll demonstrate how to use alcohol inks on clear resin, and how acrylic paints can bring life and vibrancy to your physical designs. I also want to share some personal techniques I use to achieve realistic textures, dynamic colour schemes, and intricate little details that will elevate your piece.

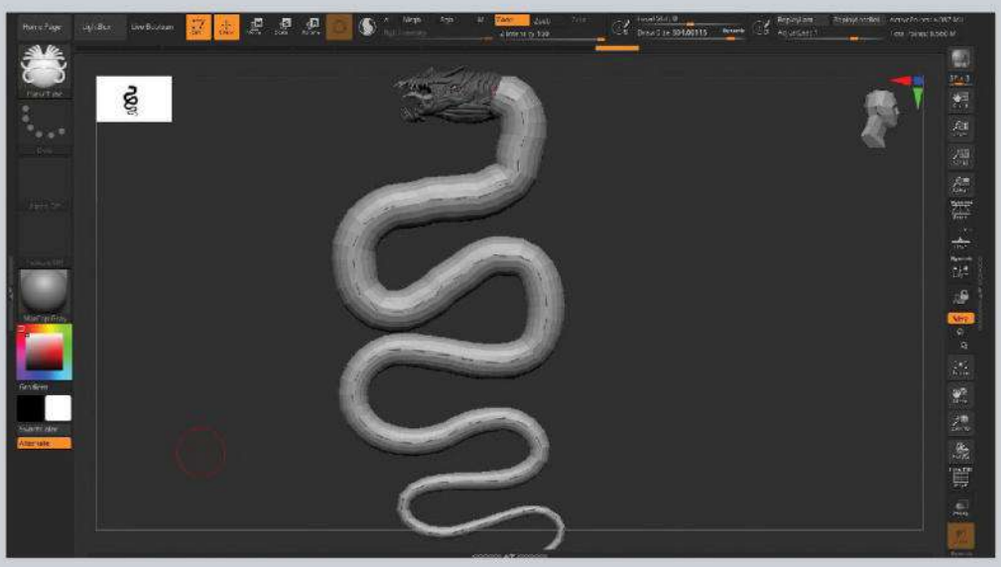
Hopefully this will give you inspiration and further your own knowledge to take your individual creative projects from concept to completion. Whether you're an aspiring artist or a seasoned creator, this session should equip you with a practical approach you can apply to your own work.

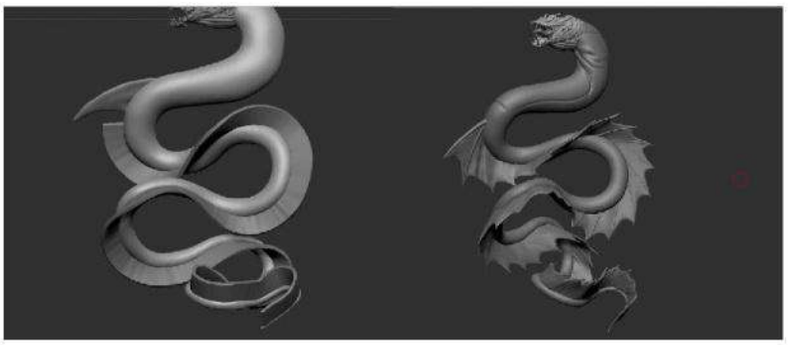
DOWNLOAD YOUR RESOURCES
For all the assets you need go to
https://bit.ly/3dworld-thewildrobot

SEA SERPENT
Emily's detailed serpent statue began it's life as a piece of terrifying concept artwork

01 BEGIN WITH BASIC SHAPES

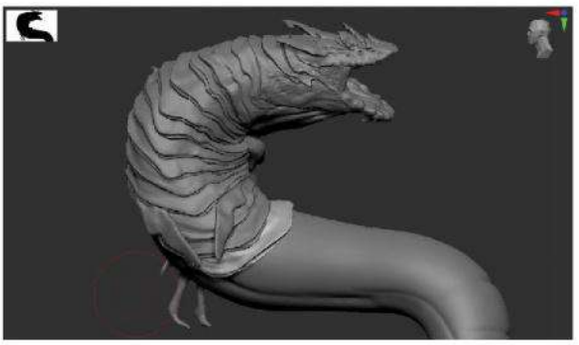
Referring to our original concept illustration, we need to match the flow of the serpent's body with a basic shape. The best brush for this would be the Curve Tube brush with a tapered end. Draw the curve shape beginning from the base of the bust, following a similar shape to the reference. Once you're happy with the shape, DynaMesh the SubTool at a low resolution to help move the object easily, as we now need to push and pull the 'S' shape with the Move brush to improve the turnaround angles.





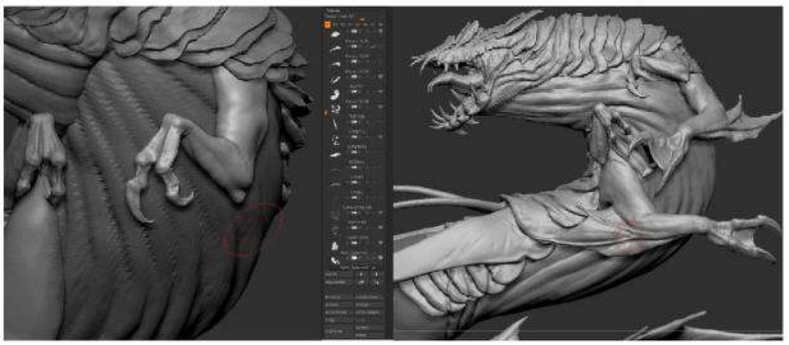
02 EXTRACT THE TAIL FINS

We'll use the Extract tool for the fins. Subdivide the body to add more resolution, then use the Mask Pen brush and paint a solid line for the top of the fin. Press Extract to preview it and experiment with the sliders for thickness and length. DynaMesh to a low resolution that keeps the shape recognisable. Add the spines by inserting a sphere or cylinder SubTool, then sculpt and duplicate it down the body. On the extracted fin, use the Move brush to gently push between the spines to create a wavy look. Repeat for the underside.



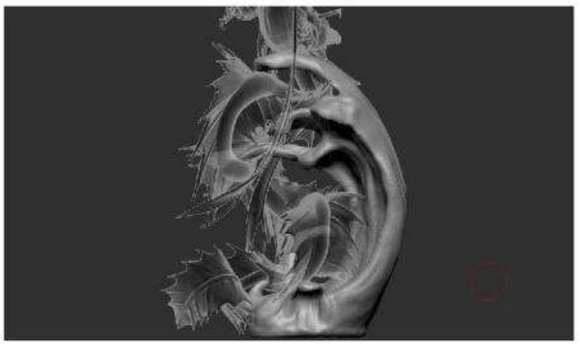
03 DESIGN THE PLATING

With the Dam Standard brush, we can sketch in the section on the body where the serpent's plating will go. When you're satisfied, paint in a section on the body using the Mask Pen brush that represents a similar shape to the scales. Use the same Extract process as the fins, DynaMesh and subdivide to then sculpt details. Duplicate them along the back of the body.



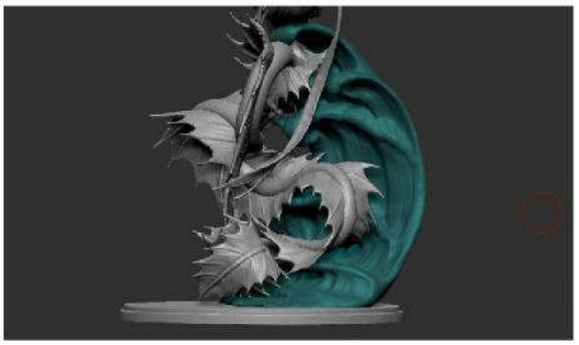
04 SCULPT THE EXTREMITIES AND MERGE

Insert a new SubTool and start sculpting each arm. When the limbs, plating and other extremities are done, we'll merge everything into one mesh. Duplicate every SubTool as a back-up, then merge your pieces into one SubTool and DynaMesh at a relatively low resolution. Subdivide a few times and use the back-up SubTools to project the details onto the newly merged body. Fix any small issues and sculpt in any missed details. It's usually best to isolate the projection area by masking, then inverting the mask.



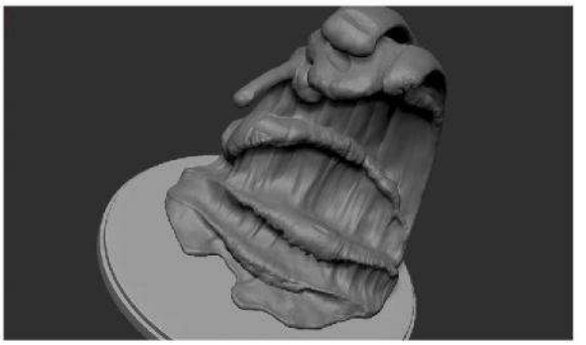
05 BUILD A BASE

Since this piece is being made for 3D printing, we need to design a supporting base for our creature to be displayed on. As this is a sea creature, a large wave felt like the best support design. Insert a new SubTool, then sculpt in a loose wave shape, using the body of the serpent in the transparent Ghost mode as a guide to see where the waves need to be placed to hold it.



06 CREATE DETAILS

Using references of real-life waves, use the Move and ClayBuildup brushes to sculpt a structure that represents the look of a convincing wave design. Think about how this will look 3D printed, and how you would want to paint it. This always helps me figure out how far to push the details, or whether I keep it fairly simple so it can support the overall aesthetics of the piece.

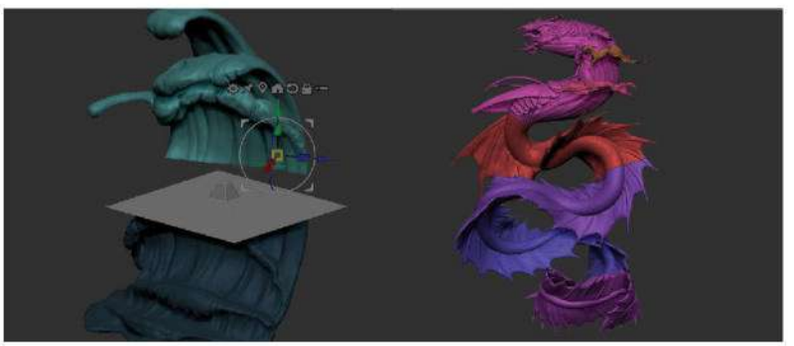


07 SET UP THE BASE WITH BOOLEANS

To make sure our serpent fits on the base in a snug fashion, we can use the Live Boolean tool to make dents and cuts into the wave for the body to sit in when printed, using our serpent as the 'cutter'. For all our pieces to be stable, we must include a standard base shape. Insert a cylinder SubTool and create the main base the same width as our serpent, which the wave will be placed onto.

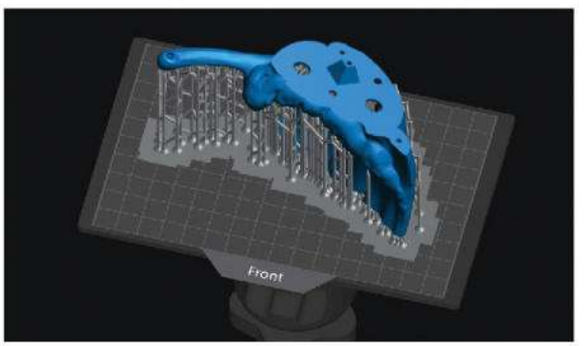
Calibrate your resin printer

Make sure to calibrate and test your printer when switching between resins to figure out correct exposure time with the Resin XP2 Validation matrix model. Clear resin seems to work better with faster exposure time as it can get overexposed easily. A room's temperature can affect this.



08 SPLIT UP THE MODEL AND CREATE KEYS

Think about how the objects will be printed, which parts would be best as individual sections to ensure minimal print failures, how they'll fit on the base plate, and which resin will be used for each part. The waves will be cut and keyed into three sections as it's a large shape. Use the Live Boolean tool during this cutting process, using a SubTool key that will cut the male and female keys simultaneously. For the serpent, since the tail is winding, it's best to slice into multiple parts, focusing the cuts on the apexes of the bends.



09 PREPARE FOR PRINTING

Let's focus on getting each SubTool right for the printing phase. Load a SubTool into Chitubox, for example the midsection of the wave. Since this piece is fairly large, it could end up being too heavy for the supports, so we must hollow it out. Add drainage holes at the top and bottom so the resin can pour out. Smaller, lighter pieces are fine to be printed as solid parts.

10 HOW TO USE CLEAR AND GREY RESIN

As we've previously determined which parts of our prints will be in certain resins, it's best to stick with one resin type at a time and print all the pieces you want in that resin first. The whole wave and 90 per cent of the serpent will be printed in the clear resin, as we want that transparency for the fins. Clear resin needs less projection time as it can overexpose easily, so be sure to do a quick test print first. After your clear prints are done, empty and clean out the vat and switch to the grey resin, which is less temperamental.

11 CLEAN AND CURE

After each print, make sure you clean off any uncured resin using isopropyl alcohol (IPA), and always use gloves to handle your fresh prints. I like to use a toothbrush during this process to get into any awkward or small spaces. Gently pull and press off the supports, being cautious around any delicate areas such as the spines or arms. Dry off any excess IPA using a paper towel, then cure each piece with UV for five or more minutes to make sure the resin fully sets.

12 SAND AWAY IMPERFECTIONS

Print supports often leave slight imperfections, as they're actually embedded into the print itself. Paired with clear resin, these can be even more of an issue as slight overexposure can make the imperfections more noticeable or harder to remove. With fine-grit sandpaper, gently sand away these support bumps while being careful not to get rid of too much detail. Sometimes the resin can shrink, expand or overexpose and the keys sometimes may not fit flush together, so use a dremel or engraving pen to sand them down.

13 GLUE THE PIECES AND FILL GAPS

Think about which pieces you want to glue together and paint as a whole. For instance, the tail would benefit from being painted as a full piece to keep its colours consistent. Where pieces connect, there may be gaps we need to fill with acrylic filler to smooth things out. Use IPA to thin down the filler. Using opaque filler on the body is fine as it isn't going to be transparent.

14 PAINT IN ALCOHOL INK

As we want to keep the fins and the wave support translucent, alcohol inks are a better choice to colour clear resin rather than acrylic paint. There's also no need to prime clear resin, as the alcohol inks immediately take to it. It's always best to build up to a stronger, darker colour, so use IPA to dilute your alcohol ink and do layers of washes over the resin. Start off with the paler colours first and then slowly add more concentrated ink to get a bolder, deeper shade. Once the inks touch the resin they can't be removed, so be extra vigilant here.

15 PRIME FOR ACRYLIC PAINTING

Use a white primer spray paint for a single coat on your grey resin print to prepare a base for the acrylics. On the clear resin tailpiece we can use white acrylic paint for a base layer on areas that will be opaque, such as the body of the tail and spines. This also helps the opacity as we want to differentiate between the translucent fins and the body. Spray paint a colour of your choice for the base.

16 DETERMINE INITIAL COLOURS AND WASHES

It's usually best to begin painting anything that will be internal, so start with painting the mouth area since it will be the palest part and can be harder, and more of an issue to fix any stray paint flecks. Make sure to use references of real-life creatures, especially ones with similar mouths as our creature such as crocodiles, other reptiles and fish. Once the mouth is mostly finished, we can wash the body with thin layers of paint. Diluted paint washes can help pick out the peaks and valleys of the sculpt for its ambient occlusion.

17 PAINT IN LAYERS

Paint gradually for more control of each layer. Start with paler shades and determine if you want a gradient in certain areas. Save the darkest shades for last. Parts of this serpent are bioluminescent, so paint a thin, light wash of the colour over areas the light would be reflected after the previous layers are dry, and repeat until you get the desired look. Paint over that area again with a thin layer of a deeper pigment for more saturation. Using minimal paint and no water, you can also dry brush a light tone over the scales to create highlights.

18 GLAZE AND CLEAR COAT

We can now clear-coat our pieces for protection and aesthetics. Make the supporting wave as realistic as possible by spraying with a glossy clear coat to push the specularity with a wet look. After the clear coat has dried, paint on the white foam and breaches for crashing waves, as the roughness of the acrylic paint will mimic the foam. Clear-coat each piece of the main serpent as well.

19 ASSEMBLE THE PIECES

All our pieces are complete, so it's time to assemble the sculpture! Super glue is probably the best choice of adhesive as it's strong, quick-drying and doesn't string or bulge out of the sides. It's best to have the support structure intact first, so figure out the best position for the wave and glue it in place. Add small amounts of glue to each piece of the body and attach them as needed. Give this a moment to dry and solidify, then glue the full serpent piece to the wave support. It's best to glue the smallest fins and extremities to the body once this has been set in place. •

CANYON ABSORPTION
Romain put his imagination in control when creating his canyon scene

GAEA | BLENDER | QUIXEL BRIDGE | ADOBE LIGHTROOM

CREATE A CANYON ENVIRONMENT

Build a stunning desert setting with an expert walkthrough from **Romain Eboli**, who uses high-quality Quixel assets

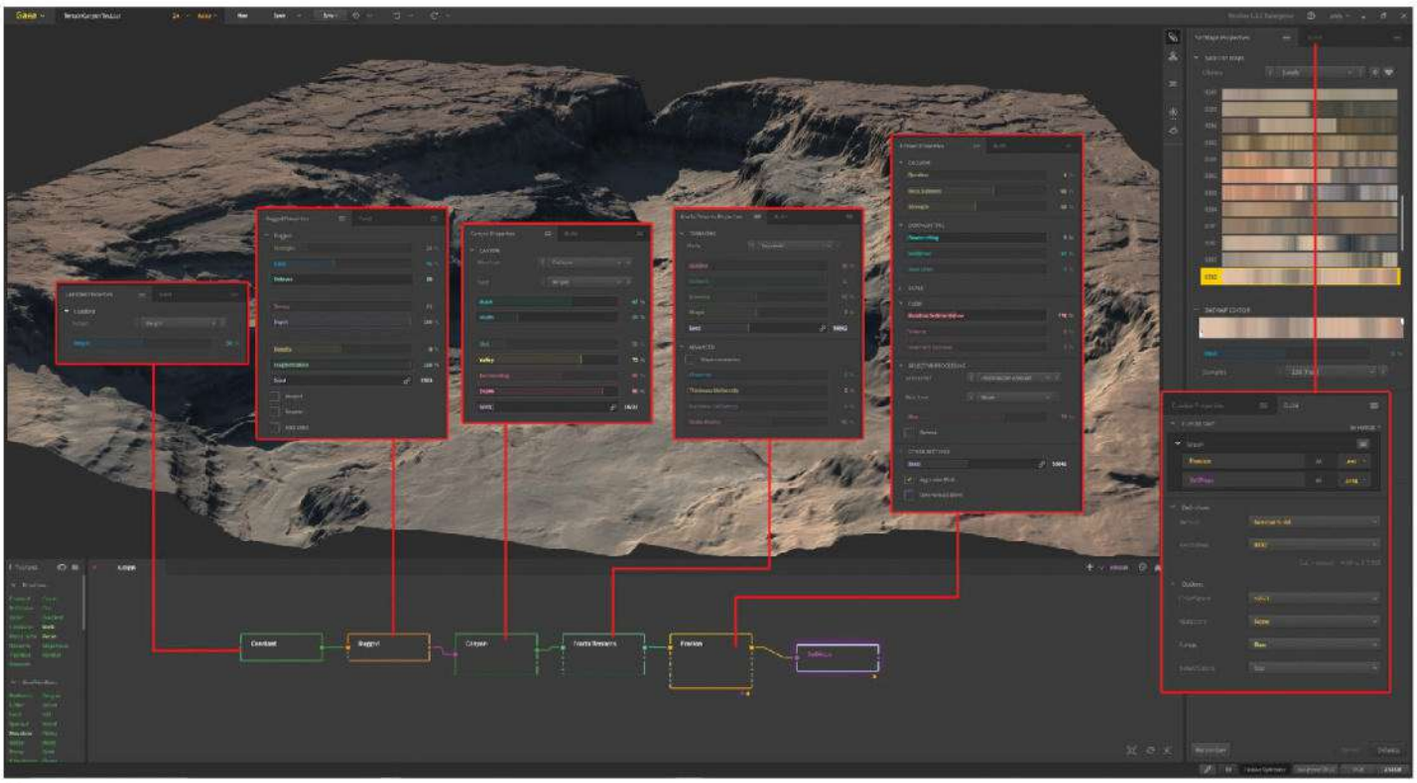
Becoming a successful 3D environment artist has been my goal for a long time now. After a few years of testing, technique research and learning by myself, I've been able to use several different workflows to get the results I'm looking for.

In this tutorial, I'll introduce one workflow that I use regularly to create my environment art, which I've titled Canyon Absorption. The workflow will facilitate your way to achieving a great aesthetic result. After that, you should be able to understand and master several aspects of creating environments in Blender including volumetrics, scattering and plenty more.

We'll mainly use Blender, plus Gaea and Adobe Lightroom. Although they're not free, there are always alternative ways that allow you to achieve similar end results. Another of my favourite tools is one of the most practical: Quixel Bridge. It's a library rich in materials, assets and more, but above all it's free. Bridge's arrival has undoubtedly revolutionised the 3D industry.

DOWNLOAD YOUR RESOURCES
For all the assets you need go to
https://bit.ly/3dworld-thewildrobot

AUTHOR
Romain Eboli
Romain, also known as Geepeg, has been practising 3D creation for several years, working in various media and bringing ideas to life.
geepeg.art



01

More options for terrain

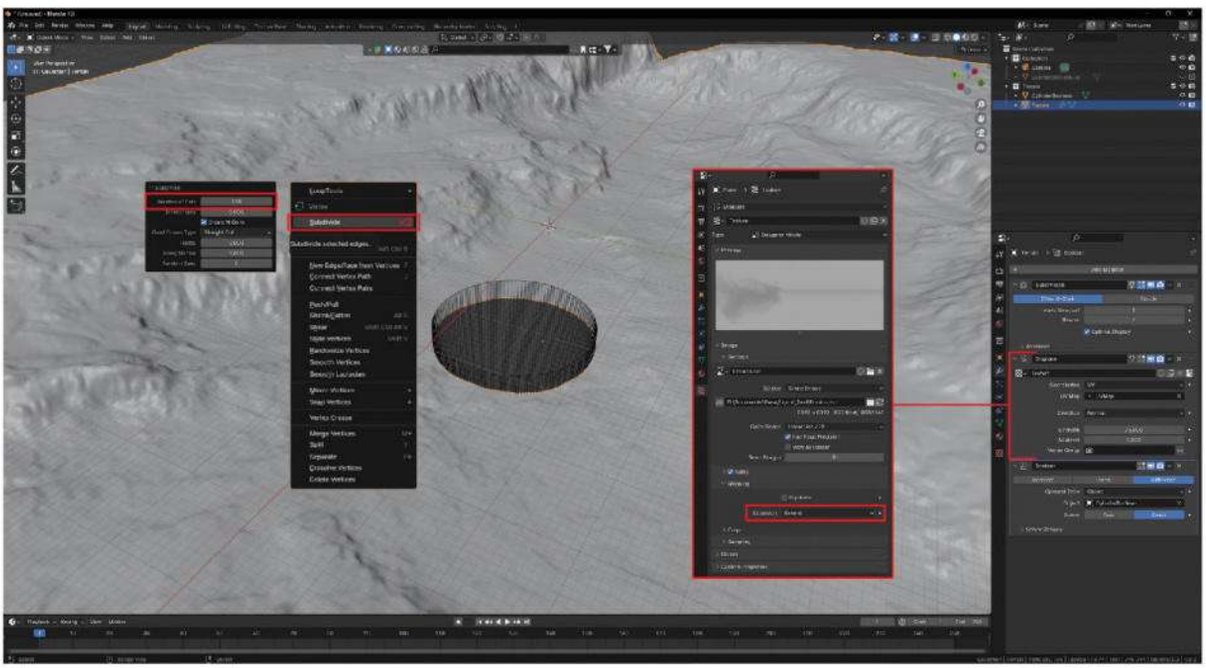
There are several methods for creating a terrain without Gaea. The first is to use Displacement maps from sites such as the ArtStation Marketplace. You could also combine the Landscape and Sculpt tools in Blender, which enables you to sculpt the terrain according to your ideas, though this requires patience and technique.

01 SET UP DISPLACEMENT USING GAEA

Gaea is great when it comes to creating realistic and detailed environments quickly. You can get a starter terrain with little knowledge of the software by going with presets and tweaking each parameter according to your needs. Once you're satisfied with the terrain, you have to export it as an EXR with a Displacement map by pinning the last node before the SatMaps for export. Next do the same thing for the SatMaps in a PNG, which we'll use to add detail in Blender. If you don't have Gaea, you can download my files from the **3D World** resources to follow along.

02 DESIGN THE TERRAIN

Over in Blender, you'll need to create a plane and scale it according to your needs – x115 for this tutorial, and don't forget to apply the scale – use enough subdivisions to get a good displace result, and add a Subdivision modifier to boost the quality on the final render. Now you can add the Displace modifier, import the map made in Gaea, and increase the Strength as needed. To create the hole in the terrain, use the Boolean modifier and a cylinder with around 256 vertices to maintain good quality.



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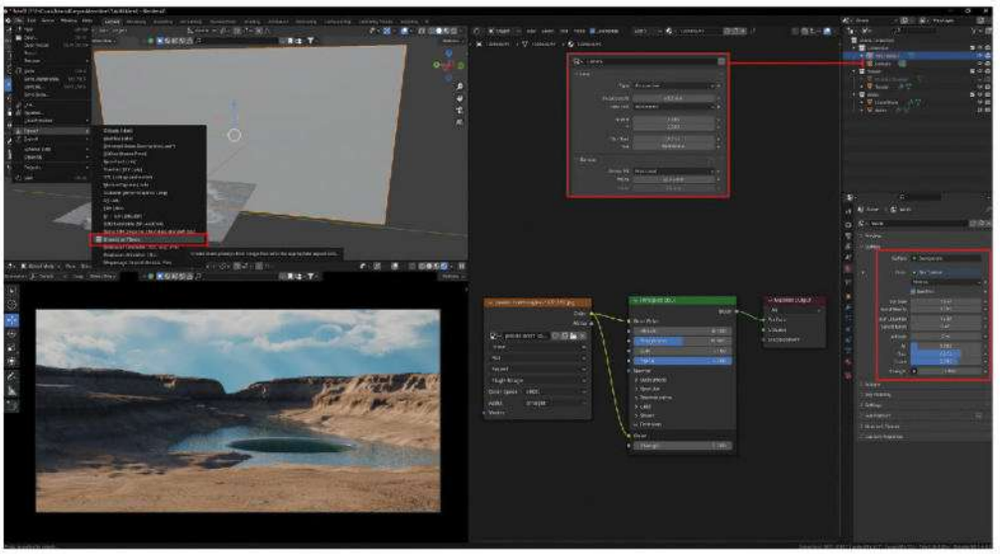

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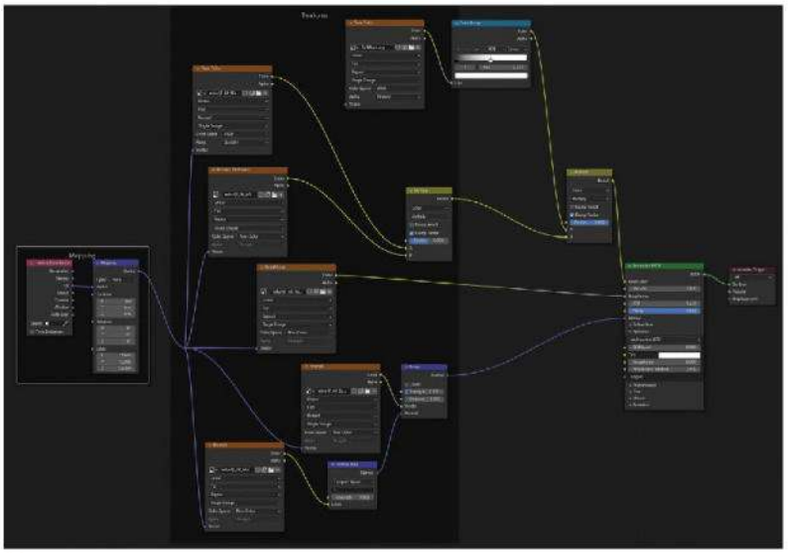
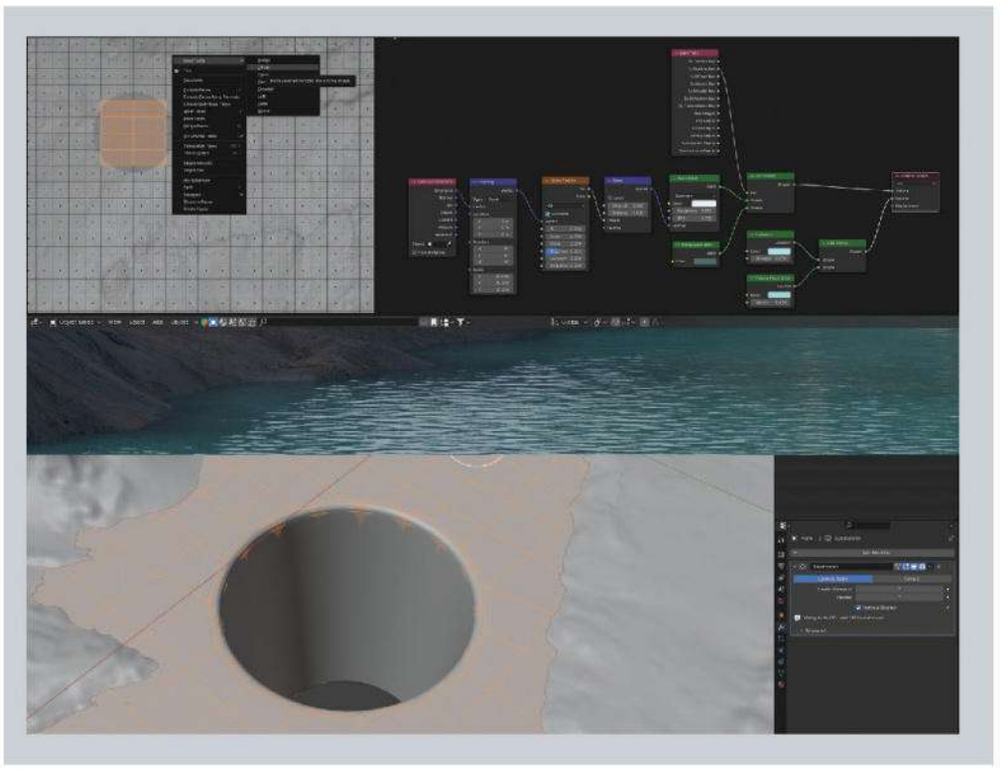


04

SatMaps alternative

If you don't have a SatMaps node to improve the terrain material, you can use a Color Mix in Multiply mode, add a Hue/Saturation/Value node to your Base Color then plug it into A, and plug the Base Color into B. Next link a Noise texture into a Musgrave texture and a Color Ramp, then plug it into the Factor of the Multiply.



05

03 CAMERA, LIGHTS AND BACKGROUND

Use Blender's Sky Texture to create the lighting, setting the elevation and rotation of the sun and then adjusting its intensity. The Dust and Ozone parameters can help change the overall mood of the lighting. Next, place the camera in the desired viewing angle without forgetting to define the image size; for a large scene you also have to increase the Clip End in the camera settings. For the background, we'll import a sky image using the 'Image as Planes' function and plug it into the Material Emission.

04 TEXTURE THE TERRAIN WITH QUIXEL BRIDGE

Adding the terrain material is a fast step because we can use the Quixel library for the main texture. Download Quixel Bridge, go to the Surfaces category and type 'Canyon Sandy Mud' in the search bar to find the texture I used. Choose your resolution – I chose 4K – and for the download settings pick Albedo, AO, Bump, Roughness and Normal. Plug the maps in as seen in the screenshot and use the SatMaps node to mix it with the terrain's Base Color, which enables us to add details and break up the texture tiling.

05 ADD THE WATER MESH

Create a plane that covers the surface where you want there to be water and add subdivisions, then go into top view and activate X-Ray mode. Select the quads on top of the hole, then right-click and choose LoopTools>Circle. Adjust the circle for the hole and extrude it downwards, then delete the face and bevel the hard edge. Now add the Water shader provided in the tutorial files. Finally, duplicate the mesh you just created, put it below the water, scale it a little, and apply the terrain material.

06 SCATTER PLANTS

I use the Botaniq library add-on for the plants, but you can use your own assets. To place these we'll use the free Gscatter add-on. Select the terrain in the Emitter box, then select all

your assets and click 'Scatter Selected'. To define the areas you want to add the plants, create a vertex group on the terrain and select the desired surface. In Gscatter, click Add Effect Layer then Weight Mask to add your vertex group. Now you can play with the Density, Scale and Rotation, as well as the seeds.

07 CREATE VOLUMETRICS AND A WATERFALL

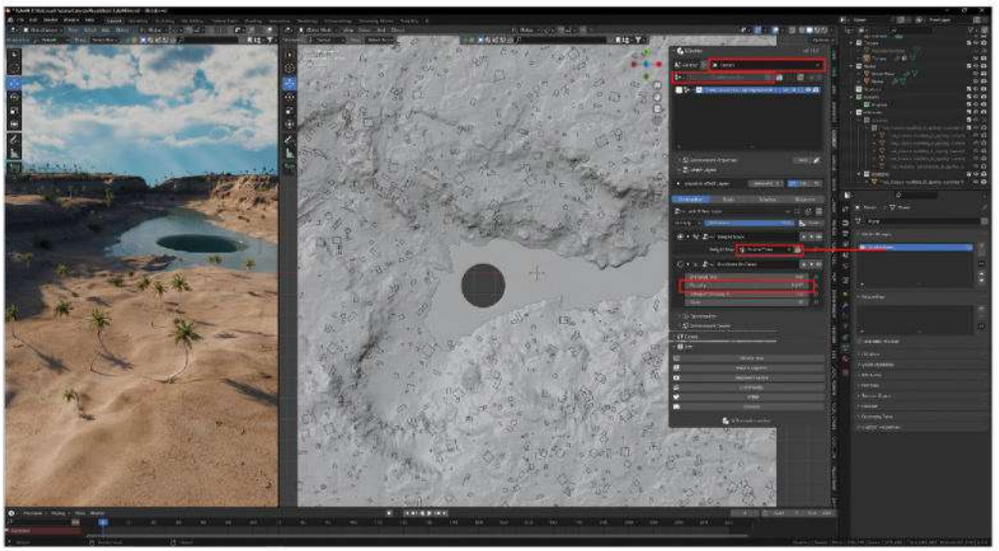
There are two methods I use to add volumetrics into a scene. The first involves a box with a Volume shader using the Volume Scatter node, while the second uses a cloud image for the background with an added alpha to make it transparent. For the waterfall we can repeat the second technique with a waterfall image, then add subdivisions to the plane and deform it to match the shape of the hole. You'll find all the images and shaders in the resources.

08 ADD THE FINAL DETAILS

Let's add details to make the scene more lively, such as trees in the foreground for more depth in the shot, mountains in the background, a character and various objects. You can also play with the camera's depth of field and improve the terrain in the foreground with Quixel assets. For the tube, use a Bezier Curve then increase the Bevel Depth and Resolution.

09 RENDERING AND POST-PRODUCTION

For the render, set the Max Samples to a figure like 2048 or 4096 and turn on the Denoise. Increase the Max Bounces in the light paths to 32 and the Transparency to 100. We'll do a little post-production too. Import the final render over to Lightroom and play around with the Vibrance and Saturation, then adjust the Exposure and Contrast, and add sharpening and texture for extra impact. All these little settings help to give more aesthetics to the final render. You can use any free post-production software to achieve this, but the difference for me is that I save my presets in Lightroom for future renders. •



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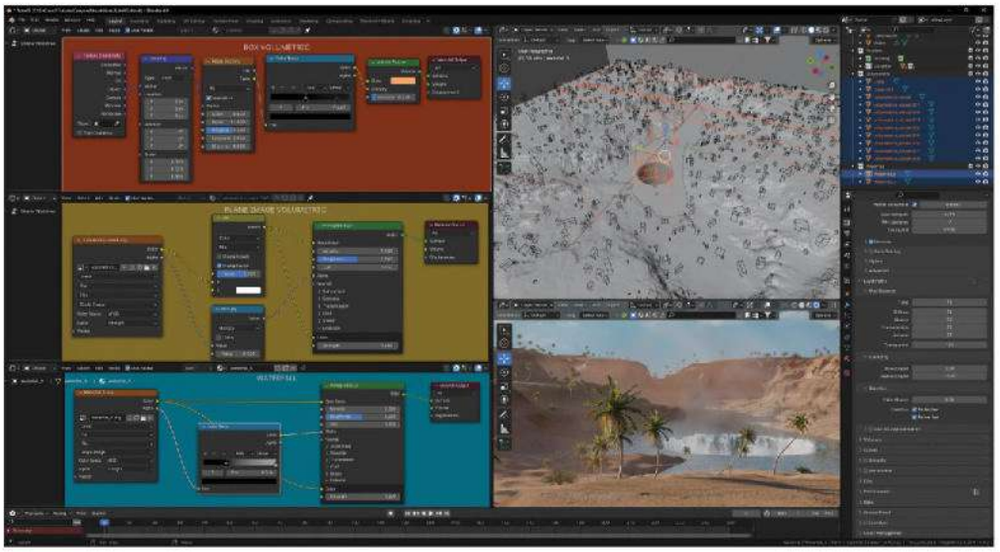
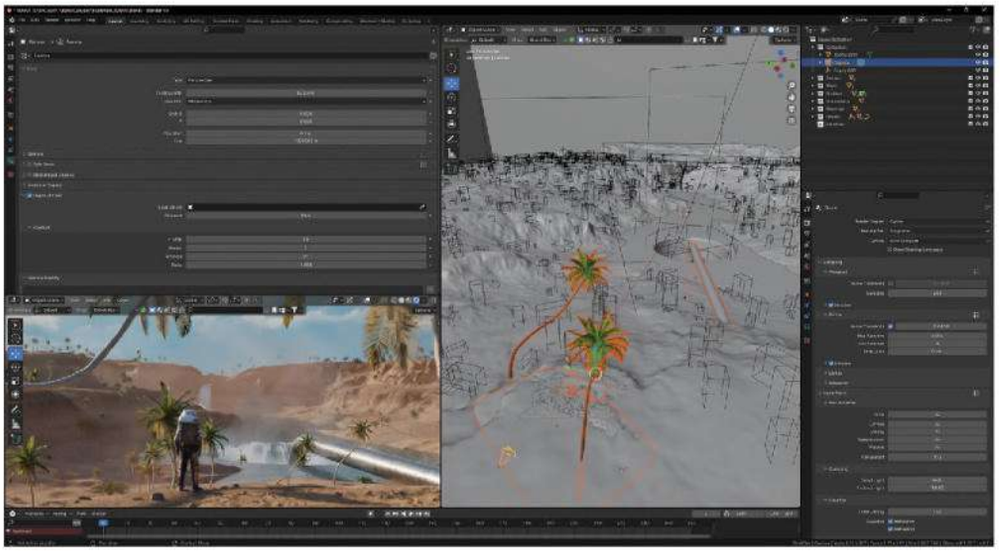


07

"QUIXEL BRIDGE'S ARRIVAL HAS UNDOUBTEDLY **REVOLUTIONISED THE 3D INDUSTRY**"



08

09

Technique focus

Incredible 3D artists take us behind their artwork

DISRUPTIVE 2D LAYER EFFECTS

I'm passionate about the 3D hand-painted technique in all of its many forms and styles. Currently, I'm exploring ways to merge those techniques with the disruptive 2D aesthetics and striking designs found in the artworks of Alberto Mielgo and Lisa Parfenova. I just love it when a 3D model gives the illusion of being a 2D concept. I'm also drawn to visual effects such as colour aberrations, bold colour combinations and hue shifts. I incorporate these through the use of floating planes with transparent alphas layered over hand-painted 3D models, a technique I picked up from art directors James Marcus and Matthew Zikry.

Luis Servin
bit.ly/3Zzd8RZ
Luis is an industrial designer and 3D character artist from Reynosa, Mexico.

JUAN THE DIMENSIONAL PIRATE
Software ZBrush, 3ds Max, Maya, Photoshop
Year made 2024


I'M DRAWN TO VISUAL EFFECTS LIKE COLOUR ABERRATIONS AND HUE SHIFTS

FAT BABY BOTO
Inspired by a concept from Fred Rambaud, Mary took advantage of the opportunity to practise Blender and work on her lighting

ZBRUSH | SUBSTANCE 3D PAINTER | BLENDER

DESIGN STRIKING SCULPTS AT SPEED

Learn how to build 3D characters that balance visual quality and efficient workflow with pro advice from **Oh Holy Mary**

AUTHOR

Oh Holy Mary
Mary is a character artist in the video game industry. Her dedication translates into captivating characters perfected both at work and in her free time.
artstation.com/oh_holymary

Over the two years that I've been working in the video games industry, I've increasingly realised just how highly valued it is to work on projects efficiently. That's why I've decided to take some time to perfect my working process.

To enhance my skills, I chose to model the Fat Baby Boto design by artist Fred Rambaud. When I discovered his art, I knew it would be perfect for improving my process. Baby Boto is simple yet impactful in terms of shapes and design. The blend of hard-surface and organic elements also makes it ideal for practise.

The workflow I've developed helps me to create projects so much faster while improving my finishing techniques, which is an equally important facet.

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01

01 BLOCK OUT THE MODEL

In the blocking phase, we need to create our 3D model using basic primitives, which will allow us to save time on details and avoid putting in unnecessary work. At this stage, it's crucial to ensure the silhouette and the overall feel of our character work well. Once we're satisfied with the result, we can apply a DynaMesh and start sculpting some general details, obtaining a rough version of the final outcome without worrying too much about the geometry.

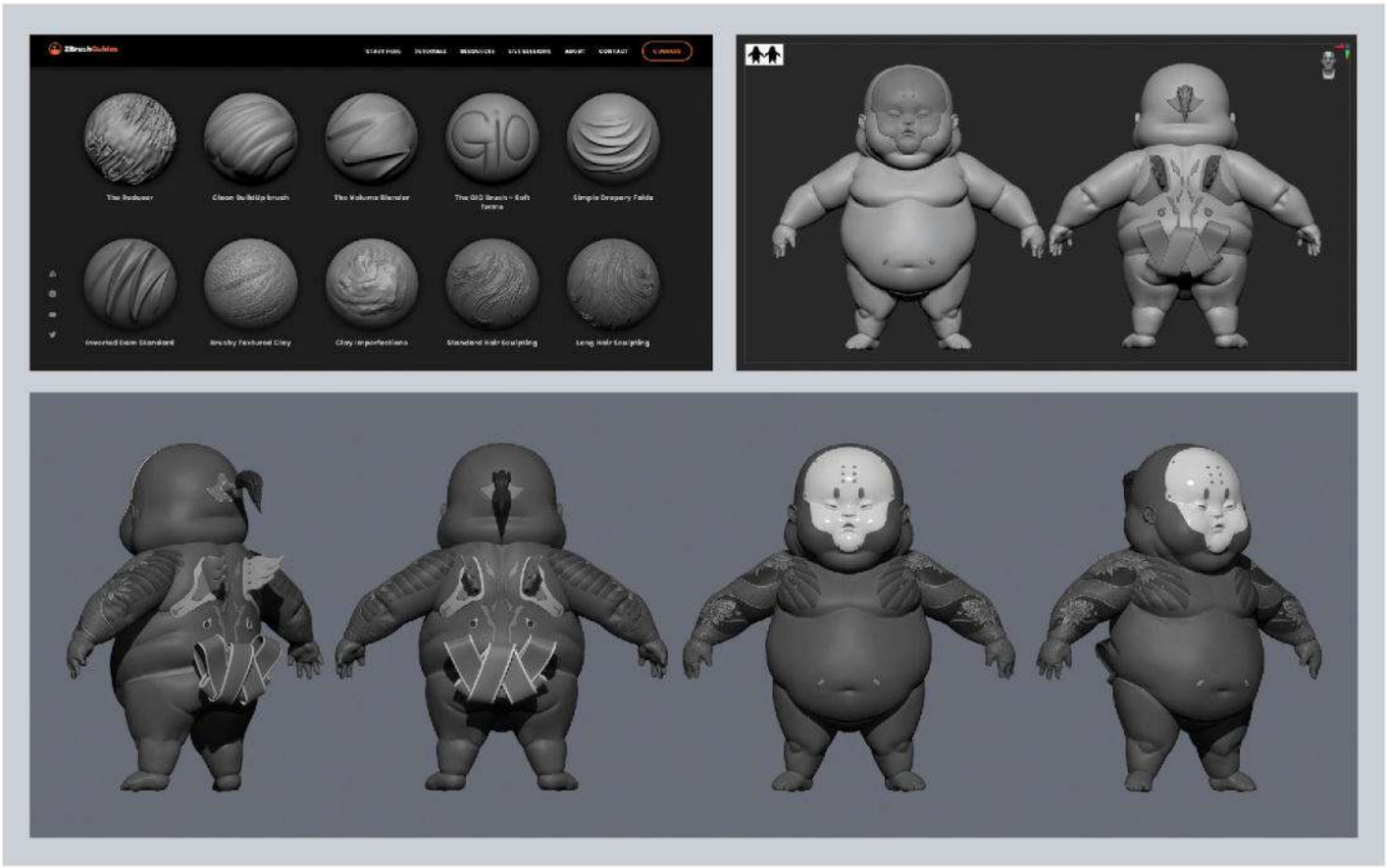
Take control of ZRemesher

To ensure ZRemesher follows a good loop flow, you can use the ZRemesher Guide brush and manually guide the direction you want ZRemesher to generate the topology.

02 CLEAN THE TOPOLOGY

When we're satisfied with our sculpt, we can perform some quick retopology in ZBrush. The most important aspect of this step is to get a good geometry flow and a low resolution, which will allow us to work with subdivisions more easily. This will be especially useful during the posing phase, as it will facilitate masking the parts of the model that we want to move. Once satisfied with the remesh, I usually project my old blockout onto the new mesh to retain the details I created in that phase, but with clean geometry.

02



03

03 SCULPT THE DETAILS

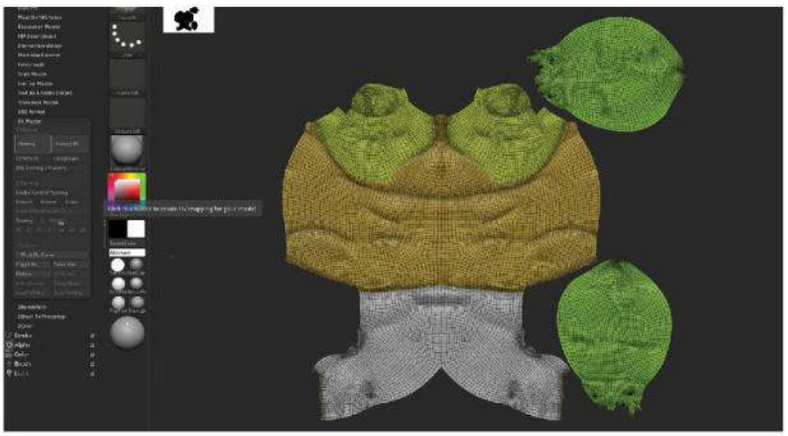
With clean geometry, it's now possible to sculpt details and microdetails using alphas or brushes with high quality and resolution. For this project, the ZBrush Guides brushes, specifically the 'The GIO Brush - Soft Forms', are ideal for creating wrinkles in the skin, as their deeper pinch makes them more realistic. I focus on detailing the parts that will be visible given that, as it's not a real-time model, we can afford not to detail the non-visible areas, such as the back or the legs, when making a portrait.

04 CREATE UVS

I usually generate automatic UVs directly in ZBrush for these types of projects. As long as they work correctly, it's not necessary to worry about the layout since no one else will see it. To unwrap your UVs in ZBrush, go to Zplugin>UVMaster and click Unwrap.

05 MAKE TEXTURES

For the texturing phase, we'll take the model into Substance 3D Painter as it offers more tools than ZBrush and facilitates texture



04

UV process

To open UVs in ZBrush, you need to be in the lowest subdivision you have. If you encounter issues, you can always delete the subdivisions and keep just the lowest one, open the UVs, and once you have them copy and paste the UVs onto the previous model with subdivisions.

05

Get baking
Even though it's not a real-time model, it's important to perform bakes on the character to facilitate the creation of masks used for our textures.

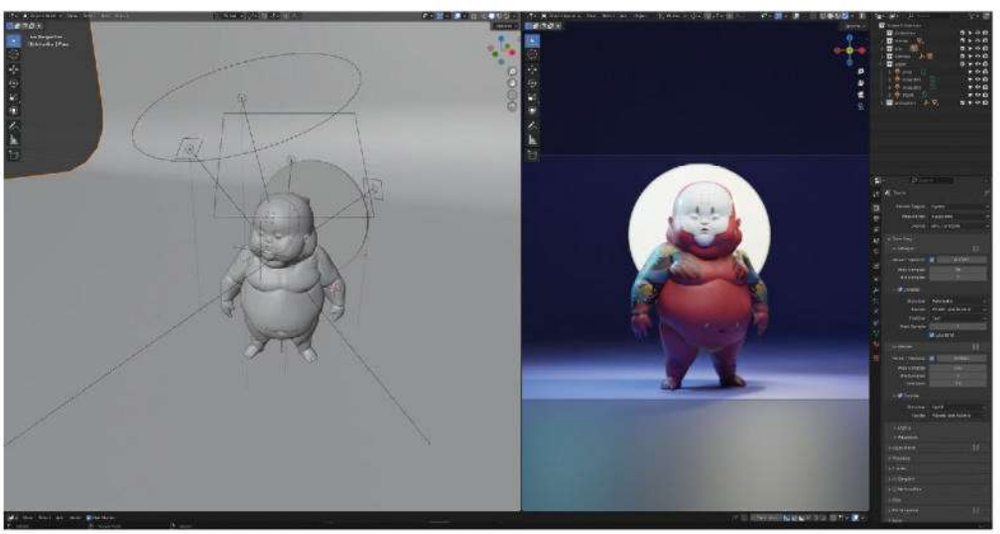
06

> "THE WORKFLOW HELPS ME CREATE PROJECTS **SO MUCH FASTER**"

creation. However, if the model doesn't require extensive painting, you can also Polypaint directly in ZBrush. For tattoos, it's always a good idea to make an initial sketch on a separate layer and then create more precise line-art. This helps speed up the process and avoid unnecessary delays. Once satisfied with the result, we can refine the details using masks and generators so the final render doesn't have a flat appearance on our character.

06 POSE THE CHARACTER

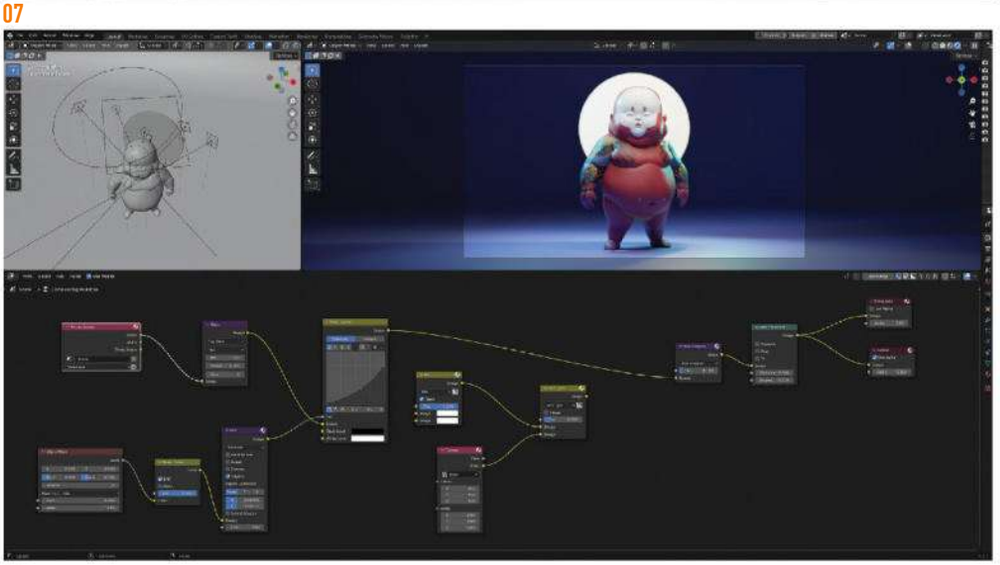
Once we have the textures ready and imported onto the model in ZBrush, it's time to pose. Here it's important to keep in mind how we want the final image to look, as this will make planning the pose easier. We'll aim to give it a dynamic pose to make it more appealing. Usually a three-quarter pose with a slight head rotation towards the viewer works well. This phase is crucial and often undervalued, so don't forget to pose your characters properly, as effective presentation can make a big difference. When we're satisfied with the pose, we can finalise the details to make it more natural and grounded, for example sculpting additional wrinkles or folds.



07

07 SET UP THE LIGHTING

It's better to keep the lighting simple, as it can be a complex topic. However, with a few well-positioned lights you can create effective scenes. Starting in Blender, create an infinite background with a plane to prevent the character from appearing to float, and to cast shadows on the ground. Next, add the key light above your character to illuminate a large part of your model. Use secondary area lights on the sides of your model, one warm and one cool, to create contrast and depth. Finally, add a rim light to highlight the character's outline and define its silhouette.



08

08 POST-PROCESSING

We'll use Blender for post-processing, as it offers effective options and is interactive, making it easier to adjust settings in real-time. You can see the nodes I used for this project in the screenshot. They're basic elements, but each serves a specific function and contributes to making the render visually striking. The nodes used were a Glare to make the circle behind shine since it's emissive, an Ellipse Mask to make the edges of the render darker and focus the viewer's attention, a subtle Blur to further separate the distant areas and focus the viewer, a subtle Noise to prevent the render from looking too flat, and finally a Lens Distortion to add chromatic aberration and give colour variation in some areas. •

WATCH THE VIDEO
https://bit.ly/3dworld-thewildrobot

ZBRUSH | MAYA | SUBSTANCE 3D PAINTER | BLENDER

BUILD AND ANIMATE A FUN-FILLED ROBOT

Expand your horizons with **Julio Benavides**, who reveals his workflow for creating a charming hard-surface character

Getting acquainted with a variety of software is vital for virtually every digital artist today, as all of them have their particular strengths to help you along in every part of the creative process.

In this tutorial I'm going to explain my step-by-step workflow for creating this gorgeous robot character, including posing it and making a basic animation using Blender's physics options to help capture more stunning renders. To get all this done, I'll be using ZBrush, Maya, Substance 3D Painter and Blender. I should note that the entire process can be done using a single program if you wish, but this time I wanted to use an expanded toolset to get the result I desired.

You can try out this model for yourself by downloading it, including all the necessary rigging and textures, from the **3D World** Resources, which also contains a video to follow along. The model is ready for 3D printing too, with the cuts made for you!

Finally, I want to say thanks firstly to Matt Dixon for allowing me to make this robot based on his artwork. Thanks also to Javier Lugo Hernandez for rigging the robot, and to OctaSpace, a render farm for Blender that's currently in a free beta.

DOWNLOAD YOUR RESOURCES
For all the assets you need go to
https://bit.ly/3dworld-thewildrobot

AUTHOR
Julio Benavides
Self-taught artist Julio has worked on *The Walking Dead* and Netflix's *One Piece*, and was part of the Ingenuity Studios team whose work on *The Night Agent* was nominated for a 2023 HPA Award.
benavidmark.com

3D CANDY
The sweets in Julio's robot feature logos from our favourite 3D companies

01

"IT'S VITAL FOR VIRTUALLY EVERY DIGITAL ARTIST **TO GET ACQUAINTED WITH A VARIETY OF PROGRAMS**"

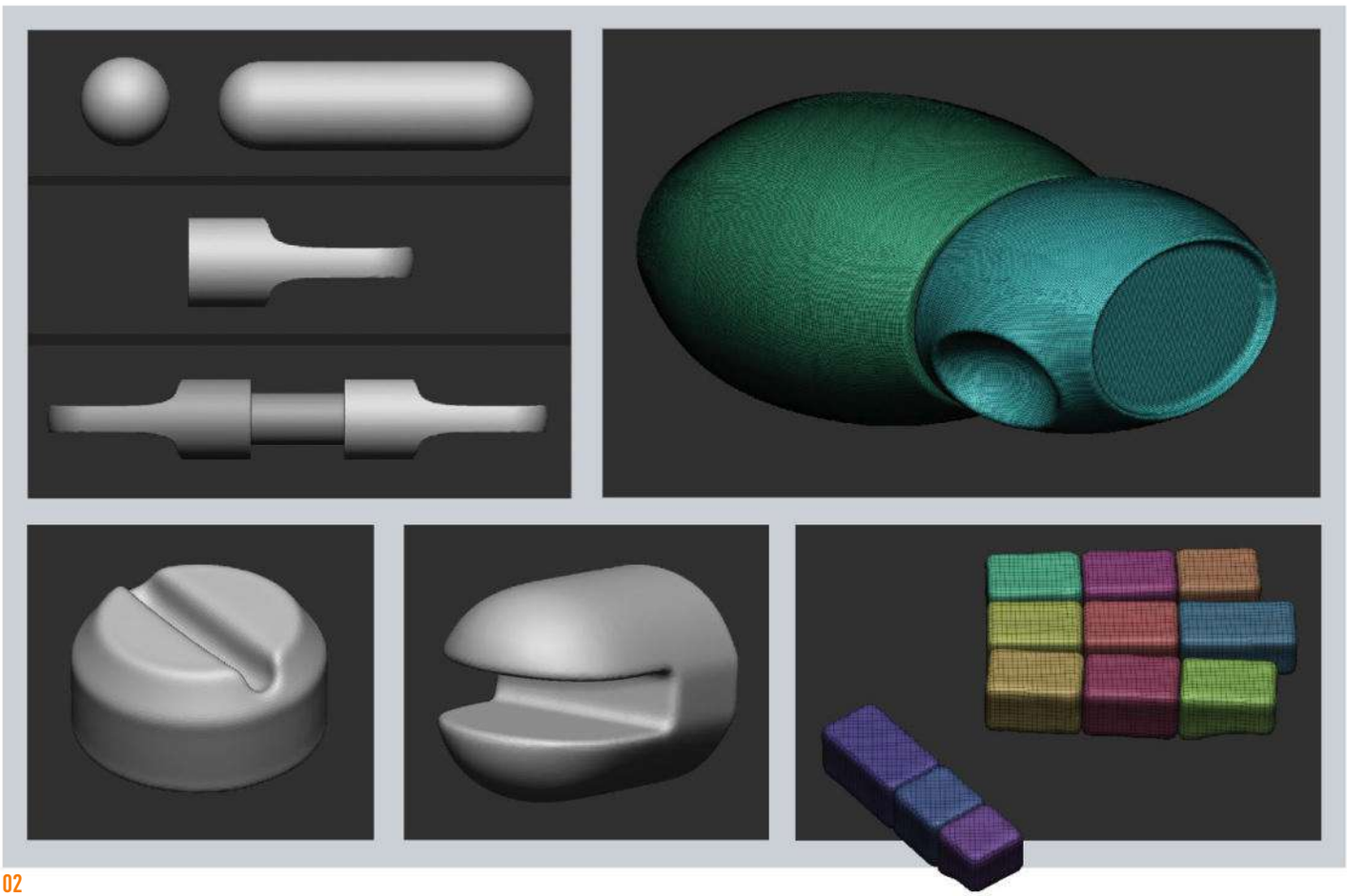
01 FIND YOUR REFERENCES

This stage is always the most important part when starting a new project. In this case, my main reference was a stylised robot by the awesome concept artist and illustrator Matt Dixon, who gave me permission to recreate his artwork in 3D.

I completely understand the importance of finding the right artistic references. For this piece I took the time to search for a variety of old and new pieces of metal, car paint and more, which are all crucial visual materials for the modelling, texturing and rendering work. By using these references, you'll be able to choose the best direction to make the image you had in mind.

02 START BUILDING THE HARD-SURFACE AREAS

ZBrush is one of the best tools out there when it comes to building hard-surface parts. With DynaMesh and ZRemesher, you can create props and more at speed. The first step for us is to create a spherical mask, position it, DynaMesh and make any cuts required. By using Booleans and DynaMesh you can seamlessly build the remaining components needed for the robot, while



02

the rest of the model can be created using manual topology in either Maya or Blender.

03 OPTIMISE THE TOPOLOGY

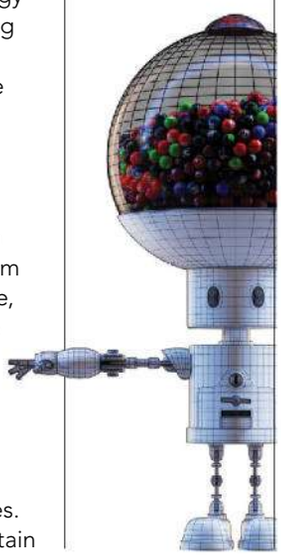
The best way to perform retopology in Maya is the Quad Draw tool. Before this step, I'd recommend taking a screenshot of the figure and then drawing the possible topology over it. This helps optimise the topology more effectively before creating it in 3D, ensuring everything is in quads and the model can be subdivided correctly.

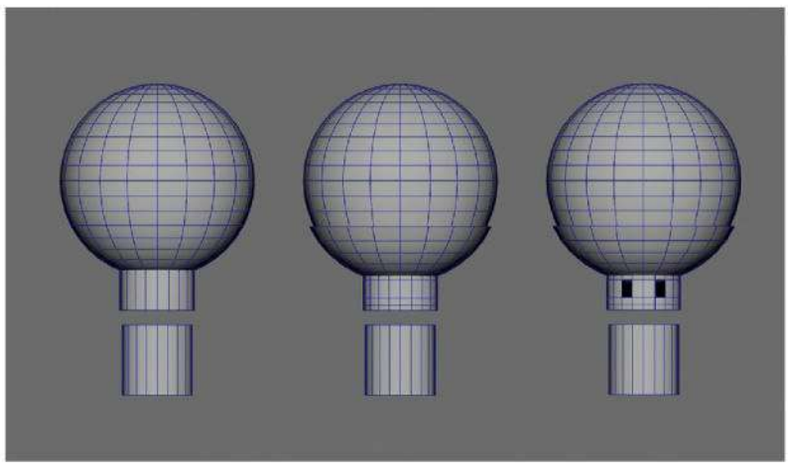
04 CREATE THE BODY

To build the main body of the robot, you need to use a cylinder and a sphere. Join them together as shown in the image, and add some edges to create the eyes. This is important because when this model is subdivided, it will take on a circular shape. Using the same body, you must extract pieces to create the other torso shapes. Next, join the pieces and maintain

Explore a range of references

Try to get the best storytelling out of your props and characters by using a variety of reference material.





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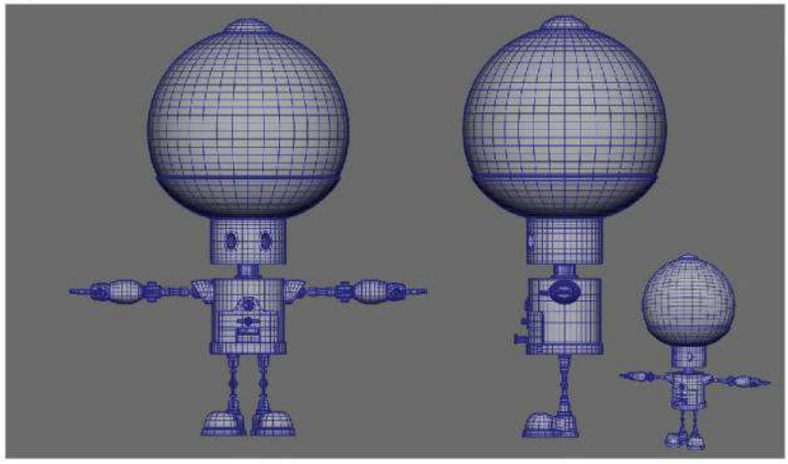

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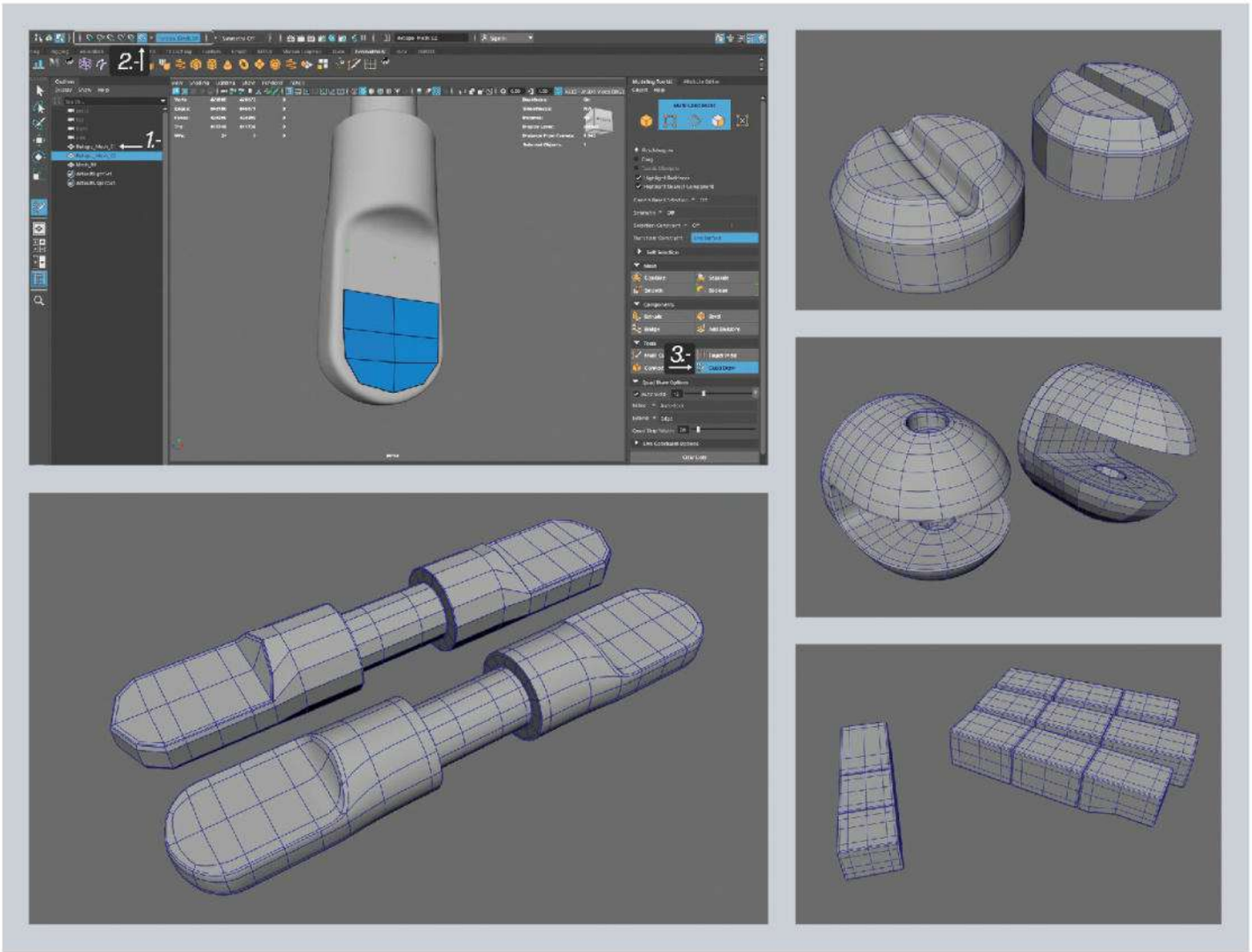

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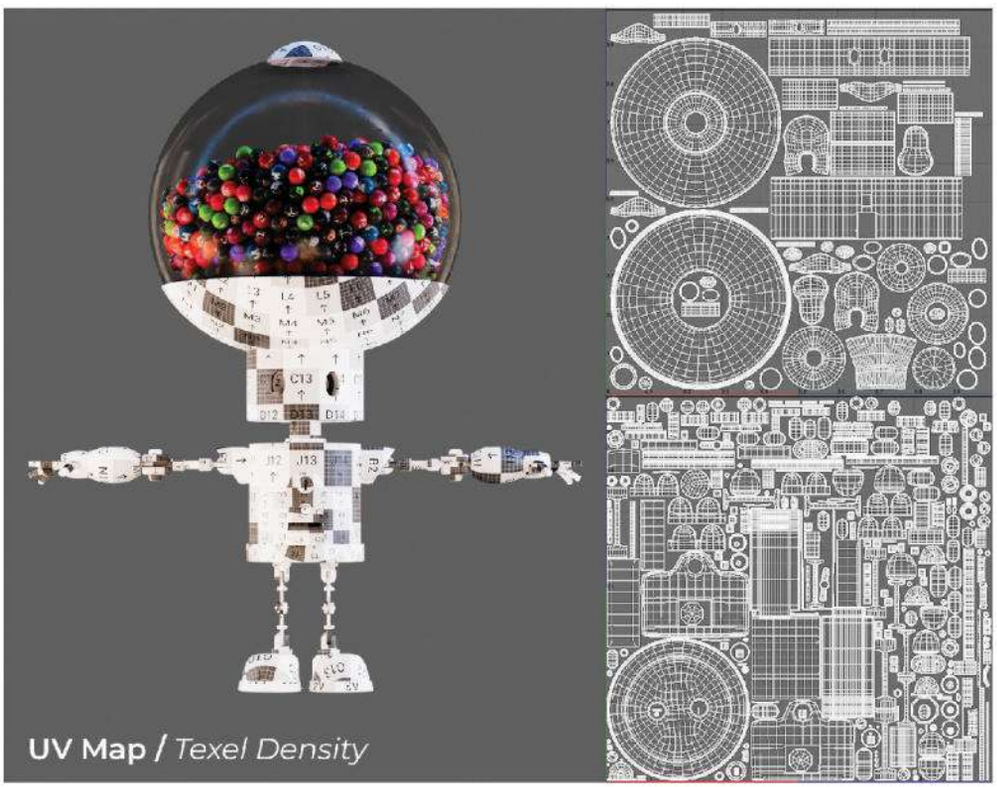


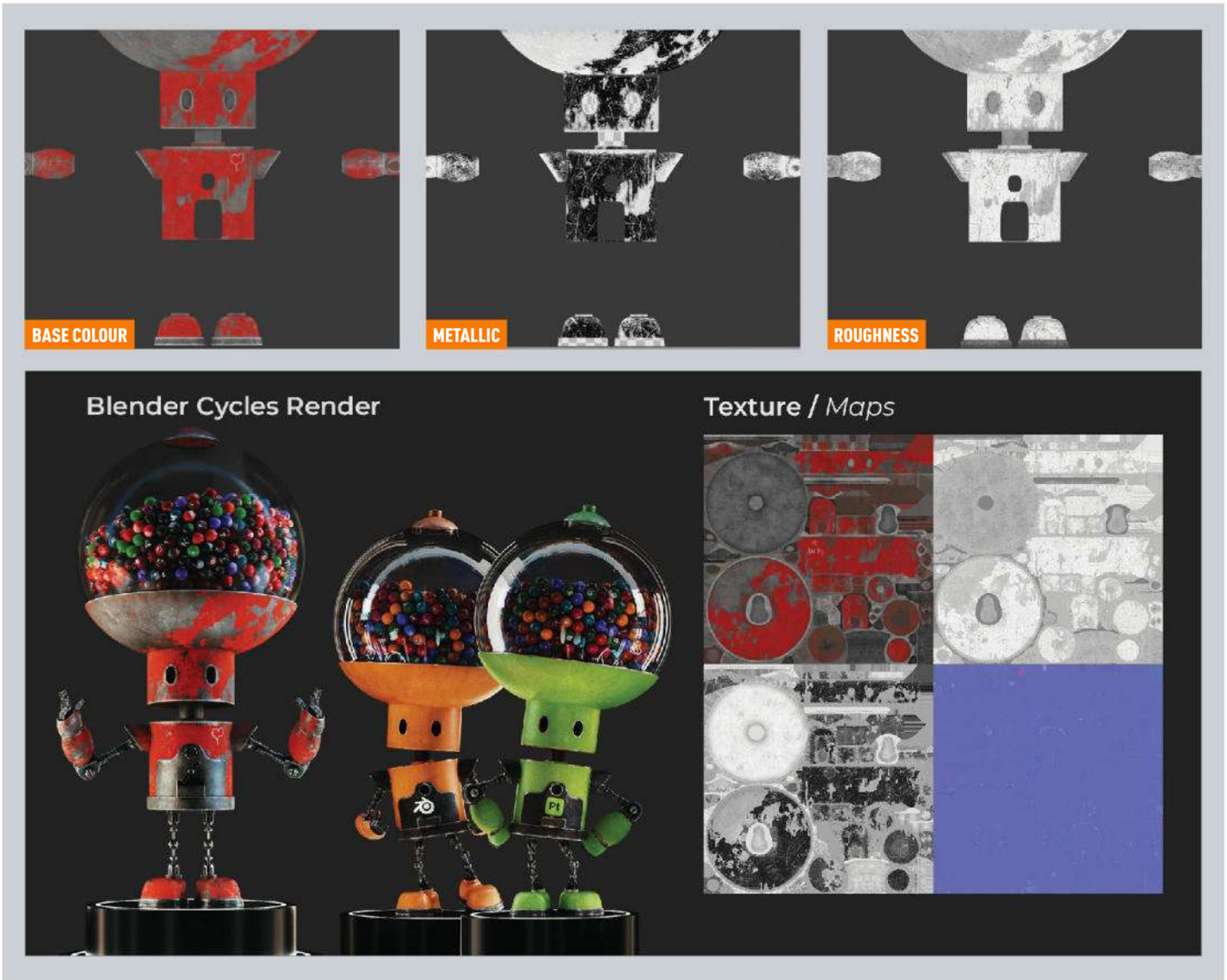
04c

"ZBRUSH IS **ONE OF THE BEST TOOLS** WHEN IT COMES TO HARD-SURFACE PARTS"

uniformity in the amount of topology for a consistent look. Finally, create the UVs.

05 MAKE TEXTURES

It's important to create the robot's textures carefully in Substance 3D Painter based on your end goal. Let's start by crafting a metallic base. Using alphas and Dirt maps, you can build nice Roughness and Metallic maps. Next apply the paint over



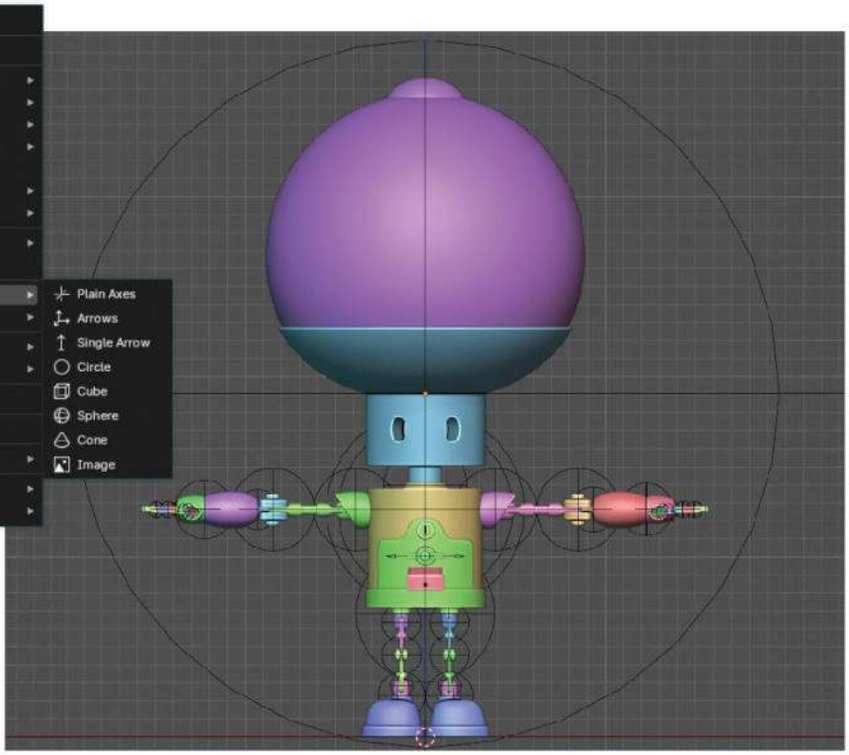
05

the top, using masks to show wear and tear. We'll create two versions for this project, one with less damaged paint and another with more wear and tear.

06 BUILD AN ANIMATION WITH BLENDER

If you're unfamiliar with creating a rig in Blender, there's a great user-friendly alternative in the Parent option, which is particularly good with robotic models. Once you import your model, you must add an empty sphere (06a). To build the hierarchy, select the sphere and position it on each joint of the robot. Press Shift+D to quickly duplicate the object, and hit the '1' or '3' keys to get the front and side views, and '7' for the top view. If done correctly, you should end up with something that looks like image 06b.

06a



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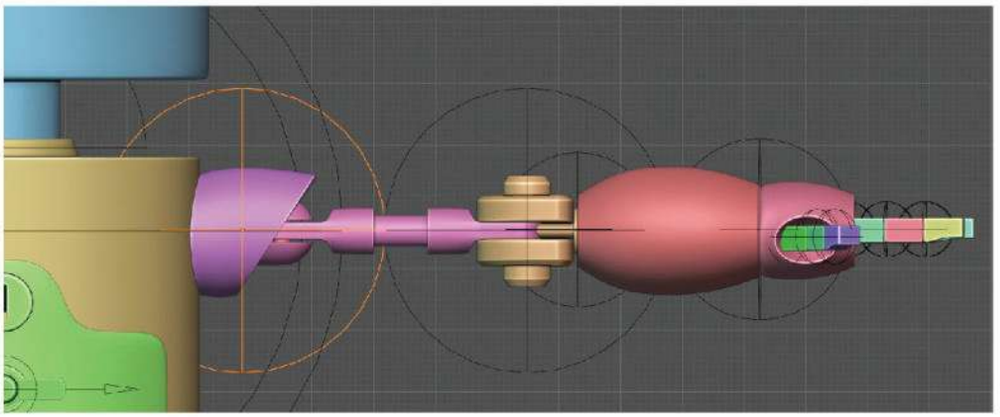

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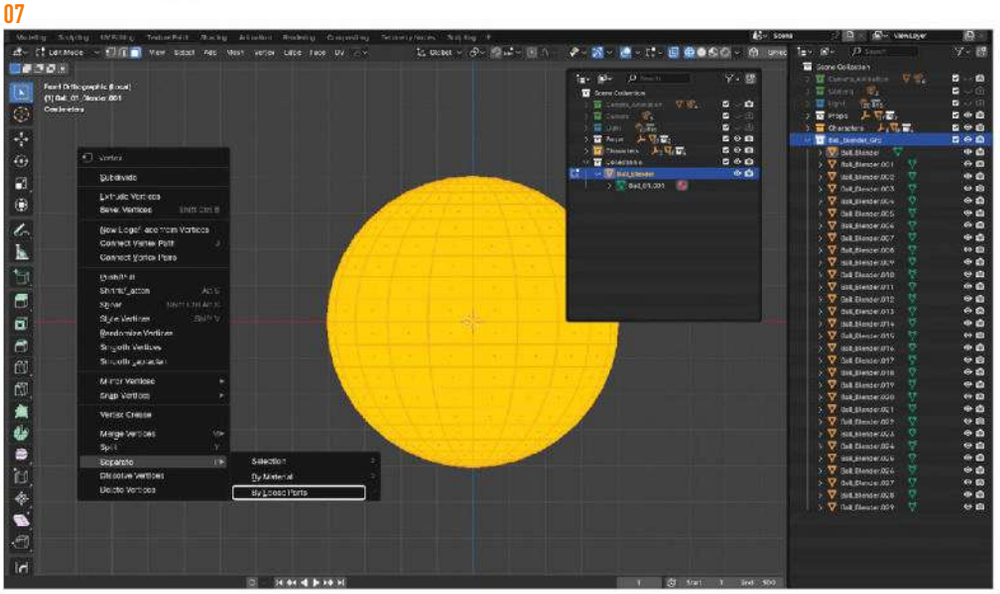

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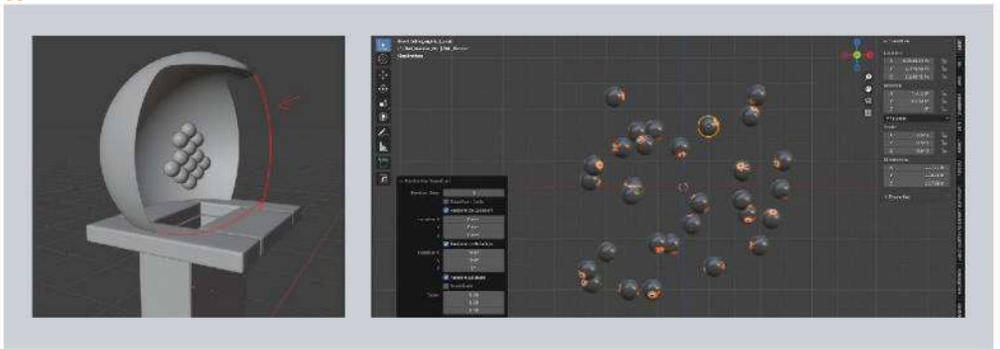

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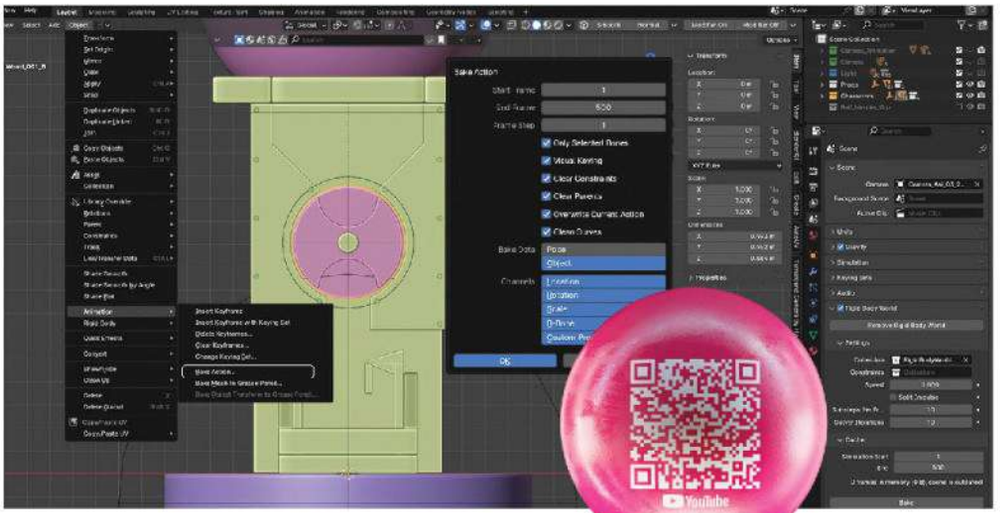

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07 SET UP THE HIERARCHY

This is a vitally important stage as you must have the hierarchy set up correctly before moving on, with all the circles across the model representing the various joints. Hit Ctrl+P and select the 'Object (Keep Transform)' option, and continue doing so to create the hierarchy ready for animation, working from the biggest element, the torso, to the smallest. Once done, press Ctrl+A, select 'All Transforms to Deltas', and set all the Location and Rotation values to 0.

08 BLENDER PHYSICS

Creating dynamic physics animations in Blender can be an enjoyable experience! To follow along with this stage, you can download all the files for this simulation from the Resources. The first step is to add a modifier to a sphere, set the Count to 30 and the Factors to 0, then click Apply. Next go to Edit mode, right-click on the window and go to Separate>'By Loose Parts'.

09 FILL THE HEAD

Select all the pieces and go to Object>Transform>Randomize Transform, which will allow you to play with the values to separate the spheres. However, we still want them to remain inside the glass sphere during the animation. First switch to Edit mode, right-click on the window and again go to Separate>'By Loose Parts'. You also need to add a rigid body that's copied to all the spheres (Objects>Rigid Body>Copy from Active). And don't forget to activate the Collision Margin and lower it to no more than 0.02.

10 VIEW YOUR ANIMATION

Do the same with the other objects but select the Passive option, and if the object will be animated remember to tick the Animated box. Press Play in the Timeline to see your animation, and if you're satisfied you can proceed to baking and converting the simulation to an animation. Remember to check out the video in the Resources if you need a little extra assistance. •

BLOOD MOON
Heather used NASA's Scientific Visualisation Studio to create a full moon

AFTER EFFECTS | RED GIANT GEO

DISCOVER RED GIANT GEO'S HANDY TOOLS

Heather Sterland introduces one of the newest additions to Maxon's suite of Red Giant VFX plugins with an atmospheric lunar creation

April this year saw Maxon release a new Red Giant tool with Geo. It's partly for artists who want to render 3D files in After Effects while skipping the step of rendering an object as a sequence of stills with alpha channels in rendering software, then adding these into their motion graphics software.

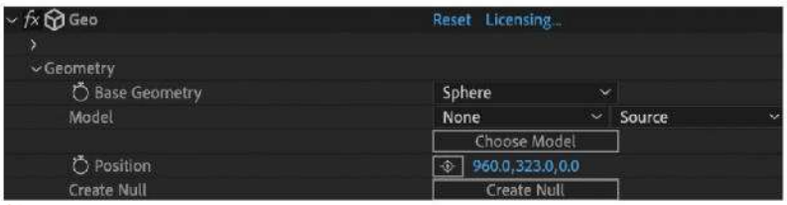
But there's another aspect to Geo too: it performs the playback and rendering of thousands of objects, at speed, and is well worth considering if you need to create a potentially dangerous and expensive scene like a rockfall or underwater setting.

In this tutorial, we'll be creating the Moon using Geo, with a little help from a UV map from NASA, and adding a rain shower in the foreground using Geo's Clone tool. In the first four steps we'll make the rotating Moon, followed by creating the rainfall. For me, Geo's best selling point is its Clone tool, which can clone a 3D object thousands of times, handle it well and render it fast, as we'll see with the raindrops; but they could easily be snow or rocks too.

One tool that won't be covered is the Shadow Catcher, which is well worth exploring once you're familiar with Geo. If you're using a Red Giant trial, take the time to add native After Effects effects such as camera lens blur or lens flare to the scene, or test out the Bokeh Transition added to Red Giant Universe and Real Lens Flares in the Red Giant VFX set. This includes Obscuration layer ability so a flare can be calculated by reacting to obscuring shapes you place in front of the light.

DOWNLOAD YOUR RESOURCES
For all the assets you need go to
https://bit.ly/3dworld-thewildrobot

AUTHOR
Heather Sterland
Heather creates SFX for Shear Rock and Interstellar Duo, and reports on 3D modelling and rendering software.
interstellarduo.com



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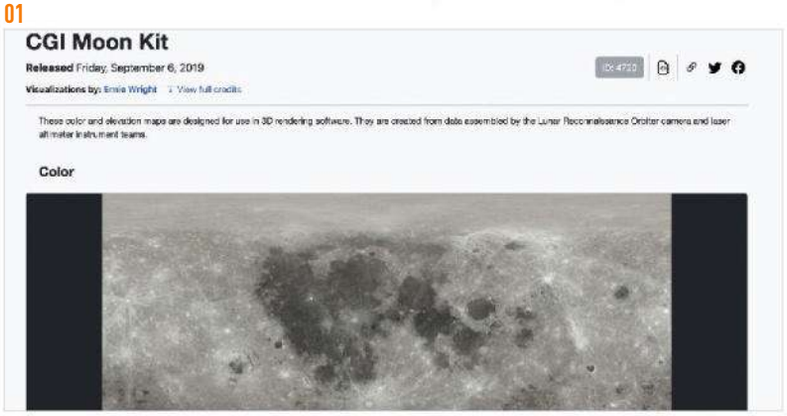

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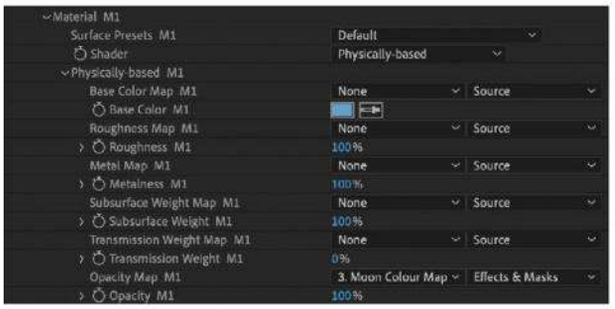

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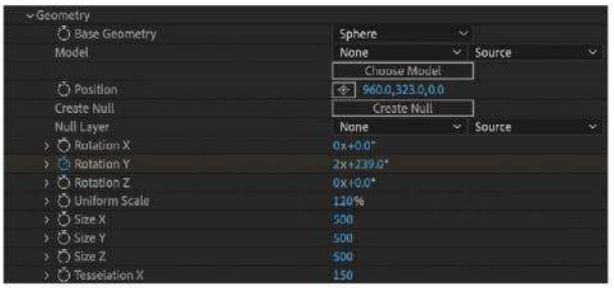

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01 IMPORT A SPHERE ACROSS FROM GEO

Open a new composition in After Effects at either 1,920 x 1,080 or 3,048 x 2,040 as you prefer. Create a new solid, go to the Effects panel and select 'RG Trapcode', then Geo. Open up the Geometry, select your sphere, and resize it to suit your needs.

02 GRAB THE MOON MAPS

For this project we're going to use a UV map of the Moon from NASA, which you can download at **bit.ly/3TkcO5O**. There are two maps in the kit: one Colour map and one Displacement map. Each has been made using the Lunar Reconnaissance Orbiter camera and laser altimeters. Import these maps and we can move on.

03 LINK THE BUMP AND EMISSION MAPS

Drag the imported maps into the composition. Back in the Geo Effects panel, link both the Bump and Emission maps to the files you've just dragged into the composition. You'll see the sphere change from looking plain to having the surface texture and pattern of the Moon. Change the colour in Geo to get the Moon's usual grey complexion, or choose a red or yellow hue if you're going for a blood moon.

04 ROTATE AND EXPORT

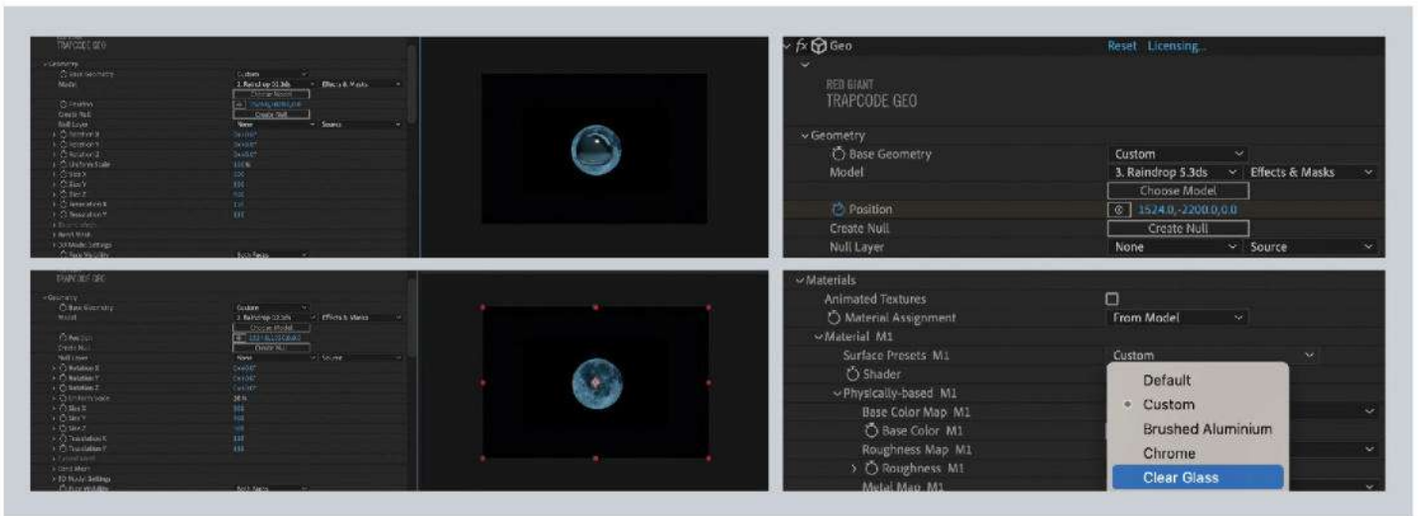
Now rotate the Moon using the Stopwatch in the Geometry part of the Geo tool, then go back to the Geometry settings and activate the Stopwatch. Set the degree and number of rotations, and slide the marker along the timeline as appropriate. When finished, add your composition to the Adobe Media Encoder Queue and export it as desired. Settings that work well are H.264 and HD 1080p, as well as high-resolution JPEGs.

Software choice

It's worth noting that there is other software to create spheres, such as Video Copilot's free ORB plugin. If you're thinking about using Geo for planes of water, I'd also consider After Effects' native tools, though Geo is great for its Clone and Shadow Catcher tools.

05 BRING IN RAINDROPS AND PICK A MATERIAL

For the rainfall I used several 3D raindrops made in Rhino3D for variation, given that falling raindrops aren't the commonly depicted teardrop shape and the scene needs a little variety. Drag the 3D file of the raindrop into the composition. As before, create a new solid and add the Geo effect to it. Link Geo to the



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newly imported raindrop, and in the Geometry section change its Uniform Scale to around 30% to prepare for cloning. Once that's done, go to the Material settings in Geo and select Clear Glass under the preloaded materials. Either keep the Refractive Index setting at its default of 1.55 or adjust it to 1.33, which is the true refractive index of water.

06 START UP THE CLONER

Enable Geo's Cloner and increase the total number of raindrops as you desire. The total is calculated by multiplying the number in the X axis by the number in the Y and Z axes to create a matrix. The Shape field refers to the overshare of all the clones seen as a whole. For this step, the Shape can simply be kept as a Box.

"GEO PERFORMS THE PLAYBACK AND RENDERING OF **THOUSANDS OF OBJECTS** AT GREAT SPEED"

07 RANDOMISE THE DROPS

The distribution of the raindrops across the X axis can be randomised using the Clone Randomizer part of the tool. Set the Position to around 1000, or as large as you think you need to get rid of the regular spacing of the initial matrix shape. The same can be done for the Y and Z axes.

08 CREATE DEPTH

When creating 3D rain, you usually need closer, larger drops to move through the frame faster than the smallest distant raindrops to create the illusion of depth. Geo does this automatically, as the raindrops have already been distributed along the Z axis and into the distance. Drag the raindrops layer to an out-of-frame position above the frame, start the Stopwatch, and then drag it to below the frame so that the drops enter and exit.

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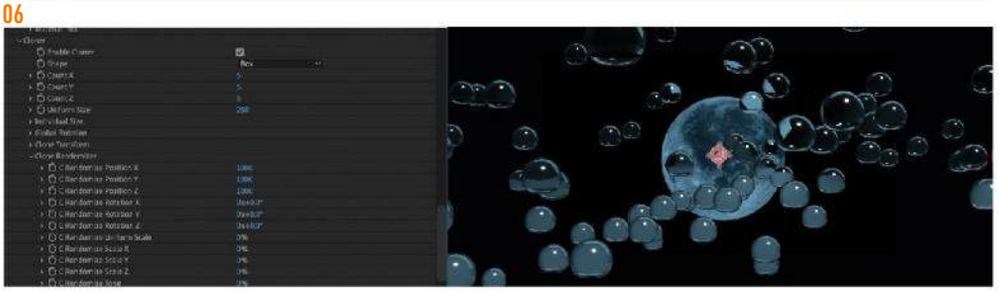

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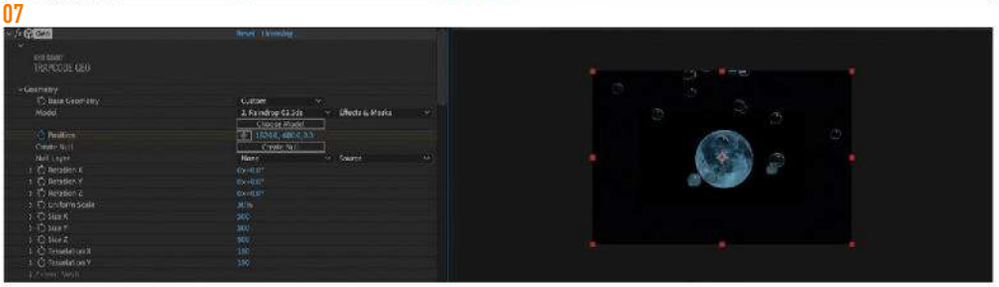

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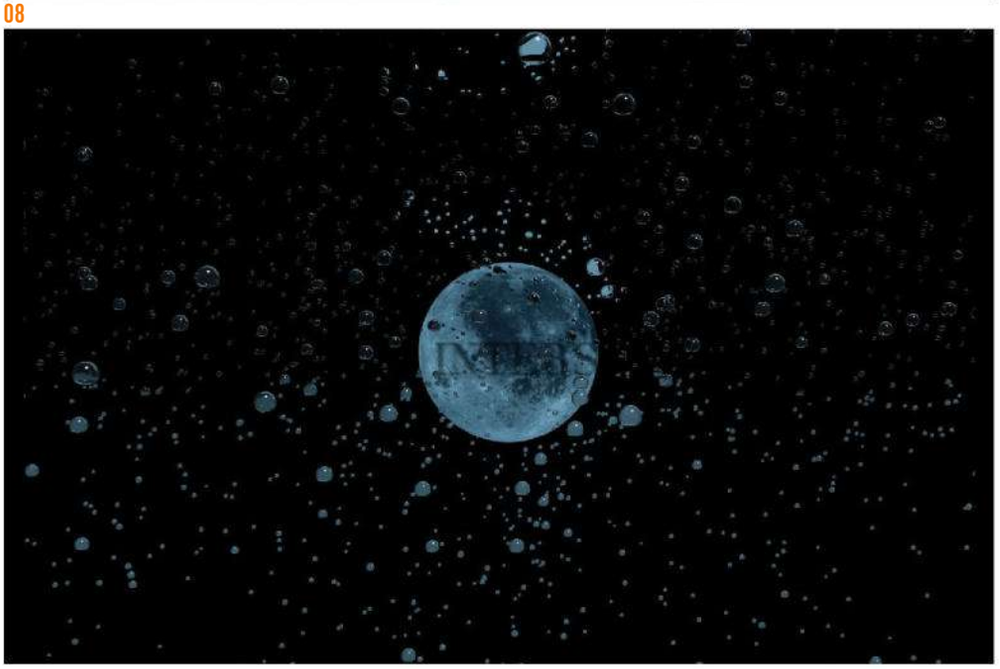

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Background troubleshooting

If you find that the background is interfering with foreground objects, double check that you're running After Effects 2023 or later.

09 LAST ADJUSTMENTS

Finally, adjust the number of raindrops in the Clone tool. The more you add, the more distant drops you'll have, but you'll also get more foreground drops. What you really want is many, many more background drops to add to that sense of depth. To do this, duplicate layers as necessary to create sheets of varying sizes of raindrops. This develops the depth field necessary to create a much more immersive 3D feel within the scene.

FYI Turn to page 90 to read our review of Red Giant Geo. •

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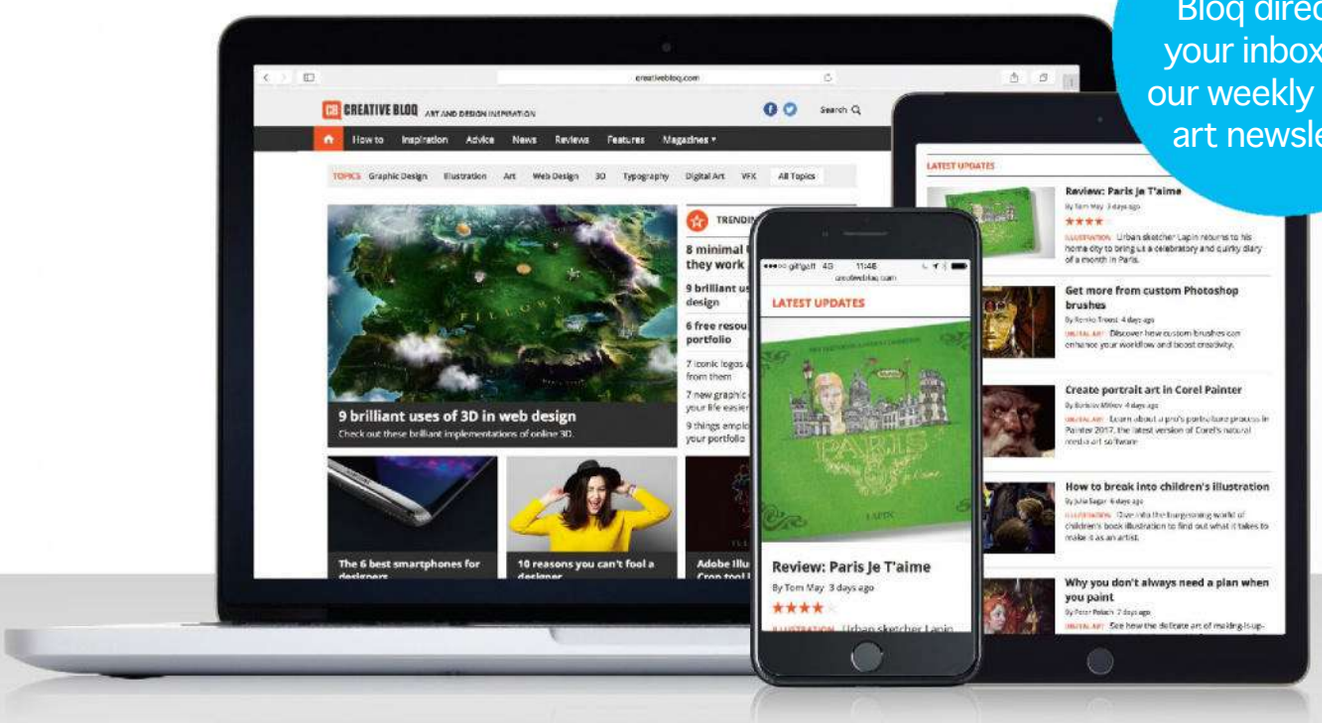

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youtube.com/c/SouthernGFX/videos

Mike Griggs
Mike Griggs is a digital content creator with over two decades of experience creating VFX and CGI for a wide range of clients.
www.creativebloke.com

Paul Hatton
After graduating with a first-class computer science degree, Paul Hatton has spent nearly two decades working within the 3D visualisation industry.
bit.ly/3vuv0AT

Pietro Chiovaro
Pietro is a freelance 3D artist and YouTuber. An expert in the creation of game assets and environments, he shares many of his creations on his channel.
www.pietrochiovaro.com

GET IN TOUCH

EMAIL YOUR QUESTIONS TO
rob.redman@futurenet.com

SOFTWARE: ZBRUSH FOR IPAD

ARE ZSPHERES ON IPAD SIMILAR TO THE DESKTOP VERSION?

Wes Nolan, Dublin

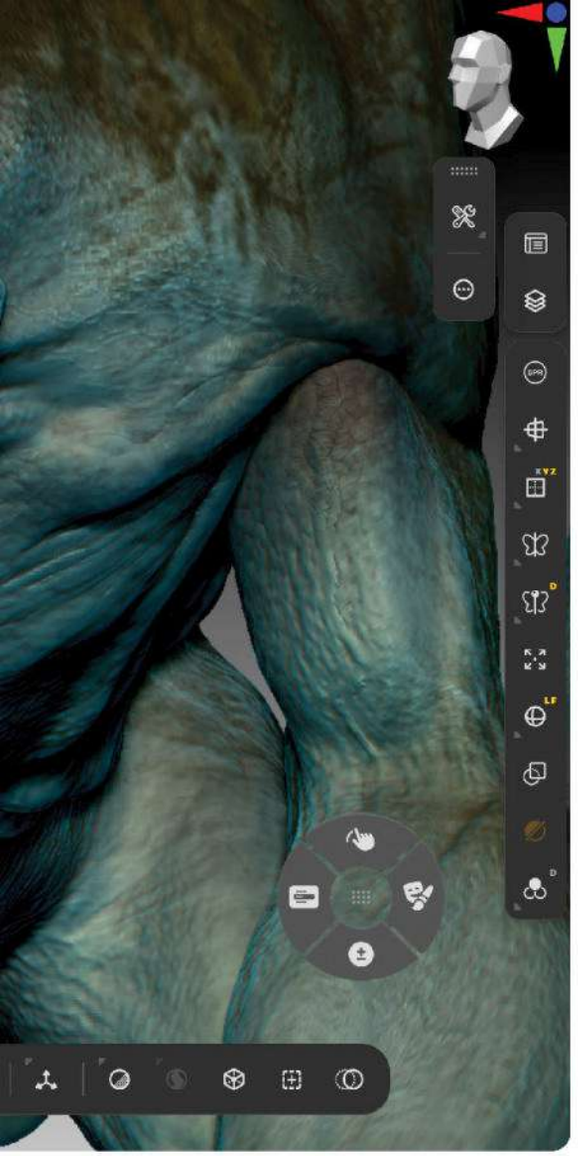
Glen Southern replies

ZSpheres are a popular way of making a shape that an artist can then sculpt on, and until this year were only available in the desktop versions of ZBrush. But now ZBrush for iPad has landed thanks to Maxon. You may know that name if you use Cinema 4D.

So what are ZSpheres? Well, they're a unique and intuitive method of creating base meshes in ZBrush. Instead of starting with polygons, you begin by placing and connecting ZSpheres, which act like the joints or bones of your model. These spheres are connected in a branching, organic way, allowing you to create a skeleton-like structure that can then be transformed into a polygonal mesh. This method is especially advantageous for organic modelling, such as characters or creatures, due to its flexibility and ease of shaping complex forms.

ZSpheres allow for rapid creation of basic forms, making it ideal for organic shapes like characters, animals, or even plants. The process feels almost like sketching in 3D, letting you focus on the overall structure rather than worrying about individual polygons. By using ZSpheres, you can block out a character's silhouette or body in minutes. This is faster than manually extruding, pushing and pulling vertices in a traditional polygon modelling workflow. You can easily adjust the proportions and pose of the model by moving the spheres around. This flexibility is much more convenient than manually manipulating a dense polygon mesh.

Once the ZSphere structure is complete, ZBrush can generate a mesh that you can further refine. It provides a good starting point for sculpting without worrying about the underlying geometry.



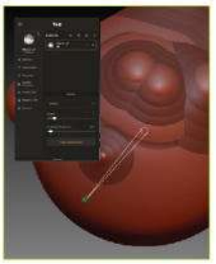
Find out why ZBrush for iPad could be a real game-changer in our comprehensive review on page 88

ZSpheres can also be quickly reposed after the mesh is created; particularly useful when creating characters that need to be placed in different poses.

ZSpheres are a powerful tool for quickly building base meshes in ZBrush and now ZBrush for iPad. As mentioned, it particularly applies to organic models like characters and creatures. Their intuitive interface and the flexibility they offer for posing and adjustments make ZSpheres a strong choice compared to traditional polygon modelling and some sculpting methods. They allow artists to stay in the creative flow and rapidly iterate without getting bogged down by technical details.

By learning to master ZSpheres, you can streamline your workflow and focus on what really matters. In this short tutorial, I'll show you how the process works on the brand new iPad version.

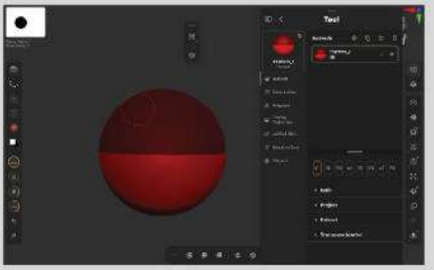
EXPERT TIP



SYMMETRY IS FIDDLY

We often use Symmetry when making creatures. It's the same with ZSpheres, but can be a little bit tricky to get just right when you want them dead on the centre line. When drawing a new ZSphere, if it's preceded by a green dot it means it's right on the centre, rather than two very small dots.

STEP BY STEP ZSPHERE BASICS ON IPAD



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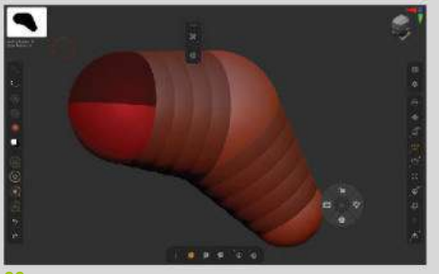

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01 START WITH A ZSPHERE

Open ZBrush on your iPad, start a new scene and then look for the Tool menu on the right of the screen. If you tap the little tool icon, at the top-left of the panel you'll find a list of tools. At the bottom is a small red sphere – that's the ZSphere icon. Tap on it and one will appear in your document window. You'll also see a little menu at the bottom with +, M, R and S icons for Draw, Move, Rotate and Scale. You'll be switching between these quite a lot.

02 DRAW OUT ZSPHERES

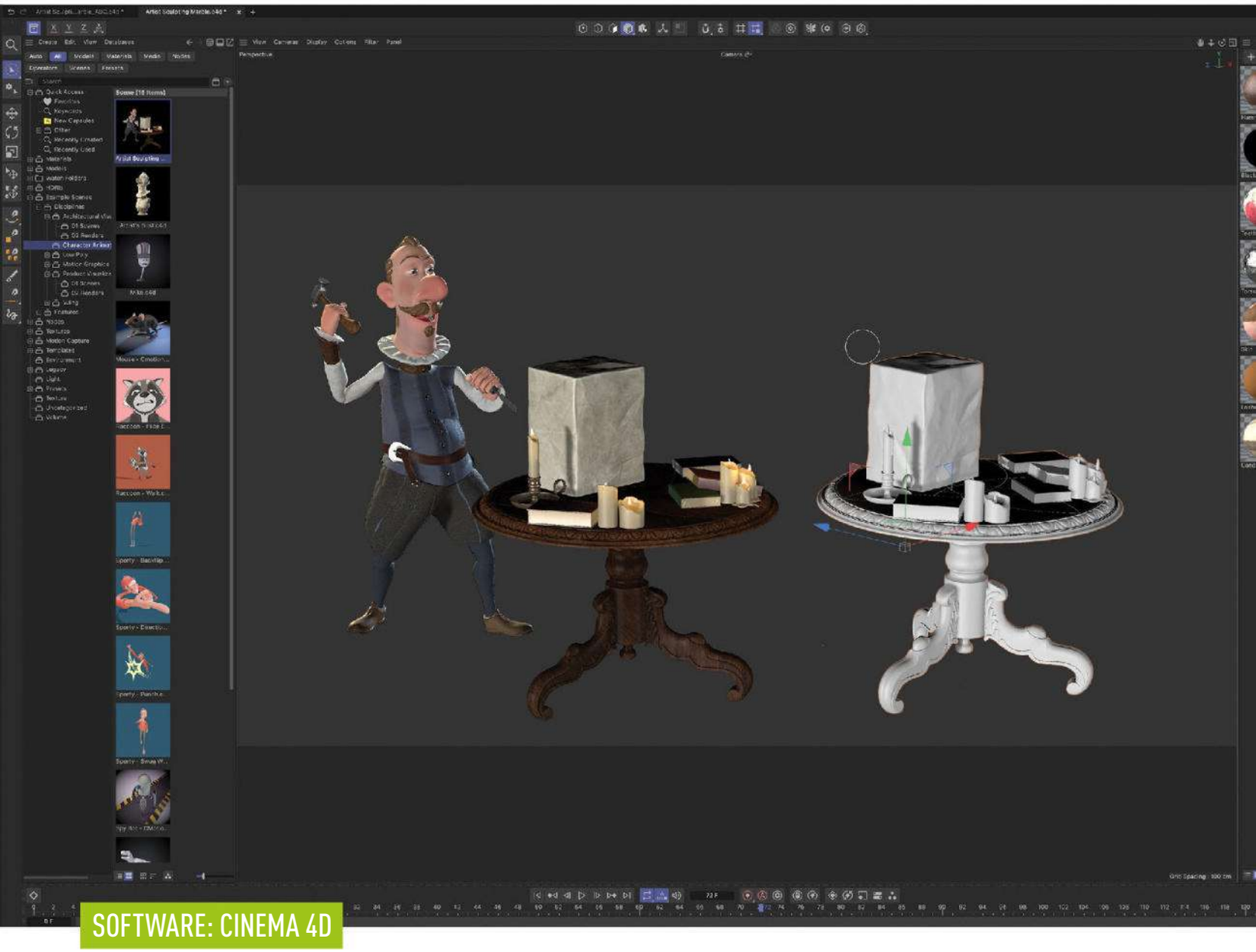
Make sure Symmetry is on in the right-hand menu, as most creatures are made with this option on. Now use the + sign at the bottom and draw a new ZSphere in the centre of the first one, then switch to M and move it out to one side. Now add another ZSphere placed between those two. You can Move, Scale and Rotate any ZSphere that you've laid down. Start to think about making a quadruped creature and begin making the back limbs by creating, moving and scaling new ZSpheres.

03 BLOCK OUT THE ENTIRE CREATURE'S SHAPE

Work up a whole body to suit your design ideas. Don't worry about any details, but just focus on the overall shape and form of the creature. For instance, don't worry about fingers and toes as they can be sculpted in later. Worry about the volume of things like the chest, biceps, thighs and so on. You can add all the details you like down the line, but for now it's about getting the blockout just right.

04 MAKE YOUR GEOMETRY

Once you've got the body sorted, you're ready to convert it into polygons. If you're using a keyboard with your iPad, you can hit 'A' to see what the model will look like. Press it again to return to the ZSphere mode. When you want to make the conversion permanently, go to Tool>Adaptive Skin to make the new mesh. This actually makes an entirely new mesh that can be found in the Tool menu, while leaving your ZSphere version there as well so you can make any iterations. Now you can sculpt, paint and texture the model to your heart's content.



SOFTWARE: CINEMA 4D

HOW DO I ASSIGN A TEXTURE TO AN ALEMBIC FILE IN CINEMA 4D?

Seth Scott, Denver

Mike Griggs replies

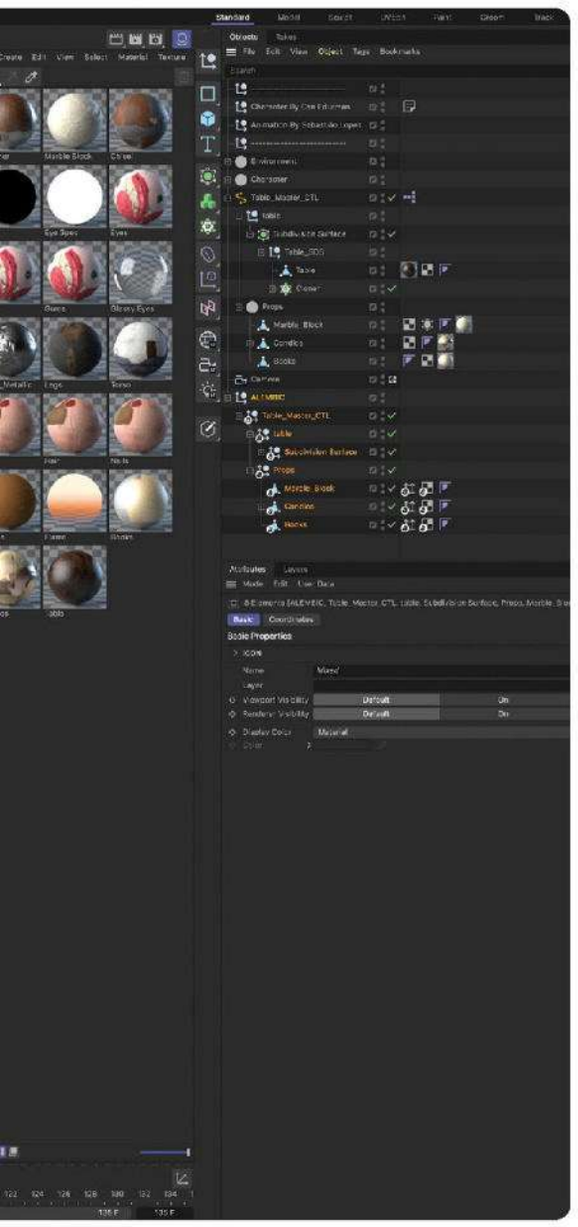
When working as a 3D artist, trade-offs always have to be assessed while running through a project, and one of the most fundamental is learning how to optimise a scene for the available hardware resources.

It's common for a 3D scene to become sluggish when you're just starting out. The obvious and easiest answer is to invest in the fastest workstation with the biggest graphics card. While this might make the scene feel a bit faster, it hasn't dealt with the potential reason why it became bogged down in the first place: because the scene itself isn't very efficient.

So what is an efficient scene? As with many things in 3D creation, the film set analogy can work well. On a film set, the primary focus is usually the actors and their interaction with each other. Every other element around them is secondary, and may even be out of focus depending on the camera lens used.

If we apply that same logic to a Cinema 4D (C4D) scene of a room where the primary focus is the character and the surroundings are secondary, the artist needs to ensure that when they're happy with the modelling and texturing of all the secondary elements, they need to be made as efficient as possible.

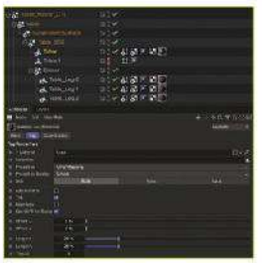
C4D has lots of great tools for this such as the Book and Stair generators, plus lots of downloadable assets that can populate a scene quickly. Still, they require the program to keep all of these elements live and editable, which can use up a lot of resources and slow a scene down, no matter how powerful the computer.



Understanding how to assign textures to Alembic in Cinema 4D can vastly improve your scene's efficiency

This is where scene exchange file formats such as Alembic can be handy. An Alembic file can hold a vast array of information such as animation, which can be easily moved between post-production applications. They can also be used to replace secondary elements in a C4D scene's files. As Alembics are a read format, they use a fraction of the computer's resources in a scene, though the catch is that they import without textures. In this tutorial, we'll take a look at applying texture to an Alembic in C4D.

EXPERT TIP



TEXTURE TROUBLESHOOTING

Sometimes textures won't immediately appear correctly mapped. If this is the case for you, it could be a scaling issue with the texture tag. This can be easily adjusted by clicking on the material in the Objects list and changing the Material Tag properties.

STEP BY STEP SET A TEXTURE FOR AN ALEMBIC FILE

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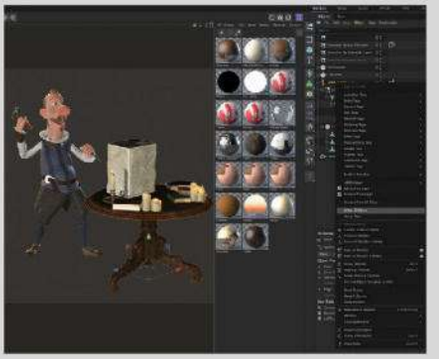

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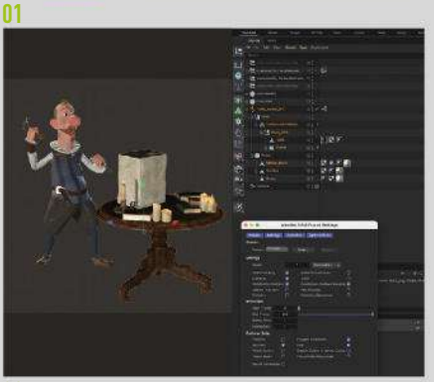

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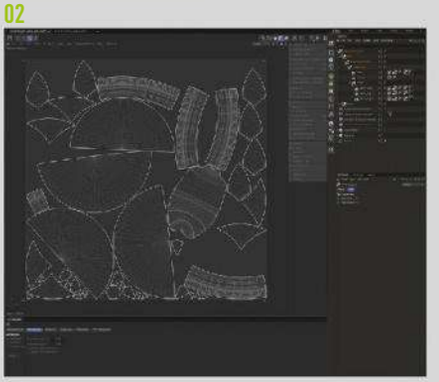

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01 LOAD UP AN EXAMPLE SCENE FOR PRACTICE

The scene being used here is the 'Artist Sculpting Marble.c4d' file, which is available in the Asset browser of Cinema 4D 2024. The scene has an animated character with a table prop that's textured with animated candles, with the file size just under 50MB. The table group will be what we convert into an Alembic.

02 SELECT ALL THE REQUIRED GEOMETRY

To create the Alembic model of the table, we need to export every element of it. In the Cinema 4D Object Manager, under the Objects tab, select the 'Table_Master_CTL' Null, then right-click and choose Select Children to select all of the elements within the group, as otherwise only the Null could be exported with none of the geometry inside of it.

03 CREATE THE ALEMBIC

With all the table elements selected, in the Objects tab go to File>'Export Selected Elements as…'>'Alembic (*.abc)'. This will bring up the Alembic export options. Ensure the 'End Frame' dialogue is set to the final frame of the animation so the Alembic contains all of the candle flickering information, and then click OK.

04 IMPORT THE ALEMBIC FILE

You can import the Alembic using the Merge command for it to occupy the same space as the original table. Version the file and delete the original table geometry to halve the scene's file size. To add texture, select an appropriate element in the Alembic list, duplicate it and then press 'C' to convert the Alembic part into editable geometry. Uncheck the new geometry's UV tag, place it on top of the Alembic geometry, and apply the texture.

SOFTWARE: KEYSHOT

HOW DO I PREVENT MY OBJECTS FROM OVERLAPPING IN KEYSHOT?

Lennon Dene, Birmingham

Paul Hatton replies

The placement of objects in any 3D scene requires a certain amount of attention to detail to ensure models don't overlap when they shouldn't. This is especially the case for product or small-scale visuals, where it would be immediately obvious if there was an issue.

In most 3D software packages you have to rely on your eye or, more helpfully, the built-in snapping tools to ensure accurate contact but nothing more. Snapping tools are an absolutely essential part of any modelling workflow, but they can be a bit cumbersome when you need to adjust the properties and make sure you're snapping to the right parts.

The KeyShot team has come up with an innovative way of ensuring objects are positioned correctly. The workflow includes a falling simulation element and a snap-style implementation for moving objects. This partnership provides a foolproof solution for getting your objects placed correctly every single time.

One of the benefits of the simulation side of things is that it does away with having to spend time carefully positioning objects. This comes into its own when you either have lots of objects, or when those objects are particularly complicated and difficult to position without a lot of fine movements and rotations.

The new collision tools live within the Move tool, accessed by right-clicking on an object in the viewport or list of scene items. These tools aren't immediately

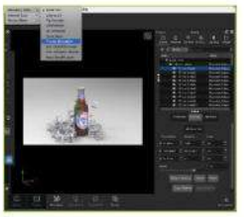
KeyShot's new Collision functionality extends the capabilities of the Move tool

obvious but are instead hidden in the Advanced rollout. There are only three parts to the new functionality, providing a remarkably simple implementation that's perfect for beginners or users who aren't big fans of using 3D software.

The first part is a simple collision checkbox that will activate a blocking functionality between the object being moved and the other objects in the scene. The second is a Settle button that lets the selected object drop according to gravity until it settles on top of other objects. The final part is another checkbox option that lets the selected object settle based on individual components rather than as a whole. This last part is ideal for breaking objects up in an automated way rather than having to keyframe the whole thing.

You can download the 'Render Juice Bottle and Ice' model I've used, created by Kmerchant, from KeyShot Cloud.

EXPERT TIP



PHYSICS SIMULATION

It's also possible to perform a physical simulation between two objects by going to Tools>Physics Simulation. On the right-hand side, tick the objects that you want gravity applied to and then, with the default settings, click Begin Simulation.

STEP BY STEP USE COLLISION IN KEYSHOT

01

02

03

04

01 ENABLE COLLISION

The first part of the Collision functionality is a simple checkbox that stops objects being moved through other objects. This is similar to a snapping tool, but its operation is a little different. Right-click on your object and select Move Part, then open up the Advanced rollout in the Move window and select the Collision checkbox. Now try moving your object and you'll see that it stops dead when it encounters other objects.

02 COLLISION AND SCALING

When in Collision mode, KeyShot removes the ability for you to scale objects through the Move Tool window. This can be overcome either by turning Collision off while you perform your scale operation, or by scaling the object using the Object Properties panel. This is a little annoying but a necessary downside of using the tool.

03 HIT THE SETTLE BUTTON

Extending Collision functionality, KeyShot has also made it possible to simulate objects falling and colliding with other objects. The settling process begins as soon as you hit the Settle button and ends when you click in the viewport. You can leave it running until you're happy with the way your objects have settled. You can also perform the settling process with multiple objects at the same time.

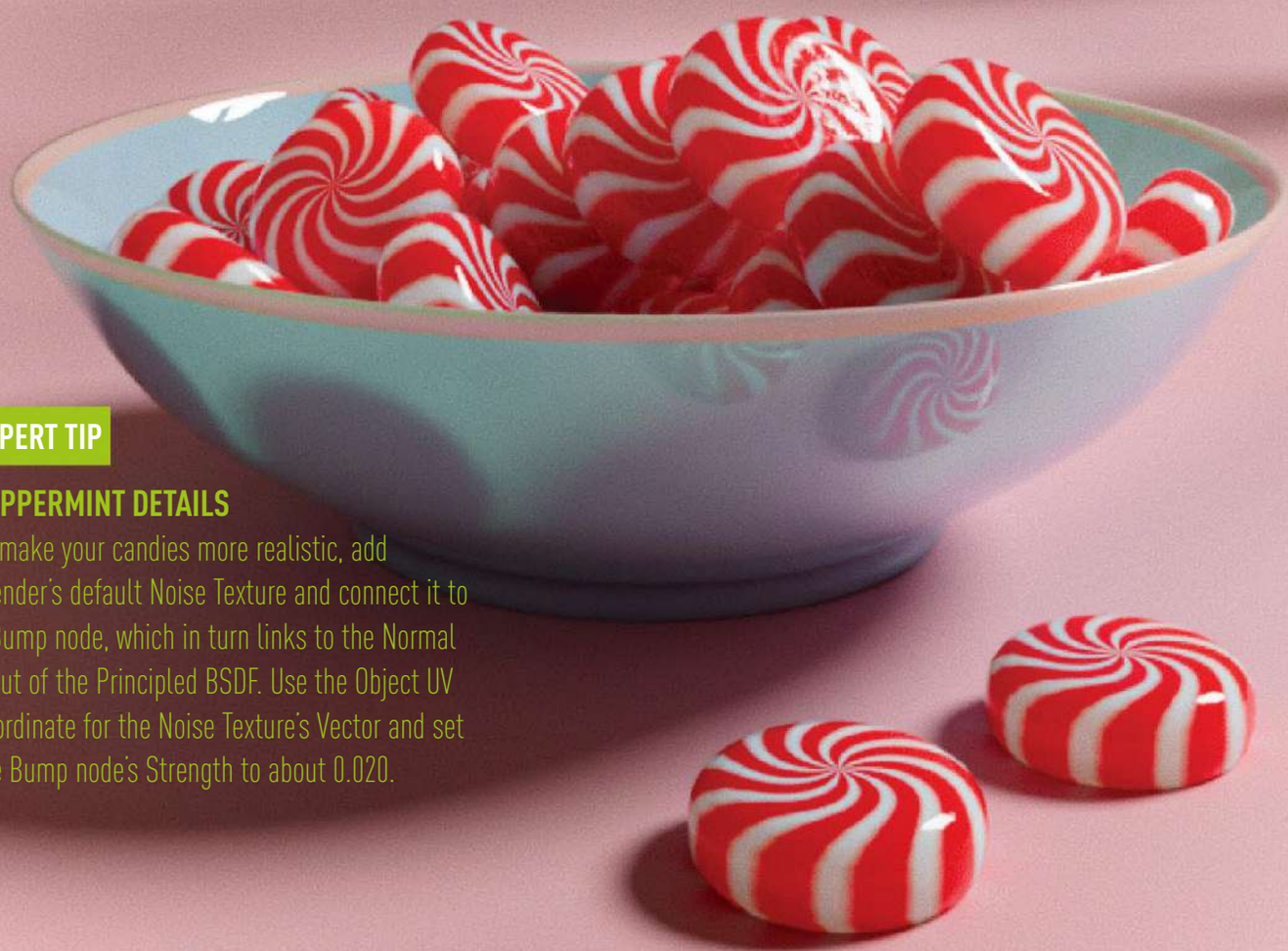
04 SETTLE AS PARTS

So far the settling process has been calculated using the object as a whole. KeyShot also makes it possible to treat objects based on their parts. This is helpful when you want to break an object up and scatter it naturally. Do this by selecting your object and ticking the 'As Parts' checkbox. Hit the Settle button and watch it break into pieces. The speed of settling depends on the model's complexity.

SOFTWARE: BLENDER

HOW DO I CREATE A REALISTIC PEPPERMINT CANDY MATERIAL IN BLENDER?

Emily Foy, Nottingham



EXPERT TIP

PEPPERMINT DETAILS

To make your candies more realistic, add Blender's default Noise Texture and connect it to a Bump node, which in turn links to the Normal input of the Principled BSDF. Use the Object UV coordinate for the Noise Texture's Vector and set the Bump node's Strength to about 0.020.

Pietro Chiovaro replies

Last issue I showed you how to make a realistic jelly material, and the sweet theme continues here with an introduction to creating procedural peppermint candy, with no external textures or photos required.

First of all, let's create the peppermint. You can use any shape you want as the material will work regardless, but in this case I just added a cylinder the size of the peppermint and applied a Subdivision Surface modifier to bevel the edges. After that add a material called 'M_Peppermint' and check the Use Node box on the Shader panel. At this point we're good to go for the material set-up.

For this, we need the following nodes in this order: Texture Coordinate, two Gradient Textures, two Math nodes set to Multiply, a Combine XYZ, Mapping and another Math node set to Fraction.

Now we can start connecting them. Working from left to right, start by linking the Object output of the Texture Coordinate node to the Gradient Texture, setting the Type to Spherical in the latter. This then connects to the first Multiply Math node, with the second Value field set to 2.000. Next hook this into the Combine XYZ node, and link that Vector output to the Rotation input of the Mapping node. In turn the Mapping node's Vector input connects to the Object output of the Texture Coordinate.

The Vector output of the Mapping node is linked to the second Gradient Texture, with the Type set to Radial this time, then connect the output to the second Multiply Math node and make the second Value field 10.000, which will define the number of spirals in the pattern. Hook this into the Fraction Math node, which then connects to the Color Map, where we create a white-red-white curve. With this, you should have the red in the middle and the white at the extremes in your Color Ramp. Link this to the Base Material of the Principled BSDF.

If we render right now we already have the peppermint candy look, but we can still improve it. Reduce the Roughness to 0.050-0.150 for a shiny appearance; I used 0.080. With that we're done, so let's hit Render and enjoy our creation.

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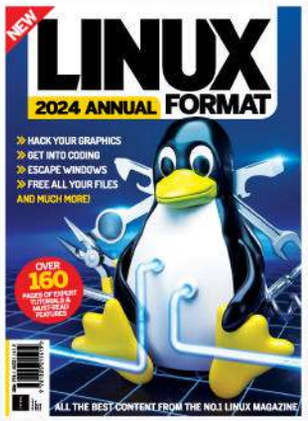

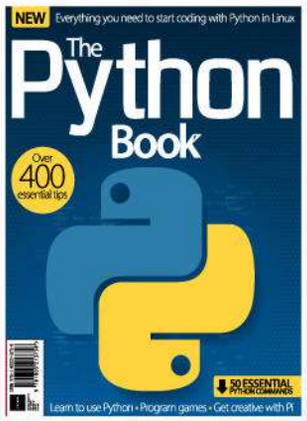

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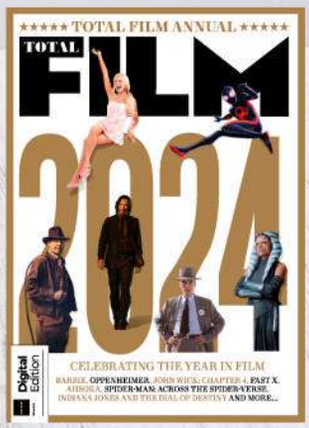

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Reviews

We explore the latest software and hardware tools to see if they are worth your time or money

GROUP TEST

THE BEST GRAPHICS CARDS FOR 3D ARTISTS

We run the rule over the top GPUs from Nvidia, AMD and Intel

REVIEWED BY ORESTIS BASTOUNIS

When building a PC for professional 3D work, you'll want to dedicate the majority of your budget to the graphics card, or GPU, rather than any other component. 3D software will render scenes in the quickest time when run on a GPU. They say time is money, so investing in the best GPU you can afford means you'll finish projects sooner.

Unfortunately, the best graphics cards now make a serious dent in your wallet. The top-end Nvidia GeForce RTX 4090 GPU is currently the most powerful graphics card there is, but you won't find one for under four figures. Even opting for something less powerful is quite an investment, and this is generally true for AMD's range of cards as well.

In addition to high pricing, you'll need to be aware of the myriad of options offered by GPU manufacturers that make your buying decisions more complicated. There can be dozens of different versions of a single card, with various prices and clock speeds, often with customised cooling that can help a card run faster, and may also inflate the price.

Lastly, you'll need to pay close attention to your power supply. Not only do top-end cards need a high wattage output, but Nvidia cards require a 12VHPWR GPU cable. Converters are supplied but the best option is a new modular PSU that adheres to the PCIe 5.0 standard, such as the Corsair RMx Shift we opted for. That's yet another expense to consider, but important to maintain safety and stability in a professional 3D system.

We've tested out a total of eight graphics cards, including Nvidia's new Super lineup of RTX 40-series GPUs based on the Ada Lovelace architecture, AMD's top-end RDNA 3 cards, and Intel's plucky Arc GPU.

All 3D software is different, and your own rendering times will be affected by the resolution, detail, complexity and lighting of the scene that you're creating. It will depend on factors such as your GPU's graphics memory, the number of processing units, and the clock speeds they run at, while your CPU and system memory are factors as well.

We've used a range of tests including Blender, Cinebench, and SPECviewperf to look at all aspects of 3D performance, as well as power consumption, for an overall perspective of how today's top-of-the-line graphics cards are performing.

Intel Arc A750

PRICE £240/$275 | **COMPANY** Intel | **WEBSITE** intel.com

Above: Despite decent specifications, the A750 is underpowered for professional 3D work

For decades, Intel GPUs were a dirty word, synonymous only with basic integrated graphics that are no good for 3D whatsoever. But now Intel is finally taking a more active role in discrete 3D graphics, and adopting an interesting pricing strategy to boot.

The Intel Arc A750 costs just £250, making it the most affordable card we're testing, and one of the few options for building a 3D-capable design workstation if you're on a severely limited budget.

These specifications are also good for the low asking price. Based on Intel's Xe architecture, made up of 448 XMX matrix engines, 224 TMUs (texture mapping units) and 112 ROPs (render output units), the A750 has a decent enough 2,050 MHz clock speed, with 8GB of GDDR6 memory that offers 512 GB/s of bandwidth over a 256-bit memory bus. On paper these specifications are rather good.

The card looks nice too, is relatively quiet and has a nice trick up its sleeve in the form of dedicated AV1 hardware encoding. In various tests of its gaming performance, the A750 is generally compared to the performance of Nvidia's previous-generation GeForce RTX 3060 card.

However, while that sort of performance is fine for gaming, it's a tad weedy for 3D design. Our test results were between half and one-third of the RTX 4060 Ti, one of Nvidia's less powerful cards. It did well in a select few tests, particularly the OpenCL and Vulkan Geekbench scores, but we recorded poor SPECviewperf trace results in Solidworks and Blender rendering times. Most embarrassingly, the now ancient GeForce GTX 1080 outperformed the A750 in a few tests. Additionally, we suffered the odd driver crash when running applications, something that we didn't have to deal with when testing any of the other cards.

All in all, while the A750 demonstrates that Intel can put together a decent discrete GPU, it also shows the firm, known more for CPUs, still has some way to go to be the best in graphics. But we're watching closely to see if the upcoming second generation of Arc cards are able to finally break the current graphics duopoly.

FEATURES

8GB GDDR6 memory

28 Intel Xe cores

Budget pricing

VERDICT

6.0
OUT OF 10

MSI RTX 4060 Ti GAMING X TRIO 8G

Above: If budget is an issue, the 4060 Ti represents a solid entry-level choice

PRICE £420/$450 | **DEVELOPER** MSI | **WEBSITE** msi.com

FEATURES

8GB GDDR6 memory

4,352 Nvidia Ada Lovelace cores

Entry-level rendering performance

VERDICT

7.0
OUT OF 10

When you're building a 3D system on a tight budget, you're no doubt considering any possible saving that won't severely impact the ability of your system at getting real 3D work done.

The RTX 4060 Ti meets that requirement, since it's the most affordable Nvidia GPU we're testing, and can deliver in all 3D applications. It doesn't offer the ultra-fast rendering times of the most expensive cards, but it absolutely gets the job done, while saving you about £200 over the next tier up in the RTX 4070 Super.

That saving, unfortunately, does mean giving up a lot of 3D performance. The 4060 Ti can be found with both 8GB and 16GB of GDDR6 VRAM, but is handicapped by a 128-bit memory bus. It has a lower transistor count, significantly fewer shader models and a core count of 4,352, which is far less than the 7,168 found in the 4070 Super.

> "IT GETS THE JOB DONE, **SAVING YOU £200** ON THE NEXT TIER UP"

The clock speeds are great though, especially with the overclock that MSI has applied, all made possible by the enhanced Tri Frozr 3 fans in the RTX 4060 Ti Gaming X Trio we tested. Running at up to 2,670 MHz, it makes up for the reduced hardware by blasting pixels and polygons at lightning-quick speeds. This combination does indeed deliver rendering performance that certainly means you can work with all 3D applications without having to watch your PC struggle.

That said, the 4060 Ti has serious competition. AMD's more powerful RX 7900 GRE is in an approximately similar pricing bracket, with 16GB of GDDR6 VRAM as default. It costs just a bit more, but beats the 4060 Ti in every test, in some cases by a wide margin, with the exception of Blender, where the OptiX renderer still works better for Nvidia.

Given the challenging level of competition, this tips us towards not recommending the 4060 Ti for more than entry-level 3D design. It may be a good GPU, but you can get better performance from AMD's 7900 GRE.

Left: The 4070 Ti Super has come with a range of improvements

Below: Our tests saw the card come close to the 4080 Super

Asus TUF Gaming RTX 4070 Ti Super OC

PRICE £860/$850 | **DEVELOPER** Asus | **WEBSITE** asus.com

Until Nvidia released the Super range of 40-series GPUs, the 4070 Ti was the best card for most people. It offered great performance and wasn't insanely expensive, unlike the 4080 and 4090. But now the more powerful 4080 Super has had a price cut, things have changed and the 4070 Ti doesn't stand out as much.

But Nvidia has refreshed the 4070 Ti as well, and the Super version has had a lot of improvements, including 25 per cent more transistors, an increased core count of 8,448, a wider 256-bit memory bus, 16GB of GDDR6X ram and increased clock speeds, resulting in an approximate 10 per cent performance uplift to what was already a stunning graphics card.

With the Asus TUF Gaming overclocked version of this card, it's an even bigger performance improvement, with clock speeds up to 2,670 MHz thanks to the headroom offered by the beefier cooling. In fact, the Asus TUF Gaming RTX 4070 Ti Super OC is so beefy it sometimes performs within a hair's breadth of the RTX 4080 Super, which also has 16GB VRAM.

Going through our tests, the two GPUs were close, at least in some trials. There was about 10 per cent difference between the 4080 Super and the Asus 4070 Ti Super in Geekbench and Cinebench. In Blender, the 4080 Super was only one second quicker and similarly, in most SPECviewperf tests, there was only a tiny gap between the two cards.

With the nice cooler and beefy overclock, expect to pay a little more for the Asus TUF Gaming RTX 4070 Ti Super. That squeezes it out a bit. Unless you can find one on an excellent deal, we'd choose to either go for the slight saving with the more affordable 4070 Super or top performance with the 4080 Super.

FEATURES

16GB GDDR6X memory

8,448 Nvidia Ada Lovelace cores

Almost as good as the RTX 4080 Super

VERDICT

8.0
OUT OF 10

Gigabyte 4070 Super Aero OC 12G

PRICE £680/$680 | **DEVELOPER** Gigabyte | **WEBSITE** gigabyte.com

Above: Gigabyte's take on the 4070 Super comes with a swish white design alongside excellent performance

Nvidia's Super versions of its graphics cards are second-generation hardware that can mean major increases in processing power and render times over the original variants. Considering the RTX 4070 was already a popular sweet spot in the original Ada Lovelace lineup, the RTX 4070 Super is now even more compelling as it sees the most hardware improvements of all the updated cards. It's variety of enhancements include many more CUDA cores, without any increase to the MSRP.

The 4070 Super offers 12GB of GDDR6X VRAM over a 192-bit memory bus, which results in 504 GB/s of bandwidth. Increased pixel and texture fill rates, a higher core clock, more L2 cache and added streaming multi-processors mean the 4070 Super can deliver a 3D punch that's approximately 20 per cent better than the original 4070. With Gigabyte's 4070 Super Aero OC 12G variant, these improved hardware specifications are accelerated further by a handy overclock at 2,565 MHz, beating out the standard 2,475 MHz.

Notably, Gigabyte has opted for a striking white design with the Aero card, which looks great in a white case. It also offers a dual bios with a welcome Silent mode, which lowers fan speeds and acoustic noise. It's also worth noting the 4070 Super uses the 12VHPWR power connector.

Perhaps most tellingly, our tests showed the rendering performance of the 4070 Super was only slightly below that of the 4070 Ti Super, which costs roughly £200 more. In our Geekbench, Cinebench, Blender and SPECviewperf testing we noted only a 10 per cent difference in OpenCL performance between the 4070 Super and 4070 Ti Super, although the gap was wider wherever CUDA was involved.

The obvious conclusion from all this is that the 4070 is rather good value for money in this lineup. It will certainly provide ample 3D rendering capabilities that won't disappoint whatsoever, and do so without ruining your bank account in the process.

FEATURES

12GB GDDR6X VRAM

7,168 Nvidia Ada Lovelace cores

Our choice for mid-range rendering rigs

VERDICT

9.0
OUT OF 10

Below: It might not be the most powerful card we tested, but the RX 7900 GRE offers great value

Sapphire PULSE AMD Radeon RX 7900 GRE 16GB

PRICE £550/$570 | **DEVELOPER** Sapphire | **WEBSITE** sapphiretech.com

You may well be looking at GPU prices and quietly crying in a corner. The top-end cards are as much as a good laptop alone. But the cheapest Nvidia card we've included, the RTX 4060 Ti, is nothing special. It has a narrow 128-bit memory bus, a paltry 8GB of VRAM, and offers relatively middling performance, all told.

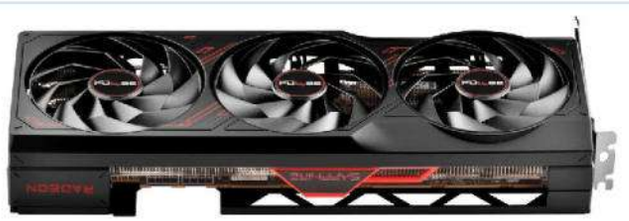
AMD's modus operandi in both graphics and CPUs is to challenge larger competitors with products that may not be more powerful, but offer significantly better bang for the customer's buck. The RX 7900 GRE is trying to do just that, squeezing into that critical gap in the market for something relatively affordable that's also darn good.

"AMD HAS DONE A GREAT JOB AND **IT'S EASY TO RECOMMEND**"

Based on the same nifty RDNA 3 architecture as the RX 7900 XTX, the 7900 GRE costs roughly half as much for about two-thirds of the performance. It comes with 16GB of GDDR6 VRAM, cuts the core count by 20 per cent, reduces the number of TMUs to 320 and ROPs to 160, lowers the core clock speed, and reduces the memory bus to 256-bit.

But despite these cuts, in benchmarks the RX 7900 GRE packs a real punch, at least for this price segment. While it's still priced as a mid-range card rather than what we'd label as budget, the well-rounded performance results means it beats Nvidia's 4060 Ti, and even the pricier 4070 Super in some tests. As with the 7900 XTX, this means the 3ds Max and Solidworks sections in SPECviewperf, while doing very well in OpenCL and Vulkan tests as well.

It falls a bit short in other tests, most crucially in Blender rendering times, which could be a dealbreaker for a lot of 3D artists. Blender's OptiX renderer runs like an absolute dream on Nvidia cards, and unfortunately AMD can't keep up with that pace. But if you look past that, AMD has done a great job with the 7900 GRE, and it's easy to recommend at this price point.



FEATURES

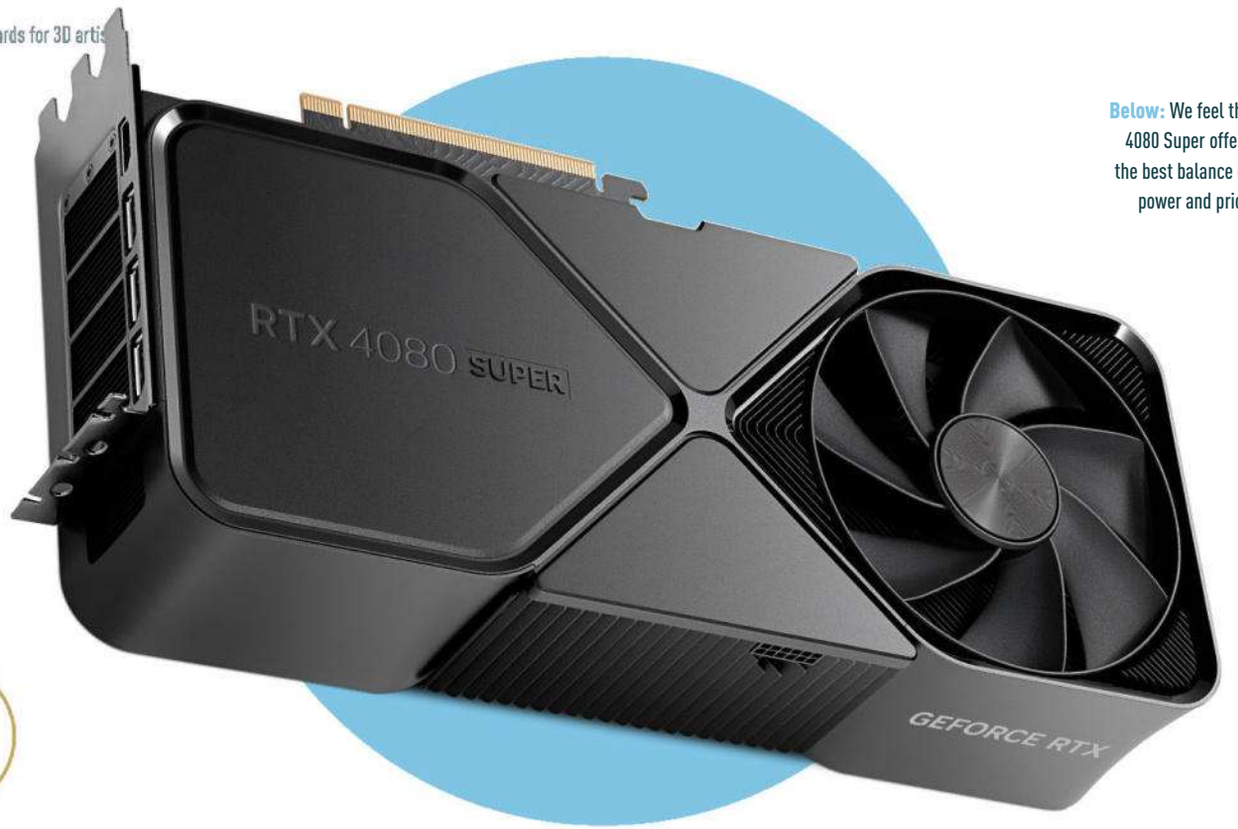
16GB GDDR6 graphics memory

5,120 AMD RDNA 3 cores

Excellent value

VERDICT

8.0
OUT OF 10



Below: We feel the 4080 Super offers the best balance of power and price

BEST IN CLASS 3D WORLD

Nvidia GeForce RTX 4080 Super Founders Edition

PRICE £1,000/$1,050 | **DEVELOPER** Nvidia | **WEBSITE** nvidia.com

FEATURES

16GB GDDR6 graphics memory

10,240 Nvidia Ada Lovelace cores

The best option for a high-end 3D workstation

VERDICT

10
OUT OF 10

On the surface, the GeForce RTX 4080 Super is barely any different from the vanilla GeForce RTX 4080 that was launched in 2022. It has an almost identical specification, save a tiny boost to the clock speeds and some tweaks to the core count.

With the launch of the Super version, Nvidia took the opportunity to drop the price quite a bit, going from £1,199 to £999, which was no doubt partly a reaction to the highly impressive performance of the cheaper AMD Radeon 7900 XTX graphics card.

This changes the value proposition of the RTX 4080 Super considerably. It was hard to recommend at the old price, given you'd get up to 50 per cent more performance by spending about £300 extra on the 4090. But now it's in a more attractive position, and is the card that we'd recommend most people go for in a high-end 3D design rig.

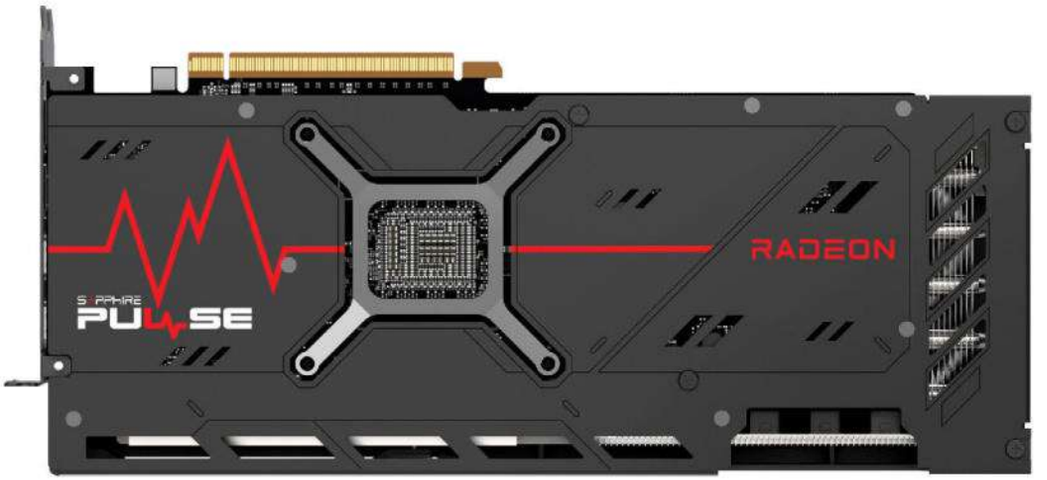
> "EVEN THOUGH ITS QUITE PRICEY, IN A TOP-END SYSTEM **THE 4080 SUPER IS A FIRST CHOICE**"

Unlike all the other GeForce cards, the 4080 Super we've tested is a Founders Edition, which means it has a sleek 304mm triple-slot cooler that absolutely dwarfs any other GPU. In our subjective opinion it looks better than any card with RGB lighting.

The 4080 Super chip boasts 10,240 CUDA cores clocked at 2,550 MHz, 320 TMUs, 112 ROPs, a 256-bit memory bus and 16GB of GDDR6 VRAM, and offers 736.3 GB/s of memory bandwidth.

After the 4090 dominated the benchmark testing, the next best card was the 4080 Super. It showed some great results in Blender, OpenCL, 3ds Max and dropped good Cinebench CUDA results.

Of Nvidia's new set of Super cards – the 4070 Super, 4070 Ti Super and 4080 Super – it's the latter that's probably the best bang for your buck. It flexes its muscles in every benchmark, outpacing the more affordable cards. And even though its still quite pricey, in a top-end system the 4080 Super is a first choice if you're not going to opt for the 4090.



"THE 7900 XTX BEAT THE 4080 SUPER IN MORE THAN A FEW TESTS"

Sapphire Pulse AMD Radeon RX 7900 XTX

PRICE £900/$930 | **DEVELOPER** Sapphire | **WEBSITE** sapphiretech.com

AMD's modular "chiplet" design has proven itself in Ryzen desktop and Epyc workstation CPUs, and the 7900 series now brings this to graphics cards via the RDNA 3 architecture. The RX 7900 XTX is AMD's full-fat, top-end GPU, taking aim at Nvidia's RTX 4080 and 4080 Super, rather than the high-priced and high-performing 4090.

At this tier the 7900 XTX proves itself with hardware and performance advantages that, in some circumstances, may be better for 3D than Nvidia's offering. Its 57.7 billion transistor 5nm die features 6,144 cores, 384 TMUs and 96 compute units with a 384-bit memory bus, which is the same as the RTX 4090.

In terms of pricing, physical size and power consumption, the 7900 XTX is every bit as beastly as its competition. We measured it consuming 350W of power during our tests, it needs three eight-pin power connectors, the card is 313mm long, and it will set you back the best part of £900.

There are some notable differences though. While the 4080 Super comes with 16GB of graphics memory, the XTX offers 24GB, a capacity you can't get from Nvidia without forking out for a 4090. That extra memory could make a big difference in some of your rendering jobs. The Sapphire Pulse variant adds a very small but nifty overclock too.

There are some impressive numbers on offer with the Sapphire Pulse version of the RX 7900 XTX

The 7900 XTX managed to beat the 4080 Super in more than a few of our tests. Some of the SPECviewperf results were astonishing, even getting the better of the 4090. These results point to excellent rendering in Solidworks and Maya, suggesting better performance from AMD than you get from Nvidia in these particular applications.

However, it's not a clean sweep for the 7900 XTX. Once again, Nvidia outperforms in Blender by a significant margin, and the 4080 Super beats the card in 3ds Max and OpenCL testing too.

Depending whether VRAM capacity is the limiting factor in your scenes, the 7900 XTX may be the better choice over the 4080 Super, given the similar pricing. But Nvidia has a few other tricks up its sleeve, which we'll look at next.

BEST IN CLASS 3D WORLD

FEATURES

24GB GDDR6 VRAM

6,144 AMD RDNA 3 cores

Close competitor to the 4080 Super

VERDICT

9.0
OUT OF 10

MSI GeForce RTX 4090 SUPRIM LIQUID X 24G

PRICE £1,870/$1,830 | **DEVELOPER** MSI | **WEBSITE** msi.com

FEATURES

24GB GDDR6X graphics memory

16,384 Nvidia Ada Lovelace cores

Powerful, but expensive

VERDICT

10
OUT OF 10

The GeForce RTX 4090 is the current all-conquering top dog in the world of graphics cards now that Nvidia has seemingly moved away from it's Titan branding of this elite upper echelon of GPU performance.

The 4090 is a massive jump over the 4080 Super, featuring 16,384 CUDA cores compared to 10,240 in the 4080 Super. The AD102 chip has 76.3 billion transistors, a wider 384-bit memory bus, 512 TMUs, 176 ROPs and a hefty 24GB of GDDR6X VRAM. This translates to faster rendering times than any other card on test, almost across the board. It also costs a lot more.

The Founders Edition RTX 4090 from Nvidia looks identical to the RTX 4080 Super Founders Edition, with a triple-slot cooler and measuring 304mm in length. It also requires the same 12VHPWR power cable.

However, MSI sent us something a little more interesting to test. The MSI GeForce RTX 4090 SUPRIM LIQUID X 24G does away with the chunky metal cooling and instead has an integrated water cooling setup, with a radiator pre-attached to the card with tubes.

This means you could fit the MSI RTX 4090 SUPRIM LIQUID into smaller cases, just as long as they can accommodate the radiator and its tubing. The SUPRIM is considerably shorter, shaving its length down to 280mm, and is also slimmer, occupying just two slots in your case. It also runs with a higher boost clock at up to 2,640 MHz.

Above: This 4090 model comes with a free mouse pad packed in

> "TESTS SHOWED AS MUCH AS A **50 PER CENT SPEED BOOST**"

Compared with the 4080 Super Founders Edition, we got some test results that showed as much as a 50 per cent speed improvement, including both Cinebench R20 CUDA performance and the Geekbench OpenCL test. We shaved 33 per cent off the Blender classroom render and got improvements between 20-50 per cent in most of the SPECviewperf workloads.

This performance is very impressive indeed. The 4090 lives up to its reputation as a top-end GPU, but whether or not it's worth buying depends on your budget. The 4080 Super and 7900 XTX are also both excellent cards and will serve most artists very well, without creating such a deep financial crater.

CONCLUSION

Everyone has their own personal Goldilocks zone of just the right amount of performance they need in order to match their budget.

The RTX 4090 is a no-brainer for anyone who makes a living from 3D design. If long rendering times are what holds projects back from completion, then the 4090 can pay for itself in time.

For everyone else, it's a bit more tricky to decide. At the budget end – for people who may just be getting started in 3D, students, or those simply unable to afford the top-end cards – beware of false economies. Spending as little as possible can mean frustratingly slow renders, which is why we feel the approximate performance level of the 4060 Ti is the lowest we'd choose for comfortable 3D design work, while AMD's RX 7900 GRE will really boost your performance.

Looking at the similarly priced top-end Nvidia RTX 4080 Super and AMD RX 7900 XTX cards, AMD edges ahead of Nvidia in certain tests, while Nvidia comes out on top in others. AMD offers more VRAM, but Nvidia utterly crushes AMD in the Blender rendering times. Ultimately this one entirely depends on your workflow.

Unfortunately for AMD, Nvidia's proprietary CUDA language is rather good, and it can't run on AMD cards.

"NVIDIA'S RTX 4090 IS A NO-BRAINER FOR ANYONE WHO MAKES THEIR LIVING FROM 3D DESIGN"

That means opting for Nvidia offers artists options for different renderers across a wider range of software. AMD's response is to offer better value, more memory and better performance in some tests, at the same price point as Nvidia's competing cards. This strategy pays off in some applications, where AMD cards will get better results.

For the mid-range, we'd opt for the 4070 Super. It's a little pricier than AMD's excellent 7900 GRE, a lot faster than Nvidia's 4060 Ti, and is unlikely to disappoint. If you want more, we'd skip the 4070 Ti Super and go straight for the 4080 Super, which is our overall winner here and the card that we'd recommend as a first choice.

AUTHOR PROFILE

Glen Southern

Glen runs SouthernGFX, a small Cheshire-based studio specialising in character and creature design. He is a Wacom ambassador, VR Artist, and a fully accredited ZBrush instructor.

bit.ly/3MVAwBC

FEATURES

Digital sculpting and painting on a mobile device

Industry-standard sculpting tool, rewritten just for the iPad

Customisable UI

PROS

Huge amount of brushes

Same sculpting experience

Improved UX and interface

CONS

No real-time rendering

No ZModeler or UV option yet

SOFTWARE REVIEW

ZBrush for iPad

PRICE Limited free version / full access £10/$10 monthly / £90/$90 annual | **COMPANY** Maxon | **WEBSITE** bit.ly/4gw9xKv

ZBrush for iPad has finally stopped being a rumour, a leak and a tease and is now a real app. This new release feels like it could be breaking with the software's history to be something quite new and unique, for new and old 3D artists alike.

Maxon is offering up a free version with some of the higher-end tools missing, while the full version is going into the Maxon store as part of the Maxon One offering, as well as a standalone subscription. This is a model the company uses for Cinema 4D, Redshift, Red Giant, Forger, Universe and the full desktop version of ZBrush.

I was lucky enough to be on the ZBrush for iPad pre-alpha team, so I've been testing out this new app for quite some months now. I've been training ZBrush for 25 years and the biggest single issue all users raise is how unconventional the interface feels and the steepness of the learning curve. This seems to have been addressed in most cases for the mobile version, although it will be interesting to see what the wider digital sculpting community will feel about that.

Maxon has removed some of the older features such as the recording tools, and things like markers have all gone now. Oddly, 2.5D brushes are still here. If Maxon gets ZBrush for iPad right and it's widely adopted, I'm guessing there will be a push to retrofit the core program in some way.

INITIAL IMPRESSIONS

One of the first things I noticed when using ZBrush for iPad is that I had no keyboard – unless you're rocking the Apple Folio of course – and ZBrush relies heavily on keyboard modifier keys and shortcuts.

The fix? ZBrush for iPad uses an on-screen wheel with tools assigned to Shift, Alt and Ctrl equivalents. Combined with the iPad's excellent touchscreen, it's possible to pinch, swipe and rotate the sculpt directly. I pretty much stopped worrying about the lack of keys right away.

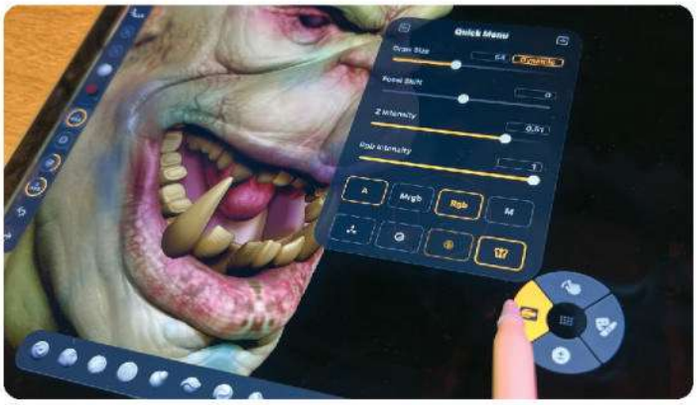
Using the touchscreen, combined with Apple Pencil, to manipulate the sculpt is a very personal choice, and every artist will have their own options when it comes to their favourite tools, but ZBrush has tried to place the core tools front and centre.

ZBrush for iPad has a more logical UI, which is also customisable. It's cleaner and clearer, lean and well thought out for a mobile device and in no way a poor desktop port.

TABLET TOOLBOX

For me, what brings the full ZBrush experience to iPad are firstly ZSpheres. This is a unique way to create a

The desktop version of ZBrush has been redesigned for iPad – and it's brilliant



sculpting armature out of spheres and then use this as your base to start sculpting on.

Then we have some of the more obscure features such as Slime Bridge, ArrayMesh, Dynamics, FiberMesh, Morph Targets, Polygroups, Polypaint, Masking and DynaMesh. There are also plenty more tools that have been brought over from desktop to iPad, but my initial reaction to getting all of these powerful features, some of which you only see in ZBrush, is very positive.

Impressively, Maxon has packed in a mammoth list of brushes that you'd find in the desktop program. While the free version is limited to a smaller number of the core brushes, Maxon has omitted the one that I found I really wanted: the Dam Standard brush for making creases and wrinkles. That was the first thing that would make me want to get the full subscription. It's funny how one little tool can have that much impact, but in many ways, this is why ZBrush is so successful and means so much to 3D artists.

TARGET MARKET

So who is ZBrush for iPad aimed at? I've considered and discussed this topic for a few years now, and I believe the first group consists of people who are new to 3D modelling or have previously struggled with complex programs.

When you've already been modelling for any length of time, it's easy to forget just how overwhelming it can be when you're starting out. Trying to explain concepts like ZSpheres or DynaMesh to someone without a digital sculpting background can feel like speaking a foreign language. Mobile sculpting apps in general, while often lacking some more advanced features, let beginners jump in and create fairly impressive results with little knowledge or experience behind them.

"EXISTING USERS MAY LIKE THE MOBILE VERSION MORE THAN THE ESTABLISHED ONE"

The second group is made up of experienced sculptors who are familiar with ZBrush on desktop and want a way to continue their work on the go, seamlessly integrating what they create back at the studio. Maxon has made it a seamless process with GoZ as the bridge, and existing users may well end up liking the mobile version more than the established one, me included!

ROOM FOR IMPROVEMENT

This list could change quickly. Firstly, there's no UV master that will give you a set of UV coordinates. I use that sort of feature in almost every project, so I'd want to see that added.

Then there's the lack of ZModeler. This is the method for low-poly modelling, where you can manipulate models at the component level, for example the points, edges and faces that make up your design. While this isn't a huge omission for me, it's something I'd like to see brought in.

But the dealbreaker is that there's no real-time rendering. ZBrush for iPad is going up against Nomad Sculpt, which boasts a real-time rendering solution with post-processing akin to Sketchfab, Marmoset or even Blender's EEVEE. In this day and age real-time rendering is a must, especially if you're hoping to convert artists that have only used Nomad. This should be a high priority going forward.

THE VERDICT

9.0
OUT OF 10

ZBRUSH FOR IPAD

Much easier to navigate and learn than its desktop counterpart, ZBrush for iPad is a rewritten app with almost all the tooling you'd see in the full version. Powerful and feature-packed, this feels like a historic release.

AUTHOR PROFILE
Heather Sterland
Heather creates SFX for Shear Rock and Interstellar Duo, and reports on 3D modelling and rendering software.
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FEATURES

Includes 74 primitive shapes such as rocks, spheres, diamonds, nuts and gems

28 preloaded Cinema 4D shapes including a spur gear, male/female figures and a palm tree

12 preloaded materials including chrome, glass, gold, gummy, plastic and porcelain

Supports C4D, OBJ, FBX, GLB, 3DS, DAE and GLTF files

PROS

Powerful Cloner tool

Create After Effects layers for Bump and Emission maps

CONS

Reset reverts all parameters

SOFTWARE REVIEW

Red Giant Geo

Above: You can use the clone tool to create packed scenes such as this asteroid cluster

PRICE Red Giant plan £85/$85 monthly / £635/$640 annual | COMPANY Maxon | WEBSITE maxon.net/red-giant

Red Giant Geo is a new plugin that enables 3D objects to be rendered in Adobe's After Effects. The feature stands out mostly for its Cloner tool, which can create thousands of copycat versions that Geo handles smoothly and easily.

A part of the Red Giant Trapcode set, Geo can work with either preloaded or custom objects. The selected objects can be scaled slightly with more freedom to be found in the Bend Mesh tool, while altering a basic plane or sphere can produce interesting shapes. This can be useful for morphing transitions such as a bouncing ball.

But arguably the real selling point of this plugin is the Cloner, which provides users with intuitive adjustments once learned. The clone array is built by increasing the number of objects in the X, Y and Z axes to build a clone matrix. These clones can then be resized so they don't overlap, with added scattering options, for example changing the randomness in rotation and spacing, able to bring extra variety.

An example of a project that would benefit from the Clone tool could be slow-motion graphics of hundreds of objects falling. You could import 10 different objects and clone them all, a task that Geo will take in its stride.

Creating scenes like snow and rockfall, meteor storms or even giving the impression of millions of bubbles are all possible. Something else to try with Geo would be shattering an object such as a vase into thousands of tiny pieces.

Coming up in second place behind the Cloner feature is the powerful Shadow Catcher tool. This allows the placement of shadows to be controlled with layer transformations in After Effects. The shadows can essentially be enabled when creating a new solid layer where they'd fall. Your sun's colour, intensity and angle can also be adjusted with Geo's environment tooling.

Meanwhile, Geo comes with a variety of material presets including clear glass, porcelain and brushed aluminium to help speed up setups, with users able to choose up to five materials for each imported model, which can also be adjusted. For example, you can up the Transmission Weight to allow light to pass through, or tune the shine and reflectivity. With the ability to play with glowing effects, link to custom Bump and Emission maps in After Effects, and a whole lot more, there's no shortage of useful adjustments to be made with Geo's options.

The plugin has also been well streamlined. You don't have to go through the process of importing a custom shape into the library to add a custom 3D file. As long as you've dragged your 3D model into the composition – and seven kinds of 3D files are supported – the shape can be linked in the Geometry dropdown menu within Geo. The same workflow also applies for Bump and Emission maps; as long as they're in the composition, they'll automatically appear in Geo's Material Assignments.

THE VERDICT

9.0 OUT OF 10

RED GIANT GEO
Geo renders objects in their thousands and does so quickly. It's a useful tool for some specific projects, so paying for it on a monthly basis or the duration of a project could be a more economical option than the annual subscription.

HARDWARE REVIEW

GXT 612 Cetic speakers

PRICE £45/$60 | COMPANY Trust | WEBSITE trust.com

AUTHOR PROFILE

Rob Redman

Rob is Editor of 3D World and also works as a creative director, producing 3D animations and VFX. When not at his desk, he can usually be found painting miniatures.

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PROS

Lightweight, but well built

Good, balanced sound

RGB lighting

Can be used wirelessly or via 3.5mm cable

CONS

Can distort at higher volumes

Lights aren't fully controllable

POWER OUTPUT CONFUSION

Speakers are often rated in watts with a second figure in RMS, but what does this mean? Well, the stated watts is a measure of the maximum output a speaker can produce. A more realistic measure is the RMS figure: the level that a clean tone can be delivered indefinitely. Peak watts can distort if reached for too long.

Audio is so often overlooked by visual artists, but it's a key element of a successful project, so don't skimp or simply use your earbuds for audio in your next project. Even if you have limited space, there are options that will suit, just like these GXT 612 speakers from Trust.

They are small but pack 18 watts of output, plenty for a smaller workspace. And better yet they can connect via cable or Bluetooth, so adding them to an existing setup is simple.

While not for everybody, they have a band of animated coloured LEDs around the bottom edge, which could suit your workstation innards well if that's your style. The lights have various modes and, while limited, can be set to move with your music, cycle through the range of colours, or simply be turned off.

© Trust International B.V.

Above: The GXT 612s are attractive small-form factor speakers that sound good for their size

"THEY'RE **CLEAR, SMALL, EASY TO CONNECT AND USE, AND DO THEIR JOB ADMIRABLY**, AS WELL AS BEING AN ECO-CONSCIOUS BUILD"

One benefit of the GXT 612 speakers is that you won't need a wall power outlet for them like bigger speakers require, as they're USB-powered. That's a nice touch, as is the fact that they're made from recycled plastics; not entirely, but it's a step in the right direction.

All that is only of any use if they sound good though, and luckily these do – to a point. 18 watts (10 watts RMS) is decent, though at higher volumes they do break up a little, but I doubt they'll be pushed that hard.

The balance between bass, mids and treble is pretty good for a small speaker too. They certainly aren't weighted disproportionately towards the lower frequencies like so many speakers are, which makes for an easy listening experience. At this price point you can't expect the best in separation, clarity and definition, but they are more than acceptable and don't tire the ears.

The target audience is a more casual listener rather than those needing studio monitors, and if that sounds like you, then you won't be disappointed. They're clear, small, easy to connect and use, and do their job admirably, as well as being eco-conscious.

THE VERDICT

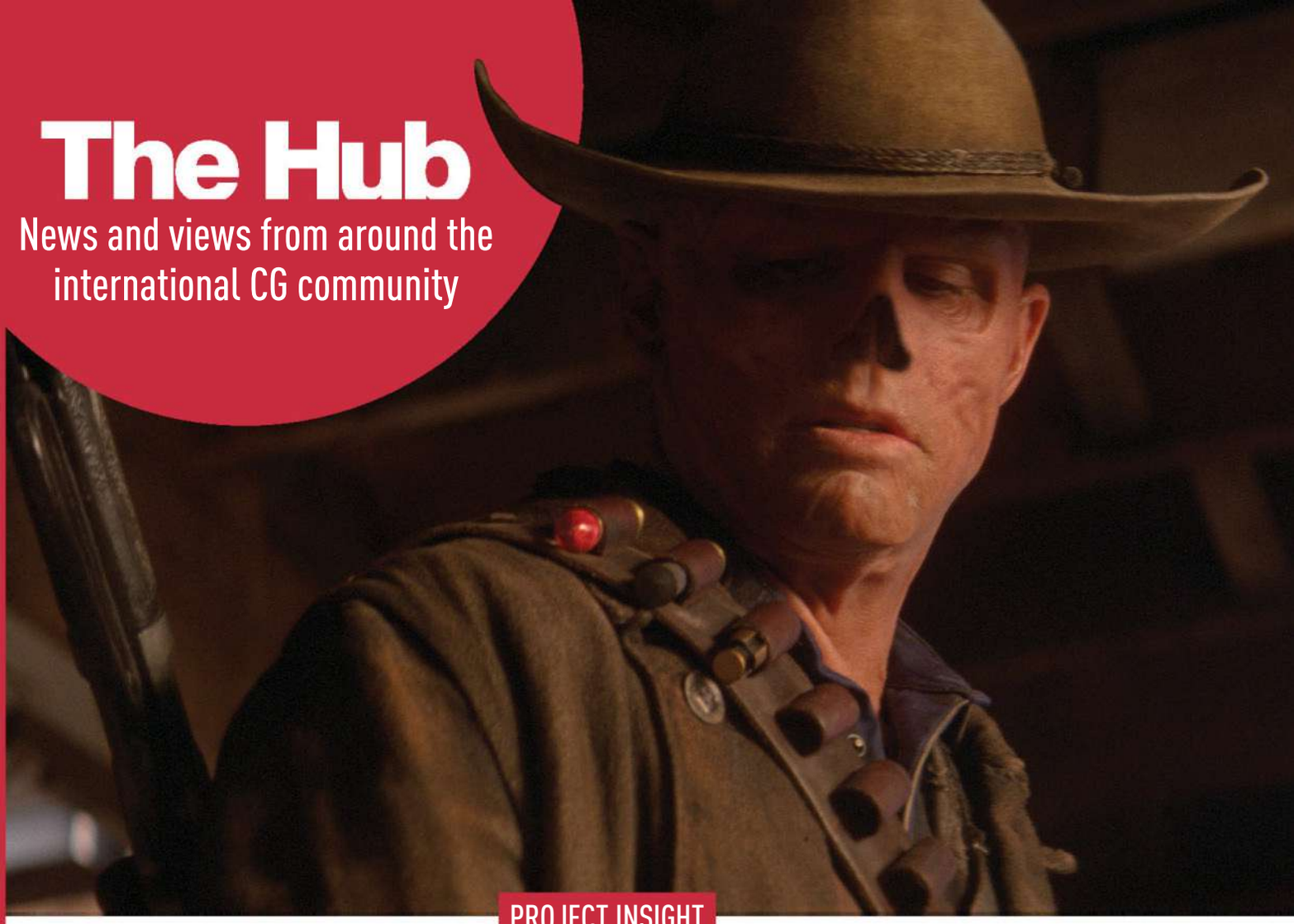
8.0 OUT OF 10

GXT 612 CETIC SPEAKERS

If you're limited in space but still need good audio and like an RGB-lit workspace, then the GXT 612s are a good option for you. They might not be the loudest, but they're well balanced and a solid overall choice for the price point.

The Hub

News and views from around the international CG community



PROJECT INSIGHT

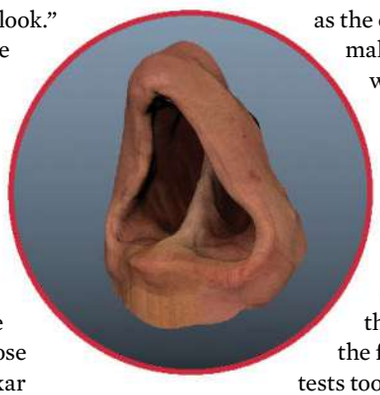
Nosing around on Fallout

We sniff out the story of how **FutureWorks** brought The Ghoul to life with the creation of his iconic noseless face

Long-time FutureWorks collaborator and VFX supervisor Jay Worth turned to the studio's visual effects team to create one of the most iconic composites of the 16-times Emmy nominated Amazon Prime hit *Fallout*. In addition to the ideation and delivery on the look of The Ghoul, the FutureWorks team delivered over 700 shots for the series, including set extensions and clean-ups.

VFX supervisor Gouri Shankar worked closely with Worth and over 150 FutureWorks artists to bring the character to life. "Jay has been a long-time partner of FutureWorks," he explains. "We were fortunate to work with him on projects like *Westworld, The Peripheral*, and more recently the Apple TV+ limited series *The Lady in the Lake*. Naturally we jumped at the opportunity to work on *Fallout*. The success of the franchise set it up for a promising reception. This was never going to be a straightforward comp job, but we relished the challenge and were excited to be involved from the conceptualisation of the look."

The job at hand for the FutureWorks team was to remove the nose of actor Walton Goggins, lost as a result of nuclear radiation from the *Fallout* universe's Great War. "Our task was to create the negative space where The Ghoul's mutilated nose would have been," Shankar says. "We got on board at the very beginning, working closely with Jay but also the makeup and prosthetics teams led by Jake Garber. We had to ensure the final result was as realistic and as true-to-the-games as possible.



"The challenge lay in making the skin look as radiation-affected as possible, with the nose area authentically damaged. Using references to the original game, as well as the exceptional craft of the makeup and prosthetics team, we continuously iterated the render until Goggins' character came into its grizzly self."

FutureWorks' process began with a scan of Goggins' head, which developed into a 3D model that was then tracked to the footage. "The initial look tests took place in the summer of 2022," Shankar says. "Using head scans and working closely with Jacob and his team to ensure consistency with makeup, we produced a 3D model of Walton's head, utilising 3D motion tracking to follow and understand his facial movements.

Left: Walton Goggins, who played The Ghoul, had his nose marked to identify the 3D tracking points

Below: Goggins' head was captured from multiple angles to detect every single nuance of his facial expressions

Inset: A 3D closeup of the radiation-mutated nose with just the septum remaining

> "WE HAD MULTIPLE VENDORS DO A VERSION OF THE HERO SHOT... FUTUREWORKS' VERSION **WAS THE ONE THAT WE ALL LIKED**"
>
> **Jay Worth, VFX supervisor, *Fallout***

We then modified the 3D model, removing the nose and sculpting the negative space to reflect his radiation-scarred face. We used numerous references to the ghouls in the games to ensure the replication was as accurate and true-to-the-game as possible.

"Using the tracking data, we aligned the 3D model with the footage, ensuring it followed the movements and expressions of Walton's face. The sculpted nose model was textured and relighted in Nuke for complete control at the compositing stage. Our comp team includes experienced body track artists who enabled the compositors to track a perfectly aligned nose to the head. After the tracking data was imported, the compositors had to apply the texturing data on the final nose asset."

GUNNING FOR REALISM

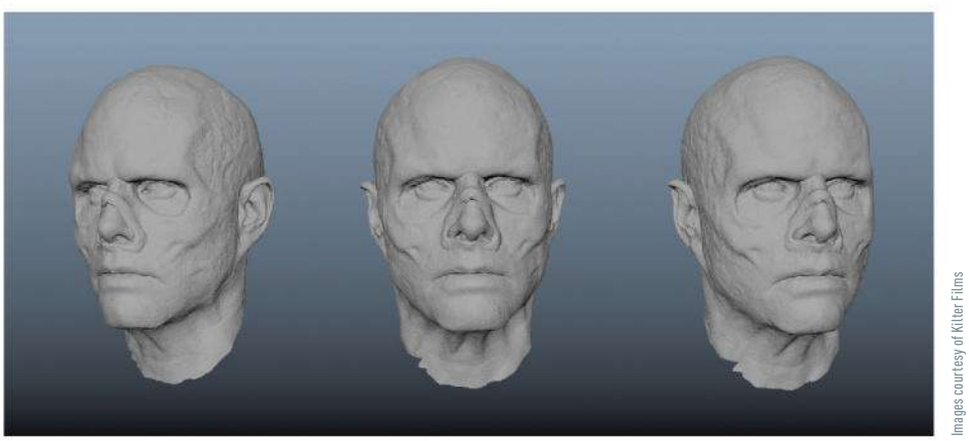
Extra care was taken to ensure the composited footage looked realistic. "The next stage was the edges; the juncture between the prosthetic nose and our 3D asset," Shankar continues. "The prosthetic team generously gave the best reference possible on the edge. We were able to replicate this and blend through the edges of the 3D asset, giving the subsurface scattered skin texture. This was the key element in blending, as most scenes where the nose was against strong backlight, it needed to feel organic. Once we achieved this, the rest of the process was easier."

Shankar says the input of a revered VFX artist in Worth was a major factor in successfully pulling off The Ghoul's noseless look. "During the testing stage, we faced challenges of how to create a convincing CG nose with such close proximity to the camera," he says. "Thankfully we had the best direction possible from Jay and the rest of the creative team behind the show. Once we realised our approach was aligning to what [director] Jonathan Nolan, the cinematographers and the VFX supervisors had imagined, we were confident our methodology worked and implemented the same pipeline for the entire show.

"Jay delivered a keynote on the show at FMX this year and explained his reasons for using 3D to remove the nose. A number of methods were considered and although the makeup looked amazing, the team were stuck on how to remove the nose. This resulted in training on the sculpt to see if a machine-learning approach was possible and although interesting, it wouldn't allow the flexibility needed for 500-plus shots in a variety of body positions, environments and lighting, hence the 3D approach."

Worth's career has spanned over two decades and seen him work for giants including Disney and Warner Bros. He was the VFX supervisor for HBO's dystopian sci-fi series *Westworld*, for which he won an Emmy. Reflecting on The Ghoul's facial aesthetic, Worth explains: "Initially we'd hoped to achieve the look with a 2D approach using the sculpt from our amazing makeup FX team, but we realised that it wouldn't give us the flexibility we'd need to capture Walton's incredible performance.

"We had multiple vendors do a version of the hero shot in Filly and when I showed all the options to producers, we all agreed the FutureWorks version was the one we all liked. We based everything in terms of the look, size and detail on it. It all started with the concept art and makeup created by Jake Garber and Vincent Van Dyke. It was fun to bring those designs to fruition."



Images courtesy of Kilter Films

5 OF THE BEST

MCU VFX moments

Pros choose their favourite CG shots from the Marvel Cinematic Universe

The best CG in the Marvel Cinematic Universe is hard to pin down, as there's just so much of it at such a high quality. When it comes to sheer quantity of visual effects shots, one could argue Marvel Studios has created an offshoot industry, as thousands of shots have been created by an army of visual effects studios that span the globe, and literally works 24/7 when factoring in the time-zone differences.

In order to manage the huge demand for digital content, several visual effects coordinators are assigned a particular set of VFX companies to support the production visual effects supervisor and producer. The process alone is as epic as its end products, which are perennial nominees for the Oscars' Best Visual Effects crown.

There's a lot of material to go through when selecting the best of best here, but interestingly some of the industry experts we spoke to have chosen to highlight the beginning of the MCU, as it set the standard for what was to follow.

IRON MAN (2008)

When the Marvel Cinematic Universe was launched in 2008 with the release of *Iron Man* and *The Incredible Hulk*, it was the cheeky, irreverent attitude and charisma of Robert Downey Jr. paired with high-tech wizardry, featuring innovative HUDs and imaginative advanced robotic armour suits, that became an irresistible box office sensation and won over ILM's John Knoll. He told us: "I'm a big fan of the work on the first *Iron Man* film."

Knoll isn't alone either, as veteran visual effects supervisor Robert Legato, who collaborated with *Iron Man* director Jon Favreau on both *The Jungle Book* and *The Lion King*, is in agreement with his colleague. Legato explains: "Not being very fluent in Marvel films, I would have to say the CGI I admire the most is from the first *Iron Man*. It presented a level of quality and fun that I hadn't seen before in human animation. The CGI effectively rounded out and enhanced the character, making that my choice for the best use of CGI in the Marvel films."

X-MEN: DAYS OF FUTURE PAST (2014)

Joining the Marvel Cinematic Universe are the X-Men, who have a rich history of gravity-defying abilities that couldn't be achieved without a successful marriage between the worlds of stunt choreography and digital manipulation. Oddly enough, there's one mutant character that has crossed over before, played by two different actors and having two diverging adaptations, with the Fox version gaining the most traction among fans and critics.

Indeed, Quicksilver's slow-motion kitchen scene from *X-Men: Days of Future Past* remains an iconic and often replicated piece of VFX magic. "That is one of the film's most memorable sequences," enthuses digital animator and compositor Sheena Duggal. "In this scene, Quicksilver uses his super-speed abilities to manipulate a fight sequence in the Pentagon kitchen. Everything else in the room moves in super slow-motion compared to his lightning-fast movements, allowing him to reposition bullets, disarm the guards, and playfully rearrange their faces.

1

"What many don't know is that Quicksilver was shot with a stunt guy who ran practically around the room on a specially designed rig, while the rest of the performers held their positions and were later stabilised by the visual effects team. All the interactions, like the wedgie and the poke in the face, were done practically and CGI elements were added later. The effects on the face were also created practically by blowing wind into the stunt actors' and performers' faces. It's a beautiful example of how stunts and effects teams work in tandem with visual effects teams."

"I THOUGHT THE LAST GUARDIANS OF THE GALAXY WAS NOT ONLY **THE BEST VFX IN A MARVEL MOVIE**, BUT THE BEST OF 2023"

Adrian de Wet, visual effects supervisor

DOCTOR STRANGE (2016)

Getting seriously psychedelic is exactly what happened when an Eldritch Whip, Astral Projection and a kaleidoscopic New York City skyline got introduced into the visual language of the MCU. "*Doctor Strange* [2016] was great fun with its mind-bending, Escher-esque, trippy visual effects," says Duggal, who got to deal with some supernatural elements herself on *Ghostbusters: Afterlife*.

The visual effects in *Doctor Strange* are a brilliant use of the visual effects toolset to master design and creativity.

GUARDIANS OF THE GALAXY 2 (2017)

Ironically, the trilogy of movies in the MCU that constantly gets praised for its visual effects work was initially seen to be an odd choice for Marvel Studios president Kevin Feige to adapt, but his instinct, along with recruiting filmmaker James Gunn, turned out to be a masterstroke.

"It was such a brilliant intro to the second instalment of the *Guardians of the Galaxy* franchise," notes Sara Bennett, who surprised the world when *Ex Machina* won the Academy Award for Best Visual Effects. "The animation of Baby Groot dancing around and being carefree, oblivious to the carnage going on around him, is really well executed by the animation team. The visual look from the environment builds, and the dynamic use of the camera gives it this great energy. The beats throughout that reintroduce you to the characters are seamlessly done with the very cool design of the CG Abilisk that's in the background."

GUARDIANS OF THE GALAXY 3 (2023)

Bennett and Duggal aren't alone with their praise of the *Guardians of the Galaxy* franchise. Adrian de Wet, who was the visual effects supervisor for the fantasy adventure *Slumberland*, was so impressed with the third instalment that he felt its VFX rivaled the best that 2023 had to offer across the cinema scene.

"I thought the last *Guardians of the Galaxy* was not only the best visual effects in a Marvel movie, but it was also the best visual effects of 2023. Every single shot was beautifully designed and composed, and expertly executed," he says. "And that oner was a real joy. The visual effects dovetailed perfectly into the production design and the DI [digital intermediate] gave it a beautiful colour scheme that made the whole thing an absolute treat for the eyes."

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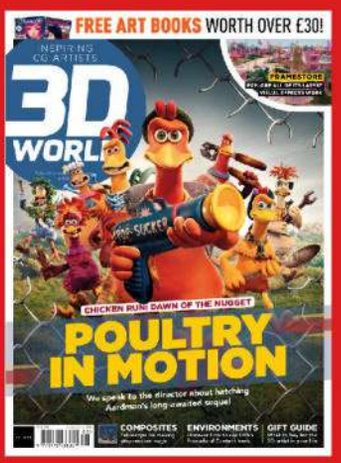

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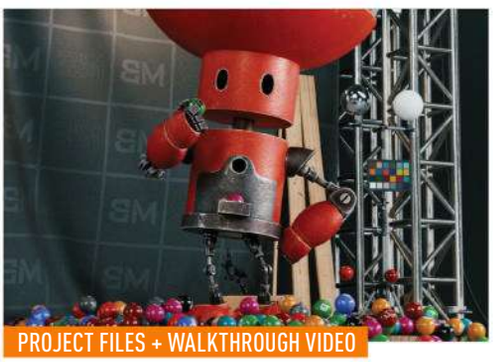

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TUTORIAL IMAGES + PROJECT FILES

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Thank you!

3D WORLD

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