ComputerGraphics World

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ComputerGraphics World

June 2005 • Volume 28 • Number 6

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Departments

Features

On the cover:

In *Star Wars Episode III,* the establishing shot for the city-world of Coruscant was a 3D digital matte painting, one of hundreds used for the film. For more info, see pg. 10.

editor's note

Phil LoPiccolo
Editor-in-Chief

When Hemispheres Collide

Those who visit the Emerging Technologies gallery at SIGGRAPH next month may notice a novel twist. Each exhibit on display will put a creative spin on the technology to explain the innovation and its potential significance.

Why blend the art and science of computer graphics in this way? One answer is to attract the attention of people in the field, who are by nature at ease with the creative side of technology. But a more compelling reason is to try to spark ideas to further the concepts. Here are a few exhibits that underscore this approach:

Virtual Hang-Gliding: Researchers at the University of São Paulo combined head-tracking and stereoscopic head-mounted display technologies to create an interactive virtual hang-gliding experience, in which 3D imagery, sound, and wind sensations change according to the user's head orientation and movements. Users soar over a detailed 3D model of Rio de Janeiro that was created for a tourism exhibition. The developers contend that instead of trying to make images for virtual-reality applications more photorealistic, the key to making the experiences more immersive and believable is to engage several of the user's senses, in this case sight, hearing, and touch.

Scenting a Scene: Speaking of engaging other senses, a team at the ATR Media Information Science Laboratories in Japan has devised an apparatus that uses "scent projectors" to waft small regions of scented air toward users at specific times and locations. The SpotScents device uses an air cannon mounted on a panning and tilting platform that launches a series of aroma rings that are timed to cancel out distracting air currents at the target point. The developers envision that with the technology users will be able to smell what's happening in movies, games, advertisements, and the like.

The Ultimate SteadiCam: Inventors from ViewPlus Inc., the University of Tokyo, and the University of Electro-Communications in Japan have developed a new technology called MotionSphere that they propose can record real-time images from multiple cameras embedded in swinging and spinning objects, like baseball bats and basketballs. An image-processing algorithm compensates for camera rotations and stabilizes the image so viewers can see a steady image of a scene from the perspective of a rapidly moving object.

Engaging both right- and left-brain processes may be the best way to spark technological innovation.

Smart Stereoscope: Imagine turning any room into an environment that immerses inhabitants in stereoscopic imagery. That's what a team from Bauhaus University Weimar in Germany is promising with a new image-correction technique that can project stereo images onto complex, colored surfaces—such as in rooms with curtains, furniture, and wallpaper—as if they were displayed on flat white screens. The system performs pixel correction of shape, color, and focus and uses multiple projectors to enhance brightness in shadows and to minimize blur. The creators suggest that the technique could be used for immersive environments in industry, museums, the home, or any locations where installing large CAVE-like structures would be impractical.

Will the convergence of art and science illustrated in these exhibits, or at least envisioned by their developers, inspire further technological innovation? Absolutely. Fanning both the technical and creative fires of the SIGGRAPH attendees—who have spent more time than most building pathways between right- and left-hemisphere brain processes—may be the most powerful way yet to advance the state of the art.

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The Magazine for Digital Content Professionals

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PRODUCTS

WORKSTATION

Alienware Unveils MJ-12 7550a System

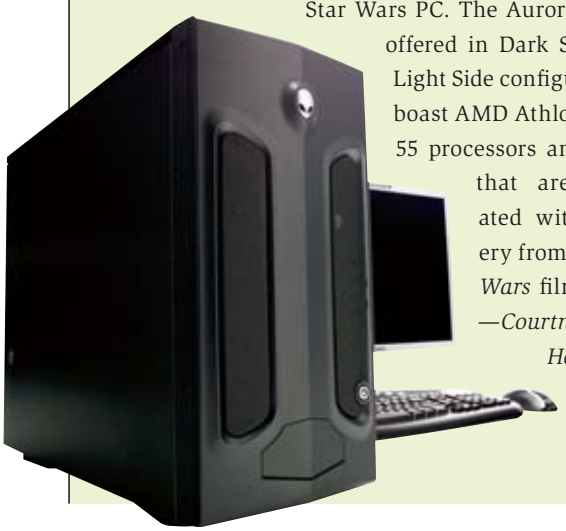
During the National Association of Broadcasters (NAB; www.nabshow.com) show in Las Vegas recently, Alienware introduced its latest professional computing system, the Alienware MJ-12 7550a.

Designed for digital content creation and other rendering-intensive applications, the MJ-12 7550a employs dual AMD Opteron 200 Series processors, the Nvidia nForce Professional chipset, and dual PCI Express graphics. The new model provides support for Nvidia SLI technology and Quadro graphics, DDR registered memory, and SATA II drives.

The company's MJ-12 7550a workstation sports a new case design that takes advantage of next-generation acoustic dampening for quiet operation, front-accessible ports for user convenience, and extra ventilation to ensure low system temperatures.

Alienware has announced its plans to offer the dual-core Intel Pentium Processor Extreme Edition 840 using the Intel 955X Express chipset in its Area-51 5500 desktop, Area-51 ALX desktop, and MJ-12 5500 workstation.

The company also debuted Aurora: Star Wars Edition, reported to be the first officially licensed Star Wars PC. The Aurora model, offered in Dark Side and Light Side configurations, boast AMD Athlon 64 FX-55 processors and cases that are decorated with imagery from the *Star Wars* film series. —*Courtney E. Howard*



PRODUCTS

3D ANIMATION

Avid Previews 64-bit Softimage XSI

Softimage and its parent company, Avid Technology, previewed a native 64-bit version of Softimage XSI during WinHEC, Microsoft's Windows Hardware Engineering Conference, held in Seattle.

WinHEC attendees were among the first to witness a prototype of Softimage XSI 3D animation software for use with 64-bit computing architectures. During the technology preview, Avid imparted the benefits of 64-bit performance over 32-bit computing, such as greater interactivity and faster rendering of complex 3D scenes.

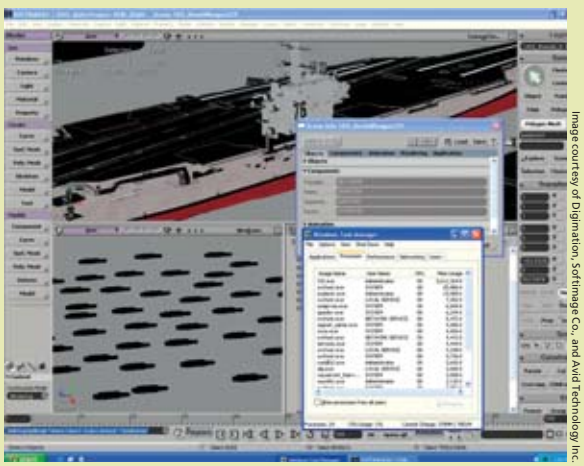


Image courtesy of Digimation, Softimage Co., and Avid Technology Inc.

For the demonstration, Softimage worked with large, high-quality imagery in the 64-bit XSI prototype software running on a Dell workstation with 6GB of RAM. In fact, the image above required 3.6GB of RAM. On an 8GB Dell system, the company loaded a scene with 500 million polygons, taking up 6.9GB of RAM.

The 64-bit version of Softimage XSI is designed to streamline such 3D animation processes as modeling, texturing, and rendering. And it does so by taking advantage of the latest 64-bit technologies, including the Microsoft Windows XP Professional x64 Edition operating system. —*CEH*

PRODUCTS

OPERATING SYSTEM

Apple Unleashes Tiger

Apple Computer, in special events held at Apple retail stores and authorized resellers, began selling its latest operating system, Mac OS X Version 10.4.

Called Tiger, Version 10.4 boasts more than 200 new features, including enhanced security. Spotlight, a new desktop search technology, aids users in locating virtually anything stored on their Macs, including images, documents, e-mails, and contacts.

Another utility new to Mac OS X, Dashboard provides instant access to information via widgets, the name given to accessory applications. Accessible with a single click, widgets provide user-selectable information—such as stock quotes, currency conversions, weather forecasts, airline flight tracking, or a phone book—and disappear from the user interface as quickly and easily as they appear. Dashboard, built on such standard Web technologies as HTML and JavaScript, can curently access 14 widgets.

Designed to automate repetitive tasks, Tiger's Automator provides users with a library of more than 100 customizable actions that can be dragged and dropped into a simplified, efficient work flow. At the same time, iChat improves collaboration by enabling audio conferences with up to 10 people and videoconferences involving a maximum of four participants. With support for the new H.264 video codec and QuickTime 7, iChat offers improved picture quality, live video resizing and video streaming, and the ability to create virtual 3D conference rooms.

Additional features include support for 64-bit applications, Core Image and Core Video tools for image and video processing, Xgrid distributed computing, and the Xcode 2 suite of developer tools. An updated open-standards Unix-based foundation and enhanced compatibility with Microsoft Windows round out the upgrade.

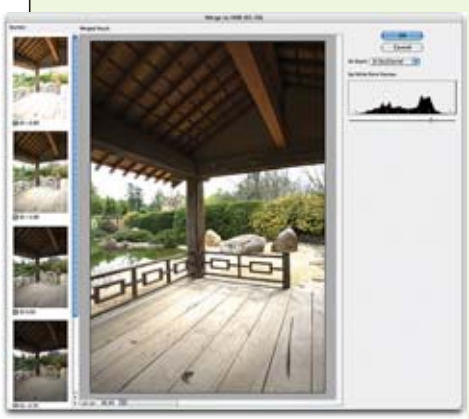
Apple's Mac OS X Version 10.4 is priced at $129 for a single-user license. The OS X Tiger Family Pack provides a single-residence, five-user license for $199. Tiger requires a Macintosh computer with a PowerPC G5, G4, or G3 processor, built-in FireWire, and at least 256MB of memory. —*CEH*

PRODUCTS

VIDEO

Adobe Debuts Video Collection 2.5 Professional

Adobe Systems has unveiled Adobe Video Collection 2.5 Professional, a software bundle that now includes the latest version of its Photoshop digital image editing and creation software. Photoshop CS2 joins Premiere Pro 1.5, After Effects 6.5, Audition 1.5, and Encore DVD 1.5.



Aiding professionals in the production of broadcast-quality images and effects, Photoshop CS2 brings with it Adobe Bridge for locating and previewing various file types, Vanishing Point that enables cloning and other image editing tasks while maintaining visual perspective, timesaving Smart Objects, and 32-bit HDR color and YUV processing. Running on Windows XP, Adobe Video Collection Professional is priced at $1499. Owners of the previous version can upgrade for $399, and users of the Standard version can upgrade to the latest Professional edition for $799.

Adobe also has announced its agreement to license, develop, and distribute Curious Software's rotoscoping technologies. The company plans to incorporate technology from Curious Software's gFx Pro—such as a paint engine for moving images, a roto-matte system, and wire and rig removal—into future Adobe software releases.

Additionally, the company intends to acquire Macromedia, developer of such popular Web publishing software solutions as Flash, Dreamweaver, Fireworks, FreeHand, Director, ColdFusion, and more. The all-stock transaction, in which shareholders will receive 0.69 shares of Adobe common stock for each share of Macromedia common stock, is valued at roughly $3.4 billion. The combined company will continue to deliver products for the creation, management, and delivery of content, and focus on growth in the mobile and enterprise markets. The acquisition is expected to close in the fall (see "Merger Mania," pg. 6). —*CEH*

viewpoint Video

Merger Mania

By Jeff Sauer

Just last month, Avid's pending acquisition of Pinnacle Systems seemed sure to be the video industry story of the year. It's a major shake-up that smartly positions Avid to broaden its customer base and remain the dominant video-editing manufacturer moving forward. Yet early on the first day of NAB2005, Adobe dropped an even bigger bombshell, and announced that it is acquiring one time archrival Macromedia.

Jeff Sauer
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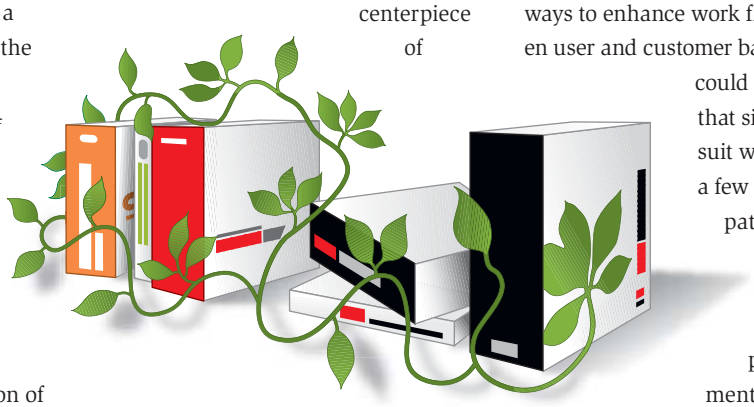
Adobe and Macromedia extend an industry consolidation trend.

Arguably, the Avid-Pinnacle merger will still have a more direct effect on higher-end digital video professionals than Adobe buying Macromedia. But at slightly less than a half-billion dollars, the Avid-Pinnacle deal can't touch the $3.4 billion Adobe is paying for Macromedia. Nor does Avid-Pinnacle ultimately reach such a potentially broad cross section of users, including those working in digital video, digital graphics and animation, and publishing, both print and online.

Content creators who remember the multimedia glory days in the 1990s might find Adobe buying Macromedia as startling as Ford buying Chevy, and they may focus on the end to some classic product rivalries: Photoshop vs. Fireworks, Illustrator vs. FreeHand, and more recently GoLive vs. Dreamweaver. Yet, the bigger monopolistic threat should really be having one company owning three hugely popular technologies—Postscript, Acrobat, and Flash—that are installed on an extremely high percentage of desktop computers. And the exciting part of the deal is that Flash may yet become the true video-capable application it's been trying to be for that past few years.

Product Blending

Adobe has some decisions to make, of course, regarding the blending of the most similar parts of the two product lines. Photoshop is, and will be, the centerpiece of Adobe's creative product line. That means Fireworks, as we know it, almost certainly won't last, although it might be an effective replacement for ImageReady as the Web engine for Photoshop, if it could be neatly integrated.



Illustrator is the dominant graphic design application, although you might find some argument in the creative community about Illustrator vs. FreeHand. Still, Illustrator's tight integration with Photoshop will be impossible to abandon, and that leaves FreeHand in a tenuous position. It would be ideal if Adobe could take the best of FreeHand and combine it with Illustrator. Dreamweaver has a much larger following than Adobe's GoLive, and that should keep it around as a future Adobe brand.

The concern is that the merger of these two strong brands will reduce competition and future product advancement, and that may happen to an extent. However, that's hardly as much an issue today as it would have been a few years ago. Each of these products is now mature and at least in a seventh revision, and feature one-upmanship isn't what it used to be. The bigger goal for both Adobe and Macromedia has been finding ways to enhance work flow and broaden user and customer bases. In fact, one could certainly argue that since Adobe's lawsuit with Macromedia a few years ago—for patent infringement on user interface elements—true product advancement has suffered from the competition, particularly with Flash.

And it's Flash that is the crowning jewel in this deal. Indeed, Flash has been a thorn in Adobe's side for years. Adobe has tried to match it with the unsuccessful LiveMotion application that could create Flash files. It has tried to leapfrog it in a way with the oddly conceived Atmosphere 3D format. And it has tried to make Flash obsolete by throwing sup-

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port behind the industry's SVG (Scalable Vector Graphics) initiative. Now, Adobe has just bought Flash, which Macromedia has claimed is installed on 98 percent of desktop computers.

The fun part of this acquisition is imagining what could happen with all of Adobe's and Macromedia's technologies under one roof. That starts with PDFs opening in SWF files and vice versa. Adding SVG to that mix could make a new Flash an extremely powerful creation tool. Yet for video professionals, it's Flash's potential as an online video distribution format that should wet the chops. Macromedia has been trying to incorporate video into Flash for several years now. Macromedia was the original developer of what is now Apple's Final Cut Pro, but it could not sustain a lengthy development cycle that increasingly came to be a distraction to its core products.

This year at NAB, Macromedia's booth was all about Flash video, although the design tools to work with video in Flash are limited. But imagine Flash working with serious and familiar video tools like Premiere and After Effects. Imagine the round-trip integration that those two applications share with, for example, Adobe's Encore DVD authoring application. Now imagine Flash being able to deliver integrated and interactive video and graphics content to 98 percent of desktop computers without installing anything. Online video production could actually reach the promise of the late 1990s.

Industry Shakeout?

The Adobe-Macromedia announcement was actually the third video industry takeover announced in less than two months. The first was InterVideo gaining a controlling stake in Ulead Systems, a video company dating back to the early 1990s. Then, it was Avid buying Pinnacle, and now with the Adobe-Macromedia deal, it may seem like industry consolidation or the proverbial shakeout. And it probably is.

The video industry is long past the pioneering years of product development and user experience revolution. Creation tools are, for the most part, quite robust, and while manufacturers are always looking to improve products and to sell the next dot revision upgrade to as many users as possible, the shakeout reflects that it's getting harder to maintain the same level of improvement.

Today, content-creation vendors are looking for new opportunities to broaden their installed bases. That can mean extending product lines, like Avid is likely to do with Pinnacle's broadcast tools. Or it could mean going in unrelated directions, like focusing on corporate customers. In a real way, the Macromedia acquisition does both for Adobe, giving it a line of well-respected business tools like Director and Authorware, and an opportunity to raise the creative potential of designers by enhancing Flash.

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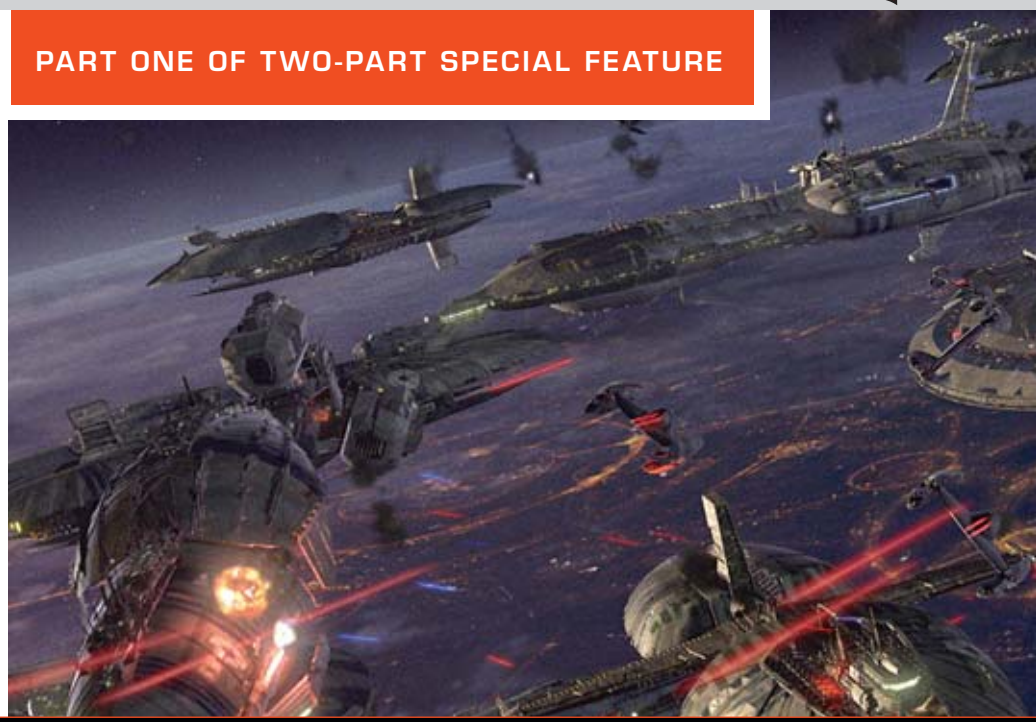

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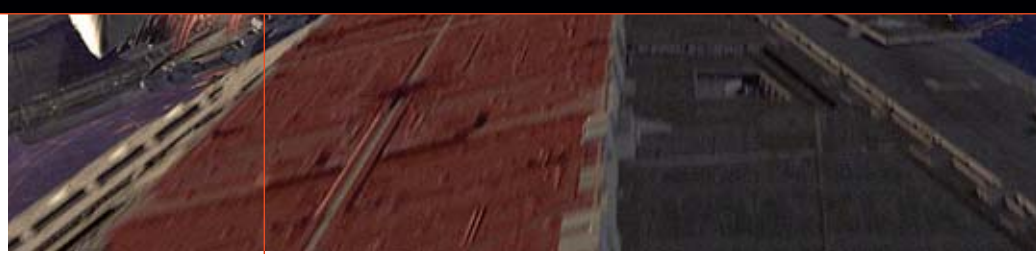

ILM creates new tools to craft a galaxy far, far away

By Barbara Robertson

For the millions of *Star Wars* fans around this world, a ticket to *Star Wars Episode III: Revenge of the Sith* buys one last ride to a much-loved galaxy far, far away. It's the final flight in a journey begun nearly 30 years ago when George Lucas introduced the world to the Force, Jedi Knights, an Evil Empire, and the Dark Side. *Episode III*, the sixth film in the series, but the saga's linchpin, marks the turning point in the story: In this episode, Anakin, the heroic young Jedi Knight, falls into the dark side and becomes the loathsome Darth Vader, setting up the final three films. In reality, however, this film concludes the cinematic journey, one of the most financially successful film franchises in history, with a stunning climax and rave reviews, particularly for the visual effects.

Paintings by digital matte artists at Industrial Light & Magic appeared in three-fourths of the 2151 visual effects shots. In addition, using a new camera mapping tool called Zenviro, technical directors and CG supervisors assembled environments for action shots from 3D models, 2D cards, and projected images.

The five episodes thus far have made visual effects history, and *Episode III* is on track to do the same. To create effects for the first *Star Wars* film, now named *Episode IV—New Hope*, Lucas created Industrial Light & Magic. And to realize Lucas's vision of intergalactic war and peace, ILM forged technical breakthroughs in visual effects and computer graphics: from optical filmmaking to digital, from motion-control cameras used for the first film to virtual cameras in synthetic environments for the last, from stunt doubles for leading actors to digital doubles, from puppets and actors in robot suits to armies of digital droids, clones, and furry Wookies, and lastly, from human to digital stars, including Jar Jar, Yoda, and, in *Episode III*, the evil CG General Grievous, commander of the droid army.

It's fitting that for this last tour of the *Star Wars* universe, the major technical breakthroughs helped build the galaxy rather than create its denizens. For *Episodes I* and *II*, released in 1999 and 2002, respectively, Lucas had asked ILM for more and better characters and digital doubles. That mandate spurred development in skin, hair, cloth, motion capture, rigid-body dynamics, and in rendering crowds of digital characters. Thus, for *Episode III*'s digital cast, the toolmakers fine-tuned the character animation technology—applying motion-capture cycles to multiple digital characters, for example, streamlining rigging, repurposing hair simulations, changing small pieces of a cloth simulation, and so forth—to make the process more efficient.

Meanwhile, for *Episode III*, Lucas turned his attention to the environments. The action in *Episode III* takes place on and above several planets: the city-world of Coruscant, the volcanic Mustafar, the Wookies' dreamy lake and forest home planet Kashyyyk, the sinkhole planet Utapau, exotic Felucia with its fungi, idyllic Alderaan, Padme's Naboo, and the barren Tatooine. On those planets, and in the atmosphere above them, the actors (live and digital) craft the epic tale in wide shots of cities, mountains, lakes, forests, deserts, and in interiors—corridors and pilot stations on battleships and planets, the Senate Chamber, conference rooms, and private apartments.

Seventy-two physical sets were used for principal photography, as were miniatures of complex environments, from the Wookies' giant trees, to Utapau's complicated sinkholes, to Mustafar's rivers of lava created in ILM's model shop. But the sets were usually small pieces of large digital environments, and the miniatures often became elements in synthetic environments.

"Some shots require computer graphic [environments]," says John Knoll, who supervised 1700 of the 2151 visual effects shots. "For others, the smart thing is to build a model and shoot it. And then there is a big gray area where you could

ILM created the fiery explosions by combining fluid simulations, particle effects, and live-action elements, and rendered them with a custom volumetric rendering system that worked with RenderMan.

do it either way. Sometimes you make the choice on a gut feeling. Sometimes you choose CG for the control. Sometimes it's price. For this film, George [Lucas] asked us to bias more of the shots in the gray area toward digital. That drove a few bits of technology forward."

Fiery simulations provided the first opportunity for technical advancements: The film opens with the longest space battle of any episode. The battle takes place in the upper atmosphere of Coruscant, where Obi-Wan and Anakin fight General Grievous's droid army to rescue Chancellor Palpatine. In the previous episodes, smallish fighters fired at one another during the space battles. This time, behemoth, mile-long ships shoot thunderbolts at each other, and because they're fighting in Coruscant's atmosphere, not outer space, they trigger explosions.

The Kitchen Sink

"The space battle lasts eight minutes," says Willi Geiger, CG supervisor. "We have lasers, fire, explosions, digital pyro. We used everything, and the kitchen sink." Literally, it turns out, the crew did add a kitchen sink, as digital shrapnel hurled into one battleship's side.

Although many of the fireballs, the flaming debris, and the smoke trails during the battle used live-action elements, some were entirely digital. These used ILM's proprietary smoke simulation software and new pyro techniques. The simulator, developed in collaboration with Stanford University under the guidance of Ron Fedkiw, uses a fluid solver and particles that can be positioned and adjusted to sculpt the combustion. As these combustion particles burn, they create areas of local expansion. In addition, "spin" particles can create vortices in precise areas. The new tool developed for *Episode III* allowed the particle sequences to be retimed non-linearly. That meant the speed and timing of the pyrotechnics could be changed—that is, art directed—without running another simulation.

For further tweaking, particles output from the simulation engine could be imported into Alias's Maya, and models and simulations could be exported from Maya to the simulation engine. A new rendering system that used a custom RenderMan DSO handled volumetric rendering of the large particle sets.

For the first digital fireballs in the sequence, the crew started with the fluid-simulation engine, retimed it and adjusted it in Maya, then gave it a cellular look with Voronoi patterns based on the particle positions and a noise function. For this fireball, the crew again started with an explosion from the simulation engine. They imported the resulting particles into Maya, used those particles to trigger secondary events, exported the particles back into the fluid engine, ran the simulation again to include these events, and then combined and rendered all the simulations together. A similar process produced such other effects as smoke clouds during the battle.

Beneath the battle's fire and smoke lies the dense city-world of Coruscant. The establishing shot for the planet—the wide-view, flying-in-for-a-landing shot—is an intricate 3D matte painting, one of many used in the film. Digital matte supervisor Jonathan Harb estimates that three-fourths of the 2151 visual effects shots incorporated matte paintings—or, in the case of establishing shots, were entirely matte paintings. "We'd revisit the places many times," he says. "And, even though we had assets that could be re-used, George [Lucas] wanted particular moods, so the painting changed. The complexity of these places, especially Coruscant, was amazing."

Generally, the painters would start with relatively simple 3D geometry—models that they would texture, light, and render. Then, they began working on the rendered result, adding light as well as details. For an establishing shot of Naboo, digital matte artist Yanick Dusseault started with underlying rendered geometry from earlier episodes, adding trees and other painted elements, including final lighting.

For some shots, rather than sending Coruscant's digital environment to technical directors to finish, matte painters created the spaceships darting between the painted buildings.

Similarly, for an establishing shot of Coruscant, digital matte artist Yusei Uesugi incorporated buildings from both *Episode I* and *Episode II*. "What's incredible about this shot," Harb says,

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Kashyyyk, the home planet of the Wookies, was fashioned, as were other planets, from live-action photos, 3D models, digital still images, and matte paintings.

"is that it incorporates elements created and rendered in [Autodesk Media and Entertainment's] 3ds Max, [SplutterFish's] Brazil, [Alias's] Maya, [Softimage's] XSI, and [ILM's] Zeno." The shot was rendered using global illumination, and then Uesugi painted the rendering and projected it back onto the geometry.

"A shot like this might require 30 layers of projection, but compared to the time it would take to calculate global illumination for every frame, it's worth it," Harb says. "Plus, there's always going to be a place like this area. See that wash of light on that building? It wasn't in the rendering. Someone is always going to want to add something like that."

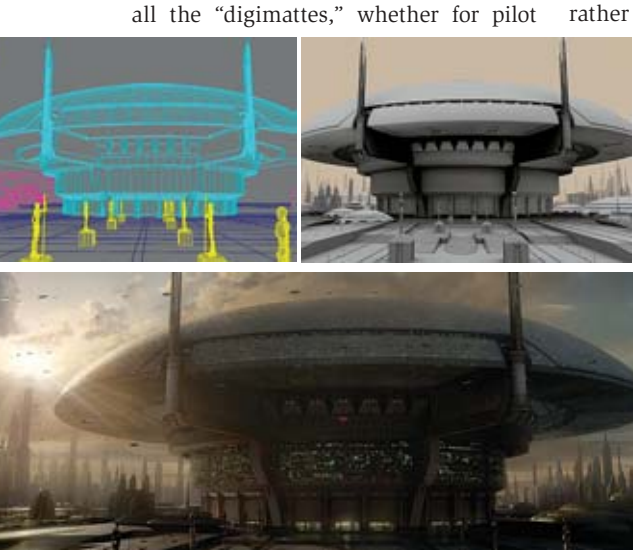
Moving Elements

In addition to adding painted details and lights, the matte artists would often add moving elements—spaceships navigating the corridors between Coruscant's skyscrapers, for example. It fits with a kind of one-person, one-shot philosophy that the matte department shared with ILM's former "Rebel Mac group," which is now permeating the pipeline. New tools have given people working on the pipeline more flexibility.

In the past, for example, the matte-painting department would have created all the "digimattes," whether for pilot ships or entire planets. This time, thanks to a new camera mapping tool named Zenviro, the 33 matte-painting artists concentrated on "establishing shots," while CG supervisors and technical directors crafted the "zenvironments." Alan Trombla led the Zenviro development effort in ILM's R&D department based on earlier work by Dan Goldman, now at the University of Washington.

"Suddenly, camera mapping was available to the rest of the crew, and they were taking on shots that would have come to us," says Harb. Although designed to handle huge environments, Zenviro quickly became adopted throughout the pipeline.

"People began using it for all kinds of things because it's really easy to use," says Knoll. "If they had a shot where the texture didn't hold up in the foreground, a lot of times they'd fix it with Zenviro rather than sending a little thing like that to the matte-painting department."



Digital matte artists created the senate office building on Coruscant (above) by painting a rendering of a 3D model (top, left) that was textured with a basic "cement" shader (top, right).

They built big things, too—a pilot station, cities on the sides of sinkholes, corridors on space ships, and large environments. CG supervisor Hilmar Koch, who oversaw work on synthetic environments, estimates that Zenviro settings were used for approximately 500 shots. "We used it for a lot of the heavy action shots," he says.

Working within Zenviro, CG supervisors could build a 3D scene using multiple image planes and 3D models, all textured with photographic elements that were projected onto the 2D and 3D geometry and then touched up, when needed, in Adobe's Photoshop. In other words, Zenviro artists could project high-res textures—2D images—onto 2D cards and onto 3D geometry within a 3D environment, paint on the textures, and move the camera around inside the resulting environment. The images could be live-action photography, motion-control shots of miniatures, paintings, 3D renderings, digital photographs, and so forth. The system managed multiple projections so that all surfaces seen by the camera had projected images and the correct amount of detail.

For example, if a cyclorama—a series of digital photographs or paintings stitched into a 360-degree loop—encircled a Zenviro scene, the camera saw the painting everywhere it turned. As the camera moved, it became obvious whether elements in the scene needed to be fully 3D or if they could be photographic elements on 2D cards—or, if they could be seen at all. Thus, Zenviro made it possible to have synthetic environments in which the camera is following fast action without needing to model and render an entire 3D scene for every frame.

"George [Lucas] pushed to do shot composition at the end of the pipeline," says Koch, who managed the synthetic environments. "So we had to build synthetic worlds in which to fly the camera, and Zenviro allowed him to work with miniatures in the same way he worked with pure CG assets."

Some of the largest miniatures were used to create the sinkholes on Utapau,

the Wookies' 1000-foot treehouses on Kashyyyk, and lava beds on Mustafar. For all three planets, matte paintings provided the first look.

On Utapau, aerial footage of a landscape not far from Lucas's Skywalker Ranch provided the background onto which stills of the sinkhole models were projected. On Level 10 inside a sinkhole, the complex environment where General Grievous fights Obi-Wan, was created with Zenviro.

For Kashyyyk, footage taken in China helped matte painters set the scene. The Wookies' treehouses were 12-foot miniatures shot from various angles that were replicated and augmented digitally for final shots. Branches and leaves were created with a Maya simulation using probability offsets. The branches were grown inside spheres; when a branch hit the sphere's border, it sprouted leaves. Here, again, Zenviro helped set the stage for a battle with backgrounds layered on cards.

The battle, which pits the Wookies and Yoda against the droids, takes place near a lake. "The water is calm, which made it easy," says Craig Hammack, CG supervisor, "but at the same time, it was hard because it was shallow and clear." A complex RenderMan shader created the flat surface, with RenderMan's raytracer handling reflections and refractions. Maya particles and practical elements helped create splashes for the digital droid tanks.

Hellfire

The film's climax, the fight between Anakin and Obi-Wan, takes place on Mustafar. "Anakin and Obi-Wan have become enemies," explains Rob Coleman, animation director. "The mentor is hunting the apprentice. It's the end of hope and friendship. It's the bowels of hell."

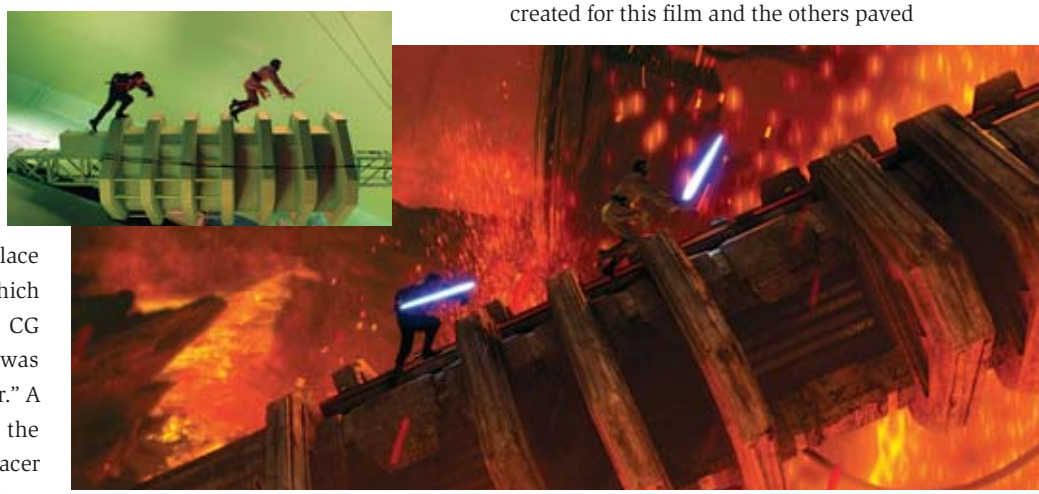
Roger Guyett supervised the sequence, which involved creating droids and character doubles. But the lava is the real star—10 to 15 minutes of fiery eruptions, molten rivers, flaming waterfalls, and blazing geysers. The far background is a matte painting; the rocks and lava rivers are miniatures—the molten material is actually gallons of methylcel poured into four-foot-wide channels. Many of the volcanic eruptions are clips from footage taken when Mt. Etna erupted during principal photography. The rest is CG.

Because the lava is integral to the plot and takes part in the action, it had to be art-directed in ways fluid simulations wouldn't allow. Instead, a crew led by Willi Geiger that included Philippe Rebours, Kevin Sprout, and John Helms developed techniques that used Maya particle effects to create 100 shots of splashing, falling, flowing, erupting fiery lava that matched the real Mt. Etna lava and interacted with the methylcel lava.

For massive lava events, giant eruptions in the middle of the fight, the crew hand-sculpted the flow using a combination of runtime expressions, locally controlled fields, and inter-particle forces. "Maya particles react individually to field forces, but real fluids are a continuous body," explains Geiger. "So using a system created by Masi Oka, we added inter-particle forces to make each particle aware of the other. We also created a system that allows us to precisely control the influence of each field. Rather than using global fields like 'gravity,' we could cheat physics to have some gravity here, another amount there, none somewhere else."

For other shots, the crew rendered the particle simulations as deforming or implicit surfaces that were sometimes textured with photographic elements and sometimes used to create displacement images that compositors used to warp the photographic plate—for example, to make flowing lava from the miniature splash when something hit it. The most intense and dramatic example of the crew's work, though, is the lava fall—Niagara Falls made of liquid fire. To organize the particles into streams, they constrained a series of radial fields into narrow tubes and had the streams within each tube flow to a point.

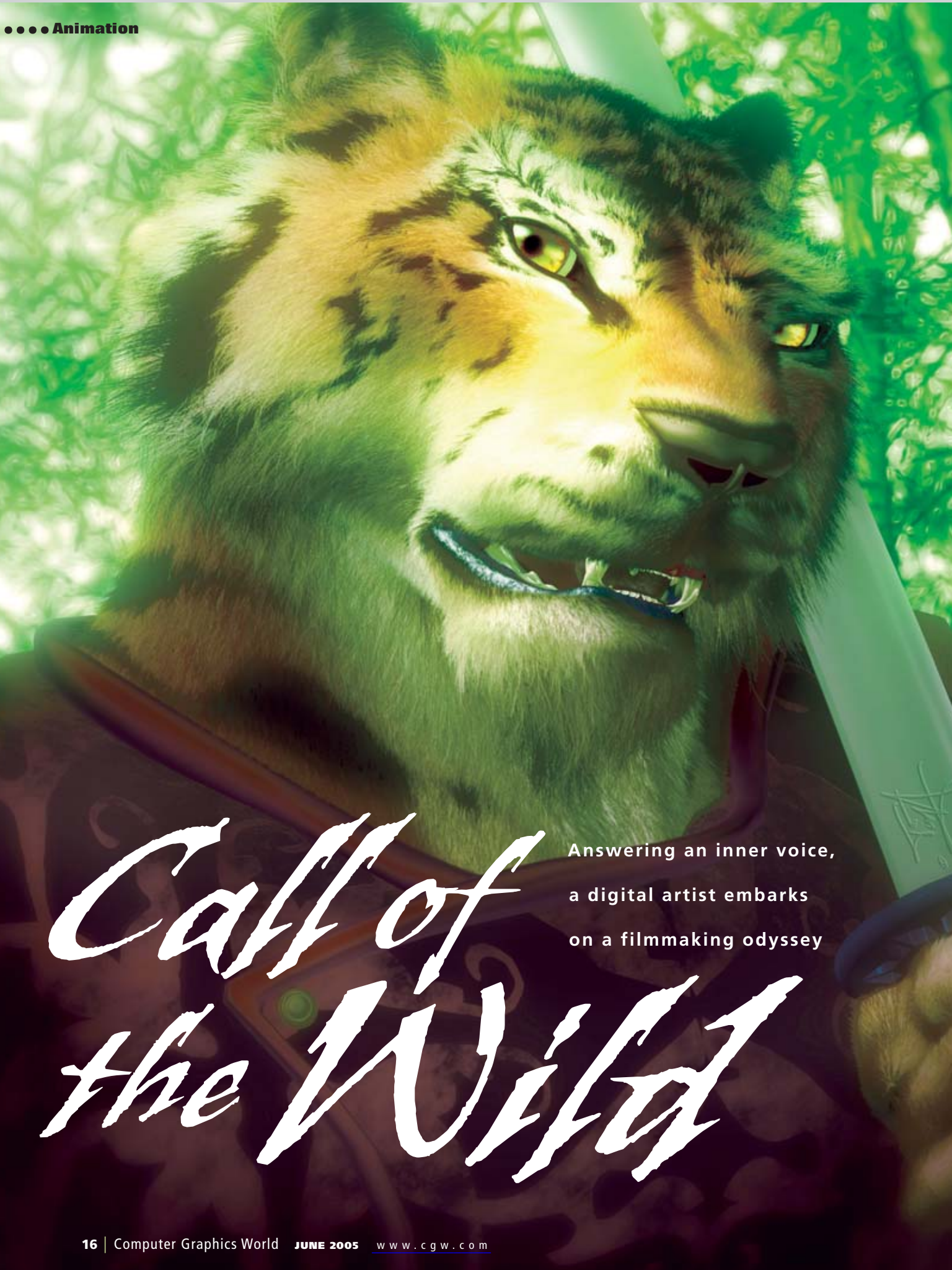
The film doesn't end in the bowels of hell; the scenes that follow prepare the way for the next three films, the first episodes Lucas released. So, too, has the technology that Lucas's effects studio created for this film and the others paved the way for new kinds of filmmaking. As directors turn ever more toward digital tools, the facile manipulation of virtual environments will become increasingly attractive. In this film, Zenviro created science-fiction worlds, but it can as easily replicate a real landscape—or create a mixture of real and fantasy, giving directors "new hope" for the future.



The fire below Anakin and Obi-Wan (shown inset against greenscreen) combined footage of Mt. Etna erupting, motion-control photography of a miniature, and Maya particle effects.

Barbara Robertson *is an award-winning journalist and a contributing editor for* Computer Graphics World.

Next month, in Part Two of our series, we look at the new cast of virtual characters and digital doubles in *Star Wars Episode III.*



Call of the Wild

Answering an inner voice, a digital artist embarks on a filmmaking odyssey

By Karen Moltenbrey

When you live in the Alaskan wilderness, every day is a test of survival, both physical and mental, and it was within this unforgiving environment that digital artist Timothy Albee challenged his willpower and creative skills. During a six-month period while living alone in a one-room cabin, he produced Kaze, Ghost Warrior, *an impressive 23-minute 3D film, on a budget of only $5000. In doing so, he rewrote the rules of CG filmmaking, proving that by thinking outside the box, one person, on two home computers, can make a feature-quality animated film. As remarkable as it is, Albee's story is not merely about the making of the film; it's just as much about the making of a filmmaker.*

The concept for *Kaze, Ghost Warrior* had been with digital artist Timothy Albee for many years, though it took a trip to the great white North for it to crystallize into a CG film.

There are those who dream of quitting their 9-to-5 job, selling their home in the suburbs, and moving to an exotic location to fulfill a lifelong goal. There are those who dare to make this a reality. And, then, there is Timothy Albee.

Four years ago, Albee, a digital artist, traded in the bright lights of Los Angeles for the northern lights of Fox, Alaska. Once there, he wrote a book and painted, then he wrote a screenplay, made a CG film, voiced all the parts, and wrote another book documenting his groundbreaking filmmaking process. And he did all these things by himself, with his sled dogs as companions, on the edge of the Northern frontier.

The Northern Edge

When Albee was a young man, he longed to move from his one-stoplight town in Michigan to Los Angles and become a Disney animator. So he did that. Then he wanted to form his own animation studio. So he did that, too. "I had and did all the things that defined me as a groovy dude—the car, the house, the job, the lifestyle," he says. "Yet, I still felt hollow inside."

Following a friend's advice, Albee read the self-help book *The Artist's Way* by Julie Cameron, and after performing the suggested exercises, decided to refocus his creativity and time during a year's sabbatical in Alaska. That one year turned into four.

"Alaska has a way of polarizing everything that already has been polarized," Albee says of his new environment. "It's a very rough, challenging, and difficult place to live—you can die just changing a tire when it is 20 below or more."

In May 2001, Albee packed limited belongings into a rental truck, and headed north. Since then, Albee's combination home/studio has been a wood-framed cabin that he describes as "ramshackle and run-down," but a bargain, he notes, for $325 a month in rent. Although it has no running water, the cabin has electricity and Internet service (albeit 19.2K).

A Long Journey

The concept for what would become the animated film *Kaze, Ghost Warrior* had been with Albee since he was a teen. Then, during the 3000-mile trek to his new home,

that compilation of ideas gelled into an actual story, the details of which the artist recorded on tape as they flowed forth.

At its base level, *Kaze, Ghost Warrior* is straightforward, though it is swathed in complex ideals and emotions. It tells the story of Kaze, a masterless samurai warrior who, driven by honor, transcends mortal life to avenge the murders of a royal family in a distant world's feudal past. After tracking a band of villains to a nearby tavern, Kaze confronts the troublemakers as they harass a helpless "server" offering patrons companionship. Proving to be no match for the warrior, the group flees, but not before revealing the identity of their boss—the feudal lord Soshi, a person Kaze knows well. Later, in a tranquil forest, more of Soshi's henchmen surround Kaze, mistaking him for easy prey. Despite his distaste for killing, Kaze easily eliminates the foes, and when the last attacker fails to relent, Kaze does what he must, albeit compassionately. When the warrior finally locates Soshi, it becomes obvious that the former soldier Soshi has benefitted greatly from the royals' deaths. But rather than kill Soshi, Kaze instructs him to warn "the others" that he is coming for them.

"At first I wondered whether the computer technology evolved to the point where I could make this larger picture happen," Albee recalls, "that of making a feature-quality film on less than a shoestring budget, more like a dental floss budget."

Between writing, painting, and mushing with his sled dogs, Albee began testing this theory, making wildlife art on the computer in such a way that took hours, not days, to render a single frame that was of print-quality resolution. "When you have trees, leaves, and animals with fur, it requires a lot of computer computation," he explains. "As the final crucible to determine whether the rendering was indeed possible, I re-created Maxfield Parrish's *Daybreak* painting, in which I substituted wolves for the girls, and placed Mount McKinley in the background. And, indeed, it worked."

By this time, however, Albee had depleted his savings and couldn't purchase the expensive hardware and software necessary for achieving his vision.

The artist devised a new process for generating expressions and morphs, thus streamlining the complex process of animating faces, including those of the innkeeper Itsua and the "server" Yasashii.

Facing the Facts

Because *Ghost Warrior* is such an emotional tale, told through the powerful performances of the characters, facial animation was paramount. Unfortunately, it was also time-consuming—particularly for a one-person production team. With necessity being the mother of invention, digital artist/filmmaker Timothy Albee developed new techniques that enabled him to achieve detailed facial motions for his characters in a fraction of the time that it would have taken using the traditional method of applying morph sliders.

First, Albee isolated parts of the facial mask: the inner ears, outer ears, eyebrows, eyelids, eyeline, cheekbones, lower jaw, upper jaw, lower lips, upper lips, teeth, gums, and tongue. Then, in NewTek's LightWave, he chose facial mask sets to add to, or remove parts from, thereby quickly isolating the segments of the face that he wanted his tools to affect. Having isolated a region of the face where he could adjust specific points without touching other areas, he then built shapes that would serve as morph targets for the facial animation.

"I needed to get my facial expressions done quickly, and I also needed them to have a wide range of flexibility and diversity," Albee explains. "So I built some 'large' predefined expressions like smiles and frowns, which affect the lips, muzzle, cheekbones, and lower eyelids. I also built specific morph targets to affect the individual facial parts, such as the corners of the mouth (bringing them forward or stretching them tightly backward) and the brows, and to swing the ears in specific directions."

Discovering that his favorite but little-known tool for facial animation, Lip Service, was discontinued and unsupported, Albee approached programmer Mac Reiter to create a new breed of software for doing facial animation. Now called Timothy Albee's Facial Animation (TAFA), the program uses OpenGL to display real-time sub-patching of UV textured models at interaction rates of over 100 frames per second (Kaze's head model, for example, yielded 118 fps on average). Dragging and dropping phonetic morphs from the OpenGL-based Morph File onto an exposure sheet, similar to the way it has been done in traditional, hand-drawn animation for more than 100 years, Albee used the tool to "scrub" through the animation, achieving the desired synchronization between the audio and the animation while simply moving the mouse. The artist then adjusted the strength and the left/right position of the morph from the exposure sheet.

Once the character was speaking, Albee chose from palettes in which morph targets had been assigned to each quadrant of the main window. He then used the mouse to record, in real time, the animation created by moving the mouse; this affected the blending of those morphs as applied to the existing animation. "Even in pre-pre-alpha, I was able to do the lip sync for the entire 55-second prologue in about two hours," he notes. —*KM*

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Alternatively, he used the Alaskan culture's barter system, trading software reviews and digital artwork for 3D software licenses. He also supplemented his AMD Athlon 1GHZ PC with a 2GHZ dual Intel machine containing 2GB of RAM by making a television commercial. Additional review work for a computer show on the Alaska Public Radio Network netted an Nvidia Quadro FX card, and a book deal with 3D and video software vendor NewTek provided a Video Toaster 3.

"Some people look at my numbers and say this project was impossible to do for only $5000. And yes, they're correct, if you are looking at doing it by using traditional means," Albee contends.

Conceptualizing Kaze

Like Albee did for his render test, rather than using humans in the film's roles, he opted for animals. He did this for a number of reasons, foremost to eliminate prejudices or race association with the characters. Moreover, he believes that audiences disconnect with realistic CG humans, and that the closer an artist gets to achieving photorealism with virtual humans, the more focused the audience becomes on the look of the characters rather than the story.

"I also didn't want to re-create reality because we live in reality all the time," Albee adds. "I had already accomplished that a few years ago when I worked on the movie *Dinosaur*, and I wanted to try something more artistic and challenging." Although creating realistic CG humans is extremely difficult, crafting *Ghost Warrior*'s animal characters was hardly a walk in the Denali Park: Because the animals walked on their toes, this type of animation (called digigrade) presented a series of complicated balance and weight issues.

Albee created this seemingly complex forest by generating over two billion instanced polygons from a single modeled stalk of bamboo using Happy Digital's HD Instance renderer.

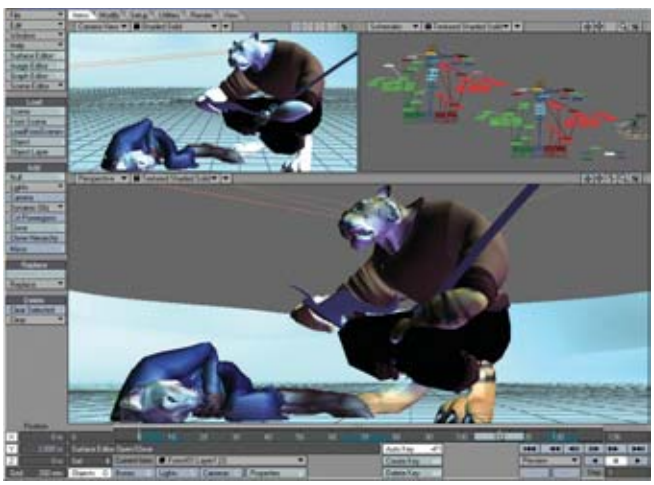
Perhaps a subconscious factor that swayed the artist to use anthropomorphic animal characters was his love of nature—the way animals move and think. "I see great artistry in their physical forms, as well as in their behaviors," Albee says.

During this pre-preproduction stage, as Albee refers to it, he also finessed the story line, first by rearranging Post-its on the walls of his cabin until the sea of yellow squares told the story of Kaze in the way that Albee wanted it told: respectfully, and with the characters upholding their integrity. This became especially important to him after incurring a personal loss in Alaska. When one of Albee's beloved dogs was killed in his yard, the artist infused his emotions into the final death scene as Kaze exacts his revenge. "I don't know if I would have dealt with that incident if I weren't able to channel that pain and sorrow into those scenes and, in a sense, give my dog Joe the death I wish he would have had rather than having him suffer as he did."

Furthermore, pacing past the walls and viewing the Post-its enabled Albee to see the holes that needed to be filled and the bridges that needed to be created between the main story points. "I could also picture each scene in my mind, and in doing so, was able to create the first 'screening' of my film," he says. Later, Albee traded in the Post-its for scanned drawings, cut together on the Video Toaster, which he used to create the animatic.

Once Albee knew how the piece would be told, he focused on how it would look, choosing a style that infuses neo-romanticism's naturalist focus with techniques from present-day Japanese animé in which complete features are produced on what would be the budget of a single, animated episode in the US (see "Breaking the Mold," pg. 40). "I wanted the film to resemble a painting as opposed to the typical CGI movie," he explains. "Yet, there are many close-ups and shots where the held background is slightly out of focus, reminiscent of traditional animé."

Then, taking his cue from Disney classics, Albee used color to convey emotion: As the story intensifies, more blood reds are present; to cool things down, teals and blues are added. "You are conducting the feelings of the audience as if it were an orchestra," he says of the process.



LightWave's IK system, when coupled with Albee's unique character riggings, virtually eliminated the flipping issues that commonly occur during character animation and in poses such as this.

Even though detailed visions of *Ghost Warrior* danced through his head, Albee still had to pay the rent and eat. So, although he deems pre-preproduction the most important phase of filmmaking, the artist could devote only two hours each day to this task.

Then, not long after he began preproduction, near-tragedy struck, when Albee found himself caught in the middle of what seemed like a real-life action film as his cabin was almost destroyed by raging silt-laden floodwaters. Though his computers and files were not damaged, the harrowing experience—which forced Albee to find a temporary home—taught the artist the value of maintaining current backups of his work.

Immediately after the incident, Albee created the movie's trailer, a test for the production's pipeline, and began chronicling his filmmaking experience in the book *CGI Filmmaking: The Creation of Ghost Warrior*. He also imposed a six-month deadline for the production phase to prove that given 18 months, it would have been possible to complete a full-length feature film.

To accomplish this ambitious feat, Albee chose NewTek's LightWave as his 3D software weapon of choice. While creating the *Ghost Warrior* models, the artist used subdivision surfaces, which allowed him to finesse the geometry using a low-resolution mesh, and later render it in high resolution.

For his character riggings, Albee made sure the computer performed the least amount of work possible. "Anything more and I probably would've been disappointed, as the computer makes bad decisions about the poses and motions you're trying to achieve," he says. Therefore, the artist spent a lot of time creating detailed character rigs and skinning/clothing solutions so that Kaze's hands, feet, and torso moved in a realistic way. Next, he tested the riggings, putting Kaze through extreme poses to ensure that the positioning looked believable and the "in-betweening" didn't jitter.

Then Albee used Kaze as a base model for creating all the other rigs for the characters of similar proportions. "By thickening some things here, thinning other things there, and pushing and pulling points in muzzles, ears, and bodies, I was able to build the other 21 characters from Kaze's base form in less than one and a half weeks," he notes. "That includes all surfacing as well as the application of each character's unique fur patterns."

Similar to the way he moved the characters' skin, Albee used a bones setup to move the characters' clothing. However, he augmented the motion with a simulation that affected only the portions of the garments that hung loosely, thereby reducing calculation times. He also "hid" the fact that he wasn't using full cloth dynamics through his choice of camera angles.

Characterization

Model texturing was also accomplished in LightWave, mostly with procedural rather than photographic or hand-painted surfaces. This allowed for close-ups of the rich, organic models without degradation or pixilation of the images. And because they were mathematical-based, the procedural textures could be quickly altered to look like something completely different with only a few numerical changes yet retain their original "feel."

However, for the characters' skins, which defined their fur patterns, Albee did paint textures, laying the hue areas in Kaze's stripes and the patterns on the face of the innkeeper Itsua, for example, using NewTek's Aurora.

"By using only one texture map layout for all the characters, after painting about the third character, I began to know exactly where each bit of paint would be applied on each model's skin," says Albee. "Therefore, painting the maps was much faster than it would have been using a new map layout tailored for each character, since I had to learn only one UV map layout."

To create the animals' pelts, Albee used Worley Labs' Sasquatch hair and fur generator. From his previous film experience, Albee knew that rendering fur meant calculating a large cloud of data, which would be time-consuming, particularly when testing scenes prior to final ren-

Fur Real

Fur was a major part of the texturing process, given that all the characters had pelts. Using Worley Labs' Sasquatch fur-simulation software, digital artist Timothy Albee controlled the length, density, clumping, and curling of the hair, as well as the direction of the fur flow over the skin.

To more efficiently render the hairs, Albee derived the shading for the fur from the rendering results for the skin. Because there are so many individual hairs in a pelt, calculating self-shadowing and shadow casting would have made a render ten times longer. So, he theorized that by figuring out which kinds of shading were affecting the skin that was "growing" the fur, those colors could be extrapolated into the fur itself and yield good-looking shadowing effects without the fur simulation having to calculate the shadows from each individual strand of hair.

Because NewTek's LightWave (the 3D modeling/rendering program that was used) can bake the shading into a UV texture map, Albee pre-baked the shading information. Therefore, the fur simulation did not have to calculate any lighting, just the geometry of the fibers, rendered through instancing, so it could be handled quickly. To do this, the artist created a special UV map of the character's skin that represented each polygon, then ran a surface baking plug-in within LightWave that generated on a frame-by-frame basis the way that surface would look. He then directed the fur simulation to pull all its color information from that pre-baked image. The end result was a reduction in render time from about 18 minutes to under 1 minute.

"All the information was there, as were all the shadows," Albee points out. "And while it is not 100 percent correct as far as a simulation goes, it looked good and was efficient." —*KM*

With off-the-shelf software and a unique rendering solution, Albee created fur for the characters, including barmaid Naosa.

der. Evolving the technique originally developed in his CGI wildlife art tests, Albee reduced the render time per NTSC-resolution character plate from 20 minutes to less than one minute (see "Fur Real," pg. 21).

During the film's production, Worley Labs released FPrime Interactive, a progressive rendering engine that allowed Albee to stop the render whenever the animation frames reached an acceptable level of quality, and restart the render where it left off if more fur had to be added.

FPrime also creates, in effect, a real-time window into the CG world, rendering high poly-count and high light-count scenes, complete with soft-edged ray-traced shadows, reflections, and depth of field instantly, which simplified the setup of the complex lighting environments. In fact, Albee compares the lighting setup for the inside of the tavern, when Kaze begins tracking the villains, to hanging real-world lights that he could grab and move, and instantly see the results of those changes.

Albee then lit the scenes in LightWave, illuminating each environment first without any characters, then adding character-specific lighting rigs optimized for each animal. "I wanted the rich lighting to look more like the backgrounds in *Lady and the Tramp* than those in any modern movie," he adds.

Next, Albee used Eyeon Software's Digital Fusion to composite the characters, backgrounds, and other elements—along with their shadows, specular maps, and Z buffers—into the scenes. To save time, the artist often composited his foreground elements onto a single, static background plate. Even in many of the shots where the camera was moving in perspective, or dollying slightly around a character in the foreground, Albee still was able to use a single background image by utilizing the motion tracking, image warping, and destabilization tools in Digital Fusion.

While rendering the final imagery, Albee was achieving 58 seconds per character plate—fully shadowed and fully furred—at NTSC resolution. He did so by using one of his Intel dual processor machines as a render node, and the other for animating. "I was always trying to keep up with the rendering. Typically I would wake up in the morning and composite what I had rendered the night before," Albee says. "And when the composite was running, I would take care of the dogs, come back, edit the scene, and see if there were any changes that had to be made. Then I would animate from noon until about 7:00 pm. That's when I would kick back with a good movie or book. And on weekends, I would mush."

With Albee so immersed in the Alaskan culture, could he have pulled off this filmmaking feat from his home in California? Probably not, he says. "I am too sensitive to my surroundings and would have had a difficult time with all the distractions and sensory overload of Los Angeles," the artist explains. "In Alaska, I can choose where I focus, and it allows me to choose what enters into my world for the most part."

Top, left to right: The speed of LightWave's IK and real-time subdivision systems simplified complex character interactions such as these. Above: The use of dynamic parenting and other constraints helped the artist create this shot of Kaze gingerly carrying one of his victims.

Only the Beginning

Presently, *Ghost Warrior* is garnering attention at film festivals, including this month's Annecy. But Kaze's, and Albee's, adventures are just beginning. In fact, the artist's decision to edit the film down to 23 minutes was not happenstance, nor was the cliffhanger ending. Rather, Kaze's tale is part of a planned story arc that includes a TV series and a prequel feature film that Albee hopes to begin soon from his new home in Poland. Indeed, just a few weeks ago, the artist, his dogs, and Kaze began a new adventure that includes the formation of an animation studio that will be a training ground for new artists who will take up Kaze's cause as well as a host of others.

Whatever the property, Albee promises to deliver films that are as distant in form and style from the cookie-cutter CGI films produced in the US as, say, California is to Alaska, or even to Poland. ⌗

Karen Moltenbrey is a senior technical editor at Computer Graphics World.

swimming with the sharks

HD-to-IMAX technology gets viewers up close and personal with the denizens of the deep

By Jenny Donelan

The ability to surround audiences with larger-than-life 3D sharks might sound like a recipe for an underwater horror movie, but frightening viewers à la *Jaws* was not the intent of the filmmakers when producing *Sharks 3D: A Close Encounter with the Lions and Tigers of the Ocean*. Rather, this new IMAX film from 3D Entertainment was designed to communicate the passion shared by director Jean-Jacques Mantello, his brother and executive producer Francois Mantello, and director of photography Gavin McKinney for these great ocean predators.

To this end, *Sharks 3D* allows audiences to "experience" sharks in their natural element. And through the high-definition filmic encounter made possible through newly invented digital technology, the trio hopes to generate admiration and sympathy for these feared fish, many of which are actually endangered. This is because approximately 100 million sharks are killed by humans each year for food and sport.

In fact, *Sharks 3D* is the second underwater-themed IMAX offering from the 3D Entertainment team, which also made

A grey reef shark was one of several species that 3D Entertainment was able to film in digital 3D high-definition format for the IMAX movie *Sharks 3D*.

Using a proprietary postproduction process, the 3D Entertainment group was able to film the sharks in 2K-resolution HD format, and output it at 4K-resolution IMAX format without a loss in image quality.

Ocean Wonderland 3D, a trip through coral reefs that is "narrated" by a sea turtle. Released in 2003, *Ocean Wonderland 3D* was the first stereoscopic large-format film to be shot entirely in digital 3D high-definition format. And it continues to play in IMAX theaters worldwide, having grossed $17 million to date.

Sharks 3D, presented by Jean-Michel Cousteau in conjunction with the United Nations Environment Programme, premiered in Las Vegas early this year and is now being shown at IMAX theaters around the world.

The 42-minute documentary (narrated by the same friendly sea turtle from the first film) was shot over a period of nine months in offshore locations in Mexico, Columbia, Egypt, South Africa, Mozambique, and French Polynesia. Nearly 500 diving hours were required to complete the film, which takes place entirely underwater, among the fishes—and among hammerhead, whale, and great white sharks.

Undersea 3D

Although filming underwater in 3D has its own set of challenges—many of which Mantello's team already encountered during the making of *Ocean Wonderland 3D*—filming sharks made matters more difficult still. That's because sharks, unlike coral reefs, are constantly on the move, and, therefore, difficult to locate and shoot. Moreover, some species have become so rare that the film crew couldn't locate them at all. And of course, the divers had to take special care because they were filming some of the world's largest and fiercest predators.

Using a typical IMAX camera—which weighs about 200 pounds, takes 17 minutes to load, and shoots only three minutes of film at a time—was out of the question for underwater shooting. Another disadvantage of the camera is that it is so noisy, it would have disturbed the sharks. Instead, for both *Ocean Wonderland 3D* and *Sharks 3D*, the crew opted to use a pair of Sony HDW-900 cameras, which weigh less than 100 pounds each and can handle up to 45 minutes of film at a time. The two cameras—one to film the "left-eye" image and the other the "right-eye" image, for stereoscopy—were placed side by side in a waterproof camera housing designed by Mantello.

Nevertheless, this setup still weighed 300 pounds. So for the first movie and the early part of the second one, the crew moved the camera rigging in and out of the water with a crane. Partway through *Sharks 3D* filming, however, Mantello contrived a new camera housing that weighed less than 150 pounds, cameras included. This far more portable rigging could be ferried on a rubber dinghy to an area where the sharks were, providing the speed and flexibility the filmmakers needed to shoot their fast-moving targets. A custom workstation with two Apple Cinema 23-inch monitors onboard the ship let the crew view their undersea HD footage immediately, and also cut it in real time.

The HD format provided an excellent solution to the problem of shooting underwater, although transforming the footage to IMAX format was a shark-size challenge. "HD is 2K resolution; IMAX is 4K," explains Mantello. "If you just 'blow up' the images to the higher resolution, it doesn't look good." To overcome this issue, 3D Entertainment used a proprietary process in postproduction to enhance each frame of the film so that it would look suitably crisp and rich in IMAX format.

Still, concedes Mantello, the quality is not quite that of a film shot in IMAX from the get-go: The HD-to-IMAX converted imagery is a bit less sharp and a bit more grainy. "People working in the IMAX business will notice a difference," he says, "but most others will not." In fact, the team was nervous about image quality when it first shot *Ocean Wonderland 3D*, he recalls. But filmgoers surveyed at previews before the film's general release responded favorably to specific questions about image quality, so Mantello decided the trade-off was more than worth it. In fact, he notes, many divers have remarked that the lighting and imagery of both films reproduces accurately what an underwater world looks like to them.

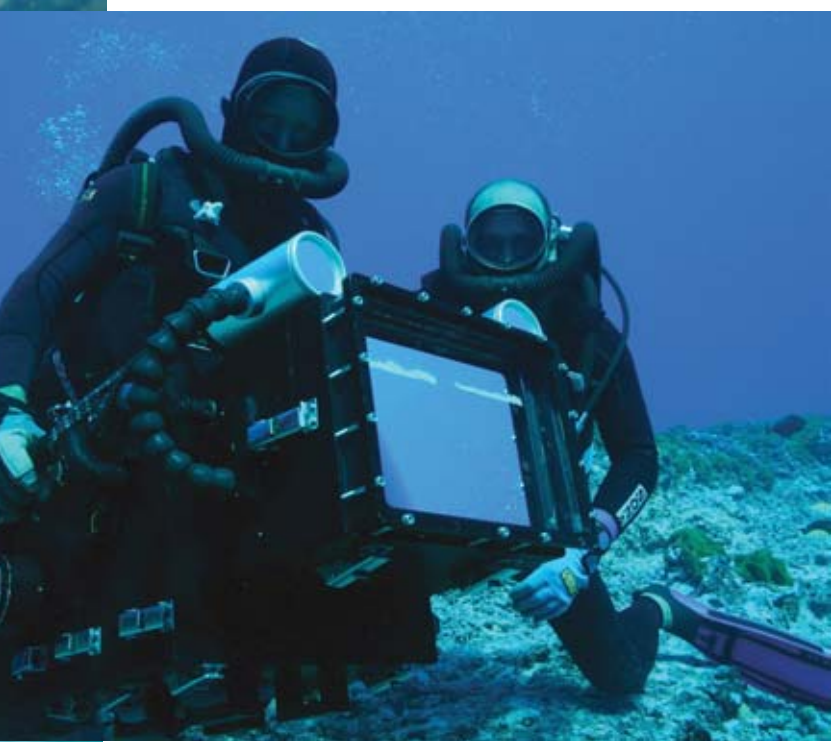
The stereoscopic images, in HDCAM tape format, were stored and edited using hard disks, workstations, and editing and data management software in a configuration customized by 3D Entertainment. Then, using Celco's Fury Digital Film Recorder, the team performed color corrections and several visual corrections, such as vertical adjustments, before the HD-format film was output to the 65mm IMAX film format. According to Mantello, Celco's new Advanced CRT Imaging technology made this output process far quicker for *Sharks 3D* than for *Ocean*

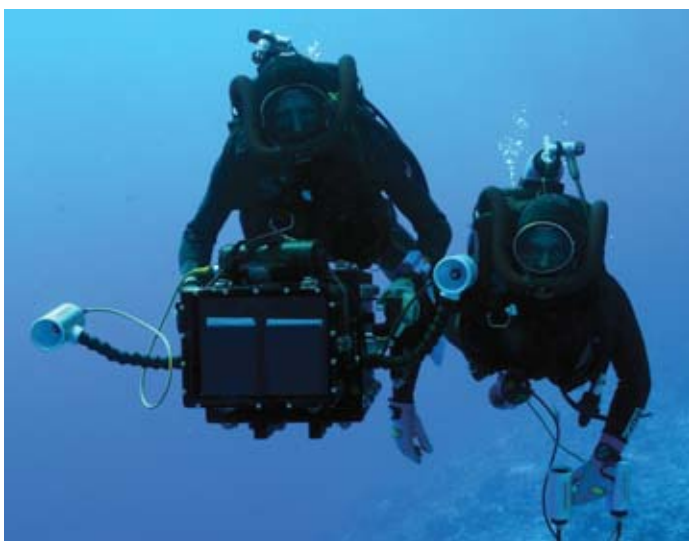
Wonderland 3D—eight seconds per frame as opposed to the 20 seconds per frame that it took previously.

Sharks as Subjects

Although the sharks were hard to find at times, they were less difficult and less temperamental to photograph than some movie stars. In fact, the divers did not use any cages, though one was kept nearby while they shot the great white sharks. The closest a crew member got to being harmed was when Mantello's brother Francois found himself surrounded by a group of silky sharks that prodded him to see if he might be likely prey, but he escaped unharmed.

The sharks themselves provided the greatest satisfaction, and the greatest disappointment, of making the film, comments Mantello. Among the highlights for him was finding and filming whale sharks, the largest fish in the ocean. Though whale sharks can measure up to 50 feet long, these water giants are gentle and generally tolerate, and seemingly enjoy, being near divers. But while being close to the whale sharks was exciting for the group, filming them was nerve-racking because of their sheer size, says Mantello.





(Top) A grey reef shark approaches the group underwater. Despite being in such close proximity to many of these predators, the divers were threatened only once during the filming. (Left and above) A custom-designed housing unit reduced the weight of the underwater camera setup, thereby enabling the crew to keep pace with the sharks.

Getting an entire whale shark into a frame was hard enough (cameramen used a wide-angle lens), but having them "pop" in 3D was downright worrisome to the filmmaker. In fact, getting any large object to work in stereo is difficult. "If you look at a mountain, for example, it doesn't look 3D," Mantello says. "If it's far enough away for you to see the whole mountain, it looks flat." That's why small, close-up objects work best in stereoscopy. However, by shooting the whale shark from a variety of distances and angles, then choosing the footage that worked best, Mantello was able to present the whale sharks in 3D, which he cites as probably the most satisfying technical achievement of the film.

Conversely, a major disappointment was the fact that the *Sharks 3D* crew was unable to locate tiger sharks, which Mantello had planned to include in the film. "It is sad," he says, "because if we were not able to locate any, that means it's likely that there aren't that many out there."

If viewers are as moved by *Sharks 3D* as its makers hope, perhaps the tiger sharks' plight will become less desperate, as Mantello hopes that people who see the movie will be motivated to protect the ocean and its inhabitants—even, and especially, those as formidable as sharks.

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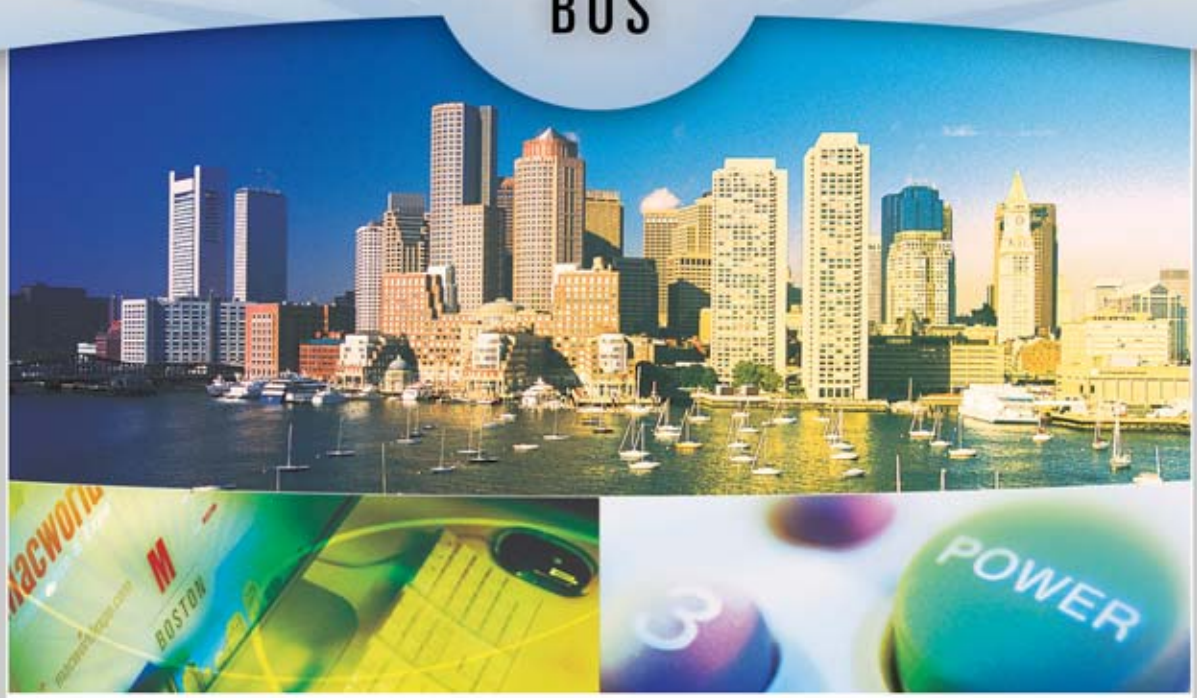

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Portfolio

SIGGRAPH 2005 Art Gallery

Clockwise from top left:

Loop by Maud Bonassi is from a short film, created in 3ds Max, in which a digital snail moves to the beat of music as it interacts with elements in its virtual environment.

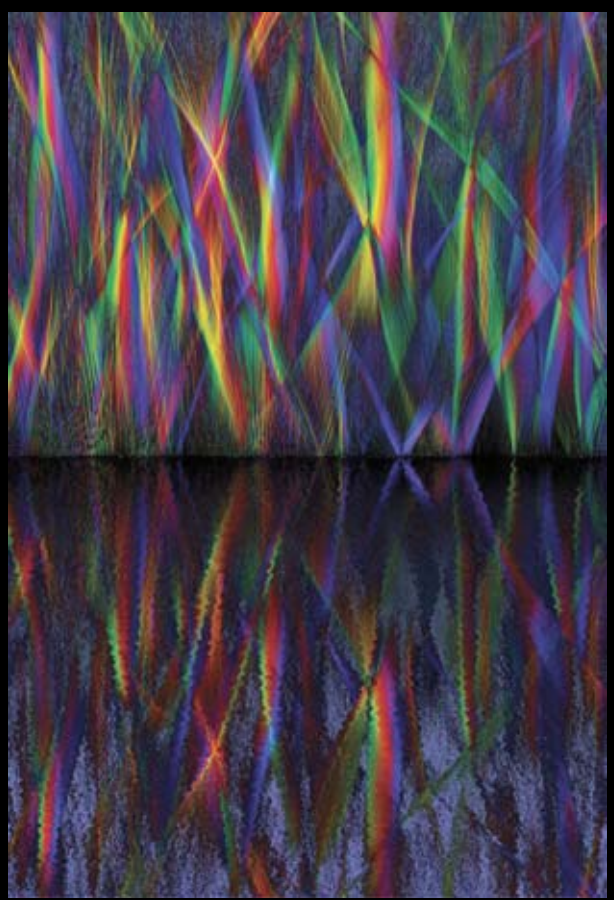
The Greater Accumulation of the Infinite Fractions of Solitude by Thomas Briggs is a still image, produced as a print, that was created using rules- and dynamics-based behaviors that border between randomness and order.

2004.4 by Kenneth Huff taps into a viewer's primal cognitive framework in which the person draws on familiar forms, patterns, and experiences to identify and classify new discoveries. In this print, he incorporates complex 3D constructions that resemble familiar organic shapes and patterns to engage the mind.

Falling Down by Kate Chapman is one piece in a set of four sculptures representing motion in static form, this one of a woman falling to the ground. Using digital tools, the artist derived the final shape from various animations she made of a figure, with the arc of the body's motion defining the final form. She then used a Sony TRV900 camera to acquire a video reference of the shape, onto which a Maya 3D model was placed and then animated. Later, the artist positioned the model and output it using a rapid-prototyping system.

Digital artists are marking time at this year's SIGGRAPH Art Gallery. Called Threading Time, the exhibit will showcase works that map or trace new narrative threads—figurative and abstract, linear and non-linear, moving and still—that examine the passage of time in unique ways. "The theme, Threading Time, has many layers of significance," says Linda Lauro-Lazin, this year's gallery chair from the Pratt Institute in New York. "I wanted to provide a poetic sense to the passage of time. I also wanted to make a subtle reference to Ariadne's thread from Greek mythology. And of course, the term 'threading data' is clearly a reference to the digital world."

The exhibit, displayed during the annual ACM SIGGRAPH conference, features a range of computer-generated works, including 2D, 3D, interactive, prints, and screen-based (online) selections.



In contrast to last year's show of more than 150 juried pieces, this year's gallery will highlight 110 works by only 52 artists, selected from a record number of 1100 submissions. "I wanted to build a show based on content, selecting content-based artwork and displaying the works by themes rather than by the media or tools used to create them," says Lauro-Lazin. "In this year's exhibition, each selection is inherently digital—it cannot exist without computer graphics. But the technology is in the service of the art, not the other way around."

A significant trend this year is greater audience involvement in the work, notes Lauro-Lazin. While not entirely new to SIGGRAPH, audience involvement is becoming more integrated with the meanings of the work, she points out. Moreover, there will be several cooperative pieces involving

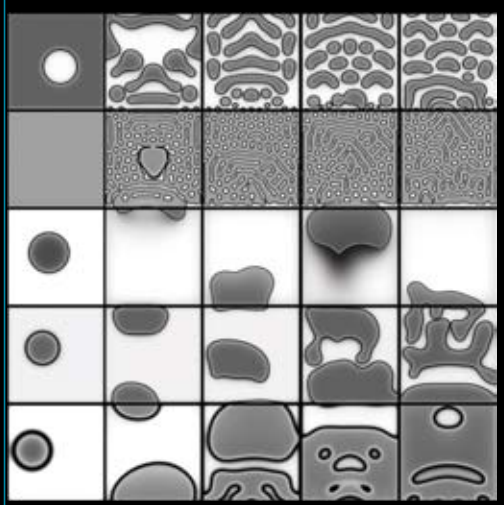
Clockwise from top left:

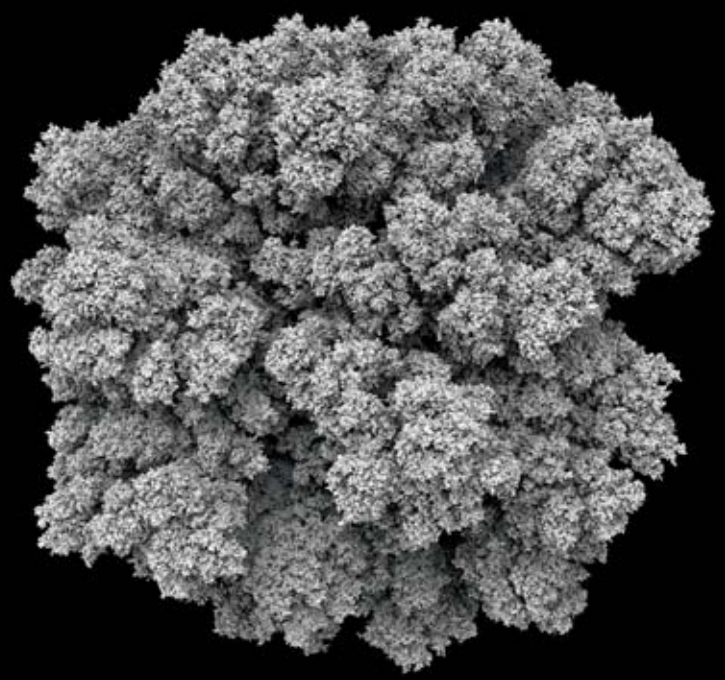
mona+lisa by Meggan Gould is a composited image from the artist's "Go ogle" series in which she created new images from the first 100 pieces of art retrieved from a Google query for a word or phrase, in this instance Mona Lisa. Each downloaded image relinquished its size, shape, and pixel clarity when it was merged with the others. Often this resulted in a jumble of unidentifiable pixels, though occasionally a recognizable shape emerges, as it did here.

Tentacle Tower by Yoichiror Kawaguchi is a mixed-reality work representing the growing visual impact of lenticular 3D imaging. The artist intends for viewers standing beside or walking around this huge column of 3D imagery to experience a type of "meta-perceptual vision" stimulated by the stereoscopic CG visuals.

Persona in Fields by Sherban Epure is an inkjet print that fuses mathematical rules, fine art criteria, and technological capabilities to produce visual metaphors.

Rogue IV by Eric Heller is a lightjet print that illustrates complicated natural occurrences through artwork. In this image, the artist uses the repeating patterns arising from the complex natural phenomenon of energy-flow branching patterns that arise when ocean waves negotiate strong currents.





Clockwise from top left:

Touring Suburbia/Number One by Dolores Kaufman is a lightjet print that reflects the artist's love-hate relationship with suburbia. Using digital tools, she re-visualized the so-called American dream in which a person sees his or her home as a castle, no matter how "ordinary" it is in style, size, or structure.

Daughter's Rebirth by AnnMarie LeBlanc is a digital print that uses organic objects (germinating plants and water) to depict natural life cycles. This particular work celebrates the youthful Greek goddess Persephone, depicted as a newly formed seedling, and her role as queen of the underworld.

Aggregation 2 by Andy Lomas is a printed image inspired by the artist's fascination with complex natural forms, particularly coral-like structures, and their relationship to simple mathematical rules such as those governing flow. This image was gradually "grown" by simulating the paths of millions of particles randomly flowing in a fluid field. Over time, the particles aggregate on top of a simple surface, resulting in structures of great complexity.

Drift Grid 1 by Brian Knep is a projected image of drifting and evolving organic shapes illustrating the concepts of "complexity out of simplicity" and "infinite out of finite."

network collaboration of participants as well as data.

Also featured with this year's gallery will be 11 art animations, six art papers, three art symposia discussions, three distributed performances, and six art installations shown in the adjoining Emerging Technologies area. In fact, this is the first year that the Emerging Technologies and Art Gallery will be sharing a physical space.

"In addition, I wanted to show digital work that is seriously considered in the art world but still somewhat new to the SIGGRAPH community," says Lauro-Lazin. "To this end, I curated the work of six award-winning digital artists: Jim Campbell, John Gerrard, Perry Hoberman, Camille Utterback, and the collaborative team of Paul Kaiser and Shelley Eshkar. Their pieces, some of the most provocative today, will

form the cornerstone of the gallery exhibition."

Another gallery landmark is the exhibition of 52 storyboards and concept art from award-winning animation pieces shown in the Electronic Theater, providing insight into the development of the ideas and the creation of the animations. These projects range from blockbuster feature films (*Star Wars Episode 3: Revenge of the Sith*) to short films (*Fallen Art*) to games (*World of WarCraft*).

"Now that CG is ubiquitous, the 'wow' factors seem to be settling down, and artists are finding a real vehicle for their voices," notes Lauro-Lazin. "As a result, we may see a return to the Renaissance model and away from a segregated and compartmentalized perspective of human creativity and aspirations."

A selection of gallery images appears on these pages. —*KM*

Clockwise from top:

(R) Doc Series #8 Threatened and Too Scared... by Laura Rusnak is an inkjet print from a series of digital collages based on Irving Wallace's *The R Document* book whereby erasure (the process of erasing, rubbing, scraping, and so on) produced a new, visual, rhythmic pattern to the book's text.

Chrysalide by Damien Serben is part of an animation, created in 3ds Max and MotionBuilder, that transcribes various states of a Buto dance. A mixture of 3D animation and film, the work contrasts the carnal, visceral motions of the dance with the "coldness" of 3D and its architectures and polygons.

Diamond Age by Jeff Prentice is a digital print that investigates the concept of overpopulation in areas of limited space. The image comprises numerous digital photographs of people in specific locations that are then carefully and methodically placed into the scene in such a way as to achieve a balance between the traditional notion of pristine digital graphics techniques and a painterly aesthetic.

Landscape by Afanassy Pud is a digital work borne from the artist's scientific background and his love of fine art.

Snapshot

Editors' NAB2005 Picks

By Courtney E. Howard, Senior Technical Editor

The editorial staff of *Computer Graphics World* was among the nearly 105,000 electronic media professionals in attendance at the 2005 National Association of Broadcasters (NAB; www.nabshow.com, www.nab.org) show in Las Vegas, where a number of leading industry vendors made newsworthy product and company announcements. In these two pages, the editors—including contributing editor and Video Viewpoint columnist Jeff Sauer—spotlight their picks for the hottest and most innovative product releases made during the recent industry event, at which 1400 companies exhibited.

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Final Cut Studio

Apple unveiled Final Cut Studio, its HD video production suite including upgrades to Final Cut Pro 5, Motion 2, and DVD Studio Pro 4, as well as a new release, Soundtrack Pro. Present at Apple's NAB2005 press conference, senior technical editor Karen Moltenbrey recalls, "The Apple User Group portion of the audience, in particular, erupted in applause during a demonstration of Final Cut Pro 5's multicam functionality—enabling simultaneous real-time playback of up to 16 camera angles and supporting up to 128 video sources." Also a hit among editors, in addition to Final Cut Studio's price tag, were Motion 2's GPU-accelerated 32-bit float rendering and more than 130 filters and over 50 new particle effects. Now available, Final Cut Studio is priced at $1299 for the full version, $699 for registered users of Final Cut Pro, and $499 for users of Production Suite.

Apple Computer www.apple.com

AG-HVX200 DVCPro HD P2 Camcorder

Panasonic Broadcast introduced the new AG-HVX200 DVCPro HD P2, a handheld, high-definition camcorder. A multiformat device, the AG-HVX200 shoots in 1080/60i (30p and 24p), 720/60p (30p and 24p), DVCPro50, DVCPro, or DV. The camcorder incorporates a native progressive 16:9 three-CCD HD imaging system, an HD-quality Leica Dicomar wide-angle zoom lens, a 3.5-inch LCD monitor, two P2 card slots, and an 8GB P2 card. HD and SD video is recorded on the camera's P2 card as MXF files, which can be edited from the card or downloaded to an NLE or server. "Panasonic's AG-HVX200 is easily the biggest story at NAB2005 alone, partly because it does not support HDV," says Jeff Sauer. "The 24p and variable speed-capable handheld camera will record in both SD and HD modes to either a DV [SD only] tape or to a solid-state P2 memory card." The new HD camcorder will be available in the fall, priced at $5995.

Panasonic; www.panasonic.com/broadcast

TriCaster

NewTek unveiled its TriCaster live production suite for the production of quality presentations, Webcasts, and video through the combination of graphics, titles, PowerPoint slides, live and recorded video, and other forms of digital content. "In these harried times, flexibility is key, not only for a professional, but also for a solution," recognizes Courtney E. Howard. "NewTek has packed a lot of production power into a portable, versatile system." TriCaster envelops integrated real-time editing, keying, and live streaming functionality, replacing space- and budget-intensive production equipment with a single, compact box. The device sports enough storage capacity for roughly six hours of digital video, three camera inputs, and various video, projector, monitor, and Internet outputs. TriCaster supports Microsoft PowerPoint, archiving to hard disk or DVD, and simultaneous output to three destinations: video, the Web, and projectors. Its more than 200 transition effects and title templates promise ease of use and timesavings. At the same time, its non-linear editing, live Internet streaming, video capture, camera setup, and Virtual VCR playback capabilities and its $4995 price tag are among the reasons the new offering drew much attention at NAB2005.

NewTek; www.newtek.com

OpenHD

Adobe Systems, Hewlett-Packard, Intel, Microsoft, and Dell have partnered to deliver HD technology to the masses. As part of the OpenHD initiative, the companies involved intend to deliver open, scalable, certified HDV and HD solutions to professionals in the video, film, and broadcast markets. As part of the OpenHD certification process, Adobe, HP, Intel, Microsoft, and Dell look for compatibility between hardware and software components, a simple purchasing process, and a validated turnkey system. During NAB2005, Adobe presented its OpenHD Certified solutions: Adobe Premiere Pro 1.5, After Effects 6.5, Adobe Audition 1.5, and Adobe Encore DVD 1.5—software programs included in the company's Video Collection, now in Version 2.5. Also on hand was an HDV system incorporating the Dell Precision 670 workstation with 64-bit Intel Xeon processors, Adobe Premiere Pro, and Sony's HVR-Z1 camera and HVR-M10 recorder. The HP xw9300 workstation, Blackmagic Decklink HD and Matrox Axio Capture cards, and Cineform PospectHD plug-in also could be seen driving uncompressed and compressed real-time HD work flows. "HD, although the hottest and most sought after technology in the industry, has been beyond the reaches of many due to its high cost of entry," notes Howard. "If successful, the OpenHD intitiative will spur the launch of affordable, integrated, and stable solutions, and thereby fuel the widespread adoption of HD."

Adobe Systems; www.adobe.com, www.openhd.org

Multibridge Studio

Blackmagic Design released Multibridge Studio, a bi-directional converter with a built-in PCI Express port. Says Sauer, "It represents the state of the art in video I/O. It captures up to 12-bit RGB 4:4:4 at rates as high as 10GB/sec, and works with both HD (720 and 1080) and SD video. There's even integrated DVI-D output to an LCD monitor." The new offering supports Windows XP and Mac OS X, and such popular applications as Apple's Final Cut Pro 5, Autodesk Media and Entertainment's Shake and

Combustion, and Adobe's Premiere Pro, After Effects, and Photoshop. Priced at $3495, Multibridge Studio is a two-rack unit offering analog component RGB/YUV and composite NTSC/PAL video conversion.

Blackmagic Design; www.blackmagic-design.net

Symphony Nitris

Avid Technology expanded its Digital Nonlinear Accelerator (DNA) product family with Avid Symphony Nitris, a non-linear HD and SD finishing system. The new release combines the company's Nitris hardware, offering real-time editing, effects, and compositing capabilities, with Avid Symphony software, providing corrective finishing tools, such as color correction, motion tracking, image stabilization, and hardware-accelerated 16-bit SpectraMatte chromakeying. It supports a maximum of two streams of 10-bit HD media or up to eight streams of 10-bit uncompressed SD, in addition to analog and digital video capture and various HD resolutions and formats. Avid Symphony Nitris is priced at $89,995.

Avid Technology; www.avid.com

Ultra 2

Garnering much attention during the show was Serious Magic's Ultra 2, an upgraded version of the company's professional chromakey and virtual software tool. Sauer credits Ultra 2 with one of the most clever ideas of the show: shooting a virtual set subject with a 720x480 SD camera turned on its side for a 480x720 image. "Ultra 2 lays that 720p image over a virtual set and gets true HD from an SD camera," says Sauer. "It's a major upgrade in both features and quality." Version 2 features expanded support for HD and HDV cameras, including 1080i, 1080p, and 720p formats, 16:9 and anamorphic widescreen sources, and standard frame rates. The upgrade also boasts improved integration with 2D compositing and 3D animation applications, including Adobe After Effects, Autodesk Combustion, and Pinnacle Commotion; compatibility with Apple QuickTime, Macromedia Flash, and Avid MXF file formats; and support for GPU and CPU rendering. Ultra 2 is priced at $495 without virtual sets. Master Sets Library 1 is offered at $395, whereas editions 2 and 3 each carry a $495 price tag.

Serious Magic; www.seriousmagic.com

Runners-up

Given the 1400 vendors exhibiting at the show, it was difficult to limit our choices. In fact, the following products narrowly missed inclusion in our top seven.

The JVC GY-HD100U handheld three-chip camera

Matrox Axio hardware for working with real-time HD

Miranda HDV Bridge for converting HDV to HD SDI

The Sony SRXR105, a 4096x2160 digital cinema projector

Ciprico MediaVault 4212 extreme data protection with RAID 6

Autodesk Media and Entertainment's Toxik film compositing solution

Silicon Graphics Prism deskside visualization system

reviews

3D MODELING AND ANIMATION

Poser 6.0

The latest version offers valuable tools at an affordable price

By Frank McMahon

Poser 6.0's new Firefly renderer improves rendering and lighting. Adjust settings via a global slider or customize each render parameter in manual mode.

Curious Labs continues to refine and expand its Poser application with the latest edition. Version 6.0 adds a wealth of new features, including improved rendering and lighting.

Poser is a software program dedicated to the design of human figures, or 3D renderings that can be animated. Recent versions have advanced to include features such as realistic hair and cloth dynamics. As a result, digital cloth can deform and collide with other objects, as well as sweep around realistically when a character is spinning. Each version has contributed to the production of more realistic and professional-looking renderings. This current version provides options to make renders and animations look even better, continuing to raise the bar as to what can be achieved with the software.

A new feature called image-based lighting enables you to use any image map that you import as a 360-degree light source (sometimes called environmental maps in other 3D programs) for ultrarealistic renders. You can also apply generated Poser materials to the lights, for even more possibilities.

A new rendering option, ambient occlusion, creates a natural lighting environment. Surfaces are darkened in a scene when exposure to the lights is blocked by other objects, thanks to an advanced raytracing algorithm. You can toggle this lighting mode on and off, as well as target it for specific parts of your scene.

The new shadow-catcher feature allows you to render shadows separately from objects. Shadows are independent not only from the object from which they are cast, but also from the surrounding scene. You even have the option of rendering just the shadows in a scene and re-using shadows maps. The new fastscatter node allows you to add subsurface scattering of light to translucent objects, a feature that goes a long way toward producing better skin shading and realism. Light rendering also has been improved. You can add, as well as revolve, point lights. Specular and diffuse are available on a light-by-light basis for more subtle lighting effects. If you are looking for less realism, a new toon-outlines mode adds dark outlines to images and animations for increased drama.

Perhaps the biggest rendering news is full support for OpenGL. With OpenGL cards, such as those from ATI or Nvidia, coming in at hard-to-beat prices (typically starting at less than $200), it makes sense that Poser helps you take advantage of the technology and enjoy accelerated previews of your scenes. You can even export an OpenGL animation preview with the preview renderer. Other new options and features include adult figures James and Jessi, additional children models, a few superhero figures, and new poses, hair, clothing, and lights.

The new render wipe option allows you to compare two rendered images, whereas area render lets you render just a section of your scene. Auto balancing has been enhanced for easier and more accurate posing. At the same time, depth of field and Flash export have been improved. Poser's entire user interface, including the palettes, have been redesigned to improve usability.

Also new is the redesigned Content Paradise, a Web resource that can be accessed from within Poser, from which users can search and obtain figures (some free and some with a price tag). the newly updated Web site is much easier to navigate than previous incarnations and offers a multiple store search.

Previous versions have improved the models, whereas Poser 6.0 focuses more on rendering. If you export to another program to render your figures, you'll miss a lot of what is new in Version 6.0. Poser's Firefly renderer delivers the added realism and subtle lighting that you've been wanting. Poser 6.0 offers high-resolution, realistic rendering with the included figures and a wealth of third-party props and models, as well as provides great cartoon work for Flash and film/video. Combined with realistic cloth dynamics and an intuitive user interface, Poser 6.0 is hard to beat. ⌗

Frank McMahon, a graphics and video professional, runs a blog for creative artists called Media Artist Secrets (www.mediaartist.com).

stats

Poser 6.0

Price: $249 ($129 upgrade from Poser 5)

Minimum System Requirements:
Windows 2000 or XP with a 500MHz Pentium class or compatible processor or Mac OS X Version 10.2 or later with a 500MHz G3 processor, 256MB of RAM, 500MB of hard disk space, a 24-bit color display with 1024x768 resolution, OpenGL-enabled graphics card or chipset recommended, and a CD-ROM drive.

E Frontier, Curious Labs
www.e-frontier.com

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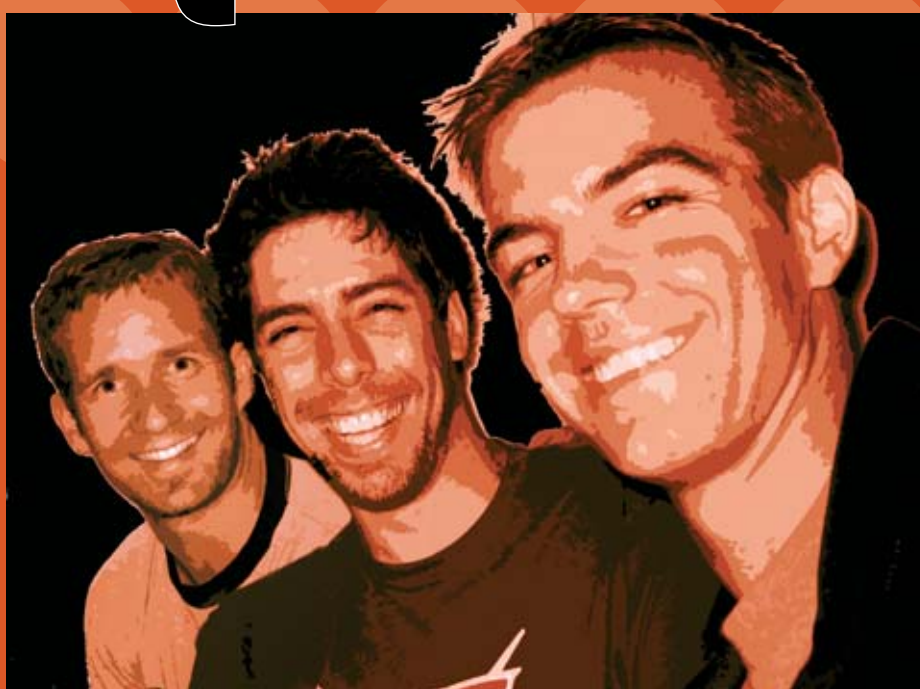

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ComputerGraphics World
The Magazine for Digital Content Professionals

Bobby Beck Animating for over 8 years and has worked for such places as Disney Feature Animation and Tippet Studio. He has spent the last 5 years animating at Pixar Animation Studios on such films as *Toy Story 2*, *Monsters Inc.*, *Finding Nemo*, and *The Incredibles*. He has mentored several students and co-taught local college animation classes.

Carlos Baena Animating for over 8 years. He is one of the most noted animators to come out of Spain in the last decade and he's worked on films such as *Jurassic Park 3*, *StarWars: Episode 2*, *Finding Nemo* and *The Incredibles*. He has also given animation lectures both in America and internationally.

Shawn Kelly Animating professionally for 8 years, the last 6 of which have been spent as a character animator at Industrial Light & Magic, where he has worked on such films as the *Star Wars* Prequels, *AI*, and *Hulk*. Over the last few years, Shawn has also enjoyed teaching advanced animation classes at the Academy of Art University in San Francisco, as well as mentoring students on a one-on-one basis.

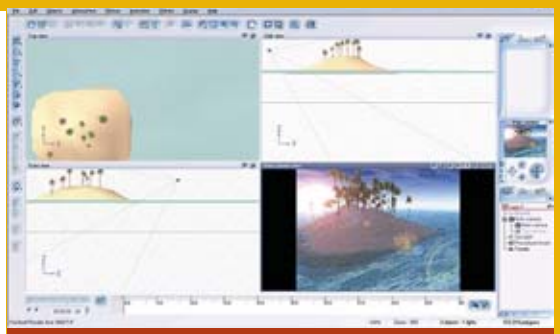
reviews

SCENERY SIMULATION

Vue 5 Infinite

The latest edition improves natural scenery generation

By Doug King



Although the latest version of Vue, Vue 5 Infinite, is ripe with powerful new tools and enhanced functionality, its user interface is clean, intuitive, and uncomplicated.

I enjoy tools that aid me in creating incredible vistas and unexplored worlds. Having used the majority of programs that offer the opportunity to create breathtaking environments, I recently had the chance to test-drive Vue 5 Infinite. Vue 5, the upgrade to Vue 4 Professional, is promoted as a natural 3D scenery generator.

Designed to interface with major 3D applications for use in film, digital media production, and game development, the program imports and exports from Autodesk Media and Entertainment's 3ds Max, Alias's Maya, Softimage's XSI, NewTek's LightWave, and Maxon's Cinema 4D. It also supports industry-standard G-buffer information, together with RPF and RLA file formats, making the rendered scenes compatible with Adobe's After Effects and Autodesk Media and Entertainment's Combustion and Flame.

Vue 5 is a significant upgrade from Vue 4. Some of the most important new features include global illumination and radiosity, HDRI support, shadow and volumetric light optimization for a dramatic increase in rendering speed, procedural terrain, and an improved interface. Although I liked Vue 4, after having spent some time with Vue 5, I know I can never look back.

The program is incredibly user friendly. When you create a new scene, the Atmosphere-selection tool opens. This controls the position of the sun, color of light, shape and size of clouds, and more. There are nine categories of atmospheres, for daytime, bad weather, animated, and so forth, each with at least a dozen preset choices. You can edit presets by adding cloud layers, changing sun color, and adding fog, haze, and other effects. A nice feature of the Atmosphere selection window is that each preset comes with a thumbnail image and, when highlighted, a larger image with a text description. It makes finding the perfect starting point for your project simple.

The interface is a standard four-view window with side, front, top, and main cameras. On the right side of the screen are Camera Controls and a World Browser, which anyone familiar with Adobe Photoshop will recognize as a layers menu, making for efficient organization of the objects in your scene.

Part of the Camera Controls is a small window that shows a rendered preview of your scene, which updates in real time whenever you make adjustments to materials, lights, and objects. You no longer need to wait for rendering to have an idea of how your scene looks. This preview even includes shadows and lens flares.

I found Vue 5 to be easier to work with than other stand-alone landscape and environment generating packages I've worked with, and the results are stunning. The Terrain Editor is one of the most intuitive to use, and making modifications to terrain is as easy as painting or sculpting, in real time. Procedural terrains can adapt their level of details dynamically, and editing them is as easy as applying preset functions from Vue's function library or adjusting Function Curves; the program to does the rest.

After your terrain is built, you can populate your environment with plants and rocks. SolidGrowth 3, Vue's plant technology, is the easiest method for producing realistic trees that don't take thousands of hours to render. Vue 5 ships with more than 50 different plants species; all Vue 5 plants are editable from trunk size/gnarl/falloff to leaf material and width. By default, all plants created in Vue automatically animate as if swaying in a breeze; this trait is user-definable by plant.

Each time you create a plant in a scene, it will be unique from previous vegetation. If you need to grow a forest or grove and don't want to place each tree, Vue 5's EcoSystem can populate a scene with plants en masse. EcoSystem works with Instances, which allow you to gain great visual complexity without vast computational overhead.

You can use preset quality settings—sketch, preview, broadcast, and ultra—or customize your own. You also can select how much of your scene to render. In fact, I've just scratched the surface of what Vue 5 Infinite offers. Game designers, digital matte artists, architects, and digital artists would do well to investigate Vue 5 Infinite. ⌗

***Doug King**, a contributing editor based in Dallas, develops animated projects for his company, Day III Productions.*

stats

Vue 5 Infinite

Price: $599

Minimum System Requirements: 1GHz Pentium III or better processor, Windows 2000 or XP, Mac OS X Version 10.3 or later, 512MB of RAM, 100MB hard drive, and a 16-bit, 1024x768 video display.

E-on Software
www.e-onsoftware.com

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European cultures, and am fascinated by artists who have spent their entire lives surrounded by art history.

Q ***What do you hope to accomplish there?***

A The first step is to successfully complete the *Kaze* feature, furthering the techniques used in the *Kaze* short. Then, we will open our doors to apprentices who have the passion for animation but not the resources to pay for school, and develop stories in-house that support mainstream and art-house productions.

Q ***What's preventing others from taking similar risks with unique productions?***

A Nothing. In fact, I know several people who have already committed to taking that risk, and many others who are planning to do so. I believe there are 100 Walt Disneys out there who just need the right property or project to ignite their passion and allow them to believe in themselves.

Q ***What's the next step in CG filmmaking?***

A I see the development of tools and techniques that will let smaller teams of artists produce greater visual quality. When we link smaller teams with funding and distribution, we'll get more unique stories. And artists will be able to choose projects based on things they enjoy most, as opposed to today's MO whereby animators have become the new migrant workers, choosing 'the best of the worst' jobs.

Q ***What's your vision for the future of animation?***

A I hope to someday soon watch hundreds of animated films, spanning all the ranges of dreams and desires, made because they were the films their creators had wished to see. Eventually I will segue out of physically doing animation myself because the people who I will train will be able to do it much better, more quickly, and more effortlessly because they will not have experienced the struggles and frustrations that I have experienced in my career. ⁂

By revamping filmmaking's business model to give artists and storytellers more control, other revolutionary CGI projects like *Kaze* will emerge.

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backdrop

Interview by senior technical editor
Karen Moltenbrey

Breaking the Mold

A digital artist rewrites the rules of CGI filmmaking

Digital artist and CG filmmaker **Timothy Albee** *is the creator of* Kaze, Ghost Warrior, *a 3D animated drama that he wrote and produced by himself for $5000 while living in a remote area of Alaska. For more information,* *see "Call of the Wild," page 16.*

Q A ***Why do CG films, particularly those made in the US, look so similar?***

Most 3D CGI productions focus on what can be done quickly and without crashing the render-farm. This means a propensity for clearly defined edges and simplifications that result in the look we've come to expect.

Q A ***What makes* Kaze, Ghost Warrior *look different?***

It's more painterly. Soft edges and reduced contrast outside the centers of focus guide the audience's eyes to where you want them to be looking, just as artists are taught to do in painting composition classes.

Q A ***How does the film's animation style differ?***

The animation is limited; I tried to spend my animation budget wisely, and keyframes are costly in terms of time. I used lots of moving holds, dramatic close-ups, and angles to tell the story, all of which allowed me to average only four hours of working time per scene.

Q A ***What makes the story unique?***

Kaze is a powerful drama. While American animation is recovering from the 'Saturday morning cartoon' perception of the '70s and '80s, it is still thought of mostly as a medium for comedy or children's programming.

Q A ***How will new styles further the art of CGI?***

By breaking the perception that homogeneousness equals quality, every successful new style that the public embraces will whet their appetite for more.

Q A ***What's the key to a successful film?***

The truly successful ones are made by visionary filmmakers, particularly those who have always wanted to see a particular film, and, as in the case of Peter Jackson, director of *The Lord of the Rings*, grew tired of waiting for someone else to make it. The best stories are not meant to be liked, nor understood, by everyone.

Q A ***Can independent CG projects compete at the box office?***

Absolutely. My experience with *Kaze* has shown me that the public is craving animated films and characters that respect their intelligence by delivering deep, powerful story lines. This is especially true as their 'real world' grows more challenging with each passing year.

Q A ***What's needed for widespread adoption of these types of projects?***

Proof. Filmmaking is a business, and those guarding all the doors usually don't know what constitutes a good story and good storytelling. So they go with what has been successful in the past. We need a quiet revolution in which artists and storytellers are the ones shaping the visions that reach audiences.

Q A ***How can we change this business model?***

The astronomical budgets of current filmmaking have made it so that most major film releases have to be liked by a huge number of people, otherwise they lose incredible amounts of money. Reducing the workforce per film, thereby increasing the number of films per artist, will show business-minded individuals that this kind of production environment is a better business model.

Q A ***Can this be done for a full-length feature?***

The full budget for the upcoming *Kaze* feature is well under $10 million, and that's for a project that doubles or triples the production value of every aspect of the *Kaze* short film: animation, characters, environments, music. That price is a coffee break for most big-budget features, and could repay investors in the first weekend at the box office, even with a limited theatrical screening.

Q A ***Who is making the Kaze feature?***

I am, along with others, at Timothy Albee Animation, a studio I just opened in Poland. I find myself drawn to the

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