

ComputerGraphics World

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world of tomorrow*

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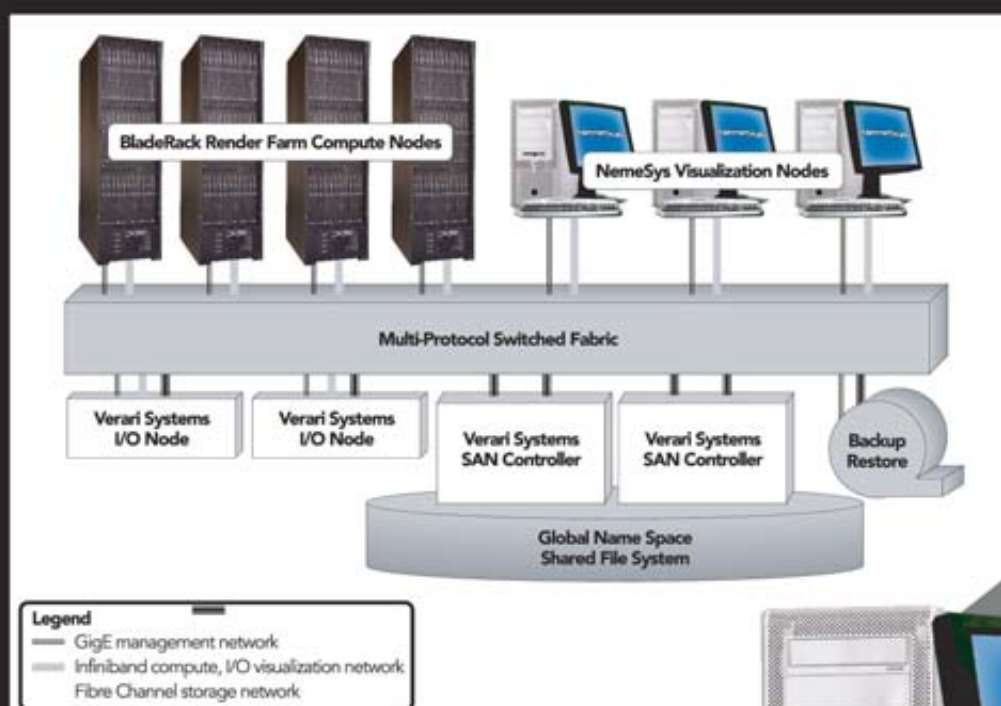


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**Phil
LoPiccolo**
Editor-in-Chief

Show-Biz Viz

What a difference a few years can make in the computer graphics industry. One segment in which this couldn't be more obvious is visual simulation. In 2001, the last time we looked at the VizSim market at large, we found that it had screeched to a halt and was being sustained almost exclusively by traditional science and engineering applications. In contrast, we now see a dynamic business whose growth is being fueled by novel uses in training, education, and entertainment.

In fact, exactly three years ago, when summarizing his annual report titled "The Visual Simulation/Virtual Reality Systems Market," Ben Delaney, president of CyberEdge Information Services, reported that revenues for VizSim technology—defined as "computer systems incorporating real-time, interactive, 3D computer graphics to create a user-responsive environment"—had fallen 17 percent during 2001 to \$22 billion (see "Moving to the Mainstream," October 2001, pg. 18).

At that time, research was ranked as the largest application of the technology, while virtual prototyping in manufacturing was proving to be the rising star. Meanwhile, people involved in high-end training and education applications, including virtual military exercises, reported a declining use of the technology. And entertainment users were registering as little more than a blip on the revenue screen, failing to reach even the top 20 market segments using VizSim.

Now each of these trends has been reversed. First, the market has rebounded dramatically. Revenues grew by 40 percent the year before last and by another 10 percent last year to top \$42 billion. Moreover, revenues are projected to grow between 10 to 18 percent annually for the next five years, reaching \$78 billion by 2008. In terms of applications, while research remains the leader, representing more than one third of the \$42 billion market, this segment actually declined by 2.5 percent in the past year. Likewise, manufacturing—ranked second among applications in terms of total spending on VizSim systems just three years ago—reduced expenditures for VizSim by some 60 percent two years ago, and raised that total by only 8 percent last year.

The application that has adopted VizSim technology the fastest in the past couple of years has been the training and education market, which increased spending on the technology by a staggering 822 percent two years ago and another 66 percent last year, with counter-terrorism training and medical/biotech applications leading the way. Also impressive was that last year, the biggest increase in spending for VizSim technology, a jump of nearly 150 percent, came from the entertainment industry, namely from increased uses of interactive 3D graphics for creating video and computer games, location-based entertainment,

films, performing arts presentations, set designs, interactive TV, and online worlds.

Why are trainers, educators, and those in the entertainment field adopting VizSim technology at such a rapid rate? The answer is simply that they have discovered what scientists and engineers have known for many years—that there is no better way to work interactively with large, complex, and dynamic data sets. Now that their projects have reached such large-scale proportions, which at times surpass scientific data sets, these new users are finding that applying advanced visual simulation tools and techniques is the best way to push the state of the art of their work—and gain a competitive edge. ■

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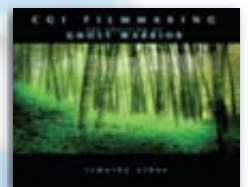
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ATI Demonstrates the FireGL X3-256

ATI Technologies has debuted its FireGL X3-256 workstation graphics accelerator for the digital content creation and previsualization markets.

Offering a 30-percent increase in performance over previous FireGL products, the FireGL X3-256 sports 256MB of GDDR3 memory, 12 pixel pipelines, six geometry engines, and improved sub-pixel precision. Also included are dual DVI connectors, dual link support for 9-megapixel displays, and stereo 3D capabilities with quad-buffered support.

Now shipping, ATI's FireGL X3-256 carries a suggested price of \$1099.

—Courtney E. Howard

■ **ATI Technologies;**
www.ati.com



Image courtesy ATI Technologies.

painting
products

Corel Upgrades Painter to Version 9

Corel has announced Painter IX, an updated version of its Natural-Media painting and illustration software.

Now available, Painter IX provides creative professionals—including entertainment artists, commercial designers, fine artists, and photographers—with various digital brushes, art materials, and textures with which to create art. In collaboration with Apple, Intel,

and AMD, Corel increased the application's overall speed and performance, resulting in brush speeds between two and 10 times faster than in the previous version. At the same time, its new welcome screen, brush control palettes, customizable short keys, and multi-user support lend to increased efficiency.

Among Painter IX's animation tools are Onion Skinning, Rotoscoping, control over frames per second, and the ability to output animated GIFs, QuickTime movies, and AVI movies.

The new Artists' Oil Painting System incorporates four components: oil brushes, colors based on the color measurements of real-world paints, a Mixer palette with artists' oils and a multicolor eyedropper,

and control over the amount of oil, viscosity, blend, bristling, clumpiness, and more. The new system enables each brush dab to hold a finite amount of oil; as the oil runs out, the brush stroke becomes fainter. Time-savings can be had through Painter's new Snap-to-Path Painting utility, which constrains a brush stroke to a path or shape, and Quick Clone for transforming a photo to a painting. Also included in Version 9 are seven KPT filters, including KPT Gel, Goo, LensFlare, Lightning, Pyramid Paint, Reaction, and ShapeShifter.

Available for Mac OS X and Windows 2000 and XP operating systems, Corel Painter IX is priced at \$429 for the full version, \$229 as an upgrade, and \$99 for the education edition. —CEH

■ **Corel;** www.corel.com



Curious Labs Introduces Shade 7

Curious Labs has begun shipping Shade 7, a 3D graphics suite targeted at designers, illustrators, and architects.

Curious Labs' Shade 7 offers Bezier modeling tools, Boolean modeling, polygon mesh modeling, and auto-smoothing of curves. Its PoserFusion enables the hosting and playback of Poser scenes within Shade, whereas MagicalSketch automatically creates shapes from 2D lines and 3D solids, and ShadeExplorer aids users in the management of Shade data, files, and images. Shade's TextEffector supports TrueType, PostScript Type 1, extrude, and bevel support, and its global illumination renderer boasts Photon Mapping and Path Tracing. Moreover, the latest version enables automatic

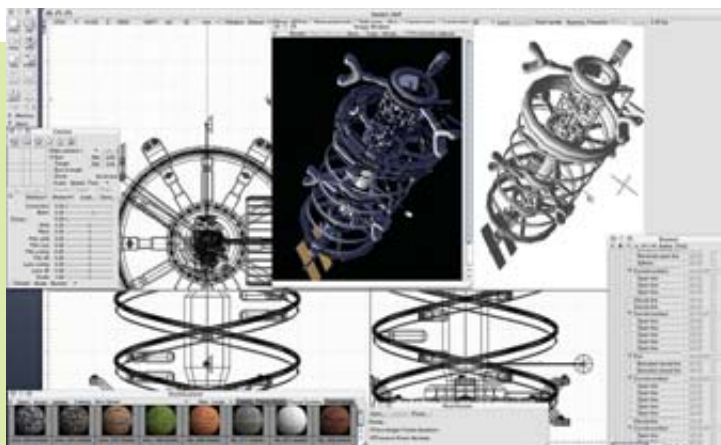
keyframe creation and the importation of 2D illustrator designs.

In addition to raytracing and radiosity capabilities, Shade 7 includes network rendering, a render queue, and support for unlimited nodes. Shade 7 can integrate with popular 2D and 3D programs, including the company's Poser and Adobe's Illustrator and Photoshop.

Shade 7 is available in three edi-

tions. Priced at \$999, Shade 7 Professional provides design and architecture professionals with modeling, lighting, and rendering tools, whereas Shade 7 Standard benefits designers, illustrators, and graphic artists and boasts limited-time launch pricing of \$199. Lastly, Shade 7 Designer LE is targeted at aspiring designers and carries a \$99 price tag. —CEH

■ **Curious Labs;** www.curiouslabs.com



Wacom Debuts Intuos3

Wacom Technology has introduced its new Intuos3 family of professional pen tablets.

For designers, artists, and digital photographers, the Intuos3 tablets offer improvements over previous Intuos models, lending to increased productivity. Wacom has infused the Intuos3 pen tablets with a new industrial design having a high-gloss, transparent surface and twice the resolution of past incarnations, taking it to 5080 lines per inch. Moreover, the Intuos3 tablet is accompanied by a new software bundle, complete with Adobe Photoshop Elements 2, Corel Painter Essentials 2, and Nik Color Efex Pro 2 IE.

Its redesigned Grip Pen sports a larger rubber barrel for increased comfort, whereas the battery-free mouse boasts five programmable buttons and a scroll wheel. Although the onboard ExpressKeys default to Control, Alt, Shift, and Spacebar keyboard modifiers, these timesaving utilities can be customized for quick access to often-used modifiers, mouse clicks, keystrokes, and other operations. Also developed to speed work flow, Intuos3's

Touch Strips aid users in quickly and easily zooming or scrolling as they work.

Wacom's Intuos3 pen tablets require a USB port and the Windows or Macintosh platform. The Intuos3 family of pen tablets spans three different sizes having active areas of 4x5, 6x8, and 9x12 inches and priced at \$200, \$330, and \$450, respectively. —CEH

■ **Wacom Technology;** www.wacom.com



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Postmodern Webcasting

By Jeff Sauer

There was a time, not too many years ago, when Webcasting was all the rage. It was during the dot-com craze, of course, when the Internet and Internet distribution seemed like the future of all things, and Webcasting was no exception. It didn't matter particularly that streaming video technology was immature, the products narrowly conceived, and Webcasting services just

plain mysterious. The industry expected everyone—businesses and consumers—to hop aboard the stream train.

In the nearly four years since those high-flying days, streaming has kept a fairly low profile, and rightly so. For a while, it was kind of embarrassing for people to admit that they actually thought it would ever really work. Yet, a low profile does not mean Webcasting has gone away. Rather, the technology has simply taken its more appropriate place as an enabler of practical visual communications and entertainment solutions, rather than a solution unto itself.

A good example is in products like VBrick Systems' VBrick "streaming media appliances," which began to emerge during the Webcasting



With its streaming media appliances, VBrick tries to appeal to a broader audience by eliminating techno-speak and calling what it does "Television over IP."

boom, and somewhat surprisingly, have continued to grow in popularity ever since. The idea of an appliance comes straight from the dishwasher, toaster, or refrigerator in your home: a product designed for a specific purpose that you essentially just need to plug in and turn on for it to do its job.

With VBrick, that task is inputting a standard video/audio input, encoding it into MPEG video, then packetizing it as IP (Internet Protocol) data for distribution over a network. VBrick Systems further attempts to remove as much of the techno-speak as possible by calling what it does "television over IP," thus allowing potential customers to understand in very straightforward terms what the products can do for them.

And what is that? For educational organizations like the State of Utah's schools and universities, it means giving students in remote parts of the state direct virtual classroom access to the system's best instructors. By sending real-time feeds of classroom lectures over a closed wide-area network, students across the state can receive much of the same classroom experience as those attending lectures. VBrick has also had widespread success in government and military applications by, for example, giving military base supervision direct visual oversight of remote training exercises.

Those are examples of narrowcasting that leverage the available bandwidth of closed intranets to send high-quality MPEG-1 or MPEG-2 video. Yet, VBrick also supports

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MPEG-4 and Webcasting to the broader Internet with products like VBXcast. It has the same appliance-like mission of encoding and packetizing data, but with a lower data-rate compression format.

One of the smartest things that VBrick has done with VBXcast is to include 5Gb of prepaid streaming content with the purchase of the device. That allows new users to test and explore their Webcasting and bandwidth needs before ever committing to monthly service and bandwidth agreements. What's more, a ready-to-go account with an experienced service provider means that Webcasting is still as easy as plugging in an appliance, connecting video sources, starting a Webcast, and sending viewers an e-mail link to see the stream. That's a big difference from the complexity new users faced a few years ago.

Sony is another company that is offering Webcasting as a feature rather than a focus. Sony's new Anycast Station is a six-input video switcher and six-channel audio mixer built into a briefcase-sized carrying case. On the surface, that's not



Sony's Anycast Station includes a server application that simplifies Webcasting for applications ranging from business presentations to distance learning.

really all that new; it's reminiscent of Pinnacle Systems' portable StreamGenie streaming media from a few years ago. The difference is that the Anycast Station is built for switching first, with Webcasting as one possible output rather than the primary purpose of the product.

With plenty of experience in video-

production and live-event switching, Sony has built a professional portable switcher that's appropriate for use in a variety of applications, including business presentations, event staging, on-site promotions, and distance learning, whether or not Webcasting output is even used.

However, the Anycast Station is built on an embedded Linux OS and has a CPU and a hard disk drive that allow it to record and store both still-image graphics and overlays, including PowerPoint slides and motion video clips. With a computer keyboard and mouse, it can easily call up these stored files during a live presentation or event. There is also great facility for on-the-spot title creation, as well as an RGB input for displaying content for a separate PC. The CPU is also powerful enough for real-time encoding, and a built-in server application makes Webcasting almost as simple as any other output, just as it should be.

Serious Business Models

Offering one of the clearest examples of the move away from technology for its own sake and toward practical solutions is RealNetworks, the company that once dominated streaming audio and video compression and whose RealPlayer once led in the battle for the desktop over Windows Media and Apple's QuickTime. Today, the RealPlayer has been superseded by the Windows Media player in terms of installed desktops, but RealNetworks has remained a streaming industry leader by charting a course that may be more important to the success of streaming in the long run.

First, RealNetworks has openly become codec agnostic, as RealPlayer works as comfortably with MPEG-4 and QuickTime (and even codec rival Windows Media) as with its own RealVideo compression format. In so doing, the company has boldly given up its former focus in favor of providing an infrastructure within which content owners can serve media to the Internet and, just as importantly, realize a return.

Most visibly, RealNetworks has spent much of the last four years building media partnerships and turning them into subscription-based Web channels viewable using the company's RealOne player. Content owners as diverse as CNN, the NBA, and iFilm now use the RealOne player and RealNetworks' SuperPass service as the vehicle for allowing paying customers to view premium content over the Web. For content owners, that means an Internet billing strategy potentially able to deliver a real return on investment.

RealNetworks' subscription-based content franchise has also grown to include RadioPass (featuring more than 3200 radio stations), RealArcade online gaming, the RealRhapsody online music store, and online movies in partnership with Starz. There's a lot to offer to a diverse viewer base, although it's ultimately only an example of what might be possible in the Internet age. More importantly, the company has shown that customers are willing to pay a subscription fee for streamed content and has offered a for-profit business model for Webcasting. That's a huge step forward for an industry that once had a "build it and they will come" mentality and effectively relied on broadcast-style advertising for narrowcast content.

Equally important, RealNetworks' Helix server platform offers a scalable architecture for delivering that content over a corporate LAN to a few viewers or, with gateways and proxies, over the Internet to thousands of simultaneous viewers. Helix even supports the emerging distribution of content to wireless devices, such as cell phones and PDAs. Most recently, Real 10 added important digital rights management, including support for portable and home consumer electronics devices.

Admittedly, none of these examples show that Webcasting has returned to the public perception prominence it had during its dot-com heyday. But they do indicate that Webcasting is increasingly a serious solution for distributing content to a targeted audience. And they prove that the promise of Webcasting, allowing both large and small entities to leverage the power of video, is starting to be realized. ■■

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•••• Film

Reef Madness

By Barbara Robertson



Cartoon animation techniques were used by co-director Bibo Bergeron and a staff of former 2D animators to create comic performances for *Shark Tale*'s characters, thanks to innovative Maya rigs that allowed "off model" deformations. Inset: Oscar (Will Smith) and Lenny (Jack Black) conspire.

DreamWorks pushes commercial software in state-of-the-art directions to create a painterly, luminescent underwater world populated with cartoon characters for *Shark Tale*

Think *The Godfather* meets Tex Avery or Chuck Jones, switch the sound track to hip-hop and reggae, set the action in a painterly underwater world, turn the characters into sea creatures, and you have a taste of *Shark Tale*, the first 3D animated feature from DreamWorks Animation. Scheduled to open October 1, the film features the voice talents of Will Smith, Robert De Niro, Martin Scorsese, Renee Zellweger, and Angelina Jolie and an “in-fin-ite” number of fishy puns.

The lead fish is Oscar (Smith), a sometime hustler whose day job as a tongue cleaner at the whale wash couldn't be worse. Oscar gets his big break when a shark chasing after him dies in an accident. The little hustler takes credit for killing the shark, and changes from shark bait to shark slayer. Things go swimmingly for the new big fish on the reef until the neighbors spot another shark. Luckily, it's Lenny (Jack Black), who has a secret of his own, and the unlikely pair become partners.

The partnerships that turned this story into a feature film were formed more than three years ago when DreamWorks Animation began its sea change from a traditional animation studio into a 3D studio, following in the wake of PDI/DreamWorks' award-winning box-office hit *Shrek* and other CGI films. “By the time [DreamWorks'] *Spirit* was finished, everyone wanted to get on the CG bandwagon, so we had a 100 percent changeover,” says producer Janet Healy. “Also, it was a time when amazingly talented people were available in all areas of the CG industry. We hired 150 really good artists.”

To give this new talent pool the tools they needed to create production designer Dan St. Pierre's stylish environments and help directors Bibo Bergeron, Vicky Jenson, and Rob Letterman tell the story, the production team sifted through an ocean of possibilities when deciding what pipeline to build for the film—and the studio.

“We formed a brain trust,” Healy says. “We had 14 key people and, depending on the discipline being discussed, special guests. We met every day for two months.” At the end of the brainstorming sessions, they settled on off-the-shelf application software but with PDI's file and data formats for everything below the application level. “We wanted to build a pipeline for the film that would last,” she adds, “and we realized that strategically we needed to leverage as much as we could from PDI to put one foot toward uni-

fication [between the two 3D studios].”

At the application level, DreamWorks chose Alias's Maya and PaintEffects, Pixar's RenderMan, and Mental Images' Mental Ray, all running on Hewlett-Packard machines. But it wasn't that simple. It became clear during the brainstorming sessions that to achieve the look St. Pierre had in mind, the entire film would need art-directed global illumination, and to create the animation Bergeron wanted, Maya would have to be rigged to allow cartoon animation.

Manhattan in the Drink

The story takes place in an underwater New York City, complete with Times Square and an outer borough in a coral reef-styled setting. “Our world was not meant to be naturalistic,” says Jenson. “It is an allegory. We didn't want it to look like a sunken human city; we wanted a reef. It's a complete fantasy, but it triggers familiar responses for us.”

Kevin Rafferty, lead CG supervisor, who was part of the brainstorming team, helped streamline methods for creating the underwater city. “We needed to find ways to bring the city to life in the way the art director wanted without breaking the memory bank,” he says. “Originally, we just wanted the feeling of a city built by fish, but as the film evolved, we needed a recognizable underwater Times Square with familiar icons such as the Flatiron building, billboards, jumbotrons, and neon lights.”

The recognizable buildings were “hero” buildings, created from scratch to resemble those in the real world. For other buildings, the team used a modular approach: Rafferty, who came to DreamWorks after working on live-action visual effects for 20 years in such studios as Industrial Light & Magic, led a team that designed and built a “Tool Box Town.” He points to his computer screen where an asset browser scrolls through a catalog of building parts—building shells, windows, stoops, doorways, billboards, fire hydrants, and much more. Each piece carries two or three types of texture information so that one piece of geometry can sport various



•••• Film

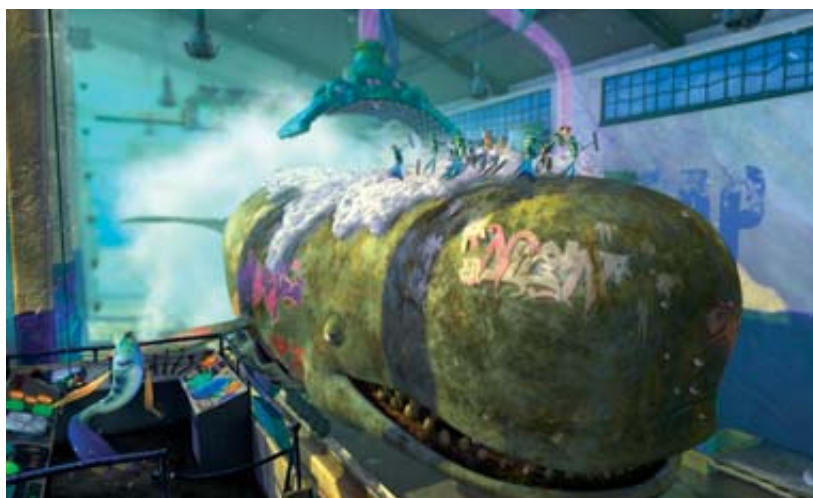
styles through changes in hue, bump maps, and displacement maps. “We took advantage of asset-instancing within Maya so that even though a window might be used 100 times in one building shell, it would be counted as only one window in memory,” he says.

Once the building pieces were approved by the art department and built in the modeling department, a city could be assembled. To further the allegory of a city built by fish, projection maps applied to several buildings added colorful veins of coral, graffiti, and other visual elements to the underwater fantasy.

Painterly Effects

Further increasing the visual richness of the undersea environment were bubbles, coral, kelp, and other seaworthy items, most of which were generated with Maya particles or Maya PaintEffects. For example, for the whale wash where Oscar worked, a 23-person effects crew led by Mike Miller created foam, bubbles, steam, and goo. “We calculated that we had between 350,000 and 400,000 particles for one foamy whale shot,” he says. To move the particles for that shot and others, the team used Flu, a proprietary 3D fluid simulator developed by Nick Foster at PDI/DreamWorks.

For vegetation, coral, and brushes in the whale wash, and other elements, the team used Maya PaintEffects. “We needed to ‘fishify’ the movie, so we used PaintEffects to paint vegetation onto surfaces,” says Miller. “We used it almost like a fancy graphical user interface. We would paint the surfaces, see how it looks in Maya, move stuff around, and change colors and styles. We like



The DreamWorks effects team used Maya particles and PDI's FLU simulator to create and animate foamy bubbles that interact with the whale and the surrounding water.

the PaintEffects front end, but the back end wasn't usable for us.”

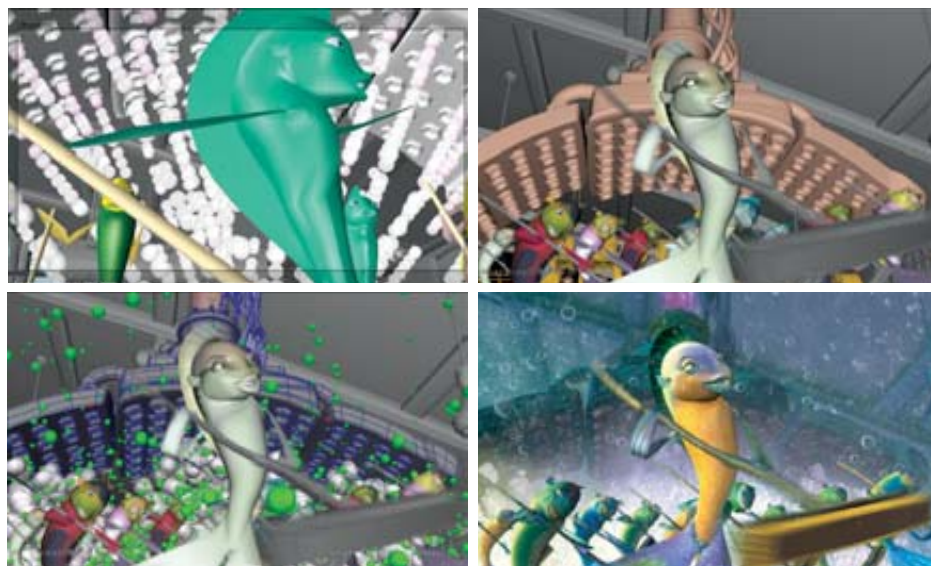
Rather than rendering the PaintEffects elements in Maya, the effects team wrote a Maya plug-in that exported PaintEffects curve data as points into proprietary files. The points turned back into curves during rendering via a proprietary RenderMan DSO (dynamically shared object), carrying with them information about motion, size, color, and so forth.

“We could also instance geometry to the curves using the Renderman DSO,” Miller says, “and with the help of shaders, we could use the normals exported from Maya to light them with shadows. We could even do procedural kills.” For example, after generating a field of kelp, the team realized that some vegetation was in front of the camera as it moved. They pruned the branches without having to go back into Maya.

Pipeline designer and developer Scott Cegielski, who wrote the Maya plug-in, the RenderMan DSO, the shaders, and other tools, devised a way to drive procedural motion in the DSO. “We could have a character grab a piece of PaintEffects stuff and move it out of the way,” says Miller. “It's a really innovative tool. We're going to try to document and share our work at SIGGRAPH.”

Short RIBs

Because the environments were so complex, rather than pre-process and send the renderer all the geometry for buildings, characters, and other models in RIB (RenderMan Interface Bytestream) files, the *Shark Tale* team put into its RIBs only shading and lighting information plus a procedural primitive that points to models stored on disk in a proprietary format. As a result,



Clockwise, from top left: First, layout artists use low-res graphics to block out camera moves and character poses. Then, animators create the character's performance, and the layout department dresses the set. Next, effects artists set up the bubble and foam simulations. Last, the simulations are run and final lighting is added to the scene.

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the RIBs were one-tenth the size of a typical RIB, according to Doug Cooper, visual effects supervisor. In addition, models in the proprietary format were smaller than they would have been if converted to a RIB file format.

“We combined the advantages of procedural primitives, which people use for instancing, with RIB archiving, in which models are pre-baked into RIBs and loaded as needed,” says Cooper. “It gave us the means to manage complexity.”

The proprietary model format was created by a stitcher, which managed a complex arrangement of NURBS. “We can have five-point unions and T-junctions that you can’t do with typical stitchers, which means that our character models can be more flexible,” says Cooper. In this system, the Isoparms (curves on the surfaces) can look like a crazy-quilt jumble of streets in a medieval village rather than parallel lines on a grid. “I can’t tell you the details of the stitching,” Cooper says, “but I can tell you that we have to convert it into a set of surfaces that RenderMan understands.”

That conversion happens on demand at render time. “Because we can load one model at a time, we don’t have to stuff everything into the RIB file,” says Cooper. “RenderMan loads in a RIB with the shading information but no models. When it gets to a model, the



Modelers and animators needed to create an allegorical world in which characters could sit at tables and use their fins as hands—and then swim away.

procedural primitive kicks in. So, if we have a scene with thousands of windows on buildings in a city, instead of feeding all those windows into RenderMan in one big stream of RIB files with models baked out of Maya, the window is loaded off disk when it’s needed and turned into something RenderMan understands. When RenderMan is done rendering the window, it’s discarded.”

Shades of Light

The shading and lighting information that went into the little RIB file took an equally innovative path. “We were able to apply global illumination [in all 1375 scenes] throughout the film using commercial tools,” Cooper says.

“We used Mental Ray for global illumination—specifically for exposure mapping [ambient occlusion] and bounce light,” he says. “We had RenderMan use the pre-computed Mental Ray data when we rendered our final beauty passes.” By separating all the components in this way, they could tune parameters in each to enhance the film’s painterly style.

“Dan St. Pierre, our production designer, had soft area shadows and bounce lighting among his specific goals,” says Mark Wendell, CG supervisor. To simulate the soft shadows created with ambient light, rather than using dozens, perhaps hundreds, of fill lights to emulate diffuse lighting, many visual effects studios have begun using a technique called ambient occlusion in which the amount of light received from a sky dome is calculated for every point on a surface. The result looks like a perfectly exposed grayscale photograph taken on an overcast day. To integrate CG elements with live-action photography, the ambient occlusion pass is composited with environment lighting.

“We wanted more artistic painterly control,”

3D Cartoon Animation

Usually, animators perform 3D characters using models with built-in shapes that, for example, might control the way a character smiles. But most of the animators working on *Shark Tale* were traditional 2D animators.

“We decided we did not want to do shape interpolation,” says producer Janet Healy. “We wanted our animators to be able to go ‘off model,’ to have the same ability in computer graphics that they have when they draw. So, when Oscar flaps his fins, it’s not just motion blur happening, he’s got five arms. And if you looked frame by frame,

you would be able to see ‘Picasso in-betweens’—with his chin in one place and his forehead in another—just like you’d see if you stepped through a 2D animation.”

The extreme stretching and deformation was accomplished with Maya plug-ins developed by DreamWorks’ character riggers and with custom skinning and wrapping tools. “Bibo has a distinct squash-and-stretch style,” says visual effects supervisor Doug Cooper of director Bergeron. “We had to pull character rigs in directions we’ve never pulled them before.” —BR



Modelers sculpting Oscar and Angie could create complex arrangements of Isoparms (surface curves) knowing a proprietary stitcher could handle them.



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says Wendell. “We knew the production designers and art directors all came from a painting background, so we wanted to give the lighters a way to control a simulated ray-traced lighting environment.” The system he developed and Mike McNeill implemented put the controls for ambient occlusion and bounce light into RenderMan lights. DreamWorks lighters could place CG lights as usual, but the lights they used were far from typical—soft shadows and bounce lights were built in. The lighters could paint anything with colored lights and soft shadows—even the kelp fields created with PaintEffects.

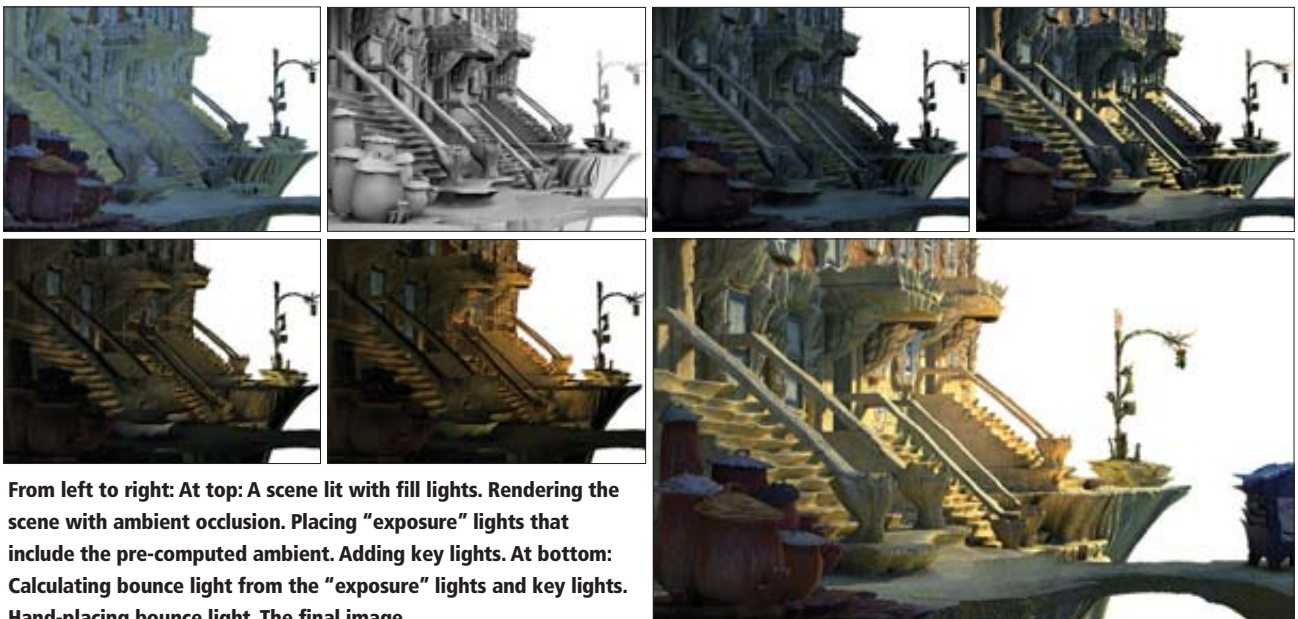
Painting with Light

Here’s how the lighters might use the system for a background: First, ambient occlusion (what DreamWorks calls “exposure”) would be pre-computed with Mental Ray and stored as texture maps. Then, the lighters would place traditional key lights into the

and then after that all the lighting with the exposure maps is straightforward RenderMan lighting using the maps, so the turnaround is fast.” Last, a lighter might want to emphasize characters or an area in a scene with direct light that picks up colors from the environment as it bounces.

“The hard part of using traditional ray-traced bounce lighting is that you do the direct lighting and then run the bounce simulation,” Wendell says. “It takes a long time because it’s a big ray-tracing calculation and if it’s not what you want, you have to go back and change the direct lighting. We also pre-compute the bounce and get a given result. The difference is that we can selectively put the bounce back into the scene with a hand-placed light.”

To do this, they baked the scenes lit with the key lights and the exposure lights into a texture map, computed the bounce light from that map, and stored it as another texture map. “Now, we can do the same thing with the pre-computed bounce as we did with



From left to right: At top: A scene lit with fill lights. Rendering the scene with ambient occlusion. Placing “exposure” lights that include the pre-computed ambient. Adding key lights. At bottom: Calculating bounce light from the “exposure” lights and key lights. Hand-placing bounce light. The final image.

scene for directional light and shadow. Next, they would add the system’s new “exposure lights”—fill lights that include the pre-computed ambient light.

“You can hand place these lights to your heart’s content and really sculpt the space,” says Wendell. As they would have done using fill lights, the *Shark Tale* lighters placed lights and created shadows, but the shadows in the nooks and crannies of the space were soft and looked natural because they used the pre-computed ambient occlusion. Further, each of the “exposure” lights not only controlled where the light fell, but also its color, intensity, and so forth, just as did the fill lights without ambient light built in.

“When you put the exposure lights together with the key lights, you get directional shadows from the traditional key lights plus soft lighting from the ambient occlusion,” says Wendell, “and yet the lighter can make a green light a little bluer without compromising the soft contact shadows. The exposure [ambient occlusion] was computed once with Mental Ray—in the render farm overnight—

the exposure lights,” Wendell says. “And because we can put the bounce lighting back into the scene, not globally but with hand place-able lights, we can alter that bounce result.” The lighter could, for example, shower an element with a golden tint. “When you put it all together,” he says, “you get soft contact shadows and an enhanced bounce light right where you want them.”

While the techniques invented by the DreamWorks Animation team solved particular problems for *Shark Tale*, the ability to create a traditional 2D style of cartoon animation with 3D tools and to art direct the look of a scene by using customizable lights that contain pre-baked global illumination and bounce light will likely find their way into other productions.

“It’s the best of both worlds,” says Wendell. “Simulation and art direction.” ■■

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



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.... CG / Live Action

Artists use the
digital tools of today
to build Sky Captain's
World of Tomorrow

[DREAM WORLD]

By Karen Moltenbrey

It all started with a dream: Amid the flurry of a snowstorm, the outline of a behemoth zeppelin becomes more defined as it floats into view and eventually docks atop a statuesque structure of concrete and steel. Moments later, a vintage P-40 Warhawk piloted by a revered flying ace rips through a stylized 1930s New York City skyline, cutting down giant marauding robots as they wreak havoc on the city.

— This was Kerry Conran's dream, and one that the digital artist had relived day and night for nearly a decade. Finally, it has become a reality, now that his retro/futuristic story of *Sky Captain and the World of*

Tomorrow has landed in theaters. Told through unconventional filmmaking, the movie follows Sky Captain (Jude Law) and his ex-girlfriend, reporter Polly Perkins (Gwyneth Paltrow), as they search for clues to the robotic madness and attempt to solve the mysterious disappearance of scientists from around the world.

— A trailblazing project, the live-action film has no real sets, landscapes, or locations. Instead, the entire movie was filmed against bluescreen, with teams of CG artists generating all the sets and nearly all the props, except those with which the actors physically interact. Yet every

A landmark in filmmaking, the live-action feature *Sky Captain and the World of Tomorrow* contains all-digital sets and backgrounds created with a wide range of imagery, from period photographs to high-end 3D graphics.

scene is brimming with detail, as some of the backgrounds were crafted from period photos and film footage augmented with CGI, while others were crafted entirely by digital methods. With this type of composition, the group was facing 2000 effects shots; 1100 of which were completed by World of Tomorrow, an effects studio



formed for this project only. The remainder, under the direction of senior visual effects supervisor Scott Anderson, were outsourced to several effects houses after Paramount signed on and set a release date for the film.

—“The notion that the technology was finally evolving to the point that you could break down live action [into layers] the same way that animation had been done for years meant an explosion of choices, possibilities, and opportunities for filmmakers,” says Conran. Yet for *Sky Captain*, going digital was far more than a technical feat; it was the only way Conran could achieve the desired style for the movie: a period look with a sci-fi bent.

—More than six years in the making, this ambitious film is the first full-length feature by writer/director/artist Conran, who spent four of those years creating a six-minute short that provided a glimpse of his dream. Using the short—which merged classic styles and iconic images with cutting-edge digital technology—he was able to capture the hearts and support of prominent industry players. These included producer Jon Avnet and A-list actors Law, Paltrow, and Angelina Jolie in the lead roles.

Realizing that without help his vision would never materialize, Conran used the short to recruit other heavyweights, including Darin Hollings. Excited by what he saw, Hollings signed on as visual effects supervisor and assembled a team of 100 artists who comprised World of Tomorrow. “Many people were getting onboard for all the right reasons, because they loved the project,” says Hollings. “But with every shot a composite, we knew that to do it as an independent project would require unconventional methods.”

By factoring in a number of what-ifs from the realms of science fiction, fantasy, and history, Conran crafted an all-digital world for the film, unlike anything seen before. And yet, somehow, it appears familiar by reflecting cinematic film classics, Republic Pictures serials (1930s film chapterplays, or cliff-hangers), and comic-book superhero flicks through the use of stylized realism.

With no template for making a movie like this, the group had to forge solutions as it went along. Yet, because the actors could devote only five weeks to principal photography, there was no time to allow for mistakes. This situation prompted Conran, Hollings, and the rest of the crew to assemble a unique previsualization and preproduction plan that contained a comprehensive 3D animatic,

created in Alias’s Maya, which included every detail in the film, whether it was real or virtual, including the camera specs.

“We were going to have to do a shot every 12 minutes—or 40 shots a day—in order to finish the filming on time,” says Hollings. “Each shot had to be planned in advance. We had to know exactly where the camera and the actors would be in one shot as well as the next.” Therefore, before the shoot, the filmmakers conducted a full technical run-through of the film with friends substituting for the actors, a process that enabled them to uncover and fix a number of unforeseen problems, including mismatched lens information between the virtual Maya cameras and the Sony high-def video cameras.

Then, at Elstree Studios in London, where the live action was filmed, the team replicated every detail from the practice shoot. Employing location grids for its virtual stages and the actual three bluescreen stages, the group planned the subsequent day’s filming in exhaustive detail, including the choreography of the actors and the cameras, distances, tracking issues, lighting, the camera rigs, and even the costumes. Additionally, the group superimposed the grids onto the animatic to make sure the imagery was properly aligned, while the actors reviewed the animatic before each take so they’d have an idea of their on-screen surroundings amid the sea of bluescreen.

Building a Virtual World

With its all-virtual sets, the movie takes viewers around the world and then some, from the frosty Himalayan Alps to the brilliant Technicolor valley of Shangri-la. For years, Conran had amassed volumes of reference books, photographs, actual period and stock film footage, and other images to use for creating these locations. Initially, the group had planned to use actual archived imagery for nearly 70 percent of the backgrounds, and 3D for the rest; however, when the film was completed, those figures were nearly reversed. At times only portions of the period file photos and footage were used; other times additional types of imagery were layered and integrated, including recent photos.

The majority of the scenes, especially those of New York City, were modeled in Maya and rendered with Pixar’s RenderMan, while the animation was keyframed in Maya. For the explosive elements,

Conran had planned for the film to be black and white, in keeping with its period noir style. To avoid a potential risk at the box office, however, he opted for a unique stylized look instead. This was achieved with a contrast and diffusion system whereby the color shots were tinted black and white during compositing, and later, the original colors were reintroduced over the black-and-white images.



the team used a combination of Maya rigid-body dynamics and pyrotechnics footage filmed by Hollings and his colleagues. “We had our core CG software, but if you name any piece of software for creating visual effects, we used it,” notes Hollings. “We had an eclectic group of artists who worked on this, and we didn’t have time to hold them back from using a certain tool.”

In the end, the artists had expanded nearly every 3D set to the point where each scene contained 50 to 60 layers on average, including the background plates, stock footage, archived footage, digital mattes, live-action explosions, and CG elements, composited together in Adobe’s After Effects, and edited with Apple’s Final Cut Pro. To manage all the assets, the group initially used Nexsan Technologies’ Ataboy storage drives with a capacity of about 10TB. But when Paramount came aboard, the studio expanded its setup to 30TB with a Network Appliance (NetApp) storage device.

“This movie is not so much about the technology we were using to put it together, because we were using off-the-shelf tools,” says Hollings. “Rather, it was about the style and the look of the finished product, and why we were using visual effects. We wanted to make a piece of art.”

Conran’s Style

Even though the film is being hailed for its technical achievement, what lies beneath is great filmmaking, realized through the composition of the shots and the use of lighting and framing. The entire movie was shot in 24p HD, which is less expensive and more flexible to use than film, and faster to use on set. Yet, unlike most other movies shot in high def, *Sky Captain* forgoes the format’s crispness and instead uses a soft focus, subtle modulations of light and dark, and the textured look of film rather than video to help integrate the live action and CGI.

As a matter of fact, the group’s intention to maintain a film noir look for the project led to a major obstacle: Traditionally, these types of environments are formed by shadows, and in this film, there were no environments to project the shadows. So the team had to rely on creativity and digital techniques, such as adding low lights, backlights, and sidelights on set to produce illumination contrasts. Later, the artists carried this theme over to the digital side by setting up lighting rigs that provided a similar dramatic effect.

“Unlike traditional visual effects in which the CG elements are lit to match the live-action plate, little or none of the live-action plate’s lighting influenced the CG lighting,” says Michael Sean Foley, lighting director. “Instead, we lit the virtual sets as if we were lighting a real set, by making a light rig that would work for the widest shot of a sequence, and later adding more lights for the tighter shots. Then, we’d bring in all the cameras for that sequence and render a frame for each shot with that one rig.”

According to Foley, this process took one person nearly a week to do 20 to 30 shots. After the lighting rig was correct, however, the group rendered the whole sequence at once. If two sequences had



While trying to solve the film’s mounting mysteries, reporter Polly Perkins (Gwyneth Paltrow) and Sky Captain (Jude Law) travel to various locales, including this all-digital exotic jungle realm.

similar lighting, the team recycled the rigs, sometimes flipping the key light or adjusting the fill ratios. “We addressed each sequence as a whole, but handcrafted each shot as if it were a still photo,” he explains. “This enabled us to complete over 900 shots and still maintain a unique style throughout the film.”

Conran had planned to extend the darker period style by creating the entire movie in black and white, but had decided against it because of the financial risk such a project posed at the box office. Instead, the group chose a washed-out foreboding look, with a digital twist. “We decided that if we were going to do color on this movie, we would do it in such a way that it added to the lure and didn’t look like a colorized movie,” says Hollings.

Therefore, to achieve the unusual period look for *Sky Captain*, the group set up a contrast and diffusion system whereby the color film ran through a filter that tinted the color images with black and white. The artists then composited the shots in black and white, focusing on composition, tone, and diffusion. After the shots were approved, the group reintroduced the color using the original colors from the film plate that were then washed over the entire black-and-white image. This process proved especially valuable because it helped smooth out the varying tones in the range of image types present in each scene.

“A lot of the film’s magic comes from the compositing, and we used many After Effects filters and were creative with edge blurs, diffusion passes, and other passes that isolated certain values and either pulled them out or suppressed them,” says Hollings.

Without question, *Sky Captain*’s atypical style and story take viewers back in time to a place they are familiar with but have never seen before. Ironically, modern films don’t embrace this genre, contends Conran, yet the older films, which might have, didn’t have the capacity to pull something like this off. “We were finally able to realize what visionaries back then had imagined,” he says, “but could never quite articulate, at least on film.” ■■

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

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..... Video

HDV

Will the new HDV format usher in the next revolution in video production?

By Stephen Porter

Ready for Prime Time?

T

here's a debate going on in the professional video world that's eerily reminiscent of one that occurred back in the mid '90s when the DV format made its first appearance.

Back then, the discussion focused on whether DV would one day replace the much-revered Betacam SP analog video format and the higher-end DigiBeta format. At the time, many dismissed DV as a toy for consumers, arguing its low quality was incapable of meeting the needs of true video professionals. But time proved the fallacy of such arguments, as the DV format slowly but surely infiltrated even the highest ends of the professional video world.

Today, a similar debate has emerged around HDV—a new high-definition video format that promises to make HD production affordable for nearly everyone. Since its introduction a year and a half ago, more and more vendors of video cameras and non-linear editing (NLE) software have announced their support for the format, and the list of HDV users continues to grow.

But the big questions about the ultimate role of HDV remain: Is HDV really bringing

affordable HD production to consumers and video professionals alike? Does the emergence of HDV spell the end of the DV format? Will HDV equipment one day replace the need for the more expensive HD equipment currently on the market?

The Rise of HDV

One of the most common myths about HDV is that it is the invention of one company, JVC. This misconception stems from the fact that JVC brought the first HDV camcorder to market back in April 2003, and even now, more than a year and a half later, its JY-HD10U remains the only HDV camcorder available.

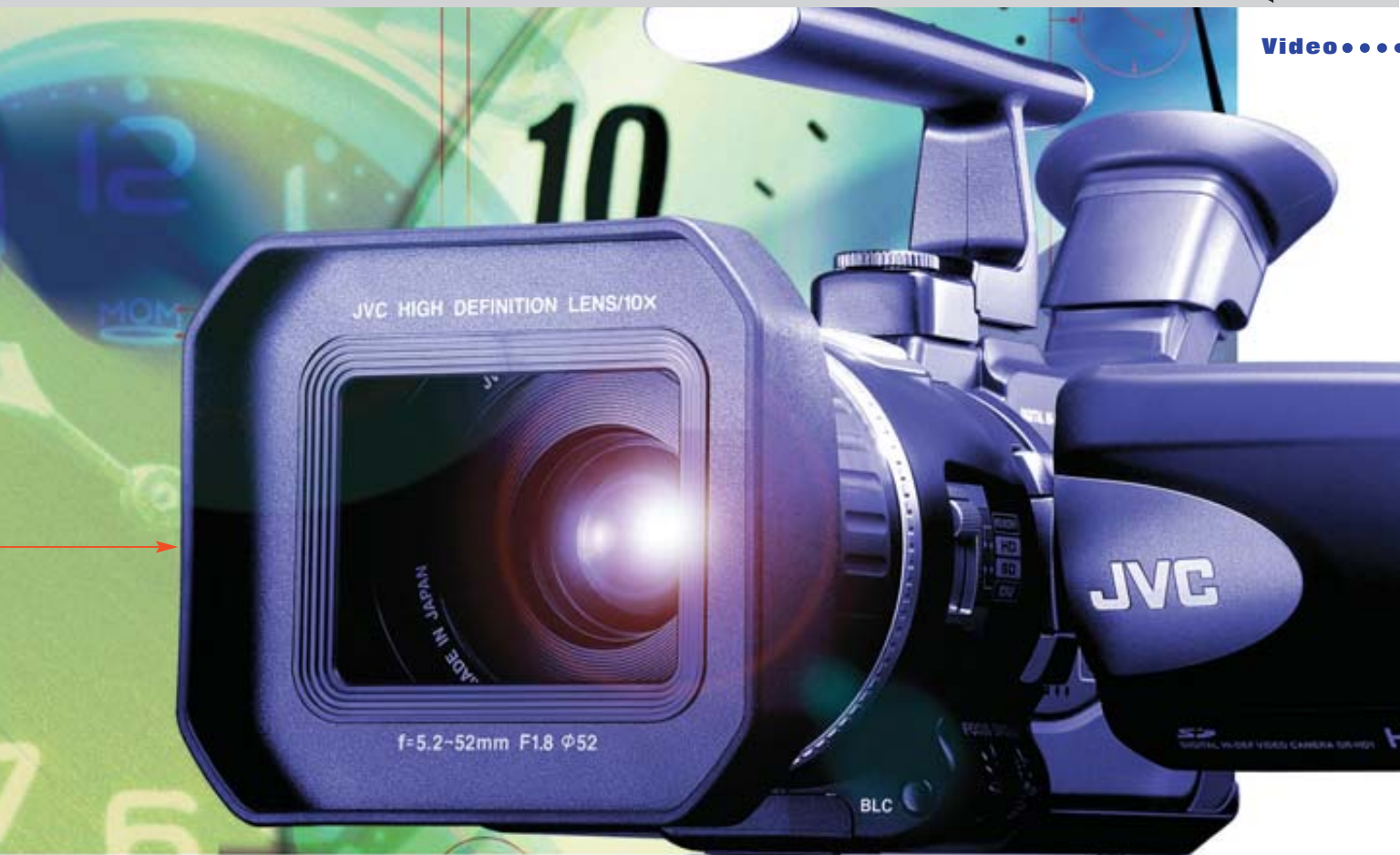
Despite that, however, the HDV specification was actually developed jointly by JVC, Canon, Sony, and Sharp. And both Sony and Canon are expected to bring their own HDV camcorders to market sometime soon. In fact, Sony has announced it will begin shipping a new HDV model in Japan this month and will make it available globally by the end of the year.

According to Dave Walton, marketing communication manager at JVC, the HDV format was developed because of a need to

create a more affordable way to produce HD content, a need made more urgent by the growing popularity of HD television sets. "The ability to view and display HD programming is growing at an incredible rate," he says. "However, until now, there has been a limited number of ways to shoot and record HD video, and those options have existed only at the high end of the price spectrum. And that's because HD video consumes a lot of data, so it has required high-capacity, data-driven systems."

To solve that problem, JVC and its vendor partners built the HDV specification around the same MPEG-2 compression scheme adopted by US broadcasters. While higher-end HD camcorders use an intra-frame compression scheme—which basically means each frame of video is compressed separately—the MPEG-2 format uses interframe compression (see "Comparing Compression Schemes," pg. 30). This eliminates some of the redundancy between frames, and allows the video to

Introduced last year, JVC's JY-HD10U is the only HDV camcorder on the market, although Sony plans to ship a competing product in the US later this year.



be recorded at a 19MB/sec data rate, low enough to allow the video to be recorded on DV cassettes, which can handle up to 25MB/sec.

The fact that the HDV format uses the same cassette case, tape speed, and track pitch as the DV format is a key factor in its affordability. It not only allows HDV to be highly compatible with the DV format, but

it eliminates the need for vendors to redesign tape-recorder mechanisms. As a result, JVC was able to bring its HDV camcorder to market for just \$3995.

At the moment, HDV users are able to shoot HD video at 720p at 30 frames per second (fps), the only HD mode supported by JVC's single-chip JY-HD10U camcorder. (The camera can also record in standard def-

inition at 480p at 60fps.) However, the HDV specification also supports 1080i HD video, and at the last NAB show, Sony and JVC demonstrated prototypes of three-chip HDV camcorders that will support that mode.

Gauging Acceptance

Excited by the ability of HDV cameras to provide nearly three times more resolution than DV cameras, Dave Taylor, CEO of Cineform, is bullish on HDV's future, even in the short term. That's not surprising, given that Cineform was one of the first vendors to provide NLE software for HDV.

The product is Aspect HD, a software-based plug-in for Adobe Premiere Pro that lets Premiere users edit HDV in real time in a variety of resolutions and frame rates,

including 480p60, 576p50, 720p30, 720p60, and 1080i60. Unlike

most other HDV NLE systems that have since come to market, Aspect HD is not a native HDV editor. That is, it does not edit the video in the MPEG-2

format in which the video is captured. Instead, it con-



Cineform's Aspect HD is a plug-in program for Adobe Premiere Pro that lets Premiere users edit HDV in real time using a variety of resolutions and frame rates.

•••• Video

verts the video to Cineform's wavelet-based compressed format, which, Taylor contends, is better suited to the needs of the post-production suite because video compressed with wavelet technology holds its quality through multiple generations.

From Taylor's perspective, the HDV format is already gaining acceptance among people in film, news, corporate events, and the like. "We anticipate that over the next three to five years HDV will totally replace DV," he says. "There may be some lingering work done with older equipment. But new equipment sales will shift dramatically toward HDV."

Walton of JVC is also optimistic about HDV's potential, but he isn't ready to concede that HDV is poised to replace DV. In fact, he says, asking whether HDV will obsolete DV is essentially like asking whether HD video will replace SD video. The answer, he suggests, is yes, although it's likely to be a gradual process.

"The decision as to whether someone will shoot in DV or HDV depends on the playback capabilities of their viewers," Walton says. "Moreover, there is a whole infrastructure that has developed around DV. That is not going away anytime soon. But one of the key features of HDV products is that they will be switchable with DV. So it's not a matter of one obsolescing the other. With the addition of the HDV capabilities, I think the life span of DV might even be extended."

But there are some video pros who are ready to make the transition now. One is Geoffrey Pepos, an independent filmmaker and founder of Rhythm Films. Last year, Pepos was in the middle of shooting his newest film, *Purgatorie Playhouse*, when, as luck would have it, one of the DV cameras he was using was destroyed during a shoot of some horse footage. When he went looking to replace it, he stumbled upon the newly announced JVC HDV camcorder and decided to give it a try. He ended up liking it so much, he shot the rest of the film with it.

For Pepos, his experience with the JY-HD10U camcorder represented his first foray into HD, but he says he'll never go back to using DV. "This has got to be the future. Even if I'm doing SD work, I'll shoot it on HDV and down-



During the production of *Purgatorie Playhouse*, filmmaker Geoff Pepos switched from a DV camcorder to JVC's new HDV camcorder. While the HDV camcorder lacked some professional features, he was thrilled with the resolution and the progressive format.

rez it. It's just like oversampling in music. You get extra data that let's you create a higher-quality image."

HDV Skepticism

Not everyone, however, is ready to leap onto the HDV bandwagon. Kevin C.W. Wong, director of photography at 4 Lanes Productions, has been working with the HDV format for nearly a year, employing it for a music video, a television commercial, and an independent feature film. He also has experience shooting with both DV and HD video, as well as film.

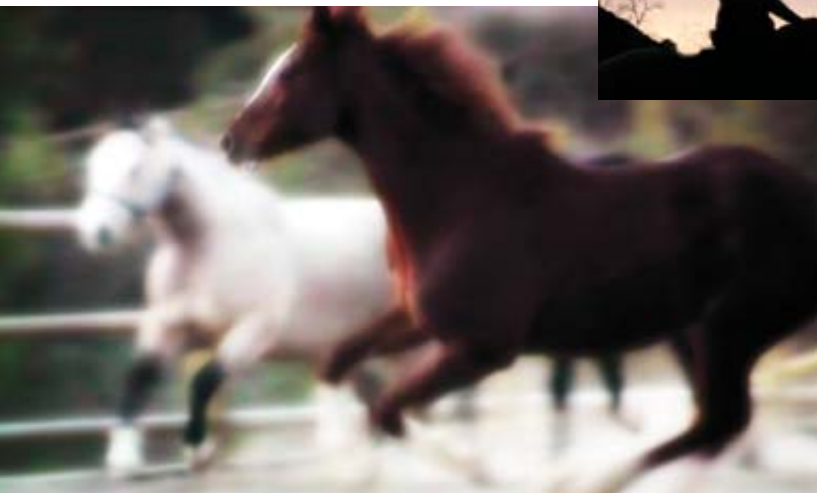
In evaluating HDV, Wong says the picture quality is good, especially for the price, and he believes the format has a great deal of potential. But he's also been frustrated by the lack of professional features on JVC's HDV camcorder—such as precise control over focus and aperture size—as well as the still-immature infrastructure that surrounds the HDV format.

Brian Greene of Greene HD Productions, a dedicated user of HD video who produces documentaries for HD broadcasts, believes HDV is suitable for consumers and producers of corporate and industrial videos currently shooting in DV. But for higher-end users, he feels the limitations of HDV are too significant.

One big limitation, Greene says, is the fact that JVC's HDV camcorder comes with only a low-end, fixed lens. So much of an image's quality depends on the quality of the lens you use, he says, and there's no way for a low-cost, small-format camcorder without either a broadcast or HD lens to provide the same quality as the more expensive HD cameras.



Pepos began shooting with HDV after his DV camera was destroyed while shooting footage of horses. The quality of the images produced by his HDV camcorder were so impressive, he says, he won't go back to shooting in DV.



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•••• Video

Beyond that, Greene says, because the compression ratio of the HDV format is so high, even if you had a quality lens, you would run into image quality problems.

"If you're shooting a static image, you'll get something fairly passable with an HDV camera," Greene notes. "But if you start shooting something with lots of color and fast motion in it, the image falls apart because the compression ratio can't keep up with the rate. You begin to see blocking. The image starts falling apart."

Still, Greene does see a role for an HDV camcorder in two scenarios in the high-end HD world. The first would be for situations when you need to get a shot in an extremely tight location where a larger HD camera wouldn't fit. The second would be for physically risky shoots where the camera could easily be damaged. In both instances, he says, an HDV camcorder offers a solution that's more attractive than doing the shot with a DV camera.

Early Limitations

Neither JVC's Walton nor Cineform's Taylor disagrees with Greene's assessment of HDV's inability to replace high-end HD equipment. On the other hand, they are quick to point out that many of the limitations that currently plague today's first-generation of HDV equipment will be resolved with future product releases.

"We have to realize there are huge technology gains coming," says Taylor. "My argument is that second-generation cameras will have good lenses and other features demanded by the professionals in that marketplace. It is not a limitation of HDV. This was just simply a feature design spec that JVC used in its first-generation camera."

In addition to better lenses, the next cameras to hit the market will offer increased frame rates, 1080i resolution, and three

Comparing Compression Schemes

The main difference between HDV and mainstream HD formats is in the way they compress video. Unlike existing HD camcorders that use *intraframe* compression, the HDV specification is built around MPEG-2, an *interframe* compression scheme.

With intraframe compression, every frame of a video is compressed separately. In contrast, interframe compression strives to reduce the size of a video file by eliminating redundancies between frames.

In other words, if there is certain imagery that does not change from one frame to the next, an interframe compression scheme records that data only once and then re-creates it as necessary for each frame. The process is analogous to the way a copy-and-paste function works in a word processor, where the same information is used multiple times so it does not need to be re-created each time.

A big advantage of interframe compression is that it allows you to achieve a higher degree of compression, since less data is needed to create imagery for each frame.

On the downside is the fact that interframe compressed video can be harder to edit since cut points don't always fall neatly between frames as they would with intraframe compressed video. In addition, because interframe compressed video consists of less data, the video will not hold its quality as well when it goes through multiple generations, which often happens during the video editing and postproduction process.

CCD chips. Those kinds of improvements, argues Taylor, will represent an important step up for the HDV format.

Walton agrees. "Right now, the limiting factor is the camera itself," he says. "But as the camera technology improves, we are confident the format will accommodate the higher quality of the camera and thus deliver a much higher quality image."

While users will welcome those improvements, Pepos says that he's already able to overcome many current limitations through some creative work in postproduction. For example, he says, "HDV video does have a certain amount of chroma noise in it, especially if the contrast ratio isn't right. In lower light, it tends to get noisier. But if you look at the luminance of the camera, it's perfect. The resolution is there. So I've created a bunch of filter specs in Adobe After Effects—different ones for different types of scenes—and I've been able to smooth out the chroma. There are work-arounds for everything, and they are not really that troublesome."



Pinnacle's Liquid HD Edition video editing system, which is scheduled to begin shipping this fall, will support native HDV editing.



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Video

That kind of creative spirit is something Walton thinks is essential for anyone willing to take up the HDV format in this early stage of its life. "There's no question that the SD products we and others sell are a lot more mature, and they have a lot of the subtleties that are appreciated by professionals. But if you want to do HD, you are going to have to put up with some inconveniences. That's simply the characteristic of a new technology. But people eager to be on the cutting edge are willing to do that."

Future Developments

In addition to the introduction of more HDV cameras with more professional features, there's one other development that many say must occur before HDV can really take off, namely the introduction of an affordable distribution medium for HD content. And the distribution medium that will most likely serve the need is HD DVD.

Unfortunately, the effort to create an HD DVD specification is still ongoing, a process complicated by the fact that there are two different groups of vendors supporting two different versions of an HD DVD standard. But the hope is that the first wave of HD DVD recorders may start hitting the marketplace by the end of the year.

Once HD DVD finally arrives, says Taylor, "I would expect there would be a fairly large adoption of HDV cameras. After all, why would anybody ever use anything but high definition once you can shoot and distribute it in HD?"

In the meantime, the HDV format is already receiving a big boost from the rapidly growing number of NLE software vendors and video board makers who are bringing their own HDV-compatible products to market. Among the vendors that have either recently announced new HDV-compatible products or have announced plans to offer them are Pinnacle, Ulead, Canopus, Matrox, Sony Pictures Digital Networks, Boxx Technologies, and Blackmagic Design.

Many of these announcements were made at NAB in April, and they represented a show of support for HDV that JVC's Walton, for one, feels was important. "This is an area that the editing companies really want to be involved in," he says, "because they know that the companies that get there first with the most elegant solutions are going to be in the driver's seat."

Alas, editing MPEG-2 interframe recordings is not as easy as editing intraframe video, Walton notes. So it is a challenge for the NLE systems to move over to a new standard. "But this is cool stuff," he says. "And I think it's going to be a hot area for the next few years." ■■

Stephen Porter is a contributing editor of Computer Graphics World and a freelance writer who covers video, graphics, and digital content creation technologies and applications. He can be reached at sporter@gsinet.net.

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..... Character Animation



Creature feature

**Intricate modeling
and animation bring
the characters in
Alien vs. Predator up
close and personal**

By Martin McEachern

In 1979, director Ridley Scott terrified moviegoers with his horror classic about an alien that gestates in a human host. Since then, the *Alien* film series has earned a venerable reputation in science fiction by adhering to a simple structure: pushing its heroine, Ripley, to her physical and emotional limit against the insect-like, metallic monster in frightening action and suspense sequences. For the latest chapter in the story, *Alien vs.*

Predator (*AvP*), director Paul W. Anderson strayed from that formula, and borrowing a page from the Dark Horse *Alien vs. Predator* comic-book scripts, locked two of movie-dom's iconic alien antagonists—the bio-metallic Alien and the camouflaged hunter Predator—in an epic battle.

In the setup to this monster clash, a team of unsuspecting scientists and adventurers arrive in Antarctica to investigate an ancient pyramid. After discovering that Predators are keeping alive a captive Alien Queen, whose offspring are used to test the prowess of young Predator warriors, the group finds itself battling for survival in the midst of this inter-alien warfare. While critics dismissed the film as gimmickry, and purists feared it could portend the end of both series, *AvP* raked in over \$38.3 million at the box office during its opening weekend.

In spite of the less-than-positive reviews, the film received acclaim for the CG character animation completed by The Moving Picture Company (MPC), which created the digital creatures and seamlessly integrated them into the live action with a clarity and visibility never before achieved in the previous *Alien* films. While animatronic and cable-operated puppets were often used in the past, the closer shots of the larger Aliens were reserved for a person in a suit, so rarely, if ever, were they shown in plain view, so as to not betray the human form inside. That “less is more” strategy proved effective and was carried over into the subsequent films, until now.

“For *AvP*, Anderson wanted the Aliens unobscured, fully active, and credible, but with the same mystique from the older *Alien* films,” explains animation director Adam Valdez, who also served as visual



Images © 2004 20th Century Fox

effects supervisor. This meant that MPC had to fight its battle on two fronts. Not only did the artists have to populate the Antarctic pyramid site with some of the most believable CG Aliens yet created, but they also had to digitally enhance full-size animatronics to give them far greater movement and exposure than before.

Alien Anatomy

Amalgamated Dynamics, Inc. (ADI) created the conceptual designs for *AvP*'s Predators, the Alien Queen, and her warriors according to Anderson's mandate of remaining faithful to their previous incarnations. Of particular focus were those from James Cameron's 1986 *Aliens*, which included the rod- and cable-operated "face huggers" and "chest busters," the lightweight bodysuits that gave the creatures their insect-like agility, and the 14-person-operated queen.

On set, however, the group was unable to realistically propel the mechanical queen with animatronic legs, so MPC grafted digital legs onto the models in postproduction.

Similarly, Anderson's vision of the Alien Queen as a rampaging T-Rex-sized monster could not be achieved solely with a mechanical puppet, whose torso, tail, and legs were inoperable. Alternatively, MPC tracked and animated the torso, lengthened and bulked up the legs and tail, and enlarged the feet to make the body pieces anatomically consistent with her movement.

To craft the all-CG creatures, technicians at Soho Scan separately captured the geometry of the arms, legs, heads, and other body parts of the ADI-designed, full-size animatronic props and costumes, delivering 3D scans ranging from 50,000 to 4 million polygons. Next, the MPC team imported the segments into Cyberware's

The characters in *AvP* appear in close-up shots, which required the artists to create believable CG versions of both the Aliens (left) and the Predators (above) that had the same mystique as their obscured predecessors that appeared in earlier films.

CySlice software and assembled them, then exported the geometry as a polygonal Alias Maya file. In Maya, the artists cleaned and scaled the parts, and stitched them together to create the final models, using scripts written with Byron's Poly Tools from Sebastian Thiel to manage the surfaces. All told, the completed Alien Queen has 200,000 polygons; the Alien warrior, 85,000; and the Predator, 50,000.

The modeling team then crafted multiple variations of each Alien and Predator species from these basic designs, and tailored numerous versions of each model to suit the animation or resolution require-

..... Character Animation

ments of the shots. For the wide shots framing hundreds of thousands of Aliens climbing the pyramid, the artists created four models of varying resolutions ranging from 250 to 2300 polygons. The Alien Queen required three high-resolution variants, each depicting her in successively worse condition as the battle raged on.

At render time, Pixar's RenderMan converted all the polygonal models to subdivision surfaces, which offer the continuity of polygonal surfaces and the flexibility of NURBS, allowing for uniform deformation of the Aliens' skin. "Subdivision surfaces aren't perfect for every occasion, but for creatures they do quite well, generating a more intuitive topology for the skin deformation," says Valdez. "Points can be laid out in such a way that they are the most advantageous for simulating flesh and skin stretching and wrinkling."

Troop Movement

In the most terrifying scenes from previous *Alien* films, the cinematography evoked terror through the use of shadow and suggestion, or leaving the monster off the screen altogether with the terror mounting in the audience's imagination. According to Valdez, when the Alien was explicitly shown in the past, it usually strained credibility. Yet for this film, Anderson wanted to show the creature in some of the more "heroic" poses from the comic books. Therefore, the team had to eliminate the awkwardness of their movements, which were limited by the human inside, and instead take advantage of the mobility offered by the CG versions, but without compromising the audience's familiarity with the pre-established nature of the creature.



For the grid pattern on the head of an Alien subspecies, artists painted separate displacement, blood, and opacity maps atop the base maps.

"Our biggest animation challenge was trying to give the world a new Alien that would be a departure from what's been seen before, but still make it feel like the same character," explains Valdez.

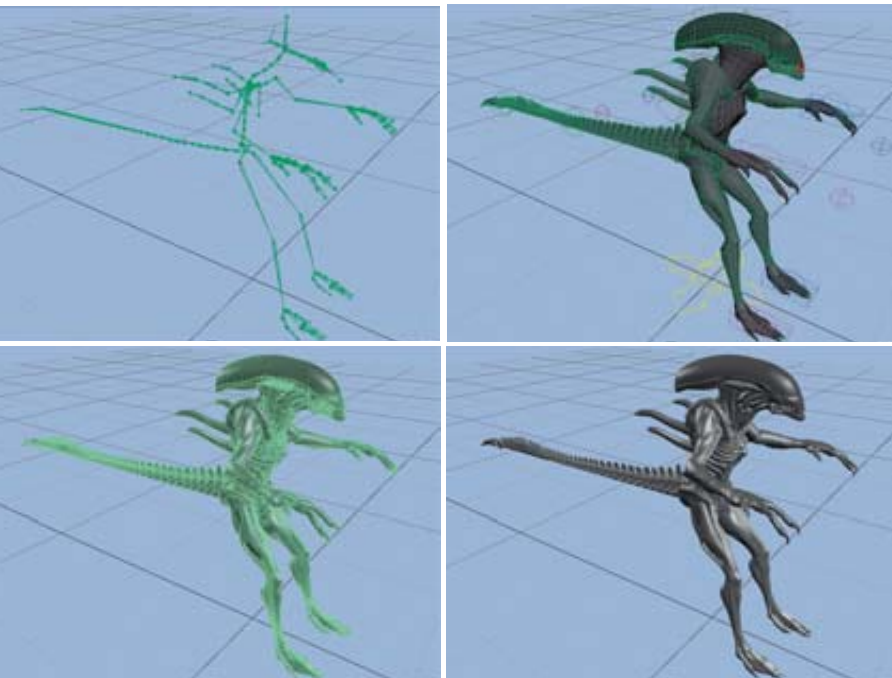
Because of the complex biomechanical composition of the monsters—an amalgam of flesh, machine, and insect—MPC was concerned about their deformation. "The original Alien suits are foam rubber, and it was how you'd light them that kept them from looking fake," says Valdez, "and this was true of their CG counterparts."

Another crucial aspect in making the creature withstand the scrutiny of close shots was the articulation of the Alien Queen's neck. Working in Maya, the crew rigged the neck for intensive deformation, ensuring it twisted like an intricate meshwork of slimy metallic structures and insect-like segmentations. Though the design of the Alien is such that neither the warriors nor the queen have traditional muscles, they do have muscle-like features, which were rigged using a combination of joint-based muscles and blend shapes.

Because of her segmented design, the queen's movement was limited, especially in the arms, which created rigging and animation challenges. On the other hand, the tails for the Aliens in *AvP* have an almost prehensile ability through a complex spline IK system that was set up as a separate rig.

For the first time in the *Alien* series, several metal chains are appended to the Alien Queen's body that she can wield to snag objects. Because the animators needed to increase the length of the chain from shot to shot for dramatic effect, riggers designed another flexible spline IK system that allowed for the application of any size chain on a per-shot basis, while constraints and additional rigging enabled the chains to dynamically snag and attach to props.

Meanwhile, the rig for the Alien warriors comprised 400 joints and 50 IK handles, with the neck, back, and tail having three spline IK chains respectively. The Predator, receiving a much simpler rig overall, required spline IK chains: one for the back and another for the neck.



This series shows the complexity of the Alien warrior in various stages, including the skeleton, with 400 joints and 50 IK handles (top left), with smooth-shaded geometry (top right), and with varying levels of hardware texturing (bottom two).



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..... Character Animation



In the movie's pinnacle, a raging battle scene between the two creature species, The Moving Picture Company generated thousands of CG Aliens. Then, using Alice, the studio's proprietary crowd-simulation software, the artists sent thousands of Aliens on an ascent to the top of a pyramid to face the Predators.

Alien Ensemble

For the climactic showdown between the two warring races—and the centerpiece visual effect of the film—MPC staged an epic battle between the live-action Predators and 16,000 digital Aliens atop the Antarctic pyramid site. To accomplish this, the studio further developed Alice, its proprietary crowd-simulation software, which was previously showcased in the extensive battle scenes in the feature film *Troy*.

The team customized Alice to generate Aliens that could crawl, leap, and move their tails en masse or individually. The program has rigid-body dynamics built in, so the crowds could respond intelligently to their environment. To individualize each crowd member, artists applied various Pose Deformers to vary the geometry, textures, and movements, achieving the latter by modifying and blending the motions assigned to each member on the fly. The Pose Deformers for the crowd of Aliens climbing the pyramid included three variations for mounting big steps and three others for navigating small ones, two for walking and running up the slopes, one for tumbling down the pyramid, and 12 for jumping. These cycles stopped at the summit of the pyramid, where the crowd members were then keyframed for the fight scenes.

Battle Scars

When scanning a creature as texturally complex as the Alien, MPC inevitably had to divide the detail between the geometry and the displacement maps. Since paintwork for CG creatures tends to adhere to different visual rules than those for on-set props, it wasn't necessary for the team to capture the texture detail when it scanned the character. "Instead, the artists simulated a base coat of color and displacements, and then painted on a 'slime' layer, so the shader could vary the slimy quality of the surface," explains Valdez. "This emulated how the skin of the Alien suits worked on set."

The multi-layered shading networks for the Alien warriors included color, bump, specular, reflection, ambient, occlusion, and displacement maps, but the driving force behind the wet, gelati-

nous sheen of their bodies was the displacement and specular channels. Each of these had two components: The specular channel comprised a standard specular map and a wet specular map, and the displacement channel featured a standard 8-bit map as well as a 16-bit High Dynamic Range Image (HDRI) map to accentuate the finest cracks and details in the queen's crown.

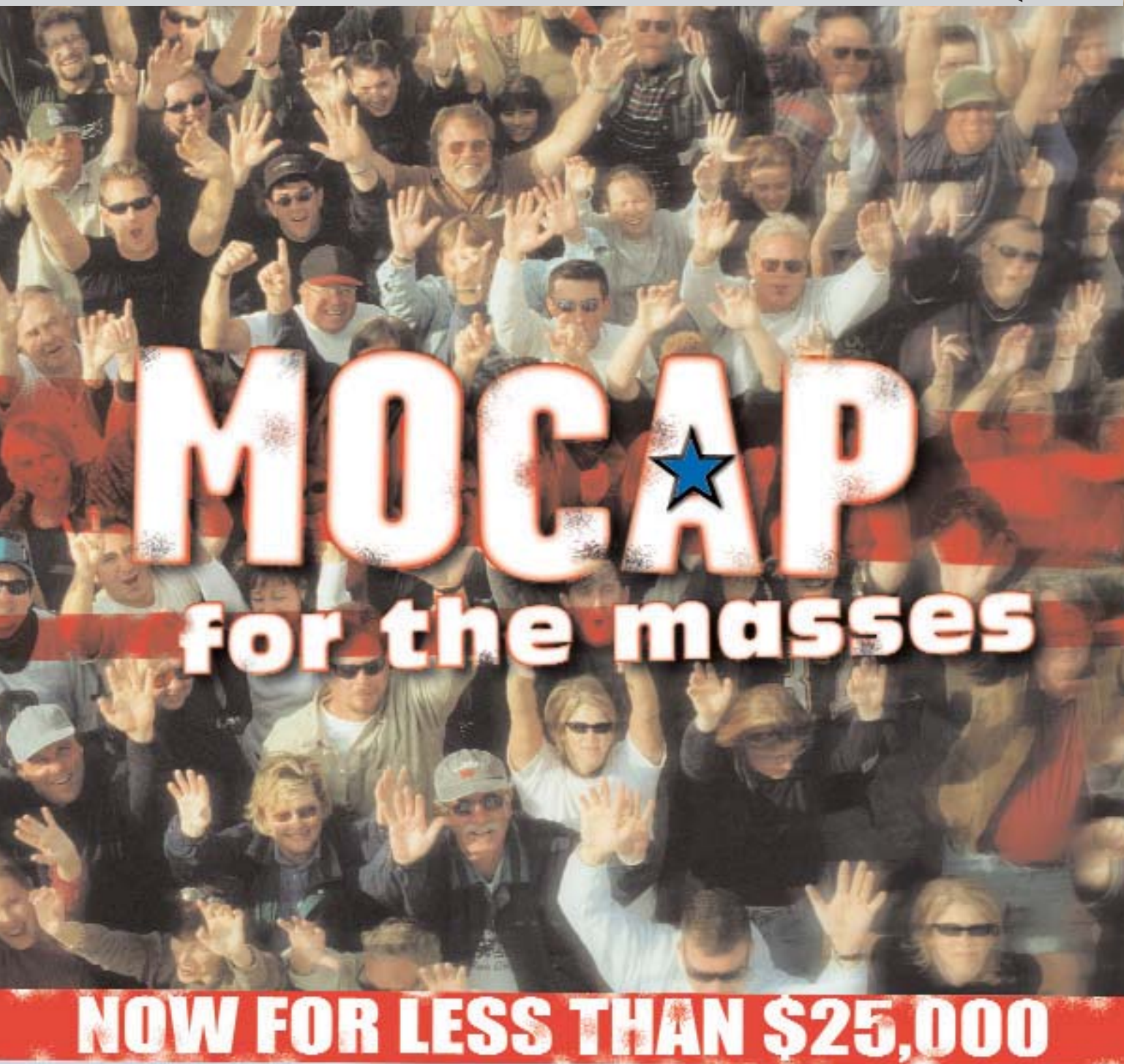
Then, by applying multiple layers in Right Hemisphere's Deep Paint 3D and Adobe's Photoshop, the artists executed all the texture painting at 4k for the prominent "hero" Aliens, and at 2k for the less-prominent crowd Aliens. For an Alien subspecies called the Grid Alien, which sports a deep grid pattern on its head, the artists painted separate displacement, blood, and opacity maps on top of the base maps. The group also painted numerous tail textures to fit a variety of lengths and reflect varying levels of damage.

For the base model of the Alien Queen, which shows her in prime condition, the artists applied the same shading network used for the warriors. However, for her two other models, portraying her in successive stages of deterioration, MPC used both the HDRI floating-point displacement map and a secondary displacement map—painted in Deep Paint 3D and composited above the HDRI map using Apple's Shake—for the deep cracks in the her crown.

Given the slimy and highly reflective surfaces of the creatures, seamlessly intercutting the live-action Predator costumes and the Alien puppets with their digital counterparts demanded pinpoint accuracy in mapping the position of on-set lights, achieved through an HDRI lighting setup for each effects shot. Meanwhile, the lighting and compositing teams combined those reflection renders with CG lighting and highlights, allowing them to preserve creative control until the very last stages of production by quickly adapting a creature to last-minute re-shoots or changes in a plate.

The catchphrase for the film is "No matter who wins, we lose." But judging by the quality of the creature work, MPC can be declared the winner in this alien battle. ■■

Martin McEachern, a contributing editor for Computer Graphics World, can be reached at martin@globility.com.



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Portfolio

Elemental Art



Clockwise from top left:

Basilic (Master Award, Environment) This image by professional artist Luciano Roberto Neves of Brazil is illustrative of his quest for realism, particularly when re-creating 3D architectural models for insertion into live-action scenes for TV or film projects.

Entering Darkness (Excellence Award, Environment) Professional video-game artist Ivan de Andres Gonzalez of Spain generated this still image containing a photorealistic building with manipulated shadows for dramatic contrast.

The Old Sawmill (Master Award, Exterior Architecture) Rather than creating photoreal imagery, CG hobbyist Juan Siquier of Spain generates works reflective of his "perceived reality," including this scene of a building near his home.

After a long struggle, digital imagery finally has been acknowledged as a legitimate form of fine art, and, recently, this accomplishment has been recognized in coffee-table books showcasing CG works. One of the latest offerings is *Elemental*, a collaborative publication by Ballistic Publishing and Discreet that features art created with the software vendor's 3ds max DCC program. The imagery was selected on its artistic merit by an advisory panel of high-profile artists in visual effects, game development, architecture, and software development, as well as by a group from Discreet. The committee narrowed the nearly 1000 entries to 251 images from 147 artists hailing from 36 countries. The pieces were then allocated to one of 13 categories, with the best works receiving Master and Excellence status.

"Ballistic Media's first book, *Expose*, has been heralded as a watershed, demonstrating



that 'digital' and 'art' do co-exist," says Kevin G. Clark, senior manager of corporate communications at Discreet. " *Elemental* continues this tradition and demonstrates that there is a new generation of artists who can create expressive, moving imagery within the digital realm."

As demonstrated in *Elemental*, CGI is being used to generate works that show the medium's artistic range. Nearly a quarter of the entries had an Interior or Exterior Architecture theme, a predictable volume, says Mark Snoswell, the book's art director and co-editor, given the growth of the visualization industry. Also, one in 10 entries fell into the Environment category, which features sets or locations, whether indoors, outdoors, underwater, or in space.

These two pages contain a sampling of images from the book that fall within those three themes. —Karen Moltenbrey

From top to bottom:

Daylight (Interior Architecture) For artist Chen Qingfeng of China, photorealism is an important aspect of his work as an architectural designer. This image, from a business project, focuses on the glass, and is balanced by the light and empty space.

Rising Age (Excellence Award, Environment) This work, from a short film by Jorge Seva and Sergio Miruri, uses full global illumination to mimic a photo by the Spanish artists on whom it is based.

Dawn on the Ancient Hall (Environment) Raphael Lacoste, a professional matte painter and art director from Canada, uses light to introduce atmosphere into his imagery, thereby establishing a specific mood. Here, the strength of the image is also a result of its composition, scale, and detail.

SIGGRAPH 2004

By Courtney E. Howard, Senior Technical Editor



Snapshot

The editorial staff of *Computer Graphics World* was among the 27,825 professionals and students who attended SIGGRAPH 2004, the 31st conference on computer graphics and interactive techniques, in Los Angeles. In many cases, attendees were among the first to witness firsthand the latest new and enhanced products from the more than 200 companies that filled the exhibition portion of the venue. At the close of the event, the editors submitted their picks for the hottest products demonstrated at the show. In no particular order, these two pages offer insight into *Computer Graphics World's* Top Ten Products at SIGGRAPH 2004.

Luxology's Modo 3D Modeling Software

Los Angeles's Museum of Neon Art served as the backdrop of a Luxology event at which the present incarnation, and future potentiality, of Modo was demonstrated. A polygonal and subdivision surface modeling tool, Modo was developed to meet the needs of film, gaming, television, print, and other demanding markets. Modo offers a customizable, interactive, real-time environ-



ment in which to create models—from organics to hard surfaces and film models to meshes—and manipulate subdivision surfaces. Priced at \$895 and running on Mac OS X Version 10.2.8 or Windows 2000 and XP platforms, Modo combines a flexible user interface, intuitive modeling tools, and a subdivision surface engine.

Luxology; www.luxology.com

HP Remote Graphics

Hewlett-Packard's Remote Graphics software is designed to aid 3D artists and graphic design professionals in collaborating remotely, interactively, and in real time. The program enables artists and designers to work more easily and efficiently with remote colleagues. HP Remote Graphics employs the company's proprietary compression and decompression technology to provide real-time, multi-site collaboration on graphics-intensive projects over a standard network connection. As well as offering support for large-size 2D and 3D graphics, the new software ensures security by hosting the intellectual property within a secured network boundary. For use with workstations, notebook computers, and commercial desktop PCs, HP Remote Graphics doesn't require both the sending and receiving system to have a high-bandwidth connection or high-end 3D graphics card. HP Remote Graphics starts at \$399.

Hewlett-Packard; <http://software.hp.com>



Sunnybrook Technologies' Zeetzen 5

SIGGRAPH's Emerging Technologies section featured Sunnybrook Technologies' Zeetzen 5, a High Dynamic Range (HDR) display developed in collaboration with the University of British Columbia. Through the application of active backlight technology, the HDR display is described as being roughly 30 times brighter and also 10 times darker—resulting in a 40,000:1 contrast ratio—compared to conventional CRT, plasma, and LCD monitors. It emulates the real-world luminosity range to produce vibrant, lifelike, accurate images for film and video editing applications. The Zeetzen 5 boasts an 18.1-inch viewable image size, 1280x1024 resolution, and compatibility with existing video cards.

Sunnybrook Technologies;

www.sunnybrooktech.com

Ascension's Animation Star

Ascension debuted its Animation Star workstation, a combination of Ascension magnetic motion-capture hardware and Kaydara Mocap 5.5 software. The animation workstation includes the tools necessary to capture, edit, blend, and apply motion data. Also among its components are a magnetic transmitter with mounting pedestal, an anti-distortion mat, a sensor mounting kit, and standard sensors with 35-foot cables, a cable sheath, and strain relief. The workstation itself is a 2.4GHz Pentium 4 tower having 512MB of RAM, an 80GB hard drive, CD-ROM and CD-RW drives, an Nvidia GeForce SX 5200 graphics card, electronic cards for real-time motion capture, Windows XP Pro, and a 17-inch CRT display. Animation Star pricing starts at roughly \$25,000.

Ascension; www.ascension-tech.com

Discreet's 3ds max 7

Garnering considerable attention at SIGGRAPH was the latest edition of Discreet's 3ds max 3D modeling, animation, and rendering software. Making its public debut at the show, 3ds max 7 now incorporates Normal Mapping, a trait that generated much talk and excitement among attendees. Accelerating game development, film, and visualization work flows, Normal Mapping involves adding detail to low-polygon models with high-resolution maps. Other significant upgrades to the software include the addition of Mental Images' Mental Ray 3.3.

Discreet; www.discreet.com



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Softimage XSI 4

Softimage's new pricing strategy for its XSI Version 4 product line, which began shipping in early June, piqued interest among digital content creators. At \$495, XSI Foundation is priced at roughly one-quarter of its previous \$1995 price tag. Softimage XSI Essentials has been reduced to \$1995, from \$3995, whereas the full cloth and rendering version of XSI Advanced is priced at \$6995. According to the company, the new price structure for



Version 4 is intended to improve access to the product line, which should contribute to a larger talent pool of professionals with XSI skills. Among the new features in Version 4 are a character development kit, rigid-body dynamics, Mental Ray 3.3, vector and raster paint, and UV unwrapping.

Softimage; www.softimage.com

Imagineer Systems' Monet

Imagineer Systems' Monet, based on technology developed in collaboration with Cinesite (Europe) Ltd. for use in *Harry Potter and the Prisoner of Azkaban*, attracted broadcast, film, and video postproduction professionals during the show. The end-to-end solution simplifies, streamlines, and speeds the tracking and replacement of an element—for example, a product such as a soda can—throughout a film or video project. Monet enables users to apply properties of the source material—including lens distortion, shadows, highlights, and grain/noise—to the new element. Offering per-pixel motion blur, focus blur, and color controls, Monet is well suited to such applications as complex package replacements, language adaptations, and screen inserts. Monet is available as a software-only system or as Monet Extreme, with a workstation from Boxx Technologies, an Aspek Accelera hardware card, and an optional DVS Centaurus video I/O card.

Imagineer Systems; www.imagineersystems.com

3Dlabs' Wildcat Realizm 800 Graphics Card

3Dlabs' Wildcat Realizm 800 was demonstrated publicly for the first time at SIGGRAPH. In fact, it could be seen throughout the show at the 3Dlabs booth and those of partners 3Dconnexion, Eastman Kodak, Intel, LightWork Design, NewTek, and Side Effects. At 3Dlabs' exhibit, attendees were privy to the Wildcat Realizm 800 powering Softimage XSI 4, as well as the Wildcat Realizm 100 and 200 driving Alias's Maya, Discreet's 3ds max, NewTek's LightWave, Planet 9, and Side Effect's Houdini. A 16-lane PCI Express-based graphics accelerator, the Wildcat Realizm 800 achieves impressive speeds (reportedly more than 64GB/sec), thanks to its total 512-bit bus to 512MB GDDR3 graphics memory and 128MB of onboard DirectBurst memory.

3Dlabs; www.3dlabs.com

Kaydara's MotionBuilder 6

Kaydara introduced Version 6 of MotionBuilder, its 3D character animation software for games, film, the Web, and broadcast. Version 6 incorporates interchangeable character setups with support for props, constraints, and custom properties. Enhanced FK and IK keyframe capabilities, new tools for managing motion-curve dynamics, and a customizable user interface further contribute to the upgraded version. Kaydara's MotionBuilder 6 is offered in two versions, now available for Windows 2000, Windows XP, and Mac OS X 10.2 and higher. MotionBuilder Standard is priced at \$995, whereas the Pro edition carries a \$4195 price tag. In other company news, the SIGGRAPH show floor was buzzing with the unanticipated news that Alias intends to acquire Kaydara.

Kaydara; www.kaydara.com

Apple's Motion

Apple delivered on promises made in April during NAB, where a preview of its new motion graphic design and production application, Motion, was met with much excitement among dedicated Mac users. Apple opened SIGGRAPH with news that Motion was available, and being sold at the show. At \$299, Motion is being billed as an affordable, but comprehensive system for creating motion graphics and effects for film, video, and DVDs. Designed to take advantage of Apple's Power Mac G5 and Panther operating system, Motion



boasts an advanced particle generator, self-propelled procedural animation technology, customizable motion templates and presets, an intuitive user interface, and tight integration with Apple's Final Cut Pro HD, DVD Studio Pro 3, Shake 3.5, Soundtrack, and Logic Pro 6.

Apple; www.apple.com

Runners-up

Given the high quality and vast quantity of product releases that took place during SIGGRAPH 2004, the editorial team was faced with a daunting task. Although we were limited to highlighting our Top Ten, we felt a few other innovations deserved an honorable mention. Other vote-getters included:

Vicon's MX system

Alias's Maya 6

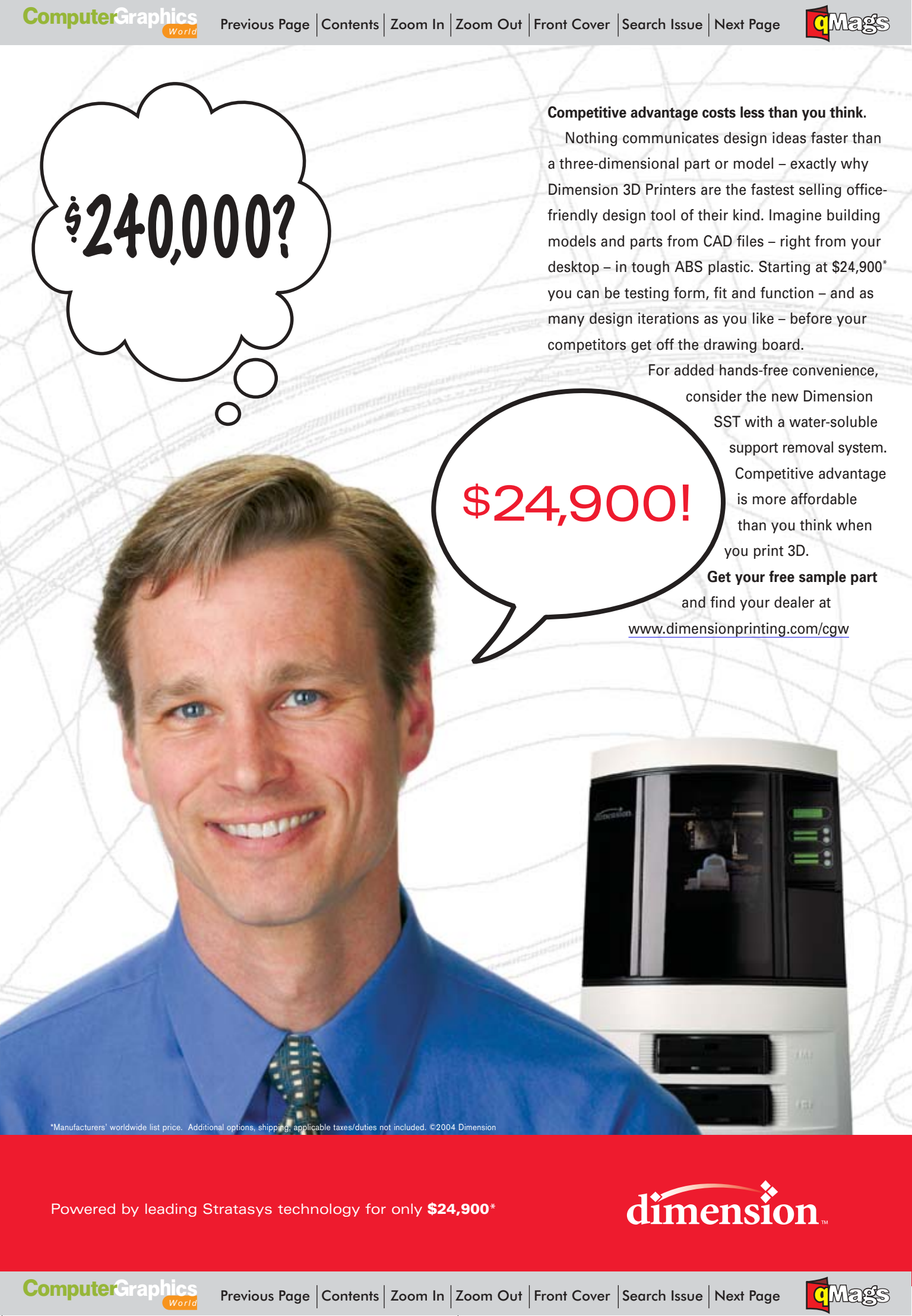
Avid's DS Nitris 7

NewTek's LightWave 8

X3D's 3D display technology

2d3's Boujou and Boujou Bullet

Verari Systems' NemeSys X64



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3D MODELING AND ANIMATION

LightWave 3D Version 8

NewTek releases significant upgrade

By Tom Patrick McAuliffe

In the beginning, a.k.a. the early 1990s, there was the Commodore Amiga, NewTek Video Toaster, and LightWave 3D. Hollywood saw it, and it was good. The Amiga is gone and Toaster is now on the PC, but the LightWave 3D animation and graphics program continues to be refined and improved.

LightWave 3D's greatest strength is its flexibility and versatility. Whether for modeling, texturing, scene layout, image correction, titling, or animation, the program suits a broad range of users in a wide variety of disciplines, including the print design and manufacturing industries. LightWave 3D is an affordable software package that can create whatever the designer's mind conjures. And that's especially true with Version 8.

Installation was straightforward. I tested the program on a Mac G4 equipped with a 1GHz CPU and Mac OS X Version 10.3.3. Software piracy, unfortunately, is rampant, so LightWave 8 ships with a USB dongle. While I understand and support the need for NewTek's developers to protect their hard work, I believe there has to be a better way. At the very least, I'd prefer a dongle that has a pass-through, so other USB devices can be used.

LightWave 3D Version 8 makes a great impression right out of the box. The package includes four CD-ROMs, including two discs of content, as well as a bonus CD of useful third-party plug-ins. The Getting Started guide and the full printed manual, which weighs in at a whopping 1500-plus

pages, is comprehensive and includes several well-written tutorials to get you up to speed on using the tools. Those who purchase the electronic upgrade version (for \$495) receive a PDF of the manual.

This latest release features several enhancements, the best of which is its improved stability. At the same time, LightWave has been optimized for speed via its support for the OpenGL standard. I experienced fewer crashes than with previous versions. The user interface is more intuitive, and the new menu layout felt more natural. Menu and interface refinements make things cleaner and more standard. One trait that I've always appreciated is the ability to configure the menu layout and hot keys any way you'd like so you can work the way you want.

New users or those working with earlier versions of the software are really in luck with the new real-time Help system, perfect for any beginner. With the push of a button, you have access to a large searchable database with an easy-to-navigate index and a full glossary of 3D terms. It's very handy indeed. The program also gained Autosave, which will save your work at any given point automatically—a useful tool for those 3 a.m. render sessions.

Version 8 also sports an improved workflow in Layout and Modeler, thanks in part to a new Bridge tool that allows one object to be pasted to another and unlimited layers. Yet, it is in the area of character animation where LightWave really shines. Setup and control of character animation is now faster, more flexible, and more intuitive than ever before. When it comes to character animation, NewTek has been listening to its users. Faster features like Bones, IK and FK



Of all the 3D tools in my arsenal, LightWave has the cleanest and most user-friendly interface.

functions, and soft- and rigid-body dynamics will have you making realistic little green men in no time.

Using fast dynamics and inverse kinematics, the software now automatically responds with real-world physics, motions, and reactions when one object strikes another. Import and export functions for character rigs have been improved, enabling you not only to apply old rigs to new meshes, but also cut, paste, or adjust the hierarchies of objects or characters easily.

LightWave 3D Version 8 is for virtually anyone involved in the creation and animation of characters. For me, the ability to switch from a single- to a quad-window view and back again quickly and without having to change the display menu parameters is a godsend. I can immediately see the object I'm modeling from three different angles. This feature alone is worth the price of the upgrade for me. For current users, the speed, real-time preview, and production flow enhancements make the upgrade worthwhile.

No amount of software horsepower will replace visual talent, but with some effort, learning, and NewTek's new LightWave 3D 8 animation software, almost anyone can create television network-caliber work. ■■

Tom Patrick McAuliffe, a writer and video creator living in Hawaii, can be reached via e-mail at reelcom1@earthlink.net.

LightWave 3D

Price: \$1595

Minimum System Requirements: 230MB of hard-drive space, 512MB of RAM, 64MB of video RAM, Mac OS 10.3.3 with G4 CPU or Windows 2000 or XP with Intel Pentium 4 and DirectX

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Vegas+DVD Production Suite

Sony Pictures Digital deals Vegas users a winning hand

By David Singer

With its release of Vegas + DVD Production Suite, Sony Pictures Digital is positioning Vegas as a professional-level, all-in-one video and audio tool. The software suite includes Vegas 5, DVD Architect 2, and a Dolby Digital AC3 encoder.

Vegas + DVD Production Suite boasts a wealth of new features. Using its new 3D track motion feature, you can move and rotate video clips along the x, y, and z axes. You can pan and crop events with keyframable Bezier masking and import Macromedia Flash files. With downmix monitoring, you can preview how your audio will sound—from 5.1 channel to stereo to mono—ensuring your audio will sound the way you want regardless of the end users' hardware.

As you build your 5.1 surround projects, you can use a joystick to control your sound panning, faders, and more. Add support for Sony DSR-DU1 and DSR-1000 video disc recorders and J-H3 support with 3:2 pulldown removal and you can see why Vegas is quickly becoming one of the top choices for professionals.

The biggest impact, though, is on work flow. Multiple docking windows, customizable window layouts (up to 10 of which can be saved and recalled), real-

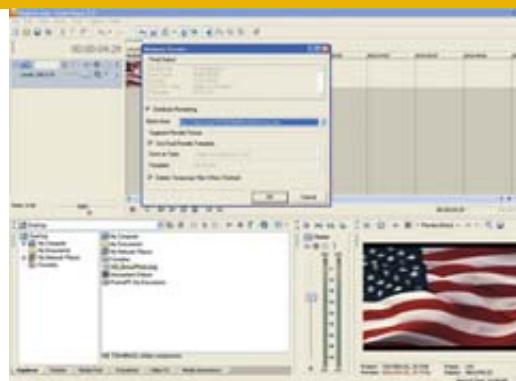
time event reverse, and enhanced application scripting contribute to a smoother production experience. Of all the new work flow enhancement features you will find in the suite, Network Rendering makes the biggest impact.

Vegas + DVD Production Suite comes with a full license for installation on one machine and two additional rendering licenses for other machines on your network. Asked to produce a commercial with a very fast turnaround for a political candidate, I utilized the network rendering feature. It unquestioningly saved time in postproduction.

Network support offered in other nonlinear editors allows multiple users to share resources. Vegas's distributed network rendering actually enables you to break your project in pieces to be rendered across multiple workstations (called renderers); the pieces are later re-assembled by the host workstation (called the stitch host). Another option in the Vegas + DVD Production Suite is non-distributed rendering. In this case, the workstation serves as the render host. The non-distributed rendering feature in the suite allows you to assign renderers to output the entire project

in different formats. For example, one renderer can be directed to render to WMF (Windows Media Format) while another renders the same file to AVI simultaneously.

You can output your project for distribution using Sony's DVD authoring application, DVD Architect 2, included in the bundle. It quickly became



A strong addition to Vegas, Network Rendering aided me in meeting a tight production deadline.

clear that Sony Pictures Digital didn't save all of the software improvements for Vegas 5.

DVD Architect 2 is enhanced with greater flexibility, including support for multiple audio tracks and subtitles. This trait enables you to display subtitles with multiple language tracks or to add running commentary.

Additionally, in DVD Architect 2, you can now disable DVD remote-control functions during playback of menus, media files, and more. You can also define the navigation properties for each button, as well as program the end actions for your menus and media files. DVD Architect 2 supports 24p MPEG files for 24p DVD projects and supports all valid NTSC and PAL DVD video resolutions. Before committing your project to disc, you can use the new external preview, which allows DVD Architect 2 users to preview colors, layout, and TV safe areas on external devices before committing to the final burned disc.

As with its Vegas + DVD (Vegas 4 and DVD Architect 1) predecessor, Vegas + DVD Production Suite is a powerful, flexible, and stable NLE. Sony Pictures Digital has broadened Vegas + DVD's professional appeal, and it should be considered by those seeking a comprehensive, high-end video and audio solution. ■■

David Singer (*singercreativeservices@charter.net*) is a founding partner of Singer Creative Services offering digital photographic, video, and other services.

Vegas+DVD Production Suite

Price: \$800

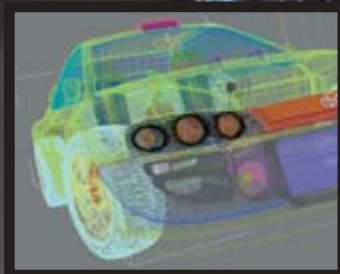
Minimum System Requirements:

Microsoft Windows 2000 or XP, 500MHz processor, 60MB of hard-disk space for program installation, 128MB of RAM, OHCI-compatible i.LINK connector/IEEE-1394DV card, Windows-compatible sound card, ASIO-compatible sound card, supported CD-Recordable drive, supported DVD-R/-RW/+R/+RW drive, Microsoft DirectX 8 or later, Microsoft .NET Framework 1.1 (included on CD-ROM), and Internet Explorer 5.0 or later

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Part Two of our series looked at the next generation of graphics workstations. Our expert panel featured Alex Herrera and Jon Peddie of Jon Peddie Research (JPR) and Stephen Thorne, senior product marketing engineer at Intel's Enterprise Platform Group. Citing the new edition of JPR's "Workstation Report," Herrera and Peddie examined the current landscape -- comparing and contrasting the latest offerings of today's leading workstation vendors -- and provided an industry insider's preview of tomorrow's market and technologies.

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from July 13 presentation

Next-Generation Workstations:
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A Graphic Arts Contest From Computer Graphics World:

What's in your
Dreams?

As the magazine of innovation in visual computing, *Computer Graphics World* has a rich history of recognizing what's new in the digital arts. Now we are proud to put the spotlight on the future: the talent and imagination of student artists and animators. To showcase the creativity of this new generation, we are pleased to announce a student art contest for the Fall of 2004, titled "**What's in Your Dreams?**". Open to anyone enrolled in a college-level program, the contest seeks to identify the most promising new digital artists and reward them with prizes and recognition.

When to Enter:

The contest begins September 15 and closes November 15, 2004. The awards will be announced in March 2005, and the selected images will be featured in *Computer Graphics World*.

What to Enter:

Any digitally created or enhanced still image will be accepted that illustrates the theme "**What's in Your Dreams?**". Please do not

submit any copyrighted, trademarked, or sexually explicit images. Images will be selected and featured that are most suitable for a professional audience.

How to Enter:

Please submit your entries at our website, www.cgw.com, where you'll find instruction for uploading images. Please include your name and contact information. We are accepting JPEG files, 7 x 10 inch @72dpi.

Judging and prizes:

The entries will be judged by the *Computer Graphics World* staff and other professionals in the industry. Prizes include graphics software, a workstation, design software, and more. Plus, the selected images will be featured in *Computer Graphics World*.

More information:

Complete contest information can be found at:

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products

For a direct link to more product information and vendor Web sites, click on:

www.onlinecenter.to/cgw

SOFTWARE

ASSET MANAGEMENT

Artbox Intro

Win During IBC in Amsterdam last month, Proximity debuted Artbox, its video asset management system targeted at broadcast television and postproduction creative professionals. Through a single interface, users of Artbox can store, search, locate, transfer, and transcode video content, streamlining the production work flow. The program sup-



ports popular still and video formats and hardware and software solutions from such makers as Adobe, Avid, Chyron, Discreet, Leitch, Pinnacle, and others.

Proximity; www.proximitygroup.com

MODELING

Upgraded Esprit

Win • Mac E-on Software has upgraded its scenery rendering and animation software tool, Vue Esprit, to Version 5. For creating and rendering realistic scenery, Vue 5 Esprit features High Dynamic Range Image (HDRI) and Image-Based Lighting (IBL), global illumination, and radiosity via an EasyGI slider, 3D text editing, advanced atmospheric and OpenGL engines, pre-animation mesh support, and more. Now shipping, Vue 5 Esprit is priced



at \$249; the company also offers special upgrade and sidegrade pricing.

E-on Software; www.e-onsoftware.com

VIDEO

A New Squeeze

Win • Mac Sorenson Media has begun shipping the new Sorenson Squeeze 4 family of video compression programs. To date, the new product line boasts Sorenson Squeeze 4 Compression Suite, Sorenson Squeeze 4 for Macromedia Flash MX, and Sorenson Squeeze 4 for MPEG-4—priced at \$449, \$119, and \$199, respectively. Sorenson has upgraded the product family with support for HD, improved usability and efficiency, and a customizable interface. Squeeze 4 also gains a batch-processing feature, a video zoom tool, a preview slider, and shortcut keys.

Sorenson Media; www.sorenson.com

HARDWARE

WORKSTATION

Hornet for Pros

Monarch Computer has unveiled its Hornet Pro NexGen P4, a workstation targeted at graphics design and gaming professionals. The Monarch Hornet Pro NexGen P4 features a small form factor, an Nvidia Quadro FX graphics card, and support for PCI Express and DDRII memory. In addition to an Intel Pentium 4 775 processor, the new release is equipped

with Intel's D925XBC motherboard, onboard Gigabit Ethernet from Marvell, high-definition 6.1-channel audio, three IEEE-1394 FireWire ports, and one PCI Express x1 slot. Offered as a Barebone or Complete System, Monarch Hornet Pro comes with a choice of modem and Windows operating system (Windows Professional, Home Edition, or 2000 Pro). Optional equipment includes a sound card, video card, video capture card, and NIC.

Monarch Computer;

www.monarchcomputer.com

events

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18–19

Serious Games Summit

held in Washington, DC. Contact Serious Games Summit, 888-234-9476, 415-947-6134, www.seriousgamessummit.com.

23–30

2004 Savannah Film Festival

held in Savannah, Georgia. Contact Savannah College of Art and Design, 912-525-5051, www.scad.edu/filmfest.

25–27

CTIA Wireless I.T. &

Entertainment 2004 held in San Francisco. Contact the Cellular Telecommunications & Internet Association (CTIA), 301-694-5243, www.ctia.org, www.wirelessit.com.

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From left to right:

Bobby Beck Animating for over 8 years and has worked for such facilities as Walt Disney Feature Animation and Tippett 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 III*, *Star Wars Episode II*, *Finding Nemo*, and *The Incredibles*. He has also given animation lectures 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, *A.I. Artificial Intelligence*, 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.

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