



Image courtesy of Softimage and UVPFACTORY

Don't lose your head keeping up with production demands.

The powerful new **HP xw9300 Workstation** delivers top-of-the-line dual-processing performance, large computation and visualization capacity, the ultimate expandability engineered into a totally tool-less chassis, and ground breaking technology including

- **AMD Opteron™ processor** — Industry leading performance that gives you the ability to run both 32- and 64-bit applications simultaneously. AMD64 with Direct Connect Architecture helps eliminate bottlenecks by directly connecting the processors, the memory and the I/O to the CPU.
- **NVIDIA Quadro® FX** — Award-winning quality and precision, along with the ISV certifications that professionals demand for the very best computing experience.
- **NVIDIA nForce™ Professional** featuring NVIDIA® SLI™ Multi-GPU technology — Specifically designed for workstation environments for industrial-strength performance with dual x16 PCI Express graphics capability.



Visit www.newworkstation.com/cgw to learn more and buy.



©2005 NVIDIA Corporation. NVIDIA, the NVIDIA Logo, NVIDIA Quadro, nForce, and NVIDIA SLI are trademarks or registered trademarks of NVIDIA Corporation. All rights reserved. Image courtesy of Softimage and UVPFACTORY. Other company and product names may be trademarks or registered trademarks of the respective owners with which they are associated.

The Magazine
for Digital Content
Professionals

ComputerGraphics^{World}

March 2005 www.cgw.com

Night Moves

Splinter Cell's Sam Fisher returns
with new powers and prowess

Riveting Roles

*Parts with personality
star in Robots*

CG To Die For

*Effects breathe life
into TV's Dead Like Me*

Pregame Graphics

*VFX set the tone
for Super Bowl XXXIX*

PennWell

\$4.95 USA

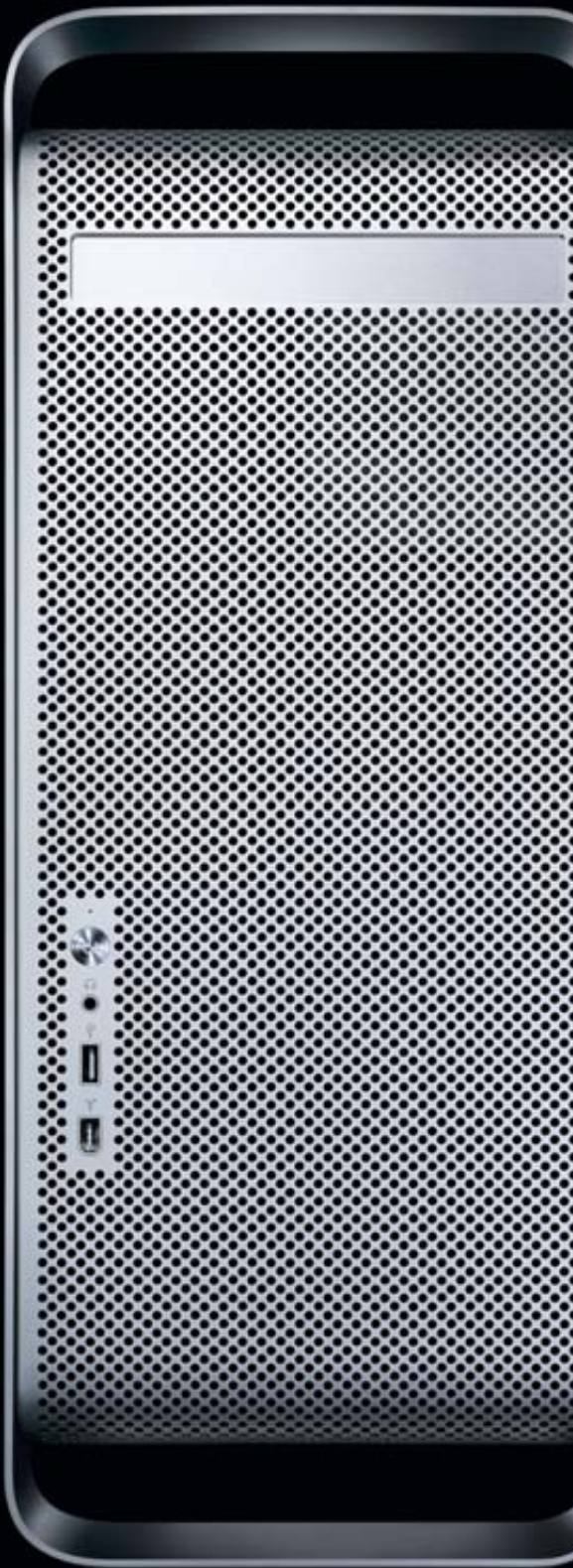
\$6.50 Canada



Professional-strength motion graphics. Made stunningly easy.

Presenting Motion, a powerful new motion graphics package that offers real-time design tools, behavior-based and DVD Studio Pro. Plus, it's been fine-tuned for the Power Mac® G5 and Mac OS® X, so you get responsiveness

TM & ©2005 Apple Computer, Inc. All rights reserved. \$299 is SRP. FCP and DVD SP not included. For more information, visit www.apple.com/motion.



animation techniques, flexible title animation, dynamic particle effects and seamless integration with Final Cut Pro® HD and interactivity that feel like a dedicated system. All for just \$299. Motion. Real-time motion graphics redefined.



the evolution of 3D continues

Selected for performance. Adapted for next generation productions.



Image by Kenneth A. Huff / www.itgoesboiling.com © Copyright 2004-2005 Alias Systems Corp.

Maya® 6.5 software delivers the tools you need to work efficiently with massive datasets. Key optimizations in areas such as file transferring and interactivity – plus the addition of mental ray® for Maya network rendering (Satellite) and new scene segmentation tools – let you meet the demands of your next generation productions.

Rated **P for_PLAY**

**Don't miss the last stop on our P4Play Tour.
Check out www.alias.com/p4play for details!**

Maya™ 6.5
CAN YOU IMAGINE®

Alias
www.alias.com

Come visit Alias in Booth 230 at GDC 2005

© Copyright 2005 Alias Systems Corp. All rights reserved. Alias, the Alias logo, Maya and Can You Imagine are registered trademarks and the Maya logo is a trademark of Alias Systems Corp. in the United States and/or other countries. mental ray is a registered trademark of mental images GmbH in the United States and/or other countries. All other trademarks mentioned herein are the property of their respective owners.

For more information: www.alias.com/maya

ComputerGraphics World

March 2005 • Volume 28 Number 3

Also see www.cgw.com for computer graphicsnews, special surveys and reports,
and the online gallery.

14



22



30



36

Departments

Editor's Note 4

We Could Be Heroes

Spotlight 6

Products

*Discreet's 3ds max 7.5**Sharp's Actius Mobile Workstation**Alias's Maya 6.5**Hewlett-Packard's xw9300 Workstation*

User Focus

Talk with the Animals

Video Viewpoint 10

HD Format Wars

Portfolio 38

The Art of Oddworld

Snapshot 40

Graphics Boards

Reviews 42

*HP's xw9300 Workstation**Luxology's Modo 102*

Products 44

Features

Cover story

Thriving on Chaos 14

GAMING | Ubisoft takes CG realism from the theoretical to the practical in *Splinter Cell: Chaos Theory*.*By Martin McEachern*

Mech Believe 22

FILM | A mechanical world springs to life in Fox/Blue Sky's new full-length animated feature, *Robots*.*By Barbara Robertson*

Death Becomes Them 30

VIDEO | For TV's *Dead Like Me*, visual effects artists explore the extremes of death and dying.*By Karen Moltenbrey*

Game-Day Graphics 36

BROADCAST | Digital Dimension creates legendary CG effects to kick off last month's Super Bowl.*By Karen Moltenbrey*

On the cover:

Ubisoft's new lighting system and rendering engine give Sam Fisher, hero of *Splinter Cell: Chaos Theory*, the power of night vision. For more, see pg. 14.www.cgw.com

MARCH 2005 Computer Graphics World 3



**Phil
LoPiccolo**
Editor-in-Chief

We Could Be Heroes

Most of us would not be surprised to learn that video games have had a significant impact on a whole generation of young people who grew up playing them, simply because of their enormous popularity. Recent studies show that in the US alone, some 90 million adults over age 17 have regularly played video games. And more than 90 percent of children under 17 have regular access to them.

Unfortunately, most assumptions about the effects of video gaming have been negative. Indeed, the medium has been blamed for everything from rotting the brains of our youth to turning them into psycho killers.

But now there's evidence that the positive effects of gaming may outweigh the possible harmful ones. In a new book titled *Got Game: How the Gamer Generation Is Reshaping Business Forever*, authors John Beck and Mitchell Wade report that the experience of growing up surrounded by video games has endowed a new generation of employees with a competitive spirit and some unique cognitive abilities that, if harnessed, could transform the business world as we know it. They also contend that the spoils will go to managers, young or old, who are savvy enough to exploit these differences.

Perhaps the most intriguing finding from Beck and Wade's survey of more than 2500 people in the US is that gamers want to see themselves as heroes. That's understandable, for in a great many games, the story is all about heroism. For example, in the new game *Splinter Cell: Chaos Theory* (see "Thriving on Chaos," pg. 14), the player assumes the role of Sam Fisher, the National Security Agency's elite secret agent, whose goal is to prevent the next world war. And in the enormously popular *Halo 2* (see "The Halo Effect," January, pg. 16), the player becomes the cybernetically enhanced super-soldier Master Chief, who must defeat an alien race bent on conquering humanity.

During all the hours spent playing games such as these, adolescents become like our image of the ancient Greeks or Native Americans, groups of people who value heroism more than the things that we now assume drive everyone: power, money, and love, say the authors. And the opportunity for service, for accepting a dramatic personal challenge, is what drives their decisions and inspires their highest performance.

So how does one tap into this generation's instinct for heroism? The best strategy is to find an important task, frame it as dangerous, and provide an opportunity for public praise or failure. One company that succeeded with this

approach publicly linked employee efforts to corporate goals. Managers held regular meetings that were more like tribal ceremonies during which teams stood in front of the company and committed to a high-stakes mission. A few weeks later, they'd report on their successes or failures. "This is the kind of pressure gamers are looking for," state the authors, "and they will reward you with an intensity that is hard to inspire any other way."

Developers are often challenged to create games that are more practical for education or training. However, in one important way they have already been doing just that. Not only have game developers enticed players to spend hundreds of hours analyzing situations and solving problems in virtual worlds, they have helped create what is perhaps the most highly motivated and heroic generation ever to enter the workforce. Now it's time for business managers to figure out how to inspire them in the real world. ■■

PHIL LOPICCOLO: Editor-in-Chief
phil@pennwell.com

COURTNEY HOWARD: Senior Technical Editor
courtney@pennwell.com

KAREN MOLTEMBREY: Senior Technical Editor
karenm@pennwell.com

CONTRIBUTING EDITORS:
Jenny Donelan, Audrey Doyle,
Evan Marc Hirsch, Doug King,
George Maestri, Martin McEachern,
Stephen Porter, Barbara Robertson

SUZANNE HEISER: Art Director
suzanneh@pennwell.com

DAN RODD: Senior Illustrator
danro@pennwell.com

BARBARA ANN BURGESS: Production Manager
barbarab@pennwell.com

MACHELE GALLOWAY: Ad Traffic Manager
MacheleG@pennwell.com

KATHLEEN GREAVES: Reader Service Manager
greaves@pennwell.com
(843)705-9243

SUSAN HUGHES: Marketing Communications Manager
shughes@pennwell.com

MICHELLE BLAKE: Circulation Manager
michellb@pennwell.com

MARK FINKELSTEIN: Group Publisher
mark@pennwell.com

COMPUTER GRAPHICS WORLD

Executive and Editorial Offices:

98 Spit Brook Rd.
Nashua, NH 03062-5737
(603)891-0123; FAX: (603)891-0539

CGW ONLINE: www.cgw.com

For customer service and subscription inquiries only:
cgw@omeda.com TEL: (847) 559-7500 FAX: (847) 291-4816
POSTMASTER: Send change of address form to Computer
Graphics World, P.O. Box 3296, Northbrook, IL 60065

We make portions of our subscriber list available to carefully screened companies that offer products and services that may be important for your work. If you do not want to receive those offers and/or information, please let us know by contacting us at List Services, Computer Graphics World, 98 Spit Brook Road, Nashua, NH 03062.



ROBERT F. BIOLCHINI
President and Chief Executive Officer

ADVANCED TECHNOLOGY DIVISION

ADAM JAPKO
President & COO

GLORIA S. ADAMS
Director, ATD Audience Development

ATD PUBLISHING DEPARTMENTS

MEG FUSCHETTI
ATD Art Director

MARI RODRIGUEZ
ATD Production Director

PRINTED IN THE USA GST No. 126813153
Publications Mail Agreement No. 40052420



The image shows the retail box for Autodesk LightWave 3D software. The box is primarily blue with a large, stylized sunburst logo in the center. The text "LIGHTWAVE 3D" is prominently displayed below the logo, with "model animate render" written in a smaller font underneath. The Autodesk logo is visible in the top right corner. The box is shown at an angle, revealing the side panel which contains technical specifications and system requirements.

Spotlight

Your resource
for products,
user applications,
news, and
market research

products | mobile workstation

Sharp Unveils the Actius AL3D

Sharp Systems of America has announced the availability of its Actius AL3D, a new mobile workstation targeted at the professional market.

The latest addition to the Sharp Actius Notebook line of computer systems, the Actius AL3D takes advantage of the company's second-generation TFT 3D LCD screen technology. The 3D notebook achieves high-end performance through the combination of Intel's new Pentium M P750 1.86GHZ processor, 1024MB of DDR2 SDRAM, and the newly-

released Nvidia GeForce Go



6600 graphics processing unit, driven by PCI Express and boasting 128MB of dedicated graphics memory. The Actius AL3D provides not only support for 3D software applications, but also an advanced optical drive for viewing 3D DVD content. Additional features include Microsoft Windows XP Professional, an 80GB hard drive, a DVD Dual-Layer Super Multi-Drive, 5.1-channel virtual surround sound, and a trial version of Mercury Computer Systems' Amira software for realistic 3D visualization.

The Actius AL3D sports a 15-inch XGA (1024x768 resolution) 3D LCD display panel coated with the company's Clear LCD finish for saturated,

rich, pure colors. Moreover, users can switch the display between 2D and 3D modes with the touch of a single button. To date, more than 1000 games can be viewed in 3D on Sharp's 3D displays, thanks in part to Nvidia GeForce series graphics processors offering support for stereoscopic displays. The mobile workstation also ships with TriDef DVD Player software, which converts DVD movies to 3D on the fly, from Digital Dynamic Depth Group.

Sharp's Actius AL3D notebook computer, now shipping, is priced at \$3499. —CEH

■ **Sharp Systems of America;**
www.sharp3d.com

products | modeling and animation

Discreet Releases 3ds max 7.5

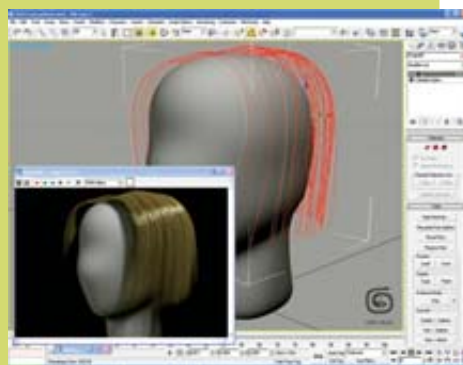
Discreet, a division of Autodesk, has upgraded its 3ds max modeling and animation software application to Version 7.5 for its subscription customers.

Of benefit to creative professionals working on feature films and game cinematics, Discreet 3ds max 7.5 offers an integrated hair and fur system that enables users to create, groom, and render 3D hair on characters and models. Based on Joe Alter's Shave and a Haircut software tool, the new hair and fur system boasts styling tools, hair dynamics utilities, integration with Mental Ray, and the use of instanced geometry to create landscapes, such as forests or fields of flowers.

Moreover, the rendering options available in 3ds max have been expanded with the addition of Mental Ray 3.4 and eight Mental Ray satellite rendering nodes. Version 7.5 is available only to Discreet customers who have a subscription; all others, who are not on the subscription service, are unable to take advantage of the software subscription delivery of the Version 7.5 update.

Discreet's recently released Clothfx certified plug-in extension for 3ds max 7, described in January's Spotlight on Products section, can be purchased separately by 3ds max 7 customers who do not have a subscription for \$595 via the Discreet e-Store (www.estimate.discreet.com) or from authorized Discreet 3ds max resellers. —Courtney E. Howard

■ **Discreet;** www.discreet.com



Alias Upgrades Maya to Version 6.5

Alias has released Maya 6.5, the latest generation of its software developed for professionals in the game, film, broadcast, and digital publishing markets.

Maya 6.5 has been redesigned for enhanced performance with large datasets, such as complex models, scenes, and animation. New scene segmentation tools—including new and enhanced file referencing features and options—provide enhanced collaboration, improved data handling, and control over scene load times. Maya 6.5 also includes Mental Ray for Maya Satellite and a new Mental Ray 3.4 core. Version 6.5 boasts such modeling gains as an improved polygon bevel tool and faster polygon and UV texturing. Character animators benefit from optimizations made to various tool sets and to the soft modification feature, the ability to bind to

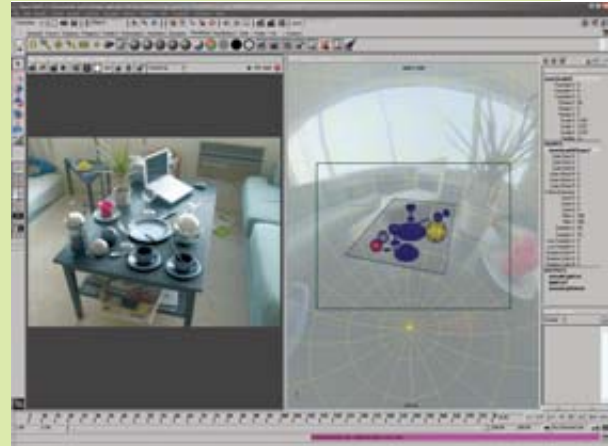
non-joint objects and maintain max skin influence, and faster wrap deformer setup, cluster deformation, and sculpt tool deformation.

Alias is offering a new network rendering option designed for improved rendering speeds. It enables artists to take advantage of Interactive Photorealistic Rendering (IPR), faster interactive and batch rendering, and fast pre-lighting of both textures and vertices.

Maya Version 6.5 is now shipping and available for download by customers in the Maya Platinum Membership Program. Available on Windows, Irix, Linux, and Mac OS X platforms, Version 6.5 of Maya

Complete and Maya Unlimited are priced at \$1999 and \$6999, respectively. Users of previous versions can upgrade to Maya Complete for \$899 and Maya Unlimited for \$1249. Mental Ray 3.4, available as a stand-alone renderer, also is shipping now. —CEH

■ **Alias;** www.alias.com



HP Presents the xw9300

Hewlett-Packard has introduced its latest high-end workstation, the HP xw9300. Hewlett-Packard's first workstation to be powered by AMD Opteron processors, the HP xw9300 looks like the company's xw8200, but the similarities end with the tool-less chassis and Whisper Quiet fan technology. For example, the xw9300 boasts a 750-watt power supply, a 150-watt increase over that of the xw8200. Moreover, the new dual PCI Express-enabled xw9300 incorporates Nvidia's newest advancements, including the nForce Professional 2200/2050 media and communication processors (MCPs), Scalable Link Interface (SLI) multi-GPU technology, and a choice of Nvidia graphics cards. The HP xw9300's support of SATA-2 combats low latency, whereas its dual PCI Express x16 slots improves GPU rendering, and AMD Opteron Direct Connect Architecture increases application performance. —CEH

■ **Hewlett-Packard;** www.hp.com



"Lemony Aid" (January, pg. 22), an article about the film *Lemony Snicket's A Series of Unfortunate Events*, describes the innovative work performed on the character Sunny. The article reported that ILM used the Panoscan MKIII, when it actually employed the SpheroCam HDR from Spheron VR.



film
user focus

Talk with the Animals

The live-action film *Racing Stripes* is all about overcoming obstacles to reach an ambitious goal. In the movie, when a young zebra named Stripes first lays his eyes on the Turfway Racetrack bordering his farm home, he believes that if he trains hard enough, he'll be able to achieve Thoroughbred racing's top honors, the so-called Kentucky Crown. With verbal encouragement from his animal and insect friends—who do indeed talk in this family film—Stripes is off to the races.



Hybride devised a script that automated a good deal of the lip sync process, giving the artists more time to work on facial expressions for each animal.

On the other side of the fence, digital artists overcame their own obstacles to enable the animals to speak and deliver their lines with feeling. Many of the film's digital effects, distributed among four studios, were of the talking animals, ranging from Goose the gangster pelican to a cranky Shetland pony named Tucker. And creating lip sync for such a menagerie presented its own challenges, says Pierre Raymond, president of Hybride Technologies, a Quebec, Canada, postproduction facility that was hired by Digiscope to animate the manic CG horsefly duo Buzz and Scuzz, the wise goat Franny, the lazy bloodhound Lightning, Tucker, and the star, Stripes.

In fact, this project was Hybride's

first opportunity at lip-syncing animals. So before bidding on the project, the studio conducted internal tests on some nontalking animals it had created for *Spy Kids 2*. "We started working on expression for that project, and realized that we were on the right track," says Raymond.

The Hybride artists then refined their lip-sync technique and applied it to their assigned characters, using the



same process for each one, whether a live animal, such as Stripes, or 3D models, such as Buzz and Scuzz. The process involved digitally replacing not only the mouths of the characters, but also their eyes and ears so they would be more expressive while they spoke.

To accomplish this, the team generated approximately 75 expressions for each animal. "Some needed more expression than others, depending on their morphology," says Raymond. "So each detail had to be worked out

differently depending on the animal and the animal's personality."

In order to free up as much time as possible to focus on the expressions, the artists wrote a script that automated the actual lip sync on the first pass so the artists wouldn't have to adjust the lip movement frame by frame. According to Raymond, the proprietary software recognizes the phoneme on a tape of each actor's voice and then generates the digital phoneme from one of the 75 preestablished expressions created for each animal.

"That rapidly gave us a talking animal whose lips moved in perfect relation to the audio track, but the animals were very robotic in their movements," Raymond says. "So we designed sliding bars and adjustments that let us alter the expressions in the first draft, and then all we had to do was polish it."

Hybride's lip-sync program runs within Softimage's XSI, which was used to create and animate the mouth, ear, and eye models for all the animals the studio animated. The group then surfaced the models using projected textures from the film plates of the live animals. After tracking each animal's head using Science-D-Visions' 3D-Equalizer, the group used Discreet's Inferno to rotoscope the eyes, ears, and mouths from the frame and to add the CG replacement objects.

According to Raymond, the learning curve for the project was steep, mainly because it was the Hybride artists' first attempt at talking animals. After proving it can compete in this arena, the studio plans to improve its techniques, Raymond says, making them even more efficient, which will allow the team to reach the finish line even faster the next time. —Karen Moltenbrey

Come see us at NAB, booth #SL 4916

Blackmagic Design **DeckLink™**

Introducing DeckLink HD Pro

The world's highest quality HDTV Dual Link 4:4:4 and NTSC/PAL video card for only \$1,995!



New features v4.7

DVCPRO HD support on all DeckLink cards (Mac OS X™) • New Varicam support allows low data rate uncompressed HD editing on all DeckLink HD models (Mac OS X™) • New hardware down conversion on DeckLink HD Pro provides simultaneous HD and SD output of editing and design workstations

DeckLink HD Pro Features: HDTV and standard definition support in 4:2:2 or Dual Link 4:4:4 • All HDTV formats including 1080/24p, 50i, 59.94i, 60i, 720/59.94p, 60p • Standard definition SDI format support for NTSC and PAL • Precision 14 bit analog monitoring output. Switches between HD or SD • True 10 bit RGB 4:4:4 or YUV 4:2:2 HDTV capture • Instantly switch between SMPTE-259M SDI and SMPTE-292M HD-SDI • Dual HD-SDI input and output for Dual Link 4:4:4 and 12 bit support • AES-S/PDIF output, AES-S/PDIF input and AES word-clock output • Sony™ compatible RS-422 serial deck control port included • Black burst & HD Tri-Sync compatible genlock input.

Dual platform compatibility.

Includes drivers for Microsoft Windows XP™ and Premiere Pro™, Mac OS X™, QuickTime™ and Final Cut Pro™.

Support for all leading broadcast applications. Apple Final Cut Pro™ • Adobe Premiere Pro™ • Adobe After Effects™ • Discreet Combustion™ • DVD Studio Pro • iDVD™ • Discreet Cleaner™ • Color Finesse™ • Microcosm™ • Apple Shake™ • Motion™. And most other QuickTime™ and DirectShow™ based applications.



Blackmagic Design's industry leading range of 10/12 bit Dual Link 4:4:4 products for HD and SD

DeckLink HD Pro

Introducing the world's highest quality video card with amazing Dual Link HDTV 4:4:4 SDI for 10/12 bit RGB workflow. DeckLink HD Pro instantly switches between HD and standard definition. Now you can afford the best quality HDTV card available, even if most of your work is in standard definition. DeckLink HD Pro does both!

DeckLink HD Pro features an unprecedented 14 bit 4:4:4 analog monitoring output, retaining the subtle detail of film originated video. Combined with high speed converters, adds up to the world's best HDTV monitoring. Monitoring instantly switches between HD and SD. Great features like AES-S/PDIF audio and black burst & HD Tri-Sync input helped DeckLink HD Pro win 4 leading industry awards at NAB 2004.

New Single Link 4:2:2 model of DeckLink HD Pro available! Only RRP \$1,495

Workgroup Videohub

Workgroup Videohub eliminates manual cable patching by connecting everyone together into a fully featured professional routing switcher. Also includes independent monitoring outputs so you can instantly see any deck or editing system in your facility. Workgroup Videohub has 12 fully independent dual rate SDI inputs and 24 independent SDI outputs that auto switch between HD-SDI and Standard Definition SDI.



RRP \$4,995

HDLink

HDLink connects SDI video to any supported DVI-D based LCD computer monitor for true HDTV resolution video monitoring. Featuring Dual Link 4:4:4 HD-SDI, 4:2:2 SD-SDI and a fast USB 2.0 input with de-embedded analog RCA audio outputs. Because every single pixel in the SDI video standard is mapped digitally onto the pixels of a 1920 x 1200 resolution LCD display, you get a perfect digital pixel for pixel HDTV image quality. There's simply no higher resolution HDTV monitoring possible! Now features SD anamorphic mode for 16:9 display.



RRP \$695

DeckLink HD

This world leading 10 bit HDTV SDI card has changed the broadcast industry. It instantly switches between HDTV or NTSC/PAL SD eliminating your upgrade risk to HDTV.



RRP \$595

DeckLink Extreme

This amazing video card features 10 and 8 bit SD-SDI, HD-SDI down conversion, analog composite and component I/O, balanced analog audio I/O, DV, JPEG, internal keyer, genlock and so much more.



RRP \$895

Blackmagicdesign



Visit our website www.blackmagic-design.com or call your local DeckLink dealer for more information

viewpoint
Video

HD Format Wars

By Jeff Sauer

Undeniably, high definition is becoming increasingly prominent in just about all areas of the video production world. Maybe it's due to the FCC's mandated migration to digital television. Maybe it's an altruistic desire for higher image quality. Or perhaps it's simply a result of manufacturers successfully hawking a new mousetrap.

In any case, more HD content is being produced, edited, and distributed over the air, satellite, and cable. However, HD is not being recorded for mass distribution, nor rented at video stores, nor delivered to clients on disc. That's because the DVD-Video disc format doesn't support HD.

While DVD was the most successful new product launch in history in terms of the speed of mass adoption, according to the Consumer Electronics Association, the DVD-Video specification cannot accommodate HD content, and, therefore, neither can DVDs as we know them.

That's a problem the industry is trying to solve. Unfortunately, there is more than one solution, and a format war is already afoot between competing proposals: HD DVD and Blu-ray Disc. At stake for



content creators is the final piece of an increasingly enticing HD puzzle that goes from production to post and increasingly to broadcast, but not yet all the way to other forms of distribution.

Bigger Buckets

On the one hand, of course, DVDs are just discs—bit buckets that can hold any kind of data, whether video, text documents, or photographs. And a standard 4.7GB DVD-ROM can hold well more than an hour of HD video content if it's compressed with MPEG-4 or VC-1 (the SMPTE name for the pending Windows Media HD standard). Unfortunately, almost no DVD players can play them because they are all built to support only the standard-definition MPEG-2 based DVD-Video standard. Thus, there's a need for a new authoring standard and a higher-capacity disc.

The first option, HD DVD (originally known as Advanced Optical Disc), was developed by Toshiba and NEC, and will have a capacity of up to 30GB on a dual-layer disc (15GB/layer). It squeezes more data into the same physical area of an Audio CD or DVD, in part by relying on a shorter wavelength blue laser instead of the red-laser technology used in existing players. HD DVD augments that storage capacity by supporting current MPEG-2 compression, but also the more efficient compression and smaller file sizes of MPEG-4 (including H.264, Advanced Video Coding) and VC-1.

The alternate approach, Blu-ray Disc from Sony and Philips, also uses a blue laser, but adds phase-change technology to fit up to 27GB (single layer)/54GB (dual layer) on a single-sided disc. Admittedly, the 30GB of HD DVD sounds like plenty of storage. But history suggests that if the space exists, content creators will find a way to use it. Until last fall, the Blu-ray supported only MPEG-2, but now also supports MPEG-4 (H.264 AVC) and VC-1.

HD DVD has the potential for greater, less-expensive, backward compatibility and

Jeff Sauer

is a contributing editor of *Computer Graphics World* and director of the Digital Video Group, an independent research and testing organization for digital media. He can be reached at jeff@dtvgroup.com.

Which will
be the next
standard
format for
HD content:
Blu-ray Disc
or HD DVD?

NEC

My vision. My NEC professional displays.

When your livelihood rests on every detail, rely on the precision of NEC professional LCD displays. Count on the #1 brand of stand-alone LCD displays to give you the vibrant, high-resolution graphics, large screen sizes and blazing color saturation your creativity demands. Our 19" (19" VIS) MultiSync® LCD1980SXi, 20" (20.1" VIS) MultiSync LCD2080UX+ and 21" (21.3" VIS) MultiSync LCD2180UX capture the intensity of your ideas with exclusive Rapid Response™ technology for lifelike, full-motion video, XtraView+™ for 176° viewing angles with virtually no off-angle color shift, Ambix+™ for total digital/analog compatibility and IPS technology for overall excellent image quality—all inside a space-saving, ultra-thin-frame design.

Yet another way we're working to be your display solutions partner. See details at www.necmitsubishi.com or call 888-NEC-MITS.

SEE MORE.™



**In
Plane
switching**
available on select models

NEC/MITSUBISHI
NEC-MITSUBISHI ELECTRONICS DISPLAY

NEC ranked as the #1 best selling stand-alone LCD monitor brand according to the iSupply/Stanford Resources Flat Panel Monitor Quarterly Report, Q1 '04. MultiSync is a registered trademark and See More, Rapid Response, Ambix+ and XtraView+ are trademarks of NEC-Mitsubishi Electronics Display of America, Inc. ©2004 NEC-Mitsubishi Electronics Display of America, Inc. All rights reserved. Simulated images in monitors.

could even rely on existing equipment for copying and replicating discs. Blu-ray's phase-change technology would make that impossible. But it's Blu-ray's larger capacity that seems to be winning more industry support.

Taking Sides

The DVD-Forum, the self-appointed regulator of the DVD industry, has formally sided with HD DVD, and under many circumstances that might be enough to seal the deal. Yet Blu-ray is gaining accolades for technical superiority, and the growing list of proponents includes some odd bedfellows. For example, Matsushita, Panasonic's parent, is siding with archrival (in just about everything else) Sony on Blu-ray. Pioneer, the main DVD-RW adversary to Sony/Philips' DVD + RW technology, sees a Blu future, too, as do Hitachi, LG, Mitsubishi, Samsung, Sharp, and Thomson/RCA.

Even computer heavyweights Dell and HP have come out in support of Blu-ray. And now that Microsoft's VC-1 codec is to be supported by Blu-ray, a potentially powerful force has been neutralized on the HD DVD side.

Still, while the prospect of a format war between device manufacturers is bad enough, this battle has the potential to be particularly brutal. Rather than just technology companies, the proponents include technology companies that own Hollywood studios, and that raises the unseemly prospect of movies playing on one type of player and not the other. As of now, Paramount, Universal, and Warner Bros. have come out in support of HD DVD, while Sony Pictures, Disney, and Columbia have voiced support for Blu-ray Disc.

The questions moving forward are how strong or soft those studio endorsements really are, and whether there is enough momentum on the Blu-ray side to turn the tide before mass-distribution players hit the markets. (First-generation products of each type are already available in Japan and have been announced domestically.) At the just-ended annual Consumer Electronics Show, Blu-ray clearly had the stronger presence throughout the show floor and more enthusiastic support from a wide variety of entities.

That could all have been the result of a better marketing campaign on the part of the Blu-ray group. However, one of the most striking announcements at what is usually a product-centric trade show was Sony Pictures formally concluding its acquisition of MGM Studios, including MGM's massive film archive going back through motion-picture history, all of which will be available for Blu-ray, high-definition release.

In the interest of simply letting content creators work in higher quality without limitations, it would be nice if that sheer volume of support, both from manufacturers and content owners, turns out to be enough to end any format war before it really gets started. ■■

Appro High-Performance Workstations, Servers & Cluster Solutions

Appro servers and workstations based on AMD Opteron™ processors boost performance on existing Windows® and Linux applications.

Appro WH300 Workstation

configure and buy online!

- Designed for demanding compute-intensive applications
- Delivers outstanding graphics capabilities for content creation, animation, 3D modeling, EDA and CAD to meet all your design and analysis needs
- Provides robust memory and storage with up to 16GB of DDR333/400 RAM
- Integrated FDD and CD/DVD drive
- Supports NVIDIA graphics solutions

Appro HyperBlade

Designed for High-Density, High-Performance Technical Computing Applications

- Full-Cluster**
Up to 80 nodes
- Mid-Cluster**
Up to 50 nodes
- Mini-Cluster**
Up to 17 nodes

- Powerful, modular and scalable architecture
- Blade servers fit all cabinet sizes
- Dual AMD Opteron™ processors per node
- Up to 16GB ECC DDR memory per node
- One PCI-X slot per node
- Up to two internal HDDs
- Remote Management Options
- High-Speed Interconnect Options: Myrinet, Dolphin, Quadrics and Infiniband
- Support for Windows® and Linux Operating Systems

For an overview of how to plan and build a high-performance Linux cluster, get a white paper, sponsored by Appro at www.appro.com.

AMD Opteron™ Processors: Integrated AMD HyperTransport™ technology allows for concurrent multiple processors in a single system. Shorten run-time cycles and increase bandwidth for processing computing requests. 32 bit applications while you migrate to 64 bit computing for long-term investment protection.

Appro has everything you need to create a network blade cluster-ready. On-site maintenance and installations services are available.

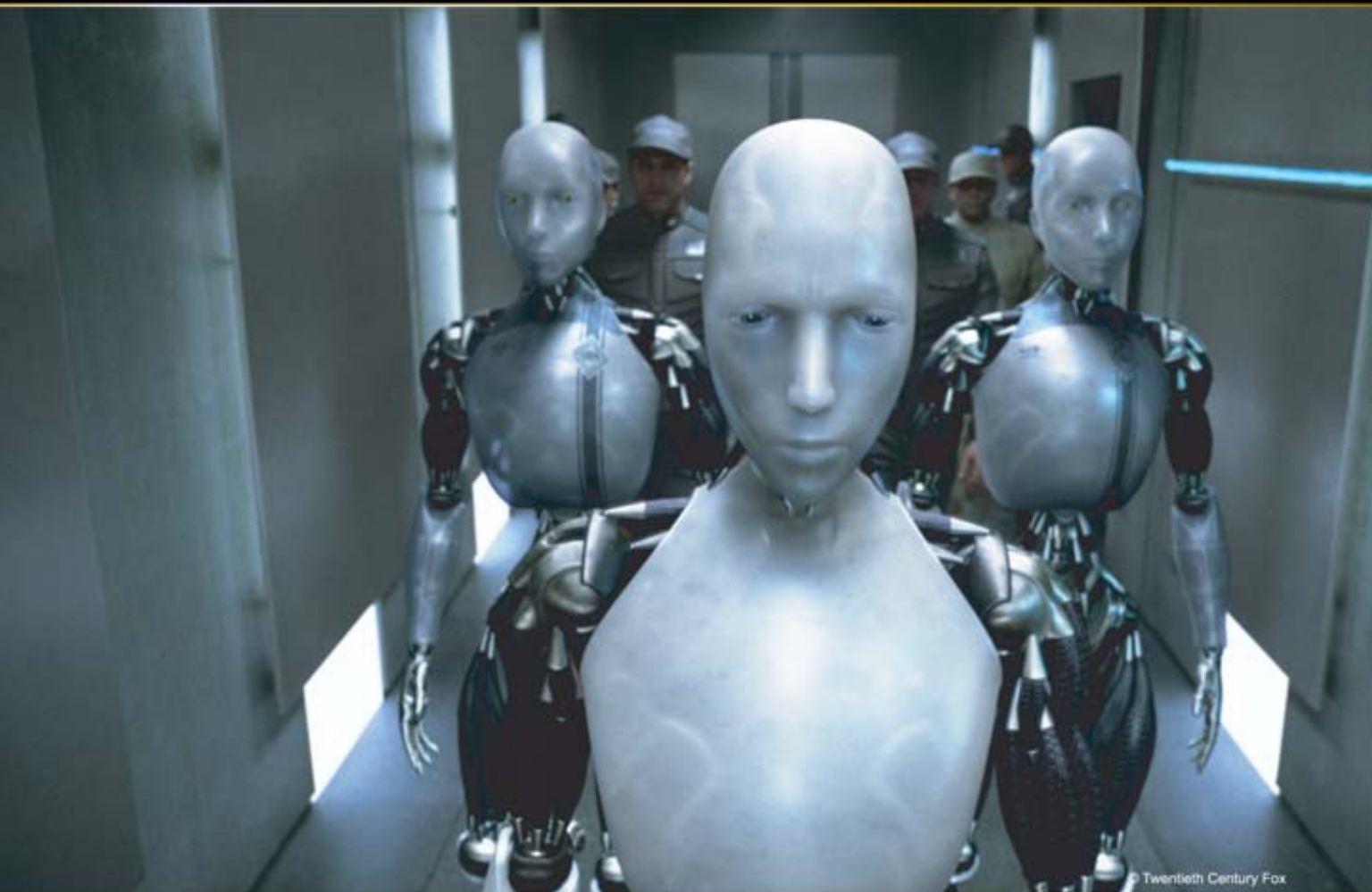
For more information, please visit www.appro.com or call Appro Sales at 800.927.5464, 408.941.8100.

APPRO
HPC Cluster Solutions

AMD 64
Opteron

nuke™

NUKE™ composite by DIGITAL DOMAIN® for *I, Robot*,
Academy Award® nominee for Achievement in Visual Effects.



© Twentieth Century Fox

powerful. proven.

NUKE™ is the Academy Award® winning compositing and effects application behind 40 feature films and hundreds of commercials. It features the most powerful 3D workspace in its class, a unique 64 channel dataflow, a comprehensive toolkit for film and broadcast work, and a blazing fast floating point renderer.

D2SOFTWARE™

www.d2software.com

sales@d2software.com

310.314.2976

NUKE™ is a trademark of Digital Domain, Inc. in the United States and other countries. Digital Domain® is a registered trademark of Digital Domain, Inc. in the United States and other countries. D2 Software™ is a trademark of D2 Software, Inc. in the United States and other countries. The names of other companies and products mentioned herein may be the trademarks or service marks, or registered trademarks or service marks, of their respective owners in the United States and/or other countries.

..... Gaming

While most big-name computer game franchises are plagued by seemingly interminable gaps between releases, Ubisoft, creator of the hugely popular *Tom Clancy's Splinter Cell* series, has been the only developer to deliver a standard-breaking sequel on nearly a yearly basis.

Only 18 months after the original *Splinter Cell* took the computer game scene by storm, *Splinter Cell: Pandora Tomorrow* followed quickly in its wake. Then, when Ubisoft announced that the next game in the series—sporting advanced AI and a completely renovated graphics and physics engine—would arrive a mere 12 months later, gamers and industry experts alike voiced their skepticism that this goal could be accomplished within such a brief development cycle. Nevertheless, for the legions of players loading up *Splinter Cell: Chaos Theory* for the Xbox and PC on March 22, those fears will be quickly laid to rest by cutting-edge imagery and gameplay that dramatically surpass those found in the game's predecessors.

To ensure that *Chaos Theory* would attain a strong foothold at the leading edge of technology, Ubisoft charged 17 programmers with pushing every technological boundary in an effort to redefine gaming's state of the art. Their breakthroughs included a new weather system that dynamically updates environmental and atmospheric effects, a new lighting model that merges the material and light systems for more realistic and efficient real-time lighting, and new dynamically distributed navigation meshes for more adaptive and competitive AI. By far, their

biggest achievement in this first-person shooter was the application of advanced normal mapping technologies, which gave newfound detail to every object in the game, from hero Sam Fisher's layers of Kevlar clothing to the grooves in the weaponry's gunmetal.

Set in 2008, *Chaos Theory* begins when Japan forms an Information Self Defense Force (I-SDF), which is deemed by many to be a violation of both international law and its own constitution. Intent on inciting a massive world war in the Pacific Rim, the leader of the I-SDF secretly launches a misinformation campaign, igniting growing tensions among Japan, China, and North



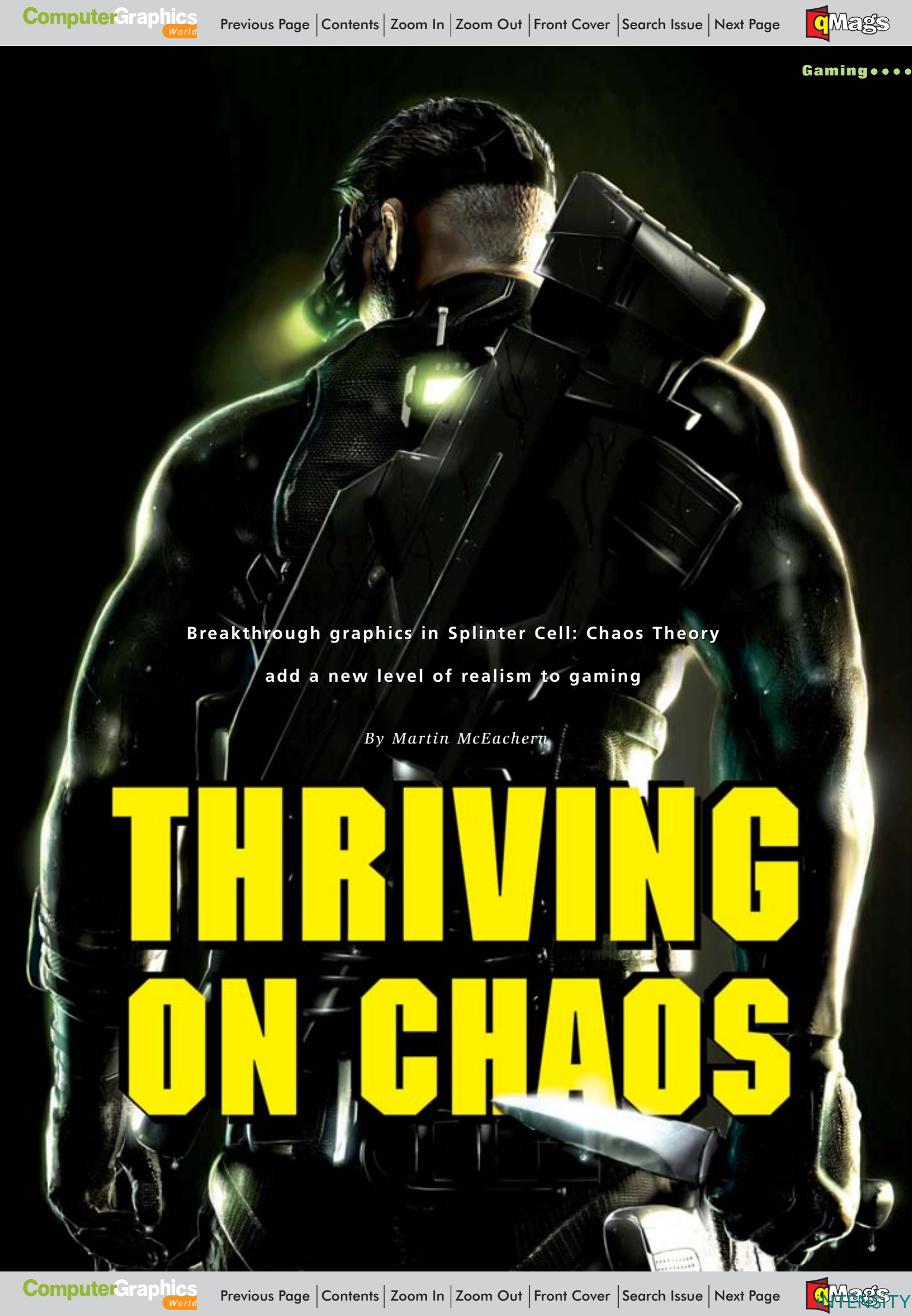
In Ubisoft's *Splinter Cell: Chaos Theory*, black-ops agent Sam Fisher returns for a third mission. This time, he is better trained for close combat, thanks to finely tuned "proximity" animations that allow him to act more cautiously. For instance, when he is near an enemy, his hand may reach for his combat knife while his other hand readies for a grabbing maneuver.

Korea. Soon, the US becomes involved, and it is up to Fisher, the National Security Agency's most elite black-ops agent, to investigate and eliminate a new source of information attacks or risk the possibility of another world war.

Complex Characters

To create secret agent Fisher, as well as the countless guards, sentries, and other non-player characters (NPCs) populating the sprawling Asian game setting, the Ubisoft artists chose not to recycle the geometry from the previous titles. Instead, they built new models from scratch that are far more detailed and higher in resolution. Using Discreet's 3ds max, the group created the model meshes, and used the software's advanced surfacing tools to generate the various "hard" models, including battle gear (helmets, Kevlar body armor, night-vision goggles, fiber-optic cameras, and more) and Fisher's arsenal of weapons, including a new combat knife.

As the lead character, Fisher commanded the most attention. His model has two skins, comprising 4000 and 3700 polygons, while the generic soldiers have a single level of detail (LOD) containing 2500 polygons. For those and nearly all the other models, rather than use multiple LODs, the artists employed memory-efficient normal mapping, for which Ubisoft built a brand-new graphics engine to process the added information. While a more traditional bump map encodes two planes of information (height and width), a normal map contains three vectors, or channels, of information—height, width, and length. The normal map, created

A high-contrast, low-key photograph of Sam Fisher from the video game Splinter Cell: Chaos Theory. He is shown from the chest up, wearing his signature black tactical suit and a night vision device on his head. He is holding a large, black, futuristic assault rifle. The lighting is dramatic, with bright highlights on his suit and the rifle, and deep shadows elsewhere. The background is dark and indistinct.

Breakthrough graphics in Splinter Cell: Chaos Theory
add a new level of realism to gaming

By Martin McEachern

THRIVING ON CHAOS

..... Gaming

from a high-res model, is then applied to a low-res counterpart. Consequently, the low-polygon model can be rendered more crisply and with greater geometric complexity than with bump maps alone, and it can be lit more realistically, casting shadows and highlights along three axes.

In contrast, all the characters in *Splinter Cell* and *Pandora Tomorrow* were merely vertex-lit and bump-mapped. “Because the [*Chaos Theory*] characters were already modeled in high definition, the addition of the normal maps pushed their realism beyond anything the players were anticipating,” says lead artist Pascal Beau-lieu. “Sam Fisher’s face uses the same texture size as the one in *Splinter Cell* and *Pandora Tomorrow*, but it is easy to see that with the normal maps his facial anatomy and lighting is more realistic.”

According to assistant technical director Jeff Giles, the normal maps were the key to achieving the game’s realistic textures, which were made using Adobe’s Photoshop and an assortment of in-house plug-ins. “All the objects in the game are normal-mapped, which makes them look worn, weathered,” he adds. When a normal-mapped object is lit and rendered, the first render pass calculates the shadow effects of the vertices comprising the geometry, and the second render pass calculates the shadows cast by the normals of each pixel in the normal map. This is done at the texture rather than the vertex level, so it includes all the intricate, three-dimensional relief features that would be impossible, and too memory-intensive, to create with geometry.

To set the characters in motion, lead animator Jacques Dussault and his team constructed two skeletons in Discreet’s



The artists turned to normal-mapping techniques to create new, more detailed versions of *Splinter Cell*'s returning cast, including hero Sam Fisher. The images from left to right show the model's polygonal mesh, low-res geometry, high-res geometry from which the normal maps were derived, and the finished version with the normal maps applied.

Character Studio 4.0: one for Fisher and another for the NPCs, each comprising a total of 55 bones. Another 16 bones drove the facial expressions along with a proprietary phoneme system for lip sync. In addition, Ubisoft's technical directors also wrote a host of scripts to further enhance the animation capabilities of Character Studio. For example, to achieve a natural deformation during pronation, or the rolling of an arm, the artists employed a combination of scripts and roll bones on both the forearm and upper-arm sections of both skeletons. To modify the already rigged meshes of the NPCs without having to redo the rigging and weighting, the animators used a proprietary tool that saves the skin-weight-vertex information of the skin modifier, and then reapplies it to the modified mesh.

A STEP AHEAD

Sam Fisher has returned with greater flexibility and acrobatic agility, which he can employ in a variety of stealth combat maneuvers—including climbing, crawling, hanging from his hands or legs, and swinging. To accommodate these actions, the artists developed a three-step process for constraining all the characters' feet to the ground so they'd move without sliding.

The first stage uses inverse kinematics to calculate the distance required to make the foot carrying Fisher's weight touch the ground. The leg is then bent at the hip, knee, and ankle, while the other leg's position is fixed in the world coordinate system until the weight is transferred to the other foot. If the distance

between the stepping foot and the ground is too great, the system lowers the hip until the feet touch the ground. Similarly, the hip bones are adjusted for moving uphill or downhill.

In the second step, Alias's HumanIK (formerly from Kaydara) calculates the torsion and constraints applied to each bone, namely the toe, ankle, knee, hip, and spine. This is done based on assigned parameters and the weighting and design of the actual skeleton.

In the final step, the system analyzes the data compiled by HumanIK, and if the torsion is too high or the bend in the leg is too acute, the system gently reverts to the original animation, putting the weight



on the other leg or both feet. The engine then renders the result before returning to the initial step to repeat the process for the next animation frame.

Work without boundaries. Create without boundaries.



Dell recommends Microsoft® Windows® XP Professional

Adobe® Video Collection Standard

Software, documentation or packaging may vary from retail version.



Say goodbye to creative constraints. Dell™ and Adobe® have joined forces to help provide solutions for your creative needs. Dell Precision™ workstations feature the latest Intel® processors, loads of memory, and PCI Express™ x16 2-D and 3-D graphics cards, making them powerful enough to handle large graphics files quickly and deliver stunning visual effects. Best of all, Adobe has a range of Dell ISV-certified software options, including the new comprehensive Adobe® Video Collection 2.5 Standard. Simple solutions, so all you have to do is be creative.

Limited time offers.

DELL PRECISION™ 370 WORKSTATION

Maximum Performance, Single Processor Workstation

- Intel® Pentium® 4 Processor (3GHz, 1MB L2 Cache, 800MHz FSB)
- Microsoft® Windows® XP Professional
- 1GB Dual-Channel DDR2 SDRAM
- 80GB* (7200 RPM) SATA Hard Drive
- 128MB ATI FireGL™ V3100 PCI Express™ x16 Graphics Card
- 48x CD Burner/DVD Combo Drive
- 3-Yr Basic Service Plan (Ltd. Warranty,* On-Site Service,* Tech Support)

\$1599 Monitor Not Included
Lease as low as **\$43/mo.** (48 pmts*)
E-VALUE Code: 02555-S40315m

Recommended Upgrade:

- Dell™ UltraSharp™ 1905FP 19" Flat Panel Display, add \$599

DELL PRECISION™ M20 WORKSTATION

Workstation Performance, Notebook Mobility

- Featuring Intel® Centrino™ mobile technology with Intel® Pentium® M Processor 730 (1.60GHz, 2MB L2 Cache, 533MHz FSB); Intel® PRO/Wireless Card
- Microsoft® Windows® XP Professional
- 256MB DDR2 SDRAM
- 80GB* (5400 RPM) Hard Drive
- ATI Mobility™ FireGL™ V3100 64MB PCI Express™ OpenGL Graphics
- 8x DVD-ROM Drive
- 14.1" SXGA+ Active Matrix Display
- 3-Yr Basic Service Plan (Ltd. Warranty,* On-Site Service,* Tech Support)

\$1999 Monitor Not Included
Lease as low as **\$53/mo.** (48 pmts*)
E-VALUE Code: 02555-S40319m

Recommended Upgrades:

- 512MB DDR2 SDRAM, add \$149
- 3-Yr Standard Service Plan (Includes On-Site Service,* CompleteCare™ Service,* add \$169)

Dell recommends Adobe® software with Dell Precision™ workstations.

Adobe® Video Collection 2.5 Standard

- Package includes Adobe Premiere® Pro 1.5, Adobe After Effects® 6.5 Standard, Adobe Audition™ 1.5, and Adobe Encore™ DVD 1.5.

Special Offer with Purchase of Select Dell Precision™ Workstations*

Only **\$599** Great Value!

Adobe® Photoshop® CS 8.0

Operate with powerful, next-generation digital imaging features that are the professional standard for graphic and web designers, photographers, and video professionals.

\$649 SKU A0176740

Adobe® After Effects® 6.5

Add stunning 2D and 3D compositing, animation, and visual effects as well as motion tracking and stabilization to production.

Standard Version

\$699 SKU A0369456

Adobe® Premiere® Pro 1.5

Revolutionizes non-linear video editing with real-time tools that provide precise management of virtually every aspect of video and audio editing.

\$729 SKU A0356041

Call or go online for latest promotional offers! Free 3-5 Day Shipping* with Purchase of Select Business Systems.



Get more out of creativity. Get more out of now.



CALL 1-800-934-5259 CLICK www.dell.com/SMB/DCCsolutions

Call: M-F 7a-8p Sat 8a-5p, CT

***Pricing/Availability:** Pricing, specifications, availability, and terms of offer may change without notice. Taxes, fees and shipping and handling charges, except for free shipping offer, extra, vary and are not subject to discount. May be combined with other select offers or discounts. U.S. Dell Small Business new purchases only. LIMIT 5 DISCOUNTED OR PROMOTIONAL ITEMS PER CUSTOMER. In case of customers leasing under these promotions, please note that items leased will be subject to applicable end-of-lease options or requirements. Dell cannot be responsible for pricing or other errors, and reserves the right to cancel orders arising from such errors. **Special Offer:** Offer excludes n series. **Warranty:** For a copy of our Guarantees or Limited Warranties, write Dell USA L.P., Attn: Warranties, One Dell Way, Round Rock, Texas 78682. For more information, visit <http://www.dell.com/warranty>. **On-Site Service:** Service may be provided by third-party. Technician will be dispatched, if necessary, following phone-based troubleshooting. Subject to parts availability, geographical restrictions and terms of service contract. Service timing dependent upon time of day call placed to Dell. **Leasing:** Monthly payment based on 48-month Fair Market Value ("FMV") QuickLease and does not include taxes, fees and shipping charges. Your monthly payment may vary, depending on your creditworthiness. QuickLease arranged by Dell Financial Services L.P. ("DFS"), an independent entity, to qualified Small Business customers. Minimum transaction size of \$500 required. At the end of the FMV QuickLease, you can: purchase the equipment for the then FMV, renew the lease or return the equipment to DFS. Please contact your DFS representative for further details. All terms subject to credit approval and availability, and are subject to change without notice. **CompleteCare Service:** CompleteCare service excludes theft, loss, and damage due to fire or intentional damage. CompleteCare not available in all states. Customer may be required to return unit to Dell. For complete details, visit www.dell.com/servicecontracts. **Hard Drive:** For hard drives, GB means 1 billion bytes; actual capacity varies with preloaded material and operating environment and will be less. **Free 3-5 Day Shipping:** To qualify for free shipping, minimum purchase thresholds may apply. Call or go online for details. Free shipping is lowest cost (3-5 day ground) shipping. Continental (except Alaska). Offer excludes online Software and Peripheral orders under \$50, all S&P orders placed by phone, and S&P orders placed in systems configurator pages. **Trademark/Copyright Notices:** Dell, the stylized E logo, E-Value, UltraSharp, CompleteCare and Dell Precision are trademarks of Dell Inc. Intel, Intel Centrino, Intel Xeon and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries. Microsoft and Windows are trademarks or registered trademarks of Microsoft Corporation in the United States and/or other countries. Adobe, the Adobe Logo and Acrobat are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries. ©2005 Dell Inc. All rights reserved.

..... Gaming

Weathering the Elements

In addition to normal mapping, *Chaos Theory* also sports a new real-time weather subsystem. Dynamically updating the environment as the game is played, the system can, for example, make rock walls slick with rain and have puddles form and then ripple and shimmer in the light. If a player enters a zone where it is raining, the engine dynamically modifies the specular highlights of Fisher, the NPCs, and the environmental surfaces to give them a wet, shiny look. Moreover, the system dynamically updates the normal maps to create raindrop effects on surfaces.

Along with rain, fog, snow, and lightning, the weather system can also generate wind that can affect the NPCs, the environment, and Fisher. For instance, as a storm builds and the rain thickens and a gale begins to blow, the objects in the environment—plants, smoke, characters—become wet and struggle against the wind.

Water effects also have a strategic role in the gameplay, for example, when Fisher activates courtyard sprinklers to distract guards blocking his path. To generate the plethora of fluid effects in the environments, the development group used a combination of simple particle effects, animated meshes, and normal maps. “When the sprinkler system is activated, it creates a ‘show’ effect using a combination of particles and meshes created in 3ds max,” Giles explains. “To make the area appear wet, we generated a puddle on the floor, which we gradually make visible by playing with alpha values and increasing the specular of the puddle’s surface and any target objects.” For an object caught in



The weather system can impact gameplay by affecting the environments and their objects, and because the system is also tied to the game’s sound system, the player can use weather-related noises to cover the sound of Fisher’s movements.

the spray, the artists created beading and cascading droplets of water by adding animated normal maps to the object’s texture map and then modifying its specular. In some instances, the artists also animated an object’s texture map to forge the illusion of water streaming across the surface.

In addition, the team generated sand, dust, smoke, and other particle effects in 3ds max, all of which are produced in-game through the engine. To make the environment’s trees, grass, shrubs, bushes, and ivy respond realistically to forces such as wind and human and vehicle contact, the group rigged the foliage with a set of bones normally reserved for character ani-

COOPERATIVE ANIMATION



In *Chaos Theory*, Ubisoft introduces a new multiplayer, cooperative mode, in which two players can coordinate their maneuvers on missions playable over the Internet or a LAN. For instance, when charged with infiltrating a glass-sided building that is fronted by a large wall, one player can crouch down, clasp his hands together, and boost his teammate over the wall and onto a pipe that leads to the roof of the building. Once on the roof, the character can lower a rope for his partner to climb, and even motion to his teammate to pull the rope left or right, thereby moving him out of a guard’s view. When they’re inside the building, the players can peer under doors using a fiber-optic camera, and can share the view through each other’s camera. Finally, faced with hacking a computer next to

a sleeping guard, a character, perched inside an air duct, can lower his teammate on a rope, dangling him headfirst over the keyboard, *Mission Impossible* style.

According to lead animator Jacques Dussault, the greatest challenge in creating these cooperative animations involved connecting two characters with some element of the environment or an NPC. “For example, lowering your teammate by a rope to neutralize an unsuspecting NPC below required the connection of three characters, a deceptively complex mixture of animation and programming,” he notes. “This involved figuring out the starting and ending position of the animations for a character moving in space and coming in contact with another, which is tedious work that requires a good deal of patience.”

mation. Then, when the foliage is disturbed, these bones are directly manipulated at run-time to create the movements.

Naturally, one of the principle attractions in any first-person shooter is the array of weapons at the player's disposal, all of which demanded realistic particle-based imagery and volumetric effects for fire, combustive exhaust, tracer fire, and so forth. To this end, *Chaos Theory* marks the debut of per-pixel normal-mapped particle effects, which bombard the player with smoke, explosions, and other volumetric effects that unfold with unprecedented realism.

Lighting the Way

After previous *Splinter Cell* titles pushed light maps and vertex lighting to the limit, the Ubisoft team deemed it essential to generate a completely new lighting model that would mark a quantum leap forward in technology. As a result, *Chaos Theory* boasts some of the most impressive real-time lighting effects ever seen in a computer game, from flickering candles behind translucent rice paper doors and solid floodlights from a lighthouse, to fire, lightning, and arcing flares that dynamically reflect off wet and dry surfaces.



While light maps and vertex lighting were still used for some low-level illumination and distant scenery in the new game, the team achieved the new breakthrough in real-time lighting by merging the game's light and material systems. In the first *Splinter Cell*, the lighting model was almost completely independent from the material system, with the exception of the shadows, whereas in *Chaos Theory*, everything is merged, making the lighting far more problematic. To resolve these issues, the artists spent three weeks tuning material characteristics, such as the per-pixel attenuation equations, to perfect the lighting properties of the textures and to remove the plastic look that often plagues normal-mapped surfaces in games.

Furthermore, the game's new lighting engine necessitated some complicated lighting-material setups, especially for the

weather system, involving a complicated shader with two normal maps. The first normal map was prepared for the material itself; the second was procedural, representing the thin layer from the water accumulation and the raindrop effects. "Considering that everything is wet, you need full light-reflection effects and a fairly strong cube map—a type of texture that projects an image from all around an object, reflecting, for example, the sky above, trees and buildings from the sides, and dirt or grass from the floor," explains lead programmer Dany Lepage. "Then, when you add material transition (dry to wet), you get what could be the most complex material simulation ever done in a video game."

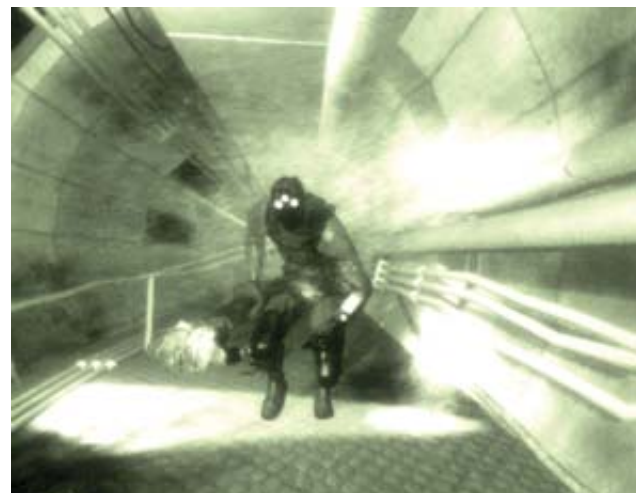
Improved Rendering and AI

New technological advances such as these have resulted in a massive amount of on-screen graphic content, which has to be rendered in real time. To manage this workload, Ubisoft developed a rendering engine that is almost four times as efficient as the one used for the original title. It features dynamic loading of textures, meshes, and sound, which make a huge difference in the amount of content that a level can support. "We did a lot

of things more intelligently than before, including zoning most objects for prioritizing their rendering according to their proximity to the camera," says Lepage. "This enabled us to reduce the CPU load significantly." As a result, the engine is capable of drawing approximately 300,000 triangles per frame, which is close to 100,000 more than the norm.

This powerful rendering engine, coupled with the newly merged lighting and

While light maps and vertex lighting are still used for low-level lighting and distant scenery in *Chaos Theory*, nearly everything else is lit with per-pixel omni lights and per-pixel spotlights, which can cast filtered shadows in the game.



..... Gaming

material system, also enabled greater transparency in the environment, significantly improving the quality of the stealth systems used for Fisher's night-vision goggles, fiber-optic cameras, and thermal-imaging equipment. "We designed special shaders to amplify the rendering of dark areas to increase the usefulness of night vision during gameplay," says Lepage.

Like the rendering, *Chaos Theory*'s AI also surpasses that of its predecessors. After studying the original *Splinter Cell*, Ubisoft decided to improve on several key aspects of the game's AI. The group's first concern was making the player feel like the NPCs were trying harder to survive; therefore, the NPCs now run and hide when threatened, or receive proper cover fire from a teammate. Second, the team enhanced the NPCs' animation and facial expressivity to convey their emotional state. The last big step addressed the communication among the NPCs, either when they're talking in a group or coordinating their searching and fighting. The developer laid the foundation for these advancements by completely overhauling the way the NPCs make decisions and navigate a level. By using dynamically distributed navigation meshes, the NPCs can find the best path at all times and, at a minimal CPU cost, constantly recalculate their decisions based on the state of the environment.

The NPCs also show their intelligence in other ways, such as exhibiting an awareness of their environment. For example, when rain begins to fall, the characters that are not engaged in

CLOSE COMBAT

After reviewing the original *Splinter Cell*, Ubisoft found that the most empowering feeling for the player was when Fisher was extremely close to an enemy and in control of the situation. Therefore, of particular importance were the animations that focused on proximity.

When Fisher and a guard converge on each other, their respective animations blend into a series of "close proximity" animations, such as a crouching, furtive walk. For instance, when Fisher gets close to an NPC, his head suddenly turns toward the guard and his steps become more cautious and calculated. In a more threatening situation, the game engine automatically activates an animation in which Fisher, for example, prepares to grab the NPC by the neck.

The team also developed a number of unique animation cycles for Fisher centered on a new weapon: a combat knife. And, the animators reworked all the standard animations—walks, grabs, attacks—to make them less acrobatic and more thoughtful and purposeful than those from previous games.

To string these movements together, the team

used a blending system that employs three types of blends. The first, and most commonly used, is "tweening," which transitions between two animations as soon as the current one is interrupted. The second type of blend combines two or more animations, and the resulting animation, for example, could be 40 percent of a walk and 60 percent of a jog. The third type of blend, called additive blending, counterbalances the displacement of one animation with another, and is used primarily for facial animations.



battle will turn their palm upward, feel for drops, and then seek shelter to avoid the oncoming downpour. In addition, the AI personalizes the reactions of the NPCs to various threats, and allows them to recall past events for more intelligent behavior.

With this third installment in the *Splinter Cell* series, secret agent Sam Fisher has secured his place in the current pantheon of computer game franchises, alongside *Halo*'s Master Chief and *Half-Life*'s Gordon Freeman. In fact, the game's characters and environments stand as the most impressive display of normal

mapping yet seen in a computer game, pushing the performance of the new texturing technology beyond the standards set recently by *The Chronicles of Riddick* and *Halo 2*.

And, if Ubisoft is able to continue upgrading the series at the current pace, a new standard-bearing *Splinter Cell* title could arrive within a year. Right now, however, *Chaos Theory* is not only the most eagerly anticipated game of 2005, but it is one of the all-time high watermarks for gaming graphics.

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



Because the normal maps didn't extend beyond the character meshes, the artists had to perform added modeling work within 3ds max so that the silhouettes, such as this one of Fisher behind a rice paper screen, manifested a level of detail in tune with the rest of the game.

Powerful

Just Press POWER.

Unleash your creative potential with perfect finesse, plus blistering speed and stability. BOXX workstations and render nodes are propelled by AMD Opteron™ single and dual processors offering simultaneous 32-bit and 64-bit computing for outstanding flexibility. In addition, the AMD Opteron processor delivers high-performance, scalable solutions for the most advanced DCC applications.

Choose NVIDIA Quadro FX by PNY Graphics boards and blazing I/O internal SATA storage to 4.8 TBytes and beyond. Validated by our software and hardware partners certified by BOXX to be the ultimate performance rush.

BOXX

BOXX® Technologies, Inc. | 1.877.877.BOXX
www.bboxtech.com | sales@bboxtech.com

Powerful. Integrated. Reliable. Supported.

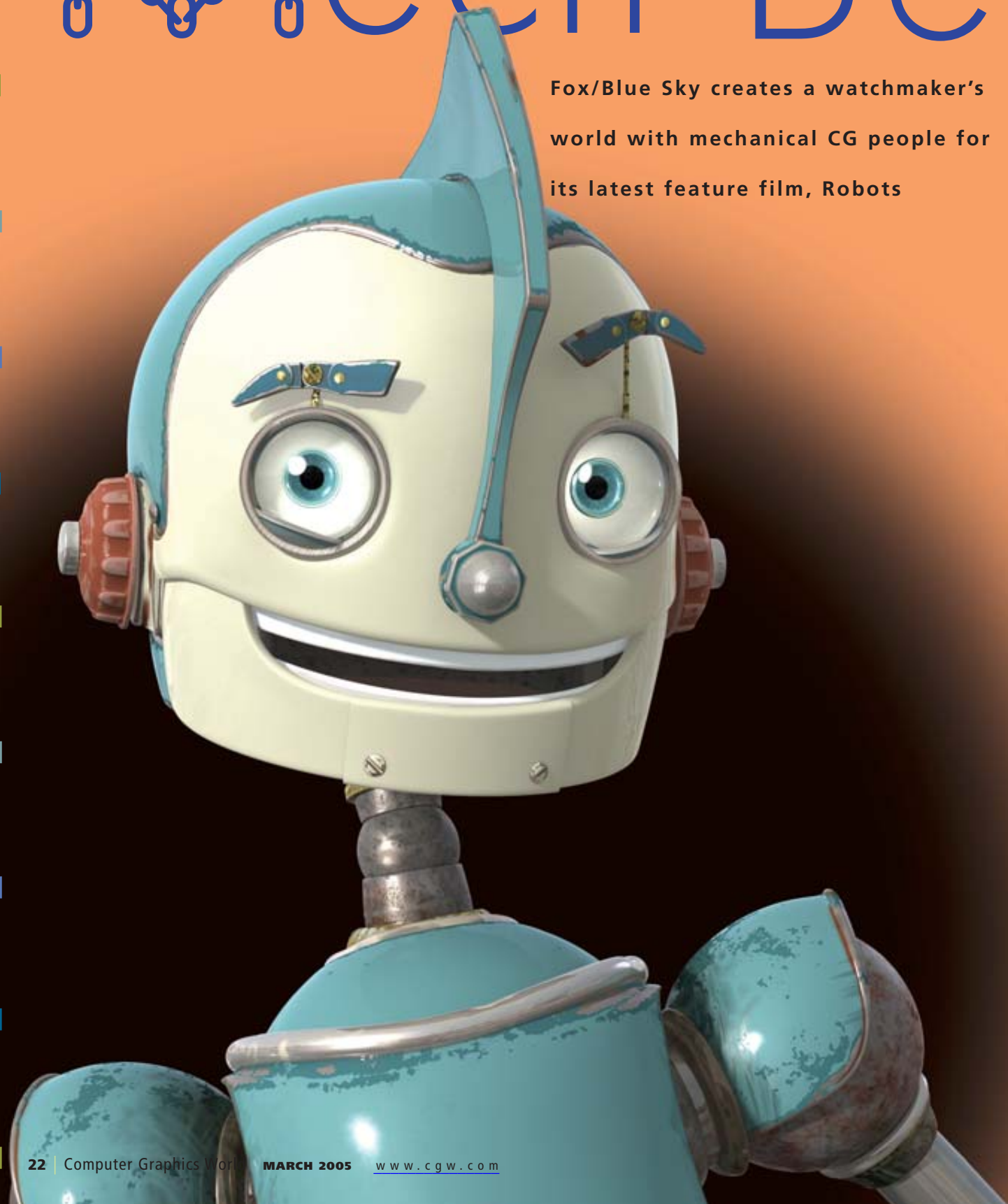


BOXX is a registered trademark of BOXX Technologies, Inc. registered in the U.S. Patent and Trademark Office. AMD, the AMD Arrow logo, and the Opteron, and combinations thereof, are trademarks of Advanced Micro Devices, Inc.

.....Film

Mech Be

Fox/Blue Sky creates a watchmaker's world with mechanical CG people for its latest feature film, *Robots*



By Barbara Robertson

I believe



They don't follow Isaac Asimov's laws of robotics. They don't have to. The bots in Fox/Blue Sky Studios' film *Robots* live in an alternate world, a ball-and-socket, wheels-and-gears, mechanical universe where lampposts walk home in the morning and a character named Crank Casey is made from... you've guessed it...a crankcase. There's not a human in sight.

"We call the film *Robots*, but there's nothing in it that's science fiction or futuristic," says Chris Wedge, codirector with Carlos Saldanha. "It's a colorful, whimsical world of mechanical people, a comedy adventure."

The film, which puts the voices of Ewan McGregor, Halle Berry, Mel Brooks, Greg Kinnear, Drew Carey, Amanda Bynes, and Robin Williams into animated characters, is on track to become more well-loved than the studios' predecessor, *Ice*

Age, which was nominated for a Best Animated Feature Oscar in 2003 and scored big at the box office. But in every other way, it couldn't be more different.

"It's very dense," says Wedge. "There are lots of characters, lots of action, and in every shot, a lot to look at. With *Ice Age*, we didn't know whether we could make a feature film, and I think some of our insecurities resulted in a style that looked very simple. We were more confident on *Robots*, so we bit off as much as we could get in our mouths."

Production designer William Joyce, who created the famously successful 1998 TV series, *Rolie Polie Olie*, inspired the complex, quirky, always-in-motion environment with characters to match.

"Bill Joyce would go out shopping for antiques near where he lives and bring in huge amounts of junk," says visual development artist Daniel López Muñoz. "We



Robots Rodney Copperbottom (left) and Fender, a "Rusty" who lives in Robot City, were assembled from CG parts inspired by junkyard finds and antique shop rummaging by Blue Sky artists and production designer William Joyce.



We Don't Need No Stinkin' UVs

To peel back *Robots'* complexity, the research team removed texture maps from surfaces. "We came up with procedurally based ways to create materials," says Carl Ludwig, director of R&D, "and that cut memory usage way down. It also made it easier because we did not have to deal with UV spaces. The technique is akin to procedural textures, but we had a tremendous amount of local control. We could create grease stains."

Rather than using painted texture maps, the crew created these materials with a node-based system developed in Maya. "It was a real paradigm shift," says researcher Maurice van Swaaij. "The materials are created out of noise functions that are evaluated in space and layered together—a paint layer, another paint layer, a rust layer. You can hook little processing nodes together to make elaborate things." One node might interpolate between two colors and then be hooked to a third node; a control element called a "spotty" might add bits of texture.

Sometimes the team worked on simple geometric shapes; however, more often, they used actual models. When they finished, the system compiled the network of nodes and launched the renderer. For rendering, the subdivision surfaces were converted to Bezier patches. "Compiling was the essential step," says van Swaaij. "We'll not go back to mapping, even for organic characters."

Film

looked at automobile parts, coffee pots, perfume bottles. I designed one building based on the gas tank of a Harley Davidson and another that looked like a snail. We drew inspiration from many things, but we interpreted everything in a mechanical way, whether it was a building or a robot.”

Thus, you won’t see a tree or a bush or any furry little critters in *Robots*, but you might spot your grandmother’s oven or spare parts from your uncle’s Buick.

“We used the whole gamut of industrial design from the past 100 years as reference,” says Wedge. “You’ll see a social hierarchy for the robots, from ones that look old and worn out to ones that look shiny and new. Our main character [Rodney, played by McGregor] was inspired by an Evinrude outboard motor that my grandfather had when I was a kid.”

The plot centers on Rodney, a clever robot who searches for his hero, the super inventor Bigweld, only to discover that he has been replaced by the evil Ratchet, one of the newer machines. “Rodney grew up without some of the material benefits the newer robots have,” says Wedge. “The newest machines are the corporate executives, the people climbing the social ladder, and they’re



Ratchet, a later model robot than Rodney, was built with sliding sheets of steel using subdivision surfaces that were converted to Bezier patches for raytracing.

in the best shape. Rodney is born into being outmoded. He falls in with the Rusties, but he’s so inventive he becomes a hero.”

Machine Shop

All told, a modeling crew of around 14 people built the intricate principal characters. “We have one character, called Madam Gasket, who was inspired by a furnace, and she has more geometry than an entire set and cast of characters for any given sequence in *Ice Age*,” says Michael DeFeo, modeling supervisor.

To help speed the modeling process, the team developed a data management system that let them rummage through bins and catalogs of parts. “When we finished a character, we would break out any parts that could be reused—nuts, bolts, pistons—and put them in our backlog,” DeFeo says. “When we started on the next character, we’d have some ready-made parts.”

Another triumph for the ‘bot builders was finding ways for animators to do cartoon-style squash and stretch with the hard metal parts. For low-end robots like Rodney, modeled after gas-driven machines with pistons, pivots, and axels, the modelers created multilayered cylinders. “Every arm or limb had a double-piston setup so the cylinders could telescope out to get arm stretches,” says DeFeo. For newer robots like Ratchet, sliding sheets of metal provided flexibility. All the models were fashioned in Alias’s Maya using subdivision surfaces.

“Usually carmakers use NURBS to create parts, and each part is made from a set of patches,” says research and development team member Maurice van Swaaij. That might be fine for a car, but it can be torturous for an animator—or for the technical director who has to glue seams back together. “With subdivision surfaces, you can have an arbitrary topology with handles and holes, and it’s all one surface,” he says. “Modelers have an easier time, and animators don’t have pieces with seams everywhere.”

Parts Department

To make Robot City look inhabited, the crew needed to populate it with hundreds of mechanical extras. So, in addition to build-

Pure Energy

Blue Sky’s proprietary raytracing software, CGI Studio, has evolved since the studio was founded in 1987. Often, people think of raytracing as slower than other rendering methods. But R&D director Carl Ludwig boasts that Blue Sky has found ways to make it more efficient. “Our average render time was about six or seven hours per frame,” he says. The studio has some 500 processors in its renderfarm—a combination of Xeon and 48-bit addressable AMD chips.

“One thing we do is look at where the rays will do the most good,” Ludwig says. “We’ve built an almost expert system that knows where light comes from, what needs to be addressed, and where it will be rendered.”

Eugene Troubetzkoy, one of the founders of Blue Sky, is also one of the fathers of raytracing, says Ludwig. “He has become very efficient at calculating the intersection between a ray and a surface.”

“Because we use a raytracer, it’s easy to set up algorithms for diffuse reflection and those sorts of things,” Ludwig adds. “But when you want to do diffuse reflections from highly specular materials, you have to be careful because there’s so much energy. Sometimes we’d see a little dancing, so we’d have to increase the sampling rate. Also, we had a notion of how to treat specular energy along the ray, which was a rather important breakthrough for us. But I don’t want to give away too many secrets.”

He’ll reveal one secret, though: “The problem when you render something digitally is that the brightest you can get is white,” says Ludwig. “So to make spots on the metal look brighter than a white spot, the renderer supports a huge dynamic range and can represent values up to a million. We can then do a calculation on energy and bloom the white out into a flare. When you look at the flared thing, your eye almost winces even though it’s no brighter. It’s a psycho-physical thing that your brain does.”

ComputerGraphics World

The Magazine for Digital Content Professionals

WEBCASTS

PennWell

**NOW AVAILABLE
ONLINE**

Computer Graphics World invites you to view one of our online Webcasts.

Each Webcast focuses on specific topics and can affect the way you do business.

Archived Webcasts are free and available for viewing 24/7. Learn from industry experts as they share their ideas, opinions and expertise. Viewers must register to attend.

Visit www.cgw.com to register and for more information.

Now archived at
www.cgw.com

Trends in Graphics
Board Technology
from July 13 presentation

Next-Generation Workstations:
Technologies, Trends,
and Forecasts
from Sept. 28 presentation



Webcast Sponsor



Webcast Sponsor



Webcast Sponsor



Webcast Sponsor



Webcast Sponsor

Film

ing hero characters, modelers created parts for untold numbers of “Frankenbots.” For these, the modelers cranked out several basic robots and then disassembled them into parts.

“We had bipedal robots, uni-wheeled robots, and multi-wheeled robots,” DeFeo says. “We had dozens of heads, torsos, limbs, and legs. A designer could pick and choose a head, a torso, and an arm, then press a button and they would attach to a pre-existing rig.” The system would scale the parts proportionally.

“The volume of work was scary at first because we could see how many parts were needed,” DeFeo says. “But the backlot system was valuable and the shared rigs made the volume and diversity achievable.”

The modelers adopted a similar strategy for dealing with Robot City, the complex urban environment in which the robots live. Inspired by the inner workings of a watch, the city was created in layers, with the oldest, industrial revolution-inspired neighborhood at the bottom. “We would build core ground planes, and then our assembly department would build environments from parts we created,” DeFeo says. “For example, we’d model the floor, walls, and ceiling, and they’d add the set dressing.”

Building Plans

For *Ice Age*, Blue Sky built sets based on layouts, pragmatically constructing only what the camera could see. “We lost a lot of work because things changed later on,” says Robert Cardone, 3D layout

Domino Theory

In one scene, lead character Rodney accidentally tips over a domino and starts a chain reaction that builds into an ocean of little black blocks with white dots that carry one of the characters on a wave as if he’s surfing. The sequence is as over the top as the avalanche of acorns in Blue Sky’s Oscar-nominated short film “Gone Nutty.”

Because the sequence requires millions of dominoes, the animation had to be procedural. However, effects lead Robert Cavaleri wanted animators to control the action. So, he created a kind of blanket underneath the dominoes using a simple NURBS patch; animators choreographed the changing shape of the wave by manipulating this geometry

using keyframe animation. Cavaleri then covered the blanket with millions of procedurally animated particles that were rendered as dominoes—little pieces of geometry with randomly generated white dots—all created within Blue Sky’s CGI Studio.

“Procedural math and simulation can be hard to control, but by incorporating keyframe animation techniques, we were able to sell the story points, drawing attention to or away from characters and elements when needed,” says Cavaleri. “We also got approvals faster because we could get a buy-off on the wave animation and characters before we designed the look of individual dominoes on the waves.”

supervisor. Thus, for *Robots*, the crew devised a new plan: They’d build the entire set and look for camera angles within it. However, they’d do so by cleverly creating modules that could be pieced together as needed like a play set. “It gave us 360 degrees in which to move the camera,” Cardone says. “Something was always there.”

In addition to camera moves, layout artists also roughed in lighting. “We show where light comes from as part of the thumbnail stage,” says Cardone. “That goes to the art department so they can follow the shadow shapes. Half of composition is about what the shadow shapes are doing.”

The layout artists also composed shots showing character choreography. Once the cameras were set, characters placed, and thumbnails approved, 3D artists tightened up the action by working in Maya. The result was a digital workbook that represented each scene that went to the animators. “We have a script that grabs a camera, the characters, and all the set pieces for a shot and gives it a file name,” says Cardone. “So when the animator opens that file, everything that’s needed is there.”

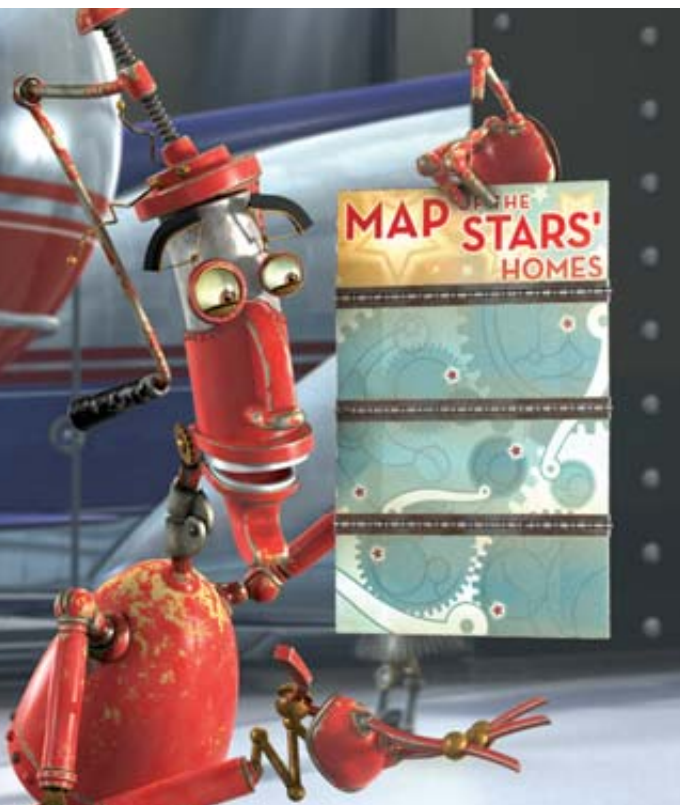
Moving Parts

About 35 animators worked on the film. At first, the crew tried to animate the ‘bots as if they were truly machines—with no deformations. “We thought it would be clever if we never had

Fender’s worn paint and rusty spots were not produced by rendering painted texture maps. Instead, the R&D team fabricated procedurally based methods to create complex materials.

to bend the metal,” says Wedge. “But by the time we finished, we did squash and stretch and deformations to make the characters more appealing. I think the audience forgets they’re made of metal at some point.”

Also, to keep the machines





Monarch Computer.com™



Monarch Empro Custom SLI Workstation

Part# 80544

- Thermaltake Shark Aluminum Case (Fire Pearl Custom Paint) -550W Enermax Power Supply)
- Tyan S289A2NRF Dual Opteron™ Board Audio/GbE LAN/SATA-II RAID/IEEE/ PCI-E
- (2) AMD Opteron™ Processors 252
- 4 GB (4 pcs 1 GB) DDR (400) PC-3200 REG ECC Corsair Low Profile Memory (CM72SD1024RLP-3200)
- (4) Western Digital 74 GB 10K RPM Raptor (WD740GD) 8 MB Cache SATA HDDs w/RAID 10 Setup
- Sony DDU1613/B2 DVD-ROM 16X
- NEC ND-3520A/GNB 16X Dual Layer DVD±RW
- Mitsumi Floppy 7-in-1 Smart Card reader
- Choice of 1 or 2 PCI-E Graphics Cards*
- Windows XP Professional
- 1 or 3 year warranties available
- 24/7 on-site service optional

Dual AMD Opteron™ & Dual PCI-E Graphics!

"The Empro blew us away with its performance. The more demanding the task, the greater its margin of victory."

As Reviewed by
www.geek.com Feb. 2005!

On SALE!
Starting @
\$1276

As configured
at left:

\$4979*

Price does not include graphics cards. Please see graphics card section below for prices.



Pictured with Custom Fire Pearl Painted Logitech Cordless Desktop LX700 Keyboard and Mouse Combo

Browse now to monarchcomputer.com for a full list of available options

Visit MonarchComputer.com or Call 1-800-611-0875



Professional Graphic Cards HUGE SELECTION! - LOW PRICES!

PNY Quadro FX 3400 256MB GDDR3/PCI-E/Dual-DVI **\$1,182.00**
PNY Quadro FX 1300 128 MB DDR/PCI-E/Dual-DVI **\$567.00**
PNY Quadro FX 330 64MB DDR/PCI-EDVI **\$157.00**
PNY Quadro NVS 280 PCI-E **\$147.00**

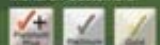
ATI (Original) Fire GL V3100 128 MB DDR/PCI-E/DVI **\$183.00**
ATI (Original) FireGL V3200 128MB DDR3/PCI-E/Dual-DVI **\$300.00**
ATI (Original) FireGL V5100 128MB DDR3/PCI-E/Dual-DVI **\$586.00**
ATI (Original) FireGL V7100 256MB DDR3/PCI-E/Dual-DVI **\$858.00**

3D Labs WildCat Realizm 800 640 MB DDR3/PCI-E/TV-Out/Dual-DVI **1,989.00**



We're rated in the Top 10 of PC Companies in the U.S. by ResellerRatings.com...

This graph shows how Monarch measures up against the big names in PC systems. The numbers don't lie! Visit ResellerRatings.com & MonarchComputer.com to read testimonials from satisfied Monarch Customers.



Monarch Computer Systems™ **9.30**

Dell™ **3.13**

Alienware™ **6.18**

Gateway™ **0.83**

HP (Hewlett-Packard)™ **0.71**

*The data used for this graph was collected from ResellerRatings.com in February 2005. Scores noted here represent scores for Overall Customer Service as determined by that site. Scores factor in Pricing, Shipping, Packaging, Support, Returns, and Future Purchasing.

AMD 64-bit CPUs



AMD Athlon™ 64 OEM CPUs

AMD Athlon™ 64 2800+ (754) **\$122.00**
AMD Athlon™ 64 3000+ (754) **\$149.00**
AMD Athlon™ 64 3200+ (754) **\$194.00**
AMD Athlon™ 64 3400+ (754) **\$223.00**
AMD Athlon™ 64 3500+ (939) **\$272.00**
AMD Athlon™ 64 3700+ (754) **\$329.00**
AMD Athlon™ 64 3800+ (939) **\$424.00**
AMD Athlon™ 64 4000+ (939) **\$643.00**

AMD Athlon™ 64 FX-55 (939) **\$848.00**

AMD Athlon™ 64 features:

- Enhanced Virus Protection for Microsoft® Windows® XP SP2
- Cool'n'Quiet™ technology
- HyperTransport™ technology



Exclusive Athlon™ 64 FX Launch Partner

AMD Opteron™ OEM CPUs

AMD Opteron™ 142 1.6GHz **\$158.00**
AMD Opteron™ 144 1.8GHz **\$173.00**
AMD Opteron™ 146 2.0GHz **\$211.00**
AMD Opteron™ 146 2.0GHz **\$270.00**
AMD Opteron™ 150 2.4GHz **\$404.00**

AMD Opteron™ 242 1.6GHz **\$157.00**
AMD Opteron™ 244 1.8GHz **\$203.00**
AMD Opteron™ 246 2.0GHz **\$307.00**
AMD Opteron™ 248 2.2GHz **\$441.00**
AMD Opteron™ 250 2.4GHz **\$669.00**
AMD Opteron™ 252 2.6GHz **\$825.00**

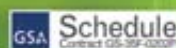
AMD Opteron™ 846 2GHz **\$677.00**
AMD Opteron™ 848 2.2GHz **\$847.00**
AMD Opteron™ 850 2.4GHz **\$1130.00**
AMD Opteron™ 852 2.4GHz **\$1469.00**

AMD Opteron™ 246 HE 2GHz **\$441.00**
AMD Opteron™ 840 EE 1.4GHz **\$847.00**
AMD Opteron™ 846 HE2.0GHz **\$847.00**

The AMD Opteron processor delivers high-performance, scalable server solutions for the most advanced applications.

Commercial leasing available for purchases as low as \$1000.

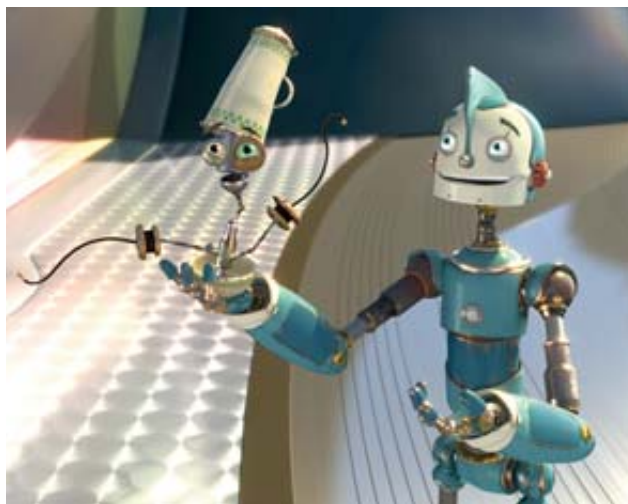
Prices subject to change without notice. Monarch not responsible for typographical errors. AMD, the AMD Arrow logo, AMD Opteron, AMD Athlon, combinations thereof, are trademarks of Advanced Micro Devices, Inc.



We ship to the Continental U.S.,
Alaska, Hawaii, APOs,
Puerto Rico, and Canada



Film



Lighting an all-raytraced environment became an intricate dance between diffuse and specular illumination.

alive, the animators soon realized the mechanical people had to keep moving. “A mechanical person is dead at the beginning so you have to create the illusion of life,” says David Torres, animation lead. “It’s not like a furry or fleshy creature. If the machine stopped moving, it died. So, to create weight and life, we had to move everything slightly.”

For example, with most animated characters, when an eyebrow moves, the forehead wrinkles, and the cheek also moves. Not so with the 'bots. Each part moved independently. Ironically, even though the characters were machines, most of the action was hand animated. “We didn’t have muscle systems, but we did have some mechanical setups,” says animation lead Galen Chu, noting the piston-like structures for extending limbs. “Also, we have a utility called ‘follow-through’ that we used, so that when a character turned its head, we got a bit of overlap for free.” And when Madam Gasket walked around, the steam, smoke, cinders, and ash that followed her were animated procedurally.

Similarly, the city had to keep ticking along as well. “Because it’s like the inside of a clock, everything is moving,” says Torres. “Pendulums, cars, trains, blimps. We set up our own procedures, so that we could store animation curves. For example, any time a gear pops into a scene, we would load the gear animation.”

Ultimately, the entire world comes to life when it’s lit and ren-

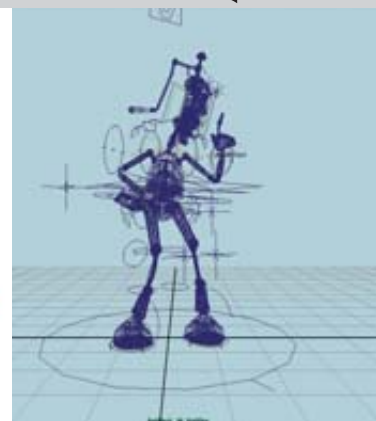
Singing in the

On his way home from a party, the character Fender breaks into song and dances into a fountain. “He’s in an area of the street that has oil fountains,” says effects lead Robert Cavaleri. “They’re lit beautifully; it’s like Las Vegas.”

To create the oil, the effects team first tried using particles, but the resulting motion didn’t look like flowing oil. “The Newtonian mechanics were not as pleasing as fluid dynamics,” he says. “So we used [Next Limit’s] Real Flow software and the resulting motion looked right for the action. The artistry, though, came from the technical directors tweaking the parameters to make it feel like oil and not mud or water.”



Fender’s eyebrows were bendable windshield wipers, but most body parts for the 'bots were not deformable. So the characters had to be rigged with “movers” that rotated or translated individual body parts mechanically, as shown at top right, in wire frame and at bottom right, on a low-res shaded model.



dered—not a small task in such a busy environment as Robot City. “We didn’t have to deal with subsurface scattering,” says Dave Esnault, lighting supervisor, “but we did have to light in a completely metallic world. We don’t use environment maps; we use the environment. Sometimes, we would get the lights perfect for a character, and then a highlight on a wall behind would reflect back onto it.” Thus, lighters sometimes rendered characters and backgrounds in separate passes.

“We didn’t want to go into the making of *Robots* with any preconceived constraints,” says Ludwig. “We wanted to show how far we could take the rendering, our forte.” But when the development group examined the design, it became clear that it was beyond the capabilities of what the budget would allow. “The world was extraordinarily complex, but it’s amazing what you can achieve when you put yourself into a challenging place.”

“The world appeals to me more than anything,” says Wedge. “*Ice Age* was fun, but the characters would go from one set piece and one idea to another. *Robots* feels more like a movie. We made a complete fantasy world, so we had to invent a lot of rules about how it works. Much of the time in the movie is spent discovering new aspects about the world.”

“It’s a little trippy,” Wedge adds. But it’s a ride worth taking. ■

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

WHERE BUSINESS GETS FUN



THERE'S NO BETTER PLACE TO EXPERIENCE
THE LATEST PC, ONLINE AND VIDEO GAME PRODUCTS

Conference: **May 17-19**

Exposition: **May 18-20**

Los Angeles Convention Center

E³ is a trade event - only qualified industry professionals may attend. No one under 18 will be admitted, including infants. This policy is strictly enforced. Visit www.e3expo.com for registration guidelines.

•••• Video

Death Becomes

Artists create effects 'to die for' in
the Showtime series *Dead Like Me*

By Karen Moltenbrey



Showtime's *Dead Like Me* original series uses digital imagery and effects, such as the CG graveling creature (atop the couch), to drive its unusual story lines that focus on death.

Them

Recently ending its second and possibly final season, Showtime's original series *Dead Like Me* livened up cable television with its dark humor and Emmy-nominated visual effects that place a new spin on life, death, and what might follow.

The series focuses on Georgia Lass, a cynical college dropout lacking ambition and direction. While on a lunch break from a boring temp job, she is struck and killed by a toilet seat that falls from the MIR space station. She then joins a group of grim reapers who, like herself, died with unresolved issues. With many "life" lessons to learn, these reapers exist among the living in the Pacific Northwest—eating, sleeping, working, and so forth—yet they perform some unique functions, such as collecting the souls of the just departed.

To lend a tongue-in-cheek spirit to the series, the manners of death can entail far-fetched scenarios, such as the one involving Georgia, or those that are ironic, such as when animal rights activists get mauled by a caged bear they are trying to release. As a result of the show's bizarre bent, the "death scene" effects had to be computer generated. Yet, because the effects are so integral to the story lines, the artists had to ensure that the CG blended naturally into the live action.

"Most of the effects are used when we cannot accomplish what we want for the script—and often, that involves killing people, which is difficult to do practically," chuckles Jennifer McEachern, *Dead Like Me*'s visual effects supervisor.

Each episode contains approximately 20 effects shots, which are planned by McEachern and senior visual effects super-

visor Robert Habros at MGM's Bridge Studios in Vancouver, Canada. The actual effects, however, are generated by any number of local postproduction facilities under the duo's supervision. The two-hour pilot, for example, contained nearly 120 effects shots, including those by Rainmaker and Image Engine depicting an elaborate train wreck.

To create the harrowing accident during which a passenger train car disengages and careens down a steep hillside, McEachern and Habros located stock film footage of a moving freight train that served as the base of the action. Also, using NewTek's LightWave, Rainmaker built a CG replica of a practical train car that the actors boarded during an earlier scene. The artists then animated and composited the 3D model into the film plate with Discreet's Inferno, digitally replacing the freight train in the stock footage. To complete the accident, Rainmaker and Image Engine crafted digital matte paintings of the hillside, while live tree elements shot on bluescreen provided foreground elements.

Like the train scene, a number of *Dead Like Me*'s digital effects are created in CG, but others are done using filmed elements, which are added later during postproduction. In the show's "Always" episode, for example, post house Atmosphere Visual Effects used breaking glass elements, shot

against bluescreen, for a scene in which glass shards from an office building rain down on victims below. To accomplish this particular effect in-camera, the group filmed real sheets of glass against bluescreen as they were dropped from a forklift situated just out of the frame. To get more out of the effect, the team shot the action using 35mm film at 120 frames per second (fps) instead of 24 fps, which allowed the action to be slowed down without excessive motion blur. The team then filmed this action using several takes—with the glass breaking as it hit the ground, as it fell on a blue sawhorse, and as it broke over a dummy standing in for a victim—to obtain different breakage results that coincided with the action in the scene. With so many takes, the compositors were able to build up the elements so that the glass shards in the final scene had more volume and weight.



To create this scene, effects artists at Atmosphere combined bluescreen shots of several different types of practical glass breaks, including one of a pane crashing over a blue dummy, which served as a stand-in for the actor in the final composited shot.

•••• Video

Simultaneously, the team filmed the action with an HD camera, which enabled the artists to better blend and transition the effects shots into the live-action plate. Meanwhile, blue mannequins were placed on the ground level as stand-ins for the actors, who were later composited into the scene. Finally, the artists used numerous layers of shards from the bluescreen shots to matte tiny bits of glass in and around the actors, helping to blend the stunt footage and some larger glass elements.

Signature Effects

Not all of the show's effects, however, are done for a single episode, as there are several recurring "signature" elements. Among them is the so-called soul ripple—a glowing distortion, created by Rainmaker using the Inferno system—that appears after a reaper touches a person who is about to die. Depending on the scenario, the artists sometimes augment that reaction with pre-shot footage of smoke elements.

"A lot of our inspiration, and the base of many of the series' effects, come from organic elements," says Rainmaker digital artist Carmen Pollard, "which gives the images an ethereal look yet makes them more realistic."

The show also features a CG character, called a graveling, a mischievous creature from the afterworld that sets deadly accidents into motion. Created by Image Engine, the graveling—the brainchild of the series creator, Bryan Fuller—looks like a cross between Gollum and a porcupine, and is visible only to the reapers.

Following the design process, CG artists spent another month building the 3D model in Alias's Maya. To animate the creature, a team rigged the model inside Maya, using inverse kinematics and blend shapes to achieve the desired movement. As Habros explains, Fuller wanted the graveling to be amphibious and, when desired, to scale walls as well. For this reason, the graveling's forearms are larger than its biceps, similar to a frog's anatomy. "Its movements are quite different from that of a biped," says Habros. "So you end up with joints that are fixed, like an amphibian's, but every now and then the creature will stand upright and move in a human-like way." Accomplishing this wide range of motion required the animators to rework and reskin the model before giving it human motion.

Using Adobe's Photoshop, the artists then textured the model, giving the creature bumpy, wart-like skin with quills running down its back. "My texturing process comes from the practical school of visual effects, which entails airbrushing," explains Kevin Little, digital effects supervisor at Image Engine, "whereby layers and layers of color are applied to the model in Photoshop until they give it an almost fractal-like skin pattern." The final models were rendered in LighWave.

Last, the team composited the gravelings into the live action with Eyeon Software's Digital Fusion. To ensure that the CG character (whether by itself or in a group) blended seamlessly into the plate, a team from Image Engine employed HDRI as its main lighting technique, using a mirrored ball and a gray ball to cap-

ture the on-set lighting and shadows, respectively, before applying that information to the CGI.

Growing Gravelings

When the gravelings move in a scene, they move quickly, phasing in and out between the dimensions of the living and the dead. "The concept is that the gravelings could be around us all the time if they wanted to, only we just can't see them," explains Habros. "They make the transition from one dimension to another whenever they slow down. It's like seeing a flash out of the corner of your eye, where you know something was there, but you can't tell what it was."

In the first season, only Georgia saw the creatures, but could catch only a fleeting glimpse. However, the artists knew that as the series progressed, the character would have more camera time, so they made sure that the original model contained enough detail to withstand that kind of scrutiny. In the second season, some of the other reapers also could see the gravelings. And, in three consecutive episodes, the creature evolves from a



For one episode in which the gravelings swim underwater, applied dynamics allowed the quills on the creatures to react to the environment, while caustics were used for the underwater lighting.

shadowy figure to a major player when an unusual graveling gets a starring role. In those episodes, Eric McCormack guest-stars as a charming but untrustworthy reality-TV producer named Ray, and when he dies, a white graveling is born.

"This was a big moment in the series' folklore, because it introduced a new character with a unique personality, and it hints at where the gravelings may come from," explains McEachern. "If you are a very bad person, a graveling comes out of your corpse in place of a soul."

According to Habros, the team wanted this particular creature to be different from the other gravelings, yet it had to be consistent in appearance to the others. The group's solution was to create Ray as an albino graveling, but retain the same form as the origi-



TSUNAMI Animation Station

No matter what application you're using for animation, you can rely on a TSUNAMI professional workstation, powered by NVIDIA Quadro FX by PNY graphics boards, to create the best content possible. Designed specifically to take advantage of the next generation PCI Express bus architecture, NVIDIA Quadro FX by PNY graphic boards provide the power that is critical to animation professionals in dynamic production environments. NVIDIA Quadro FX takes digital content creation (DCC) applications to a new level of interactivity by enabling unprecedented performance, features, and photo-realistic image quality leading to shorter production cycles. NVIDIA Quadro FX by PNY ultra high-end products deliver up to 35.2GB/s memory bandwidth, 512MB GDDR3 frame buffer memory, 256-bit memory interface and support for 2 ultra-high resolution (3840 x 2400) digital panels. Configure your perfect TSUNAMI at www.sharbor.com/build-yours/. Leasing available!



SoftImage|XSI Essentials

This robust and cost-effective software has extensive polygon modeling tools, industry leading subdivision surfaces, unmatched realtime shaders, a wealth of standard scripting languages, and more. **FREE tutorials included!** **1839.99**
SoftImage|XSI Foundation 479.99



Deep Creator

Create interactive 3D environments, assemblies, and objects for training, simulation, support, and sales and marketing applications. Includes a 3D modeler, a texture creator, and a scripting engine in one high performance package, all essential to producing powerful, interactive 3D content **1999.00**



Photoshop CS

The animator's choice for creating textures and texture maps, color correcting, resizing and converting images, painting and drawing, and so much more! An absolute must-have for your toolbox. **FREE Total Training tutorial included** . . . **579.00**
Upgrade to CS **165.00**



Cinema 4D R9

A fully integrated 3D modeling, animation and rendering package! It is the only 3D package that renders directly to After Effects, Combustion, Final Cut Pro, Alien Brain, Motion and others including multi-pass layers and 3D elements. **FREE tech support from Maxon!** **639.99**
Competitive Upgrades **Call**



LightWave™ 3D [8]

This Emmy award-winning animation package is production-proven with fast, efficient modeling tools, free tech support, 999 free render nodes, enhanced character animation tools, a new hard, soft, and bone dynamics system, and more **1199.99**
Upgrade to [8] **489.99**



Dosch 3D for Maya - Toons

Expertly designed 3D characters can be used in your animations and presentations, or as starting points for your own designs! Change their colors, reflections, poses - even animate them. This bundle of 3D models for Maya 5 and higher includes Cartoon Babes, Comics Volume 1, and Comics Volume 2 **119.00**

Terms: POs accepted from schools and government agencies • All checks require 5-7 days to clear. • Defective products replaced promptly. RMA number required for all merchandise returns. Returns accepted within 15 days, in original packaging, postage prepaid, undamaged. Opened software not returnable. Shipping charges not refundable. Returns subject to a 15% restocking fee. • Not responsible for typos. Prices subject to change.



Information
 262-548-8120
 Tech Support/RMAs
 262-548-8157
 Mon-Fri 8:30am-5:00pm CST
 Fax: 262-548-8130
 Safe Harbor Computers
 W226 N900 Eastmound Dr.
 Waukesha, WI 53186
www.sharbor.com



© 2005 Safe Harbor Computers. All rights reserved. TSUNAMI and the TSUNAMI logo are trademarks of Safe Harbor Computers.

YOUR SOURCE FOR ANIMATION AND NLE PRODUCTS!

www.sharbor.com

800-544-6599





In one episode, the fleeting 3D graveling evolves from an effect to a main character, an albino creature named Ray. Rather than remodeling the creature from scratch, the artists used the same body mesh as they did for the other gravelings, but gave Ray a more extensive quill setup and a different texture that enabled the model to withstand the longer, closer camera shots.

nal gravelings, just with a more extensive quill setup and a different texture map.

Nevertheless, using an all-white CG character spawned a new challenge. “When you put a white model into any environment, it reflects all the light in the room,” explains Habros. “So, suddenly, he’s pink, then blue. And when you put him outside, he’s blinding white, and it looks like a bad composite.” To overcome this hurdle, the group at Image Engine spent two weeks altering the lighting and shaders in LightWave until, says Little, the model finally sat in the frame right. “The Ray creature straddles the line between a character and an effect,” he notes.

The artists used the main graveling body mesh for the albino as

they did for the fleeting characters. But since the creature did not have to match the flock exactly, the artists made some minor tweaks, including the creation of new hand-painted texture maps and the use of a new hair-dynamics system now built into Maya 6. “It definitely proved to be a faster calculation system and more stable than the setup we were using, which took overnight to complete a full-sequence calculation for driving the geometric quills,” notes Little.

Alas, like all beings in the show, the albino creature dies, having lived for only three episodes before perishing in a flashy, Hollywood fashion as it froze, disintegrated, and then crumbled into dust. This sequence of events was achieved with rigid-body dynamics, which enabled the group to freeze vertexes on the model’s geometry and then, through the use of another MEL script, apply a UV map. The MEL script generated a soft-body duplicate from the geometry that then froze the soft-body particles in place when the artists exported the models to LightWave, where they wrote another script that broke the model apart using a different algorithm. The team then ran that through a rigid-body dynamics simulation. Meanwhile, all the residual organic effects—smoke, dust, etc.—were done using Maya fluids and a Maya particle pass.

And like the albino, *Dead Like Me* met its own demise recently, as the network chose not to renew the series despite its edgy look, graphics, and content. However, the evolutionary tale of life, death, and what lies beyond will be resurrected this summer as Showtime re-airs Season 1 and 2. The series may even get a second life, as insiders speculate on the possibility that another network may pick up the property. ■■

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



The artists spent a good deal of time adjusting the lighting and shading within LightWave so that the white CG character Ray wouldn’t reflect the set lights and would fit naturally into the live scenes.





SIGGRAPH 2005

The smart place to be. You'll find all the data, techniques, people, and inspiration you need for another successful year of research, creativity, development, and production. **COURSES:** Upgrade your knowledge. Extend your warranty against career obsolescence. **COMPUTER ANIMATION FESTIVAL, ART GALLERY:** Encounter extraordinary images and learn from the minds that made them. **EMERGING TECHNOLOGIES, GUERRILLA STUDIO:** Optimize your real-time interaction with digital machines. **EXHIBITION, RECEPTION:** Interact with an astonishing accumulation of A-list minds in the world capital of entertainment and innovation. **PAPERS, PANELS, POSTERS, EDUCATORS PROGRAM, SKETCHES, WEB PROGRAM:** Join the industry's best and brightest stars as they illuminate engineering and art, animations and equations, allegories and algorithms. Five Days Only! 31 July through 4 August 2005. For conference details:

www.siggraph.org/s2005



bring your brain

Conference 31 July-4 August 2005 Exhibition 2-4 August 2005 Los Angeles Convention Center

The World's Leading Marketplace of Computer Graphics and Interactive Techniques

  Sponsored by ACM SIGGRAPH

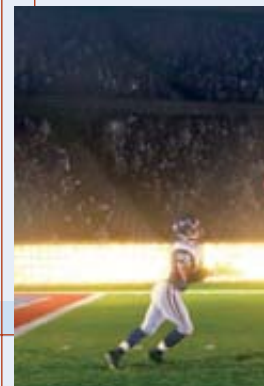


SIGGRAPH2005

Digital Dimension opens this year's
Super Bowl with legendary effects

Game-Day

By Karen Moltenbrey



For decades, the Super Bowl has crowned world champions and football legends. This year, visual effects studio Digital Dimension kicked off Super Bowl XXXIX with a dazzling 80-second animated/live-action segment featuring a new legend in the making.

The spot, aptly titled “Legends,” begins with an all-CG shot of waterfront Alltel Stadium in Jacksonville, Florida. As the camera pans across the shimmering water and up to the arena, spectacular fireworks explode into the night sky.

The scene then cuts to a live-action segment of a lone player standing downfield waiting for the kickoff. At the opposite end is the player’s ultimate goal: a towering digital version of the coveted Lombardi Trophy. As the player surveys the field, towering images of past Super Bowl greats erupt from the turf, reminding him that this is no ordinary game. Rather, it’s a monumental struggle against the sport’s best, during which a defining play or a shining moment can establish a new legend for eternity.

The player receives the ball and traverses the field, battling past greats such as

Mike Singletary, Reggie White, Jack Lambert, and Lawrence Taylor, until only one more figure, Ray Nitschke, remains between him and the trophy. The player breaks the tackle, shattering the ghostly image of Nitschke into millions of crystal-like shards before crossing the goal line. As he raises the ball in celebration, the camera tilts up to the scoreboard, where video of other Super Bowl legends play on the screen.

“We wanted to create something special that captured the spirit and excitement of this event,” says Ben Girard, Digital Dimension’s founder and visual effects supervisor. Doing so, though, meant topping their previous presentations for Super Bowls XXXIII and XXXVI, both of which earned Emmys for the studio. Adding to that pressure was the fact that the segment had to set the tone for a game seen around the world by millions.

So instead of crafting an all-CG animation, Digital Dimension decided to combine live action, video, and computer graphics. “This time we took more of a visual effects approach,” says Girard, “as opposed to an animation approach.”

Game Plan

Just about the time when players began reporting to training camps this past July with a glint of the Super Bowl in their eyes, Digital Dimension began looking toward the big game as well, only its appearance there was already a sure bet. After collaborating on a theme with designer/senior vice president Gary Hartley at Fox Sports, Girard and his team began calling their plays. First, the group spent two nights filming an actor, posing as the generic Super Bowl player, as he traversed the field at the Los Angeles Memorial Coliseum.

Meanwhile, Fox art directors Nick DiNapoli and Marco Bacich began selecting and editing a dozen or so archived NFL video clips of football legends in action. The Digital Dimension artists mapped the footage onto video screens and enhanced the effects with HDRI reflections. The team then tracked the video and the actor with SynthEyes’ camera-tracking software.

Meanwhile, the group created the shattering video screens by matchmoving the live-action player and running the geometry headfirst into sheets of computer-generated glass. According to technical direc-

Graphics



Super Bowl XXXIX featured some impressive plays by both the New England Patriots and the Philadelphia Eagles. Perhaps none, though, was more exciting than the kickoff return, ending in a touchdown, that occurred in the pregame segment that kicked off Fox's broadcast presentation of the game. The 80-second segment, created by Digital Dimension, featured a blend of live action, video, and computer graphics.

tor Christian Zurcher, the artists then used Cebas ThinkingParticles to calculate a rigid-body simulation of the collision, as well as to procedurally generate glass dust and other debris as the screens burst apart.

Next, the digital artists built the virtual stadium within Discreet's 3ds max, and filled the seats with an all-CG crowd of approximately 30,000 fans, controlled by Discreet's Character Studio. "Usually artists use tricks such as mapping pictures of people in the stands to create a crowd," says Girard, "but we wanted to make them look more realistic."

The artists discovered that by using normal mapping they could achieve the look of highly detailed people while avoid-

ing the time-consuming rendering requirements of full 3D geometry. Available in 3ds max Version 7, normal mapping is a form of texture mapping that captures surface features from dense geometry and encodes the information on simple objects using three vectors of information instead of just two vectors designated by bump maps. The objects appear to be highly detailed and respond appropriately to the direction of scene lights, even though they are actually very basic shapes.

The artists then animated individuals in the crowd using scripts to randomize their movements, seat placement, and color. "Without these processes, we wouldn't have been able to render 30,000 3D people without making them low-res or fuzzy," says Girard. Though the camera never zooms in for a close-up of the fans, it does come within about 200 feet—which is close enough, he notes, for viewers to see the details.

To enhance the segment, the team used ThinkingParticles to generate the CG fireworks, smoke, and camera flashes. Once this was done, the group rendered the CG imagery—which included every-

thing except for the actor, most of the stadium grass, and the video—with Mental Images' Mental Ray software.

"We wanted to do something special," states Girard, "seeing that 80 million people would be watching this." In addition, the pregame segment would be kicking off some of the season's most innovative and expensive commercials, which would be pushing the envelope creatively and technologically, "so we had to set the pace as well," he adds.

While the theme of the segment had been planned since July, it was far more appropriate for this particular championship than Fox, or even Girard, could have imagined. That's because the New England Patriots, with its victory over the Philadelphia Eagles, gave the team its third world championship title in the last four years. And this rare accomplishment gave Digital Dimension the opportunity of introducing a game that officially crowned the sport's newest dynasty and its newest football legends. ::

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

Portfolio

The Art of Oddworld



Clockwise from top:

All the images are from the new *Oddworld Stranger's Wrath* game.

Says production designer Silvio Aebischer of the imagery: "Regardless of its oddness, we try to follow nature closely, looking at its intricate workings, beauty, and behavior, and infuse that into our so-called Odd-creations."

The Oddworld artists begin their creation process by forming rough ideas on paper, and then sketching them out in Photoshop. Later, the group transforms the concepts to 3D within Maya, where the team models and animates the imagery, before rendering and compositing it within Shake and Combustion.

For more than 10 years now, the digital artists at Oddworld Inhabitants have been making far more than game imagery; they have been creating digital fine art that just happens to appear in interactive environments. That accomplishment has been recognized time and again, from industry awards for the detailed work to international film festivals for the game animations. In addition, the developer's second title, *Oddworld: Abe's Exoddus*, enjoyed a theatrical release in Los Angeles and was in contention for Oscar consideration in 1998. And, more recently, Oddworld's fantastical creatures and backgrounds became the sole focus of a coffee-table book called *The Art of Oddworld Inhabitants: The First Ten Years*.

Oddworld's four games are somewhat of an oddity in the gaming world in that the quality of the imagery, no matter how "different" the style, is just as important as the gameplay



itself. According to company president and creative director Lorne Lanning, the game stories support the imagery rather than the other way around, and that is the key to what makes *Oddworld's* imagery more "artful" than that of most other games.

"It really isn't that hard to impress people with great graphics these days, but to have art without purpose leaves you with, well, just nice graphics," Lanning says. "Our images aren't always pretty, but there's always a purpose and a story behind every detail...such as the posture of Abe, the number of legs on a Gabbit, the color of the eyes of the Live Ammo, the stranger's boots. We'd like to think that *Oddworld* gives players an entertaining experience, and a little something to gnaw on for a while once they're done."

A sampling of *Oddworld* game images appears on these two pages. —Karen Moltenbrey

Clockwise from top left:
From *Oddworld Stranger's Wrath*.
From *Abe's Oddysee*.
From *Abe's Oddysee*.
From *Oddworld Stranger's Wrath*.

The creative style of the *Oddworld* game imagery is inspired by the company's president and creative director, Lorne Lanning, who is a painter and illustrator. Lanning began studying fine art at the State University of New York (SUNY) before focusing on illustration at the School of Visual Arts in New York. He then supplemented these practices by studying animation and effects at the California Institute of the Arts. However, he claims his real education occurred at effects studio Rhythm and Hues, where he honed his skills.

Graphics Boards

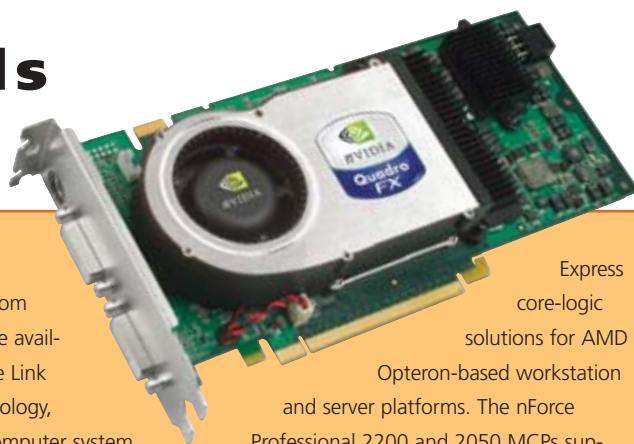
By Courtney E. Howard, Senior Technical Editor

The digital content creation and video markets are aflood with the latest advancements in computing technology, especially with regard to chipsets and graphics boards. The heart of any graphic arts workstation, the graphics board (and, in some cases, two graphics boards) infuses the computer system with speed, power, connectivity, and reliability. All of these traits contribute to throughput, and thereby to one's productivity and ability to meet the most stringent deadlines. After all, what is more frustrating than waiting for a sluggish workstation to process, render, or merely display 2D images or 3D graphics? Here's a look at the latest professional-level PCI Express graphics boards from major industry players.

Nvidia

The hottest news from Nvidia surrounds the availability of its Scalable Link Interface (SLI) technology, enabling a single computer system to employ two SLI-certified graphics cards, and its nForce Professional media and communications processors (MCPs) designed for digital content creation, visualization, and CAD environments. Nvidia's GeForce 6800 Ultra, 6800 GT, 6800, and 6600 GT graphics boards and its nForce Professional and nForce4 MCPs provide support for SLI. The Nvidia nForce Professional MCP product line includes the 2200 and 2050 (an I/O companion chip), reportedly the industry's only PCI

Express core-logic solutions for AMD Opteron-based workstation and server platforms. The nForce Professional 2200 and 2050 MCPs support PCI Express with up to 80 lanes, Advanced Error Reporting, and Message Signal Interrupts. These new PCI Express core-logic options sport a scalable single-chip architecture that takes advantage of AMD Opteron processors' Direct Connect Architecture, native Gigabit Ethernet with TCP/IP hardware offload, support for next-generation SATA 3Gb/sec hard drives, RAID functionality, multi-GPU capability, and the Nvidia Unified Driver Architecture. **Nvidia; www.nvidia.com**



3Dlabs

3Dlabs' only PCI Express-based graphics card, the Wildcat Realizm 800 begins shipping this month (see Review, February, pg. 40). Priced at \$2799, this professional graphics accelerator boasts a Wildcat Realizm vertex/scalability unit (VSU), dual Wildcat Realizm visual processing units (VPUs), and two dual-link DVI-I connectors and a stereo connector. The 16-lane PCI Express-based Wildcat Realizm 800 offers 128MB of onboard DirectBurst memory and a total of 512-bit bus to 512MB of GDDR3 graphics memory. **3Dlabs; www.3Dlabs.com**



ATI

ATI Technologies has introduced the FireGL V5000, its latest graphics accelerator for the mid-range workstation market. The ATI FireGL V5000, targeted at design professionals, is certified for such leading 3D applications as Discreet's 3ds max, Alias's Maya, Softimage XSI, Autodesk Viz 2005, Catia, and SolidWorks. The graphics board sports dual DVI connectors for multidisplay functionality, dual-link support for 9-megapixel displays, and stereo 3D capabilities with quad-buffered support. Now shipping at a price of \$669, the ATI FireGL V5000 combines native PCI Express with eight pixel pipelines, six geometry engines, a low power consumption design, and 128MB of CDDR3 memory.

ATI Technologies; www.ati.com



PNY Technologies

PNY Technologies has introduced its Verto GeForce 6600 GT PCI Express graphics card. The new offering, priced at \$250, provides support for Nvidia SLI technology, up to 128MB of DDR3 memory, and Microsoft DirectX 9.0 Shader Model 3.0. The card also takes advantage of an eight-pipe superscalar GPU architecture with an on-chip video processor, Nvidia's Ultrashadow II shadow processing, and a 500MHz GPU clock.

PNY Technologies; www.pny.com

Matrox Graphics

Matrox Graphics has launched its Millennium P650 PCIe 128 graphics card. Designed for creative professionals, the new PCI Express x16 graphics board offers DualHead and Dual-DVI support for enhanced productivity, 128MB of onboard graphics memory, and a \$249 price tag. The Millennium P650 PCIe 128 also offers various image quality and video settings, compliance with OpenGL and Microsoft DirectX, and bundled software drivers and utilities.

Matrox Graphics; www.matrox.com

1x, 2x, 4x 64Bit!



Left is the Xi MTower™ 64 workstation equipped with NVIDIA® nForce™ 4 Professional Chipset with HyperTransport™ dual PCI-E™ & SLI™ capable. Above is the Xi BladeRAIDER™ 64, 1U blade cluster, 24way Scalable, for render farm and parallel computing. Right is the Xi NetRAIDER™ 64, classic pedestal server with up to 5 Terabyte of RAID, hot swap cached disk space. All are equipped with the 64Bit AMD Athlon™ & Opteron™ Processors



AMD Athlon™ 64 w/PCIe™ & SLI™

@Xi® Computer we lead the technological revolution of 64Bit Workstations, Servers and Clusters based on the 64Bit AMD Athlon™ and Opteron™ Processors. 32-Bit Compatible, 64-bit ready and now available with the latest advancements in graphic technology: PCI-Express™ (twice as fast than AGP) and SLI™ with dual PCI-E (capable of HPC CAD/CAE/VIDEO graphics with single or multiple monitors). On the multiprocessor front we offer up to 4x64bit CPU, 32GB of 8 channels ECC RAM and over 5 Terabytes of RAID Data Storage to satisfy the most demanding computational models and the most pressing and critical real time requirements. Get yours now, @Xi Computer.



Xi MTower™ 64 Xi MTower™ 2P64 NetRAIDER™ 64

- | | | |
|--------------------------------|-------------------------------|---------------------------------|
| - AMD Athlon 64™ Processor | - 2 x AMD Opteron™ Processors | - 2x4x AMD Opteron™ Processors |
| - 2xPCI-E Nvidia®nForce®4 SLI™ | - AMD 8151™ HyperTransport™ | - AMD 8111™ HyperTransport™ |
| - 1GB DDR400MHz to 8GB | - 1GB DDR400 ECC to 8GB | - 4GB DDR400 ECC to 16/32GB |
| - NVIDIA Quadro® FX1300 PCI-E | - NVIDIA Quadro® FX500 AGP-8 | - 8 Ch. SATA CACHE RAID Ctr. |
| - 36GB 10K SATA 8MB cache | - 120GB 8ms 7200 8MB cache | - 1.25TeraB HSwap RAID Mode5 |
| - 19" Viewsonic® Q190 LCD | - 19" Viewsonic® Q190 LCD | - 2 x1GB Ethernet (10/100/1000) |
| - Xi MTower 460wPS 52xCD-RW | - Xi MTower 460wPS 52xCD-RW | - Xi 21Bays or 6U w/Dual HS PS |
| - MS Window® XP or LINUX® 9 | - MS Window® XP-Pro or Linux® | - SuSE® Linux® Enterp.Server 64 |

Xi MTower 64 3500+	\$2,999	Xi MTower 2P64 2x242	\$2,879	Xi NetRAIDER 64 2x242	\$5,333
Xi MTower 64 FX55	\$3,599	Xi MTower 2P64 2x250	\$4,399	Xi NetRAIDER 64 4x846	\$10,749



Dual & Quad monitor video upgrades:NVIDIA® Quadro® FX 3400 SLI™ & Quadro® FX 4000 by PNY



Xi Certified for AutoCAD®2005, 3D Studio® Max/Viz, Softimage®, Solidworks® & Pro/E®. We custom configure each Xi system from 100+ options to match your application and your budget. Business Lease from \$ 59/month.

@XiComputer.com Intl:(949)498-0858
Fax:(949)498-0257
www.xicomputer.com
1-800-432-0486

AMD, the AMD Arrow logo, AMD Opteron, HyperTransport, and combinations thereof are trademarks of Advanced MicroDevices, Inc. nForce 3, Quadro, NVIDIA are trademarks of Nvidia Corp. MS, Windows and Windows NT are registered trade mark of Microsoft Corporation. @Xi and the @Xi logo are registered trade marks & MTower, NTower, NetRAIDER, BladeRAIDER are trade marks of @Xi Computer Corp. Prices do not include shipping and are subject to change without notice. For more details about Xi warranty and service call or write to @Xi Computer Corp. 980 Negocio, San Clemente, CA 92673, USA. Not responsible for typos. Copyright (c) 2003 @Xi Computer Corp. All rights reserved.

WORKSTATION

HP xw9300

Hewlett-Packard debuts
top-of-the-line system with
advanced components

By George Maestri

Hewlett-Packard has been in the workstation market for decades. Its merger with Compaq a few years ago left the company with two lines of professional workstations. Last year, HP combined the lines and introduced a series of graphics workstations that were redesigned from the ground up. The new machines' speed, reliability, and quiet operation have made them popular in many studios and design facilities. HP adds to this line with the introduction of the xw9300, an Opteron-based system based on Nvidia's nForce Professional chipset.

The xw9300, HP's top-end workstation, promises excellent graphics performance. Its support for two PCI Express slots enable users to double the graphics power with the addition of a second graphics card.

The xw9300's enclosure is the same as that of the xw8200 workstation. A mid-tower design, the machine is fairly compact and, when tilted sideways, can fit into a standard 19-inch rack. The front panel is mostly black, with a large grille for airflow, three full-width slots for DVD drives, and FireWire, USB, and audio ports. The back of the system offers Sony PlayStation 2, keyboard, and mouse connectors, as well as four USB, Gigabit Ethernet, FireWire, audio, and a single serial port. Noticeably missing is a parallel port; with most printers using USB today, it shouldn't be a problem.

Popping open a latch on the side reveals the workstation's innards. The cables are nicely arranged, and there's plenty of room for expansion. The internal drive rack

offers room for three drives (in addition to those accessible from the front). The internal drives are angled so that it's easy to add drives without having to move cables around. The motherboard holds two 2.4GHz Opteron 250 processors, along with eight memory slots, SATA-2, and a dual SCSI disk interface. The included drive is a 74GB 10,000RPM Western Digital Raptor, which should provide very fast response. The power supply has a capacity of 750 watts, more than most people will ever need.

The xw9300 is the first workstation I've seen with the Nvidia nForce chipset, a new chipset likely to be widely adopted by most system vendors and motherboard manufacturers that use AMD CPUs. The hottest feature of this chipset is support for two full PCI Express x16 slots. It means you can fill these slots with two high-end graphics cards to get a fairly large performance boost. Last year, Nvidia announced its SLI technology, which enables two graphics cards to communicate and share resources. SLI also gives people an upgrade path; a machine can be configured with a single card, and then expanded as additional power is needed. In addition to the PCI Express x16 slots, the xw9300 has a standard PCI Express slot and three PCI-X 100 slots.

The device boots quickly and runs fairly quietly, but it's not as silent as its dead-quiet sibling, the xw8200. The xw9300 does emit a noticeable hum, likely from the CPU fans, but the machine is certainly quieter than most. I found that tucking it under the desk made the hum barely noticeable.

I performed some basic benchmarks on the machine to test its performance. The CPU tests came in roughly as expected for a dual-Opteron 250, with an integer score of



The high-end xw9300 takes advantage of the latest technologies from HP, AMD, and Nvidia.

22061MIPS and floating-point performance at 7507MFLOPS. As is the case with most Opteron-based systems, the memory bandwidth was excellent at 4394Mb/sec. Disk speed was good; the fast drive achieved 54Mb/sec, which should handle most video tasks without breaking a sweat. For those who need additional disk performance, the system can be configured with a RAID.

Sadly, I didn't have a chance to test Nvidia's SLI technology, as the workstation shipped with only one graphics card, a Quadro FX 3400, Nvidia's mid-range PCI Express graphics board. I did a Viewperf 8.01 test on a 1280x1024 monitor, which produced a 3ds max score of 29.70, a UGS-03 score of 26.93, and a Maya score of 48.34—all of which are excellent. Nvidia claims a performance boost of about 80 to 90 percent with the addition of a second card through SLI. If it's true, this performance boost could easily vault a two-card SLI solution to the front of the pack in the OpenGL performance race. I'm hopeful this will be the case, as the two-card solution provides a great way to get additional power at a modest upgrade price.

I have liked HP's latest workstations, and the xw9300 is no exception. It is solidly built and ergonomic. The combination of the 64-bit Opteron processors and dual PCI Express x16 slots will be popular in the high-end graphics community. HP should have a lot of success with the xw9300. ■■

George Maestri is president of Rubberbug, a Los Angeles-based animation studio specializing in character animation.

HP xw9300

stats

Price: Starting at \$1899,
\$4698 as configured

**Minimum System
Requirements:**
Not applicable.

Hewlett-Packard
www.hp.com

MODELING

Modo 102

Luxology's software packs power, customization, and efficiency in an easy-to-use package

By George Maestri

While Luxology is a new company in the world of 3D software, many principals of the company are seasoned veterans, many of whom created NewTek's venerable LightWave 3D. The company's first product, Modo, is a robust, easy-to-use 3D polygonal and subdivision surface modeling program.

Modo runs on Windows 2000/XP and Mac OS X. Like any graphics application, Modo loves memory and a good OpenGL graphics card. I loaded it on an HP xw8200 Windows XP workstation, and the installation went very smoothly. Modo's look and feel are attractive and well thought out.

Modo's interface is based on a modular design with all menus, functions, and 3D viewports existing in separate windows. These modular windows offer lots of flexibility and can be arranged in virtually any layout imaginable. In the 3D viewports, Modo has two navigation methods. The default method is similar to LightWave's navigation, a nod to the company's heritage. The second method mimics (Alias) Maya's navigation method of using the ALT key in conjunction with a three-button mouse. Because I use Maya a lot, I chose the latter method. Modo has a few little navigation tricks up its sleeve, such as a way to spin a model in a viewport automatically so you can view it from all angles.

Modeling in Modo can be handled in any number of ways. I could sculpt the primitive shapes provided or build surfaces from scratch using curves or one polygon at a time. For creating symmetrical objects, such as characters, Modo offers nice mirroring tools.

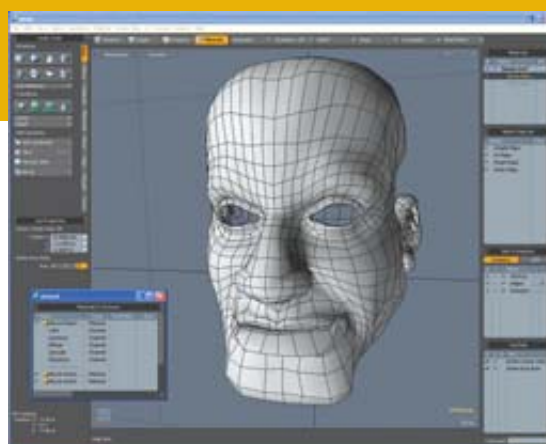
Modo's subdivision surface implementation is fast, responsive, and supports N-gons, polygons with more than four sides and a sticking point in some packages.

Editing with Modo is straightforward. Again, many of the tools are reminiscent of LightWave, but with many added features. Selecting components of an object—such as vertices, edges, and polys—is intuitive. Selecting an entire edge loop, for example, is as easy as selecting one edge and an arrow key. The software seems to have a wealth of built-in intelligence.

One of my favorite editing features is a simple concept called an Action Center, which lets you reposition the center point of any editing command. Many times, you're restricted to a pivot point determined by the 3D application, but Modo's method of a user-defined pivot point is flexible. Modo offers an intuitive way to set falloffs interactively as you edit, supplying a lot of control over how the surface deforms.

Modo has plenty of other benefits—such

as the ability to extrude, slice, or bevel parts of a model—and it has a few unique tools I haven't seen elsewhere. One is Sketch Extrude, which lets you draw the extrusion free-hand while the model updates in real time. Modo has some basic texturing utilities, the most important of which is a UV editor to assign textures to



Based on Catmull-Clark surfaces, Modo's subdivision surfaces support advanced effects, such as creasing.

a surface. Modo can model morph targets that can be exported to LightWave or Maya. Modo also keeps a command history, which can be turned into scripts and saved as custom tools. Customization is fairly easy; in fact, scripts can be written in Perl.

Modo is largely a modeling application, so you'll need to get the models into other packages for animation and rendering. Perhaps Luxology is targeting the Maya and LightWave crowds, as these are the two main formats that Modo uses to save its data. Luxology was smart in using other vendors' file formats with which to save its work, making it easy to add Modo into an existing Maya or LightWave pipeline.

Modo should be popular with those who use polygons and subdivision surfaces with Maya. Its robust tool kit adds a lot to Maya's fairly basic polygonal tools. I can see Maya artists modeling polygonal models in Modo.

As for the future, Modo is just the start. Built around a 3D operating system, called Nexus, Modo can be extended into any area of 3D, including rendering and animation. I hope Luxology continues to update the software and apply its expertise to other areas. Modo was easy to learn, and, once I got the hang of it, I was modeling more efficiently than in other packages. Its broad set of tools and intuitive interface make modeling an enjoyable process. Anyone who is serious about creating polygonal and subdivision surface models should check out Modo. ■■

George Maestri is president of Rubberbug, a Los Angeles-based animation studio specializing in character animation.

Modo 102

Price: \$895 (\$695 introductory)

Minimum System Requirements: Microsoft Windows 2000 or XP and an Intel Pentium 4 or AMD Athlon processor or Mac OS X 10.2.8 with a Macintosh G3, G4, or G5 processor; 512MB of RAM; 100MB of hard-disk space; an OpenGL-enabled graphics card; 1024x768 or greater monitor resolution; and a DVD-ROM drive.

Luxology
www.luxology.com

stats

products

SOFTWARE

MODELING AND ANIMATION

LightWave Update

Win • Mac NewTek has announced LightWave 3D Version 8.2, a software update with roughly 150 new and enhanced features. LightWave 8.2 sports a redesigned UV mapping engine, which provides UV Map Interpolation modes and a UV tear-off function. Enhancements to the render core include Pixel Lattice Deformation antialiasing technologies, image reconstruction filters, and a Mosaic render mode for the Viper preview system. The SDK boasts 22 new capabilities and improvements, whereas the IK Booster System gains new DopeTrack functions that support IK Booster and IK Booster Ghost Mode, a user-selectable onion-skin feature. The 8.2 update is free to Version 8 users. LightWave 3D Version 8 is priced at \$1595 for the full version and \$495 as an upgrade.

NewTek; www.newtek.com

Poser Preview

Win • Mac Curious Labs has announced the latest upgrade to its flagship product, Poser 6. Version 6 boasts such new features as image-based lighting, OpenGL hardware acceleration, and shadow rendering options with Ambient Occlusion, Soft Raytraced Shadows, Shadow Catcher, and Shadow Only renders. Production render support is improved by Area Rendering, Reusable Shadow Maps and Pre-Loaded Textures, and RenderWipe render comparison. Poser 6 will ship this spring for Macintosh and Windows platforms at a cost of \$249, or \$109 as an upgrade.

Curious Labs; www.curiouslabs.com

Anark Enhancements

Win Anark has upgraded Anark Studio to Version 3.0. This latest version of the compa-

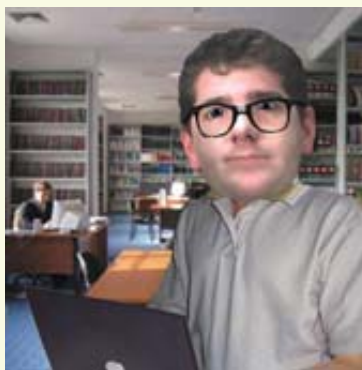
ny's 3D visualization authoring environment aids users in designing and producing 3D applications—such as multimedia presentations and communications—for game development, interactive training, marketing communication, and product visualization. Version 3.0 is enhanced with support for large-scale 3D applications with thousands of interactive objects, an increase in productivity of up to 80 percent over previous versions, and improved integration with existing data sources. Priced at \$3499, the upgrade offers text, actions, support for XML, and such drag-and-drop components as prebuilt buttons and menus.

Anark; www.anark.com

MOBILE GRAPHICS

Character Content

Turbo Squid and Face2face Animation have introduced a series of 3D mobile content delivered in a real-time streaming format to mobile phones. Coinciding with the release of its AniTones Mobile Character Player, available



via the Turbo Squid Mobile Content Portal, Face2face presents its first 3D animated comedy series for mobile phones. Face2face's 3D content, created with the company's AlterEgo video analysis software, is delivered over the air in small packages for playback on mobile phones equipped with the Mobile Character Player and Internet access.

Turbo Squid; www.turbosquid.com

HARDWARE

DISPLAYS

Widescreen Wacom

Wacom Technology has unveiled the Cintiq 21UX, an interactive pen display that features a 21.3-inch color-accurate LCD. In the new Cintiq 21UX, Wacom combines the function-



ality of its cordless pressure-sensitive tablets with a UXGA (1600x1200) resolution display. The company's tablet technology offers 1024 levels of pressure sensitivity, 5080 lines-per-inch resolution, and pen-tilt sensitivity. The professional-quality display features 24-bit color, a 170-degree viewing angle, anti-glare and hard-texture coatings, and a 400:1 contrast ratio. The Cintiq 21UX begins shipping this month at a price of \$2499.

Wacom Technology; www.wacom.com

Pelican for PlayStation 2

Pelican has unveiled the GameGlass monitor for Sony's slimmer PlayStation 2 game con-



sole. The GameGlass is a portable audio/visual system equipped with a high-resolution, 7-

inch TFT LCD. Designed to transform the PS2 into a mobile entertainment system, the GameGlass is priced at \$139 and features speakers, headphone output jacks, and more.

Pelican; www.pelicanperformance.com

WORKSTATIONS

AMD-Based Boxx

BOXX Technologies has begun shipping its latest workstation, the Boxx 3200. Designed for professionals involved in 3D graphics or digital video editing, the new desktop system is based on AMD Athlon 64 and AMD Athlon 64 FX-55 processors and the Nvidia nForce4 chipset. The Boxx 3200, the first release in a new series of high-performance workstations, features dual PCI Express x16 SLI-capable slots, as well as 3Gb/sec SATA and an internal storage capacity of up to 4TB. Pricing for the Boxx 3200 Personal Workstation starts at \$1698 and varies according to the specific configuration.

Boxx Technologies; www.bboxtech.com

Sun Upgrade

Sun Microsystems has announced upgrades to its Sun Blade 1500 and Sun Blade 2500 workstations, based on the UltraSparc processor. Both models offer a 40-percent increase in performance, as well as twice the memory and improved graphics capabilities, over previous-generation Sun Blade systems. The Sun Blade 1500 and 2500 models take advantage of the new Solaris 10 OS and such features as predictive self-healing, DTrace, and Solaris Containers. Now available, the upgraded workstations also benefit from increased storage capacity and industry-standard optical media options. The Sun Blade 1500 and 2500 are priced at \$3195 and \$7195, respectively. In a new promotion, customers purchasing an UltraSparc-based Sun Blade 1500 or 2500 can buy the

STOCK OPTIONS

CALLING ALL CARS

Dosch Design has released Dosch 3D: Cars 2004, a collection of 3D car models for use in CG artwork and animations, as well as architectural visualizations. The offering includes 15 detailed, textured models of US-brand cars provided in multiple file formats: 3DS, 3ds max (Version 4 and above), LightWave (Version 6 and higher), OBJ, Maya (Version 4 and above), Softimage XSI, VRML, and Cinema 4D (Version 7 and higher). Among the US cars featured are the Chevrolet Avalanche, Pontiac Aztec, PT Cruiser, Jeep Liberty, and Ford's F-150, Thunderbird, and Expedition. Compatible with Windows and Mac operating systems, Dosch 3D: Cars 2004 is available via the company's Web site at a cost of \$119.

Dosch Design; www.doschdesign.com

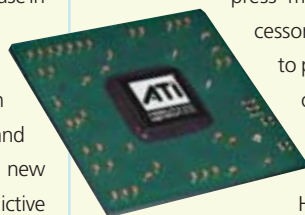


SunPCI IIIpro card for \$1. The SunPCI IIIpro, normally priced at \$695, enables users to run Windows or Linux natively on the Solaris OS.

Sun Microsystems; www.sun.com

Mobile Graphics

ATI Technologies has announced that its Mobility Radeon X300 and X600 PCI Express mobile graphics processors have been selected to power two new lines of high-performance, multimedia notebook PCs from Hewlett-Packard. The



HP Pavilion zd8000 Notebook PC and the Compaq Presario X6000 Notebook PC come equipped with ATI graphics processors, designed to deliver DirectX 9 graphics, low power consumption, up to 256MB of onboard graphics memory, and high-definition-quality video processing.

ATI Technologies; www.ati.com

events

MARCH

14-16

CTIA Wireless 2005, held in New Orleans. Contact CTIA: The Wireless Association, 800-421-6338, www.ctia.org.

APRIL

16-21

NAB2005, held in Las Vegas. Contact National Association of Broadcasters (NAB), 888-740-4622, www.nab.org.

MAY

17-20

E3 2005, held in Los Angeles. Contact 877-216-6263, www.e3expo.com.



ACADEMY of ART UNIVERSITY

FOUNDED IN SAN FRANCISCO 1929

Artwork by Jennifer Chang, Animation Student

REGISTER NOW FOR
SUMMER & FALL SEMESTERS

COURSES OFFERED IN:

2D & 3D ANIMATION | 3D MODELING
CHARACTER DESIGN | COMPUTER GRAPHICS
DIGITAL IMAGING | FILMMAKING | GAME DESIGN
NEW MEDIA | VISUAL EFFECTS | WEB DESIGN

AA | BFA | MFA DEGREES | PERSONAL ENRICHMENT
ONLINE COURSES | STATE-OF-THE-ART FACILITIES

80% OVERALL JOB PLACEMENT UPON GRADUATION

ANIMATION & COMPUTER ARTS

1.800.544.ARTS | WWW.ACADEMYART.EDU

79 NEW MONTGOMERY ST., SAN FRANCISCO, CA 94105
NATIONALLY ACCREDITED BY ACICS, NASAD & FIDER (BFA-IAD)

SOLIDS++ The Modeling Kernel of the Future
 Don't get Left Behind with Old Technology;
Leap into the Future with IntegrityWare's
Next Generation Modeling Kernel

Visit IntegrityWare.com today and see why
SOLIDS++ should be in your future plans now!

See SOLIDS++ in Action!

Download free Demo versions
of Power Plug-ins from
www.nPowerSoftware.com



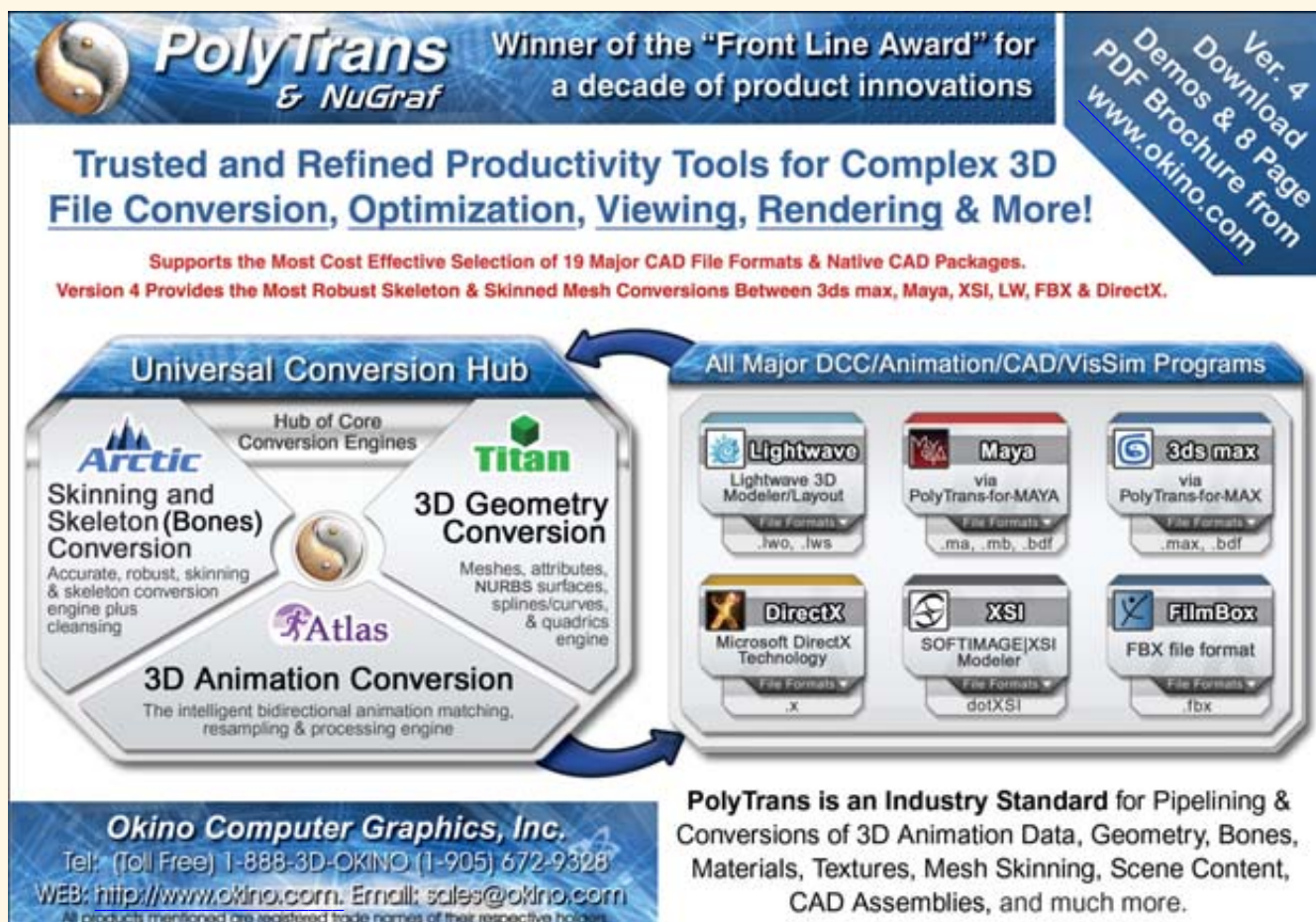
Jet Engine Conceptual Design using our NURBS and Polygon Technology
www.IntegrityWare.com iwinfo@IntegrityWare.com +1.858.538.3800

Free Inspiration



Log on today
for a FREE
Subscription

www.cgw.com



PolyTrans & NuGraf Winner of the "Front Line Award" for a decade of product innovations

Ver. 4 Download Demos & 8 Page PDF Brochure from www.okino.com

Trusted and Refined Productivity Tools for Complex 3D File Conversion, Optimization, Viewing, Rendering & More!

Supports the Most Cost Effective Selection of 19 Major CAD File Formats & Native CAD Packages.
Version 4 Provides the Most Robust Skeleton & Skinned Mesh Conversions Between 3ds max, Maya, XSI, LW, FBX & DirectX.

Universal Conversion Hub

Hub of Core Conversion Engines

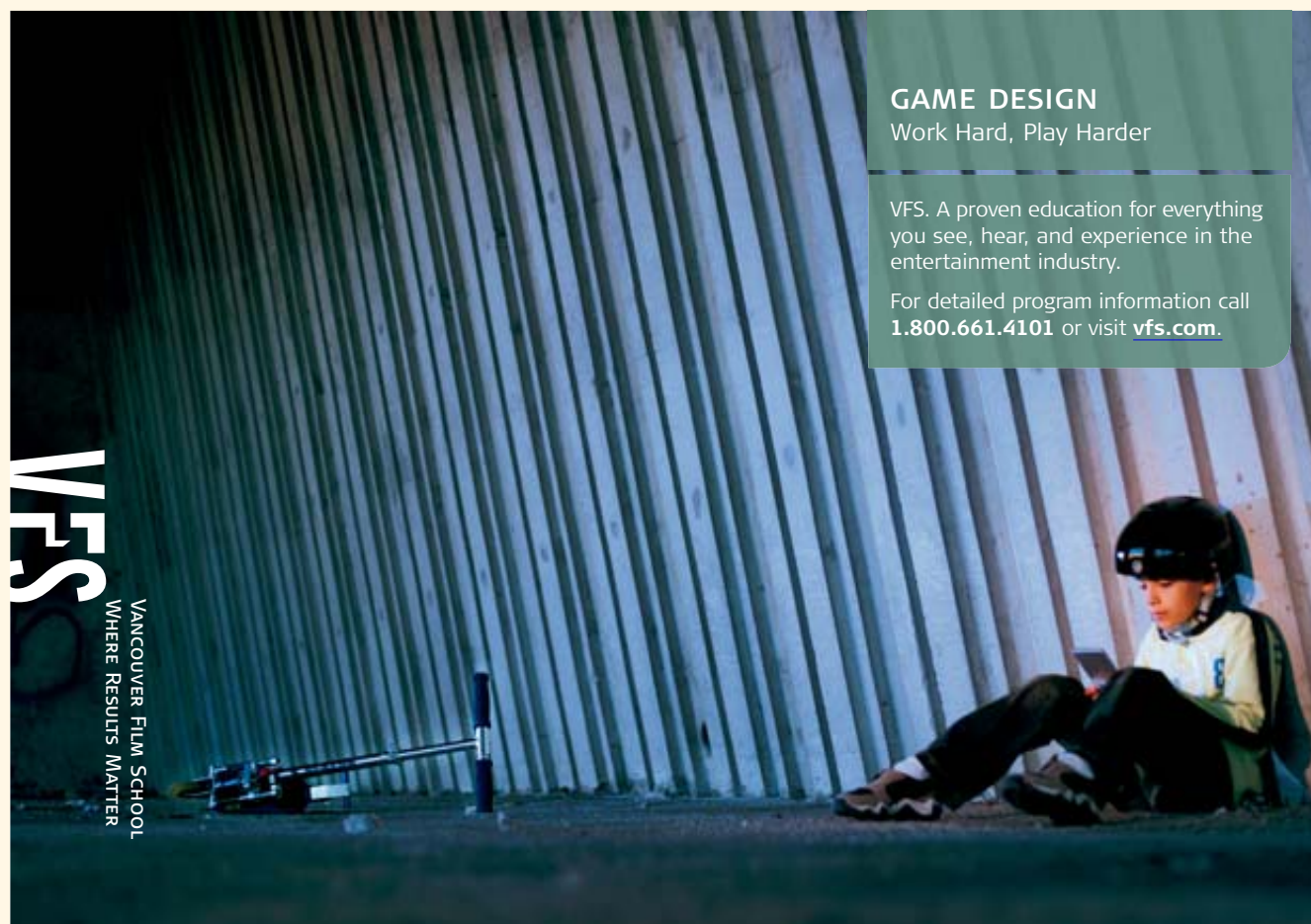
- Arctic**
Skinning and Skeleton (Bones) Conversion
Accurate, robust, skinning & skeleton conversion engine plus cleansing
- Titan**
3D Geometry Conversion
Meshes, attributes, NURBS surfaces, splines/curves, & quadrics engine
- Atlas**
3D Animation Conversion
The intelligent bidirectional animation matching, resampling & processing engine

All Major DCC/Animation/CAD/VisSim Programs

- Lightwave**
Lightwave 3D Modeler/Layout
File Formats: .lwo, .lws
- Maya**
via PolyTrans-for-MAYA
File Formats: .ma, .mb, .bif
- 3ds max**
via PolyTrans-for-MAX
File Formats: .max, .bif
- DirectX**
Microsoft DirectX Technology
File Formats: .x
- XSI**
SOFTIMAGE|XSI Modeler
File Formats: .dotXSI
- FilmBox**
FBX file format
File Formats: .fbx

Okino Computer Graphics, Inc.
Tel: (Toll Free) 1-888-3D-OKINO (1-905) 672-9328
WEB: <http://www.okino.com>. Email: sales@okino.com
All products mentioned are registered trade names of their respective holders.

PolyTrans is an Industry Standard for Pipelining & Conversions of 3D Animation Data, Geometry, Bones, Materials, Textures, Mesh Skinning, Scene Content, CAD Assemblies, and much more.



VFS
VANCOUVER FILM SCHOOL
WHERE RESULTS MATTER

GAME DESIGN
Work Hard, Play Harder

VFS. A proven education for everything you see, hear, and experience in the entertainment industry.

For detailed program information call **1.800.661.4101** or visit vfs.com.

advertiser	phone or web	page
AMD	www.amd.com/hp	C4
Academy of Art University	800-544-ARTS	46
Alias Systems	www.alias.com/maya	2
Apple Computer, Inc.	www.apple.com	C2-1
Appro Systems, Inc.	www.appro.com	12
Avid Softimage	www.softimage.com	C3
Blackmagic Design	www.blackmagic-design.com	9
BOXX Technologies, Inc.	www.boxxtech.com	21
D2 Software	www.d2software.com	13
Dell, Inc	www.dell.com/SMB/DCCsolutions	17
E3 Expo	www.e3expo.com	29
Hewlett Packard	www.newworkstation.com/CGW	C4
IntegrityWare, Inc.	1-858-538-3800	46
Monarch Computer	www.monarchcomputer.com	27
NEC/Mitsubishi	www.necmitsubishi.com	11
Newtek	www.newtek.com	5
NVIDIA Corporation	www.nvidia.com	C4
Okino Computer Graphics	www.okino.com	47
Safe Harbor Computers	1-800-544-6599	33
SIGGRAPH 2005	www.siggraph.org/s2005	35
Vancouver Film School	1-604-685-5808	47
XI Computer	www.xicomputer.com	41

The ad index is published as a service. The publisher does not assume any liability for errors or omissions.

ComputerGraphics
World

advertising sales offices

Group Publisher

Mark Finkelstein
TEL: 603-891-9133
FAX: 603-891-9297
E-MAIL: mark@pennwell.com

Associate Publisher

Randy Jeter
1150 Lakeway Dr.
Ste. 217
Austin, TX 78734
TEL: 512-261-1998
FAX: 512-261-7915
E-MAIL: randyj@pennwell.com

Reprints

PARS International Corp.
TEL: 212-221-9595
WEB: www.magreprints.com
E-MAIL: reprints@parsintl.com

United Kingdom

Amanda Loftus
TEL: 44-1793-641571
FAX: 44-1793-610001
E-MAIL: amandal@pennwell.com

France

Luis Matutano
TEL: 33-1-47-91-70-11
FAX: 33-1-55-02-03-85
E-MAIL: luism@pennwell.com

Germany

Holger Gerisch
E-MAIL: holgerg@pennwell.com
and

Johann Bylek
E-MAIL: johannb@pennwell.com
TEL: 49-89-904-80-144
FAX: 49-89-904-80-145

India

Rajan Sharma
TEL: 91-11-2686113/14/
26865103/26861758/
268617666861113
FAX: 91-11-26861112
E-MAIL: rajan@interadsindia.com

Korea

Paek Kwon
TEL: 82-2-420-1293
FAX: 82-2-420-1294
E-MAIL: keskor@kornet.net

Japan

Akiyoshi Kojima
TEL: 81-3-3261-4591
FAX: 81-3-3261-6126
E-MAIL: kojima@media-jac.co.jp

Taiwan

Teresa Fu
TEL: 886-2-8771-9388
ext. 240
FAX: 886-2-8773-7066
E-MAIL: Teresa_Fu@acertwp.com.tw

Hong Kong & China

Adonis Mak
TEL: 852-2-838-6298
FAX: 852-2-838-2766
E-MAIL: adonism@actintl.com.hk

Singapore

Joanna Wong-Monis
TEL: 65-6836 2272
FAX: 65-6735 9653
E-MAIL: jwong-monis@publicitas.com

Internet Sales

Shaun Shen
TEL: 916-719-1481
FAX: 916-419-1474
E-MAIL: sshen@pennwell.com

Director, Internet Services

Tom Cintorino
TEL: 603-579-9002
FAX: 603-579-9030
E-MAIL: tomc@pennwell.com

List Rental

Bob Dromgoole
98 Spit Brook Rd.
Nashua, NH 03062-5737
TEL: 603-891-9128
FAX: 603-891-9341
E-MAIL: bobd@pennwell.com

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

www.onlinecenter.to/cgw

March 2005, Volume 28, Number 3: *COMPUTER GRAPHICS WORLD* (USPS 665-250) (ISSN-0271-4159) is published monthly (12 issues) by PennWell Corporation. Editorial & Production offices at 98 Spit Brook Rd., Nashua, NH 03062-5737. Corporate officers are Frank T. Lauinger, Chairman; Robert F. Biolchini, President & CEO; Adam Japko, President & COO, Advanced Technology Division; and Mark C. Wilmoth, CFO. Corporate offices: 1421 South Sheridan Road, Tulsa, OK 74112, Tel: 918-835-3161; FAX: 918-831-9497; Web Address: <http://www.pennwell.com>. Periodicals postage paid at Tulsa, OK 74112 & additional other mailing offices. *COMPUTER GRAPHICS WORLD* is distributed worldwide. Annual subscription prices are \$55, USA; \$75, Canada & Mexico; \$115 International airfreight. To order subscriptions, call 847-559-7500.

© 2005 CGW by PennWell Corporation. All rights reserved. No material may be reprinted without permission. Microfilm copies are available through University Microfilms Inc., Ann Arbor, MI 48106, Tel: 313-761-4700. Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by *Computer Graphics World*, ISSN-0271-4159, provided that the appropriate fee is paid directly to Copyright Clearance Center Inc., 222 Rosewood Drive, Danvers, MA 01923 USA 508-750-8400. Prior to photocopying items for educational classroom use, please contact Copyright Clearance Center Inc., 222 Rosewood Drive, Danvers, MA 01923 USA 508-750-8400. For further information check Copyright Clearance Center Inc. online at: <http://www.copyright.com>. The *COMPUTER GRAPHICS WORLD* fee code for users of the Transactional Reporting Services is 0271-4159/96 \$1.00 + .35.

POSTMASTER: Send change of address form to *COMPUTER GRAPHICS WORLD*, P.O. Box 3296, Northbrook, IL 60065.

RETURN UNDELIVERABLE CANADIAN ADDRESSES TO: P.O. Box 122, Niagara Falls, ON L2E 6S4

SOFTIMAGE | XSI®

Do more for less.

"For the production of **METAL GEAR SOLID® 3**, we needed to produce more high quality data in a shorter time frame compared to **MGS 2**.

XSI helped us achieve this by providing our creators with a better environment in which to concentrate on our production work. **XSI** is a superior tool for sure..."

**METAL GEAR SOLID 3:
SNAKE EATER**

Design Unit General Manager
Yutaka Negishi

Starting at \$495^{USMSRP}, **SOFTIMAGE | XSI** includes innovative character creation tools, unique real-time shaders, the fastest Subdivision Surfaces in the industry and integrations for core pipeline tools.

See **SOFTIMAGE | XSI** in action at GDC 2005:
Avid Computer Graphics Booth 413.

For more details, visit softimage.com/GDC05.

I am 4. the future of animation.

© 2005 Avid Technology, Inc. All rights reserved. All prices are USMSRP for the U.S. and Canada only and are subject to change without notice. Contact your local Avid office or reseller for prices outside the U.S. and Canada. SOFTIMAGE, Avid and XSI are either registered trademarks or trademarks of Avid Technology Inc. in the United States and/or other countries. All other trademarks contained herein are the property of their respective owners.

softimage.com/games

Avid
computer graphics



Image courtesy of Softimage and UVPFACTORY

Don't lose your head keeping up with production demands.

The powerful new **HP xw9300 Workstation** delivers top-of-the-line dual-processing performance, large computation and visualization capacity, the ultimate expandability engineered into a totally tool-less chassis, and ground breaking technology including

- **AMD Opteron™ processor** — Industry leading performance that gives you the ability to run both 32- and 64-bit applications simultaneously. AMD64 with Direct Connect Architecture helps eliminate bottlenecks by directly connecting the processors, the memory and the I/O to the CPU.
- **NVIDIA Quadro® FX** — Award-winning quality and precision, along with the ISV certifications that professionals demand for the very best computing experience.
- **NVIDIA nForce™ Professional** featuring NVIDIA® SLI™ Multi-GPU technology — Specifically designed for workstation environments for industrial-strength performance with dual x16 PCI Express graphics capability.



Visit www.newworkstation.com/cgw to learn more and buy.



©2005 NVIDIA Corporation. NVIDIA, the NVIDIA Logo, NVIDIA Quadro, nForce, and NVIDIA SLI are trademarks or registered trademarks of NVIDIA Corporation. All rights reserved. Image courtesy of Softimage and UVPFACTORY. Other company and product names may be trademarks or registered trademarks of the respective owners with which they are associated.