By Lou Wallace

PUMP UP THE VIDEO

SAME

computer or set top box

The future of interactive entertainment is in television. No, not on TV as we know it, but in TV-quality video running on personal computers and high-end game machines. And if you pick up the right hardware and software, that full-motion, full-screen future is now.

Advanced video-compression technologies make interactive multimedia titles and games that look as good as your favorite television show a reality. We're talking video that fills the entire screen, not some dinky little window. And we mean smooth, natural movement, not jerky freeze-frame animation that looks like an old silent movie.

Once experienced gamers see the clearly superior detail and realism, they'll never want to go back to what they're used to. And it's only this kind of TV-quality video that will finally bring millions of new enthusiasts into the interactive entertainment market.

We're still in the early stages, with prices still relatively high and only a limited selection of titles on the market. But don't let that stop you. For a few hundred dollars, you can can play the games of tomorrow today.
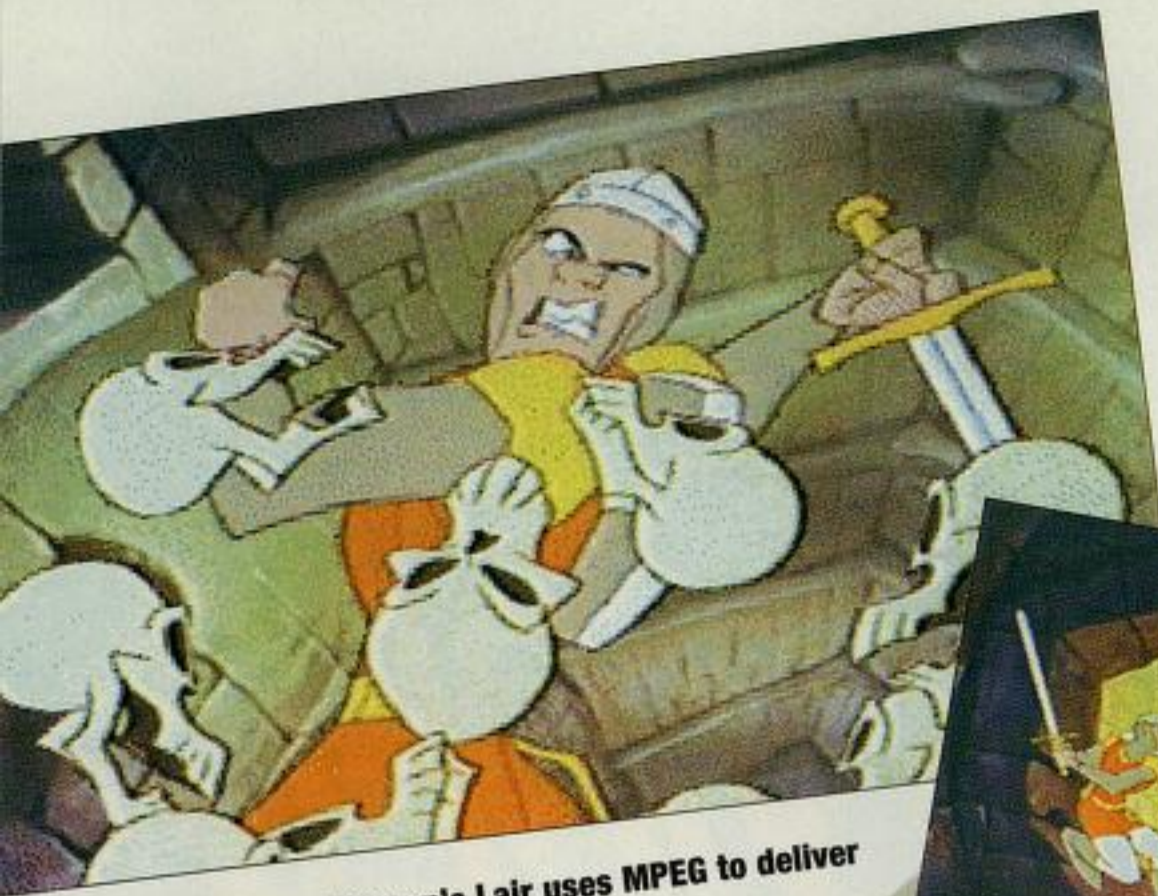
ReadySoft's Dragon's Lair uses MPEG to deliver exceptionally smooth animation.

Traditionally, full-motion video (FMV) has been beyond the capabilities of most personal computers running the two dominant video file formats, QuickTime and Video for Windows. To look real, video requires a system to display some 24 to 30 different pictures or frames each second, fooling your eye into seeing smooth motion.

Most systems, however, can't deliver enough information to create that many pictures that quickly. So developers have had to come up with a variety of compromises and workarounds. Usually the first thing to go is image size—smaller screens can be updated faster, providing a smoother, more fluid video. That's why most of today's games and multimedia titles show their video in tiny windows. Slowing down the frame rate to 10 or 15 frames per second is a complementary technique that leads to jerky, jumpy clips. Another trick is to use less color in the video. Fewer colors means less information to process, but again the image suffers.

A hodgepodge of software-based video-compression techniques—from SuperMac Technologies' Cinepak and Intel's Indeo and DVI (Digital Video Interleaved) to Media Vision's Captain Crunch and Commodore's CDXL—are all competing to solve these problems, with limited success. Today's computers and set-top boxes just don't have the horsepower to deliver seamless FMV without faster processors or additional, specialized hardware.

But since games and titles based on software video compression will run on any computer or set-top box, developers often figure that bad video is better than no video at all. That's why hundreds of games and multimedia titles use software-based video.

Enter MPEG

But in the last few months, price cuts in a hardware-based technology known as MPEG, an acronym for the Interational Standards Organization's Motion Pictures Expert Group, have changed the picture. Always a higher-performance option, MPEG is now affordable, too.

For $250 to $450, MPEG boards and add-ons are already available for IBM-compatible PCs, Philips's CD-i set-top box, and Amiga's new CD^{32} game machine. Products are due in the next few months to bring the same capabilities to the Macintosh, the 3DO multiplayer, and the Atari Jaguar.

Under the MPEG standard, digital video and synchronized stereo sound are compressed up to 200 times, delivering video almost equal in quality to that of standard VHS tape. The images fill the full screen and are refreshed 30 times a second, the same rate as those on television. The result is noticeably better than software-based video, even on very fast machines.

It's not quite perfect, though. Overall resolution is limited to 352 by 240 pixels, making it not quite as sharp as VHS videotape (Super VHS has 400 lines of horizontal resolution, for example) and significantly below broadcast TV standards. Depending on how the video is captured and processed, you may see visible blocking or haloing effects in your MPEG videos, especially in fast movement scenes or in frames with a lot of detail, like tall grass blowing in the wind.

These problems might be distracting to videophiles, but most gamers will notice only a vast improvement over the images they are used to getting. Another advantage is that digital MPEG video doesn't degrade the way tape does. It looks as good on the 100th viewing as it does the first time you watch it.

Right now, Sigma Designs of Fremont, California, is the only company making affordable MPEG boards for PCs, with two models of its ReelMagic product. The cheapest version, without sound capability, costs less than $350. MPEG board prices should soon drop dramatically, however. Several players, including Jazz Multimedia of Santa Clara, California, are expected to enter the market this summer, and literally dozens of MPEG products are scheduled to debut by year's end. Word has it that Jazz will introduce a local-bus graphics card that includes built-in MPEG and sound capabilities, all for less than $400.

For Macintosh users, Sigma Designs has signed a deal with Radius

SegaCD: A Low-Cost Alternative

Sega probably isn't one of the first companies that leap to mind when you think of high-quality, full-motion-video gaming. But the black-box giant is using its TruVideo technology to make a stab at beating the 16-color, 16-bit limitations of its hardware. The images it produces may not be beautiful, but they're certainly watchable.

Sega's second generation of SegaCD titles, including Ground Zero Texas and Prize Fighter, demonstrated that reasonable video performance was possible even from the rather stodgy SegaCD system. But the best example of SegaCD video may have been Digital Pictures' Night Trap. The game got a bad rap from Congress for its questionable content, and the SegaCD version has been pulled from stores. But Night Trap is technically excellent, using full-motion video to create a truly interactive—if violent—movie. (The 3DO version, which looks even better, is still available.)

The latest SegaCD games, such as the F-14 shoot-'em-up Tomcat Alley, push the technology even further, providing fast-action, full-screen video without the annoying delays normally associated with CD-ROMs. The video is still reminiscent of those precable days when snow meant more than the white stuff you get in winter, but Sega gets credit for doing a lot with a little.

—*Christopher Lindquist*

to release a Mac version of ReelMagic this summer, and other companies are working on similar solutions.

In the set-top gaming sector, the MPEG add-on for Philips's CD-i player has been shipping since the spring for just $250, and a new, low-priced Goldstar CD-i player is expected to debut later this year with built-in MPEG capability. MPEG solutions for the Commodore CD^{32} platform also cost $250. The 3DO game system has already demonstrated its own MPEG option, which should be available soon, although prices have not yet been set.

The expected success of the MPEG standard—along with cash payments from MPEG backers—has convinced a few brave software developers to convert their multimedia titles to support it. In addition, an increasing number of MPEG-encoded mainstream movies and videos are now coming out. Many more companies are carefully eyeing the market, waiting for people to buy MPEG equipment.

As you can imagine, the quality and availability of MPEG hardware and software varies from platform to platform. If you're interested in playing games and running multimedia titles with real TV-style video, you owe it to yourself to check out the various options.

PCs Go Full Screen

The arrival of Sigma Designs' ReelMagic video card has altered the PC video landscape, just as the Sound Blaster changed the rules for PC sound cards.

PC board makers are scrambling to come up with competitors to ReelMagic. New boards will drive down prices but could cause confusion in the market. That's because while MPEG is an open standard, ReelMagic's method of controlling the video bitstream is proprietary, just as Sound Blaster uses its own methods to deliver music and sound effects. ReelMagic is making sure that CD movies released for Philips CD-i machines will play on its boards, but MPEG movies, games, and multimedia titles developed

Sigma Designs' ReelMagic card brought affordable full-motion video to the PC.

WHY NOT JPEG?

MPEG isn't the only hardware-based, full-motion video scheme around. Motion JPEG (Joint Photographic Experts Group) has been around longer, but it seems to be targeted at the business market, not consumers.

JPEG was originally designed for still-image compression, and the Motion JPEG standard adapted it for video. It delivers higher-quality images but has a couple of problems as a consumer solution. For one thing, it's a symmetrical solution, meaning that the same card handles both encoding and decoding. That makes it perfect for video editing and creating video presentations, but it raises prices for those who just want to watch. With MPEG, consumers can get by with a simpler, cheaper decoder.

In addition, JPEG compression is not as efficient as MPEG's, so you can't store as much video on a disc and a single-speed CD-ROM drive can't deliver enough data for full-screen, full-motion JPEG video. That shuts out an important part of the potential consumer market. —Fredric Paul
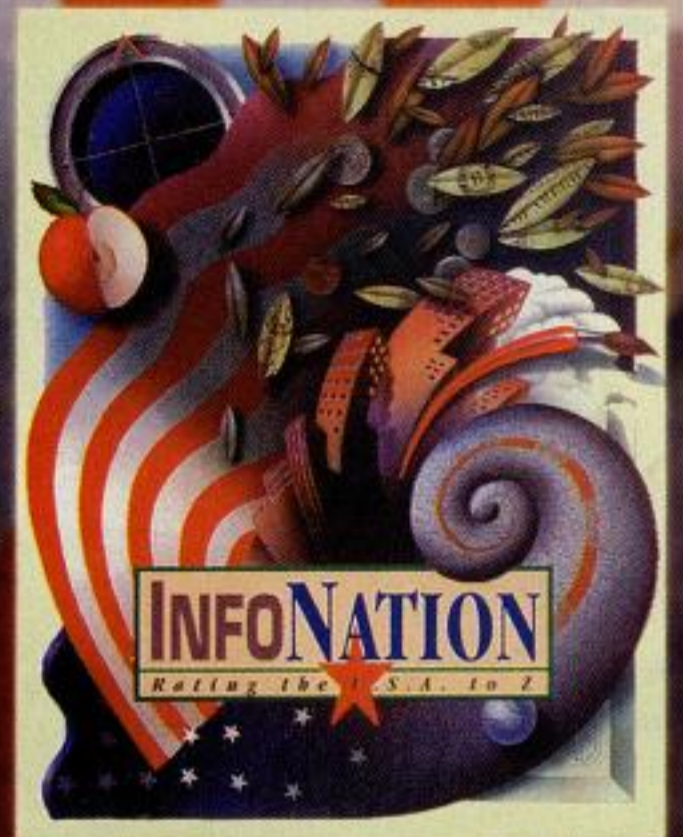
for ReelMagic boards may not play on all of the new competitors—at least not without special software drivers.

In an effort to ease the confusion, Aris Entertainment, Jazz Multimedia, and some 40 other companies have formed the Open PC MPEG Consortium, known as OM/1, dedicated to creating a hardware-independent way to deal with so-called Whitebook MPEG or Video CD data. The goal is to ensure that any MPEG Video CD you buy will play on any MPEG decoder you might own. This standard will cover only movies, however, not interactive discs. And unless Sigma Designs plays along, the new group is likely to merely establish a rival standard.

For now, you can buy the Reel-Magic card itself, pick up an MPEG upgrade kit to turn your plain PC into a high-quality video playback machine, or buy a new

The MPEG version of Police Quest 4: Open Season will look better than ever.
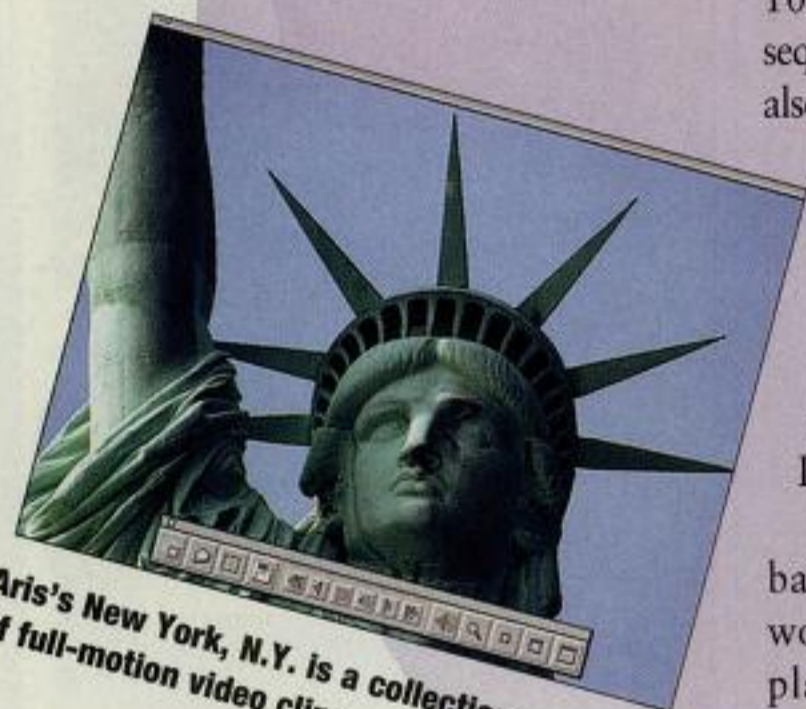
Aris's New York, N.Y. is a collection of full-motion video clips.
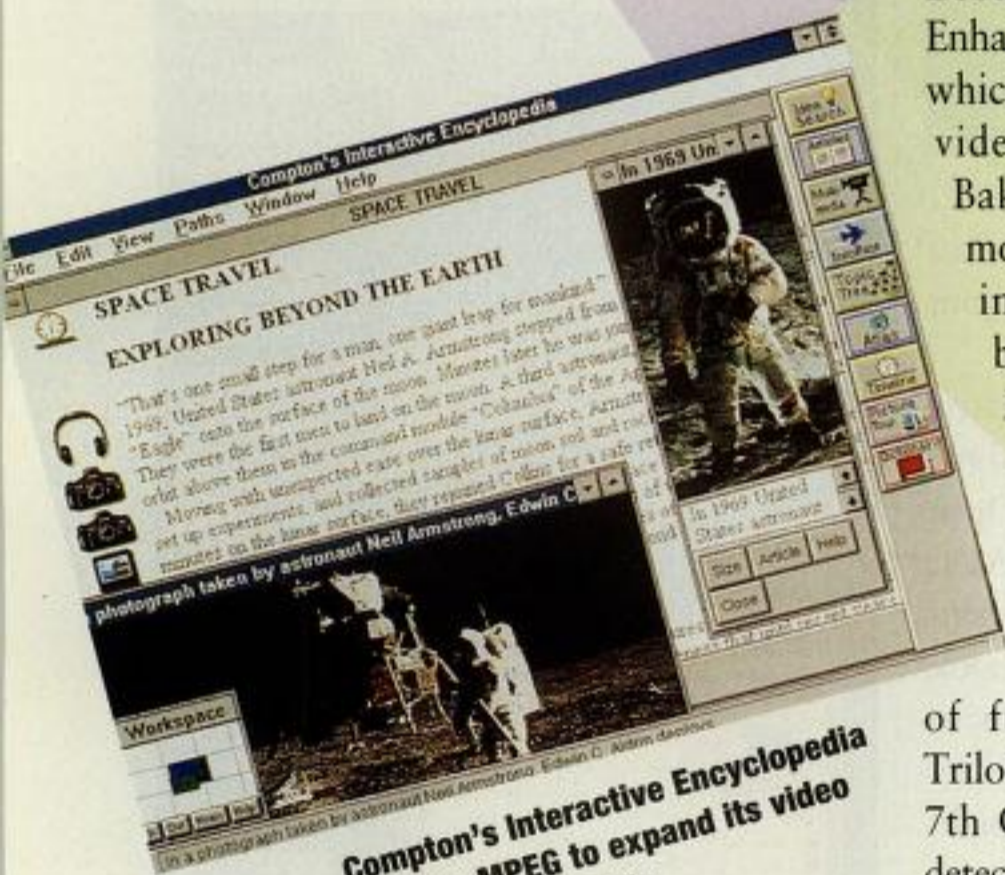
Compton's Interactive Encyclopedia will use MPEG to expand its video clips to full screen.

Learning Fly Fishing has MPEG running through it.

computer with built-in MPEG capability. Kits—including CD-ROM drives, sound capability, and speakers—are available from Sigma Designs and companies such as Smart And Friendly, while Dell Computer sells an MPEG-ready Pentium PC for less than $3,000.

A number of games and multimedia titles already support ReelMagic, including Activision's Return to Zork, with more than 100 full-motion-video and animation sequences. The arcade classic Dragon's Lair also ships in an MPEG version for PCs and 3DO machines. The MPEG version is virtually indistinguishable from the original arcade version. ReadySoft is also preparing an MPEG version of Don Bluth's Space Ace, with even richer animation than Dragon's Lair.

Other ReelMagic-based games in the works include Interplay Productions' Lord of the Rings Enhanced CD-ROM, which uses digitized video from Ralph Bakshi's animated movie to lure you into the make-believe world of Middle Earth. Upgrading this game to MPEG offers a dramatic boost in video quality, matching the impact of the original film.

If you liked the video in The 7th Guest, you'll love the 60 minutes of full-motion MPEG sequences in Trilobyte's The 11th Hour, sequel to The 7th Guest. In addition to automatically detecting an MPEG card on your PC, the new game includes proprietary software-based MPEG decoding that works on all machines. While impressive, the software-only playback doesn't match the smoothness and quality of video played over MPEG hardware.

The MPEG version of Sierra On-Line's Police Quest 4: Open Season uses extensive custom video sequences of southern California to help you solve a brutal murder. The game also exploits MPEG's audio support with a rock and rap soundtrack enhanced with state-of-the-art sound effects. Video Cube from Aris Entertainment now comes in an MPEG version with more than

100 full-motion video clips. Other Aris MPEG titles include MPC Wizard, WorldView, Animal Kingdom, Americana, and New York, N.Y., all of which are collections of video clips and utilities.

MPEG also enhances such nongaming titles as The Software Toolworks' 20th Century Video Almanac, which uses more than 100 MPEG video sequences to cover everything from 1916 to Woodstock, and an updated version of Compton's Interactive NewMedia Multimedia Encyclopedia and The Sporting News Pro Football Guide.

That's only the beginning. Other upcoming ReelMagic titles include video postcards such as Mozart Visits Yosemite, Mozart Visits the Grand Canyon, Mozart Visits Yellowstone, and Mozart Visits Hawaii, as well as learn-as-you-view titles like The Nature of Hunting and Learning Fly Fishing—all from EE Multimedia. Tsunami has an MPEG version of its Man Enough dating game. Video Toys Software has encoded its Matinee screensaver in MPEG. And more ReelMagic games are under development from entertainment producers such as Intellimedia Sports, Opti-Vision, Psygnosis, and Velocity.

The upgraded Matinee screen-saver uses full-screen video.

Philips CD-i Commits to MPEG

While PCs get the most attention, full-motion digital video is most advanced on Philips's CD-i set-top gaming console. The company shipped an MPEG-based Digital Video cartridge for its players this spring, and it has moved aggressively to release MPEG games and multimedia titles, as well as digital movies and music videos. As CD-i's base technology is overtaken by newer competitors like 3DO and CD^{32}, MPEG digital video is becoming critical to Philips's marketing pitch.

The company actively supports digital video, and far more full-motion games, multimedia titles, and movies are available for CD-i than for any other format. Four to five new CD-i digital video titles are coming out every week.

Look for digital video to enhance the graphics in Phillips's Caesar's World of Boxing

and bring a new level of realism to the venerable Mad Dog McCree from American Laser Games. This version looks just as good as the original arcade shoot-'em-up. A digital video CD-i release of Trilobyte's 7th Guest is also on tap, along with LucasArts' Rebel Assault.

But while games remain important to CD-i, Philips is concentrating on mainstream entertainment. The company has signed deals with Paramount and MGM/UA to release more than 80 movies in the new format this year. Already, a couple of dozen movies are on the market, including *Apocalypse Now, Black Rain, Fatal Attraction, The Firm, The Hunt for Red October, Indecent Proposal, The Naked Gun 2 1/2: The Smell Of Fear, Patriot Games, Posse, Sliver, Star Trek VI: The Undiscovered Country, Top Gun,* and *White Christmas.* Music-video titles include "Bon Jovi: Keep The Faith," "Bryan Adams: Waking Up The Neighbors," "Eric Clapton: The Cream of Clapton," and "Sting: Ten Summoner's Tales."

Somewhere between games and movies lie digital video titles such as Total Vision's Titanic, which documents the fatal maiden voyage of the supposedly unsinkable ocean liner. Patrick Stewart from "Star Trek: The Next Generation," narrates. Titles geared to other tastes include The Joy of Sex and Playboy's Complete Massage. Philips is also working on a variety of even more adult-oriented CD-i titles using the Digital Video cartridge. The company has signed a deal with erotica producer Vivid Interactive and is already working on a strip poker game.

Originally, the CD-i Digital Video format was nonstandard, not the pure MPEG Video CD format endorsed by most vendors in mid-1993. But since it represented the lion's share of CD-based movies, makers of other MPEG hardware were supporting the CD-i movie format. Sigma Designs recently announced an upgrade path to the Reel-Magic card that lets PCs play CD-i format movies. Now Philips has switched to a standard MPEG approach with all the movie titles to be released early summer.

Playboy's Complete Massage uses MPEG to deliver great-looking CD-i video.

Macintosh Still Stuck on Software

Back in 1991 Apple set the standard for the software-based QuickTime video file format. And with a high-speed Macintosh, or one of the new PowerPC machines, QuickTime can deliver higher resolution, larger video windows, and faster frame rates than ever before. The result is performance that can be quite respectable, if not up to MPEG standards.

That's fortunate, since the Mac is behind the curve in implementing MPEG. That should change late this summer or early fall, when Radius, a major third-party vendor of Mac hardware, introduces a Reel-Magic card for the Mac based on technology licensed from Sigma Designs. The product—to be sold under both the Radius and ReelMagic names—is said to include software designed to let MPEG-equipped Macs play software developed for MPEG PCs. Prices are expected to run $500 to $800.

You can look for more Mac MPEG boards and software to appear later this year. A Mountain View, California, company called Wired for example, is already selling developers a $2,500 MPEG decompression board that works with the Mac's NuBus. Wired is negotiating with large board manufacturers to create a consumer version, which would sell for $600 to $700.
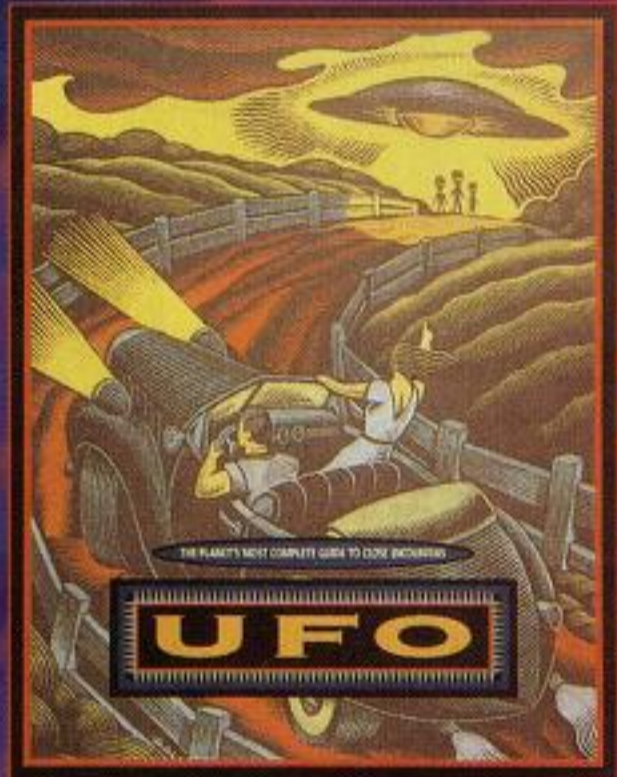
To ease the transition to hardware-assisted video, Apple has announced that QuickTime 2.0 will directly support the MPEG file format. This will make it easy for developers to transfer their QuickTime-based titles to MPEG.

And rumors are circulating that as-yet-unannounced Macs will have video-decoding hardware built in. If those rumors are true, Apple may be the first company to make digital video a true standard component of computers.

3DO Does It Hard and Soft

The introduction of the 3DO format last fall generated intense interest. The 3DO format

The Joy of Sex on CD-i is enhanced with the joy of full-motion video.

guide

her satisfaction
ourselves
clothes
arousal
his satisfaction
massage

quit

uses a powerful main processor bolstered with a pair of dedicated graphics chips to deliver impressive video performance.

Using Cinepak software video, 3DO machines can play reasonably detailed video covering the full screen at a frame rate fast enough to satisfy many users—up to 15 to 20 frames per second, depending on how the video is produced. However, there are still some compromises on image quality. In the worst cases, the video looks just plain chunky and low resolution. That's why even 3DO is investing in MPEG technology, with a hardware add-on due out soon.

Of course, the technology doesn't mean a thing without the games and multimedia titles to back it up. So American Laser Games, for example, plans to ship MPEG versions of Mad Dog McCree and the new Who Shot Johnny Rock? for 3DO. Look for ReadySoft to come out with a 3DO MPEG version of Dragon's Lair, since the company already makes versions for MPEG PCs and standard 3DO machines. And gaming giant and 3DO investor Electronic Arts is expected to use MPEG video in both Shockwave, a space-based shoot-'em-up, and Road Rash, a hot motorcycle racing game.

The Advent of CD^{32}

Commodore's Amiga line of computers set video benchmarks when they were introduced in 1985, and much of the Amiga technology is incorporated into the $400 CD^{32} game console.

The Amiga has always supported full-screen animation,

and with the addition of a $250 MPEG module, CD^{32} is capable of playing full-motion digital video in multiple formats, including its own software-based CDXL video sequences, standard Video CD, and CD-i Digital Video. Careful testing showed no problem playing CD-i movie titles on a properly equipped CD^{32}.

The availability of proprietary software remains a problem, though. While developers have released several dozen games for CD^{32}, the format is still brand-new. As of early spring, no MPEG game titles specific to the CD^{32} system were available. Several games are reportedly under development in Europe, including a football game with extensive sequences in full-motion video.

CD^{32} is already widely available in Europe and Canada, and as its U.S. introduction ramps up, its MPEG capability is expected to receive support from new titles, including Psygnosis's Microcosm.

A Full-Motion Future

Despite the incredible number of options, this is just the beginning of real video in games. Game players are some of the most demanding users in the world, and right now they're demanding better video and graphics. Hardware makers and software developers are scrambling to give it to them.

Faster com-

Who Shot Johnny Rock? will use MPEG to shoot better video.
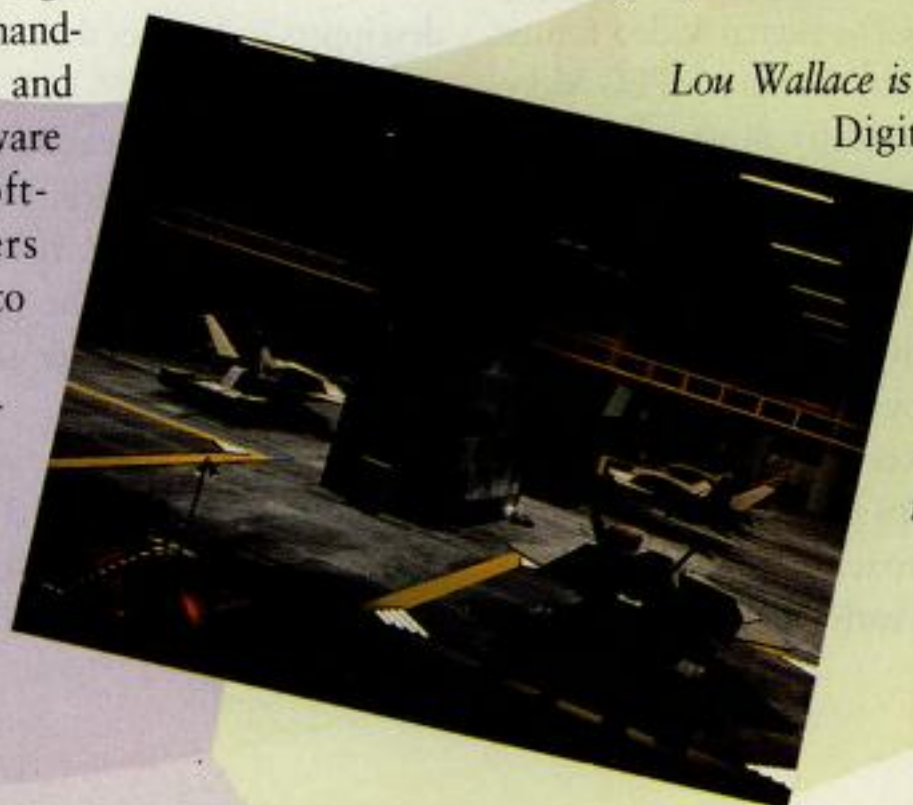
puters based on the Pentium and PowerPC chips will make software-based video solutions more acceptable. At the same time, MPEG solutions will get cheaper and more numerous. Within a year or two, look for MPEG capability to be included on multifunction sound cards, on VGA controller cards, or even on the motherboard, removing the need for separate video and sound cards.

Most observers agree that MPEG offers the video quality to pull off this radical transformation. The key to when, and whether, it happens is the software. For MPEG to catch on, movie studios and game and multimedia developers must release games and titles that support it. Available software will spur more hardware sales, creating an even more attractive software market.

Once a critical mass is reached, probably in a couple of years, digital video technology will become as pervasive, and invisible, as VHS. You'll simply rent or buy a movie, game, or multimedia title, and play it on whatever type of computer or set-top box you might have.

The combination of TV-quality video and no-brainer compatibility is the key to expanding games and multimedia beyond an avid but limited group of aficionados. Despite vast improvements in game graphics, to the casual observer today's games still look like cheesy cartoons. Most people won't be interested in playing along until they see games and titles that approach the visual quality of the TV shows they're used to watching. With the arrival of MPEG for computers and set-top boxes, that's exactly what they'll get.

Shockwave for 3DO will use full-motion video to set up its action sequences.

Lou Wallace is editor in chief of Digital Video *magazine, a multiplatform magazine focused on the convergence of video and computer technologies.*

THE COMPUTER VIDEO STORE

The Hardware

CD-i (Philips Consumer Electronics; 800-824-2567; CD-i players, $399-$499; CD-i Digital Video Cartridge, $249)

CD32 (Commodore Business Machines; 215-431-9100; $399; MPEG Module, $249)

Dell Dimension XPS P60 (Dell Computer; 800-289-3355; $2,999)

Real 3DO Interactive Multiplayer (Panasonic; 800-732-5330; $499)

ReelMagic (Sigma Designs; 800-494-8848; PC, $449)

ReelMagic CD-ROM Upgrade Kit (Sigma Designs; 800-494-8848; PC, $849)

ReelMagic Lite (Sigma Designs; 800-494-8848; PC, $349)

Mark III Cybervision and Hypervision Multimedia Upgrade Kits (Smart and Friendly; 800-366-6001; PC, price varies according to CD-ROM drive speed and buffer size)

The Software

NOTE: Many of these titles require MPEG hardware to run or to display optimal video quality.

Americana (Aris Entertainment; 310-821-0234; CD for Windows, $29.95)

Animal Kingdom (Aris Entertainment; 310-821-0234; CD for Windows, $29.95)

Caesar's World of Boxing (Philips Media Games; 800-824-2567; CD-i, $49.98)

Compton's Interactive Encyclopedia (Compton's New Media; 800-862-2206; CD for DOS, $149)

Dragon's Lair (ReadySoft; 905-731-4175; CD for DOS/Mac/3DO/Sega, $69.95)

The 11th Hour (Virgin Interactive; 800-874-4607; CD for DOS, $99.99)

The Joy of Sex (Philips Media Home Entertainment; 800-824-2567; CD-i, $49.98)

Learning Fly Fishing (EE Multimedia Productions; 801-973-0081; CD for DOS, $24.95)

Lord of the Rings Enhanced CD-ROM (Interplay Productions; 800-969-4263; CD for DOS, $64.95)

Mad Dog McCree (American Laser Games; 800-863-0234; CD for DOS/3DO/CD-i, $59.95; CD for Sega, $54.99)

Man Enough (Tsunami Media; 800-644-9283; CD for DOS, $79.95)

Matinee (Video Toys Software, 800-386-4272; CD for DOS, $59.95)

Mozart Visits Hawaii, Mozart Visits the Grand Canyon, Mozart Visits Yellowstone, and Mozart Visits Yosemite, (EE Multimedia Productions; 801-973-0081; CD for DOS, $24.95 each).

MPC Wizard (Aris Entertainment; 310-821-0234; CD for Windows, $14.95)

The Nature of Hunting (EE Multimedia Productions; 801-973-0081; CD for Windows, $24.95)

New York, N.Y. (Aris Entertainment; 310-821-0234; CD for Windows, $29.95)

Playboy's Massage (Philips Media Home Entertainment; 800-824-2567; CD-i, $39.98)

Police Quest 4: Open Season (Sierra On-Line; 800-743-7725; CD for DOS, $59.95)

Return to Zork (Activision; 800-477-3650; CD for DOS/Mac, $79.95)

Road Rash (Electronic Arts; 800-245-4525; 3DO, $69.95)

Shockwave (Electronic Arts; 800-245-4525; 3DO, $69.95)

Space Ace (ReadySoft, 905-731-4175; CD for DOS/Mac/3DO/Sega, $59.95–$69.95)

The Sporting News Pro Football Guide (Compton's NewMedia; 800-862-2206; CD for DOS, $39.95)

Titanic (Total Vision; 800-824-2567; CD-i, price not available)

20th Century Video Almanac (The Software Toolworks; 800-634-6850; CD for DOS, $49.95)
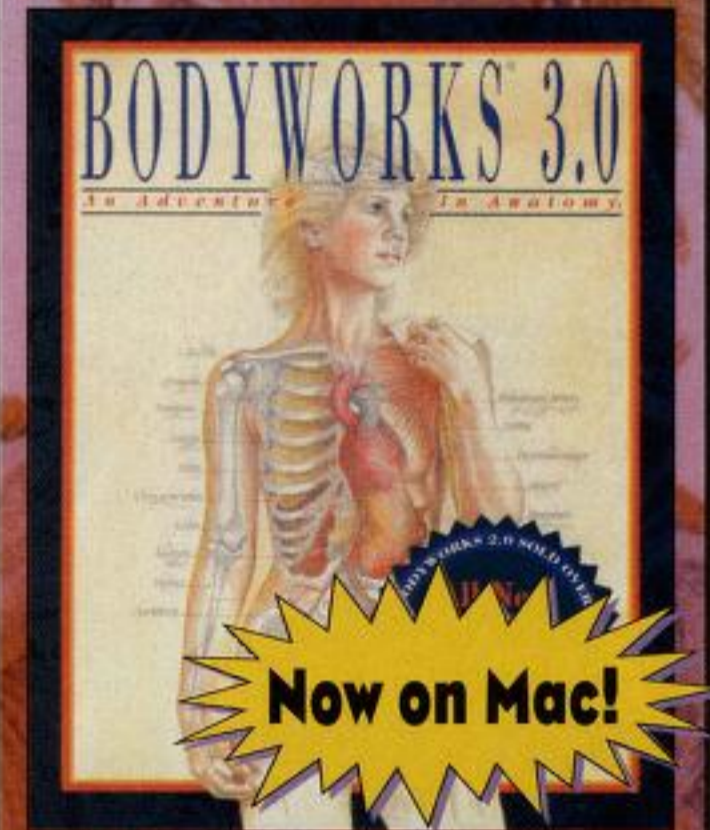
Video Cube (Aris Entertainment; 310-821-0234; CD for Windows, $29.95)

Who Shot Johnny Rock? (American Laser Games; 800-863-4263; CD for DOS/3DO/Sega, $59.95)

WorldView (Aris Entertainment; 310-821-0234; CD for Windows, $39.95)