CHAPTER 5

Entertainment

After completing this chapter, you will be able to:

- **Understand how multimedia is transforming the entertainment industry by moving from passive to interactive art forms**
- **Recognize how multimedia techniques are being used to create cinematic special effects**
- **Question the ethics of digital cinema**
- **Understand how realistic and violent video arcade games have become**
- **Recognize how virtual reality is making interactive environments more immersing and persuasive**

Much of the innovation in multimedia sound and graphics originates in the entertainment industry. There is intense competition among cinematographers and video game producers to deliver the most dazzling and engaging special effects. Interactive movies appearing on CD and DVD encourage the user to influence the story or play a role in it. Research and development in virtual reality are providing new visualization, mobility, and tracking devices that immerse the user so completely that the simulated experience seems real.

Cinema

Moviemakers are investing heavily in the development of multimedia software to make movies more engaging. Producers use multimedia computers to create realistic special effects through digital imaging, rendering, animation, morphing, superimposition, replacement, and surround sound. Remember, however, that although multimedia computers may have been used to produce a movie, watching the movie is not a multimedia experience unless you can interact with it and play a role in what happens.

Morphing

One of the more interesting multimedia effects is called **morphing**, a computer graphics technique in which one image is transformed into another in a seamless, uninterrupted segment. Duncan (1991) describes how morphing was used in the Arnold Schwarzenegger hit movie *Terminator II* to create the model 1000 terminator, a liquid metal machine that could imitate any form with which it came into contact. *Terminator II* went on to win Academy Awards for best visual effects, makeup, sound, and sound effects.

Morphing was used to convey a theme of racial harmony in Michael Jackson's music video *Black and White*. Duncan (1992) tells how 13 young people of varied racial and ethnic backgrounds were transformed into one another in a segment lasting only a minute.

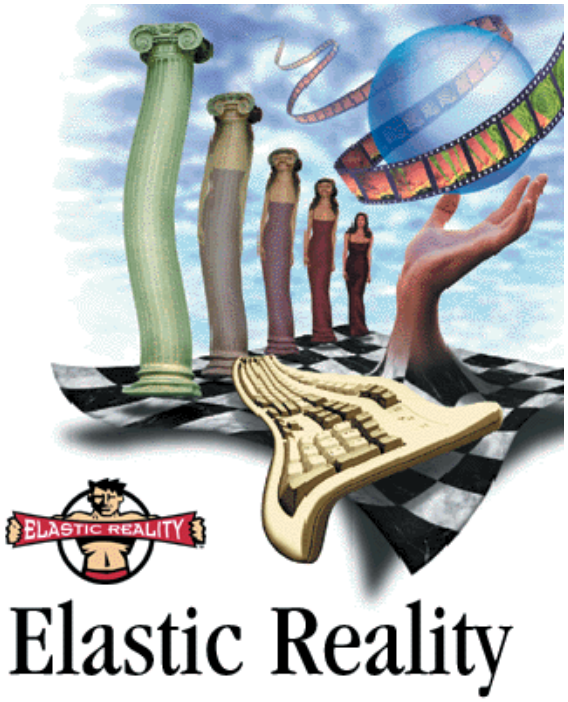

Figure 5-1 Avid's Elastic Reality enables you to morph and warp still graphics to create high-quality animations.

Pictured in Figure 5-1, Avid's Elastic Reality software has rendered morphs for hundreds of television and feature film productions. It combines photographic realism with the freedom of artist-controlled elasticity; hence the name, Elastic Reality. Figure 5-2 shows how the artist can adjust distortion, color, rotation and layering priority over time. In Figure 5-3, the artist sets parameters on key frames for animating character expressions. To learn more, follow the *Multilit* Web site link to Avid's Elastic Reality.

The *Multilit* Web site links to several online examples of morphs that you can view for free. If you want to create morphs of your own, follow the link to SuperGoo, which lets you stretch, warp, and smear images in real time as though the images were liquid. SuperGoo saves the images in a series of key frames that work like a digital flip book you can render into a QuickTime movie. To create characters that not only morph but also speak and display emotions, follow the *Multilit* Web site link to Haptek's Virtual Friends.

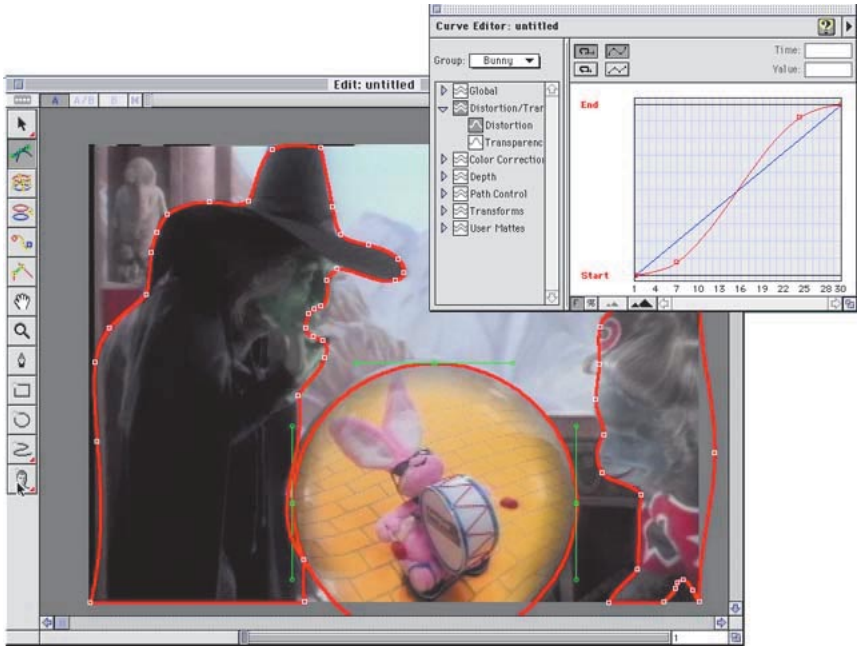

Figure 5-2 The curve editor in Avid's Elastic Reality adjusts distortion, color, rotation, and layering priority over time.

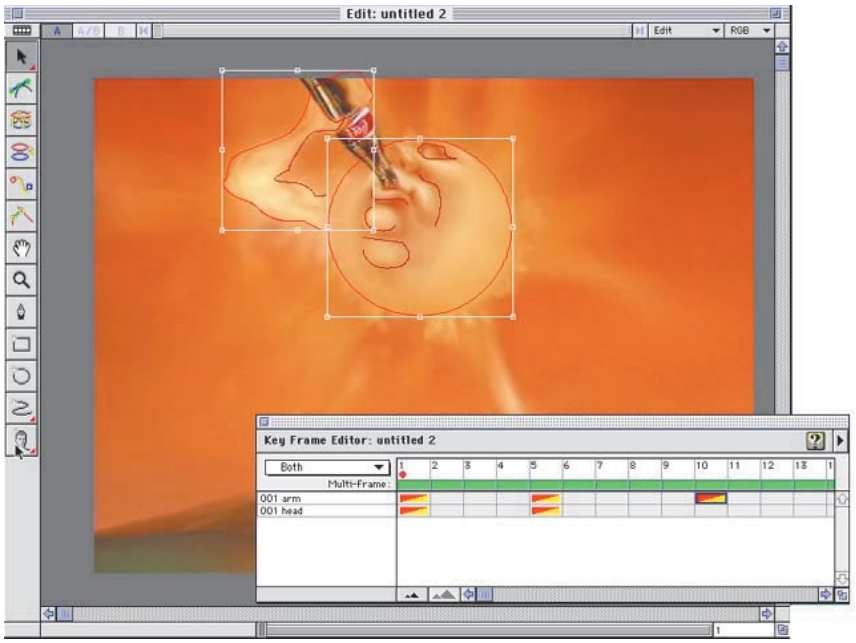

Figure 5-3 Avid's Elastic Reality has powerful key frame capabilities for animating character expressions.

Superimposition

When Gabe (played by Sylvester Stallone) failed in his attempt to rescue Sarah (Michelle Joyner) in the movie *Cliffhanger,* she fell thousands of feet to her death. Or so it seemed. In reality, Sarah fell only 35 feet into a stunt bag. Kaufman (1993) tells how an IBM Power Visualization System (PVS) superimposed her fall into the stunt bag over dramatic photographs of the Dolomites. Developed originally for high-end scientific visualization, the PVS is a rendering, compositing, editing, and viewing tool powerful enough to display composited shots at 30 frames per second (fps).

Animation

The dinosaurs in the Spielberg film *Jurassic Park* took animation to a new level. To tap the talent of stop-motion animators and translate it into the digital domain, a clever interface called the Dinosaur Input Device (DID) was created. As skilled animators moved mechanical dinosaurs to create realistic body movements, the DID created a wireframe model which was converted to a SoftImage file that could be refined through computer animation. Duncan (1993) describes how the mechanical models ensured that the dinosaur's spine, neck, tail, legs, and arms moved correctly, while the computer animated the fingers, toes, and mouth. Once the DID and SoftImage animations were complete, computer animators at Industrial Light & Magic (ILM) did the final rendering, adding breathing effects and the organic wobble of the dinosaur skin. ILM even made computer-generated rain stream off the back of the tyrannosaurus rex to establish realism in one rainy scene.

Toy Story is a Disney film produced by Pixar, which is probably the most innovative 3-D animation company in the world. If you have not seen *Toy Story,* treat yourself by viewing it. While you watch the film, remember that every single frame was computer-generated. At the end of the movie, view the credits. You will be impressed by the number of technicians involved and the new job positions created. Table 5-1 contains

some interesting statistics about the production of *Toy Story*. Disney also publishes the CD-ROM *Toy Story Animated Story Book*. Designed for children ages three to nine, the CD follows the movie's story line and features educational games on basic skills taught in the context of the story.

Table 5-1 *Toy Story* Statistics

Object Type	Number
Number of bytes required to store the film information	1 trillion (1 terabyte)
Minutes of completed animation produced each week	3.5
Months it took to write the shader for Andy's hair (it took the longest)	9
"Built-in" lights on Buzz	10
Least number of minutes required to render a frame of film	45
Most number of hours required to render a frame of film	20
Number of characters	76
Minutes of computer animation	77
Number of Sun Workstations in Pixar's Renderfarm operating on a 24-hour basis	110
Texture maps for Buzz (plus an additional 450 to show scuffs and dirt)	189
Gigabytes required to store final frames	500
Number of avars (variables which an animator can control) for Buzz	700
Number of avars for Woody	712
Number of avars for Woody's face	212
Number of avars for Woody's mouth	58
Number of avars for Sid's backpack	128
Number of leaves on the trees in Andy's neighborhood	1.2 million
Number of shaders written for the production	1300
Final number of shots in the film	1561
Number of frames of computer animation in the film	110,064
Number of texture maps created for the film (most are painted digitally, but some are photographed and scanned; the carpet in Sid's house was taken from *The Shining*)	2000
Number of storyboards drawn	25,000
Number of lines in model program required to describe Buzz	34,864
Number of lines in model program required to describe Woody	52,865
Number of machine hours required to render frames	800,000
Number of lines of code needed to create the film's models	4.5 million

Building on the success of its predecessor, *Toy Story 2* provided another opportunity for Buzz and Woody to star in what was to become the top-grossing animated film to date. For more information about the movie and related products, follow the *Multilit* Web site links to *Toy Story 2.* To learn about the Renderman family of animation products used to create the *Toy Story* characters, follow the links to Pixar.

Digital Recasting

A series of Diet Coke commercials feature the classic black-and-white film stars Humphrey Bogart, Louis Armstrong, and James Cagney playing in full color alongside contemporary stars such as Elton John and Paula Abdul. How can Bogart, Armstrong, and Cagney star in a modern commercial? Were look-alikes found to play the parts of the classic actors? Or were the original films colorized and modern actors somehow superimposed onto them?

Hubbard (1992) explains how digital video techniques were used to create the Diet Coke commercials. First, the classic films were digitized. Then traditional and electronic rotoscoping techniques were used to extract the classic actors from their original environments. Next, the commercials were composited in layers, with a background layer of people seated and dancing, middle layers in which the archival characters interact with the modern actors, and a foreground layer in which people cross in front of the rotoscoped classic actors to impart a sense of reality. Finally, the original actors were colorized, and finishing touches were added, like putting Louis Armstrong's reflection alongside Elton John's on the top of the piano. Digital video editing permitted all of this to be done without any loss of quality. Traditional editing would have required many generations of videotape, with each video transfer progressively degrading the picture quality.

Video Games

Video games have come a long way since Pong and PacMan. Advances in computer graphics have replaced stick figures and cartoonlike drawings with actual photographs of scenes and characters digitized on multimedia computers. Digital audio has made video games more realistic by providing instant access to recordings of the actual sounds made by characters and objects in the game. New input devices use lasers and 3-D mice to let the user interact more intimately with objects on the screen.

The best place to see the new technology is in video arcades. As the technology progresses, the innovations that emerge first in the arcades become available in portable versions you can play at home. Unfortunately, some of the most violent and offensive games become mass market hits. As this book goes to press, the best-selling video game, *Mortal Kombat,* contains such graphic violence that it provoked a public outcry in favor of government intervention and rating systems for video games. Although *Mortal Kombat* has controls parents can set to limit the level of violence in the game, most kids are more computer literate than their parents and have already figured out how to make the games more violent. To find out about the latest release, follow the *Multilit* Web site link to *Mortal Kombat.* While there, look for links to *Quake,* which is *Mortal Kombat*'s primary competitor. In Chapter 16 you will be asked to consider whether graphically violent and sexually exploitative games increase the likelihood that young people will engage in similar behaviors in real life.

Interactive Movies

Interactive movies played on multimedia computers let the viewer influence how the story unfolds. In Cyan's *Myst,* for example, you are mysteriously transported to the ancient island shown in Figure 5-4. Soon you learn that your presence there is not an accident. You must travel through several 3-D photorealistic worlds to untangle a web of treachery and deceit. Live actors appear superimposed on stunningly rendered 3-D scenes, such as the graphic shown in Figure 5-5.

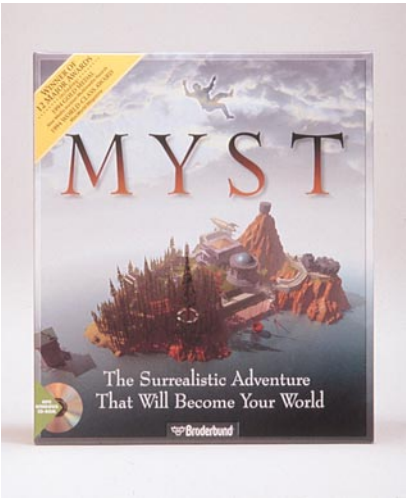

Figure 5-4 Cyan's *Myst* has surpassed 7 million copies sold.
Myst®Cyan, Inc.

Figure 5-5 Screen from the Channelwood Age in *Myst.*
Image©Cyan, Inc. All rights reserved.

Myst has a fully developed story line. The island was created by Artrus, who discovered the secret of writing books that create worlds and transport you from one world to another. But a plot against Artrus has apparently left his island and his worlds deserted. Your challenge is to uncover the story of *Myst* and find Artrus and his family. Filled with clever puzzles and unexpected twists and turns, *Myst* is a thinking game that requires 40 to 60 hours to complete. The user points and clicks with a mouse to solve the puzzle. The only directions explain merely how to move around. You can find out more by following the *Multilit* Web site link to *Myst.*

Also linked to the *Multilit* Web site is an interactive movie named *Dust: A Tale of the Wired West.* The year is 1882. You're a stranger in Diamondback, New Mexico. Mayhem follows rumors of lost Spanish silver. To discover the keys to your survival, you must unravel the mystery of the lost silver as you interact with more than 35 characters who remember your actions and behave accordingly. A strong story line pulls you into the drama as you experience interactive storytelling at its best.

Virtual Reality

Virtual reality (VR) refers to the use of a computer to immerse the user into a simulated experience so authentic it seems real. VR systems often use special hardware to enhance the experience, including visual displays (monitors, head-mounted viewing goggles, periscope booms, and direct eye scanning), tracking devices (data gloves, joysticks, body

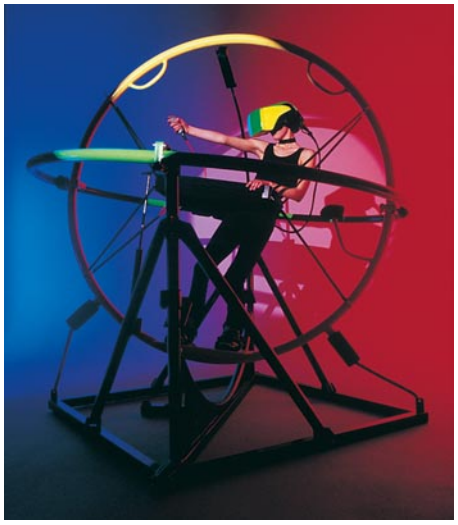

Figure 5-6 The Cybertron gyroscopic virtual reality system.

Figure 5-7 3-D graphic produced with PhotoVR technology.

suits, or infrared tracking), and mobility devices (motion platforms, treadmills, stationary bicycles, trackballs, and flying mice that let you move in a 3-D space).

One of the most participatory VR systems is the Cybertron by Straylight. Figure 5-6 shows how the user maneuvers by bodily pivoting and tilting the gyro mechanism. Straylight uses quadraphonic CD audio and 3-D imaging to enhance the experience. For example, Figure 5-7 shows a scene from Straylight's PhotoVR, a photorealistic VR engine that lets users explore highly realistic 3-D virtual environments. PhotoVR imports 3-D designs created with CAD (computer-aided design) programs and lets the user move around the 3-D environment in real time. To learn more about these and other exciting VR products, follow the *Multilit* Web site link to Straylight.

Figure 5-8 shows CrystalEyes VR hardware from StereoGraphics that lets you interact with stereoscopic images as depicted in Figure 5-9. As you move your head from side to

Figure 5-8 The CrystalEyes VR hardware consists of a lightweight, wireless set of 3-D liquid crystal shutter eyewear and an infrared emitter.

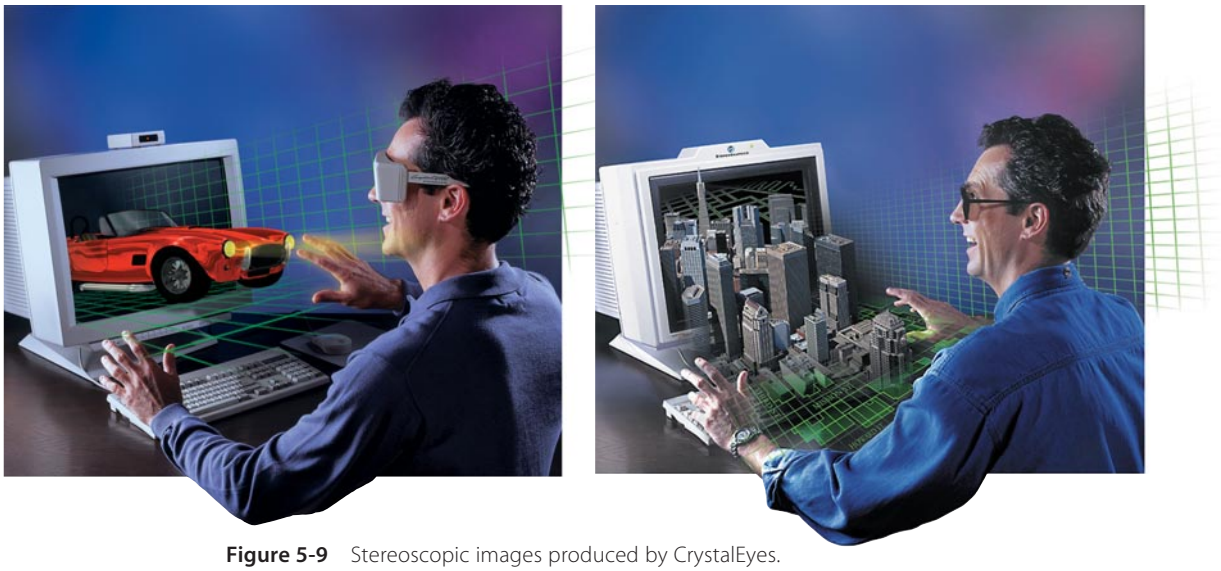

Figure 5-9 Stereoscopic images produced by CrystalEyes.

side, closer to or farther away from the monitor, the image on the display changes its perspective, creating the convincing illusion that the image is a real object. The tracking mechanism uses an infrared emitter. Thus, the user's hands are free to interact with other peripherals, such as the computer keyboard or mouse. For the latest information on CrystalEyes, follow the *Multilit* Web site link to StereoGraphics.

The entertainment industry is using VR to create virtual actors. Known as VActors, virtual actors appear on-screen as animated characters whose actions are controlled by humans wearing VR sensors. Special input devices track the actor's face, body, and hand movements. SimGraphics Engineering has created VActors for Nintendo to use in trade shows, live TV interviews, videodiscs, and mall tours. SimGraphics has also created VActors for Interplay Productions (*Mario Teaches Typing* CD-ROM), Fugi Television (touring exhibition), Hewlett-Packard (corporate video), and NHK (a high-definition television commercial). A VActor named Ratz the Cat is performed by comedian Paul Brophy on the British television shows *Live and Kicking* and *Children's BBC.* For more information on VActor technology, follow the *Multilit* Web site link to Cooper and Benjamin's treatise on *Dramatic Interaction in Virtual Worlds.*

Virtual reality has also brought Mark Twain to life in the form of *Twain-VR,* a 3-D character created by Color Concepts & Images. The brainchild of Lake Tahoe-based multimedia producer Gary Jesch in collaboration with Twain impressionist McAvoy Layne and co-producer Susan Margolis, virtual Mark Twain is spookily similar to the man himself in appearance, in his words and experiences, and in the way he sounds. For more information about Mark Twain and other virtual characters, follow the *Multilit* Web site link to CHOPS & Associates.

Tracking body movements is a tricky problem addressed by Ascension Technology Corporation's Flock of Birds tracking devices, which provide real-time, simultaneous tracking of up to 30 receivers over medium and long ranges. The Flock is typically used for head, hand, and body motion tracking in applications ranging from flight simulation and virtual reality to medical instrument localization and motion capture for character animation. The Flock can transmit up to 144 position and orientation measurements per second. For more information about the Flock, follow the *Multilit* Web site link to Ascension Technology.

Atlantis Cyberspace has a virtual reality entertainment Web site where you can find out about all of the commercially available VR systems and learn where the nearest VR theme park is in your locale. Follow the *Multilit* Web site link to Atlantis Cyberspace.

exercises

1. Attend the latest box office hit movie, or view the latest soft drink commercials. Watch for multimedia techniques. Try to find examples of digital imaging, rendering, animation, morphing, superimposition, replacement, and surround sound. How could the movie or commercial have been improved through more use of multimedia?

2. Get an interactive movie by either purchasing it from your local software store, borrowing it from a library, or buying it online at amazon.com. After playing the movie, answer these questions. What is the title of the movie you played? Who published it, and what is its copyright date? How interactive was the movie? How immersing was it? Did you really feel like you were an essential part of the movie? What role did you play? Were you able to influence the movie's outcome? Do you prefer this kind of involvement to just watching a traditional movie? Why or why not?

3. Digital editing techniques permit actors to play in scenes they have never visited physically. Singers are having their voices digitized so they can continue to record new songs after their singing voice wanes. Comment on the ethics of this. Will digitized actors and voices create problems for younger artists who cannot find work if older actors can continue to play long after they would have been forced into retirement without multimedia?

4. When the VCR was invented, it did not sell very well until videotapes of movies too sexually explicit and violent for TV became available. Will the success of multimedia similarly depend on the sale of violent and sexually explicit interactive titles, or could the industry survive if titles that provoke violent and sexually exploitative behavior were taken off the market?

5. Browse to vr-atlantis.com and choose "Where to experience VR" to find out where the nearest VR theme park is in your locale. Visit the theme park and try some VR. Describe the experience. Did you feel like you were actually "in" the situation in which the VR tried to immerse you? How real did the simulated experience feel?