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## Part 7: Movie Retrospective

*Celebrating our 25th year with digital visual effects and scenes from animated features*

By Barbara Robertson

Although Looker (1981) was the first film with shaded 3D computer graphics, Tron (1982) was the first with 15 minutes of computer animation and lots of shaded graphics. Some believe Tron's box office failure slowed the adoption of digital effects, but now most films include computer graphics. Indeed, last year, of the top 10 box office films, eight had hundreds of digital effects shots or were created entirely with 3D computer graphics. During the past two decades, CG inventors have been inspired by filmmaking to create exciting new tools. In so doing, they have inspired filmmakers to expand the art of filmmaking—as you can see on the following pages. What's next? CG tools move downstream. Synergy gets energy.

(The date at the beginning of each caption refers to the issue of Computer Graphics World in which the image and credit appeared. The film's release date follows the caption.)

**July 1982** For this one-minute "Genesis effect" during Star Trek II: The Wrath of Khan, a dead planet comes to life thanks to the first cinematic use of fractals, particle effects, and 32-bit RGBA paint software from Lucasfilm's Pixar group. (Premiere: 6/82)



**April 1982** When Disney's Tron was envisioned, few companies knew how to create CG effects, yet the film needed all-digital shots inside a videogame. Although now recognized as landmarks, the visual effects created by MAGI, Triple-I, Robert Abel & Associates, and Digital Effects are ignored by the Motion Picture Academy of Arts and Sciences' Visual Effects Branch. (Premiere: 7/82)



**July 1982** Creating the dark, futuristic vision of LA in Blade Runner is accomplished using model shots and painted backgrounds. Several different kinds of software systems help generate computer-controlled camera moves on stage by, for example, fitting motion curves to selected key frames. (Premiere: 6/82)

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**October 1983** For Star Wars: Episode VI: Return of the Jedi, Lucasfilm's Computer Division creates one effect: a wire-frame "holographic" model of the Death Star under construction. The division evolves into two groups, Games and Pixar. Pixar is sold to Steven Jobs in 1986. (Premiere: 5/83)



**July 1984** For The Last Starfighter, Digital Productions creates CG spaceships, planets, and high-tech hardware that are integrated into live-action scenes.

It is unusual that the CG tools are used for images that aren't supposed to look computer generated. (Premiere: 7/84)



**May 1986** Arguably, the first 3D character in a feature film is a knight who leaps out of a stained glass window in Young Sherlock Holmes. The Pixar group at Lucasfilm uses new motion blur technology and its 32-bit RGBA paint system to create the effect. (Premiere: 12/85)



**October 1989** Using Alias/2 animation software running on SGI's 4D/120 workstation, Pixar's RenderMan running on a Pixar Image Computer, and data from Cyberware's scans, ILM creates the water tentacle for The Abyss. Storyboards are scanned into SuperMac's PixelPaint and edited with not-yet-released software called Photoshop. (Premiere: 8/89)



**August 1990** To animate these skeletons for Total Recall, Metrolight Studios tries using motion capture on set, but this first attempt to use mocap in a film fails. Instead, the studio rotoscopes film shot in low light during the capture. The visual effects win a special achievement Academy Award. (Premiere: 6/90)



**October 1991** Director Jim Cameron develops Terminator 2, which doesn't simply include CG but relies on it for the liquid-metal, shape-shifting T-1000 character, which is modeled, animated, rendered, and morphed at ILM. (Premiere: 10/91)



**December 1991** Although 3D graphics debuted in earlier Disney animations, *Beauty and the Beast* is the first in which hand-drawn characters appear in a 3D background. Every frame of the film is scanned, created, or composited within Disney's computer animation production system (CAPS) co-developed with Pixar. (Premiere: (11/91)



**April 1992** To create 20 minutes of *The Lawnmower Man's* version of VR, Angel Studios, Xaos, Inc., and Homer & Associates use motion capture, particle systems, algorithmic-based paint, and other state-of-the-art techniques running on SGI workstations. (Premiere: 3/92)



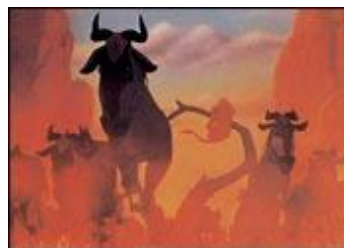
**December 1993** When ILM's Dennis Muren convinces Stephen Spielberg to use computer graphics dinosaurs as well as animatronics in *Jurassic Park*, movies are forever changed. In ILM's 80 effects shots, full-size dinosaurs move freely in background plates, and the first digital double gets lunched. (Premiere: 6/93)



**December 1993** Rather than train a real whale to leap to freedom in the open seas, VIFX inserts a CG whale between shots of animatronics for *Free Willy*. The CG orca is created with Symbolics software and hardware and rendered with RenderMan. (Premiere: 7/93)



**July 1994** For *The Lion King*, Disney Feature Animation's CGI department animates crowds of 3D wildebeests and integrates them into painted backgrounds, and Disney unveils its closely guarded computer animation and production system (CAPS), co-developed with Pixar. (Premiere: 6/94)



**July 1994** Rarely have CG effects been used in as lively a way as the Tex Avery-style ones created by

ILM for *The Mask*. The studio helps turn Jim Carrey into a live-action cartoon and does odd things with his dog, too. (Premiere: 7/94)



**June 1995** Casper is arguably the first 3D lead character in a live-action film and definitely the first 3D lead character animated at ILM. ILM creates 200 effects shots for the film, many of which integrate semi-transparent characters into live-action backgrounds. (Premiere: 6/94)



**January 1996** Following the success of the CG dinosaurs in *Jurassic Park*, ILM is asked to produce numerous realistic CG animals for *Jumanji*, including monkeys and a lion, which causes the studio to develop custom software to create, animate, and render monkey and lion fur, and long hair for the lion's mane. (Premiere: 12/95)



**August 1996** To create the tornado for *Twister*, ILM develops a custom interface for Wavefront's *Dynamation* to generate controllable, rotating funnels of particles, and a special-purpose particle renderer that runs on SGI's *Challenge*. (Premiere: 5/96)



**August 1997** Although the background is a miniature set, the cars are CG. Digital Domain creates digital effects for *The Fifth Element* with *Power Animator*, *Softimage 3D*, *Prisms*, *RenderMan* and, for LeeLu's reincarnation, data from the *Visible Human* project. (Premiere: 5/97)



**September 1997** Many of the 218 visual effects shots created at Tippett Studios for *Starship Troopers* are filled with crowds of huge, evil, alien bugs. The team uses *Softimage 3D*, *Dynamation*, *Amazon 3D Paint*, and *Photoshop*. Also, a custom "Bug Input Device" allows puppeteers to animate the 3D warrior bugs in real time. (Premiere: 11/97)



**January 1998** Digital Domain, the lead studio on *Titanic*, breaks new ground by putting thousands of digital people, animated with the help of motion capture, onboard the ship. The studio also creates CG set extensions and digital water. The film receives an Oscar for visual effects, and goes on to earn more money than any other film to date. (Premiere: 12/97)



**July 1998** By becoming the second studio to create a successful feature animation with 3D computer graphics, PDI helps ensure the future of the new medium. For *Antz*, the studio creates new crowd and water-simulation systems and muscle-based facial animation tools. (Premiere: 10/98)



**November 1998** With *A Bug's Life*, Pixar shows the world that its first 3D animated feature, *Toy Story*, wasn't a fluke. Like the first, this Disney/Pixar film is also a box office hit. For this film, the technical team develops new lighting techniques and methods for defining, painting, and rendering surfaces that help give the bugs and their world a brilliant, translucent look. (Premiere: 11/98)



**May 1999** When the effects team at Manex Visual Effects creates this "Bullet Time" shot for *The Matrix*, little do they know it will inspire similar effects in dozens of future films and help this film win an Oscar for best visual effects. To freeze time for the shot, the team uses an array of cameras; for background buildings, they use image-based modeling. (Premiere: 3/99)



**May 1999** To create *The Mummy's* Imhotep, ILM uses a combination of models and displacement maps that carve the geometry. To move him, the team uses a Vicon8 motion capture system and key frame animation; procedural animation manages the internal organs and dangling bits of decayed flesh. (Premiere: 5/99)



**January 1999** In *Mighty Joe Young*, the gorilla himself is at times a CG character created at ILM or Dream Quest Images. (The shot above is created at ILM.) Both studios develop custom hair-raising software for the film: Dream Quest's code plugs into Maya; ILM's works with its in-house CARI. (Premiere: 12/98)



**June 1999** To help create *Star Wars Episode I: The Phantom Menace*, ILM fashions 1900 visual effects shots for director George Lucas, many of which include such CG main characters as Jar Jar Binks

and Boss Nass, shown here. (Premiere: 5/99)



**July 1999** Using Disney's Deep Canvas, background artists painted on 2D plots of 3D scenes. Information about each brushstroke was stored and later applied to positions in 3D space, giving the title character in Tarzan ample room to swing through a painterly 3D jungle. (Premiere: 6/99)



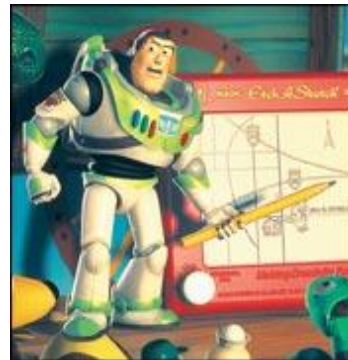
**July 1999** Some 10 visual effects companies, including Digital Domain, Manex Visual Effects, and Mass Illusions, help create the complex, non-photorealistic, and often surrealistic effects for What Dreams May Come, which wins an Oscar for best visual effects. (Premiere: 9/98)



**November 1999** For Warner's cel animation The Iron Giant, a 3D CG hero is created in Maya, rendered as a cartoon in RenderMan, and then imported into Cambridge Animation Systems' Animo. (Premiere: 7/99)



**November 1999** Having created the first feature animation with 3D computer graphics in 1995-the wildly successful Toy Story-Pixar then creates a wildly successful sequel, Toy Story 2, which has an emotionally deeper story, 10 times the visual complexity of the first film, and improved human characters. (Premiere: 11/99)



**December 1999** Surprisingly, the first photorealistic CG star in a live-action film is not a man but a mouse acting like a child. Imageworks creates the furry star of Stuart Little and costumes him with the help of Maya Cloth. (Premiere: 12/99)



**May 2000** Putting an entire cast of 3D animated characters in a world fabricated from live-action backgrounds has not been attempted before Disney Feature Animation creates a 3D animation facility to do just that for Dinosaur. To assemble the dinosaurs and lemurs, 15 software engineers write 450 programs; more than 120 are plug-ins to Maya and

Softimage 3D. (Premiere: 5/00)



**June 2000** To transplant the moose and squirrel into The Adventures of Rocky and Bullwinkle, a live-action film, ILM renders 3D characters with a 2D cartoon look while keeping their dimensionality, and finds ways to animate the oddly shaped, formerly hand-drawn characters. (Premiere: 6/00)



**July 2000** For Hollow Man, Sony Pictures Imageworks creates a CG clone of Kevin Bacon and causes its skin, muscles, organs, and bones to erode, layer-by-layer, as it becomes invisible. (Premiere: 7/00)



**July 2000** Without CG water, it would be impossible to suggest the violence of The Perfect Storm. The effects team at ILM considers the movement of light through a drop of water, generates various types of foam and spray, reproduces the movement of ocean swells and 100-foot waves, and creates CG boats, planes, and digital doubles. The film receives a visual effects Oscar nomination. (Premiere: 6/00)



**December 2000** Disney's The Secret Lab creates one spotless digital Dalmatian named Oddball, several spotted CG pups, and wipes the spots off real pups digitally for the film 102 Dalmatians. (Premiere: 12/00)



**December 2000** Putting Dr. Seuss's How the Grinch Stole Christmas onto the big screen entails creating CG landscapes and set extensions for the live-action film. Using Houdini, Maya, and RenderMan, Digital Domain also sends a CG sleigh rocketing down a CG mountain and helps populate Who-ville with digital Whos. (Premiere: 11/00)



**April 2001** Winner of the first Oscar for best animated feature, DreamWorks/ PDI's irreverent comedy Shrek sends its stars, a cartoony donkey, a story-book princess,

and the ogre Shrek on a quest through finely detailed CG landscapes. A gigantic box-office hit, the fractured fairy-tale is PDI's second 3D feature animation. (Premiere: 4/01)



**June 2001** By creating CG planes, battleships, smoke, set extensions, water, tracer fire, and digital sailors, ILM simulates the bombing of Pearl Harbor, using new rendering techniques and rigid body simulations for the movie Pearl Harbor. (Premiere: 5/01)



**August 2001** Although it fails commercially, Square's ambitious Final Fantasy, which features the first cast of photorealistic digital actors, stirs the imagination of the press and CG community. (Premiere: 7/01)



**October 2001** For Monsters, Inc., Pixar's fourth 3D feature and big hit, the animation studio's new simulation engine makes it possible to put a blue-haired monster in nearly every frame of the film. (Premiere: 10/01)



**December 2001** By creating thousands of warring, Uruk-hai, a Cave Troll, a fiery Balrog, digital doubles, the Mines of Moria, and other CG effects for Lord of the Rings: The Fellowship of the Ring, Weta Digital helps the film version of Tolkien's book win an Oscar for visual effects. (Premiere: 12/01)



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