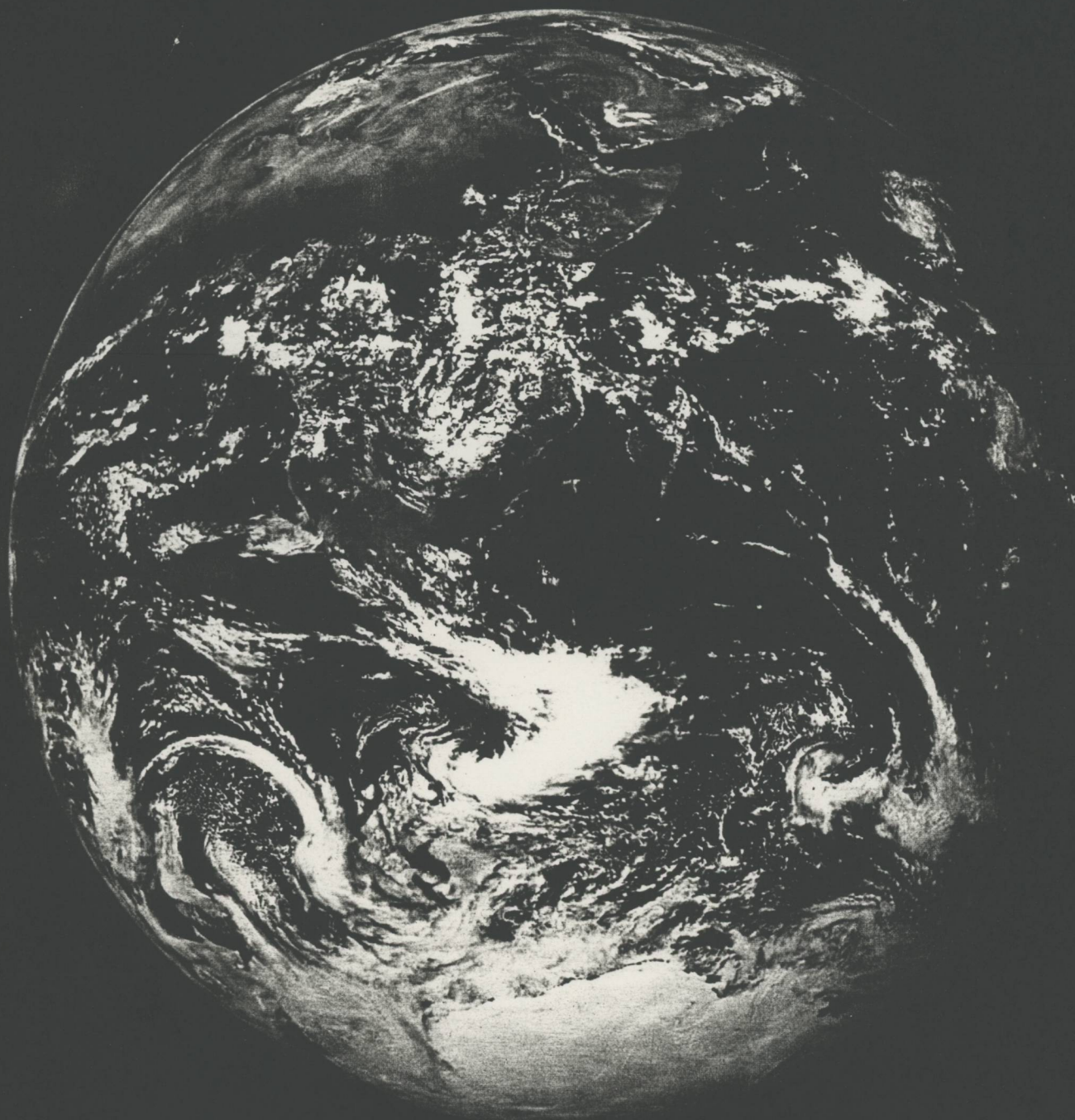


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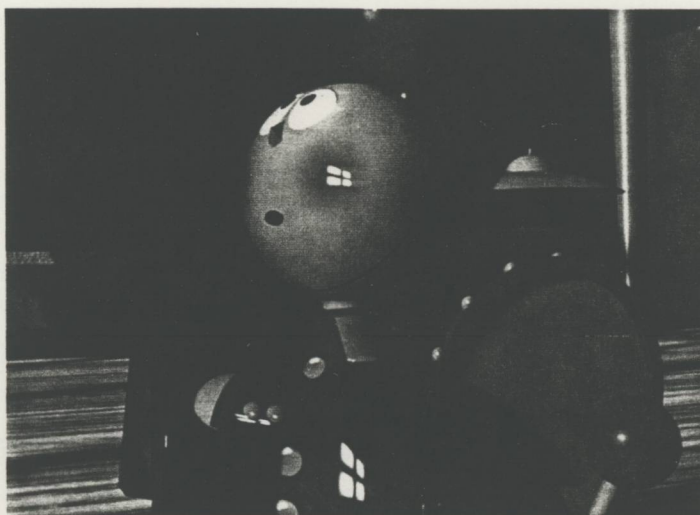


THE NEW BIG PICTURE

Computer-animated images aren't just for cartoons and movies any more. And this is only the beginning.

Inside a sterile-looking room at the Memorial Magnetic Resonance Center in California, surgeons carefully examine a woman's broken pelvis to plan treatment. They're not using traditional X-rays, and they're not probing the injured area with their hands. Instead, they're viewing a slowly rotating 3-D image that makes it appear as though the bone has been completely removed from her body. The image, created from a two-dimensional CT scan, is manipulated automatically by a Pixar image computer to produce an exact copy of the pelvis in animated form. And it is but one medical application. The program can be used to study virtually any other part of the anatomy, neck to lungs, allowing doctors to delve inside the human body without making a single incision.

A decade ago, this kind of computer animation was little more than a splashy technique for high-budget movies such as *Tron* and *Return of the Jedi*. Now the technology is changing the face of medicine, product design, business and entertainment. With a video screen as canvas and pixels of



Tin Toy: the first computer-generated Academy Award-winning animated film.

light as paint, scientists can see inside molecules and dying stars; law-enforcement agencies can see what a missing child will look like 10 years into the future; and pilots can fly an airplane anywhere in the world, under any conditions, without leaving the ground.

"Computer animation is a marriage between technology and creativity," says Ralph Guggenheim, director of animation at Pixar, a San Rafael, Calif.-based group. Initially developed as the computer division of Lucasfilm Ltd., George Lucas' production company, Pixar has grown to be a leading producer of computer-animation hardware and software. "It is a very useful tool that has made the computer an extremely powerful piece of equipment," Guggenheim says. "It is becoming a more and more important part of our lives."

Indeed, computer animation and

computer-aided design (CAD) allow scientists, business people, even laymen to transform complex mathematical equations into a realistic and understandable visual facsimile. For example, data collected from a devastating tornado can be transformed inside a computer into a visual replica of the event. Meteorologists then can use the lifelike image to better understand how weather systems behave. Archi-

tects and city planners can view a high-rise building in 3-D — from any angle or in any light — long before blueprints are created. And a company's financial data can be put into motion — providing illuminating results far superior to the basic bar graph or two-dimensional pie chart on a piece of paper.

In San Francisco, Forensic Technologies International Corp. recreates auto accidents and various other disasters in remarkable detail using computer animation — all to help sway juries. And in New York, artist Nancy Burson and computer scientist David Kramlich have devised one of the more remarkable uses of the medium yet. Using the last available photograph of a missing child, they manipulate the image by adding pictures of adult relatives the child resembles. The result? What the youngster might look like several years later. Already, the method has helped locate several missing children, and the FBI has begun using the technique to track wanted crimi-

BY SAMUEL GREENGARD

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nals who may have altered their appearances to avoid capture.

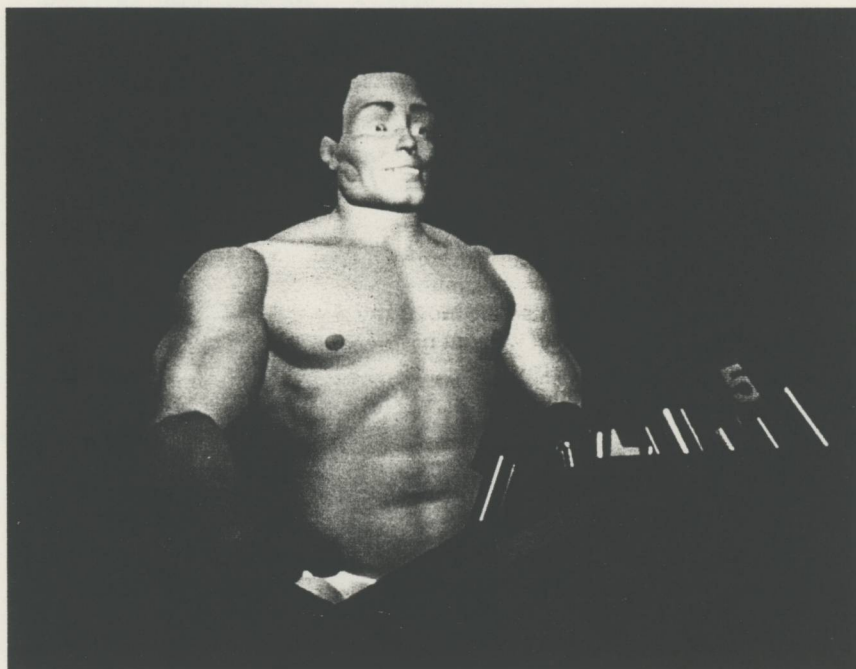
But perhaps nowhere is the full power of computer animation more apparent than in product design and manufacturing. Hundreds of items — from facial tissue to running shoes and automobiles — are now designed in 3-D on computers instead of from clay or cardboard models. In many cases, the products are tested for aerodynamics or wear before the prototype rolls off the assembly line. And modifications can be made at the last minute with the push of a button.

"The applications are enormous," says Geoffrey de Valois, who worked on *Indiana Jones and the Temple of Doom* and *Return of the Jedi* at Lucasfilm's Industrial Light and Magic division before starting his own company, Digital Vision Entertainment, in 1986. He also created the PBS special *Computer Dreams* (now available on video), which displays spectacular examples of computer animation that were assembled from more than 100 companies and artists worldwide.

In one dreamlike sequence, an underwater love affair between a bird and a fish blossoms with vivid colors, undulating shapes and subtle music. Another piece depicts a thirsty robot guzzling a can of Hawaiian Punch and then flexing his muscles like a proud bodybuilder. Yet another segment created by NASA displays a proposed robotic vehicle as it would look traveling over the surface of Mars.

"Computer animation allows you to go anywhere, be anything, do anything. If it can be imagined, it can be created. That's certainly not true for any other art form that involves motion," says de Valois. Sitting in his computer-strewn studio near Hollywood Boulevard, he watches animator Raul Fernandez build wire-frame spaceships on a 27-inch Mitsubishi monitor. They eventually will become part of a public service announcement to recruit teachers.

Creating convincing animation can take months and always involves painstaking attention to detail. Like a movie or conventional animation, tens of thousands of frames — each slightly different from the rest — must be combined to create fluid motion. The difference in the computer is that users create three-dimensional models only for key frames. After that, the comput-



Is this the first computer-animated star? Swaggering hulk Nestor Sextone.

er is programmed to draw in the remaining frames and export them in sequence to videotape.

"The most common myth is that the computer creates the images," says de Valois. "The fact is, artists and animators create the scene. The computer is just a tool, like an airbrush for an artist or a word processor for a writer." Indeed, virtually all objects that appear in computer animation are either drawn or painted using a mouse and special software, traced in by running a digitizing pen over a clay or plastic model that has been covered with a grid pattern, or manipulated after being optically scanned in from a photograph.

Helping the imagery are remarkable advances in computing power. According to Katherine Hanley, a staff artist for AT&T Graphics Software Labs in Indianapolis, "Today you can do things on a PC that five years ago would have been next to impossible on a mainframe." The current generation of computers can create 16.8 million different colors; they can render an image that once took hours in a matter of seconds.

Such technologies also make animation more accessible. Companies entering the animation business today (more than 100 of them are in the United States) find themselves spending as little as \$100,000 for a fully equipped graphics workstation, while

competitors who entered the field a few years ago still are paying off \$500,000 computers that are hard pressed to create the same level of visual pyrotechnics. This cost curve has produced a rapidly growing field. In 1988, \$810 million was spent on computer animation hardware and software, according to the National Computer Graphics Association. By 1991, the figure is expected to jump to \$1.66 billion.

Nor is it only computer animators and artists who use the medium. The Apple Macintosh, the Amiga and 286- and 386-based PCs can run animation software, which is available for just a few hundred dollars. And according to de Valois, desktop applications reach other levels of business life. "Many Fortune 500 corporations now employ computer animators to create sophisticated multimedia presentations — complete with graphics, sound, scanned photographs and other visuals — all created or manipulated from within a computer," he explains. When it comes time to show the presentation, it's displayed on a large computer monitor or transformed into a television signal that can be recorded and played back on video.

Pixar's Guggenheim believes, "It's gotten to the point where it has become mandatory for any decent computer system in a business environment to be equipped with graphics

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capabilities. These days, it's as essential as having a car with a steering wheel. It's an efficient way to communicate."

That's something the entertainment industry discovered years ago. Since the mid-1970s, computer animation has become increasingly popular as a way to create network logos, advertisements, movies and intros for sports programs. Pixar's 1988 production, *Tin Toy*, became the first computer-generated film to capture an Academy Award. It depicts a toy soldier's first encounter with a rambunctious baby and offers realistic movement, motion blur and shadowing. While the baby never looks entirely human, its mannerisms and facial gestures are so hauntingly real that at times it baffles the senses.

Two researchers at the University of Montreal have gone so far as to create computer-animated versions of Humphrey Bogart and Marilyn Monroe. The researchers, along with other pioneers in the field, hope to resurrect dead actors to star in future films — an idea that hasn't escaped

controversy. Some experts predict that within a decade, computer-generated actors will be almost indiscernible from their living counterparts.

Whether that happens or not, some computer animators already think of their artificially created actors in human terms. In a studio perched almost directly below the renowned

Computer animation may someday bring back Bogart and Monroe.

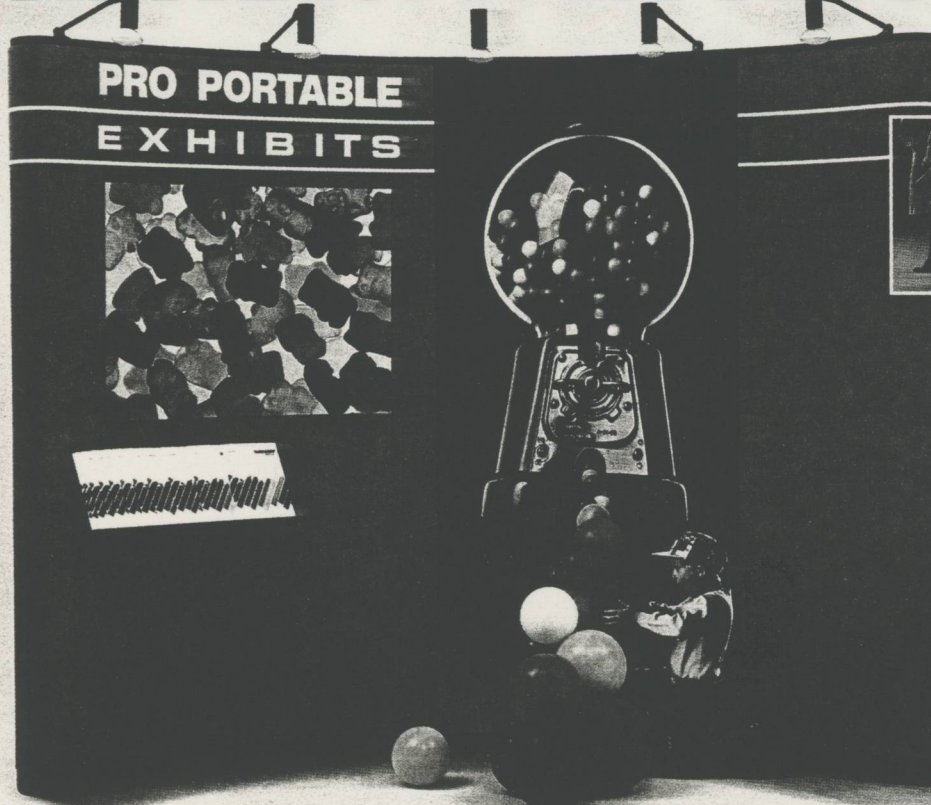
"Hollywood" sign, Jeff Kleiser and partner Diana Walczak show off Nestor Sextone, a swaggering Schwarzenegger-type character with a wit to match his strength. So far, Sextone has appeared in a PBS special and in a Samsung television commercial. And now they're hoping to make him the world's first computer-animated movie star (although Max Headroom

made quite a splash a couple of years ago, he was nothing more than an actor wearing a mask whose appearance had been digitally altered by a computer). They're even negotiating with a talent agency to represent the character.

And experts say all of this is only the beginning. Already, NASA's Ames Research Center has developed a computerized helmet that surrounds the head to create an entirely artificial world that seems oddly realistic. In this "virtual environment" an individual can walk across a Martian landscape or experience the feeling of being in a space station. Some scientists now envision a day when architects not only will be able to stroll around computer-generated buildings, but also will move windows, doors, walls and furniture by simply reaching out and grasping them. "We are standing at the open door of possibilities," Jeff Kleiser says. "Soon, our imaginations will be the only limit." 

Burbank, Calif.-based writer Samuel Greengard is a frequent contributor to American Way.

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