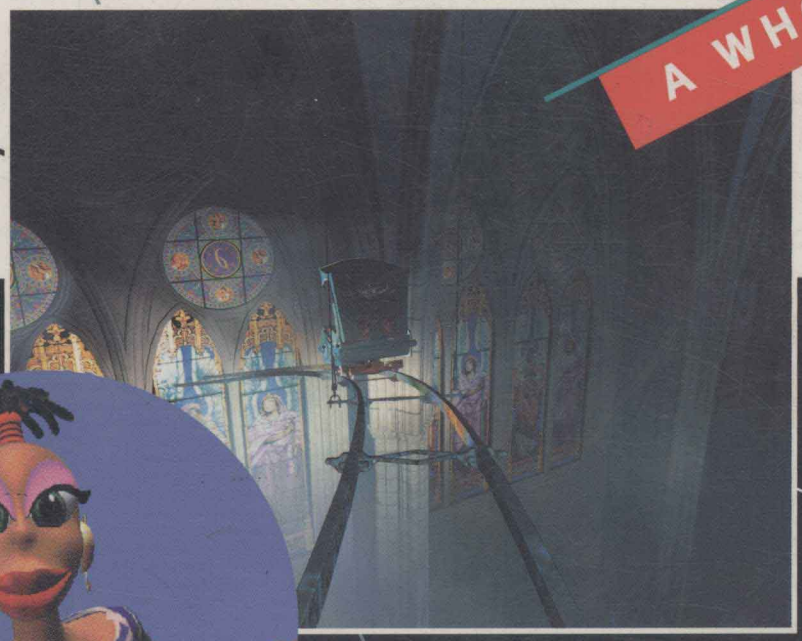
Computer Animation

A WHOLE NEW WORLD



groundbreaking work from today's top animation studios

RITA STREET

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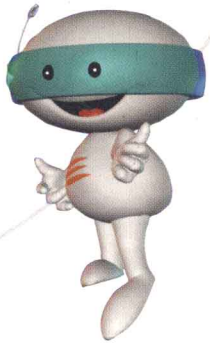

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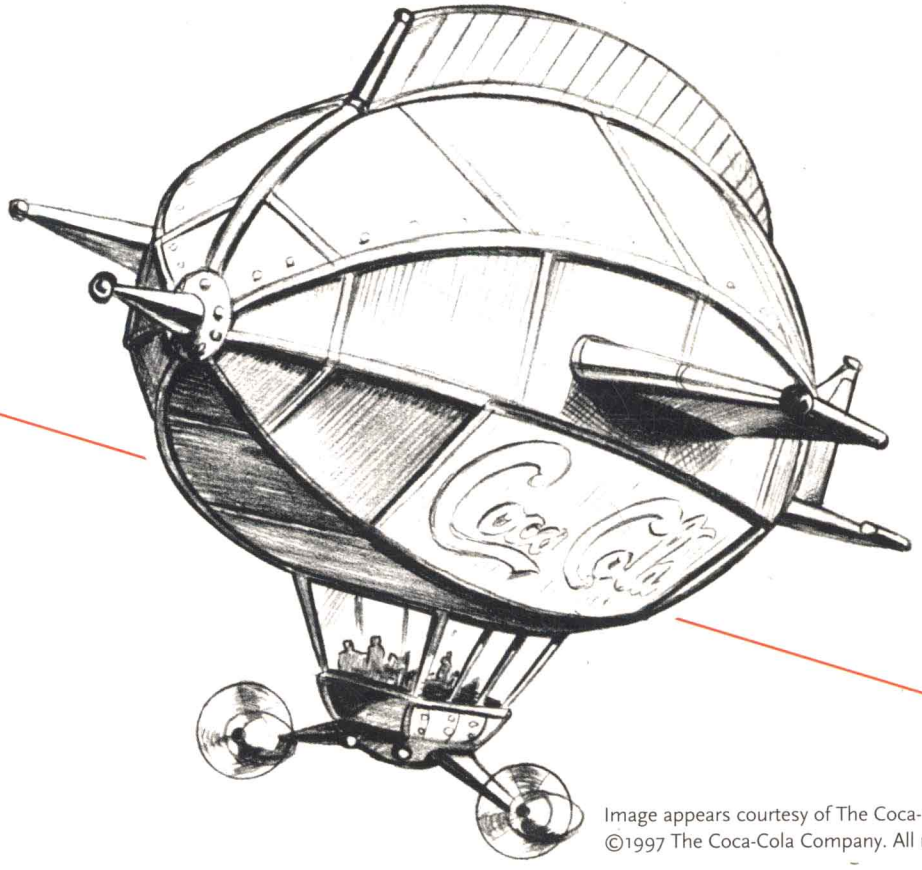


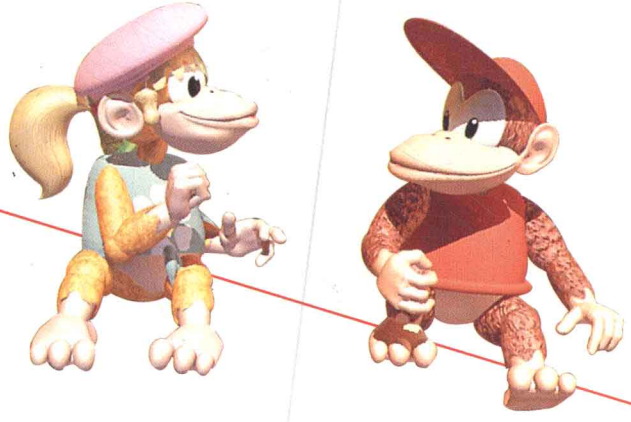
Preface

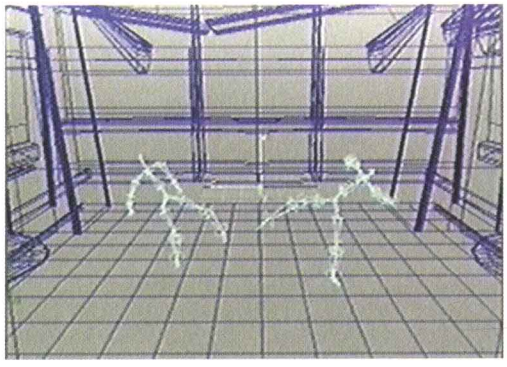
Nothing moves faster than technology. Conversely, nothing moves slower than the writing and production of a book. So, to publish a book about technology is a bit of a conundrum.

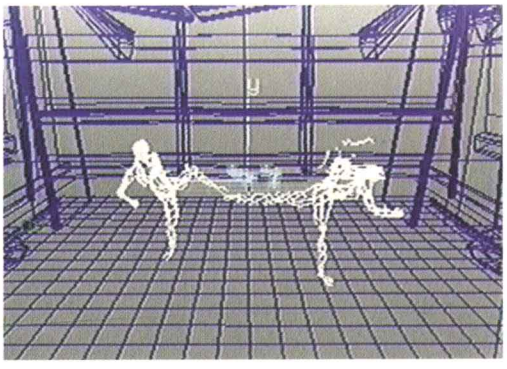
To solve this puzzle, I decided to focus on the artists (and scientists) behind the projects showcased in the pages that follow and the process each went through to bring their art to life. In other words, this is a book about process and passion—and how they coexist while pushing the envelope of technology—not about manual instruction.

Although you will find some great production tips—genuine treasures from some of today's top animators—I hope these pages will serve instead as an inspiration for your own work and an affirmation that anything you can dream you can animate!

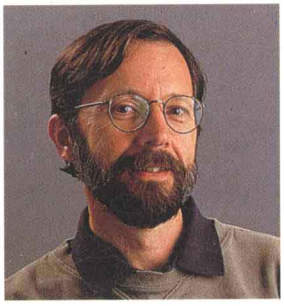
Yours, Rita Street







The history of computer animation is only twenty-five years old. In that time artists and scientists have moved from rudimentary flying logos to sophisticated, humanistic motion applied to computer-generated characters.



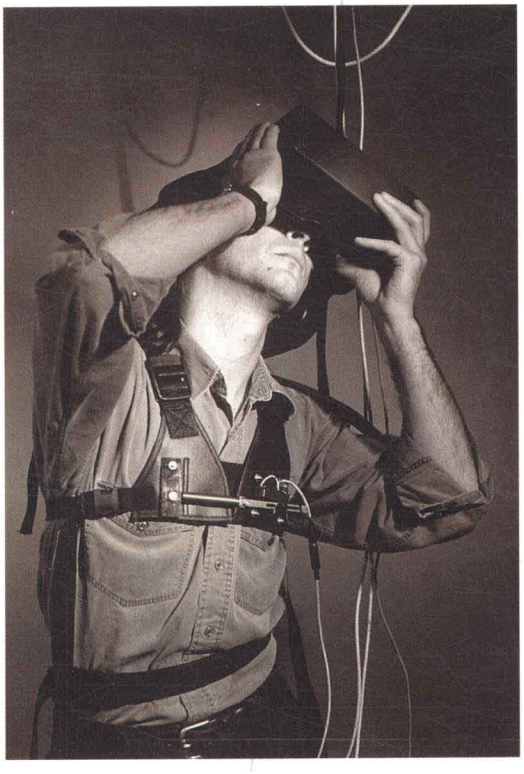
Ed Catmull, co-founder and executive vice-president of Pixar, the producers of *Toy Story*, the world's first fully computer-animated feature, recounts a brief history of the industry along with the formation of his ground-breaking company.

Introduction

I look back in amazement at the history of computer animation and still find it hard to believe that we could have had such an impact on the entertainment industry. In less than twenty-five years computer graphics has grown from the highly experimental work of a few scientists and engineers at a handful of universities to an art form virtually indispensable to the artistic creation of movies, television series, commercials, and evolving forms of interactive entertainment.

But then, entertainment, specifically the production of a feature-length computer animated motion picture, was always the goal of the artists and engineers who founded Pixar—and, of course, of our pioneering peers. However, our passion for achieving this goal shined ahead of the realities of technology. It took a bit of genius and a lot of work, luck and faith in the future to allow breathing room for science to catch up with the demands of art.

The first milestones came from the University of Utah and the Evans and Sutherland Computer Corporation (E&S). The people there worked on the foundations for rendering images and developed techniques for interactive design. Those early pictures were extremely exciting to us, yet we knew they were crude by the measure of feature films. It was easy to see that we had to be cheaper, faster, and better—but it was not easy to see how we would render complex, rich surfaces. Nor was it easy to see how we could match the lighting that we expect from reality or the motion blur necessary to mix our images with motion picture photography.



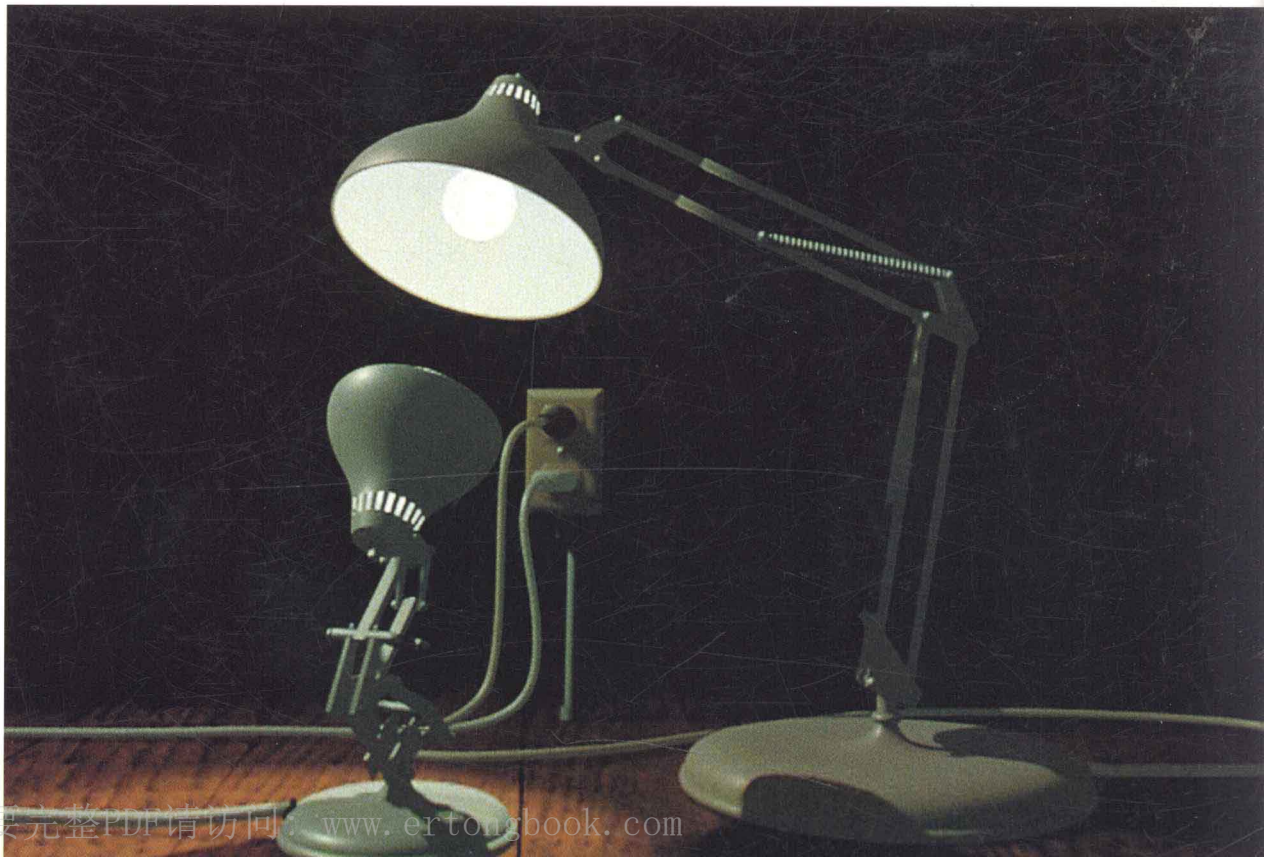
Computer animation can envelop you in a totally digital world.

Nevertheless, there were a few groups eager to tackle the problems—and many of those groups crashed and burned because the economics were not right and the imagery not good enough. Such is the fate of pioneers. Yet we all knew that we would achieve our goal if we were just smart enough about it and had perseverance.

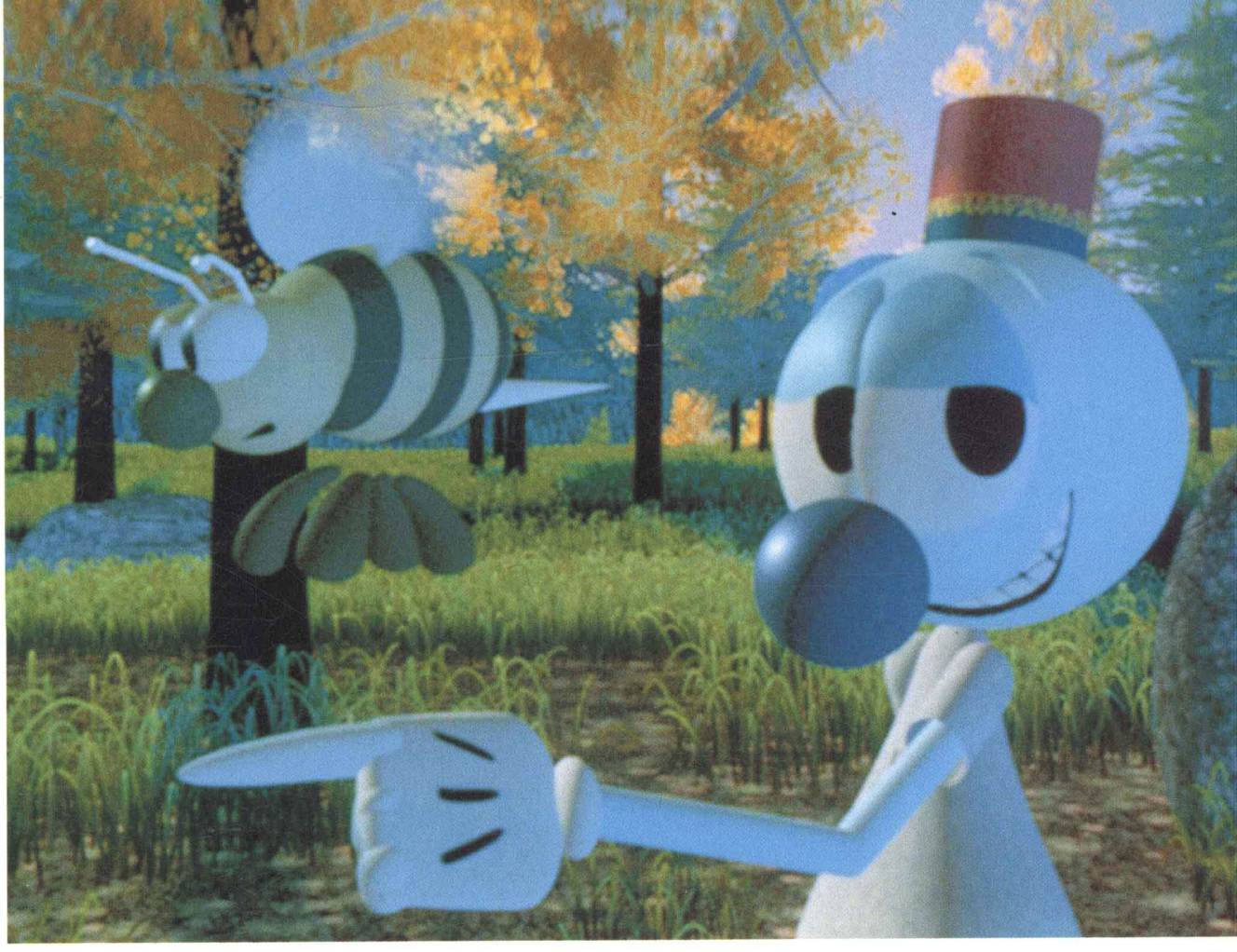
The early hardware successes came from Evans and Sutherland who built a great interactive line drawing system that was used in early work. They followed that with the first commercial framebuffer. Here was a device that could hold an entire picture—a new concept for the time, although it did cost $80,000. Today the same capability is included in almost every home computer. On the interactive side, E&S was followed by Silicon Graphics who made interactive graphics an integral part of the workstation and changed the way people worked.

With this new technology, a few companies began to make commercials and special effects for films. This was the burnout lane. Yet some notable commercials and effects were made—resulting in projects such as *Tron*, *Star Trek*, and *The Last Starfighter*. We had such companies as Digital Productions, Abel, Cranston-Csuri, and Digital Effects. While most of those companies have gone, many of the people went on to form the core of the special effects business.

I went to NYIT after the University of Utah and was fortunate enough to have worked with a very creative group of people. Garland Stern invented a method for coloring 2-D cells for conventional animation that was later used at Hanna Barbera and then at Disney. Alvy Ray Smith and I developed the Alpha Channel and, together with work performed by Tom Porter and Tom Duff later at Lucasfilm, developed the approach that formed the basis for the digital composing work that has so changed the special effects industry. Alvy also wrote paint programs that were extremely influential across the graphics industry.



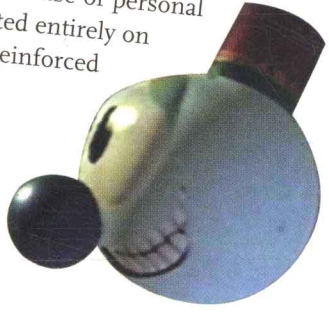
The first screening of *Luxo Jr.*, Pixar's Academy-Award nominated short, sent shock waves through the industry. Its creation proves that computer animators can produce characters with heart.

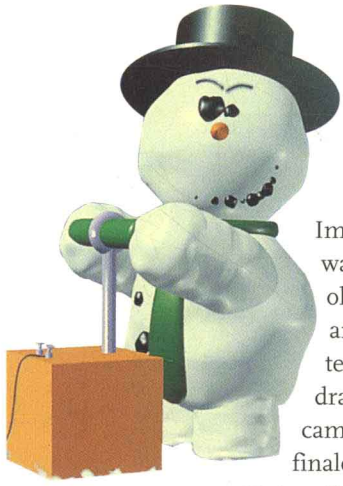


The Adventures of André and Wally B demonstrates Pixar's knowledge of motion blur.

Later at Lucasfilm, we were fortunate to have the backing of George Lucas and were not rushed prematurely into production. We could focus on three important problems: animation control, rendering of extremely complex scenes, and motion blur. Fortunately we were joined by many talented people, such as Loren Carpenter and Rob Cook, who together with Tom Porter came up with an ingenious solution to the motion blur problem. Bill Reeves and Eben Ostby developed an architecture for animation that has lasted all the way from our original shorts through the first feature-length computer animated film. We were also blessed to be joined by John Lasseter, who helped us draw a fine focus on making a system responsive to animators. He also brought a love of story which has shaped the way we work.

Our first project, "The Adventures of André & Wally B," demonstrated our knowledge of motion blur. But our second project, "Luxo Jr.," sent shock waves through the entire industry—to all corners of computer and traditional animation. You see, at that time, most traditional artists were afraid of the computer. They did not realize that the computer was merely a different tool in the artist's kit. Instead, they perceived it as a type of automation that might endanger their jobs. Luckily, this attitude changed dramatically in the early '80s with the use of personal computers in the home. The release of our "Luxo Jr.," a short film created entirely on the computer with enough personality and charm to stand on its own, reinforced this opinion turnaround within the professional community.





Pixar's short films laid the groundwork for the production of *Toy Story*. Here, the Snowman from *Knickknack* tries his best to escape his snow dome.

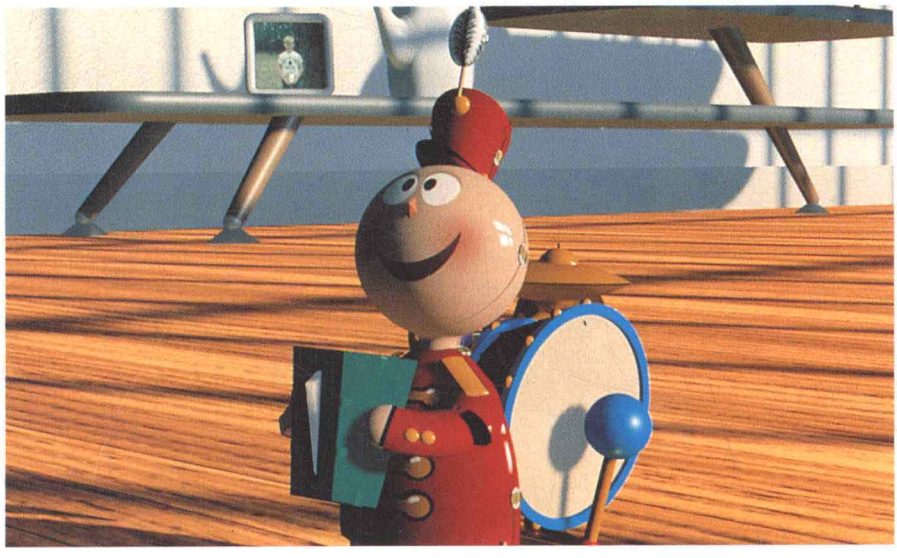
At about the same time, we completed our first prototype of the Pixar Image Computer. The Image Computer is noteworthy not only because it was the only hardware solution then available that could handle film resolution, but also because its prowess garnered us one of our first big jobs after spinning off to form Pixar in 1986. The creation of the CAPS system for Walt Disney allowed their feature department to scan in every drawing and ink and paint them in the computer. The system's debut came in 1989 with the release of *The Little Mermaid*. A single scene, the finale of the movie with its glorious rainbow, was completed on CAPS. But in Disney's next venture—*The Rescuers Down Under*—every frame went through the computer. This makes *Rescuers* the first CG movie—a little known fact.

Suddenly technology and art were beginning to work together. The second glimmer we all had that the world was about to change came with James Cameron's groundbreaking feature, *The Abyss*, also released in 1989. Cameron and Disney realized that computer graphics was more than just another special effect. This set the stage for the pivotal year of 1991. This was the year that *Beauty and the Beast* and *Terminator II* came out. Both films were smash hits and both made extensive use of computer graphics. Suddenly all of Hollywood jumped on the bandwagon.

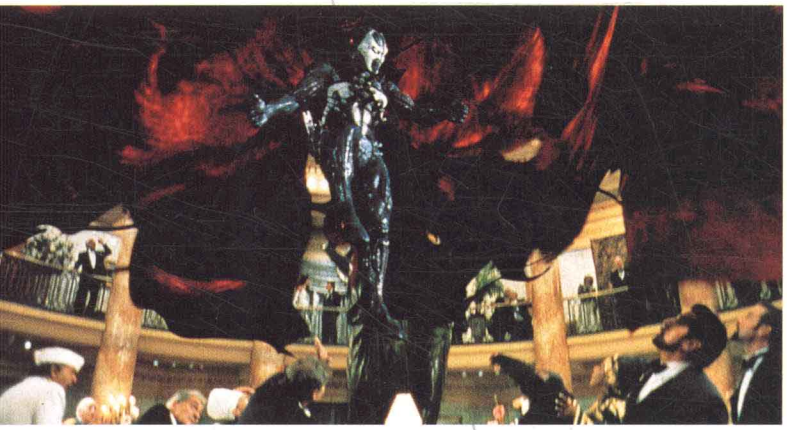
Also in 1991 we signed our deal with Disney to make *Toy Story*. Everything we'd been working toward for twenty years rested on the success of this picture. We were very aware that for *Toy Story* to be great, it couldn't be technology driven. In fact, when the reviews came out, we took pride that usually only one sentence was devoted to the fact that this was a computer-animated film—the rest of the copy was devoted to the story.

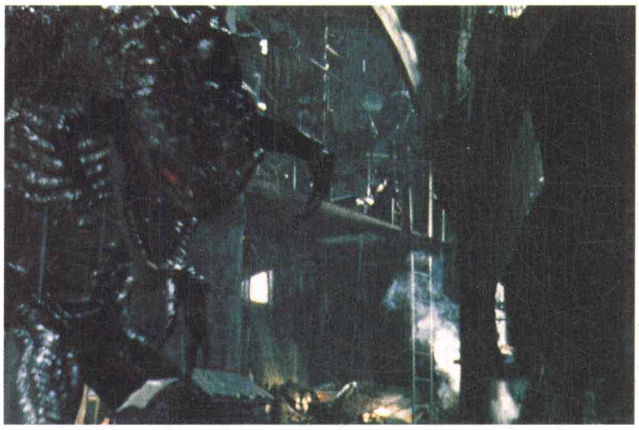
And that is the glory of working in computer animation today. No longer is art tapping its foot and impatiently waiting on the rigors of technology. Of course, we always want hardware to move faster and software to do more things, but we can make movies now—movies that move people. Engineers work side-by-side with artists and together they create some of the most exhilarating, powerful, and comedic entertainment the world has ever seen.

So while you are enjoying the pages of this book, think back in amazement, as I do, at how far we've come. Then turn your mind's eye toward the future and imagine how far we can go. With animation, anything is possible, even the dream reviews we hope for our second animated feature—in which my colleagues and I imagine reviewers might actually forget to explain that the film was made on the computer—because, while watching it, it simply didn't enter their minds!



Pixar's *Tin Toy* was the first computer-animated short to win an Academy Award.





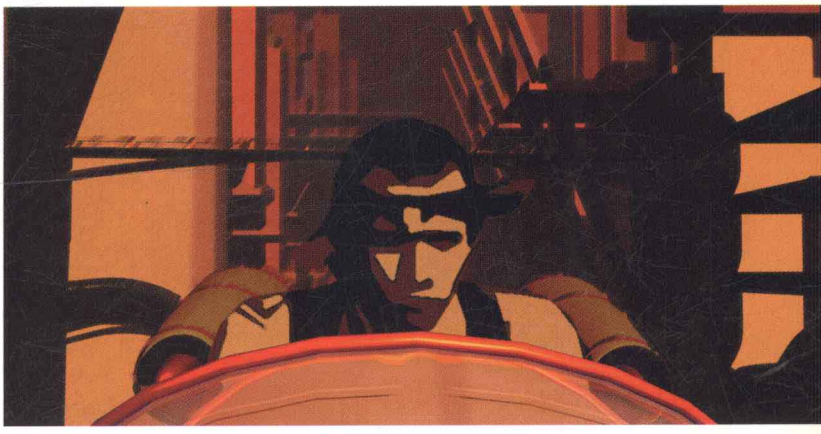
Advances in computer animation make visual effects so compelling that it's hard to believe monsters like the Violator in *Spawn* are make-believe.

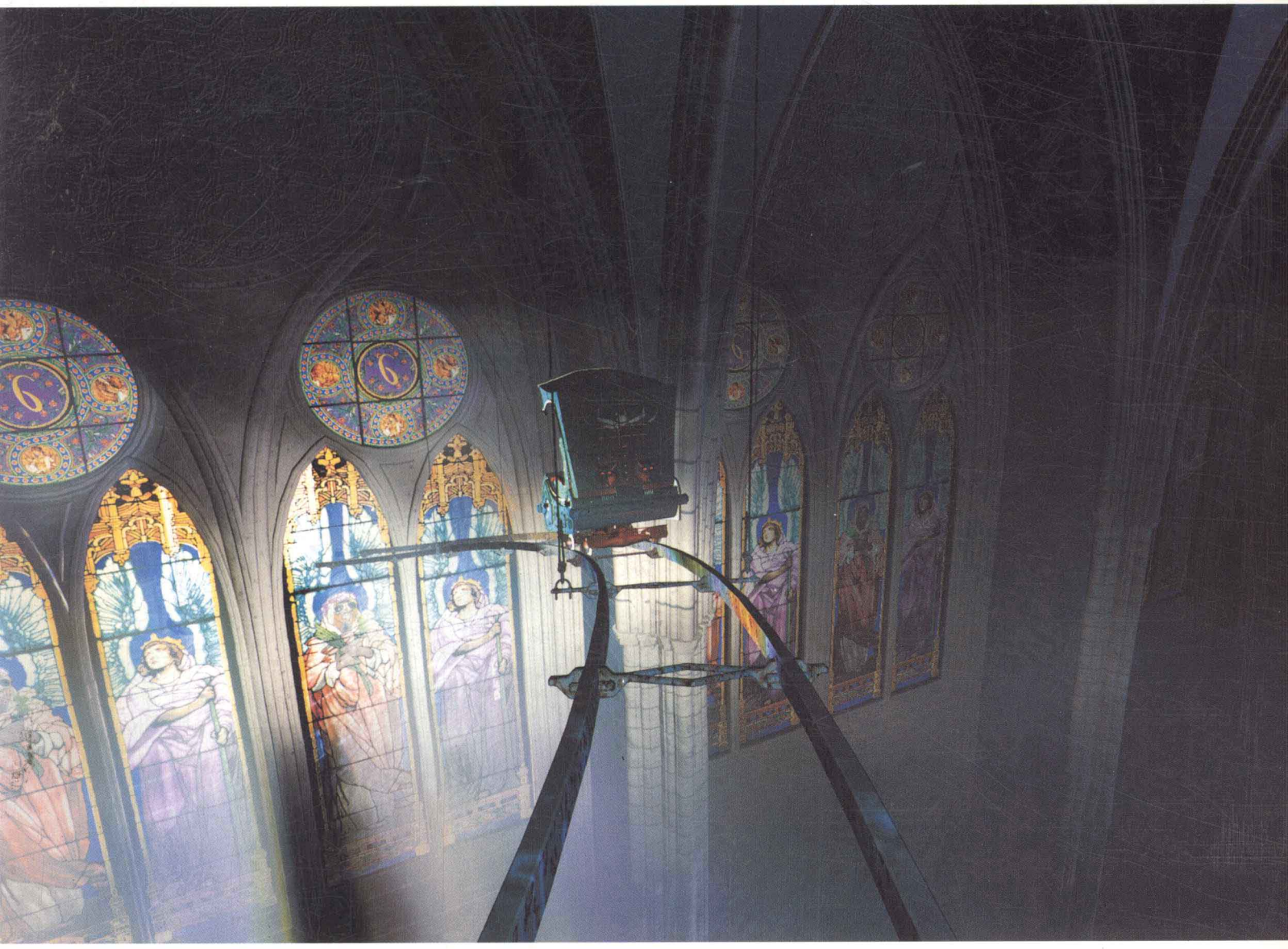
Feature Film

Bringing Dreams to the Big Screen

The evolution of computer animation has changed the look of feature films forever. Computer-generated visual effects are so refined that viewers find it difficult to tell where reality leaves off and the digital interpretation of reality (or more likely, fantasy) begins. Through computer animation, filmmakers take us to worlds that exist only in the imagination and scare us with aliens we can only hope space explorers will never find.

This opening section showcases the diverse styles, methods, and creations that computer animators produce for the big screen. But to keep you grounded, we'll first venture back in time to see how computer animation grew up so well, so fast. We'll follow the founders of Pixar as they recount the trials, tribulations, and triumphs of animation production for their famous short films. Each of the five pieces covered led to a groundbreaking step forward in technology and laid the foundation for the company's most amazing accomplishment to date, the completion of the world's first computer-animated feature, *Toy Story*. Next, artists at New Wave International take you on an unforgettable ride through the complex production process of a ride-simulation film. Animators at Industrial Light & Magic shed light on the making of New Line Cinema's cult classic *Spawn*, revealing some of the magic steps behind the integration of live action and visual effects. And finally, two young filmmakers use computers to turn live-action footage into a full-blown Anime-style cartoon.





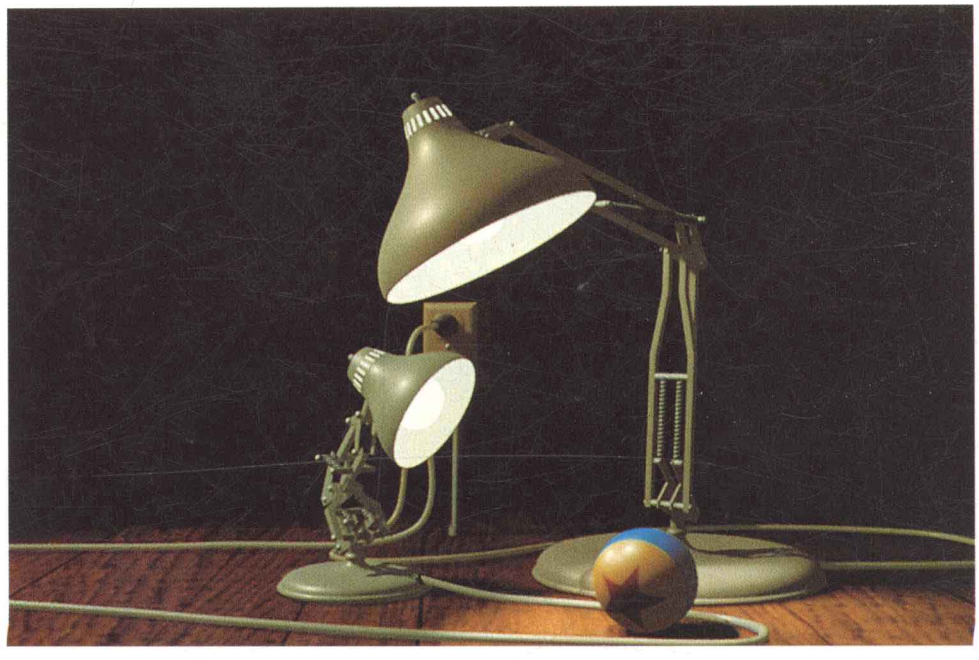
Pixar's famous short *Red's Dream* (top left) proves that computer animators handle moody settings just as well as live-action filmmakers do. They can also transform live action into cartoons as demonstrated by the making of *Plug* (top right). Or—as depicted in the simulation ride *Superstition*—they can take you to the netherworld between life and death (above).

Pixar

Five Amazing Pieces

Walt Disney's *Toy Story*, produced and created by the computer animation studio Pixar, took four years to wind its merry way from story idea to full-fledged silver screen legend. Prior to those four exciting, often grueling years, Pixar artists and scientists put in over a decade of research and development building the many digital tools necessary for Woody and Buzz to take their trip to "infinity and beyond."

Pixar started out as the computer graphics division of Lucasfilm, Ltd. Dedicated to the creation of high-end computer-generated images for effects in feature films, this forty-member team was responsible for the visual effects in *Young Sherlock Holmes*, *Return of the Jedi*, and *Star Trek II: The Wrath of Khan*. In addition, Pixar scientists created the early high-speed image processor known as the Pixar Image Computer and the Disney 2-D computer animation system called CAPS.



Luxo Jr., the endearing short starring a lamp, his ball, and his dad, brought Pixar an Academy Award nomination in 1986.