

Incredible: The Man Who Built Pixar's Innovation Machine

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Sure, the movies have cool tricks and great stories. But the secret of Pixar's success is a nerd from Utah with a head for numbers.

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EVERY PIXAR MOVIE has unsung heroes, from the whiny dinosaur in *Toy Story* to Violet, the sullen and insecure teenage superhero in Pixar's latest 3-D extravaganza, *The Incredibles*, which hits U.S. theaters this month. And, true to form, there's an unacknowledged hero sitting quietly behind the curtain at Pixar itself--the company's 59-year-old founder and president, Ed Catmull. He's a geek's geek, a mild-mannered father of five who first dreamed of making computer-animated feature films more than 30 years ago. Catmull's entire adult life has been an odyssey to fulfill that dream, paying his dues in academia and winning the backing of the likes of George Lucas, Steve Jobs, and Michael Eisner, as he virtually willed the necessary technology into being for a new art form. Along the way he's also proved to be a shrewd entrepreneur who has designed one of the world's unique enterprises. So down-to-earth is his demeanor that you'd never know by talking to him that he belongs in the ranks of Silicon Valley's most creative company builders.

Steve Jobs, Pixar's CEO, calls Catmull "our quiet Beatle" (that would be George, the deep one), and John Lasseter, the pioneering animator who directed the company's first three films, refers to him as "Pixar's heart and soul." But the best description comes from Brad Bird, a newcomer who directed *The Incredibles*: "I refer to those guys as the Father, the Son, and the Holy Ghost. Ed, who invented this cool medium and is the designer of the human machine that is Pixar, is the Father. John, its driving creating force, is the Son. And you-know-who is the Holy Ghost."

Together they've turned Catmull's brainchild into the biggest hitmaker the film industry has seen since the *Lion King* days of Disney. It's had nothing but blockbusters in five tries. And judging from the crowd reaction at a charity screening at Pixar's headquarters in Emeryville, Calif., *The Incredibles*, the saga of a slightly dysfunctional family of superheroes, will be their sixth. Each new movie successively raised the aesthetic bar for what animated movies can be. This is a new kind of movie studio that not only invents its own technology, much like a whiz-bang Silicon Valley company, but also comes up with new production methods and organizational innovations that bring unheard-of discipline to the crazy business of making movies.

The proof shows up not only on the screen but in the numbers: The price of Pixar stock, which barely shuddered amid the dot-com bust four years ago, has since more than

doubled, hovering near \$80 a share lately, giving it a market cap of \$4.5 billion. The 800-person company has no debt and more than \$750 million in cash. (Pixar's archrival, DreamWorks Animation, makes more movies but has a spotty record. It scored with the Shrek movies and Shark Tale but has had bombs like Sinbad and The Road to El Dorado. Still, it's a hot sector: DreamWorks' successful IPO last month has given it a market cap of about \$4 billion, almost on a par with Pixar.) On top of all that, starting in 2005, Pixar will double its moviemaking rate to a film a year. That should smooth out its performance, which in the past showed cyclical bulges and dips. Meanwhile, the company is shopping for a distributor after its deal with Disney expires next year, and will likely pocket a larger proportion of the profits that its future films generate. Given that Pixar already enjoys Microsoftian after-tax profit margins of 50% or so, the company is turning into a serious money machine. That is, of course, as long as the hits keep coming.

"If you're going to be creative, it's like jumping up in the air--you want to make damn sure the ground is there when you get back," says Jobs. "The business has done pretty well, and we built a brand entirely due to the creative successes. But that hasn't stopped a lot of companies from being pretty flaky. I'd say Pixar is on really solid ground and Ed is a big reason why."

A COMPANY like Pixar wasn't what Ed Catmull had in mind when he first hatched his plan to use computers to make animated films. But in hindsight, this company couldn't exist without a leader who cites Pinocchio, Peter Pan, and Einstein as the cultural heroes of his youth. Catmull grew up in Salt Lake City as one of five children in a Mormon family. As a kid he made "flip-books" filled with crude animation, and dreamed of working for Disney one day. His favorite character was a hybrid of a man and a unicycle.

He wasn't much of an artist, but he was really good at math. So, by the time he enrolled in the University of Utah, he had decided to study physics and computer science. It was the mid-1960s, and Utah was then the epicenter for the new discipline of computer graphics. Its reputation attracted students who would become some of the biggest names in Silicon Valley. When Catmull returned to Utah for grad school in 1969 after a stint at Boeing, his classmates included Jim Clark, who would start both Silicon Graphics and Netscape; John Warnock, founder of Adobe Systems; and Alan Kay, who helped invent the graphical user interface.

In 1973, Catmull made his first 3-D computer animation--a rudimentary rendering of his left hand that could be rotated and viewed from all angles. He didn't realize it at the time, but that early project launched his career as an animator. The hand made enough waves in computer-graphics circles that a Hollywood producer incorporated it as a special effect in a forgettable Peter Fonda movie called Futureworld in 1976. (That also was the one time Catmull's own animation work would make it into a feature film ... so far.)

Catmull got a chance to run his own computer-graphics research group at the New York Institute of Technology in 1974. His team never made an actual cartoon, but managed to produce a short, abstract computer-animated film which is part of the permanent

collection at the Museum of Modern Art in New York City. They also made one of the first rock videos.

In 1979, Catmull and his artistically inclined techies jumped when George Lucas, fresh from his Star Wars success, offered to set them up as the computer division of Lucasfilm. The director asked Catmull to design digital editing and special-effects systems--in other words, reinvent the technology for making films. "We interviewed a lot of people for that job," Lucas recalls. "But there were three reasons I hired Ed. His credentials were impeccable. He was a real nice guy. And he loved cinema and had this secret ambition to make a computer-animated movie. The amazing thing is, he delivered everything we asked for in three years."

Catmull never lost sight of his dream and wasn't above scheming to keep it alive. "We'd written some 3-D software and wanted to see what we could do with it," he recalls. "Remember, we were supposed to do R&D, not be an artist group. So when we hired a young animator from Disney in 1984--John Lasseter--his title was 'interface designer,' and nobody questioned it. But what he did was make an animated short called Andre and Wally B. That was the beginning of Pixar."

IN 1985, LUCAS TOLD Catmull he couldn't keep funding the group and offered to let him take his animation technology and strike off on his own. And who should come calling but another pop-culture icon, Steve Jobs, fresh after being run out of Apple. It was Catmull's old Utah buddy Alan Kay, now a research fellow at Apple, who put Jobs onto the company that would make him a billionaire. And once again, it was the combination of Catmull's single-minded passion and serene demeanor that won over another benefactor.

With Jobs on board as CEO, Catmull became chief technical officer. At first the company sold computer-modeling systems to make ends meet. Among the customers was Disney, which used one product on some of its hand-drawn work. But after a few years Catmull and Jobs sold off that business to concentrate on animation, hoping to make money by producing commercials. "That's how we first learned about deadlines and budgets and dealing with customers," says Catmull. The ads and Lasseter's short films impressed Peter Schneider, the former head of Disney's animation unit, who told Catmull and Lasseter he'd back a full-length feature. "It seemed low-risk to me," Schneider says.

It's been a thrill ride ever since. Suddenly, there was so much to learn how to do. Disney donated some production people. A massive computer infrastructure had to be designed, built, and tested. And in the middle of the four-year production, Lasseter had to plan what they hoped would be a second feature film.

We all know the rest of the tale. Toy Story and its follow-up, A Bug's Life, exceeded all expectations. Toy Story 2, Monsters Inc., and Finding Nemo were blockbusters all. And now comes The Incredibles.

It didn't all happen like clockwork, of course. "Toy Story 2 was the defining moment for

the studio," says Catmull. "We had started off making the movie for video instead of theatrical release, but we realized halfway into it that we'd created a two-tier studio, and that was not good for our souls. Then, nine months before it was to be delivered we basically threw it away. We redid the whole movie even though we were told it was too late, but we did it anyway because it wasn't good enough. We had people who had repetitive stress injuries, one permanently. After that I thought to myself, We can't run a company this way."

GIVEN CATMULL'S talents in software design, it's really not surprising that he's built such a strong animation studio. It turns out that animation, especially the 3-D computer-generated variety, is a lot more like developing software than like making live-action movies. For one thing, cartoons are, in effect, edited up front during the storyboard process when the script is mapped out into specific scenes to be individually drawn and animated. So the whole process is planned from the get-go, and individual scenes, once animated, can be tweaked to, say, reposition the characters or move the camera angle or change the hero's unitard from silver to red in much the same way programmers optimize features in a piece of software.

Live-action films operate on a looser plan that leaves room for the creative interpretations of actors and cinematographers. But the editing into a coherent whole happens after those scenes have been shot, and the cast has in all likelihood moved on to other projects. If at that point a director doesn't like the way a particular scene looks, he's stuck with it; he either has to use it as is, cut it down, or drop it altogether, which can change the flow of the story, often for the worse.

"Animation is a recursive process, not a linear process," says Disney's Peter Schneider, who worked with Pixar for a decade. "That allows the story to have more time in development, so you know exactly what you're going to get, and then you can re-animate and re-animate it if you don't like what you see. That's why the success rate for animated films is so high."

Another difference is that live-action films use a "gypsy" model--Hollywoodspeak for ad hoc groups of actors, producers, and technicians who come together to make a single production and then disperse to glom on to other film projects. It's just the way the industry has evolved, primarily for economic reasons. But animated films are so highly engineered and require so much collaboration (the credits at the end of *The Incredibles* list about 800 names; live-action pictures typically have 100 to 200) that they benefit from having the same team working together over and over again.

Finally, from the early days of Disney, animated films have always been driven by technology, and that is especially true now that the artists' easels are computers. And since Pixar has a flotilla of propeller-heads whose job is to continually invent better technology to enhance the look of the images and increase the efficiency of the animators, directors become infected by the same virus. "There's a wonderful yin-yang at the foundation of Pixar," says Lasseter, whose official title is executive vice president, creative. "The art challenges the technology, and the technology inspires the art. It's a

drug. I mean, it just powers you on."

The irony of it all, according to Catmull, is that geeks and artists, at heart, are remarkably similar in temperament, and so you can manage them in similar ways. "We've got both world-class programmers and world-class artists," he says. "Having seen both, I am of the view that there are far fewer differences than most people think. In fact, the more we think about the parallels, the more parallels we see."

The organization Catmull came up with has three parallel yet interactive groups: technology development, which delivers computer-graphics tools; creative development, which concocts stories and characters and animates them; and production, which coordinates the whole filmmaking process. What makes it all work is Catmull's insistence that these groups constantly talk to each other. So a producer of a scene can deal with the animator without having to navigate through higher-ups first. Or a technologist can talk directly to the director if he has an idea for a new visual effect. The system works so well that the U.S. Navy sent some top organizational experts to Pixar a few years ago to look for ideas to improve its own organization. Catmull, who had fought a year-long legal battle to win status as a conscientious objector during the Vietnam war years, welcomed them.

CATMULL IS THE BRAIN behind most of Pixar's technical achievements, and his name is on many of its patents. But the idea he's proudest of is Pixar University, a continuing-education program aimed at giving every employee, even the accountants, enough training in the fine arts and cinema to think like a filmmaker. The curriculum runs from drawing to acting to belly dancing--there are 111 courses in all, and every employee takes a half-dozen or so each year.

The founder has already taken sculpting classes--he's chiseled out replicas of his left hand, coming full circle back to his old Ph.D. project. And lately he's decided to get serious about learning how to actually create Pixar-grade animation. His goal is to animate a scene for one of Pixar's productions. John Lasseter can't wait to give him the assignment. Full circle indeed.