

THE YEAR IS 2017, AND the latest Indiana Jones film opens on 4,000 screens across the U.S. It stars Harrison Ford as Indy, of course. But in this installment a 35-year-old Ford returns, fighting evil treasure hunters in the deserts of Morocco. At his side? Humphrey Bogart, reprising his role as Rick from *Casablanca*.

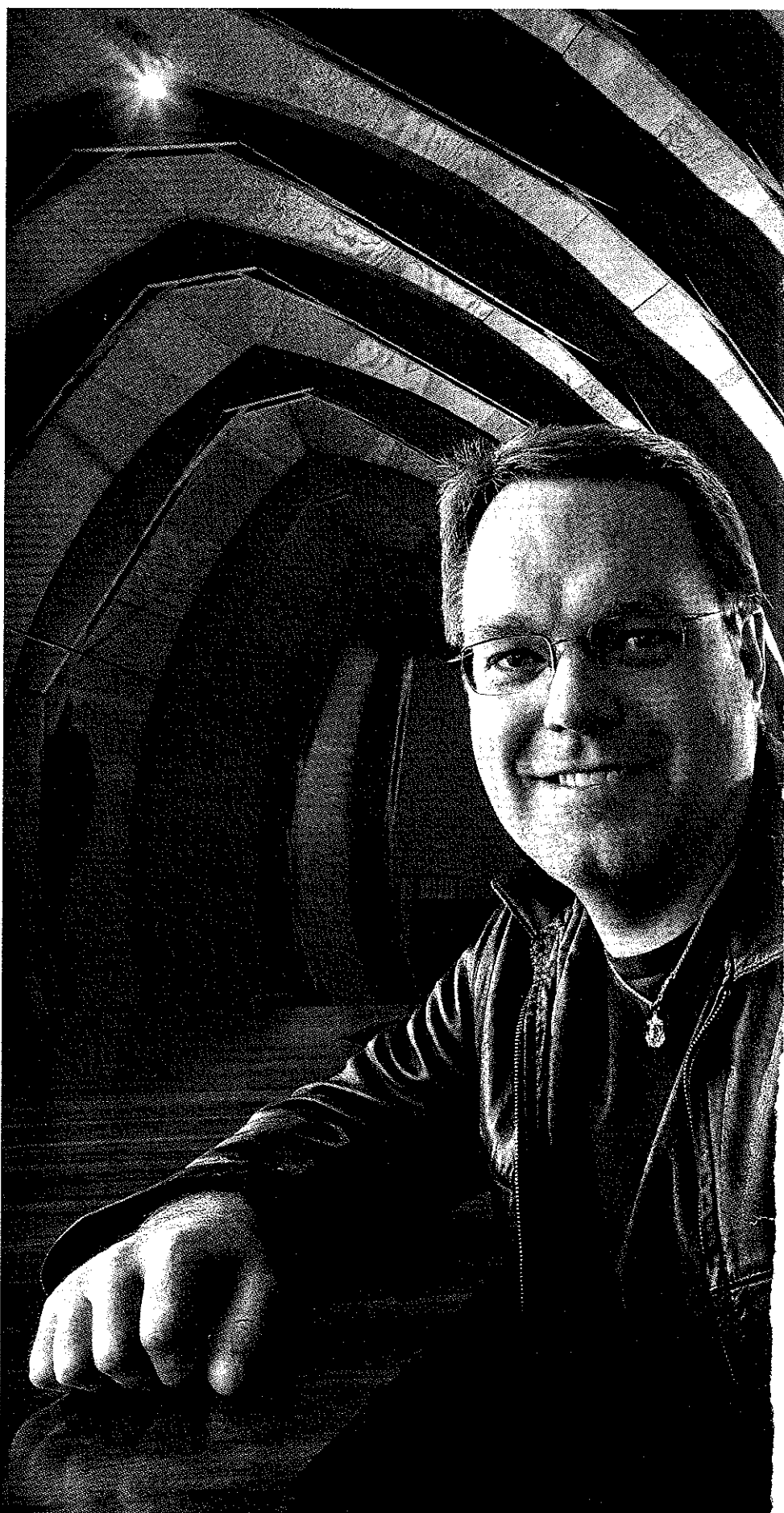
The technology to rewind the clock on movie stars' careers and bring long-dead actors back from the grave has been talked about for 20 years (FORBES first wrote about it in December 1990). But a slew of new films, including James Cameron's 3-D sci-fi opus, *Avatar*, have advanced digital filmmaking enough to supplant live action movies—and make a fortune in the process. *Avatar* has earned \$2.4 billion at the worldwide box office for News Corp.'s 20th Century Fox since hitting screens in December.

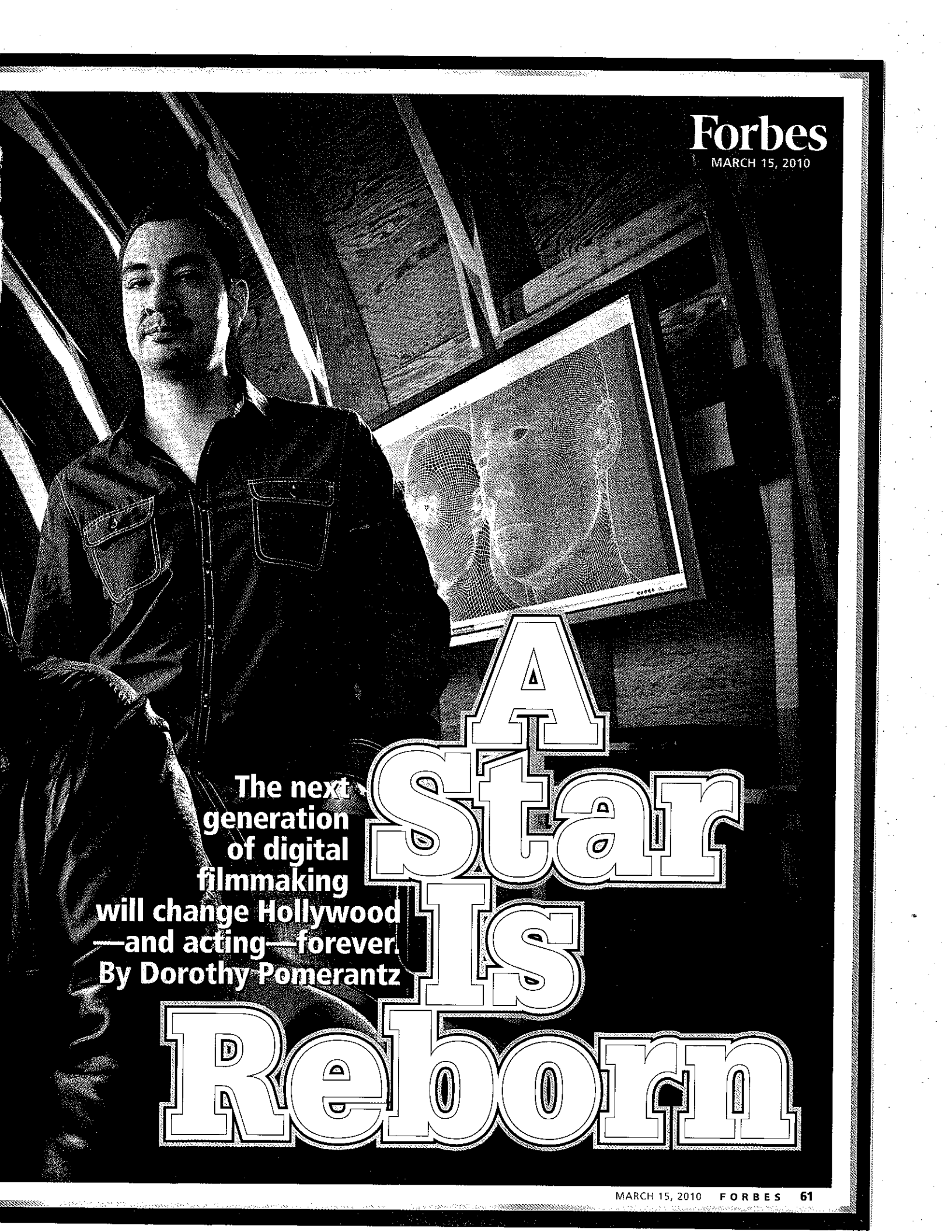
The next phase of the revolution: virtual actors, with the potential to inflame the age-old battle between Hollywood talent and studios. At stake is everything from who owns the rights to a movie star's image to what it means to be an actor to the future of storytelling. "We've already been involved in things like that," says Steve Preeg of special effects house Digital Domain. "Why? I guess because someone thinks there's money in it."

Studio executives would love to shake up Hollywood's status quo. While the box office take has grown 42% since 1999, the cost of making hit films has gone up even faster. In 1997 Hollywood was aghast that Cameron spent \$200 million to make *Titanic*. Today that budget is about average for a studio blockbuster. Result: Hol-

REANIMATORS? DIGITAL DOMAIN'S STEVE PREEG AND ERIC BARBA ARE USHERING IN THE VIRTUAL ACTING REVOLUTION.

DAVE HILL FOR FORBES





Forbes

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The next
generation
of digital
filmmaking
will change Hollywood
—and acting—forever.
By Dorothy Pomerantz

A Star Is Reborn

lywood's gross profit margin on feature films—the excess of box office, rental and DVD income over production, prints and advertising expenses—averaged only 36% from 1999 through 2008, according to Research firm SNL Kagan. Out of that comes back-end participation, studio overhead and development costs for new films.

The latest casualty of the crunch is MGM, which was sold for \$5 billion in 2004 but is now struggling to find a buyer willing to pay half that much, despite some great properties (James Bond, *The Hobbit*). "If you look at the traditional moviemaking process, it is relatively expensive and annoyingly unpredictable," says Paul Debevec, a USC professor who recently earned a Scientific and Engineering Oscar for his work on *Avatar*.

Big, expensive stars can't ensure hits, either. Just this summer Universal pumped \$100 million into bringing the 1970s TV show *Land of the Lost* to the big screen with Will Ferrell. It flopped, earning just \$68 million at the worldwide box office. (On a theatrical release a studio collects maybe 50 cents on the box office dollar but can sometimes double that take with other revenue sources, like DVDs. Thus, box office revenue is a good proxy for film revenue.) Eddie Murphy was paid upwards of \$12 million for each of his last two films: *Meet Dave* and *Imagine That*. Neither earned back its production budget at the box office. The failure of *Imagine That* contributed to Paramount's 23% decline in theatrical revenue to \$1.3 billion in 2009.

Naturally studios are experimenting. The latest formula: more technology, cheaper actors. Shia LaBeouf and Megan Fox each

earned well under \$7 million to star in the latest *Transformers* movie, a tiny part of the \$200 million budget. The film earned \$835 million at the box office. The biggest star in *Avatar* was Sigourney Weaver, and she cost maybe \$2 million, about the same as a small suite of high-end graphics computers. *District 9*, a low-budget import with great special effects, was the surprise hit of the summer, raking in \$205 million.

Rich, fully digital performances by cheap, nonmarquee actors are now commonplace. Andy Serkis was discussed as a possible Academy Award nominee for his portrayal of Gollum in New Line Studios' *Lord of the Rings* finale in 2003, even though his real face wasn't in a single frame of the trilogy. So was Zoe Saldana for her role as a 9-foot-tall blue alien in *Avatar*. (Neither actor ended up with a nomination.) Bounds of age, and even mortality, will soon dissolve. Directors will cast anyone they want, living or dead, with a talented unknown as the basis for a digital puppet on which will be plastered the computer-manipulated face of someone famous.

Hollywood's creative types profess to be skeptical—even as they embrace the technology. "I don't find synthetic characters to be all that satisfying," says director Joseph McGinty Nichol (alias McG), who used digital scans from the old Terminator movies to create a younger version of Arnold Schwarzenegger for last year's



STEP ONE

Making Faces

Lighting is crucial to creating realistic virtual characters. Professor Paul Debevec at USC cracked the problem

with his Light Stage system and won an Oscar for his work on *Avatar*. With a company called



STEP THREE

Terminator Salvation. "I think human beings have spent so long watching other human beings that it burns you out if it's not real."

"Part of the magic of any motion picture is the art and artistry of actors' performances," says Pamela Greenwalt, who speaks for the Screen Actors Guild. "Audiences recognize and appreciate that value." It's hard enough to get studios to pay live actors money from things like Internet downloads. How will SAG compete with digital actors?

Meanwhile, Preeg and the other techies at Digital Domain press on with the revolution. Based in Venice, Calif., Digital Domain was



Real Movies, Fake People

MILESTONES ON THE JOURNEY TO CINEMATIC REINCARNATION.

Zelig 1983

Painstaking edits let Woody Allen interact with historical figures.

Terminator 2

1991

Actor Robert Patrick flows between man and metal as the digital revolution begins.

The Crow 1994

Brandon Lee dies on set, but



computer effects let him finish the film.

Forrest Gump 1994

Filmmakers send Tom Hanks back in time to collect a medal from Lyndon Johnson.

Image Metrics, he created the "Digital Emily Project" to demonstrate the technology:

STEP ONE Light Stage

Inside the Light Stage 156 lights dim in different patterns to capture actress Emily O'Brien's face in any lighting condition. Polarized lenses separate the light bouncing off her face (specular light) from the light her face absorbs.

STEP TWO Specular light

By looking at just the



light bouncing off her, animators get a perfect map of every nook and cranny in Emily's face.

STEP THREE Movement

Debevec has Emily make 33 different facial expressions. Those images give

animators information about how her skin moves.

STEP FOUR The puppet

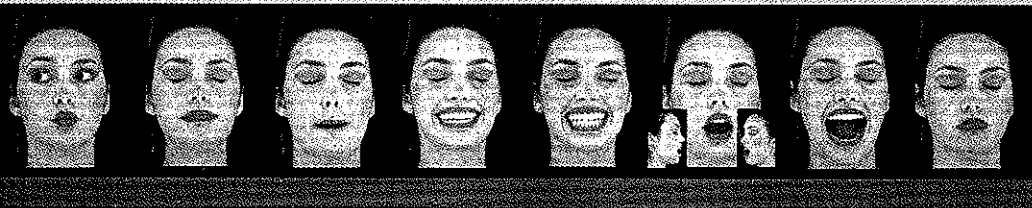
The Light Stage information is laid onto a digital mesh frame of Emily's head to create a

puppet, or rig.

STEP FIVE Acting

Animators can then move the rig to make digital Emily act. Add the voice and you can't tell it's not the real thing.

—D.P.



cofounded by Cameron, but he split with the company over a clash of egos in 1998. An investor group led by director Michael Bay later bought the company for \$35 million and set about hiring the top effects guys from George Lucas' Industrial Light & Magic. While *Avatar's* box office billions may be driving studio confidence, it was the work Digital Domain did in 2008 for *The Curious Case of Benjamin Button* that may prove to have a more lasting impact on the movie business.

Preeg and visual effects supervisor Eric Barba didn't have the luxury of a fantasy world on *Button*, the story of a man who is born

old and ages backward. When director David Fincher approached them with the script in 2002, he demanded that lead actor Brad Pitt look completely real as he goes from old man to baby.

"I was tempted to quit several times," jokes Preeg. "For the first hour of the movie it's a digital head, and if you mess that up so people have no emotional connection to the character, you've messed up a \$150 million movie." Making that connection ate up \$20 million of *Button's* \$31 million special effects budget

action or too far away for the audience to notice detail (cutting employment for thousands of movie extras as a result).

Preeg and Barba bridged the gap by focusing on lighting and skin movement. A system called Light Stage, developed by USC's Debevec (see box, above), took photos of silicon busts of Pitt's head at different ages to give the effects supervisors the information they needed to light it from any angle, under varying conditions. They could then animate a digital puppet created from the old heads using Pitt's facial movements. Once the information was captured and stored

Lord of the Rings

2001
Actor Andy Serkis brings Gollum to life through motion capture.

MOVIE STILL: EVERETT COLLECTION; AVATAR STILL: 20TH CENTURY FOX

The Polar Express

2004
Robert Zemeckis' ambitious film crashes into the Uncanny Valley.

The Curious Case of Benjamin Button

2008
A digital Brad Pitt starts out old and grows young.

Terminator Salvation

2009
Old scans of Arnold

Schwarzenegger turn back the clock on the Governor.

Avatar 2009

James Cameron creates the Na'vi, making believers of audiences—and studios.



digitally, Preeg and Barba did a lot of creative jury-rigging, synching the movements of live actors playing Benjamin's body at different ages to match Pitt's facial performance.

The process took two years, but the results were revolutionary enough to earn Preeg and Barba an Academy Award, and realistic enough that many outside of Hollywood didn't even realize they were watching a digital face rather than a real Pitt with heavy makeup.

A visitor to Digital Domain's headquarters is kept clear of the company's 175 artists and programmers. Preeg and Barba won't reveal what they're working on. But they say

lieved. Last February the sci-fi Web site Io9 claimed to have information from an insider detailing how "Tron 2.0 will clone the young Jeff Bridges." If Preeg and Barba can convince fans that Bridges is acting in scenes with his younger self, it will be the biggest step so far on the path to big-screen reincarnations.

The marketplace is ready. Dead actors are already popping up in commercials. A Mercedes-Benz ad featuring Marilyn Monroe helped the star earn \$6.5 million in 2008, despite her death 46 years earlier. More recently Steve McQueen, who died in 1980, starred in a Tag Heuer commercial oppo-

deal," says David Reeder, vice president at GreenLight.

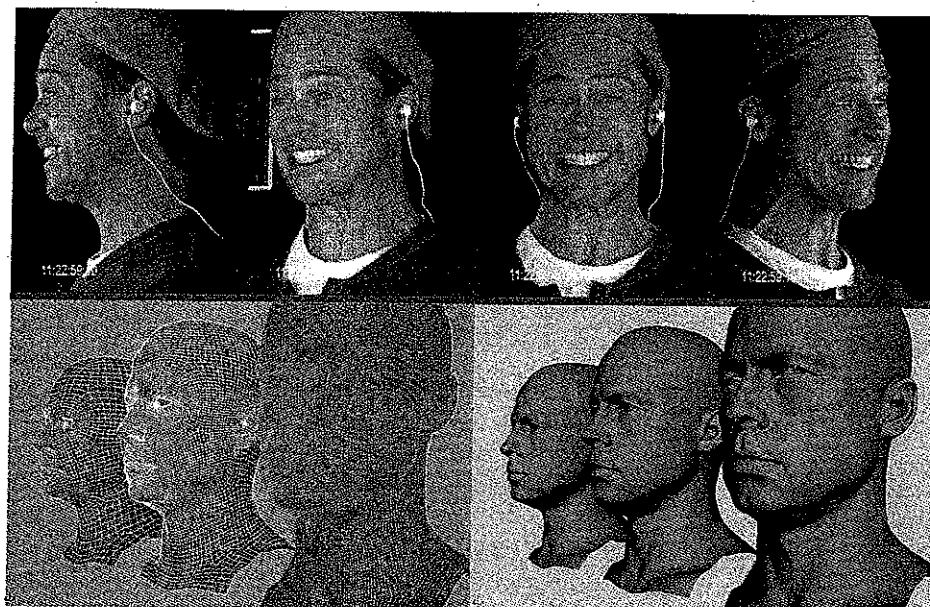
Who might be the first reincarnated star? A likely candidate is Bruce Lee, the martial arts actor who died young from an unusual reaction to a prescription painkiller. Barba at Digital Domain says that a plaster bust of Lee exists that would give the effects house a basis for a Benjamin Button-like digital version of Lee's face. Reeder says that Lee's estate is interested in some sort of animated or reanimated project for Lee. "You could imagine, given the things we saw in *Avatar*, the action scenes you could create with Bruce Lee," says Reeder.

Bruce Lee's son, Brandon, was one of the first actors to be reanimated. He was accidentally killed during the filming of *The Crow* in 1993 when what was supposed to be a fake gunshot turned out to be real. The director was able to superimpose Lee's face from existing film onto a body double to finish the movie. (It may not have been a high point in moviemaking, but it was a step up from the desperate patchwork used to finish *Plan 9 From Outer Space* after star Bela Lugosi died during production.)

Bruce Lee's daughter, Shannon, says she is interested in the possibility of a new movie featuring her father. "It's exciting and nerve-racking" says Lee. "It's quite risky, and the people taking the most risk would be us."

In the meantime the boundary between live actors and their virtual selves continues to blur. For Disney's new 3-D extravaganza, *Alice in Wonderland*, director Tim Burton refrained from completely replacing actress Helena Bonham Carter with a digital muppet. But he couldn't resist taking her head off (fitting for the Red Queen), enlarging it to twice its normal size and popping it back on her body using a computer.

Still, says Ken Ralston, the visual effects supervisor on *Alice*, machines can't replace Carter's performance. "It can't possibly be the same thing." At least not yet. **F**



PITT ACTED OUT THE FIRST HALF OF *BENJAMIN BUTTON* STANDING STILL AND MOVING ONLY HIS FACE AND HEAD. ANIMATORS USED HIS PERFORMANCE AS REFERENCE WHEN MOVING HIS DIGITAL PUPPET.

the next big step would be to create a younger digital version of a famous actor, a far tougher goal than making someone older and crucial to eventually reanimating a dead actor. "People have recollections, and you'd have to match them," says Preeg. In the case of a dead actor that would also mean either hiring a mimic to dub in the voice work or awaiting further developments in digital audio creation so that live actor A sounds like dead actor B.

There's speculation that a younger performance is exactly what we're going to see from Digital Domain when the Disney film *Tron Legacy* hits theaters in December. The movie is a sort of sequel to the technically pioneering 1982 cult hit starring Jeff Bridges. Bridges stars this time, too—with a twist, if Hollywood gossip is to be be-

site Formula One racer Lewis Hamilton.

GreenLight is a clearinghouse that licenses dead celebrities like McQueen, Johnny Cash and Bruce Lee. Heirs contract with the company to work out deals for their loved ones to appear on high-end T-shirts, posters, commercials and videogames. (A 1985 California law ensures publicity rights for a celebrity up to 70 years after his or her death.) For now the deals are done on a strict licensing basis. The estate gets a fee from the company that wants to use the celebrity's image. There are no royalties. But if dead celebrities start appearing in movies, they could end up with the same kinds of lucrative contracts living stars enjoy.

"If they're essential to a film, the approach will be to negotiate an actor's

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For more on the rise of digital Hollywood, go to Forbes.com/virtualactors

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