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Computers Now, Apocalypse Coming Right Up

By BRUCE NEWMAN

Los Angeles -- In the small, darkened room above an old airplane hangar once owned by Howard Hughes, the director Roland Emmerich and two other men sit gazing into the glow of the last campfire before the apocalypse. It is Mr. Emmerich's apocalypse now; he built it.

Bathed in the firelight of an alien spacecraft burning on a high-definition computer monitor, the director adds his unmistakable touch to a blur of finger smudges on the screen. "We need more flames here," he says, pointing. "And everywhere, destruction."

Mr. Emmerich is composing digital effects shots for "Independence Day," a film about the invasion of Earth by an alien armada that opens on Wednesday and stars Will Smith, Bill Pullman and Jeff Goldblum. When Mitchell Drain, the digital artist who is helping Mr. Emmerich blend bits and pieces of computer-generated imagery to create a single composite shot, senses there are more actors in the foreground than the director wants, he offers to make them disappear. Mr. Emmerich nods, and in a heavy German accent he orders, "Wipe them off the face of the earth."

That done, Mr. Emmerich asks to have another group of people "downsized" and moved to the corner of the frame, which Mr. Drain manages in an instant. On the screen, a helicopter flies over a group of people standing on a hillside and on toward the Los Angeles skyline, where hovering alien ships are about to give the city an extremely bad hair day. When some wildflowers appear in the bottom of the picture, Mr. Emmerich orders up a human figure to be placed in front of them. This, too, is accomplished with a touch of Mr. Drain's electronic wand.

What makes this scene unusual is that the people on the hill are not really there, the helicopter is not really flying across the sky, the helicopter is not really a helicopter, and that's not really the sky either.

In fact, the only there there is the shot of downtown Los Angeles, which was photographed nearly a year ago for use as a "backplate," or what amounts to a canvas for the film's digital artists. When the compositing session ends, Doug Smith, the visual-effects supervisor, mentions to Mr. Emmerich that the sound for this shot is finished. "It is, in a way," the director replies cryptically. "And in another way, it isn't."

This is the brave new world of digital movie making, where films are shot *inside* powerful computers by virtual cameras mounted not on cranes but on silicon chips. "So much more of the creative process is in post-production now," says William Fay, the executive producer. "When we finished principal photography for 'Independence Day,' we still had nearly half the movie to shoot."

To make the computerized portion of the film, Mr. Emmerich and about two dozen digital artists have been living for months in a virtual world of rooms like this one, lighted only by a red lava lamp and a small digital clock that flashes 12:00 endlessly.

There are occasional reminders of another world outside, with its own flashing digital clock, and today one has arrived in the form of a story in Entertainment Weekly reporting -- inaccurately, as it turns out -- that there are more than 3,000 special-effects shots in "Independence Day." The magazine was actually referring to the number of "elements" that

make up the raw ingredients of special-effects shots: the rabbit, the hat, the wand and the man in the cape that together make the trick magical.

That Mr. Emmerich and his colleagues find this error laughable says a great deal about how much is understood inside this room about an emerging art form with its own new vocabulary, and how little is understood outside it -- the difference between data and Dada. Ý

There are actually more than 360 digital special-effects shots in "Independence Day, composed from more than 4,000 individual elements. In the shot Mr. Emmerich has been working on, for instance, the backplate is one element, the helicopter another, the people a third that exist on an electronic palette like watercolors or oils. And the most important color accessory in this paint box is the blue-screen, in front of which all the separate elements are filmed. Programmed to strip out all the blue, the computer can then join the layers to form a single shot. Mr. Drain is working on a shot for one of the climactic scenes in which there are more than 70 layers of fire, smoke and debris, something no other movie has ever had before.

"A couple of years ago everybody's mouths were hanging open because 'Jurassic Park' had seven minutes of computer-generated effects," says Tricia Ashford, the film's digital visual-effects supervisor. "In this picture we deliver over 50 minutes of effects." There is a single 10-minute reel with visual-effects shots flashing past the eye at a rate of one every five seconds.

The film makers had originally planned to make "Independence Day" an aggressively low-tech production; mixed in among the 120 shots using miniaturized models -- another record -- are images that were created by literally hanging models from pieces of string in front of still photographs.

This unintended homage to the director Ed Wood's loony "Plan 9 From Outer Space," in which the aliens arrived from outer space in a pie pan, was an attempt to profit from the lessons learned by the director and the producer, Dean Devlin, in their previous collaboration on "Stargate," a surprise hit when it was released in 1994.

"I didn't want to have any CG" -- computer-generated -- "stuff in the foreground because I tried it before and failed miserably in 'Stargate,'Ý" says Mr. Emmerich. "We spent like four months doing that, and finally I stopped it because it looked terrible. But I was a little bit stupid because I should have known that CG work is taking every half-year a gigantic step forward."

The "Independence Day" script was written and storyboarded at the same time at the same table, with Mr. Devlin writing on a laptop and Mr. Emmerich drawing the scenes. The movie was always intended to be an effects spectacular, so they sent the finished script off to state-of-the-art effects houses like Industrial Light and Magic ("Twister") and Digital Domain ("Terminator 2"), which estimated the costs at about $150,000 for each visual effect. With a budget of about $70 million, the best the film makers could have hoped for was to make a stripped-down version of the present movie.

"They didn't really have a lot of money, considering how much they wanted to put up on the screen," recalls Ms. Ashford. By starting what amounted to their own effects boutiques, with teams of handpicked animators and model builders, they were able to trim the cost of the visual effects to under $40,000 a shot.

Though "Independence Day" wasn't exactly put together on Mr. Emmerich's Visa card, he and Mr. Devlin used many of the tricks common to low-budget film making. But by far their boldest move was to import a group of students from a German film school and turn over to them the early stages of the digital-effects work.

"It was a little experiment that paid off big-time for us," the director says. "What they particularly brought was the ability to not all the time say, 'That's not possible.'Ý"

During a trip to Germany to promote "Stargate," Mr. Emmerich had stopped off to see an old colleague, Volker Engel, an instructor at the prestigious Filmakademie Baden-W¸rttemberg, whom he had chosen to coordinate the visual effects for "Independence Day." Mr. Engel showed him a class project that several of his students had worked on, a 50-minute science fiction movie about an underwater station in the Marianna Trench. It contained four minutes of pure computer-generated animation and compositing that involved one actor being multiplied several times.

Recognizing a vein of undiscovered talent willing to work incredibly long hours for very little money, Mr. Emmerich brought seven of the students to America. For several months they constituted the production's entire computer animation department, and they quickly set about convincing the director and the producer that their thinking on computer imagery was prehistoric, which is to say from the "Jurassic" era.

Their opportunity arrived last fall, as work was beginning on the climactic dogfights between F-18 fighter jets and the small alien attackers.

The animators visited the U.S. Marine base at El Toro, Calif., to take photographs of an F-18 from every conceivable angle -- the fighter jocks affably swapping stories with the computer jocks -- then scanned the photos into a computer, pasted the images together to create a kind of digital skin and grafted that onto a computer-generated wire frame. Now they had a realistic, three-dimensional, virtual F-18 fighter bristling with ordnance. No more games of Donkey Kong for die Kinder.

The young Germans got permission to set up a test comparing a computer-generated shot of an F-18 with a close-up photo of an F-18 model.

"You get very close to the planes as they go whooshing by, and you really could see all the detail," says Hartmut Engel, one of Volker Engel's students. "That was when we really worked long overtime hours, the whole weekend through.

"But in the computer you are really set free," he explains. "You can make parts move that you usually can't in a physical model because you have to get motors to fit. We thought breaking through those limitations and doing stuff you cannot do in motion control would be a good chance to take over."

By proving they could make the digital pilots move around in their byte-stream cockpits, the animators earned control of the so-called hero shots that appear to show Will Smith and Bill Pullman in flight.

One problem with rendering such images in the past was that the computers always created razor-sharp images, which looked unnatural to the human eye. But the latest generation of computers has no problem creating the kind of blurring that makes the motion seem natural. This made the aerial battles in "Independence Day" -- for which not one genuine F-18 ever left the ground -- look just as authentic as those in a movie like "Top Gun," which used real jets.

"Way back in the old stop-motion times, when Ray Harryhausen was doing all the 'Sinbad' movies and 'Mighty Joe Young,' they moved their puppets, took away their hand and took photos," says Hartmut Engel. "And because there was no movement within a single frame, you had razor-sharp images of every action.

"When you look at it now, you still love the way it looks. But for some reason, you feel it's not real. You see it's a puppet. And that's because there is no motion-blur."

The German-led team of animators created jets so convincing that they were eventually mixed in side by side with model shots.

"We have a whole chase through the Grand Canyon in which we constantly switch back and forth," says Mr. Devlin, "and I defy anyone to tell which ones are the models and which are computer generated."

Such scenes are dazzling visual showpieces, and "Independence Day" has dozens of them. But for all their computer-corrected realism, they are still just sophisticated versions of Ed Wood's pie pan and can only engage an audience on the slightly giddy level of suspended disbelief dangling from a piece of string.

In some ways, it is the close-up magic of what Ms. Ashford refers to as the "invisible effects" that either put the movie over, or do not.

One of the more satisfyingly thrilling of these moments occurs when Mr. Smith's girlfriend (played by Vivica Fox), her little boy, and a dog that could pass for Old Yeller are trapped in a tunnel through which a fiery wall of destruction is about to pass. Boomer, a Labrador retriever, must leap across the back of a car to escape the roaring river of fire.

The scene is rich with the kind of detail almost certain to singe the eyebrows of moviegoers. Yet most of it was stitched together digitally on a computer screen by Conny Fauser-Ruemelin, another of the German imports.

The rolling fireball was an actual explosion, filmed from above the detonation point. Then the picture was, in effect, turned on its side so it would appear to be going through a tunnel. All but one of the cars in the shot are model-miniatures, shot in front of a blue screen on which Ms. Fauser-Ruemelin first painted the tunnel wall, then added hundreds of pieces of flying debris.

Boomer actually jumped across a blue box, over which Ms. Fauser-Ruemelin then stripped in the image of a car. She also added a reflection of the dog in the car's rear window as he jumped, and painted in subtle ripples of heat and light on the tile wall. She even animated the car that Boomer hurdles, to make it dip slightly under his virtual weight. Ms. Fauser-Ruemelin says, "I'm really proud of that bump."
