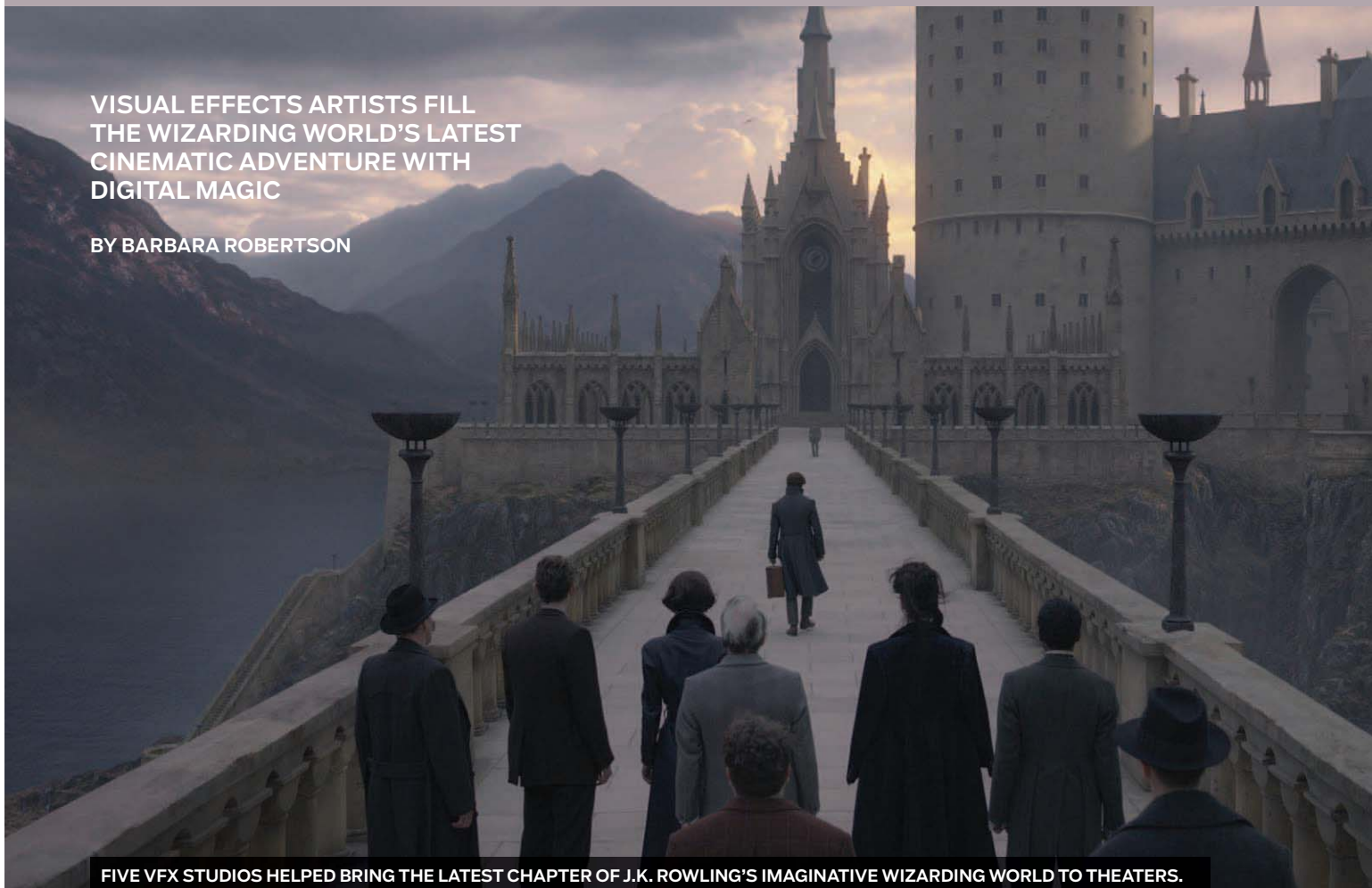


# Magic in the Real World

VISUAL EFFECTS ARTISTS FILL  
THE WIZARDING WORLD'S LATEST  
CINEMATIC ADVENTURE WITH  
DIGITAL MAGIC

BY BARBARA ROBERTSON



FIVE VFX STUDIOS HELPED BRING THE LATEST CHAPTER OF J.K. ROWLING'S IMAGINATIVE WIZARDING WORLD TO THEATERS.

The year is 1926. Newt Scamander, a self-proclaimed magizoologist, has returned to London after helping stop the dark wizard Grindelwald's violent attack in New York City. But, the wizard is not so easily stopped, and Newt is about to face a new challenge. Grindelwald has escaped his confinement and is gathering followers. His goal is to have wizards and witches rule over all non-magical beings. Professor Dumbledore, headmaster of the wizarding school Hogwarts, asks Newt to thwart Grindelwald's plans.

Warner Bros.' *Fantastic Beasts: The Crimes of Grindelwald* is the 10<sup>th</sup> film in the wizarding series that began in 2001 with *Harry Potter and the Philosopher's Stone* (aka *The Sorcerer's Stone* in the US). It is the second film in the subsequent *Fantastic Beasts* series, which in the wizarding world, takes place before that first *Harry Potter* book and film.

Eddie Redmayne stars as Newt Scamander.

Katherine Waterston is Tina Goldstein, a law-enforcement auror who hunts dark wizards. Ezra Miller is Credence Barebone, a disturbed child who apparently now has complete control over his Obscurus, a dark parasite that, when unleashed, can wreak havoc. Zoë Kravitz is Leta Lestrange, a confused young woman who Newt once loved. Claudia Kim is Nagini, who can transform into a snake and is well known in the *Potter* series as the companion of Lord Voldemort. Jude Law is Albus Dumbledore, the influential and powerful British wizard. And, Johnny Depp is the villain Grindelwald, as he was in the previous film, the 2016 *Fantastic Beasts and Where to Find Them*.

Many of the filmmakers have worked on the previous *Fantastic Beasts* and *Harry Potter* films. David Yates, who directed the final four *Harry Potter* films and the previous *Fantastic Beasts* film, directed *The Crimes of Grindelwald*. J.K. Rowling, who wrote the *Harry Potter* series, wrote the screenplay. Tim Burke, who has been a visual effects supervisor on all *Harry Potter* and *Fantastic Beasts* features except the first *Harry Potter*, and overall supervisor on all but the second, was visual effects supervisor for this movie along with Christian Manz, creative director at Framestore. Manz had also supervised effects on *Fantastic Beasts and Where to Find Them* and supervised effects at Framestore on *Harry Potter and the Deathly Hallows: Part 1*. Stuart Craig, who has been production designer on all the films, returned for *The Crimes of Grindelwald*.

"One of the interesting things about this film compared to the previous films has less to do with technology and more to do with our creative involvement in the process," Burke says. "We've had some [early participation] on each film, but on this one, the visual effects department had even more so. There are between 40 and 50 designed creatures in this film. We'd work with simple descriptions in the script for creatures we had to design. And, we had action sequences that were briefly, minimally described. We were involved in the creative storytelling and the development of the story. It was very collaborative between David [Yates], J.K. [Rowling], Christian, and me. They were open to suggestions on how to develop a sequence."

Five studios did the bulk of the visual effects work: Framestore, Double Negative, Method, Rodeo FX, and Image Engine. Burke and Manz split the action, with Manz largely handling the action sequences and Burke supervising those with CG characters. Artists from Nvizage, Proof, and The Third Floor previs'd and postvis'd the film, which had 2,500 visual effects shots.

"We had a 40- to 50-person team working on previs and postvis in the studio with me and Tim," Manz says. "It was a creative process. Like the first film, we wanted to let vendors do real work, not temps. We wanted to make the shots work [in previs and postvis] before they spent time and money doing it all properly in postproduction. By the time the vendors got going, they had a solid base to start from."

Unlike the *Harry Potter* films, the *Fantastic Beast* stories take place in the real world for the most part – New York City in the last film; New York, London, and Paris, plus Hogwarts, in this film. The feature opens with Grindelwald's escape in New York.

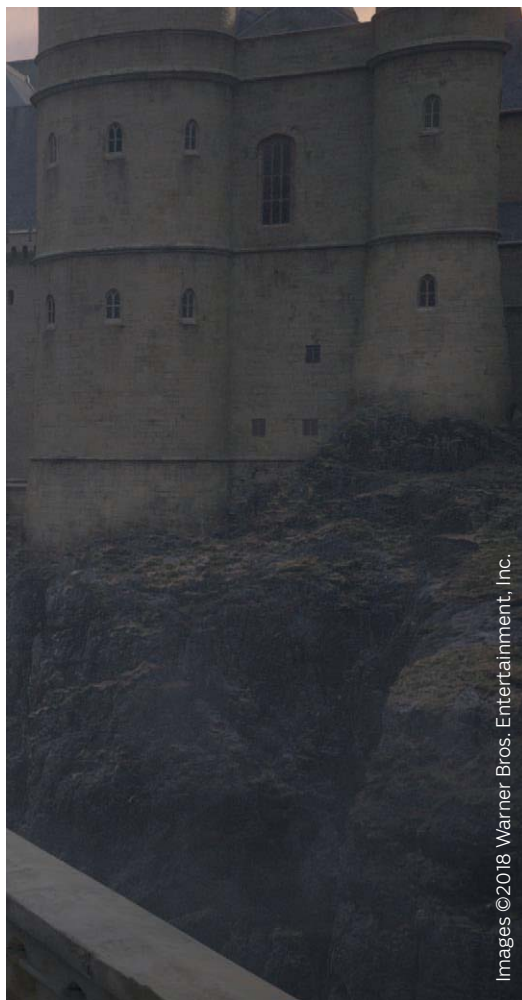
## Escape from New York

Grindelwald escapes his confinement one rainy night with help from Abernathy (Kevin Guthrie), a former MACUSA supervisor. They shoot out from a building in a black aerial carriage pulled by thestrals, huge, black, winged horses with faces like dragons and skeletal bodies visible only to people who have witnessed death. Broom riders traveling alongside escort the carriage out of New York airspace. Everything except the actors in the carriage is CG; the broom riders are digital doubles. To build the New York City beneath, the crew used assets from the previous film, referencing images of New York at night in the rain.

The Third Floor previs'd the sequence.

"We didn't do any motion-control moves or anything that looked too controlled," Manz says. "We shot free-form. We wanted it to feel real. So, we had a camera on a gimbal motion base and a rig based on a floating chair used on the first film that's driven by the weight of the actor. We did a lot of work with effects rain – [we] hosed Johnny [Depp] and Kevin [Guthrie] down and blew them with wind. We had a physical carriage on set but we replaced it with CG."

During the escape sequence, we realize that Abernathy and Grindelwald have



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GRINDELWALD ESCAPES CAPTIVITY IN A CARRIAGE PULLED BY CG THESTRALS.

exchanged identities, a trick made possible by artists at Image Engine who created full CG doubles for each actor and morphed between them.

“We do a transition where the camera is very close up and doesn’t move,” Manz says. “We see the transformation with all the hair moving on the CG character.”

### Newt’s London Apartment

It looks conventional at first, but something is happening in the living room. Lights flash and reveal baby Nifflers scurrying around. The rodent-like creatures with a long snout and fluffy hair love sparkly objects, and these babies were trying to steal things in Newt’s apartment.

“The brief for all baby creatures is that they have a cute quality, so we referenced young chicks as a starting place and guinea pigs for the different color designs,” Burke

says. “David wanted a semi-comedic Chaplin-esque shot. Newt has to use his skill and some kitchen implements to catch them in a comedic way.”

We discover that although Newt’s apartment looks simple, he has a menagerie of magical creatures downstairs in the basement.

“In the last film, he used his suitcase to capture and house creatures,” Burke says. “This is the bricks-and-mortar version. It’s like a rescue hospital. Newt has been away and come back. He wants to see his animals and get on with it.”

The basement was one of the first things Craig designed, according to Burke. It has interwoven Escher-esque staircases and multiple alcoves for Newt’s CG animals. Among the digital beasts are an Augurey, a thin, green and black, mournful-looking vulture-like creature, and a Leucrocotta.

“The Leucrocotta is a mythical creature based on a stag,” Burke says. “We designed it in the visual effects department and thought it would be amusing if it had a large jaw that it could open like a shark. We went straight into animation studies once we had a rough sketch. A team of animators, modelers, and riggers gave it basic controls so we could design the movement, weight, and some facial expressions.”

It’s in London where Newt meets Dumbledore, and the wizardly professor sends him searching for Grindelwald. The sequence takes place in the city of London, in Albert Square and near St. Paul’s Cathedral.

“We added soot and dirt to all the buildings to create the look of 1920s London in the street scene,” Manz says. “Then we filmed on greenscreen for foggy London and put the world in afterwards, digitally scanning St. Paul’s Cathedral and Albert Square, and creating mist and fog. We created shapes in the fog through light. Framestore created all that. Lots of locations, lots of scans, lots of reference photos.”

### Paris Circus

Grindelwald, Newt learns, is in Paris. Since Paris today looks similar enough to Paris in the 1920s, the filmmakers had Clear Angle Studios spend a month in that city scanning buildings and capturing textures.

“They scanned and textured whole streets,” Manz says. “We could show low-res versions to Stuart Craig in postvis and introduced him even more to what we can do digitally. We’d say, ‘Well, we can slide that building there. It’s easier than moving a large chunk of set.’”

In digital Paris, Framestore artists built a pretend square, and within it, a magical circus. There are crowds of people, fire-eaters, and children tumbling inside bubbles outside a large circus tent.

“When you go to a fun fair, you see children running after a guy making big bubbles, so we thought, What if the child could jump into the bubble?” Manz says. “David liked the idea, and it made it into the film.”

To create the effect, they spun a seven-year-old boy into the air, and then a digital double took over. Framestore created the bubbles and digital doubles in Autodesk’s Maya.

Inside the tent are Credence and Nagini, and, as is her wont, Nagini transforms into a snake.



NEWT’S ESCHER-ESQUE BASEMENT HOUSES HIS CG ANIMALS.



“She’s a big *Harry Potter* character, so we knew we had a lot of responsibility in bringing her back to life and making her look better than before,” Manz says. “We did two things. We didn’t want to use cuts – we wanted to show what would actually happen. And, we wanted the idea of Nagini being consumed by the snake.”

The idea was that she would wrap her arms around herself and coil herself into a python. As they considered what that might look like and how they would create the effect, their thoughts turned to contortionists.

“The costume department designed a snakeskin dress that would work nicely,” Manz says. “We did motion-control passes of a contortionist and of Claudia Kim, the actor.”

To help animators and lighting artists who would create the effect in postproduction, the filmmakers brought in a reticulated python that was on set for lighting reference, scanning, and video reference.

“I’m terrified of snakes,” Manz says. “When they brought in the python, I locked myself in the car. Fortunately, I had a really good team of people there.”

Artists at Framestore created a digital double for Kim, a digital snake, and the transitions between in postproduction.

“It was only one shot, but it was a massive amount of work,” Manz says.

The sequence inside the circus tent ends with a fire and a chaotic escape scene. The camera travels inside and we see circus stuff inside folding up into itself. The circus ringmaster says, “Paris is done for us,” waves his wand, and everything in the tent ends up as a smoking rag on the floor that he pops into his pocket.

“We previs’d the scene, then created it using footage from steadicam moves on set,” Manz says. “We joined that with digital creatures blending through elements of people running. We had a full-digital version of the circus set and its contents. As we go inside the tent, it feels like everything is reducing in scale. We lose depth of field and things get smaller. We discovered a lot of that with *Proof* in postvis, and then Framestore made it look fantastic.”

## Zouwu

One of the creatures escaping the circus fire is the biggest hero creature in the film, Zouwu. To create Zouwu, the team referenced a fast-moving Chinese mytholog-



DIGITAL DOUBLES OCCUPY CG BUBBLES OUTSIDE A CIRCUS TENT.

ical creature, catlike with a long tail, the size of an elephant.

“David [Yates] asked that we try to push the creatures, to create extraordinary beasts,” Burke says. “We had crazy, out-there designs for Zouwu. He was lizard-like but with the body of a large tiger. His tail is as long as his body. Our animators gave him an almost serpentine lizard-like movement that took it away from the cat. But, he still has the facial features of a cat. We gave it bulging, expressive eyes and based the facial performance on Chinese dragons. David loved it.”

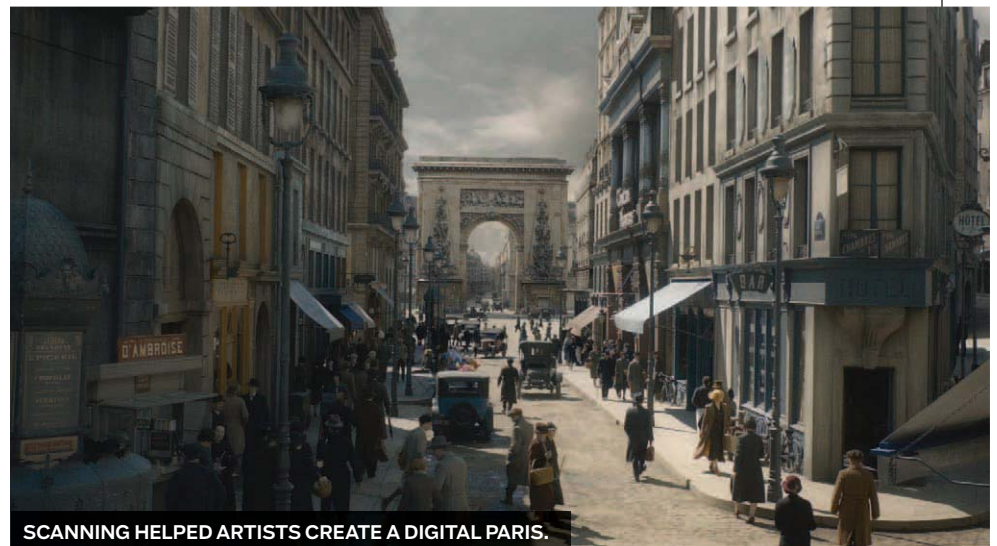
In Paris, Zouwu runs amok, crashing into buildings and cars as Newt chases him. He catches him on a bridge over the river Seine using a little toy on the end of a stick that mesmerizes the creature, much like a house cat becoming fascinated by a toy on a string. On set, puppeteers performed

a full-sized, lightweight mock-up to give Redmayne something to interact with. Once Newt captures Zouwu, he puts the creature into his suitcase, unlocks Zouwu’s shackles, restores the creature’s power, and the two beings bond.

## On the Move

As is typical in *Harry Potter* and now the *Fantastic Beasts* films, the action moves from one spectacular setting to another. In addition to new locations in this film, the characters visit several locations familiar to *Harry Potter* fans.

“Framestore re-created the great hall at Hogwarts with all the candles,” Manz points out. “It was a huge digital build. With only one shot there, there was no appetite to rebuild the set, so we scanned the set on the Warner Bros. tour and used that to re-create the hall digitally, referencing the



SCANNING HELPED ARTISTS CREATE A DIGITAL PARIS.



A CG NIFFLER SITS ATOP NEWT'S FAMOUS SUITCASE.

look from previous *Harry Potter* films.”

The filmmakers also shot scenes in Lacock Village, which *Potter* fans will recognize from the second film, *Harry Potter and the Chamber of Secrets*.

As for the Ministry of Magic...

“It was a large practical set originally, and we found photos and plans of the original drawings used in *Potter* five [*Goblet of Fire*] and seven [*Deathly Hallows: Part 1*],” Manz says. “And, we scanned set pieces on the *Harry Potter* tour that Rodeo used to build the digital environment.”

The artists also created a flashback sequence for Leta Lestrange with a capsizing lifeboat in a fully simulated ocean during a storm. For that, the filmmakers shot people in a water tank and then the artists replaced that real water with simulated water.

Another sequence with effects by Rodeo artists begins with Nagini and Credence in

an apartment. Credence wants to discover who his mother is and asks his former nurse, Irma Dugard (Danièle Hugues).

“We gave this four-foot-tall French actress big house-elf hands with three fingers,” Manz says. “Just that. No funny ears.”

A hidden assassin called Grimmson (Ingvar Eggert Sigurðsson) pulls Nagini into the walls. She turns into a snake and accidentally kills Irma. That causes Credence to turn into an Obscurus.

“He explodes,” Manz says. “We filmed on a complete set, and then when it came to the destruction, removed half the set and all the dressing and had the actors on greenscreen. Rodeo rebuilt the set, all the layers of walls, the tiles, the set dressing. They did an amazing job.”

Another spectacular environment and explosion, this created at Framestore, takes place in Grindelwald’s Alpine castle.

“We took a lot of photographs on a two-day helicopter shoot in Switzerland for a shot in which Credence casts a spell and smashes a mountain,” Manz says. “We also had Dominic Ridley from Clear Angle, who took between 10,000 and 20,000 photos. By using photogrammetry, we created 12 kilometers of the valley digitally. Framestore used that digital scan from Clear Angle as a basis for creating a full-digital environment.”

Framestore also created a phoenix that bursts into fire.

“You can see glimpses of the old animatronic phoenix in the *Harry Potter* films, but we referenced real birds and built one more anatomically correct,” Manz says. “Framestore created the fire burst with fluid simulations. You see a feathered bird born out of the simulated fire. It was quite complicated. That was a tough thing about this film. You have to make effects that look amazing, but you only see them for a few shots. In a way, though, that’s what I like. It makes you believe them more than if you focus on them.”

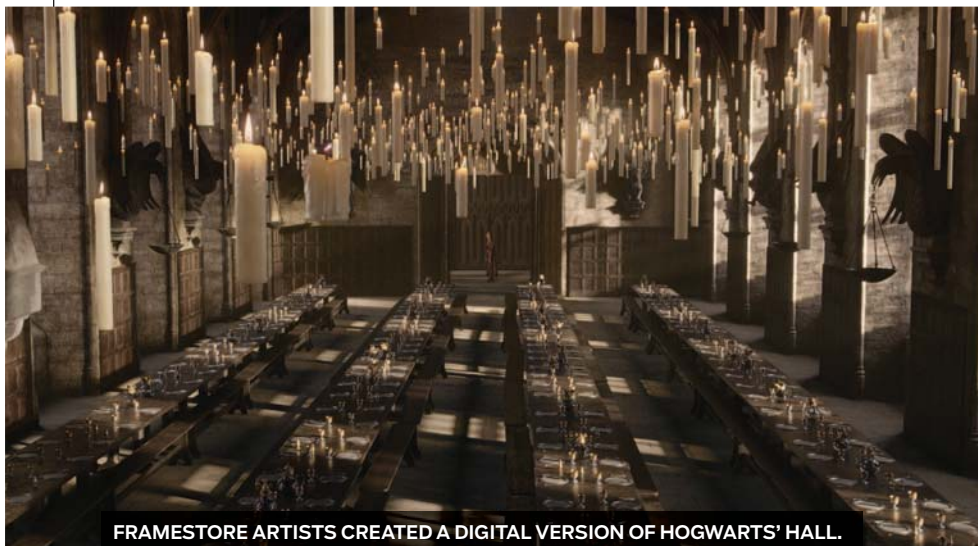
## Moving On

To move between environments, Newt is sometimes on the back of Zouwu, which has the ability to bend and warp time and travel great distances quickly. To create this effect, artists at Framestore used a fluid system.

“They rebuilt sets digitally so we could unmap all the structures and turn them into a fluid,” Burke says. “It’s almost like a viscous liquid that encases Newt on the back of Zouwu and they become weightless in the midst of this fluid. We liken it to a mind thing that Zouwu could control. He has an amazing mane with long tendrils around the neck that are like synapses from his brain that warp and distort the environment. That’s how he apparates [teleports] through time and space.”

In one of the most visually dramatic sequences in the film, Newt travels on Zouwu through a time tunnel into a cemetery where Grindelwald is holding a rally. The setting is beneath, in a huge underground circular amphitheater designed by Craig, of which approximately 20 percent was built on set. Double Negative extended the amphitheater and filled it.

“They didn’t create digital doubles,” Burke says. “They created 4,000 extras by using sprites – cards with re-projected filmed



FRAMESTORE ARTISTS CREATED A DIGITAL VERSION OF HOGWARTS' HALL.



footage. We felt the projections would be better than a CG crowd because it's circular."

It's a trap. Grindelwald creates blue fire and uses it to attack Newt. Then, Grindelwald attempts to convince the wizards and witches attending the rally that they should follow him. He creates a vision of what the humans are about to do. What they are about to do is start World War II.

"We created the vision with fluid effects using live-action footage and filled the whole underground," Burke says. "It culminates with the atomic bomb going off."

Newt and his friends escape into the cemetery exterior, and we see the whole of Paris beyond. But, Grindelwald turns blue fire into huge, winged, demonic creatures with skeletal bodies.

"They're about to be unleashed to attack Paris," Burke says. "Our remaining wizards have to stop them. So, we discussed how we did sequences with the Inferians in the sixth *Harry Potter* [*The Half-Blood Prince*] and decided to fight fire with fire." (In that film, Dumbledore surrounds himself with a ring of fire to fight the Inferi.)

In this film, the wizards slam down their wands and create a circle of fire 100 meters in diameter that entraps the blue fire.

"They use their magic to drive the creatures, almost like herding, back underground where they originated," Burke says. "It's an epic sequence. We have orange fire around blue fire creatures. DNeg built all the set extensions, all the fire effects, and the creatures. The creatures are predominantly fire simulations created in [Side Effects'] Houdini, with subtle skeletal forms underneath. The fluid runs off wing shapes. The head has minimal amounts of fire attached to it. There's a charred, blackened skull underneath. It took a lot of R&D work to get the right volume of fire, to get the right movement of the creature, and to get the right amount of fluid emitting at the correct speed."

Although the team referenced the fire effects from the sixth *Potter* film, which aired in 2009, effects such as those created for this feature would not have been possible then – or at least not possible within the same time frame.

"When I was working as a supervisor at The Mill on *Chamber of Secrets*, I'd try to show Jim Mitchell [VFX supervisor] and



THE CG ZOUWU CAN APPARATE THROUGH TIME AND SPACE.

Chris Columbus [director] animation," Burke says. "I was so limited by how many playblasts I could put in front of them. We were trying to get the spiders rendered, lit, and into the film, and we could show only one or two hits. That compared to the speed we can do things now – the complex stuff, fire and water effects.... Some of the water work that Method did in this film is among the most sophisticated interactive work I've been involved with. DNeg's fire – for such huge renders, to get those on that scale – we wouldn't have been able to complete them before. But now, we can give the director iterations. So, when we're designing a creature made of fire and the director doesn't like the way it moves, we have been able to go back, modify, and render simulations that adjust based on new animation. That kind of turnaround was restricted in the past."

This speed is also important to meet today's compressed schedules.

"Tim and I started on the film in January 2017, working with David and other key production team members, then helped design creatures and the action sequences through preproduction and through the shoot," Manz says. "Postproduction was five or six months, although we had built assets before that. But, we had a plan, and the postvis helped the studios know what to do. Plus, the industry as a whole has more experience. Work that five or 10 years ago would have been tough isn't. Having great artists and a plan makes it possible."

And, perhaps, a touch of magic. ■

Barbara Robertson (BarbaraRR@comcast.net) is an award-winning writer and a contributing editor for CGW.



VFX ARTISTS HELPED DESIGN MANY OF THE 40-PLUS NEW CHARACTERS.