Time Benders

Newton Thomas Sigel, ASC shoots in stereo for the time-traveling superhero adventure *X-Men: Days of Future Past*.

By Michael Goldman

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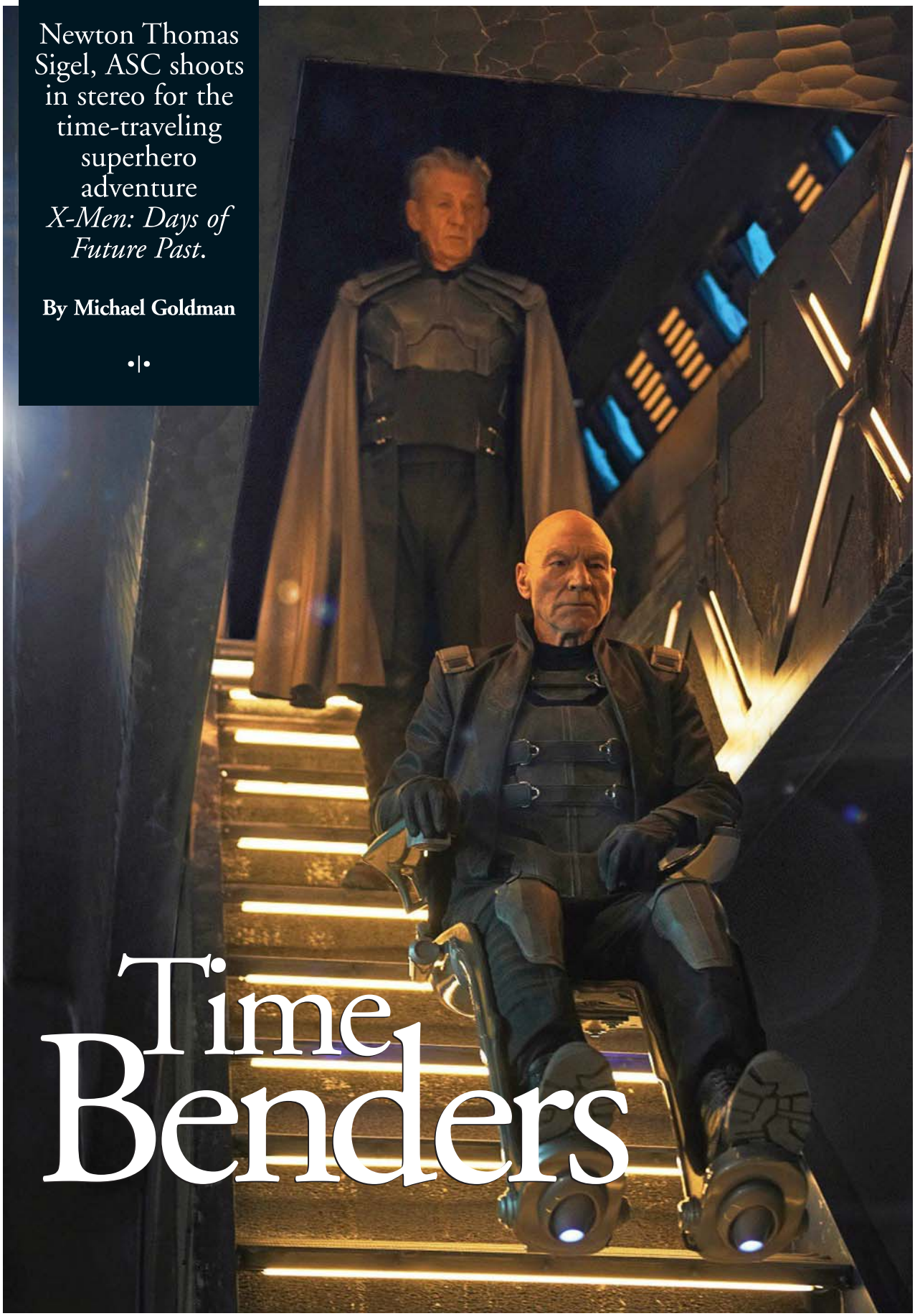

Opposite: Magneto (Ian McKellen) and Prof. Xavier (Patrick Stewart) reunite to save the mutant race in *X-Men: Days of Future Past*. This page, top: Wolverine (Hugh Jackman, left) travels back in time to join the younger Magneto (Michael Fassbender, center) and Prof. X (James McAvoy) in a fight to save their future. Bottom: Cinematographer Newton Thomas Sigel, ASC.

Unit Photography by Alan Markfield, courtesy of Twentieth Century Fox Film Corp.
Additional photos courtesy of Newton Thomas Sigel. Lighting diagram courtesy of Tony Nakonechnyj.

In *X-Men: Days of Future Past*, the mutant heroes plot to circumvent an apocalyptic future by sending Wolverine (Hugh Jackman) back in time to partner with his teammates' younger selves and alter the course of history. Shaking up the *X-Men* films via this time-traveling tale particularly appealed to director of photography Newton Thomas Sigel, ASC — who, along with director Bryan Singer, returned to the franchise for the first time since shooting *X-Men* (*AC* July '00) and its first sequel, *X2* (*AC* April '03). (Singer had maintained a producing role on subsequent films.) Beyond the narrative, though, Sigel was also inspired by Singer's insistence that *Days of Future Past* be shot in native 3-D.

The decision to shoot in 3-D came on the heels of the stereoscopic work Sigel and Singer had done on their previous collaboration, 2013's *Jack the Giant Slayer*. After that experience, Sigel says the director was confident that native 3-D capture would offer the best results. Singer eventually got Twentieth Century Fox to agree — with the financially driven caveat that about 20 minutes of complex second-unit work would be shot in 2-D and then converted.

"I think *Jack* had a big influence on Bryan's thinking," says Sigel. "We learned a lot about lens choices, cutting, the whole choreography for 3-D. [*Days of Future Past*] was certainly a very different film and a different style, and we pushed the 3-D a lot more; we went for more stereo depth on this film than on *Jack*, where we were a lot more conservative. But it gave us a certain comfort level in that we knew how to do it, and so the studio agreed to Bryan's approach."

For the production, which was

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Top (from left): Sunspot (Adan Canto), Kitty Pryde (Ellen Page), Iceman (Shawn Ashmore) and Colossus (Daniel Cudmore) steel themselves for battle. Bottom: Bishop (Omar Sy) protects the mutants' inner sanctum.

predominantly shot on stages and locations in and around Montreal, the filmmakers opted to work with Arri Alexa M cameras in 3ality Technica TS-35 stereo rigs; two rigs were configured for studio shooting, and a third, lighter-weight rig was used for Steadicam work. (Directed by Brian Smrz and shot by Larry Blanford, the second unit employed Alexa XT Plus cameras for its 2-D work.) In front of the cameras, Sigel opted to work primarily with Leica Summilux-C primes (ranging from 18mm to 100mm). The lenses, Sigel enthuses, "are really great glass and gave us a beautiful look."

First AC Cary Lalonde adds, "The Leica primes have superior image quality and consistency in their optical characteristics, and that made compiling two matched sets fairly straightforward. Their compact and nearly identical dimensions [across the range of focal lengths] worked very well in the TS-35 rigs. These factors enabled us to change lenses and align the rigs in around three minutes. That, of course, saves time and money, and makes shooting native 3-D viable."

For certain shots, the filmmakers also utilized Panavision 15-40mm T2.6 Nova zooms, which they felt were the best available match to the Summilux-Cs, "even though their size made for a tight fit in the TS-35 rigs," according to Lalonde. "Fortunately, [ASC associate and Panavision vice president of Optical Engineering] Dan Sasaki optically matched a set with PL mounts for us."

Top: Magneto defends the monastery where the mutants have taken refuge. Bottom: McKellan hovers above the greenscreen set while the 3-D camera rig, mounted on a Technocrane, captures the action.

The second unit also used the Summilux-C primes in certain situations, but relied more generally on Fujinon Premiere 18-85mm T2.0 and 24-180mm T2.6 zooms.

Framing for a final 2.40:1 release, the filmmakers recorded an ArriRaw 16:9 signal onto Codex Onboard S recorders while simultaneously capturing a backup ProRes 4:4:4:4 2K signal in the Alexa M camera bodies. The Alexa XT Plus systems used for second unit recorded an ArriRaw signal directly onboard. The production's 3-D systems supervisor, Ben Gervais, says the data-management team was given an edict to "make the workflow as efficient as possible on set, while minimizing our footprint and keeping everything mobile." Toward that end, Gervais collaborated with Arri and Panavision to create a custom fiber-optic system that "reduced rig communication, the two camera signals and video-return signals to travel down a single, rugged fiber cable," he says. "That allowed the recording and video infrastructure to be 1,000 feet or more from the camera, reducing the number of video-village moves to a minimum." Digital-imaging technician Julie Garceau utilized a Sony BVM-E250 OLED monitor during production while applying a viewing LUT built around basic CDL values.

Sigel also sought to establish an advanced look and color scheme each day in collaboration with his dailies colorist, Adrian Delude. That visual blueprint could then travel all the way through the digital-intermediate phase with his longtime colorist, Stephen Nakamura, at Company 3 in Santa

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Top: Hank McCoy (Nicholas Hoult) shows why he goes by the moniker "Beast." Bottom: Multiple 3-D camera rigs capture the action for a scene with Storm (Halle Berry, on crane) and Blink (Bingbing Fan).

Monica. To realize the goal, the cinematographer turned to near-set services provider EC3, a co-venture between Company 3 and EFilm, and one of the company's traveling, high-end grading suites, which EC3 set up adjacent to the set in a converted Star Waggons trailer. Dubbed the EC3 Wagon, the trailer featured a Christie Solaria One+ digital cinema projector, a full machine room, and a workstation where Delude utilized Blackmagic Design's DaVinci Resolve software to grade footage coming from set. The EC3 setup permitted Delude to make adjustments to the imagery far deeper than is typical for dailies footage, working with multiple windows and even doing extensive tracking and luma keying on some of them.

Each day, Sigel joined Delude and stereographer John Harper in the EC3 Wagon to view dailies in Rec 709 color space. Together, they implemented detailed color and 3-D convergence tweaks before the dailies material ever left the vicinity of the set. "Tom likes to push the image as far as he can, knowing he might tone it down in the DI," Delude says. "About three quarters of the film takes place in the early 1970s, and the other quarter is in the future, so we had two looks. The future was kind of cold, desaturated and clean. For the 1970s, Tom was really into a 'Kodachrome look.' He brought in a lot of samples of photography of that era, and we tried to make the Alexa footage look like that — we chromakeyed shadows and pulled color out, and chromakeyed highlights and added a little softness. Then, I would push the greens more toward yellow-green, and the blue we wanted was kind of 'Pan Am blue.'

Wolverine takes a moment to heal from multiple gunshot wounds.

We also took reds and gave them a rich, primary-red look. We messed around with pretty much every color, we did skin softening, and I'd track windows for almost every take. What we did was really extensive, and that was before the 3-D pass."

Nakamura calls the dailies work "a helpful guide," even for scenes in which he and Sigel ended up making significant changes in the final grade. Indeed, Sigel emphasizes that he often made changes to his color decisions in the DI. Nevertheless, he says this dailies tactic offered a much better sense of where the visuals were heading during production, and a much better foundation for experimentation.

At the end of post on a 3-D movie, the cinematographer notes, "you have to do a 3-D pass at 3½ foot lamberts, a 3-D pass at 6 foot lamberts, and a 2-D pass, and then there are still visual-effects shots trickling in with still more fine-tuning to do. You always get down to the very last seconds before your deadline. By handling dailies in this fashion, we were able to eliminate some of the work and reduce some of the things that [Nakamura] would have to spend his time on [during the DI]. He could also get things closer to final before I even got into the DI suite, so he and I could get right to fine-tuning, rather than starting from scratch. Our dailies ended up being a great tool for communication with Stephen, and the DI ended up being an evolution of a look we established in the dailies that we were very comfortable with."

Days of Future Past features a number of elaborate sets created by production designer John Myhre, another veteran of the first *X-Men* film. For example, chief lighting technician Tony "Nako" Nakonechnyj points to a major set meant to represent an ancient

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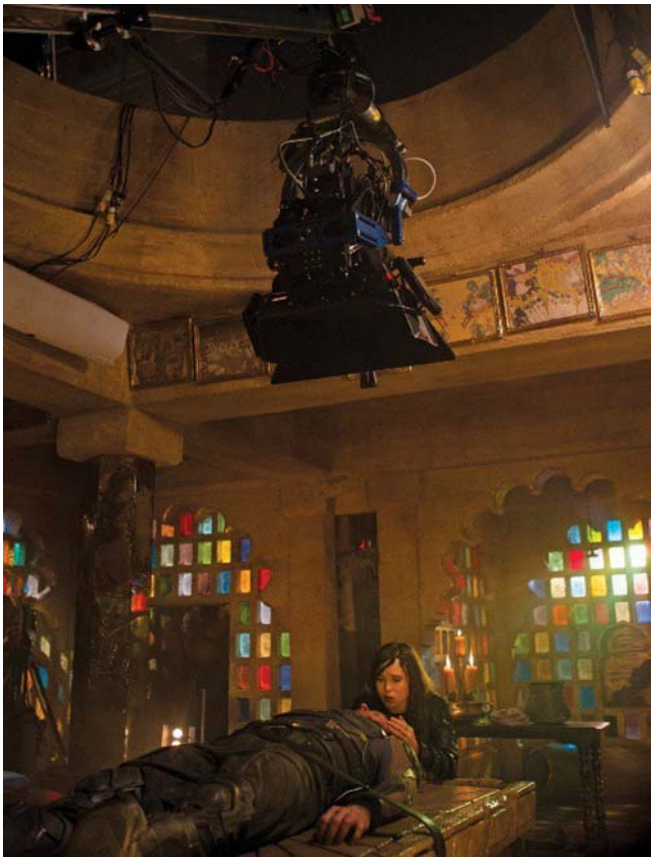
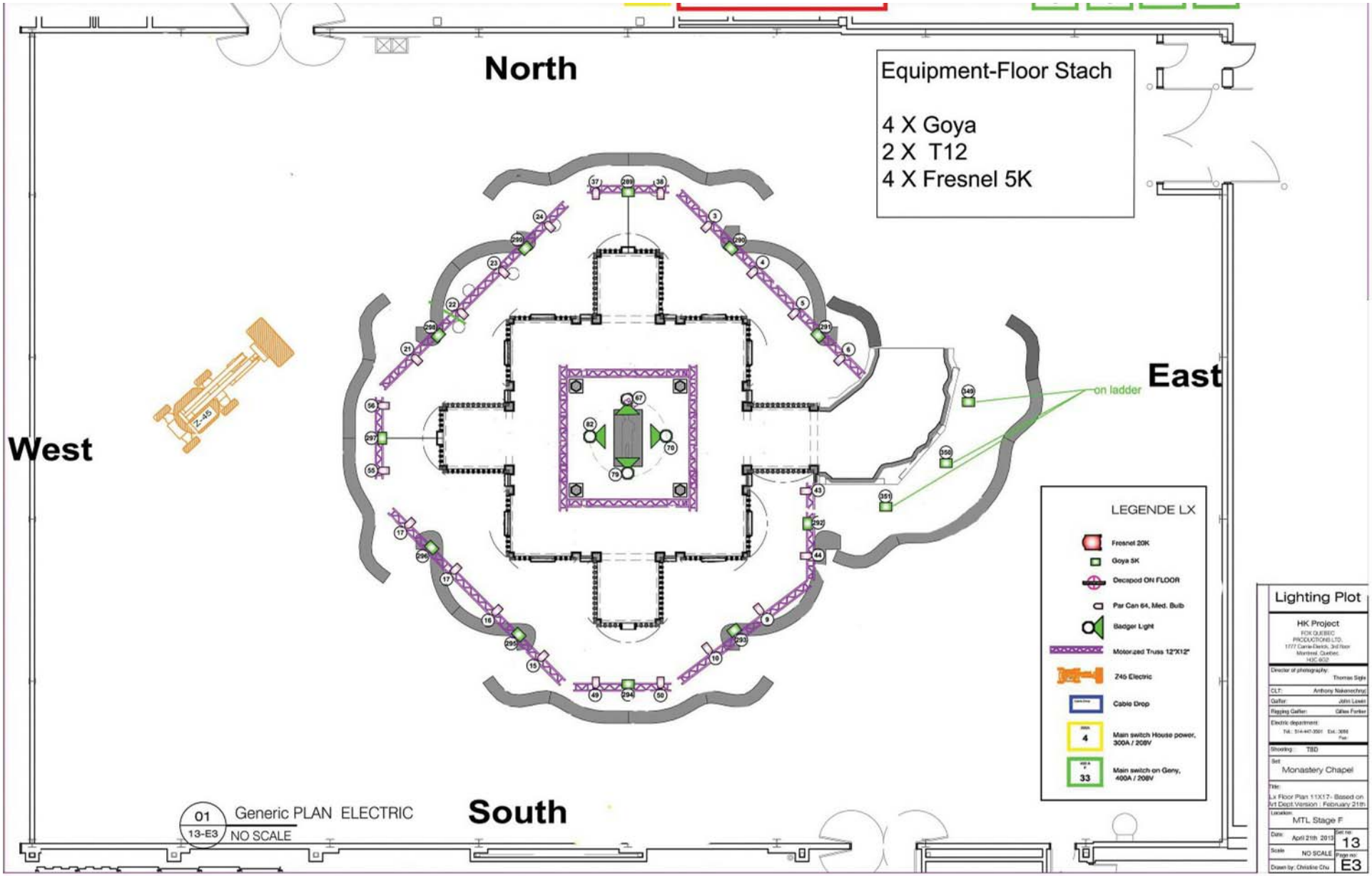


Top: The young Xavier meets his older self in the future. Bottom: Kitty Pryde prepares to send Wolverine back to 1973 under the watchful eye of a camera mounted on a 15' Technocrame. Opposite: This lighting diagram illustrates Sigel's approach to the monastery-chapel set.

monastery atop a mountain, where the X-Men of the future take refuge. To light the bottom of a massive green-screen that surrounded the set — with a mere 2' between the set and the green-screen in some places — Nakonechnyj and his crew employed MacTech 4x4 Slim Line units, which incorporate four 4' LED tubes, as ground rows. Although the set was large, it was built on a stage with a low overhead perm, which limited options for creating a large, soft, ambient glow over the entire set. Without the necessary room for space lights, the crew hung nearly 40 MacTech 4x8 Slim Line fixtures (eight 4' LED tubes) pushed through Grid Cloth, which was hung in large sections that provided gaps for I-beams, which were used to rig backlights, and stunt rigging. "There was a combination of LRX 20K and Scorpion 23 units on the I-beams," says Sigel. "These were covered with Full CTB and Cyan 60 gel, and they could be slid laterally, panned and tilted from the ground via remote control. The units cost a little


North
West
East
South
Equipment-Floor Stach
4 X Goya
2 X T12
4 X Fresnel 5K
on ladder
LEGENDE LX
Fresnel 20K
Goya 5K
Decapod ON FLOOR
Par Can 64, Med. Bulb
Badger Light
Motorized Truss 12"X12"
Z45 Electric
Cable Drop
Main switch House power, 300A / 208V
Main switch on Geny, 400A / 208V
01
13-E3
Generic PLAN ELECTRIC
NO SCALE
Lighting Plot
HK Project
Monastery Chapel
MTL Stage F
April 21th 2013
NO SCALE
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E3

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Clockwise from top: Mystique (Jennifer Lawrence) powers her way through a top-secret military installation; Sigel lined the outside of the barracks set with HMIs; with the help of his daughter, Kiana Chang Sigel, the cinematographer lines up a shot with Lawrence.

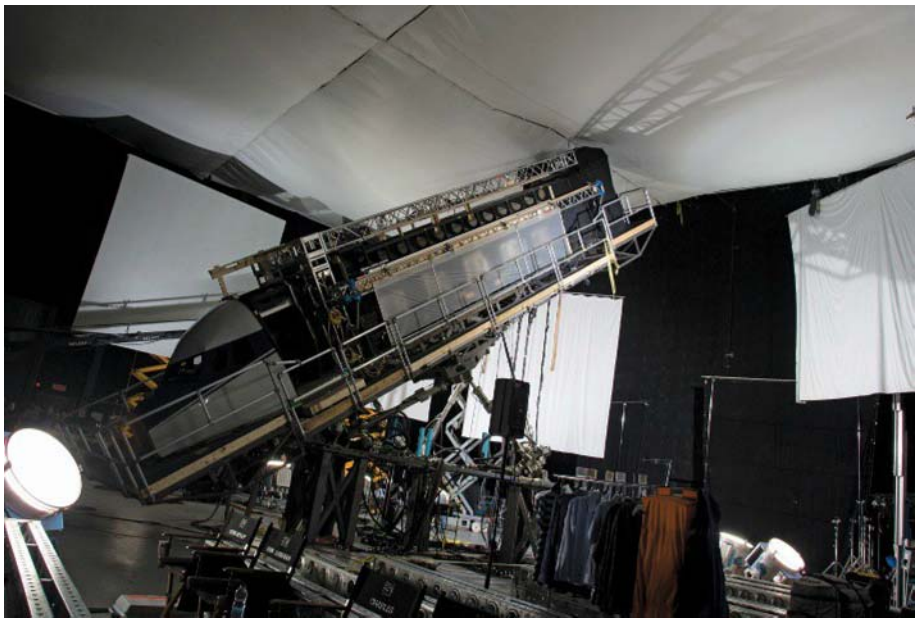
more, but they were a massive time saver during production."

Nakonechnyj adds, "We also used Par cans with FFN Globes and ETC [Source Fours] with 26-degree lenses to rake the walls and create texture."

Sigel observes that while renting LED tubes can be costly, they end up being cost effective "when you add in the savings in cable, power, fuel for a generator and all those things. It is also the right thing to do from an environmental standpoint. We weren't trying to get a huge T-stop, so we didn't need a lot of [output]. It was effective and saved us several feet in ceiling space, which permitted us to use the backlighting solution with the LRX units. We were fortunate that the production didn't only think about up-front dollars, but also analyzed such things in terms of the consequences down the line."

The cinematographer opines that "the signature [visual] scene in the movie" is part of a '70s-era sequence in which a group of X-Men need to break the younger Magneto (Michael Fassbender) out of a special jail beneath the Pentagon. Among the mutants in the scene is Quicksilver (Evan Peters), whose super-speed is crucial to the jailbreak and subsequent escape through an industrial kitchen in the Pentagon. During the action, Quicksilver catches up to bullets and redirects them away from their intended targets. "We literally show [Quicksilver] going faster than a speeding bullet," says Sigel. "Showing someone moving at hyper speed takes a lot of poetic license, and you have kind of a conundrum, which is

Top: Xavier and Magneto play a familiar game of chess aboard the 1973 version of the X-Jet. Bottom: Poised atop a gimbal, a set piece depicting the interior of the X-Jet is prepped for shooting.



that if you show it from the perspective of a normal human being, you either see a blur or nothing at all. We do have some shots like that, but far more fun is Quicksilver's point of view, which shows movement that is imperceptible to the human eye.

"We felt that if we just showed him moving through frozen time, it would be like a bullet-time shot, and you would lose the beauty and poetry that exists in ultra-high-speed photography," the cinematographer continues. Instead, the filmmakers created what Sigel calls "a climactic effect," in which they used "a combination of ultra-high-speed photography, mid-range slow motion, some 'frozen' performers [standing still] and plenty of CGI." The dialogue portions of the sequence were captured in native 3-D, while individual elements were shot in 2-D, and the ultra-slow-motion material was shot using Vision Research Phantom v642 Broadcast ultra-high-speed cameras on a Cameron-Pace "Combo" 3-D rig (as well as some 2-D shots with the same v642 cameras).

"Some of the photography went as high as 3,200 fps," Sigel explains. To accommodate such frame rates, he adds, "I decided to light almost the entire set with 50K SoftSun units from Luminys Systems. They have very little flicker at high speed, and put out an enormous amount of light. At 24 fps, we had an f32 and beyond! It literally hurt the eyes when the set was at 100 percent, but that level allowed us to change frame rates without any lighting adjustments beyond the dimmer board. It also gave us the ability for a very deep stop so that all that wonderful detail [in the set] could be in focus.

"Even though Quicksilver is supposedly moving at a speed normal to him," Sigel continues, "it just didn't look right when he was moving at 24 fps, so we would sometimes shoot him slightly

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Dr. Bolivar Trask (Peter Dinklage) plots to eradicate the mutant population.

off-speed, which added elegance to his movement. We often used massive amounts of wind with [Peters] on a treadmill and the camera at high speed to distort his face and enhance the feeling of moving at such speeds. At one point, we see Quicksilver running so fast that his centrifugal force allows him to run along the walls, with his body completely horizontal. This was done with a spinning rig in the center of the set, with arms that held the rigging for both the camera and stunt performer."

The finished film incorporates some 1,200 visual-effects shots, most of which married practical photography with CGI elements. To aid the practical photography, the filmmakers employed a number of specialized tools, including Technocrane's remote-operated and programmable Technodolly dolly/crane system, which allowed them to more easily capture motion-control shots with what Sigel describes as a "quick and easy setup." Additionally, Alexa Classic cameras were mounted on a Cameron-Pace underwater 3-D rig for shots of Wolverine being cast into the Potomac by Magneto. "Underwater lends itself particularly well to native 3-D capture, because there are always bubbles, floating debris, etc.," says Gervais. "Dimensionalizing these shots can be costly and time-consuming."

A sequence in which the massive, mutant-hunting Sentinel robots go berserk outside the White House called for a liberal mix of live action and digital imagery. The production con-

Top: An elaborate greenscreen set was created adjacent to the production's stages in Montreal for a sequence that takes place outside the White House.
Bottom: Cables lift Fassbender during the filming of the climactic set piece.

structed one prop Sentinel, which Sigel describes as "an 18-foot-high behemoth. It was very helpful for understanding how light and reflections would play on their surfaces." However, he adds, "nearly every Sentinel in the final [film] is CGI."

In the climactic scene, set in 1973, President Nixon unveils the Sentinels on the White House lawn, where a massive battle soon erupts. Given that there was no convincing stand-in for the White House exterior in the Montreal area, the filmmakers captured the live action in an elaborate greenscreen shoot inside what Sigel calls "a big box" constructed on a field of grass that was laid down in a vacant lot adjacent to the production's stages. "We knew we would shoot on a field of grass for the White House lawn, with media towers for TV cameras on one side and a stage for the president and dignitaries on the other," Sigel explains. "The rest would pretty much be CGI. In the end, it was most practical to create our own field, about 200-feet-by-200-feet, next to our stages.

"We surrounded the field with [shipping] containers stacked about 50 feet high and skinned with green-screen," the cinematographer continues. "The field was basically a courtyard surrounded by these containers on all four sides. In front of the greenscreen, we also had black curtains that could be moved on track to get rid of green spill from any of the greenscreen that was off-camera. Overhead, we built a cable

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Director Bryan Singer takes a seat on the White House lawn set. Behind him is one of the giant, mutant-hunting Sentinels.

system to support a Grid Cloth that was positioned at a slight angle to minimize the impact of wind and any water collecting in the event of inclement weather. Outside the courtyard, we had a little road so we could drive LRX lighting towers around the perimeter of the box. That way, depending on the angle we were shooting, we could get a quick, soft backlight so [the image] wasn't totally flat. For extra pump, we fit one of the LRX units with 18Ks, instead of the usual 12Ks, since we were pushing through the big rag overhead."

Not every scene called for such high-tech solutions. For example, when the mutants accidentally reveal themselves in Washington, D.C., during another scene set in 1973, Singer appears onscreen as a tourist whose vacation footage — shot by Singer with a working Super 8mm Bolex camera — captures the moment. In addition to this Super 8mm material, some 16mm "newsreel footage" was shot with an Aaton XTRprod film camera. "The unique grain and color balance of those formats help sell the time period in a very subconscious way," says Sigel. "Initially, I had hoped to use outdated stock, but availability led us to use Kodak 250D for both the 16mm and 8mm [footage]."

Sigel is quite proud of the imagery that resulted from the massive collaborative effort, but he does acknowledge that even with all the care taken to capture and build a stereoscopic film, most viewers will eventually see it presented in 2-D. At the end of the day, he advises, this reality, combined with the fact that brightness continues to vex 3-D exhibition, means that filmmakers need to take extreme care with this kind of digital filmmaking. "In production," Sigel states, "you have one issue right off the bat: You lose one stop of light [due to the 3-D rig]. Also, you can't really put any kind of filtration in front of the lens. You can have issues with flares or highlights that look different to the left and right eyes. You have to deal with those issues, but in general, you don't light 3-D differently than you do 2-D — the mood and tone you go for is the same. What you might do is put a little light somewhere, where you might have something on the edge of frame that is breaking in a certain way, and if you didn't put that light on it, it would hurt the 3-D.

"But then, if you are color correcting to have it hold up at 3½ foot lamberts, it won't look the same as when you are color correcting for 2-D at 16 or 30 foot lamberts for the average TV," he continues. "And for 3-D, you are watching the movie through sunglasses, essentially — the whitest whites will be gray. That is the reality of 3-D right now, and that can make color correcting frustrating. Fortunately, I have someone in [Nakamura] whom I have worked with for a long time, and we just have to spend a lot of extra time on it." ●

TECHNICAL SPECS

2.40:1

Digital Capture

Arri Alexa M, Alexa XT Plus, Alexa Classic; Vision Research Phantom v642 Broadcast

Leica Summilux-C, Panavision Nova, Fujinon Premiere