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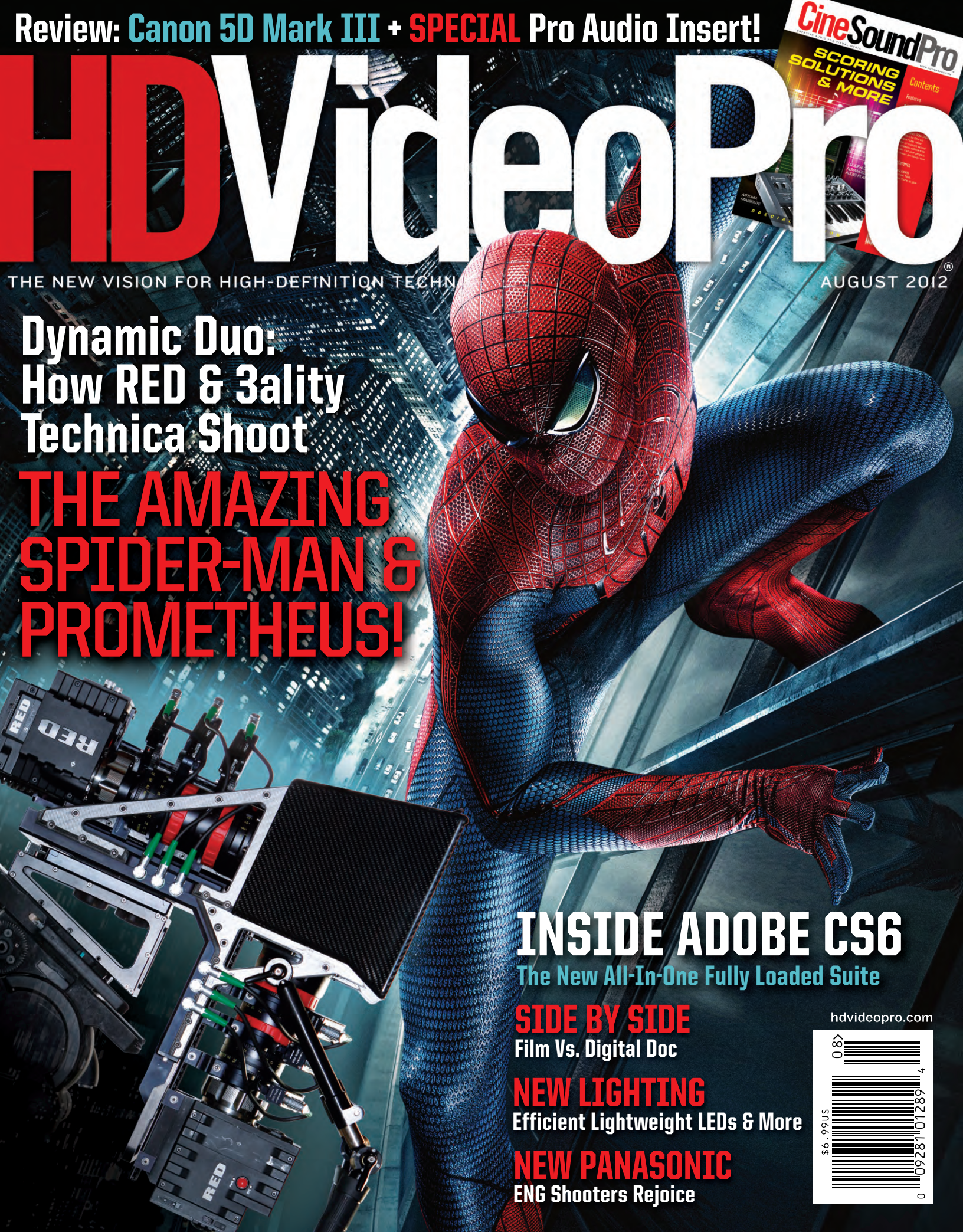

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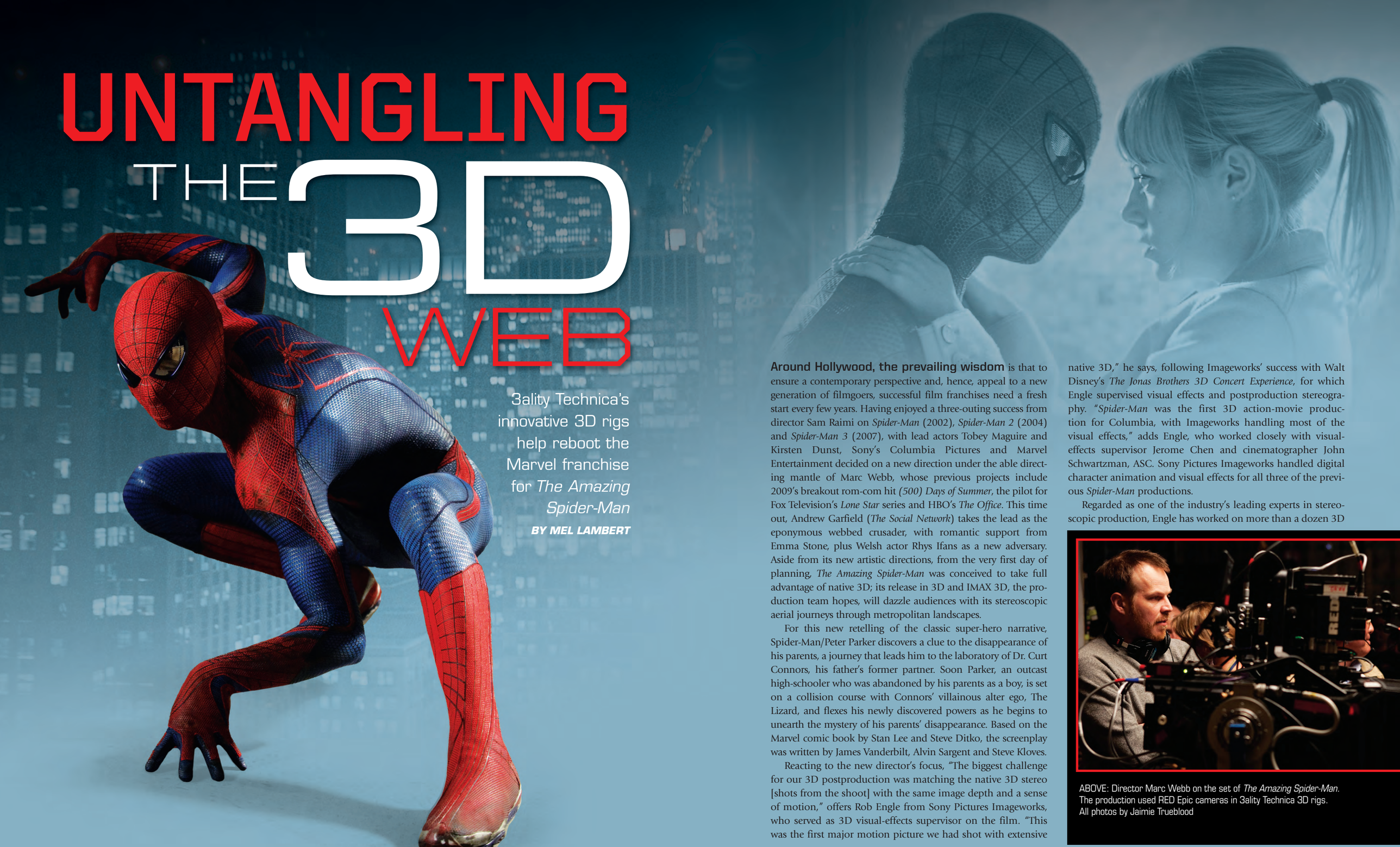
UNTANGLING THE 3D WEB

3ality Technica's innovative 3D rigs help reboot the Marvel franchise for *The Amazing Spider-Man*

BY MEL LAMBERT



Around Hollywood, the prevailing wisdom is that to ensure a contemporary perspective and, hence, appeal to a new generation of filmgoers, successful film franchises need a fresh start every few years. Having enjoyed a three-outing success from director Sam Raimi on *Spider-Man* (2002), *Spider-Man 2* (2004) and *Spider-Man 3* (2007), with lead actors Tobey Maguire and Kirsten Dunst, Sony's Columbia Pictures and Marvel Entertainment decided on a new direction under the able directing mantle of Marc Webb, whose previous projects include 2009's breakout rom-com hit *(500) Days of Summer*, the pilot for Fox Television's *Lone Star* series and HBO's *The Office*. This time out, Andrew Garfield (*The Social Network*) takes the lead as the eponymous webbed crusader, with romantic support from Emma Stone, plus Welsh actor Rhys Ifans as a new adversary. Aside from its new artistic directions, from the very first day of planning, *The Amazing Spider-Man* was conceived to take full advantage of native 3D; its release in 3D and IMAX 3D, the production team hopes, will dazzle audiences with its stereoscopic aerial journeys through metropolitan landscapes.

For this new retelling of the classic super-hero narrative, Spider-Man/Peter Parker discovers a clue to the disappearance of his parents, a journey that leads him to the laboratory of Dr. Curt Connors, his father's former partner. Soon Parker, an outcast high-schooler who was abandoned by his parents as a boy, is set on a collision course with Connors' villainous alter ego, The Lizard, and flexes his newly discovered powers as he begins to unearth the mystery of his parents' disappearance. Based on the Marvel comic book by Stan Lee and Steve Ditko, the screenplay was written by James Vanderbilt, Alvin Sargent and Steve Kloves.

Reacting to the new director's focus, "The biggest challenge for our 3D postproduction was matching the native 3D stereo [shots from the shoot] with the same image depth and a sense of motion," offers Rob Engle from Sony Pictures Imageworks, who served as 3D visual-effects supervisor on the film. "This was the first major motion picture we had shot with extensive native 3D," he says, following Imageworks' success with Walt Disney's *The Jonas Brothers 3D Concert Experience*, for which Engle supervised visual effects and postproduction stereography. "*Spider-Man* was the first 3D action-movie production for Columbia, with Imageworks handling most of the visual effects," adds Engle, who worked closely with visual-effects supervisor Jerome Chen and cinematographer John Schwartzman, ASC. Sony Pictures Imageworks handled digital character animation and visual effects for all three of the previous *Spider-Man* productions.

Regarded as one of the industry's leading experts in stereoscopic production, Engle has worked on more than a dozen 3D

ABOVE: Director Marc Webb on the set of *The Amazing Spider-Man*. The production used RED Epic cameras in 3ality Technica 3D rigs. All photos by Jaimie Trueblood

TOP: John Schwartzman, ASC, sets up a shot. ABOVE: According to 3ality Technica CEO Steve Schklair, the Epics were the perfect form factor for 3D because of their weight and portability. He also feels 3D looks better when shot stereoscopically rather than converted in post.

features. He recently completed the Columbia Pictures/Sony Pictures Animation production of *The Smurfs* in 3D, for which Engle served as 3D visual-effects supervisor and led a team of CG artists to adapt the film for stereoscopic presentation. Other recent credits include stereoscopic supervisor on *Pirates of the Caribbean: On Stranger Tides, Priest, The Green Hornet, Cloudy with a Chance of Meatballs, Beowulf* and *The Polar Express*, a film that many would credit as ushering in the modern era of stereoscopic filmmaking.

The 3D visual-effects supervisor was brought in early during the conceptual VFX and preproduction stages, and was on set for six weeks of the production, assisted by first-unit stereographer Eric Deren and second-unit stereographer Jason Goodman. "We spent a lot of time with Marc Webb to determine exactly what he was looking for with the imagery and how to achieve that in 3D [on the set]," recalls Engle. "Our recipe was to hold back on a deep 3D experience until the larger action shots with Spider-Man, as well as those involving The Lizard character," which was developed in postproduction using extensive CGI. "The director wanted us to re-create the sense of Spider-Man swinging through the New York skyscrapers, with a stuntman performing a number of the shots through traffic and under bridges. Those real-action 3D shots, augmented by our effects, really sell the action to the film-going audience. Of course, there were a number of occasions when a human couldn't do what Spider-Man can achieve, but we still wanted to use the live action as a reference—or a launch point, if you will—for the synthetic character to enhance the overall sense of realism. That was our new aesthetic; in contrast to the first three productions, we wanted to make the action seem more real during the New York City scenes."

3ality Technica, a leader in 3D production technology for the motion-picture and broadcast industries, supplied a number of TS-5 stereoscopic rigs for the live-action sequences using RED Epic digital cameras. "Being light and portable," considers 3ality Technica CEO Steve Schklair, "the Epic offers a perfect form factor for 3D shoots. We consider that 3D always looks better—and more realistic—if it's shot stereoscopically rather than being converted [in postproduction]. On the set, the director can view 3D on a video monitor and plan the shots more accurately."

The TS-5 miniature beam-splitter can be used either handheld or mounted on a Steadicam rig. "It's made to fit into those tight spaces and weight-constrained spots that won't accommodate a larger rig," Schklair adds. "Weighing just over 17 pounds without cameras and lenses, it's easy to maneuver."

The rig allows two cameras to be aligned with sub-pixel accuracy, thus ensuring the precise alignment and position control necessary for stereographic 3D imaging.

The firm's new Helix stereoscopic rig, which resulted from a collaborative effort between former designers and engineers from 3ality Digital and Element Technica, combines magnesium, carbon fiber and aluminum into a functional, cutting-edge system. "Helix has all the precision, automation and refinement of our TS-5 system with the configurability and user-friendliness of the Atom," states Stephen Pizzo, 3ality Technica's senior VP. "It offers complete functionality when coupled with our Stereo Image Processor."

Helix takes full advantage of the firm's IntelleSuite control and automation software. Coupled with various hardware configurations, 3ality Technica's proprietary software applications—including IntelleCam, IntelleCal and IntelleMatte—are said to fully automate many 3D operations via smart technology that can dramatically reduce setup time and, hence, production costs. The new SIP 2100 provides real-time 2D and 3D analysis that's said to allow cinematographers to accurately match color and alignment between shots.

The live-action 3D material for *The Amazing Spider-Man* was captured with a parallel-camera configuration "with those stereoscopic images being converged digitally during postproduction," says Engle. "By keeping the twin-camera rotation fixed during all of the location shots, we're able to secure extra image depth and resolution. I first experimented with this technique on *Pirates of the Caribbean: On Stranger Tides*; it's also very similar to a shifted film back we use for CG films.

"The image sensor in the RED cameras [used on the 3ality Technica rigs] is wide," continues Engle, "allowing a frame line 10% smaller than our captured image. That extra image area lets us select which part of the image we'll use to alter the convergence—the angle between the two stereoscopic cameras—under computer control during our VFX postproduction. In other words, shooting parallel with extra image padding means that we're not locked into how the images will be presented. With parallel shooting, we know where the final convergence point will be, but there's one less knob to adjust—only the interaxial distance, or spacing between the two RED cameras, needs to be specifically dialed on set."

Parallel images are also easier to look at once the convergence is set, Engle confirms, "and the film suffers less optical aberrations from the two cameras. All lenses, however closely matched, are slightly different. Additionally, by keeping their photographic axes parallel, we can dramatically reduce any distortion caused by keystoning. And, to my eye, images shot parallel and converted in post just look better on the screen; it's an enhanced quality and easier to watch."

Likening the control of 3D depth to that of the dynamic range between loud and soft musical passages, Engle says, "We're not always looking for deep 3D. Just as we don't like music that's loud all the time, we prefer to look at creative opportunities for 3D rather than overwhelm the audience all the time. Allowing the audience to experience scenes with less 3D 'volume' can help increase the impact of the deeper moments. Less can definitely be more with 3D."

For images captured with a parallel rig—cameras pointed in the same direction without any toe-in, and not to be confused with a side-by-side configuration with cameras next to one other rather than using a beam-splitter—the two lenses share a common, but displaced axis. In other words, the stereo window is set at infinity and everything else lies in front of that window. The image aspect ratio also isn't preserved, meaning that landscape formats become square or even portrait format during postproduction. Since the image height also can be reduced in post to regain a wide aspect ratio lost during convergence, the

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UNTANGLING THE 3D WEB

(Cont'd from page 57)

original picture often needs to be overframed to allow for such cropping.

In essence, convergence correction involves superimposing the closest objects using a process referred to as horizontal image translation (HIT) and cropping until the target stereo window is located at the screen surface. Out of the camera, distant objects are superimposed on themselves and nearer objects widely separated—the reverse of the desired effect, since the stereo window is now set at infinity or behind the scene, while it should be in front. But moving images relative to each other in the horizontal, or x, axis will superimpose the closest objects on themselves to create the desired effect, with additional rotation and keystone adjustments, if necessary. As will be appreciated, after horizontal image translation, distant objects are widely separated, which is the opposite of how they're captured using parallel cameras.

"A large number of physical stunts were shot on location in stereoscopic 3D," recalls 3ality Technica's Schklair, who also consulted on the film. "If it could be done, it was! To reduce the budget, a fair amount of the aerial work for *Spider-Man* was live action and not CGI. The Epic-loaded 3D rigs were extremely portable, with wireless links back to video village so that the director, DP and producers could view in real time [on video monitors] what the aerial cameras were seeing. The [digital-video] wireless link has a range of around 600 feet, which worked well during the shoot.

"Although images shot on parallel have less depth—since everything is coming off the screen plane—it offers a lot of creative freedom to place objects virtually anywhere in the front-back plane by varying the convergence parameters," he continues. "In other words, adjusting the convergence adds a lot more depth to the image—*The Amazing Spider-Man* is a beautifully dense 3D production, with breathtaking stereoscopic elements. Film studios tend to be conservative about the amount of depth in a 3D movie because everybody in the theater needs to experience that illusion. If we set convergence for the first third of the theater—the front seats—then the remaining two thirds will be enjoying a more shallow 3D presentation; it's a necessary compromise to ensure that the studios please the majority of the audience."

For material that was shot in 2D, says Engle, "We used every VFX technique imaginable. We make a right-eye image from the left and match geometries to synthesize another viewpoint and, hence, create an illusion of depth. All of the CGI images start off as 2D computer files, and we then generated another rendered viewpoint for the right eye that matches [the perspective and movement] of real-word images from the set. That's how we added The Lizard as a synthetic image on the screen, often recreating fully synthetic environments as if they had been shot with real cameras. Our creative process involves constantly asking ourselves: How would we shoot that scene if it was shot with real cameras? Then we computer-generate those viewpoints for a seamless insertion."

In terms of 2D-to-3D conversion and CGI scene generation, Engle advises that the visual-effects department used a number of off-the-shelf products, although Imageworks' main choice is AutoDesk Maya animation software, which offers a set of tools for animation, modeling, simulation, rendering and compositing, as well as AutoDesk's Arnold rendering engine for lighting and related effects, plus the Katana look-development and lighting tool.

"We're always looking for powerful rendering engines," the 3D supervisor stresses, "and the artists are looking for new techniques that will produce better, more real-looking images. But we focus on the creative elements of the work rather than the technical."

Reflecting on the year and a half spent on the live shoot and VFX post of *The Amazing Spider-Man*, Engle says he's grateful "for the opportunity to ride along with *The Amazing Spider-Man* and be part of his world. We're all very excited about the film and its 3D aspects. It has been quite a ride!" HDVP

Visit* The Amazing Spider-Man *website at www.theamazingspiderman.com. For more information on 3ality Technica, visit www.3alitytechnica.com.