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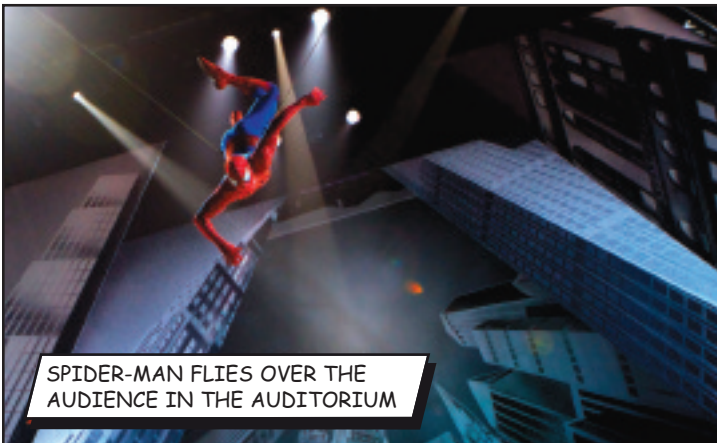
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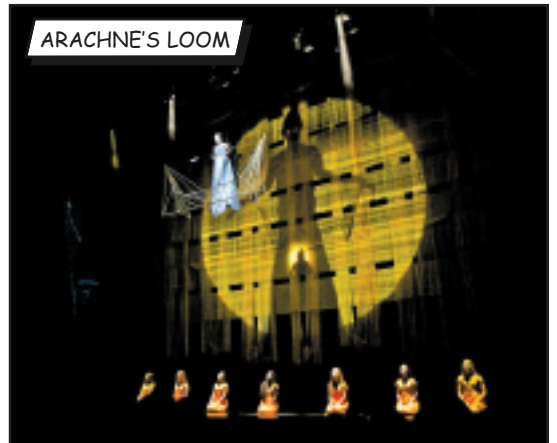
THE GREEN GOBLIN MAKES AN APPEARANCE



MEANWHILE, IN THE OSCORP LABORATORY ...



SPIDER-MAN FLIES OVER THE AUDIENCE IN THE AUDITORIUM



ARACHNE'S LOOM

SPIDER-MAN: RISE ABOVE

David Barbour tracks Spider-Man's long and crooked road to Broadway success . . .

PHOTOGRAPHY BY JACOB COHL

Spider-Man: Turn Off the Dark finally opened on Broadway on June 14. Insert your own joke here. Or better yet, don't. For in spite of everything - the ballooning budget, the delays and postponed openings, the swap-out of producers, the injuries, the jokes by late-night comics, the New Yorker cover, the replacement of key members of the creative team - the truth is that *Spider-Man: Turn Off the Dark* is looking more and more like a hit.

Since its opening in June, the musical has been routinely grossing approximately \$1.8 million each week against a capacity of \$1.9 million. If the box office can keep up this torrid pace - admittedly a big if - *Spider-Man* stands a chance of making back its record-breaking budget of \$75 million in a couple of years. In any case, the show's producers aren't sitting still; there's talk of future productions, including a possible sit-down edition in Vegas and/or an arena tour. The story of *Spider-Man*, the musical, is far from over.

Back Story

It began in 2005, when Julie Taymor, whose production of *The Lion King* long ago entered into Broadway legend, and U2 front men Bono and The Edge signed on to a musical version of Spider-Man. (Marvel Comics had announced its intention to a Spider-Man musical as early as 2002.) Taymor was to write and direct; Bono and the Edge would provide the score. Soon after, however, Tony Adams, the show's producer, died unexpectedly; his associate, David Garfinkle, took over, presiding over a budget that had grown to well north of \$25 million before it became clear that he hadn't sufficiently capitalized the production. This occurred in the summer of 2009, and construction of the set and structural work on the Foxwoods Theatre was halted, leaving the show in limbo.

At this point, an executive shuffle took place, with control of the production shifting to Michael Cohl, formerly of the concert touring giant Live Nation and the producer behind U2's touring spectacles, and Jeremiah Harris, technical supervisor on dozens of Broadway shows and chairman/CEO of PRG, the global lighting, sound, scenery, and video colossus. With new capitalization - and a budget that was now reportedly \$65 million - everyone went back to work: the production was rescheduled to open 21 December 2010.

As the world now knows, several months of turmoil unfolded, with technical delays and a series of minor injuries to cast members, culminating in the spectacular fall of Christopher W. Tierney, one of several cast members who stand in for Spider-Man during certain action scenes. As the show became a national talking point and as previews dragged on with no opening in sight, the New York press put down its collective foot, and most of the first night reviewers attended a performance in February, subsequently filing a stunningly negative set of reviews.

Seeking a way forward, the producers removed Taymor, replacing her with Philip Wm. McKinley, who, among other things, has staged a number of productions for Ringling Brothers and Barnum & Bailey Circus. Roberto Aguirre-Sacasa, an Off Broadway playwright who also

writes Spider-Man for Marvel Comics, was brought in to rework Taymor and Glen Berger's book; a new choreographer, Chase Brock, replaced Daniel Ezralow. After a short shutdown period, a new show emerged . . .

Aguirre-Sacasa's script significantly revised the story while retaining the show's theme, based on the famous Spider-Man motto, "With great power comes great responsibility." Much of the original show was cut and reworked, the extra time gained used to refashion the narrative, which now consists of a two-part battle between Spider-Man and the Green Goblin, and which focuses on Peter as he struggles to reconcile his two identities.

If anything, V2.0 (as the production team calls it) relies more on the show's spectacle and flying effects, a decision that results in a much stronger audience response. Taymor famously described *Spider-Man* as a combination of rock opera and circus, and that's a pretty good description of what is now taking place on the Foxwoods Stage. If it's not the show that anyone set out to do, it is, nevertheless, a show that audiences want to see.

In any case, another Broadway show with such ambitions is unlikely to happen any time soon. What follows is the story of how the design and technical team managed to rise above (as one of the show's song puts it) all the noise and negative buzz to accomplish their remarkable work . . .

A comic book come to life

George Tsypin has designed scenery at virtually all the major opera houses of the world. His productions for the Metropolitan Opera include *War and Peace*, *The Gambler*, and *The Magic Flute*, the latter staged by Julie Taymor. On *Spider-Man*, he says, he and Taymor began with a single, simple concept out of which everything else evolved.

"Clearly, we wanted to start with comic books," says Tsypin, who began designing the show in early 2007. "I had never opened a comic book in my life. I was surprised at what I saw, because it's a different way of reading. It's so visual; in a way, you have to take in the entire page, as there are so many events happening at the same time. Comic books are also very cinematic - you have a long shot followed by a close-up of the same event. I wanted to capture these perceptions in my design."

To create an on-stage world that was, essentially, a comic book come to life, Tsypin deployed any number of techniques, including flat illustrated backdrops with big blocks of colour, drops that open up like pop-up books, and plenty of video imagery. Scenes range from an intimate view of Peter and Mary Jane on the landing of a fire escape, floating in a night sky, to spectacularly sinister cityscapes, dominated by ominously tilting skyscrapers, to a vertiginous downward view from the top of the Chrysler Building.

The production's scenery was built and automated by PRG Scenic Technologies. PRG also provided the lighting, sound, and video gear for the production, making it a total service provider for *Spider-Man*.

ARACHNE SUSPENDED HIGH ABOVE THE STAGE IN HER WEB



Among the issues with which the designer grappled were the relationship between the stage and auditorium, and the show's extensive flying system, which, he realised, had to be integrated into the scenery. "In an ideal world, I would have treated the entire theatre as one design," he says. "Ultimately, I couldn't be more inclusive of the house." He adds, however, that, with the show's large proscenium, which has the look of a projecting spider web, "I created a tunnel that projects into the house and psychologically sucks the audience in; the barrier between the stage and the house is broken."

Of course, the flying effects are what really breach the normal gulf between stage and audience, and Tsybin says he knew from the beginning that *Spider-Man* would need to fly. This mandate occasionally complicated matters, however, as design ideas clashed with the scale of the rigging set-up. "The original design had an upside-down subway train that ran above the audience," he says. "It was cut after it was built, because of the complexity of the flying system. I had to clear a great deal of space for it, and I collaborated closely on it with the flying consultant [Jaque Paquin, who works frequently with Cirque du Soleil]; the set and the flying are basically one design."

"The big elephant is the integration of the flying system," Tsybin adds. "That's what took so long. We had to conceive the logic of it. It's completely invisible - you see the wires, but not the superstructure behind it. That steel structure has to be 100% rigid; that's why the theatre had to be rebuilt."

PRG's Fred Gallo, the production's technical supervisor, adds: "An enormous part of the job was what we had to do to the theatre. We were doing things with flying that had never been done before outside of the movies. Scott Fisher, of Fisher Technical in Las Vegas, did the system." As opposed to old-fashioned flying systems, which feature a performer on a single cable, Gallo says, "When the actor in *Spider-Man* is flying over the audience, he is tied to six different winches. There is one in each corner at the front-of-house; they talk to each other and move the actor, in plane, from corner to corner. A fifth winch raises and lowers him and a sixth

winch spins him around so he is facing the right direction. This requires an enormous amount of calculation."

Interestingly, Gallo notes, the technology for the flying system was derived from the Las Vegas production of *Phantom of the Opera*; Scott Fisher and his team worked on that production's falling chandelier effect. "It breaks apart in four different sections over the audience and flies out," Gallo says. "Fisher spent millions of dollars on software to make that happen. Here, they took that knowledge and used it to create three-dimensional flying in the theatre."

Reworking the theatre's interior to accommodate the flying system posed another set of challenges. Gallo also notes that the Foxwoods, which appears to be a vintage Broadway house, is actually a modern building synthesised from the Apollo and Lyric Theatres, which formerly occupied the Foxwoods footprint on 42nd Street. "When it was built," he says, "they kept the façade of the Lyric and created a plaster ceiling, dome, and proscenium from parts of both theatres."

The new design of the show required all of these landmarked items to be removed. This was easier said than done, Gallo adds, noting

that the theatre is owned by The New 42nd Street, a nonprofit entity established by New York State and New York City, which has presided over the neighbourhood transformation in the last 15 years. "We needed their approval," he says. The interior's landmark décor was cut, crated and stored against the day when *Spider-Man* will be gone and it can be restored; until then, the pieces are kept in a bonded, climate-controlled warehouse.

More fundamental structural work involved expanding and deepening the orchestra pit to accommodate the three scenic elevators required by Tsybin's design. This meant digging into bedrock under the theatre. Gallo, who hired a specialist company for the task, says: "The only easy method was to use dynamite, but we weren't allowed to do that. Instead, we had to use jackhammers. The New 42nd Street brought in engineers with strain gauges; if vibrations were above a certain resonance, they'd shut us down. Work was taking forever, so we brought in a big, construction-type jackhammer, which is run independently by an operator located 20ft (6m) away. That worked for a couple of months, then we brought in drills and hydraulic splitters to split the rock out." After that, a concrete sub-base was created for the three lifts.

Also, says Gallo: "We took the theatre's stage out, which was relatively easy to do, as it was built to be removed." The trio of lifts in the newly installed stage can create ramps and platforms. "The ramps, which are trapezoidal, are 37ft (11.3m) long, and, when measured together, are 38ft (11.6m) wide on the downstage side and approximately 24ft (7.3m) wide on the upstage end," he adds. "All of the stage ramps are hinged on the downstage line. The centre ramp has an additional ramp built into it that can go up another 14ft (4.3m)." This added articulation reinforces the illusion of forced perspective that is used throughout the scenic design.

"The first time you see this effect is in the Brooklyn Bridge scene," says Gallo, referring to a nightmare sequence in which Peter dreams that the Green Goblin has kidnapped Mary Jane. "Spider-Man is running downstage in slow motion as the platform rises from the edge. He leans out and Mary Jane is seen hanging from

THE 'POP-UP' CLASSROOM SCENE



the underside of the ramp." The scene ends in a blackout.

The stage ramps actuate up and down, going up to a maximum height of 14ft in under four seconds. "Since the ramps had to move extremely fast, a hydraulic system was deemed the only sensible way to go," says Gallo. "We put in a hydraulic pump room specifically for this show and then plumbed it with 4" (10cm) diameter steel pipe rather than hoses, because of the amount of oil that had to be pumped around the building. This is the largest hydraulic automation system on Broadway.

"We have 145 motorised effects in the show," adds Gallo. "A big musical typically has 50 or 60." The scenery is controlled by two of PRG's Commander automation consoles - one for scenery and one for deck effects. "We have four automation techs who run the show," he says, "two who run all the Fisher flying effects in the followspot booth, so they can see the stage, and two who run PRG's Stage Command System located on the stage right fly floor."

In addition, *Spider-Man* probably sets some kind of record for set electrics, many of which will be discussed a little later. However, one particularly notable item is the stage deck, which, says Gallo, is an LED lightbox. "I can't tell you how much development we went through with that," he adds. "We originally imagined a lighting rig in the basement, using incandescent units, which would shine through a Plexiglas deck. Eventually, we invented our own LED lightbox." The LED units were designed by PRG and built offshore.

Much of the time, the stage deck is unlit. It is lit when, raised at an angle, the floor becomes part of the set for the climactic battle between Spider-Man and the Green Goblin (more about this later). "We spent a lot of time researching the lighting for the stage deck lightboxes in the ramps," says Mark Peterson, a project manager for PRG Scenic Technologies. "The Plexiglas tops are digitally printed on the underside in blacks and grays. The internal lighting not only had to be white but it had to be dimmable. There was no real depth to be able to diffuse incandescent lighting properly, and there would be too much heat. We decided to design our own version of a white 3" x 6" LED board, with LEDs on 1" spacing. This let us mount the LED boards into different configurations to fit the trapezoidal lightboxes. Because they are so shallow, we only had 2" available to diffuse the LEDs, so we mounted diffusion filters directly underneath the printed Plexiglas panels. We provided 250 LED dimmers to deal with the enormous amount of circuits needed for the whole floor. Altogether, we have about 9,000 LED boards in the floor ramps." These custom-designed LEDs are also used elsewhere, most notably in the eight LED panels that traverse the stage.

Of course, all of this requires plenty of power, which posed another set of challenges, says Randall Zaibek, one of the show's two production electricians (along with James Fedigan). "The theatre was equipped with 17 400A disconnects," he says. "Not that you would utilise everything in the theatre, but when we did the math we had some issues. They had



a 4,000A main disconnect for the backstage feed, but we found out from Con Ed that it was only being fed with 1,200A. Between the lighting, automation, video etc., the needs far exceeded the 1,200A feed. We were estimating we needed around 4,000A to run the show. Unfortunately, what we found at the street from Con Ed, which was on 43rd Street, was a potential 800A that we could bring into the theatre, which would bring our total power up to 2,000A for the backstage feed. We got Con Ed to give us that extra 800A and got everyone to rework their power needs so now we are running the show just under the 2,000A being provided."

"Other than the show being extremely heavy, it wasn't a hard show to rig," says Gallo. "But we have about 125,000lb of electrics and scenery in the air, which puts us at the limit of the theatre's capacity. We had to install a lot of secondary steel, and work with structural engineers to ensure that we didn't overstress the building steel. The front-of-house flying required cantilevered secondary steel columns, structural bucking of the roof, and diagonally bracing the roof trusses to create a stiff frame. Each fly line, after exiting the winch drum, runs through eight to 12 different muling sheaves to finally enter super gimbles, designed by Fisher in exactly the right location in three-dimensional space. It was very important that all of the ultimate positions of the cable muling be correct in three dimensions, as we were providing three-dimensional flying. The Fisher engineers worked out the math for the software in advance, and were counting on us for accuracy."

Key moments

Almost every scene in *Spider-Man* involves some scenic effects. Certain pieces recur through the show, including a spider web drop - the web outlined in LEDs - and eight scenic legs, four each at stage right and stage left, half of which are lightboxes and half of which are video panels. But scene after scene yields many more visual surprises.

It begins with the opening sequence, in which Peter Parker is presenting a paper in his English class on the topic of Arachne; the spider web drop parts to reveal what is known in the production as the 'loom'. In it, a number of

Arachne's followers, attached to vertical silks, swing from upstage to downstage. As they do, a series of horizontal silks rise into place, as if a giant tapestry is being woven on stage.

"On the one hand, it's a very simple effect," says Tsypin. "You have girls on swings. But the geometry of it is very tricky. The horizontal pieces are timed manually. The number of tests we had to do was unbelievable. The horizontal pieces are silks, but the verticals are a special material that had to be designed, tested and produced especially for us. They had to be certified to carry that [human] load."

Next comes Peter's high school classroom, which Gallo calls "one of the most difficult" pieces in the show. It's a total pop-up effect; a backdrop depicting the school's exterior comes on stage; an oddly angled section opens up vertically to reveal a classroom interior. As that happens, four desks, created in forced perspective, roll onstage. "It opens so quickly that you don't realise what just happened," he adds. "It's like a real child's picture book that opens up and all the desks unfold."

The following scene features an effect that may not be the most spectacular, but is, in some ways, the most astonishing. Peter and Mary Jane are walking home from school. The actors are on a treadmill, and, behind them, a flat backdrop, depicting the row houses of Queens, executes a series of pivots, showing the streetscape from various perspectives. "The Queens row houses are so lightweight. They fly in and we have counter-weighted jacks on the rear to offset the weight of the panels as they pivot. They end up working very well," explains Peterson. The scene also features a whimsical inside joke: On the bridge that flies in above, a tiny version of the No. 7 subway line passes over the action. "I was told that the PRG scenic staff attached a little figure to the train, and that figure is me," says Tsypin, amused.

Speaking of the scenery for the high school and Queens streetscape, Tsypin says, "Basically, I had one idea for the show: the pop-up book. I came up with it because Julie wanted to deal seriously with comic books. I've never done graphic designs in my life - I always come up



with complex spatial ideas - and somehow I had to combine these two concepts. A pop-up book does that; it gives you a graphic image rendered in space. I got every pop-up book I could. So many of them are so beautiful - and, to my horror, I realised how complex they are. It took us months, but we finally started coming up with interesting pop-ups. Then the next issue was, how do you build them? I was told it wasn't impossible - but, of course, I was working with PRG, and they were willing to experiment."

Gallo notes: "I'd say to George, 'It's not impossible, but it's improbable that we can do this. I'd never worked with George before, and I absolutely love the guy. He does things totally differently. Most designers sketch out what they're thinking about and show it to the director. Then the assistants draft it, specify it, and finally make a model. George does the opposite. He makes 10, 12, 20 models until he is happy with what the design of the piece should look like. Then he has his assistants draw it. He's an architect; those models really helped us." Speaking of the row house effect, he adds, "It's extraordinary, like a picture book that keeps opening and opening. I can't tell you how much development went on in the shop to get lightweight materials and to figure out where the motors should go."

In fact, a key part of the process involved finding lightweight materials for this and many other scenes. The solution was carbon fibre; many of the set pieces, which split open, unfold, or telescope out, are made of carbon fibre frames with fabrics stretched over them. Gallo adds: "Carbon fibre is used for fighter jets and the masts of large-scale sailboats. We built a vacuum machine to make it; it was a whole new way of working, but it was light and stiff, and was what we needed. Of course, it's so expensive it would make your head spin around, but this show had the money to do it."

In one example, an Act II scene set in Mary Jane's Manhattan apartment uses fibre frames with rare earth magnets that allow the walls to be quickly assembled. "We are convinced that

future productions will benefit from the experience we gained from this build process. The use of carbon fibre has opened new doors of possibilities for us in scenic construction," adds Peterson.

Probably the most talked-about scenic component is seen in the climax, in which Spider-Man and the Green Goblin meet for a showdown at the Chrysler Building, engaging in a battle on the side of a skyscraper that the audience sees from a birds-eye view, gazing at the Manhattan traffic below. The Chrysler Building is stored in a hanging position, pointing straight down and folded in half. As it flies in, it actuates, opening to a total length of 50ft (15.2m), extending out over the fourth row of the audience. At the same time, the stage floor rises up on an angle, revealing the lightboxes mentioned earlier. A drop, located far upstage, comes into place depicting moving cars in the street below. It's a remarkably effective attempt at re-orienting the audience's point of view - and it leads directly into the most daring of the show's flying sequences, as Spider-Man and the Green Goblin duke it out over the entire volume of the auditorium.

Tsypin notes that, for V2.0, "many effects had to be reprogrammed, but the second version was conceived with our involvement. Everyone understood that you couldn't just rewrite a scene and stick it in, as you might do in a normal musical. The new version was very much written with the set in mind. Still, we had to make changes; I had to conceive a couple of new scenes, including one for the Green Goblin's new number, 'A Freak Like Me Needs Company.'"

Gallo says: "In every show, there's always one piece that you're worried about. In *Spider-Man*, every piece was another extraordinary challenge; after you hung it, it performed a million tricks. We were asked to do things we'd never seen before - scenery that pops up and swivels down, and scenery, like Peter Parker's bedroom, where the walls had to be so light."

He adds: "We were rehearsing two shows - a regular Broadway show that happens on the stage and another that takes place in the air. The show in the air takes more time than it takes to rehearse a Broadway show on stage. It was a continuous fight to get enough time to rehearse two shows. That's why we worked so long. It was eight in the morning to midnight for months at a time: one of the hardest things about this show was just being able to stick with it."

Villains in video

Kyle Cooper, the projection designer, created the production's original video content, much of which focuses on the Green Goblin and The Sinister Six. Howard Werner, the production's media designer, says, "My job was to work with Kyle and Julie and George to incorporate the media into a Broadway show." Ultimately, he was responsible for the final look of V2.0. Werner is a principal with the lighting and video design firm Lightswitch, and, he adds, "Lightswitch staff - including Jason Lindahl, the production video electrician, and Phil Gilbert, the video programmer - was in the theatre for 12 months, full-time. I showed up in August, 2010 and worked until the opening in June. We were full-on in support of the show from the moment the video gear starting loading in during June of last year."

Cooper and Taymor have worked on a number of movie projects together. He says that their working method was similar to that of their films. "She will tell me her ideas, and I'll go away and make books filled with storyboard frames," he says. "Sometimes they're drawn, and sometimes they're made of photo montages. I made a series of books for Spider-Man. For 'Sinister Six,' I did a series of sequences showing, for example, Rhino [one of the Sinister Six] crashing into the Leaning Tower of Pisa." He notes that, in many ways, the information in the books was highly preliminary. "Because the costume drawings [by Eiko Ishioka] weren't fabricated yet, it was hard to be more specific, so we were kind of waiting. I met with George Tsypin's people and saw designs for the set, but



WEB-SLINGING ACTION



MARY JANE'S IN TROUBLE . . . AGAIN!

I didn't know what the costumes were going to be. It was a little challenging."

Finally, Cooper says, "The costumes started to come together, and I went to New York with Julie and Danny Ezralow, and shot all of the villains against green screens. Then I put them into environments that were inspired by what George was doing, and I began to show her frames of what the video would look like."

With the others, Werner played a key role in the selection of the projection format. "At the point I got involved," he says, "there was the desire for video projection; at the time, they thought they would use RP surfaces. But, from a sanity-keeping point of view, LED panels were the way to go. At that point, however, they couldn't really afford a high-res surface. The delay in the show worked to our benefit because, during the time it was shut down, LED products became less expensive."

The eight LED panels, each 8ft (2.4m) wide by 33ft (10m) high, are configured as four pairs of legs, which track on and off stage. The 15mm SMD LED video product is part of the custom LEDs specified by PRG. The legs are covered with black rear-projection screen to soften and blend the LED imagery. In addition, they are covered with black sharktooth scrim material; that way, when no video is displayed, they essentially disappear; when lit, they look like standard black fabric legs. Each leg weighs 1,300lb, contains 100 video tiles, and can track back and forth on stage in just about any position. One image can be spread across all eight legs, or each leg can feature individual content.

Feeding imagery to the legs are three PRG Mbox EXtreme media servers - one for the eight LED panels; one for the projector mounted on the balcony rail, which is used for front-projected effects; and one for practicals onstage. There is something like 320GB of content on the servers, not all of which is used in the show. The Mboxes are linked to the production's lighting console,

a PRG V676: "The V676, which handles the video and the moving lights, is linked to an ETC Eos, which is the master," he says, adding that there's a MIDI Show Control trigger for the video. He notes that a significant number of video cues are linked to lighting cues. "If I have Video Cue 222 and Don Holder has Light Cue 222, the V676 will automatically take that cue number. We also coordinated with Don on video-only cues. When that happens, he creates a dummy cue in his cue stack; most of the time, however, I had something that would go along for the ride." He adds: "There are some moments when audio drives the bus. 'Sinistere,' for example, is locked to the orchestra; there's a click-track started by the conductor, associated with SMPTE time code, which triggers the video desk."

One major technical challenge involves allowing video content to track with the LED legs as they move around the stage. Thus the video system receives positioning information from the automation system that drives the LED walls. Encoders added to the SCS winches feed back each video panel's position to the Mbox. That way, the automation and the projection systems know exactly where the LED legs are at any time; this allows for quick and accurate mapping of video content while the LED legs are moving.

PRG developed two modes for the Mbox's video output. In discrete mapping mode, the video projection tracks with the LED leg as it moves, with the image appearing to be attached to the individual leg. Essentially, a single pixel of video output from the Mbox is mapped to a single pixel on the LED output and tracks with the screen. In projected mode, the output appears to be projected onto the stage, not attached to the individual leg, but simply allowing the legs to move through the projection. It's possible for either mode to be set for each individual LED leg. "The way that we're able to use content that the screens move through, and content that is stuck to the screens, coupled with front projection in and around the LED screens, really gives us a

video composition with a lot of depth," says Lindahl.

Werner says that collaborating with Holder was a real necessity. "We coordinated everything; there are moments when video is the key visual element - and if there's a colour scheme happening in the video, Don plays along. In the first act, video is secondary; in the walking-home-from-school sequence, the LED legs are used only to make fields of colour. Don set the colours he wanted to use and I went along with it. The part that works the best is in moments when you don't know which technology you're looking at."

Ubiquitous lighting

"It was a process I will not forget," says Don Holder, who began working on the show's lighting design in 2007, moving into the theatre in the summer of 2009. "Randy Zaibek and his crew were just about to begin prepping the lighting and doing the pre-hang, and, on 4 August 2009 - I remember the date - they pulled the plug. We started back up in the spring of 2010, and everything moved really quickly after that. All of a sudden, I had a six-month commitment - and then it got extended another six months."

By any standard, Holder's task was enormous, as he was required to not only light the action onstage, but also above the audience - and, as we have seen, the production features a daunting number of set electrics. Even so, finding space for lighting was the issue, what with all the real estate taken up by the flying rig and scenery, and considerable ingenuity was required to allow Holder to do his work. "Most of the drops measure about 50ft (15.2m) tall by 70ft (21.3m) wide, and had to be lit absolutely evenly from top to bottom," he says. "The only way to accomplish this task was to light the goods from directly behind. We had room on the back wall, so I designed a massive goalpost system fitted with Altman Spectra Cyc LED lights, [Philips Vari*Lite] VL2000 Wash lights, and [Martin Professional] Atomic Strobes. They all shoot through a muslin drop that acts as a



THE CLIMACTIC BATTLE AT THE CHRYSLER BUILDING

bounce and as a diffuser, focusing directly onto various goods: a rear-projection screen that's used as the cyc, the Oscorp Laboratory drop, the revenge drop, etc."

With this system, the muslin bounce can fly out, allowing Holder to light directly through the drops when he wants to see the sources. For example, the Oscorp Lab features a yellow sun; when, in that same scene, Norman Osborne becomes the Green Goblin, the transformation is effected using Atomic strobes from the goalpost. During the number 'If the World Should End' featuring Peter and Mary Jane on the fire escape, there's an effect with light streaming through a pinhole drop, creating a starry-night effect with moving beams of light. "I use VL2000 Wash lights mounted on the back wall goal post, programmed to slowly scan across the rear of the pinhole drop," says Holder. "It's an incredibly simple idea but very effective."

Given the demands of scenery and rigging, Holder was dealing with a light plot that had to be fit into any available space. Thus the rig is trimmed at over 40ft (12.2m) over the stage, because the fixtures must be positioned above the fly wires. In the house, followspots are necessary to track the flying sequence; however, the theatre's traditional followspot positions were no good, because the units had to reach from one end of the theatre to the other. This meant the installation of new positions for the show's three Lycian M2 units. "I think of the followspots as the first layer of the flying lighting," says Holder. "They can follow the flying anywhere in the theatre, and they are incredibly helpful. The second layer involves tracking the flights with automated lights using positioning data received from the flying system; finally, we put in the infrastructure so that the entire space is illuminated. In the end, most of the flying sequences use a combination of all three techniques."

In other scenes, he adds, other techniques must be used: "In 'Bouncing Off the Walls' we have [ETC] Source Four 10" units with hand cranks for the scrollers; the stagehands stand in the wings, operating them. We use this same approach to light all of the onstage flights, including when Arachne is flying. Three followspots isn't that

many for a show of this size; with these auxiliary units, we're pretty well covered."

Holder adds: "Overhead positions are very limited because of scenery and rigging; the bulk of the overhead plot is composed of automated lighting. This is the largest moving light rig I've ever used - because the demands of the production are so immense and space is so limited. There are about 160 units, and they're spread all over the theatre. As the show evolved, Julie kept asking for a cool white HMI light on the actors - and that limited the use of typical tungsten halogen fixtures. The arc sources became more important, because those units give off the kind of light she was looking for."

Of course, as noted, Holder had to work intensively with Tsylin and PRG staff on set electrics. Speaking of the city legs, Mark Peterson says: "The requirements were endless. Even though they were to be built as lightboxes, they could not be too deep, front to back. They had to be internally lit with RGB colour, and also individual windows in the front panel graphics had to be able to be lit and controlled. Also, the rear had to be able to be backlit with automated lights, which also meant there could be no shadows from internal framing needed to prevent twisting or torqueing. It was both a lighting and scenic challenge."

Holder adds: "The City Legs are only 6" (15cm) deep, but 9ft (2.7m) wide and 40ft (12.2m) tall. I've lit enough lightboxes to realise that it would be difficult to provide even lighting with a range of vivid colours. We did several mockups at PRG. We tried mini-strips, but they wouldn't fit in the space. We looked at LED fixtures, and decided on Philips Color Kinetics ColorGraze units. However, they didn't solve the problem completely, because there were times the centre of the box would be dark, because you couldn't get the light through such a narrow opening. I needed to backlight the legs as well."

Holder seconds Werner's comments about the colour-matching process used to unite lighting and video. "Howard and I had a very good collaboration, making the lighting and video work together, especially in 'A Freak Like Me', which is

about using an iconic colour for each supervillain. A lot of the lighting and the video cues are driven by the same console. It was a very intense and involved collaboration. It was overwhelming at times, trying to figure it out. When you see the end result, it doesn't look complicated - it seems pretty effortless and transparent - but it took a lot of work to get it there."

Holder and his team, including associate lighting designer Vivien Leone, wrote over 600 cues. Discussing certain aspects of the rig, Holder says the MAC 700s "are small and fast; they illuminate a lot of the flying. They're very facile units; they can accelerate quickly and their movement pattern is always smooth. He also notes that the Coemar unit "became very important. It's like a 1,500W ACL, with very rich colour production; I use it to do big strong slashes of light in the air." The VL2000 washes, he adds, "are used to backlight many of the drops and they illuminate the starscape in 'If the World Should End.' These wash units also animate the text on the 'revenge drop' [lighting up words like "pow!"] in 'Bouncing Off the Walls'."

Speaking of control, Holder says: "We used the first 20,000-channel [ETC] Eos console for the conventional lighting, mostly for the LEDs. The automated lighting is controlled by a PRG V676, which is also driving the video system. We used two V676s during the cueing, and now one console runs both lighting and video. Richard Tyndall, who programmed the lighting, did something that shocked some people. People ask me, 'How did you light all the flying? Was there some sophisticated tracking system?' Actually, Richie did it with helium-filled party balloons. We realised we'd get no time to light the actors, so, using the flight data from Fisher, he figured out the flight paths, their acceleration and deceleration, and, at each point along the path of travel, Richie, aided by his assistant, Porsche McGovern, would create presets for all the appropriate moving lights. These presets were used to create a complex series of follow cues, and then it was a matter of finessing each step along the path until it resulted in a smooth and continuous pattern of movement. At its core, it's a fairly simple solution; there were days and days of party balloons."

Somehow, during *Spider-Man's* tumultuous winter, Holder managed to light two more Broadway shows, Tom Stoppard's *Arcadia* and Stephen Adly Guirgis' *The Motherf**ker with the Hat*. This was possible, he says, because "after February 7th, the show went into a state of inertia" while its future was being worked out. He adds: "I had a day and a half to tech *Arcadia*, and a week and a half of previews - after working on a show that teched for two months, it was really thrilling." Then, when Taymor exited and McKinley took over, Holder, a longtime Taymor collaborator, experienced feelings of divided loyalties. Ultimately, he says, "I wanted to see it through; that was very important to me."

Holder quickly learned that the lighting approach he had devised for Taymor's vision - with lots of cool HMI lighting on the actors, set against backgrounds of deep colour - didn't fit with McKinley's approach. Holder worked with McKinley on the hit musical *The Boy From Oz*,

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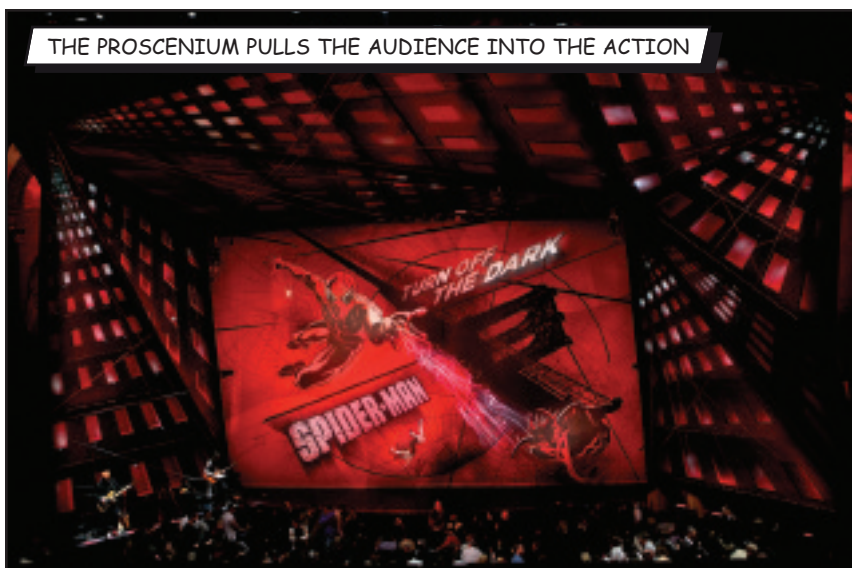
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THE PROSCENIUM PULLS THE AUDIENCE INTO THE ACTION



"so we had a working vocabulary." Overall, he says, McKinley "wanted the lighting to be less cool and edgy and more textured and colourful. I had to smooth out the edges, making it softer, lighter, and more kid-friendly. At first, I was taken aback; I thought, how can I do this? We had taken a very specific approach, and it was hard to accept the direction show needed to take. Thinking about it, reading the new script, and seeing it on stage, I realised I had to get with the program. But if I told you it was easy, I wouldn't be honest. On some level, I didn't want to mess with Julie's work. Ultimately, I tried hard to be a conscientious collaborator."

However, he adds: "I feel good about what we did. I feel that we have a strong point of view, visually, and, on many levels, we help to tell the story. We went in there every day, trying to do the best work we possibly could. It was frustrating and disappointing at times, and it wasn't always easy to stay motivated. The show was expensive for a lot of reasons, but we never veered off the path of what the design needed to be. The sheer amount of technology in the production is overwhelming, but I don't feel there's anything in the show that we didn't really need to do the job."

Spidery sound

In some ways, despite all the complex technical challenges listed above, sound proved to be the most difficult aspect of *Spider-Man*, especially since the early, unauthorised set of reviews complained that the production was, at times, hard to hear. This seemed almost impossible to believe, as the production's sound designer, Jonathan Deans, had worked fruitfully in the Foxwoods Theatre several times before, on such shows as *Ragtime*, *The Pirate Queen*, and *Young Frankenstein*. Deans departed the production, early in 2011 to work on another Broadway musical, *Priscilla, Queen of the Desert*. Peter Hylenski, a former Deans assistant and a designer with more than a dozen Broadway shows on his resumé, took over. As Simon Matthews, who worked as *Spider-Man*'s production sound engineer before leaving to take a full-time job with Meyer Sound, notes, the road to getting an effective sound system was a rocky one.

Interestingly, Matthews says, in one respect, the job of the sound design team was made easier. The pre-load-in structural work included the removal of the proscenium header and parts of the ceiling dome - architectural elements that in the past have proven to be acoustical obstacles. But the scenic design and flying rigging system posed new challenges that weren't easily solved. "In Version One, we had three things going against us," he says. First, unsurprisingly, was the battle for space. "Everyone needed something in every location. The flying department needed landing platforms. The lighting department needed positions for side light."

This, Matthews notes, was the nature of the game: "We spent a lot of time negotiating what little space there was on the proscenium. We had several versions of plans; we'd hang boxes, then something else would come along and they wouldn't work in those positions. That is the nature of this type of production; it's an installation and you just have to roll with it."

The second issue was Tsypin's highly dimensional proscenium: "Because of its angles - and the structure placed behind it to hold those angles in place - there was no room to put loudspeakers. Where you could put

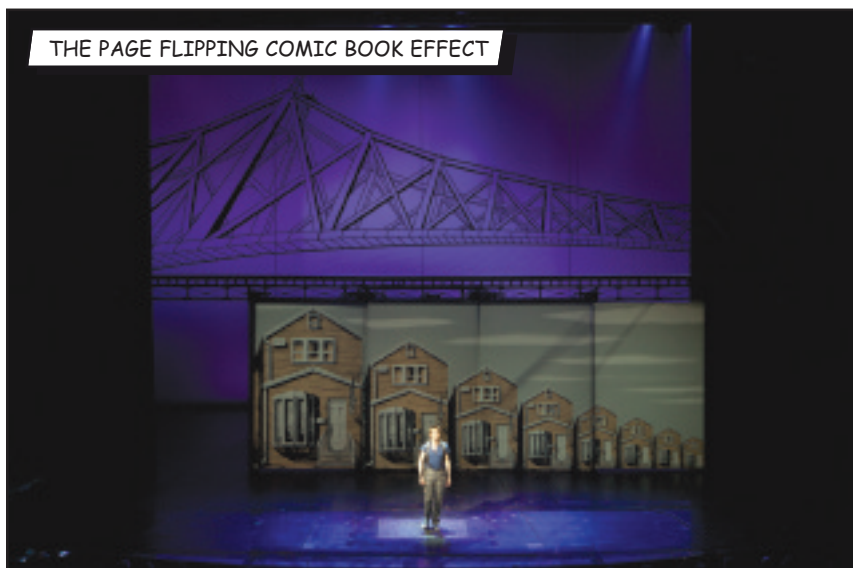
them, they wouldn't be audible to the audience. There's not much magic to sound; if the speakers aren't visible, they won't be audible to the audience." The third issue, he says, was that the proscenium was covered in what he describes as "a perforated RP material, like, say, a perforated shower curtain. "Some materials can be used without impacting the sound," says Matthews, "but not this." He adds that, by the time it became clear that there might be a problem, "some of the scenery was already built. At that point, you can't say, 'That's impossible' - you have to fix it in the theatre." Ultimately, he says, after a demo that proved how much the system could be improved, the speakers were brought out from behind the proscenium, with many of them being retained in floor positions. Even so, it's a very tight fit.

From the beginning, he says, Taymor's vision involved three distinct treatments of sound: "the theatrical world of the main characters, the astral plane where Arachne lived and which was supposed to have a floating, surround-sound feeling; and the super-hero scenes, which was supposed to be very rock 'n' roll." This idea, coupled with the show's original orchestrations, made the challenger harder: "We put in a set of pitch and delay effects in the scene with Arachne's loom; it was okay, but they wanted to hear every word." Similarly, he says, in one of the Geek Chorus scenes, "the characters had three brief lines, but there was also a horn fanfare going on." Ultimately, he adds, "I think we did nine real system designs, apart from various small changes and tweaks."

The show's main proscenium system consists of Meyer Sound M'elodies - eight per side at left and right - with Meyer JM-1Ps in a centre cluster made up of two rows of four. Originally, says Matthews, "Meyer Sound MICAs (for the sides) and L-Acoustics V-DOSC (for the centre) were specified, but the latter didn't work well with the proscenium structure and, as the system was revised, the Micas weren't available, so we went with the M'elodies."

Anyway, he says: "The M'elodies were the smallest boxes we could put in there and pull it

THE PAGE FLIPPING COMIC BOOK EFFECT



off. We knew they had enough punch for a theatrical event." The surround system features d&b audiotechnik E8s, with more of the same units used in under-balcony positions; Meyer UPJs fill out the surround system. Overhead are eight Meyer CQ-2s, with UP jrs providing side- and cross-fill, and M-1Ds providing front-fill. Because the orchestra pit contains scenic elevators, the 18-strong band is found in two locations. "The live room, which is off the trap room - formerly the green room - houses the strings and horns. The core band room, with guitars, basses, percussion, keyboard, and a monitor mixer, is in the basement down the hall, on the stage-right side."

Because of the musicians' isolation, says Matthews, "We went through a number of iterations, looking for video monitors to allow them to see each other and the audience. We tried several things and went back to CRT projectors. People wanted bigger screens, so we installed 42" LCD screens. We have a Barco Image Pro to convert the image from its native resolution to fit the screens." He adds that the musicians can see the audience, and a set of four mics in the auditorium feed the audio to both band rooms, each of which has a pair of speakers and a sub. In addition, the musicians have Aviom personal monitor mixers, "because some numbers are on a tempo clock. There's one click-track with vocals, but the rest are metronome clicks that give them the first eight bars of a song." This is necessary, he adds, to keep everyone strictly in tempo during the flying

sequences, which are cued to the music. Also, he says: "The Edge's guitar style uses a lot of delay effects, and they need to be timed to the music as well. The guitar players - who are phenomenal - spent a lot of time working on this style." He notes that the guitar players use a Fractal Audio Systems Axe-FX all-in-one preamp/effects processor: "Everyone is really impressed with it. You can say, 'I want this pedal and this brand of amplifier head,' and it's truthful. Prior to this, a model guitar box sounded like a model guitar box. This was the first I've heard that can really fool your ears."

The entire cast is on boom mics, says Matthews, citing what he calls 'Simon's Law of Centre': If you want the ultimate reinforcement, the mic must be as close to the performer's mouth as possible. Commenting on the typical Broadway practice of putting mics at the centre of performer's foreheads, he says, "No sound comes from there." The mic systems are Sennheiser, with SK5212 wireless systems, 3732 receivers and HSP-2 capsules.

Sound is controlled by a Meyer Cue Console, which features the first major D-Mitri system used in New York. "We needed the recallability and functionality that we had become accustomed to in LX300 products," he says, mentioning the Cue Console's previous effects engine. "So we took the plunge and said, 'Let's get D-Mitri.' It's pretty awesome. Although it's a magnitude of order more complex in many ways, it programs in much the same way as the LX300. We also do speaker

management using five [Meyer] Gaileo processors." The D-Mitri system also includes 48 tracks of playback for sound effects. The on-stage monitor mix is generated through the front-of-house console.

As you might imagine, communication is a critical issue in *Spider-Man*, and the show makes use of a Clear-Com Eclipse system. "There are two stage managers calling the show - one for scenery and flying and one for lights," he says. "The first of them needs to be able to communicate with a great number of people; he has the hot button, which connects to anyone in the show who flies, via in-ear receiver. These are the Navigator [the Fisher Technical automation control system] cues; he'll say, for example, 'Navigator 300 and go,' and the performers know that they're about to go to flight. With their in-ears, they clearly hear the stage manager call the cue. To conceive of that without the Clear-Com system would be very difficult; it gives you enormous flexibility and capacity." Also used are Telex TR-82N wireless belt packs and a Clear-Com Cellcom system.

Like everyone else involved in *Spider-Man*, Matthews says that the long hours and uncertain production schedule took their toll. "Everyone had to figure a way to deal with the process," he says. "I'm surprised everyone worked together as well as they did."

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