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Sarah Rushton-Read reports from Drury Lane . . .

Roald Dahl was a master of escapist storytelling, inspiring generations to dream and to unravel their imaginations. He once said: "A little magic can take you a long way," and how right he was . . .

Nothing is more of a testament to that than *Charlie and the Chocolate Factory* at the Theatre Royal Drury Lane. Directed by Sam Mendes (returning to theatre after directing *Skylfall*, the most successful James Bond film of all time) the show features an A-list cast and creative team - including writers David Grieg, Marc Shaiman and Scott Wittman, choreographer Peter Darling, scenic and costume designer Mark Thompson, sound designer Paul Arditti, projection designer Jon Driscoll and lighting designer Paul 'Polly' Pyant, who has collaborated with Mendes regularly during and since his time at the helm of London's Donmar Warehouse.

Dahl's moral fable about five children who find golden tickets hidden in their chocolate bars and embark on unimaginable adventures within the secretive walls of Willy Wonka's chocolate factory, is bursting with creative flavour. The colours, characters, creations and oddities offer an irresistible menu of stimulating ingredients. Making magic from reality is always a challenge, but the collaborative mix of creative vision and technical expertise achieved exactly that.

Structural Changes

Stationed on the crossover point, where creativity meets practicality, is production manager Patrick Molony. He and his team - Nick Smith (production carpenter), Gerry Aimes (production electrician) and Dave Lee (production sound), alongside Simon Stone and Simon Tiernan of Unusual Rigging, ensured that the impossible was entirely possible.

Of course, before a picture can be painted, the canvas has to be stretched, and The Drury Lane theatre required some considerable prep work. "Despite its substantial size, every bit of space was packed with scenery or technical equipment," explains Molony. "So much so that a new mezzanine level was built at the back of the stage to accommodate the cast's quick changes, with another at the side to accommodate the video delivery system."

In addition, rigging experts Unusual Rigging carried out extensive work on the theatre's weight capacity, as head rigger Simon Stone explains: "Drury Lane's original counterweight system was designed for flown cloths and little else. A cradle capacity of just 160kg was never going to be adequate for what is probably the heaviest, and one of the most complex shows that has ever been attempted in the West End." The new solution also had to comply with the limitations of an historic listed building.

"For the counterweight flown elements, we installed 40 brand new counterweight cradles with a safe working load of 600kg each," continues Stone. "This came complete with head blocks, drop pulleys and return pulleys plus 15 tonnes of newly cast weights: all were designed from scratch. The only elements of the existing system that have been re-used are the guides, head beams and return frames."

In total, nine tonnes of new steelwork, custom designed by Unusual's team of theatrical design engineers, support five large winches (the lightest of which is over 700kg). Between them they lift 12 tonnes of flown scenery.

"We fitted two more long runs of aluminium support trusses into the grid to accommodate 11 winches, which fly lighting towers and side masking," says Stone. "Two further winches have been positioned over stage for the operation of the 'suction pipe' and the 'Augustus Gloop' mannikin which travels through it."

In addition, Unusual supplied 1,000ft (305m) of ladder beam and 400ft (122m) of truss. The total flown scenic weight, including winches, is now 46 tonnes. The estimated total weight on the building, including URL steelwork, counterweight and trussing is 75 tonnes.

Unsurprisingly, additional strengthening to the fabric of the building was required, as Unusual's Jeremy Featherstone outlines: "Over 100m of steelwork was used to strengthen the existing (1890s vintage) roof trusses. In addition, the head beams were strengthened to resist the loads imposed by the new counterweight cradles."



Lighting

With the building prepped, the next challenge was to create a visually immersive environment, jam-packed with bizarre characters and kaleidoscopic scenes. By marrying set, lighting and video through collaboration and some enterprising approaches, Mark Thompson, Paul 'Polly' Pyant and Jon Driscoll began to weave a world of limitless make-believe. It goes without saying that this was not without challenge.

Paul Pyant and regular associate designer, David Howe, say their design was primarily dictated by the set. "The grid and side stages are packed with scenery, so there wasn't a great deal of choice when it came to positioning lighting fixtures," says Pyant. Not only that, Sam [Mendes] hates any kind of mechanical noise. He wanted a completely silent rig. This gave me quite a lot to think about!"

The backbone of Pyant's rig, supplied by White Light, is made up of Vari-Lite VL1000AS moving heads - primarily because they are fanless. Alongside are some of the usual suspects, plus some newer LED technology. These include Martin Professional TW1s and MAC Auras, Vari-Lite 1000TS and 3500Q Spots and Robe LEDWash 1200s, used to create the less realistic colours in Act 2, set in the factory. Clay Paky Alpha Wash 1200s and Alpha Wash Halos provide key light from the side, Chroma-Q ColorForce 72 LED battens are used to wash some of the scenic elements, as are Chauvet COLORdash Accent LED fixtures and ETC Source Four LED Lustr+ spotlights.

Programmed by Jim Beagley, the entire rig plus smoke and effects, set-practicals and video - over 20 DMX universes worth - is controlled

from an MA Lighting grandMA2 system.

Meanwhile, Martin Chisnall spent many weeks configuring seven universes of City Theatrical wireless DMX to control many of the onboard scenic lighting and smoke effects.

Pyant says: "When we first saw the model it was beautifully lit and we started off with a very clear idea of what we wanted. While these were excellent starting points, how we ultimately moved forward and the finer details were in a constant state of flux."

Set & Staging

Not only did Pyant have the stage to light but also practically every piece of scenery - of which there are an abundance. "The one thing that remained consistent for us was Howard Eaton and his team's ability to deliver whatever was necessary," continues David Howe. "Howard's involvement is extensive. If it moves and lights up, he's probably had a hand in it."

That includes both the 6m and 3m diameter flown LED moon light boxes, the Chocolate Waterfall, the Violet Vat, the TV Machine, the Inventing Counters, Telegraph Pole and Glass Phone Box, Oompa Loompa suit control, fibre optics in the floor and in all the portals. The list goes on, explains deputy chief electrician, Nathan White: "Howard has done so much. He even customised the UV tubes round the scenic portals. There doesn't seem to be a static or non-functioning piece of set anywhere."

For the moving elements, Stage Technologies delivered the full automation package, led by director of rental services, Ted Moore. "We supplied a massive 75-axis automation system," says Moore, "plus a full automation package, consisting of counterweight assist winches, floor tracks, trucks, sliders and supplementary motors."

"The technical expectations were huge, both because of the challenges of installing the



complex show in a 200-year-old venue and the precision required by the creative team's vision," continues Moore. "While the main system of counterweights, floor tracks and sliders were reasonably conventional and did not pose particular challenges, the bespoke elements of the show required extra focus."

One of the show's key elements, the Glass Elevator, required a specially-commissioned robot arm to lift the elevator safely and seamlessly from below stage and fly it over the orchestra pit, while simultaneously compensating for any tilting or rotation. The arm and its lifting tower were required to meet not only the challenges posed by the building, but they were also responsible for storing the elevator under the stage when not in use.

The automation system includes two Explorer trucks, controlled from an Acrobat desk but utilising a laser guidance system for positioning. The trucks are used extensively throughout Act 1 to create different shapes upstage, downstage and across stage. The challenge in this instance was that the system had to triangulate its position whilst traveling on a raked stage (to our knowledge the first time this has been achieved) and position accurately whilst other scenic elements moved around them.

Molony comments: "We were using some state-of-the-art automation equipment, which had to be made to work in conditions which had never been encountered before. Given the raked stage, totally uneven centres of gravity of the trucks and mass of other scenery determined to obscure all lines of sight for the guidance system, this was a very difficult task. After many hours of work and some impressive programming we now have a system which is extremely reliable."

Meanwhile, sister company Delstar Engineering supplied the stage engineering and hydraulics. Delstar's Paul Craven says: "Our remit was to provide 700sq.m of show deck floor that would house delivery systems (floor tracks) for various truck-mounted scenes coming from each wing and down centre, plus the centre-stage floor traps of the bed lift and a square lift upstage of that. We also provided the mechanical system to present the Glass Elevator and deploy it over the stage with Wonka and Charlie riding inside.

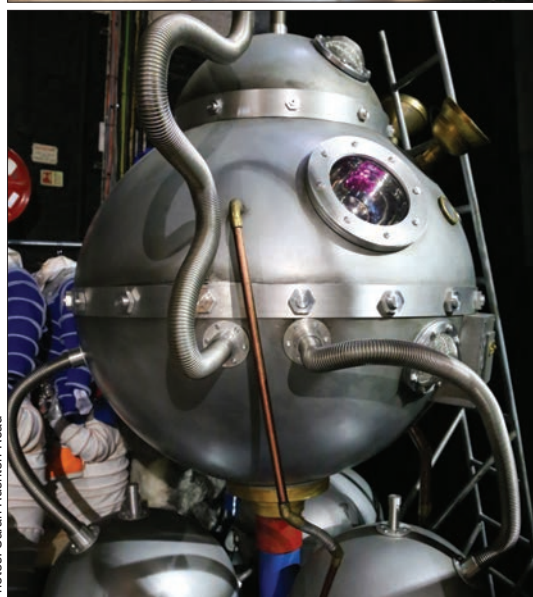
Video Content & Projection

Video and projection designer Jon Driscoll created the complex, bespoke video content, including a full animated movie, video-mapped lighting effects and characters that appeared to dip in and out of reality. His credit as video and production designer does not begin to describe the job he actually did, working closely with Mendes, choreographer Peter Darling, artist Quentin Blake and set designer Mark Thompson for over a year.

"Sam was very keen to collaborate with Quentin," explains Driscoll. "We began with a concept for two stand-alone films. The Creation Overture, which tells the story of how chocolate came to be and another which tells the story of the Oompa Loompas and how they came to be working in Wonka's factory. Quentin created the look of the characters and the environments and our team animated it - that one single movie, used at the beginning of the show, is made up of thousands and thousands of individual hand drawings. It was a great privilege to work with Quentin Blake, and the animation team we pulled in was fantastic."

After Driscoll and Mendes created the storyboard, "Quentin illustrated it in his distinctive style. Once he had drawn the characters and environments, our two line artists learned how to recreate them and, once confident, they brought each character to life."

However, Driscoll's job was not only to create video content used as a story-telling device. He was also tasked with bringing texture and dimension to the physical set and creating devices to enable the smooth transition from one scene to another. Driscoll's virtual environments had to work cohesively with Mark Thompson's set and Pyant's lighting to complement or enhance what existed in the physical world of the stage.



Photos: Sarah Rushton-Read



Photo: Helen Maybanks

While *The Creation Overture* doesn't co-exist with other things, the rest of the video content certainly does. Driscoll's content interacts with both scenery and performers. The line between the virtual and the physical world has been skilfully blurred and on occasions characters jump between the two with relative ease. To achieve this, Driscoll spent copious hours filming each of the main characters in front of a green screen, followed by complex editing and post-production to make it look as if they had fallen into the TV in real time.

In addition Driscoll created a number of scenery enriching projections, adding layer upon layer of depth, texture, light and dimension to Thompson's key scenic elements. To all intents and purposes, Driscoll was a digital *trompe l'oeil* artist. This was particularly effective on the huge Chocolate Factory Gates and the Factory.

There are other, almost imperceptible additions that make the show so visually absorbing: the evocative smoking chimneys of the chocolate factory, the tantalising silhouettes in the windows, the constantly changing light on the set and the crazy, psychedelic light effects all have a dramatic effect.

"The entire factory backdrop is backlit by mapped projection," explains Driscoll. "Every one of the windows is individually segmented, so you can project whatever you want into each."

It seems incomprehensible that with such a complex show Driscoll and his team never had a whole plotting session dedicated entirely to projection, but perhaps more

surprising is Driscoll's laid-back attitude to it: "I'm not complaining, I'm used to this way of working. Of course, when you think about it, it's pretty unusual, but everyone on this project is an absolute expert in his or her field. Many of us have worked together before. We had to be able to manage our responsibilities autonomously. We had to be resourceful, use breaks or times where attention was elsewhere to fulfil our own brief."

Perhaps the most obviously impressive use of video is the *Vidiots* section where the cast interact with the virtual world by appearing to move in and out of real television shows with apparent ease. This was a big challenge for Driscoll. "For one thing, the logistics of ensuring that each character and their understudies made a carbon copy film for the *Vidiots* scene was immense," explains Driscoll. "With so many children in the cast and with all the main characters having at least two understudies, we had to film multiple combinations of the same footage over and over again."

But that's not all: Driscoll also took on the logistics and scheduling of all the filming - studio and location, storyboarding and editing. "Most people are not aware of how many departments projection and video brings together - it's a production within a production. We work with the choreographers, the camera dept, direction and animation, lighting and sound. The music department has to ensure all the tracks they supply are correct, while costume, make-up and props have to guarantee continuity - and so it goes on."

Driscoll, assisted by Amardeep Kamboz, scheduled and managed everything from artists calls to budgets. "We made some continuity mistakes in tech', in costume, in sound, so in a bid for perfection, we also had to do a lot of re-shoots. Driscoll's associate Gemma Carrington, also did much of the animation direction, while managing the two drawn line animators.

To technically realise this Driscoll worked closely with his technical associate, Alan Cox. "We tend to use Panasonic projectors for their reliability," explains Cox. "It's a legitimate argument that other projectors can produce more uniform output with better colour telemetry, but we've yet to see other manufacturers achieve the same levels of reliability as Panasonic has. They're also relatively quiet and compact with reasonable running costs. Simple lamp change and a consistent control/maintenance interface across all of the models help the operational crew keep the show looking its best."

This show uses multiple flat surfaces, some pierced, at various stage depths, so it's a multi-plane 2D environment. "Add to this the rapid and frequent content production cycles needing a close integration between delivery and creation processes and Catalyst was the obvious choice for the Media Servers," continues Cox.

"Our biggest challenge was the circle front projection - two 20K projectors and two 10K projectors. All needed custom housings, noise-cancelling fans and baffles, and although it's not silent, it isn't bad for 60,000 lumens!"

Top, left: Jon Driscoll, video and projection designer. Right: Matt Berry.

Middle, left: Howard Eaton (left) with lighting designer Paul 'Polly' Pyant. Right: David Howes, assistant lighting designer.

Bottom, from left to right: Steve McAndrew (chief LX, Drury Lane), Mark Watts (electrics dayman, Drury Lane and production video technician for fit-up/production), Gerry Aimes (head production LX), Jamie Moore (onstage LX, Drury Lane); Matt Wright (chargehand LX, Drury Lane and special effects programmer for fit-up/production), Nathan White (deputy chief LX, Drury Lane), Chris 'Gun' Gunnell (electrics dayman, Drury Lane) and Jim Beagley (programmer).

The complete system, provided by Stage Sound Services, includes 6K, 7K, 10K and 20K Panasonic - projectors along with 55" and 32" practical flat panel displays. Content delivery is from four Catalyst Media Servers with tracking backups controlled via a dedicated MPU from an MA2 that runs both lighting and video. Comprehensive routing and monitoring uses Lightware routing and TVOne Multi-viewers with a fibre and ruggedised Cat5E/6 signal distribution network.

Of director Sam Mendes, Driscoll says: "I've worked with Sam Mendes before. He is an excellent leader, extremely clear and concise . . . because he's film-savvy, he's easy to work with. He looks at the overall picture and delivers the spec for a confident, clear design. He likes things simple, clear and elegant."

Driscoll also worked closely with Mark Thompson but in a very different way. "I worked with Mark in the aesthetic and Sam from the story-telling perspective. I have to complement and draw from his aesthetics and make sure the whole show looks like one harmonious piece of work."



Photos: Sarah Rushton-Read



Photo: Rob Halliday



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Credits

Creatives

Book: David Greig
Music & Lyrics: Marc Shaiman
Lyrics: Scott Wittman
Director: Sam Mendes
Choreographer: Peter Darling
Set & Costume Design: Mark Thompson
Associate Set Designer: Ben Davies
Musical Director: Nicholas Skilbeck
Lighting Designer: Paul Pyant
Associate Lighting Designer: David Howe
Sound Designer: Paul Arditti
Associate Sound Designer: John Owens
Video & Projection Designer: Jon Driscoll
Assistant Projection Designer: Gemma Carrington
Production Manager: Patrick Molony
Production LX: Gerry Aimes
Production Sound Engineer: Dave Lee
Lighting Programmer: Jim Beagley
Production Carpenter: Nick Smith
Puppet & Illusion Designer: Jamie Harrison
Orchestrations: Doug Besterman
Music Technology: Phij Adams
Illustrator: Quentin Blake

Video

Projection System Associate: Alan Cox
Video Programmer: Emily Harding
Production Video Engineer: Oliver Luff
Video Production Crew: Richard Clutton, Jack James, Paul Johnson, Matt Malone
Video Equipment Supplied By: Stage Sound Services

Animation

Animation Supervisor: Gemma Carrington
Drawn Animation Lead Animator: Martin Oliver
Drawn Animation Artwork: Fiona Woodcock
After Effects Animators: Shaun Clark, Kim Noce
3D Animator: Matthew O'Neil
Lighting Gaffer: Carolina Schmidtholstein
Camera Assistant/Playback: Lauren Kunicki

Lighting (for Drury Lane Theatre)

Chief LX: Steve McAndrew
Electrics Dayman & Production Video Technician (fit-up/production): Mark Watts
Onstage LX: Jamie Moore
Chargehand LX & Special Effects Prog (fit-up/production): Matt Wright
Deputy Chief LX: Nathan White
Electrics Dayman: Chris "Gun" Gunnell

Sound (for Drury Lane Theatre)

Sound No1: Matt Berry,
Sound No2: Roisine Mamdani
Sound No3: Chris Reid
Backstage: Tess Dacre



Sound

The theatre's history, character and charming features introduce some notorious gremlins for sound designers. It's a cavernous, wide space, which makes it acoustically challenging; deep balcony overhangs exacerbate the issue. Despite this, sound designer Paul Arditti wasn't fazed, though he did have a definite priority - making the words intelligible. "If I'm honest about sound design for musicals, that's really the only criterion," he says. "I very much enjoy making sound scores and sound effects, and making the band sound fabulous, but the words are the most important thing."

He continues: "Marc Shaiman and Scott Wittman have written a brilliant score, but it is chock-full of words. Most of the company numbers are very fast, with complex, unexpected lyrics."

On top of that, a number of different zones and sound styles were needed to make the performances convincing. "I split the stage up into five vocal zones. Using a cross-point delay matrix, I delayed each speaker in the rig to each zone, hopefully creating five coherent areas from which actors' vocals appear to emanate."

All the zoning and delays are achieved using two Yamaha DME64s. Arditti specified L-Acoustics KARA line-array for the main system, using two hangs of five speakers left and right and a central hang of six for the front rows. L-Acoustics SB118s deliver the low frequencies.

Battling with the challenging acoustic environment, Arditti used a mixture of delay and in-fill speakers, as he explains: "Where possible, I try to find the right loudspeaker for each job, and to get each speaker close to the area of the auditorium it's pointing at. I used hangs of KARA and KIVA where maximum horizontal coverage is required, but with vertical control. For the tricky balcony I used KARAs for the main PA (three hangs from a truss) and four hangs of Meyer M1Ds as delays for the steeply-

raked balcony seating. The rest of the rig comprises d&b and Meyer point source units."

The surround system is Meyer Sound UPMs with small Meyer Sound subs on each level. The onstage monitoring is a matrix of 32 d&b E0s under grilles in the stage floor, supported by eight Meyer UPJs on the lighting ladders at the side of the stage.

Meyer Sound's Galileo manages the system, while FOH control comes via a DiGiCo SD7T for radio mics, instrument mics, tap pickups, reverbs plus matrix, monitoring and system sends. There is also a DiGiCo SD8 for the sizeable catalogue of sound effects used throughout the show.

"My greatest single design achievement on *Charlie* is undoubtedly the sound team," says Arditti. "John Owens, my associate, and all the hard-working and amazingly multi-talented engineers led by production sound engineer Dave Lee. Matt Berry, my number one, and Roisine Mamdani, Chris Reid and Tess Dacre backstage. All are superb at what they do."

The prospect of taking on a production like *Charlie and the Chocolate Factory* must stir all kinds of emotions - intrigue, excitement and perhaps a little trepidation. It presents such possibilities but also such pressure - not only to do the story justice but to add something extra to its legacy.

Director Sam Mendes was not afraid of changing tack or scrapping elements completely, which, at times, made it difficult for the creative and technical teams. "The job of designing any show is to turn it until it catches the light in a particular way, and Mark [Thompson] is a master of that," says Mendes. Thompson himself hopes the light will catch it to reveal a dynamic and joyous tale: "I hope people will feel it's a fantastic journey and a fantastic adventure. And it's not just scenery and costumes - I would hate that, because my primary job is to tell a story visually."