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Photo: Ludovic Des Cognets

National Treasure

Rob Halliday reports on four decades of technology at London's powerhouse of creativity . . .

A funny thing happened at the National Theatre's building on London's South Bank last year: 40 years after it opened, it acquired external signage actually identifying it as the National Theatre - its architect Denys Lasdun having previously decided the building was distinctive enough.

If you're a National Theatre nerd - and I should get my personal confession out of the way here - you might know the accompanying signage that appeared inside the building as part of *NT Future* - a dramatic refurbishment project completed in time for the anniversary - wasn't that new at all. Typographically, it's a homage to the original sign that was subsequently removed or altered over the years. The lighting in the foyers, too, has been returned to something akin to the beams of light that were glancing its textured concrete in 1976. The more you look around, the more you realise that *NT Future* has brought about the biggest changes to the building since it opened, including completely re-defining its north east corner, adding a new extension to the rear and opening up vistas into its scenic paint studio and workshops to the passing public. It's a project that has been carried out by people who respected, understood, and perhaps even loved the building . . .

A CENTURY OF STRUGGLE

However, this building was not always loved. To some, Lasdun's concrete is a "monstrous carbuncle", in the words of Prince Charles a "clever way of building a nuclear power station in the middle of London without anyone objecting". In fact, building the NT there had been a journey spanning more than a century - from a first proposal in 1848, through the publication of *A National Theatre: Scheme & Estimates* in 1904, to the purchase of the site and laying of a foundation stone in 1913 in South Kensington.

Of course, a building alone can't be a national theatre - it's ultimately a home for a national theatre company, which was formed by Sir Laurence Olivier. His first company opened at the new Chichester Festival Theatre in 1962, where Olivier was appointed artistic director; a year later, that became the National Theatre Company, finding a temporary home at London's Old Vic until its permanent base was completed. The Greater London Council offered a site, close to where the London Eye now stands, for a new National Theatre and Opera House. Denys Lasdun, who had never designed a theatre but whose portfolio of educational buildings, including the Fitzwilliam College, Cambridge and the University of East Anglia, had met great acclaim, was chosen as architect.

The design Lasdun created for the two theatres - rising strata of concrete leading up to huge fly-towers - was recognisably the precursor to the NT, but politics and money intervened. The Opera House was abandoned and the National was offered a new site further east, where the Thames sweeps around to views of St Paul's Cathedral. The strata remained, but was adapted to respond to Waterloo Bridge rather than its lost twin.

For the auditoria, no one knew quite what to build. In earlier decades, architects like Frank Matcham and Bernie Crewe had conjured magical performance spaces, but few new theatres had been built in the post-war era. Those who worked and performed in theatres understood subconsciously some were great, some less so, but few tried to puzzle out what made the difference. Guided by a panel of extraordinary theatrical talents, the National ended up with three auditoria. The Lyttelton - the 'Lower Theatre' on drawings - was a child of the cinema, a proscenium design taken to an extreme with the audience entirely front on to the stage and split in two levels that cannot



Photo: Mike Spallcombe

← The Fire Garden event for the London 2012 Olympics ↑ The Olivier Theatre

see each other, so actors often feel they're playing to two separate audiences rather than one big crowd.

The brief for the Olivier - the 'Upper Theatre' - was for a thrust stage, but not too much of a thrust; a hint of Greek amphitheatre distilled into what Lasdun called "a stage in the corner of a room".

The third, galleried studio theatre The Cottesloe, was designed by theatre consultant Iain Mackintosh to fill a space under the rear of the Olivier that was left empty by earlier cutbacks. With the exception of the Cottesloe, it's fair to say the architectural and theatrical merits of the theatres have attracted heated debate ever since . . . Yet those making shows there have often overcome their particular challenges to produce remarkable shows.

PRACTICAL MATTERS

The next step was to equip the theatres. Having been Olivier's lighting designer from the start of the NT company, Richard Pilbrow was appointed to the building committee to advise on 'practical matters'. Ultimately, he and his company Theatre Projects (TP) became the NT's theatre consultants. Though British theatre at the time often shied away from technology, Pilbrow saw the challenges presented by the new building, the stages within it and the plan for the NT to perform shows in rep, perhaps with two or three different shows a day in each theatre. He also seemed to grasp that the NT presented a perhaps once-in-a-lifetime opportunity to improve the technical capabilities of a British theatre rather than just repeat what had been done before . . .

What he, his partner the late Dick Brett, the TP team and all the contractors and suppliers achieved at the National

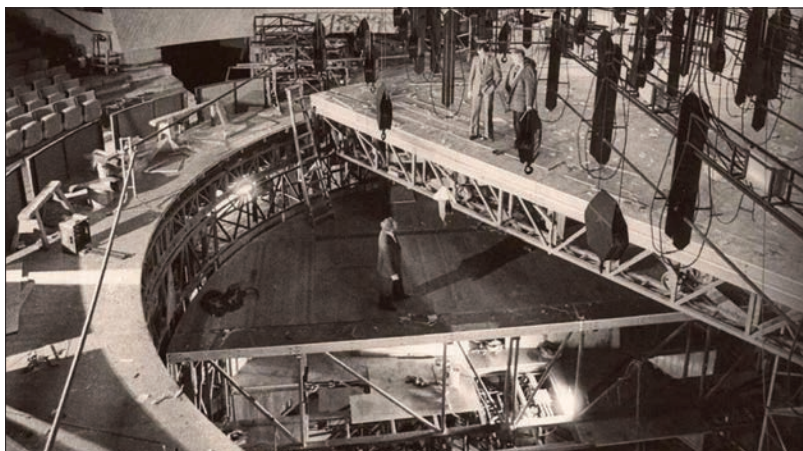
was astonishing. Highlights include an entirely new lighting control system - Lightboard - designed to deal with not just the permanent rep lighting rigs, but also the new technology, including moving lights; the Olivier Theatre's drum revolve - a revolving stage containing two semi-circular elevators that could drop into the basement to allow rapid scenic transitions; a motorised flying system of point hoists - 'sky hooks' - which could be synchronised to lift 3D objects set anywhere on, and at any angle to, the stage, silently; and a studio quality sound system with speakers distributed around the auditoria. Beyond those headline items, a host of practical revolutions happened: multi-ring comms allowing easy communication around the building; bridges for swift access to lighting; centrally-controlled worklight systems; facilities panels for sound, lighting and AV. Standard now, pioneering then.

It would be disingenuous to claim that all of this worked perfectly. Conceived in the enthusiasm of the late '60s but delivered in the turbulent early '70s, the NT building had a difficult birth, with cost rises, political unrest, strikes and more. Its timeframe also straddled technical revolutions: Lightboard, for example, was specified too early to take advantage of the upcoming microprocessor technology. And with the National a headline British project, UK contractors were selected even if in some cases they weren't the best qualified to deliver TP's cutting-edge designs. As a result, the project overran dramatically, at times feeling like construction might just never end. The late Peter Hall, who succeeded Olivier as the NT's director, ultimately decided to just move the company in and start performing. In the rush to open the theatres, getting the technology working fell down the priority list. And once the theatres opened - the Lyttelton in June 1976, the Olivier that October, the Cottesloe not until April 1977 - the contractors



From top: The NT under construction from 24 November 1969 to 22 January 1973

Above, right: The Olivier Theatre under construction



faced lots of overnight work as the venues were playing shows in rep six days a week.

But work did continue and pretty much everything ended up being useful. A decade after the opening, the lack of available spares meant one item, Lightboard, had to be replaced. It was a reminder that nothing lasts forever, particularly not cutting-edge electronics or hard-working mechanics. So how has the rest of NT's remarkable installation fared after 40 years of hard service?

STAGE ENGINEERING

"About five years ago, it was discovered that the drum was basically falling to pieces. Various reports were commissioned, one of which pretty much said put it on bricks and run away." So recalls Mylan Lester, head of stage engineering automation and rigging, who, with Steve Colley, formed the heart of the stage engineering and rigging team that has been involved in a series of projects to rejuvenate the NT's stage machinery over the last few years.

The Olivier drum revolve has a lattice steelwork forming its core, as seen on the photograph taken by its manufacturer Mole Richardson when it was first assembled in their car park prior to delivery. "It was an amazing concept that mechanically was slightly ahead of its time, and electrically and control system-wise - way ahead of its time," Lester notes. "But it had also suffered from wear and tear, running on an uneven surface, mis-loading, over-loading and just generally being abused. Trouble is, if you take it away, you're just left with a really big hole in the middle of a really big stage!"

But here is another example of the love for the building, this time from Nick Hytner, who made the drum a key feature in *His Dark Materials*, one of his earliest productions as the NT's artistic director, as well as in *The Wind in the Willows*, one of his early shows for the company. "Nick Hytner and Nick Starr, then executive director, had an overarching view that the

National Theatre should invest in itself properly, not just in putting on plays," notes Rob Barnard, most recently one of the managers for the *NT Future* project, but also someone who's been with the building from the beginning, firstly as one of the installation technicians during construction, later in the sound department. He recalls Nick Hytner's first address to the company: "I remember him saying, 'the answer isn't necessarily *no* when you come to ask for funds', which was quite different from what had come before. They had a much broader vision, and that meant we were able to rebuild." Plus, during Hytner and Starr's tenure, the National had a number of productions which enjoyed hugely successful commercial lives, notably *War Horse*, which provided the organisation with some extra spending money.

As a result, it was decided to repair the drum properly, whilst shows carried on without it. Lester says: "Beneath the shows we lifted the whole 160-odd tons of the drum, which includes the counterweights for the elevators, at 6mm. That doesn't sound much, but 6mm or 6m is still lifting, to within an accuracy of less than a quarter of a millimetre over the whole 12m diameter. Then working with Delstar Engineering [now part of TAIT] we chopped out and replaced the entire bottom 4ft, and increased the number of wheels up to 70."

Most remarkably, Steve Colley and Mylan Lester have, in some senses, finally completed the installation that began over 40 years ago. As well as the two semi-circular elevators, the drum has a half disc on top of it, so that as one elevator drops down to be replaced by the other, there is still a half-circle of stage for the performers. This could either be pinned to the stage to remain static as the drum rotates underneath, or be allowed to rotate with the drum. The NT team discovered motors allowing it to be driven independently of the drum and also brought to life another unused set of motors intended to raise a handrail around the front of the drum if the downstage

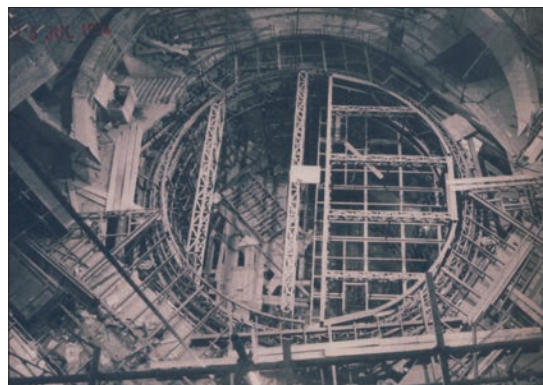
elevator was lowered to auditorium floor level to create a low, flat-floored playing area - early on, Peter Hall had the Olivier stage surface raised with a permanent forestage built around the front of the drum, rendering this handrail redundant. But the motors remained.

As part of the project, the safety and overall control systems were dramatically updated, with a comprehensive series of access keys and interlocks routing through the new TAIT Navigator control system specified by Colley. This replaced the previous control system which couldn't pre-programme the drum - everything, down to setting positions and speeds, was done manually during each show ("one sneeze away from catastrophe at all times," is Lester's summary). With the original system, rotation fell under the control of the stage team, but the elevators had to be operated by the engineering and maintenance department.

Today, Navigator not only allows programming, but also has a virtual model of the drum for blind pre-programming, including the ability to add 3D models of a set to create

anti-collision zones. TAIT's Kevin Taylor, whose father worked for Tele-Stage on the original drum, confirms the new controller is driving the original motors, connected through the Navigator's versatile interfacing system after tracing out the original wiring. "The first day we moved the drum was probably about eight days after we ripped it to pieces; we moved it very slowly, and found that of the 24 motors, two were trying to drive the wrong way - we didn't know the original PLCs flipped the direction of those motors!" That fixed, careful tuning also calmed the notoriously fidgety, noisy, vibration-prone drum. Use was also made of Navigator's customisable graphical interface to create a control layout similar to the earlier system and so immediately familiar to the operators.

The drum's key limitation remains its weight capacity - just five tonnes per elevator. As the NT's head of production Paul Handley notes, any amount of scenery plus a full company of actors can quickly get you close to, or even over, that limit. He also notes the difficulty of explaining what this unique machinery can do, particularly to



↑ Drum of steel: the drum revolve in manufacturer Mole Richardson's car park and then installed in the Olivier



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Photo: Mike Smallcombe

- ↑ The Lyttelton Theatre
- The recent production of *Angels In America: Perestroika*
- Facing page: The Dorfman's auditorium

directors and designers new to it: "One more visionary director was canny enough to drag her writer in to look at the drum before he'd even started the play he'd been asked to write - and of course he walked in there and went, 'Oh my god, this is incredible!'"

Also receiving attention in the Olivier was the flying system. The original system, the cyclo-converter driven point hoists, was a "vastly ambitious thing to do, really state of the art," according to Roger Keenan who helped create it while working for Evershed Power Optics in the '70s. It allowed direct control of motors without the need for noisy gearboxes, and enabled them to hold a load while not moving as their brakes released giving very subtle starts and ends to movement. This was all controlled by a PDP11 mini computer, the same as in Lightboard.

That system had reached the end of its life some years earlier, but its replacement had never worked satisfactorily. Colley, Lester and the team overhauled it, updating it to 30 point hoists that can be moved around in the grid plus 60 line sets, and also interfacing it to Navigator, the system set up so that the revolve and flying can run on separate controllers or can be joined onto one, to give the kind of integrated movements of revolve and flying that were always part of the original dream for the theatre.

In the pros-arch Lyttelton, the power flying system intended for the theatre was abandoned on cost and technical grounds before it opened. Instead, a standard counterweight flying system was installed and remains in place today. However, after carrying out a full survey of the Lyttelton grid, it was discovered that many of the roof beams being used to hang things from were almost worn out. "We have installed a space frame system across the grid, which has alleviated lots of grid stands or bridling from the roof beams," Lester explains. The theatre now also has a stock of variable speed chain hoists that can provide position feedback to the Navigator. At stage level, the hydraulics that drive the main



Photo: Helen Maybanks



Photo: Philip Vile

stage and allow it to tilt into a raked stage, as well as the three front stage elevators, have been replaced, reviving the system originally supplied by Tele-Stage Associates using Mike Barnett-designed Hydro-Screws. Finally, the rear stage wagon with its built-in revolve, which tracks between the rear dock and the stage, was refurbished. "In the last four years, we've tried to do not only 40 years' maintenance, but 40 years' refurbishment and replacement," says Lester. "We're only just now getting caught up to the present." Though of course, there are also plans for the future, notably one to allow the top of the Olivier drum to be used as a revolve independently of the rest of the drum when its full capability isn't required. "I think the difference in electricity use would be about the power consumption of a small village in Devon," quips Lester, only half joking . . .

Arguably, it's the little Cottesloe Theatre that has undergone the biggest transformation, along with a new name - the Dorfman, after long-time NT supporter Lloyd Dorfman. The Cottesloe has always been a hugely adaptable space, but the desire was to make it even more flexible to be able to turn into a flat-floored area for NT's Learning department. Architects Haworth Tompkins and theatre consultants Charcoalblue designed a new seating system, built by Race, who supplied the original seating in '76. The new system folds down into boxes mounted onto moving elevators to give steep or shallow-raked seating to an end stage, or a flat floor for any other configuration. Charcoalblue and Haworth Tompkins also moved outwards the outer staircases connecting the side balcony levels, allowing a second row of seats to be installed around the balconies to increase capacity and audience density.

What hasn't changed is the slightly separate identity of the Dorfman, which stands out with its entrance around the side of

the building compared to the main river-facing foyers. However, Haworth Tompkins made significant changes to the building's north east corner; in '76, the public pathway along the Thames ended at the National, so this far corner used to house the building's utility and service areas. Now, the pathway continues past the Lasdun-designed IBM building next door and down to Tate Modern, so this corner of the building now features new restaurants and coffee bars - in short, you no longer have to pass the bins to get to the Dorfman!

LIGHTING

Lighting has also been upgraded, though mostly in terms of infrastructure rather than fixtures. "I think we're a little behind in the world of moving on to LED technology," notes Matt Drury head of lighting. "We felt for a long time that it wasn't performance-ready, so we've been doing other things in that trading-water stage, preparing our infrastructure.

"Now, of course, it's bitten us because it's suddenly performance-ready, but the capital investment to go through our entire rig - the Olivier is 600 units in the basic rig - is a huge outlay. But also, we really want a moving light that is quiet, accurate, powerful enough, controllable, reliable, easy to maintain - and that's a combination the manufacturers haven't really been interested in because we're a small niche market."

That's not to say the rig hasn't evolved over the years - from the original Strand and specially-engineered CCT units to Source Fours and Robert Juliats plus moving lights from Vari-Lite, Martin and others. And the latest round of investment has now started, with the National buying into ETC's Source Four Lustr but also fixtures like the GLP X4 bar as an LED replacement for their traditional light curtains.



↑ Richard Pilbrow at the helm of the Lightboard

The infrastructure upgrades have included expanding control networks around and beyond the building to temporary outdoor venues and to its colourful exterior lighting projects, which were started by Huw Llewellyn and then, with the support of Philips, embraced LED technology some years ago.

The most recent changes have been re-working the dimming in the two main theatres. This was originally Strand XTM dimmers conventionally located in dimmer rooms. In the late '90s and early '00s, a distributed dimming approach was adopted, but never quite to the satisfaction of designers or crew because of some strange fade characteristics, lots of faults, and the difficulty of reaching damaged dimmers during a show. Now the Olivier and Lyttelton are returning to a traditional dimmer room approach, using ETC Sensor ThruPower units to cope with the fixtures. The changeover is handled by electrical specialist PTB, who is taking advantage of a rare break in the Lyttelton performance schedule to complete both this work and the replacement of the original tungsten houselight system with LED, custom made by GDS to match the original.

As part of these changes, Drury, his resources manager Paul Hornsby, and the venue operational teams managed by Marc Williams, examined how the rigs in their theatres are used. The big theatres continue to feature a permanent rep rig covering most possibilities plus the ability to add specials where needed, but with moving lights for versatility and to reduce the need to access the rig during tech, particularly over the Olivier stage.

But where LDs want to put lights has changed over the years - early pictures of the Olivier show the curved 'jaws' of the side boxes in full sight, while more recent images show them covered in lights - which has led to a re-evaluation of the number of outlets required at each location. Subsequently, the rig in the Dorfman has been completely re-imagined. "We had a big, basic rig, which we were having to run in temporary dimming to preserve around specific lights for shows, but we realised no-one was ever really touching it," Drury explains. "So we've taken that out and started again."

Control-wise, the NT is now three generations on from the Lightboard, the theatre's bespoke 'total control system', which many feel helped shape the way lighting is done to this day. "Lightboard heralded the start of serious lighting over rehearsals," notes David Hersey, who lit many of the early shows in the NT complex. "With around 600 dimmers we could begin to use one lamp per channel; the stalls control - an absolute joy to use - meant there could be two board ops plus me all banging on the main and the stalls desk trying to keep up with rehearsals." It was a remarkable controller, right at the edge of what was possible at the time and with some functionality that is still unmatched today. Lightboard lasted almost 10 years before the NT moved first to the microprocessor-based Galaxy (though the NT had to create a controller for the Pani-based moving lights installed in the Olivier, since the Galaxy didn't support them), then on to Strand's



Praise for the National

Mark Grimmer & Leo Warner - 59 Productions, video designers:

"A theatre is only as good as the people who work in it, and the National has always been one of the very best. Since 59 Productions first began working at the NT as video designers (on *Waves* with Katie Mitchell in 2006), the building has always felt like a place where innovation was cherished, and ambition was nurtured."

Sven Ortel, video designer:

"My favourite experience at NT with regards to the building and facilities must have been working with Mark Priestly and his team on the drum during the install for *His Dark Materials*. While my task was merely to design a show control and video playback solution that could be remotely controlled, the team around Mark had to re-commission and upgrade of the original drum revolve and elevator. I remember distinctly how it seemed like they were wrestling with a moody, capricious and incredibly powerful, potentially dangerous animal. It had ticks and preferences which had to be satisfied, was at times sprightly then again slovenly. But when it worked and did as requested, it was majestic."

James Farncombe, lighting designer:

"It took a bit of time to get used to using a repertory rig. Until I started working at the NT, I had worked almost without exception in houses where I had a *carte blanche* to design a rig from scratch, apart from perhaps small fixed FOH elements. At the NT, I had to considerably adapt my working practice - it was hard to visualise how the lighting would work without building the rig from the ground up. I found it necessary to add a lantern to the plan for each idea I had, feeling like I wasn't doing my job if I didn't, that somehow I wasn't designing. Invariably, I found there was something from the rep rig that could cover each task, so I then trimmed out my extraneous additions, feeling a little like a fraud, until I realised the legwork had already been done and I could concentrate on just lighting the show, adding only very specific elements when needed. My emphasis shifted to making the show 'in the room' with everyone present and involved."

Bruno Poet, lighting designer:

"The NT is one of the best places in the world to make shows. It's wonderful to work with in-house programmers and technicians who are the quality of freelancers - and the people who help make the show, then run the show for performances, and also to have talented props makers and scenic artists on-site. I can't imagine any other theatre that would have embraced the idea of hanging thousands of light bulbs under a giant mirror over the audience and then helping find a way to control them individually, as we did for *Frankenstein* - it's a building that can take risks and can push the boundaries creatively, with an incredibly supportive management."

Paul Arditti, sound designer:

"I am fascinated by the tension between the theatre building and the show. Whatever set we put on the stage, the theatre is always there; the imprint of the acoustic is always there too. The architecture is visually striking, but it hides a wild acoustic signature that successive generations of sound designers, composers, voice coaches and actors have taken turns to tame. The challenge will always exist in these rooms, whatever the show, and we need to use what we learn from them to improve the acoustics of new theatres."

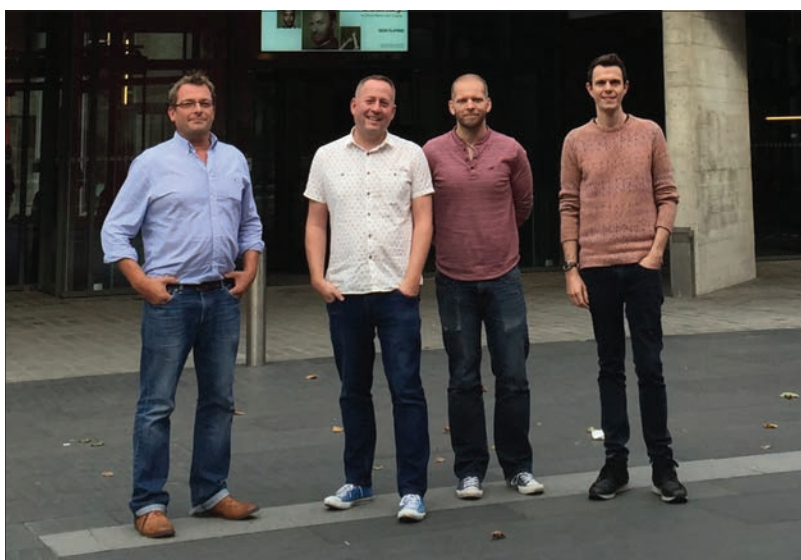
Paule Constable, lighting designer:

"Each of the three auditoria has such a distinct set of complexities - all three are eternally interesting. The character and possibilities of them are endless. That is their success. Generation after generation of designers, directors, actors - they all discover them anew and find new problems and solutions. That's the genius of what the team who designed those spaces achieved - a provocation for us all to become better - to dream beyond and to learn more . . ."

500-series consoles before becoming early adopters and active beta testers of ETC's Eos range, the family they continue to use today, though upgraded to the latest Eos Ti consoles.

The NT has also come to recognise the complexity of driving these machines and the ever increasing range of not just lights but also video and more: within the lighting department there is a team that specialise in programming, complete with a dedicated lighting control manager, Dan Murfin. Drury and Murfin are also working to bring new tools to the NT's working process, such as pre-visualisation. They are also trying to interconnect with other departments, crafting tools to allow lighting or video to track automation, whether linear movement or more recently, in *Angels in America*, the rotation of multiple revolves.

However, the influence the NT has had on lighting in Britain is more important than any technology. Almost everyone with a serious career in lighting design passes through it at some point. What they find is a rig that frees them from the worry of having to design a 'safety net' - that's all there in the rep rig anyway - which gives designers the freedom to experiment in the knowledge that if the need for



↑ L-R Matt Drury, Paul Hornsby, Marc Williams and Daniel Murfin from the lighting team, pictured in 2015

a little bit of front fill comes, it's there. That freedom has also, arguably, helped with the rise of video in British theatre design, with the time to experiment with technology in service of shows. In both cases, it is the subsidised arts doing what it does best, and everyone working with light in entertainment owes the organisation a debt of thanks.

SOUND

The National's influence on sound design is just as strong, with the list of former NT sound staff reading like a who's who of British sound designers. "I think the National helped change the landscape," comments the NT's current head of sound and video, Dominic Bilkey, "because what was pioneering in the

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"If the National's technology doesn't always look as revolutionary as it was in 1976, that's because so many of the things it pioneered have become standard. But the National has continued to evolve..."

building when it opened was the concept of a sound department that did designs, and of speakers in the roof and on stage and in other places, not just on the pros - things that were quite rare at the time. So you got to the point where directors had a relationship with a sound designer - it wasn't just 'can someone bring me some sound effects' - and wanted to work with them again, which led to people who worked here leaving to help establish that profession. But equally, I think it's healthy that people come in to work with us; when you don't just have an insular world but where people bring in ideas from outside. And where we all get on board and engage to deliver something amazing - but where we all know, and accept, it might fail. That's the key thing here - it can fail." Handley agrees: "That should be written in stone for any subsidised theatre: the right to fail."

As with lighting, the original spec' for the NT's sound systems was written by a pioneer in the field, David Collison. "It was Altec and Tannoy loudspeakers everywhere, Amcron power amplifiers, a control desk from a company called Alice, who I think built broadcast sound desks," recalls Rob Barnard. "Enormous tape playback machines that when you pushed the button went CALANK - it's a good thing they were in the control rooms!"

The sound positions stayed behind glass until Richard Eyre's famous production of *Guys and Dolls*, when Derek Zieba won the fight to move the desk and operator into the Olivier's auditorium, where they have remained ever since - though in the Lyttelton, the sound desk is in a control room except for particular shows.

As with lighting, the NT's sound team adopted new hardware as it appeared - cart machines, samplers for playback, and a long period with Cadac consoles before the digital transition came with DiGiCo. "The DiGiCo console in the Lyttelton is one of the first generation of the SD7 flagship desks," notes Bilkey. "If you open it up it's all labelled in pencil - all the connectors have the marks of the person who assembled it."

Though the DiGiCo remains the fixed epicentre of the system, the sound team are happy to vary other parts of it to suit different shows and different designers. "For the *Light Princess* we repped a line array, rigging it for that show only," says Bilkey. "It was all down to careful preparation, putting in place a rigging system that allowed it to be hung quickly - preparation is the key to making it work."

The acoustic challenges of the venues, particularly the Olivier, have always been part of the obstacles facing the sound



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team. "You wouldn't make a violin out of concrete," was actor Albert Finney's apparent retort to the architect's choice of material. Various attempts have been made to tame this, including acoustic treatments (most noticeably around the circle front) and electronic aids, including for a while the SIAP acoustic enhancement system. "All the speakers are still up in the roof disconnected - the Olivier is a bit of a graveyard of sound history," says Bilkey.

Sound also face the same problems as everyone else when trying to update the listed building and its infrastructure. "Some of the sound positions are still driven by the original 100V line cabling, because it runs through conduit cast into the concrete - so it's there until the world ends! Sometimes you find yourself stripping back layers trying to work out what's going on, sometimes you find it's easier to just add another conduit and start again. That costs a little bit more, but it also helps to future-proof things."

THE FUTURE

Apart from catching up on long-term maintenance, planning towards the future seems to be a useful shift that resulted from the upgrade works. The NT teams are also starting to think more about working across departments rather

than just within a department. "We've all run fibre routes at different times that are almost next to each other," notes Matt Drury, with Mylan Lester adding: "And there are some very good reasons for that in certain instances, and there are other instances when we should share it all - and we're having a lot more of those conversations now."

What does seem consistent across time, and noted particularly by the NT's current technical director Jonathan Suffolk is the calibre of those working at the National. "It's a factory for making plays, and it's intense," he says. Some have stayed since the time at the Old Vic and it feels as if the memory and desk drawer of one of those, Laurie Clayton (lighting supervisor in the Lyttelton), contains as much of the building's technical history as the NT's archive! Some of those who helped with the original spec' are still around, still interested. "We're very lucky that Richard Pilbrow is around and very passionately committed to telling us everything we could ever possibly want, and to seeing the original vision delivered," says Lester. "I can pick up the phone or send an email with a question and get an answer back as soon as it's daylight in Connecticut. He's phenomenal."

"Part of the drive of all of the recent work has been honouring that original vision,"

adds Handley - though at the same time, the NT is also looking to the future of theatre, whether through alternative presentation techniques such as the NT's widely acclaimed, much emulated *NT Live* broadcasts, or the NT's digital department, which looks beyond even that.

There are detractors who might still not like the building, though it seems to have gained popularity with age and has benefitted from the light touch of Haworth Tompkins' refresh. In particular, the foyers are open throughout the day and make a pretty good place to hang out and work, with tables, power, wifi and a coffee bar, to the extent that visitors have to be gently shooed from the tables come performance time.

Most importantly though, the National company - now run by artistic director Rufus Norris and executive director Lisa Burger - remains a theatrical powerhouse, much to the credit of its home. If the NT's technology doesn't always look as revolutionary as it was in 1976, that's because so many of the things it pioneered have become standard. But the National has continued to evolve - never just for the sake of technology, but rather to give those who make shows there the best possible tools to tell their stories with. ✖

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