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NATEAC 2008 Keynote Speeches

Richard Brett and Hugh Hardy

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Message from Bill Sapsis

Dear Subscriber,

Thank you for your interest in the North American Theatre Engineering and Architecture Conference (NATEAC) The session you are about to read is one of the twenty that made up the inaugural conference in July of 2008.

The idea for the conference grew out of the very real need to improve communication between everyone involved in the design and construction of performance spaces in North America. NATEAC was modeled after two similar conferences produced by Richard Brett in London in 2002 and 2006. Over 250 industry professionals attended NATEAC, which was held at Pace University in the financial district of New York City.

The NATEAC mission statement reads, in part, *"to promote communication between the architects, engineers, consultants, and manufacturers responsible for designing and building new theaters and renovating existing facilities in North America. It is also our goal to promote a higher level of interaction between these professionals and the end users of their facilities."* By all accounts NATEAC achieved its mission in excellent form. Not only were the panels well presented and received but the social events also provided an excellent opportunity to continue the discussions in a less formal setting.

The transcripts have been lightly edited to remove some of the blemishes that occur in situations like this from time to time. We have however, maintained the intent of the each speaker so that you have a clear understanding of what each session was about.

Thanks again. I hope you enjoy this transcript and that the information it provides is useful for you.

Best regards,
Bill Sapsis
NATEAC Director

BILL SAPSIS: Good morning. I can't tell you how excited I am about doing this. This has just been great fun so far. And I must admit that I wasn't responsible for the fireworks last night, but it was a nice touch. For those of you who don't know me, my name is Bill Sapsis and I am your host. *[APPLAUSE]* I hope you feel that way tomorrow after this is all over.

So it is with extraordinarily great pleasure that I want to introduce our two keynote speakers today, Mr. Richard Brett and Mr. Hugh Hardy. Richard Brett is a chartered engineer and Fellow of the Association of British Theatre Technicians. He has been chairman of the Association of the British Theatre Technicians, chairman of the Society of Theatre Consultants, and a technical committee member of the International Organization of Scenographers, Technicians and Theatre Architects. Richard created the concept of the Theater Engineering and Architecture conferences and organized two of these in London in 2002 and 2006. So now you know where I stole the idea from.

Richard joined lighting designer Richard Pilbrow in the late Sixties to create one of the first theater consulting practices, and was responsible, amongst many other projects, for the planning and engineering as well as the design of all the technical equipment for the three theaters in the Royal National Theatre complex in London. Richard is a partner in the international theater consulting firm Theatreplan LLP.

Mr. Hugh Hardy is also with us today, and he is in his third architectural firm, H3 Hardy Collaboration Architecture. He is renowned for theater design, and among his most celebrated projects are the restoration of Radio City Music Hall, multiple projects for the Brooklyn Academy of Music, the Joyce Theatre, the New Amsterdam Theatre, and the New Victory Theatre and many others. Mr. Hardy is currently working on a new theater for Lincoln Center, where he began his career working with Eero Saarinen on the Beaumont Theatre. He has won multiple national awards, including the Distinguished Achievement Award in Theatre Design from the U.S. Institute of Theatre Technology, and the Commissioner's Award for Excellence in Public Architecture from the U.S. General Services Administration. He is the author of Building Type Basics for Performing Arts Facilities. Once again, thank you very much. Please welcome Mr. Richard Brett.

RICHARD BRETT: Good morning, ladies and gentlemen. About forty years ago, I left the television industry to work with Richard Pilbrow. Richard was already a very successful lighting designer and theater producer in the United Kingdom, and had also been advising on the design of some new theaters. He had just been appointed the theater consultant on the National Theatre of Great Britain, and while he had considerable theater experience, he understandably wanted some engineering support. I had a good background in theater and had also completed an engineering degree and a graduate apprenticeship at the BBC, where I was involved in studio equipment design. Apart from production lighting installations, my work included scenery and lighting suspension systems, movable retractable seating, and a whole range of specially designed production management equipment.

By comparison, the design of the National Theatre was rather a daunting task. We both felt the great responsibility of working with Denys Lasdun, an important architect of the time, to create new drama spaces for the young National Theatre company under the direction of Sir Lawrence Olivier. Thus, Theatre Projects Consultants was born in 1967.

The story of our National Theatre has been told previously on many occasions, so I won't go into it in any detail, but it was a fantastic learning ground. While the designs of the two main auditoria are now accepted and are put to heavy use, they are 'of their period' and to a large extent each is the result of design by committee. They do not fully reflect what most people in the business now believe

are important principles in the design of drama spaces – those of intimacy and contact between performer and audience. They are both large for drama. The proscenium form Lyttelton Theatre seats 900, and the open stage Olivier 1,120. The third space, the Cottesloe Theatre, which was not designed by committee but by our team of theater consultants led by Iain Mackintosh, has been a triumphant success over the past thirty years. This seats a maximum of 400 and has been operated in many different actor/audience relationships.

In order that these two theaters could manage the repertoire that was intended, we planned a number of new technical installations that had not been seen in the United Kingdom before. Stage wagon systems, point hoist power flying, and the infamous drum revolve in the open stage of the Olivier. Building in the early 1970s was fraught with construction delays and labor strikes. Not all of these facilities finally saw the light of day. However, the drum revolve, which did initially get a rather bad press, has gone on from strength to strength, in addition to providing the facility of a pair of backup load-in elevators from the workshop level 27 feet below. It has on many occasions provided an almost cinematic ability to dissolve between scenes as can be seen in this speeded-up version of part of Act Two of Phillip Pullman's "His Dark Materials". This production was designed by Giles Cadle and directed by Nicholas Hytner on the Olivier stage; Giles Cadle and lighting designer Paule Constable both won Lawrence Olivier awards for this production.

But why am I talking about this very early project? Largely because it epitomizes for me many of the mistakes that are still being made in the design of performing arts spaces around the world. It is probable that some of these mistakes are also being made on projects here in North America, which is one reason why we are all here. When asked to undertake the theater planning and design of the technical installations of the National, we had a good knowledge of theater but not a lot of experience of acting as consultants. Now, what is experience? It is more than just having done it before. To be useful, experience has to be based on both knowledge and training, and most importantly, the subject must be fully understood. On the National Theatre, the architect had no theater experience, which was actually one of his selling points. He said he would listen and would create what was needed. We also learned fast, but it is a fact that the architect had too many people to listen to; the building committee, the incumbent National Theatre team, the government, the funders, the consultants, the building engineers and other specialist advisers. At that time, few of the people involved had sufficient experience to make all the right decisions without a certain amount of reconsideration.

I have continued as a theater consultant and have had my own international practice since 1985. Some eight years ago, I realized that there were many mistakes that were arising consistently, both on projects on which we were being asked to advise, and in completed performing arts buildings around the globe. It is clear that there is a lack of real understanding as to what some projects are really for and what they need to include, or what they can do without. There is a shortage of knowledge or experience by many of those involved in the process of creating performing arts spaces. This is not true of all projects, but there are a significant number that do not get the attention they deserve. Architects and engineers working on major buildings generally understand the importance of visiting and studying examples of what they are designing. But, I'm often surprised by other professionals in the design and construction industry who seldom, if ever, examine buildings or installations done by their competitors.

In an attempt to partially rectify this lack of understanding, I organized a small conference on theater engineering and architecture in 2002. Its aim was to get a number of those involved in planning and building small and larger theaters and concert halls to come together to hear each others points of view, to get architects to listen to theater people, acousticians to talk to engineers, venue

managers to talk about foyer spaces and catering, production managers to express their views on good and bad technical installations, and so on.

The result was an oversubscribed and very successful event in London in 2002, and everyone wanting another conference, which we held in 2006. Around 180 industry leaders from the UK, US, Europe and many other countries have already spoken on topics related to getting performance spaces and their installations right. Their knowledge is published in six books, copies of which are actually available here at this first North American Theater Engineering and Architecture Conference.

There are a lot of people around who do know about performance space design, and there are many others who believe they can foresee what will be needed in the future. Our theaters and conference venues need to develop to allow live performance to continue to attract audiences. But such people are often not the ones involved in these projects or if they are, they are brought in too late or their views are ignored. Every theater design project, however small, is effectively a prototype and vitally important to someone; to the funders, to the owners, to the expectant users. While few projects are ever total failures, their operations, their effectiveness, earning capacity and flexibility can be compromised unless everybody involved really understands what the project is about and has the necessary experience to minimize any mistakes.

Enthusiastic lay bodies, be they private funding groups, trusts or local authorities, need the assistance of knowledgeable advisers, whatever the undertaking. This advice could be anything from business planning in the case of a new project, historical knowledge in terms of a refurbishment, engineering skills where new technical installations are required, through to backstage planning, acoustics and auditorium design expertise. Most areas in a performing arts facility require special skills, and such skills when used properly will not only result in a better venue, but may save significant costs, both in capital outlay and in running costs later.

While I am a specialist consultant and must therefore declare an interest, I currently have a great deal of work as a result of serious mistakes made by owners or by the people they retained to advise them. We are having to undertake major and costly corrective work because buildings were badly planned or equipment or systems were poorly specified. Examples include quite advanced flown equipment with suspension wire ropes of insufficient load capacity and the engineering of powered flying systems that potentially increases the unreliability of the system. That excludes more frequent planning errors such as inadequate load-in spaces, insufficient offstage space, poor sight lines from the difficult parts of auditoria, and dressing rooms without daylight. And, ladies and gentlemen, we are today in an absolute gem. The artistic, technical and operational problems thrown up by this space in which we are, including its extremely wide auditorium, reminds us again of why we are all here. *[LAUGHTER]* Thank you. This sadly was built to help to train students for a career in the performing arts and entertainment. Think on these words.

Then there is the need for theater people to understand their own business. On one project the consultants produced detailed plans of the new seating layout for a refurbished theater, with careful setting out of the different seat widths to maximize good sight lines and to ensure straight edges to the aisles. The three seat widths were each indicated using a different color. A copy of the plan was issued to the theater as part of a regular exchange of information and was seen by the box office staff. They immediately complained to the theatre board about the seat colours on the diagram and that they could not possibly cope with a theatre with all these different seats – they asked, "How can we ensure we sell large seats to those who are overweight, and tell people that their seats are not all of the same size!" Sounds like time to cull the box-office staff and depend on internet bookings!

While no owner is likely to start any significant building project without an architect, it is vital that all those who have responsibility for a performing arts building give proper consideration to the other experts who must make up the design team. That team has to be able to support them through the planning, fundraising, design, construction, equipping, commissioning, and opening of the venue. There will be quite a long list of consultants involved, but that is no reason for not understanding the part that each of these specialists has to play. Many of these people need to participate long before the building has any form. In fact, the essential start to any project is to question its long-term viability, to explore not only its capital cost, but also its running costs and potential sources of income from ongoing funding. Very few performing arts buildings operate without subsidy, so the ability of a project to survive in what is an increasingly competitive world has to be evaluated. That task requires good management experience and is a special skill in itself.

The brief for a theatre building has to be properly compiled. It needs to answer questions about what the building is for, what it is going to present, how its capital cost is to be raised, the form of ownership, the management that will run it, and projections as to its ongoing running costs and sources of income, such as ticket sales, subsidy, touring work, education and corporate activities. This is the first and essential area of expertise required. Many of us consultants often hear phrases like "world-class performance space able to accommodate any number between 600 and 2400 people, an appropriate space for music, dance, drama, conferences, oh, and academic graduations."

Even supported by a draft program, or a schedule of accommodation as we say in the UK, and by descriptions of what various parts ought to look like and be used for, this sort of brief is nonsense. It is essential that a specialist consultant examine the dreams and wishes of the driving forces behind the project and formulate some practical, professional brief and business plan. This is likely to require an experienced arts management consultant working alongside an experienced performing arts building cost consultant. The arts management consultant might well be part of a larger theater consultancy practice which is capable of handling other aspects of the building design later. If such experienced people believe in and can demonstrate the need for and viability of the dream, then that project can move to the starting gate.

Unless it is privately funded, the project will need a fundraising team which is again likely to be a specialist, maybe part of an arts management consultancy, or the funds might be sought by the owner working with a project cost consultant. One of the obstacles that can affect the smooth running of a project is lack of funding. Now that's an obvious statement, but the consequences of budgeting incorrectly can be disastrous. There is often huge pressure to publish an anticipated construction cost figure before sufficient planning has been undertaken. Often this figure is guesstimated by people who are well meaning but do not have any real experience of construction, let alone of performing arts buildings. One of the most difficult tasks is to increase a budget from an incorrect low figure to one which is realistic for the building and all its required functions and equipment. Once a low-cost figure has been placed in the employer's head, nothing will get it up to a realistic level. Some increase is sometimes possible, but this is not the way to start a project. Ensure that cost estimating is undertaken by experienced people from the very start.

The phasing of when funders can make monies available can be almost as disruptive. Where many sources of funding may have to be brought together, try to limit it to one or two. In the UK, projects can be funded by national, local, regional and European funding bodies. Each of these bodies has its own agenda, its own required spending time scale, and even individual contract conditions that they want to impose on those attempting to bring a complex building to completion. We are currently working on a UK project which has five separate funders. Some of these funders are imposing

a number of individual dates by which their monies should be expended, which has resulted in major contract management issues. As a consequence of these, the theater which is being refurbished will now be closed for two years rather than for one.

Late completion of any section of the work is also very serious, as this would result in the loss of these funds, consequent delays of the construction or fitting out and the need for a new application for funds to be submitted. And as is the way with governments and local authorities, a second application for money may not succeed. Having a number of separate funders can also lead to extremely complex contracts. On this particular project, not all of the funders are prepared to accept the same contract conditions being imposed on the design team, which has led to protracted negotiations and numerous contract appendices with different qualifying conditions.

On these works we are at an increased risk in respect of one funder, compared with the risk we are at in respect of the others, a very confusing situation. However, as funders are pretty scarce on performing arts buildings, they have to be welcomed from wherever they come. Just try to make sure that they are all prepared to sing from the same hymn sheet in order to simplify the management of the project.

Which brings us to project management. We have a sign in one of our offices which you will all have seen somewhere and it's very true, "Companies don't succeed, people do." We are seeing many examples of less than competent project managers, and sometimes these are from major companies on the world scene. These people are either intent on imposing absurdly complex procedures on minor projects, which could be run extremely competently by the architect and the design team, or who are so inexperienced and without any knowledge of the performing arts that they actually impose greater risks to the successful completion of the project than the risks they are employed to manage. I believe that a good, knowledgeable project manager can be an asset on a medium- or large-scale project, but that many small projects can be managed within the design team. Obviously on major projects, it is vital to have a person or team focusing on the myriad aspects of getting the work done. That can include work by the design team, but this has to be done on the basis of efficient and sympathetic participation in the project, both through the design and construction phases.

We all know how consultants, architects and engineers can get carried away with the design issues that sometimes tend to cause delay, even before bids are sought or the general contractor is appointed. The best experience of a project manager I have had was on the Copenhagen Opera House. One man, who later in the project had the help of a part-time secretary, managed this $520 million construction virtually on his own, although when the job was on site he had significant programming assistance from the general contractor. This scheme was completed in less than four years, and in that period moved from outline brief to handover on the very day designated by the client, even before the design team was appointed. The secret was total professionalism, understanding the issues, prompt decision-making by the client, and appropriate but constructive pressure on any defaulting parties. There were problems, everything from finding the relics of three Pomeranian merchant vessels on the site, which could have led to huge delays while these were excavated, through to the usual contractors failing and materials not being available when scheduled.

But his mature approach to resolving each difficulty ensured that all parties knew where they stood and that their interests were being taken into account in the decisions that were handed down. We had to omit certain technical installations which would have been welcomed by the users because the arguments for them were found to be insufficiently convincing. But the discussions were thorough and we were listened to intently, with the result that neither we nor the users felt that we had been unreasonably overruled.

I believe it is essential that project managers should understand the business of their clients and be capable of handling people and pressure particularly well. Younger, inexperienced managers should be accompanied by senior personnel until they are sufficiently experienced to take on projects in their own right, in the same way as in any other profession. Remember the slogan, "Companies don't succeed, people do." Decide carefully on the people you're going to be working with in the same way as you would for each member of your design team.

Now, respecting my fellow speaker today, I guess I should say a few words about architects. An architect is essential on every creative building project, and theaters and performing arts buildings are often seen as landmark constructions within their localities. Much has been said at previous conferences about 'star architects'. The best story that I've heard was that of the architect who negotiated, in addition to his considerable fee, a royalty on all the images of his building that appeared on all marketing, from coffee mugs to plastic bags. This led one knowledgeable US cost consultant, Stewart Donnell, to coin the phrase "postcard premium" to refer to the extra costs that can be imposed on a project by employing a star architect. Of course, this iconic factor can lead to great public interest and support and good press comment. Obvious examples being Utzon's Sydney Opera House, Frank Gehry's concert hall, and Jean Nouvel's new Guthrie Theatre.

But a performing arts building is not a success when it does not reflect the needs of the audiences, the performers and technicians. There are times when having a stage or platform on the fourth floor can be acceptable, providing there is a good load-in and both main and standby lifts to get everything needed for a performance up to that level. And provided that both lifts can take a full trailer so that the second crew isn't needed to double handle everything out of the truck into the lift, and then again from the lift to the stage or scene dock. It may be acceptable for the stage to have glass walls to be open to view from people outside, provided that the effects of this on working practices are understood and that the ability to stage a proper performance is not compromised.

All professional theater consultants have come up against the arrogant architect who is not really interested in what the performance space, the technicians or the audience need. He's only concerned with his or her preconceived concept for the building. This can get particularly irritating when the consultant is forced to deal only with associated architects, who have to refer each of the theatrical requirements privately to the principals, the principals then passing down their decision, quite often overruling what has been agreed by those who have to make the building function. One can sometimes identify a restriction or a limiting feature that has no functional advantage and has clearly been introduced just to achieve an impressive building. But the really successful theater architects are those who create both effective performance spaces and stunning buildings. We have to hope that the functional success of such buildings, combined with the prowess of the architects, will move them into the top league of theater builders.

It is sad that much comment in previous conferences has referred to the restrictive way many organizations select architects, both here and in Europe. It can difficult for a young aspiring architect to climb to the top of the pile so that their work is noticed. But be assured that the performing arts professionals, those who have to use your buildings for many tens of years, are beginning to make known the operational and functional failures of what they inherit.

In this respect, I believe that the awards given each year by the USITT Architectural Commission should reflect performance function as much as architectural merit, as this might help to stress the importance of everyone really understanding the needs of performance, audience and technicians. I make no reference to the people who won this year, but believe the principle is important.

The design team for any performance building must involve the theater consultant and an acoustic consultant, along with structural, electrical, and mechanical services consultants, and indeed these days, often specialists in disability, security, catering, landscaping, information technology, and increasingly sustainability. This is where the need for the whole team to have some empathy and synergy with the performance becomes apparent. The architect has to be able to balance the needs of all these consultants, and just getting the detailed requirements of both the theater and acoustic consultants reconciled in an auditorium can often be a major undertaking on its own. It gets worse when the HVAC consultant plans to run air ducts through the fly tower void, or the engineer actually wants to have some depth to the balcony structure, probably acceptable to the architect but not to the theater consultant who will want to keep the vertical spacing of the tiers as small as possible to achieve an intimate space. The acoustician will want the tiers spaced so that the sound can reach the rear seats, but this can be further affected by the duct work that the services engineer requires to cool the front rows. And of course, the mechanical services required in the orchestra pit are going to provide further conflict, particularly when the pit is to carry additional seating which involves having an orchestra pit lift through which it can be extremely difficult to get the necessary cooling air.

But these are details. What is important is that the members of the team all have a good working knowledge and appreciation for the needs of the performing arts. This does not mean that everybody has to be an expert in everything, but it does make a tremendous difference if the engineers, for example, have been to some theaters and have also seen around backstage, and that the theater consultant has a general understanding of what the acoustician needs in order to achieve suitable levels of loudness and intelligibility. These three often come together in the ceiling of an auditorium where safely-accessible lighting positions have to be integrated with acoustic reflectors whilst hot air has to be extracted, and all of this has to be accommodated in a limited structural zone and have an aesthetic acceptable to and probably defined by the architect.

There are many examples of where the incumbent artistic and technical team running a theater has attempted to act as the theater consultant on a rebuilding or refurbishment project. Without a very broad experience and understanding of what they are taking on, this can be unsatisfactory and risky. It is unlikely, for example, that the theater company would have any redress against such a team if things were to go wrong, whereas a professional consultant would carry the legal liability for his work. Apart from more often than not wanting to create a larger and more technically complex version of their existing venue, such a team can be at loss when asked to provide the detailed information that the theater consultants are experienced in preparing. Also, they seldom have the breadth of knowledge of other projects to guide them.

One of the most frustrating things in my career has been being brought in late on projects and having to unpick the erroneous data provided by well-meaning but inexperienced advisers. Do remember that a little learning is a dangerous thing, and yet many projects do start without qualified and professional advisers retained. Performing arts buildings are complex and expensive, and it is foolish not to retain the most appropriate experience you can find.

When the building is reaching completion, it is vital that all the engineering and technical services are fully and thoroughly tested and commissioned. There can be quite a number of specialist installations, each of which has to be inspected and their performance and safety parameters checked. After having completed a large number of major projects, I'm convinced that it is vital that the review of working drawings, the inspection of equipment in the factory and on site, and the witnessing of the testing and commissioning of all the installations and systems must be undertaken by the theater technical designers. These are the specialist theater design and stage engineering consultants who

prepare the original designs for the client and who therefore know the detailed operational requirements of the project. Only a very few of the leading engineering contractors fully understand the detailed operational requirements of theaters, or indeed the specialist needs of theater or opera. This is again where professional training and experience is vital in ensuring that equipment is operationally correct as well as technically compliant.

At the end of the construction phase, time will have been lost and the people who ultimately suffer are the users. Time for testing and commissioning gets cut and equipment everywhere is handed over in a panic and in an incomplete state. It is probably working sufficiently to put on the odd performance, but with serious snags that a full commissioning procedure would have identified. This is the start of the downhill slide. Corners are cut, no time can be made available in the program for the correction of snags, and the users incur problems and additional costs. I have seen this occur on many projects, including some of my own. Adequate time for testing and staff training is absolutely essential, and there are good arguments for having a payment milestone before the testing and commissioning starts, to put extra pressure on the contractors and project managers to achieve this state.

Performance venues have to book artists and sell seats in advance, so opening dates cannot usually be altered. Do include extra time for these essential tasks to compensate for some construction period overrun. It is extremely valuable. The Royal Opera House Covent Garden opened after its redevelopment in 1999 with only about three weeks in which to take over the entire building and with many installations not fully commissioned, and it has suffered as a result. The Copenhagen Opera House opened after three months of having an effectively complete building with all the essential systems fully operational, and has seen almost no technical problems and sufficiently reduced maintenance costs.

Moving on to consider the completed building, one of the many reasons why this North American Theatre Engineering and Architecture Conference is occurring is a concern felt by many in the business here that there are considerable risks being taken by those operating many of the wide range of theater and performing arts venues around the country. While there are both mandatory and recommended standards in Europe for stage engineering equipment, the situation in the US is less formal. Examples are apparent of self-designed and self-installed rigging systems that are potentially dangerous, and of a significant lack of regular maintenance in many venues.

We aren't looking at fire risks here, as these and audience safety risks are fairly tightly regulated. But we do need to address the risks on stage, particularly from the range of rigging equipment which is employed and from the power systems that are becoming more popular in many medium-scale venues.

Having been involved with power systems for many years, I'm conscious of the need for proper safety regulation and for the regular maintenance of stage engineering equipment. A recent example on a highly-specified, professionally- engineered piece of powered equipment will suffice to focus my concerns. An open-circuit fault occurring in a feedback component caused the closed loop control system to demand more power, resulting in an elevator accelerating rapidly to full speed. Fortunately, an alert operator and the release of the dead man's button stopped this equipment before damage or injury could occur, but this uncontrolled movement should never have happened.

Extreme safety being a priority in power systems in Europe has resulted in the application of standard EN61508, which defines the processes by which the appropriate degree of safety integrity level must be determined for an installation, and not only in the theater. While suitable approaches are being addressed by ESTA here, there have been examples of installations in which the operator does

not need to remain at the control console during a powered scenery movement. Quite apart from negating the possibility of the corrective action that I've just described, this is a high-risk approach in any theatrical performance. Operators must always be present and in control of all moving scenery and equipment. They must either be able to see directly the moving pieces, or have these monitored by others, with dead man's or emergency stop buttons. Thorough training in the way that modern automated equipment must be operated is vital for all technicians, and it is an essential part of handing over a building and its stage systems.

Automobiles don't run forever without servicing, and neither will theater rigging systems. Manual or powered rigging systems and equipment like stage lifts and revolves must be inspected on a regular basis and serviced in order that they will remain safe and perform reliably. Failing to have your installations inspected and serviced periodically by a competent person as appropriate to its scale and type, can lead to ruined performances or worse – possibly having a technician or a performer injured. It is vital that facility managers bite this bullet and understand that, again, experience counts and that however good the local technician sounds, he or she is unlikely to have the full background or specialist training to carry out a proper professional engineering inspection. Even where they can identify wear or damage, they may not have the expertise to carry out suitable repairs or replacements. Technicians have lost limbs and been killed in what are, fortunately in our industry, infrequent accidents brought about by users' limited knowledge. This risk must be eliminated. I know there are serious pressures to ensure that regular inspections and maintenance carried out by professionals become the standard here, as in Europe. And I want to see that practice extended everywhere.

The word "experience" has cropped up regularly during this paper, and for good reason. I started out in a new industry, theater consulting forty years ago, and made mistakes. There was no real background from which to learn. But we gradually developed working principles and, as the industry grew, more and more people came on board and added their ideas. This experience base expanded to cover many different forms of performance space, from major lyric and proscenium theaters and concert halls through multi-form venues, to a whole range of studio, dance and found spaces. There is a large resource of expertise and experience out there available for use, and it distresses me when I see a project in which the basic rules of planning a performance building or an equipment installation are being broken without good reason. I'm not suggesting that new approaches should not be tried, but there are important principles that can seldom be ignored. This question of experience continues after the project is completed and opened, in ensuring that the building and engineering installations are cared for by people who have the background and expertise to ensure the minimum risk to all of us who work backstage.

That is why we're here, to share knowledge, views and experience, by listening to and questioning our peers. The expectation is that each of us will leave with a broader understanding of just what it is that everyone else can bring to the design and operation of performing arts spaces. Assess the risks and minimize them by ensuring that you have, or have on your team, someone with the required expertise for each specialist task. Thank you very much.

[APPLAUSE]

HUGH HARDY: Good morning. I'm greatly complimented by the invitation to address you this morning. This is a distinguished group of professionals participating in the enhancement of performance through the many uses of technology. I'm not a technician and therefore cannot speak to you in the language of a skilled professional. The technical aspects of all are amazing to me, but I don't understand them technically. I only know the results.

The origin of theater lies in storytelling. Presentation of a narrative underlies all traditional forms, and at its best theater technology has been used to support performance, to make it more immediate and compelling. Since the dawn of history when the basics were simple, a stage platform, perhaps a backdrop to identify location, and some kind of illumination, originally daylight, performers engaged their audiences with storytelling. And for small audiences, these simple elements were all that was needed.

Beginning in the 18th century, the addition of scenery permitted creation of different places, so that the narrative could have greater interest and the creation of large indoor spaces expanded the audience size. In the 19th century, the elaborate technology that moved painted scenery was borrowed from sailing ships. The winches and rigging invented to catch the wind with canvas were put to use moving flats and drops that displayed shifting illusions made by scenic painters.

In past generations, theater production in America began in New York. That authority was reflected in the architecture of countless other communities, all copied from buildings found here. Often, as the country extended westward, new towns were laid out whose central spine was named Broadway, as in Fargo, North Dakota. It defined downtown, a place of action. The proscenium theaters of these new communities were copied from the template made in New York. They were adapted to many uses and seating capacities, from the high school auditorium to the commercial road house. Stage lighting was only basic illumination. Sometimes involving color, but it was all housed backstage except for spotlight locations found at the back of the house. Scenery was either a box set or made of layers of painted canvas. This form of theater pervaded the U.S. The first big break in this tyranny came with motion pictures, coupled with amplified sound, itself a technical breakthrough. Their phenomenal success demanded giant rooms that they had to converge on a small screen whose size and brightness was restricted by carbon arc projectors. Architects had a field day, an eclectic field day, decorating the walls and ceilings required by large movie palaces. These giant rooms both held thousands of people and used elaborate plasterwork to disguise the small size of their projected black and white images.

Now look where we are. Technological advances have brought us the ability to control all the elements of live presentation. The power of each has been expanded and given the wonders of electronic control. Sound can now be designed to suit any size audience without loss of clarity. We have lights that can move and change color. They offer a wide range of light sources, focal lengths, pattern intensities and shapes. Rigging no longer depends on hemp ropes or counterweighted pipes. It can be motorized with lines that are located anywhere over the performance, no longer confined to working within a system of parallel counterweight pipes.

Projection of video or still images can be integrated with scenic elements, providing simultaneous images that offer performance seen from multiple points of view. Not only is the entire physical production malleable in new ways that are capable of startling change, the audience no longer stays in place. The relation of audience to performer can change from production to production, or even during the performance itself. Now, what's the result of all this extraordinary largesse? Three things come to mind. The first is we now have an amazing variety of performance types. Broadway plays and musicals are still with us, although their lumen and decibel output has greatly increased, and

the origin of their production is often found in regional theaters. Regional theaters have appeared in many cities, many enjoying highly sophisticated productions that are equal or superior to those found in New York. They also have built dazzling new buildings such as Jean Nouvel's design for the Guthrie Theatre in Minneapolis. In addition, we have new forms of spectacle the new technologies make possible. Las Vegas, having originally been content with sequined showgirl reviews, discovered Cirque de Soleil which spawned a powerhouse set of hydraulic platform movements illuminated through water and smoke, filled with acrobats. Megachurches now use large-scale production numbers to tell the story of the Bible. They use 6,000-seat rooms with the authority of Ziegfeld. Rock bands tour with equipment to play to 50,000 people in stadiums across the country, complete with every known form of illumination, including fireworks.

Opera companies have discovered contemporary uses of spectacle with abstract images that startle, such as "The Valkeries" for the Washington National Opera. And in addition to a variety of performance types, the second startling change is the large size of audience and performance spaces that are now possible, whether found in a football stadium or the plains in front of the Pyramids at Luxor. The third change brought by this technological invasion is the destruction of the famous fourth wall of theater. Performers and audience are now together in one single environment. Even when sitting in a proscenium theater, audiences and performers are physically as well as emotionally joined. Only an astonishing technological enhancement of the experience has made the diversity and giant scale of these performance types successful. But what about the future? Have the resources and appetites that made giant spectacle possible run their course? Has traditional theater, however technologically advanced, lost its appeal to the younger generation, to younger audiences? Will the increasing concern for ecological values restrict energy use? As transportation costs rise and the Internet makes an immediate communal experience electronically available to everyone will these pixel images replace live performance altogether?

One of the most recent dramatic examples of technology making large-scale production possible in New York took place last week in the Park Avenue Armory. Here, in a building the size of a full city block, a presentation of Lloyd Zimmerman's opera "Die Soldaten" was brought from Germany and given with over a hundred musicians and fifty performers. Not only did the production move throughout the drill hall without any indication of a proscenium, two large seating banks each holding 500 people were in motion, changing the focus of presentation from scene to scene. Multiple lighting sources, a myriad of video monitors and an expertly controlled sound system could mix orchestral sound with the voices of each singer to create an astonishing intimacy. It was an ominous story of indulgence and military hedonism, well suited to presentation in an armory, and its enormous size complemented both the large cast and orchestra. All production elements successfully enhanced the story.

New York's first mega performance space was Radio City, although I realize this morning that excludes the Hippodrome, and maybe the Hippodrome was first. But in 1932, a 200-foot-wide interior defined a totally new type of performance place, one intended to present a form of high-class vaudeville. Originally a failure, the hall was saved by a formula of general audience movies and a stage spectacular that provided non-stop family entertainment. But for live performance, its sound system was muddy and the place held only arc light projections at its rear wall, with a single ceiling location for front lights. Despite its size and permanent backstage machinery such as hydraulic lifts, a turntable and provisions for rear projection, it used the conventional theater technology of painted scenery, sometimes embellished by a steam curtain and perforated pipes to create a rain curtain from top of the proscenium. Other restoration renewed all the finishes and enhanced the architecture for lighting,

the originals having become shabby and discolored. We recreated the fabrics and finishes producing interiors that once again gleamed with reflected light. We also changed the original vacuum tube dimmers to electronic controls, added front-of-house lighting positions, improved the acoustics by adding sound absorption to a new sloping back wall, and provided rigging positions in the auditorium so that loud speakers and lighting equipment can be hung from the ceiling.

Although Radio City remains a prime stage for the presentation of musical talent and extravaganza, because of its large size not everyone uses the hall as originally intended. Madison Square Garden has staged prizefights there and video music award presentations have transformed it beyond recognition, raising many questions about appropriate use of the hall.

The Beaumont Theatre at Lincoln Center was built to create something new, something that wasn't Broadway. And Eero Saarinen followed this idea through with a theater unlike any other in New York. Although its thousand seats are the norm for Broadway, its large bowl-shaped auditorium and generous stage were intimidating to those used to the framed intimacy of traditional theaters. In addition, natural speech could not overcome its vast reaches, forcing directors to restrict movement to positions where the actors directly address the audience. Filled with expensive stage machinery, including a revolving ring, stage elevators and movable seating wagons, it was found too rigid and all this equipment was eliminated to accommodate more varied configurations.

Perhaps the most important revision of the Beaumont is the use of body mics that permit performers to speak without concern for where they're positioned. Speaking upstage or down, their voices produce the same intelligibility. And as the "South Pacific" production now proves, even the balance between orchestra and singers can be maintained with clear definition for each performer.

In the search for new plays and new playwrights, a return to small capacities and more simply equipped theaters is taking place. Because Lincoln Center's Beaumont Theater was built to challenge the Broadway norm, it has developed such original highly complex and expensive techniques for presentation that performance of unknown or experimental work is not feasible for such a large audience. Even the 300-seat Mitzi Newhouse Theatre has developed complex and expensive production techniques and a loyal, aging audience that expects the familiar. Therefore, a new 110-seat theater that can make presentations of new work for a younger audience is planned on the roof of the Beaumont. Andre Bishop, artistic director, intends to use this loft-like space to present new plays at low cost and identify a new audience for Lincoln Center. This new theater will have no less of a stronghold on technology and its intimate scale will permit a return to basics.

BAM is known for experimentation, for reaching out to new ideas. This non-profit organization has built a loyal audience. However, sustaining the next wave is expensive and difficult, particularly with the Lincoln Center Festival challenging its avant garde leadership. To ensure it continues to make new ideas available from all over the world, BAM is building next to the opera house a 100-seat flexible theater and rehearsal hall. Like the theater at Lincoln Center, this place will be a simple rectangular box in which flexible seating, rigging, lighting and sound can present any new import. By adding on to the existing Salvation Army building directly behind the opera stage house, BAM will create a showcase for ideas from around the world as part of its next wave series. A stunning example of the new digital technology is live broadcasts of the Metropolitan Opera from Lincoln Center. Simulcast from New York, distant communities get the sense they are simultaneously participating in performance with the New York audience, even though in some cases they're thousands of miles away.

Now, La Scala and San Francisco Opera have joined in. These presentations do not replace the experience of attending opera in the opera house, but they do potentially offer an introduction at far

cheaper cost to the entire range of performance. It's too soon to say how this digital phenomenon will affect ticket sales at the Metropolitan or the creation of new audiences for opera.

Theater continually depends upon experiencing something new. Even revivals must provide contemporary insight to elicit notice. It's not possible to exactly reproduce past productions without caricature, as even lovers of Carol Channing's "Hello, Dolly" will admit. Each presentation must be reconsidered in response to changes in the culture and changes in the nature of performance. In preparing for today, I spoke with Jules Fisher to ask him what's new. His response underlined a delight with light sources that move and change color. But he warned that for all their seductive animation, the best use of this new technology is found in ways that strengthen and clarify each basic story. Originally criticized as disco lighting, Jules believes these new tools can strengthen emotional involvement of the audience. But once again, the use of this new equipment should guide not dominate.

It can therefore be seen that the basic task of technology continues to find ways to deepen experience, whether on a large scale or small. Look at the size of the people in that. Can you find the people who are being presented in this awards program in that image? It's absolutely astonishing to me how big those people are and how big everything else is.

Presentation of spectacular surface effects is not enough, because performances take place in time, becoming as much a matter of memory as direct experience. That's why it's all but impossible to repeat our individual responses to a production as audiences change and personal states of mind vary from one performance to another. If these new technologies reinforce basic ideas, new productions will be memorable. If they address only surface appearance, creating superficial effects, no matter how dazzling, they will soon tire and be forgotten. What remains memorable are insights about the human condition, a revelation that only great storytelling can provide. But in sophisticated hands, I'm certain these potent tools will create better theater, and I wish you all every success with your next production.

Thanks.

[APPLAUSE]

The Speakers

Richard Brett, B.Sc C.Eng FIET FABTT

Professional backstage theatre work whilst at school, followed by an Honours Degree in Electrical Engineering from University College London. Completed a Graduate Apprenticeship in radio, television, electronic and mechanical engineering with the British Broadcasting Corporation and worked as a Senior Planning and Installation Engineer on the rigging and lighting installations for new and refurbished television studios. Joined lighting designer Richard Pilbrow in the late sixties to create one of the first theatre consulting practices and was responsible, amongst many other projects, for the planning and engineering design of all the technical equipment for the three theatres in the Royal National Theatre complex in London. Specified and co-ordinated the first significant powered flying computer control system and the special elevators and equipment in the Drum Revolve stage for the Olivier Theatre. Developed the first theatrical use of air castor technology in the fully-adaptable Derngate Hall in Northampton in the UK. Both managed and contributed to a range of other performing arts projects in countries from Mexico to Iceland and in cities from Calgary to Melbourne.

In 1985 he formed Technical Planning International to specialise in theatre technical installations. Contributed to the theatre planning and was responsible for the design and specification of the technical installations in the Olavshallen theatre and concert hall in Trondheim, followed by the Kulturhus in Harstad. He was invited to lead the stage engineering team on the design of the facilities for the Ballet Opera House in Toronto which was at detail design phase before the provincial funding was withdrawn. Back in the UK, he developed equipment for a number of multipurpose halls, including a complete proscenium frame which stored within the floor of a concert hall and aluminum structures to create overstage suspensions in temporary locations. Pioneered the use of tensioned-wire grids and further developed the use of low pressure air castors. Undertook a range of project work from initial brief writing for the Singapore Performing Arts Centre, through a new theatre in Bombay, to co-ordinating the technical work on the new home for the Hallé Orchestra, the Bridgewater Concert Hall in Manchester.

In 1994 he won the commission from the Government of Hong Kong for the design and specification of stage engineering and stage lighting systems in the Kwai Tsing Theatre. The following year he was awarded similar responsibilities for stage engineering, lighting, sound and communications systems in the Gran Teatre Del Liceu in Barcelona. In 1996 he was invited to join the in-house theatre consultancy team on the redevelopment of the Royal Opera House in London. Collaborated with this team and contributed to the design and technical specifications of a number of significant installations, including the powered flying, stage wagons, and stage control system. Having worked on some smaller projects in Greece, he was named in the Client's documents as the stage engineering and lighting consultant on the major lyric theatre, small theatre and banqueting hall installations forming the extension to the Music Megaron in Athens and was subsequently responsible for these designs. With this extensive experience on a number of major opera and lyric theatres and their technical installations, he was awarded the commission of the new Opera House in Copenhagen which was completed by the Theatreplan team in October 2004, just under four years from the development of the concept. Despite the short timescale, this building and its technical installations are of the highest standard and represent the current pinnacle of opera house engineering. Following this he worked on schemes for upgrading the installations in the Opera Theatre in the Sydney Opera House.

Richard is a Chartered Engineer and a Fellow of the Association of British Theatre Technicians. He has been Chairman of the Association of British Theatre Technicians (ABTT), Chairman of the Society of Theatre Consultants, and UK representative on the Executive and a Technical Committee member of the International Organisation of Scenographers, Technicians and Theatre Architects. Has also given papers on theatre equipment and installations to the ABTT, the US Institute of Theatre Technicians, the Institute of Engineering and Technology and also to theatre technicians in Asia and Holland. He created the concept of Theatre Engineering and Architecture Conferences and organized two of these in London in 2002 and 2006, also compiling and editing fully-illustrated publications of the papers given at both events. He is a Partner in the international theatre consulting firm, Theatreplan LLP.

Hugh Hardy, FAIA

Hugh Hardy is the founder of H3 Hardy Collaboration Architecture, known for design of distinctive new buildings, restoration of historic structures, and planning projects for the public realm. Among his most celebrated projects are: the new New York Botanical Garden Leon Levy Visitor Center (Bronx, NY); reconstruction and addition of the Baseball Hall of Fame and Museum (Cooperstown, NY); restoration of the Brooklyn Academy of Music's façade (Brooklyn, NY); the new office of the New York Academy of Sciences at 7 World Trade Center (New York, NY); the new 12 courtroom United States Courthouse (Jackson, MS); reconstruction of Packer Collegiate Institute's new school in a nineteenth-century James Renwick church (Brooklyn, NY); restoration of Radio City Music Hall (New York, NY); the new U.S. Customs and Immigration Center at Rainbow Bridge (Niagara Falls, NY); and the redesign of Bryant Park (New York, NY).

Hardy's latest national awards include the 2007 Distinguished Achievement Award in Theatre Design from the U.S. Institute for Theatre Technology, the 2001 Placemark Award from the Design History Foundation and the 2000 Commissioner's Award for Excellence in Public Architecture from the U.S. General Services Administration.

In 2004, Hardy created H3 Hardy Collaboration Architecture, an outgrowth of Hardy Holzman Pfeiffer Associates, which he co-founded in 1967. HHPA was preceded by Hugh Hardy & Associates, established in 1962.