

## **THEATRE RESEARCH IN A DIGITAL WORLD**

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During most of my career as a theatre researcher I have worked with material that is now described as analog information, mostly books and papers, of course, supplemented by visual images of various kinds. The results of this research were then for the most part preserved and circulated as further analog material, primarily articles and books. As the twentieth century drew to a close, however, I found that like most of my colleagues I was working and living more and more in a digital world. At first this primarily affected my writing, as I moved from typewriter to word processor, while my research itself continued to be largely confined to non-digital sources.

Gradually, however, I found that digitalization began to affect more and more of the research itself. At first this was largely confined to simple checking of facts or the gathering of straightforward information. I needed someone's date of birth, or publication information about a book, or factual information of various kinds, the sort of thing that at one time I would have found by consulting a dictionary, encyclopedia, or other reference work. More and more I found that looking up such information in digital form through the internet was much quicker and more efficient. Of course the lack of editorial controls on the internet meant that I had to view information posted there with more caution, but the ease of access more than compensated for this. When I was seeking information on more recent work, the internet became even more valuable. Material on artists and performances too contemporary to have yet appeared in my library was almost instantly available digitally. If for example, I was interested in a contemporary European director, printed biographical information on him, if available at all, would most likely be some years out of date, while the internet could often tell me what he was directing even up to the most current work.

As more and more of the world's analog information is being converted into digital form, this ease of access becomes ever greater. While a few decades ago I could

use my computer instead of going to my shelf to consult a dictionary or a history text, or use it instead of going to the library to consult an encyclopedia or some more specialized work, today in many cases I can use the computer instead of traveling to some distant country to consult a special archive. Many major libraries are now scanning their manuscript collections. For example the scholar of medieval theatre can consult a French data base that includes some 1600 manuscripts and 31000 images from the Mazarine and Sainte-Geneviève libraries in Paris<sup>1</sup>, and similar projects are underway at the National Library of the Netherlands, the Bibliothèque National in Paris and the British Library. So far, on-line resources of this sort have been primarily devoted to the digital equivalent of traditional analogic material, but since moving images and sound can be stored digitally as easily as visual reproductions of documents, it is clear that theatre students and researchers will soon be able to access visual recordings of actual or reconstructed theatrical performance with equal ease. Again in connection with the medieval theatre, one might note the "Video Showcase" called "Performing Medieval Narrative Today" created by the Studio for Digital Projects and Research at New York University



This website<sup>2</sup> offers, in addition to bibliographic and other material, a collection, now of some 25 items, but steadily growing, of digital clips several minutes in length showing actors, storytellers, singers, musicians, mimes, puppeteers and dancers

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<sup>1</sup> <http://liberfloridus.cines.fr>

<sup>2</sup> <http://euterpe.bobst.nyu.edu/mednar/>

presenting a variety of medieval texts



A very different sort of digital archive is also being developed at New York University by the Hemispheric Institute of Performance and Politics.



A base collection of 20 sample video clips, containing interviews and short performance excerpts, was established in 2001 and is steadily growing. The goal is to develop a data bank for performance documentation through North and South America<sup>3</sup>.

Most archival historians still insist that even the most accurate digital reproduction of a manuscript is not a perfect substitute for the manuscript itself, which to the sensitive researcher provides information that eludes digital reproduction and the digital recording of specific performances, both historical and contemporary, is open to the same criticisms of selectivity that have been brought against filmic reproduction of plays. While I recognize the validity of these reservations, I am also aware of the complexities of reception in such situations, first brilliantly engaged by Walter Benjamin in his classic study "The Work of Art in the Age of Mechanical Reproduction." There is no question that the digital reproduction of a manuscript has robbed it of its Benjaminian aura. The extent to which this interferes with its use by the researcher is still a matter of debate. Still, there is no question that whatever loss may be involved, such digital reproduction nevertheless is accurate enough to revolutionize the

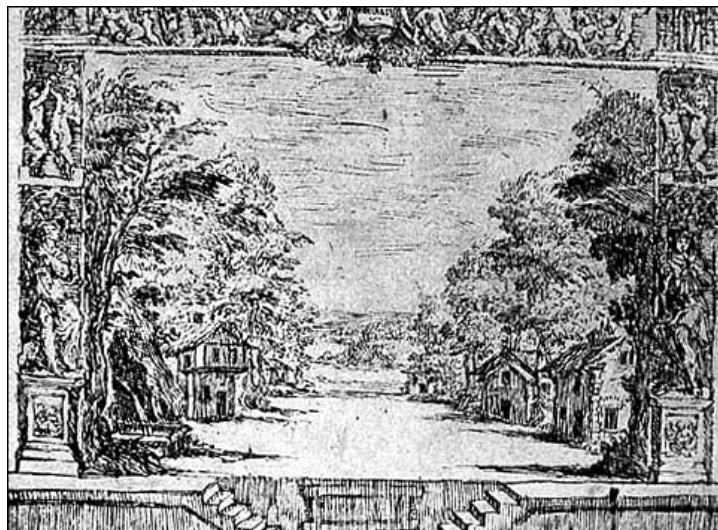
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<sup>3</sup> <http://hemi.unirio.br/eng/archive/index.shtml>

way most researchers relate to what used to be called primary material.

Whatever its potential shortcomings as reproduction, this digitalization of archives is now so widespread a phenomenon as to be a generally accepted part of the current world of research. I will return to it later in my general remarks about some of the problems presented by digitalization, but I would like now to move on from this aspect of the effect of digitalization on theatre research to some quite different aspects of this phenomenon, much more recent in their origin and only at this moment beginning to create an impact on the way that students study theatre history and the way that scholars research it and present the results of their research.

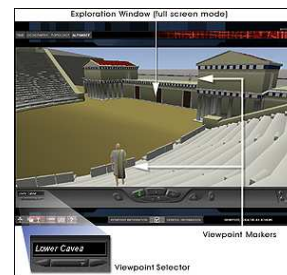
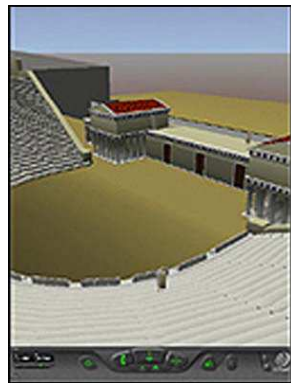
The technological development most closely related to traditional research methodology involves the creation of metadata or hypertext archives. The theatre is a research area that is particularly well suited to this sort of technological study because any individual performance can be viewed from such a wide variety of perspectives. An important pioneer in such work in America was Professor Jack Wolcott at the University of Washington who in 1984 began to work on the Olympus Project, funded by IBM and dedicated to research on the use of computer technology in education. Their first major project, in 1986 and 1987, was a digital reconstruction of a 17th century English court entertainment, *Florimene*, for which extensive drawings and descriptions remain.



To create a computer-generated three-dimensional space they utilized an early form of CADD software (Computer Assisted Drafting and Design), the kind of program

that has in the intervening twenty years vastly improved in sophistication and allows that enormously detailed environments containing moving figures that are so familiar in today's world of computer games.

Wolcott and his students expanded their work by cooperating with a software company located near the University and specializing in CADD programs. They developed three-dimensional digital models of several historic theatres such as the Hellenistic theatre at Pergamon, which were discussed in a 1990 article in *Theater Design and Technology* called "Leaning Theatre History in the Third Dimension."<sup>4</sup> A similar but far more ambitious project of this same type was launched in Europe in 1998 by a consortium of European scholars and computer experts led by the University of Warwick in England<sup>5</sup>.



This project, *Theatron*, funded by the European Commission, has to date created virtual models of sixteen major European theatre spaces, including classic examples such as the theatres of Dionysius, Epidaurus and Pompey, medieval fairground theatres and pageants, Renaissance theatres such as Sabbioneta and the London Globe, eighteenth and nineteenth century theatres such as Drottningholm and Bayreuth and twentieth century examples such as the Vieux Colombier in Paris and the Schaubühne am Lehninerplatz in Berlin.

Hugh Denard, involved with the *Theatron* project, has suggested a broad typology of performance documentation, consisting of four basic types: text (including play scripts and archival records), depictions (including paintings, drawings, and choreographical notations), recordings (including photographs, film and video) and

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<sup>4</sup> *TD26-A* (Fall, 1990)

<sup>5</sup> [www.theatron.org](http://www.theatron.org)

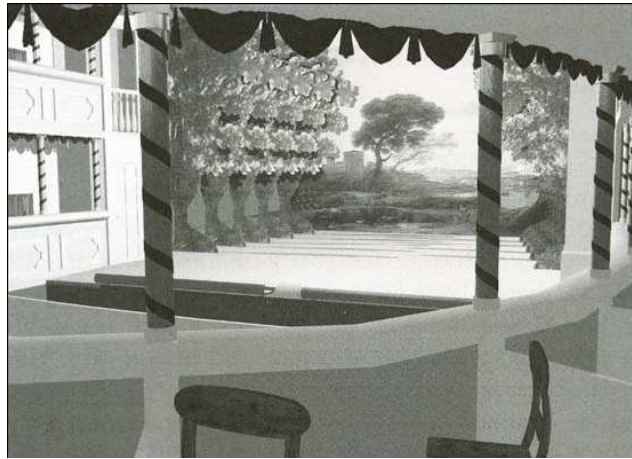
simulations (involving space and enactment). The first two of these have of course been the traditional tools of theatre history, since the technology of recording is of such recent origin. Simulations provide a very different kind of historical knowledge, closer to the embodied experience that is in fact at the grounding of theatre. Up until contemporary times, actual simulations of historical theatres were rare, due to the difficulty and expense of such projects, although they have been a significant if minor part of theatre history from the early Italian renaissance, when the Teatro Olimpico sought to reconstruct a classic theatre to the many recent reconstructions of the Elizabethan Globe in England, the United States, Germany, and Japan.

The digital technology of projects like Theatron offers an alternative approach to this type of three-dimensional documentation, by creating virtual spaces which allow a visitor to the site the same freedom of movement and perspective as an actual physical reconstruction. Although the actual embodied experience cannot be duplicated, Denard argues that virtual spaces provide advantages that offset this shortcoming. In addition to the cost of erecting actual replicas of historic theatres, like the London Globe, once such structures are built it is difficult to modify them in the light of changing evidence or scholarly opinion, and more difficult still to allow them to reflect conflicting interpretations of the historical evidence. Virtual reconstructions, on the other hand "can readily be modified, juxtaposed with alternative hypotheses," and even more important, "can be distributed worldwide, simultaneously and collectively experienced by users separated by real space."<sup>6</sup>

So far Theatron, like the Washington Florimene project, has been concerned only with the creation of virtual theatrical spaces, but other projects have built upon such work to create much more complicated and ambitious projects in the digitalization of theatre history. Again Wolcott at Washington provided an early model of such work. He followed the Florimene project in the late 1980s with the much more ambitious Philadelphia Project, which was built upon the first theatre building erected for professional performance in the United States, the Chestnut Street Theatre, built in Philadelphia in 1794.

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<sup>6</sup> Hugh Denard, "Performing the Past: The Virtual Revolution in Performance History." in Kenneth Schlesinger, ed., *Performance Documentation and Preservation in an Online Environment*, New York: Theatre Library Association, 2004, 59.



Working from the ground plan, elevation, sketches and accounts of contemporaries, Wolcott and his students spent four years creating a detailed three-dimensional virtual reconstruction of this famous theatre. As the project was developing, other researchers became involved, most notably the curators of the Textile Collection of the Henry Art Gallery, developing links from the theatre model to hundreds of examples of men's and women's clothing that might have been worn by both the actors and the audience at the original theatre.

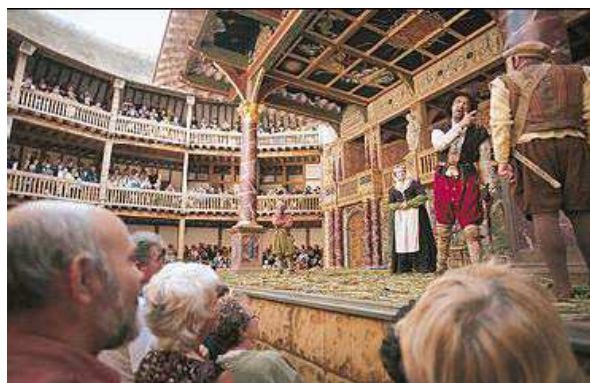
Of more direct immediate relevance to theatre history, the Philadelphia Project developed eight short "scenes" in which actors wearing historically accurate clothing, could be seen performing in period settings such as were used at the theatre. The backgrounds used were from a nineteenth century British toy theatre, and the actors were inserted electronically into these backgrounds. The Philadelphia Project was never developed into a marketable package, due to problems with permissions, finances, and adequate time. Wolcott himself called his work only exploratory, leaving it for others to develop. At the beginning of the twenty-first century, as digital technology is constantly becoming more accessible and sophisticated and the creation of virtual environments and virtual action within them better developed, a number of researchers are now engaged in carrying on the work pioneered by early researchers like Wolcott. The field of Live Performance Simulation is now one of the most ambitious and exciting areas of contemporary research in theatre history.

An outstanding current example of this sort of research is the Virtual Vaudeville project headed by David Z. Saltz, the founding director of the Interactive Performance Laboratory at the University of Georgia. This project began in September of 2000 at a workshop sponsored by the National Initiative for a Networked Cultural Heritage

(NINCH). NINCH was organized in 1993 as a diverse nonprofit coalition of arts, humanities and social science organizations, created to provide leadership to the cultural community in the evolution of the digital environment. Its sponsoring organizations were the American Council of Learned Societies, the Coalition for Networked Information, and the Getty Information Institute, part of the J. Paul Getty Trust.<sup>7</sup> From this workshop developed what came to be called the "Live Performance Simulation System," designed to recreate historical performance in a virtual reality environment similar to that of a 3D computer game. A wide variety of scholars from seven American universities have been involved in this project. These include specialists in 3D computer animation, modeling and programming as well as more traditional theatre and music artists and scholars:

Charles B. Davis from Georgia, Bruce McConachie from Pittsburgh and Susan Kattwinkel from Charleston, all specialists in nineteenth century American popular theatre, Larry Wooster from Denver, who is a musicologist, Frank Mohler, a scenic designer, and Faniel Zliner from Studio Z in Chicago, charged with writing the dialogue for interactive characters backstage and in the audience.

The Live Performance Simulation System is based on the same premises as that of Theatron, that virtual reality reconstructions avoid some of the serious problems of actual physical reconstructions like the London Globe by avoiding their enormous investment of money and property, their physical inflexibility, and their availability only to people in a particular location.



However, while Theatron, at least at this point, has provided only virtual walk-throughs of historic theatres, Live Performance Simulation has followed to a far greater

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<sup>7</sup> [www.ninch.org](http://www.ninch.org)



extent, the path suggested by Wolcott's Philadelphia Project, placing virtual actors in performance on the stage, and going much further than Wolcott by also creating virtual theatrical support personnel and even virtual audiences. The goal is a total theatrical experience, superior to a film or video record, which can only offer a single perspective, while an actual audience member can look anywhere, even at something not on the stage, and also superior to the sort of total immersion offered by a modern reconstruction like the London Globe, where the audience member has the total freedom of perspective of any theatre experience, but in looking about sees only a stage and auditorium that seek to replicate a past theatre, while the performers and other personnel, as well as the other audience members, are all, like the spectator, anachronistic visitors from the twenty-first century.

For its first major project, called "Virtual Vaudeville," the researchers set out to recreate this example of American popular entertainment as it would have actually appeared to audiences of the late nineteenth century. They selected a typical vaudeville theatre, B.F. Martin's Union Square Theatre in New York in the year 1895, digitally recreating that theatre along with its patrons, performers, and staff. The University of Georgia received a \$900,000 three-year grant in 2001 for this project.



Four actual vaudeville acts of the period were digitally recreated, based on extensive archival research:



the strongman Sandow the Magnificent, the Irish singer Maggie Cline, the comic stage Jew Frank Bush, and the sketch comedy of the four Cohans, whose youngest member, George M. Cohan, went on to become one of the great stars of early twentieth century Broadway<sup>8</sup>.

The simulated performances can be experienced in two different ways. In one, the "invisible camera" mode, a viewer can move through 3D space to observe the performance from any angle they choose, including even from on stage.



They can also zoom in on details, onstage and off, parts of a performer's costume, decorations on the walls of the theatre, the upholstery on the seats. The

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<sup>8</sup> Descriptions of the Virtual Vaudeville project are taken from its website, [www.virtualvaudeville.com](http://www.virtualvaudeville.com) and from David Z. Saltz, "Virtual Vaudeville: A Digital Simulation of Historical Theatre," in Schlesinger, *Performance Documentation*, 30-37.

alternative mode involves what is perhaps the most innovative and ambitious part of this project, the simulated audience.

A typical matinee audience at the theatre would have numbered about 800 spectators, and the researchers sought the ambitious goal of reflecting in their virtual audience as closely as possible, the distribution of gender, class and ethnicity in different parts of the auditorium.



The goal was thus not only "to fill the seats with historically accurate and convincing faces and costumes," but to animate each figure "to respond to every moment of every act in a way consistent with their demographic profile." Thus "when Frank Bush portrays his Irish character, the Irish spectators in the gallery—a notoriously boisterous group—should respond very differently from the WASP characters in the boxes."<sup>9</sup>

800 individual audience members operating in such detail proved far too difficult to create or program, and so 32 basic audience groups were created, such as one of upper class WASP men and one of middle class African-American women, with animated responses for each group. Then three to five physical variations in face and costume were designed for each group, which were further diversified by variations in hats and facial hair. Four specific spectators, or "avatars" can be selected by the viewer who may watch the performance through their eyes instead of using the "invisible camera" mode. Each represents a different socioeconomic group:

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<sup>9</sup> Saltz, "Virtual Vaudeville," 35.



Mrs. Dorothy Shopper, a wealthy socialite attending the performance with her young daughter, Mr. Luigi Calzilaio, a recent Italian immigrant, attending with his more Americanized brother. Mr. Jake Spender, a young "sport" sitting next to a Chorus Girl, and Miss Lucy Teacher, an African-American schoolteacher sitting with her boyfriend in the segregated second balcony. The viewer can move the avatar's head to focus on different areas of stage or auditorium and can trigger a limited set of responses, including laughter, applause, or on occasion, dialogue with the person in the next seat. The viewer selects a generic response and the system provides a specific one, taking into account what is happening on stage and the viewer's previous responses, so that every experience of the performance event is unique.

The kind of elaborate simulated environment represented by the Virtual Vaudeville Project clearly requires a considerable commitment in time and physical resources, but the rapid evolving of digital technology and simulation programs guarantees that the future will see more and more experiments of this sort, and it seems very likely that as Professor Saltz and his colleagues predict, such simulations will become an important tool both in visualizing historical performance and in testing hypotheses about historical performance practices.

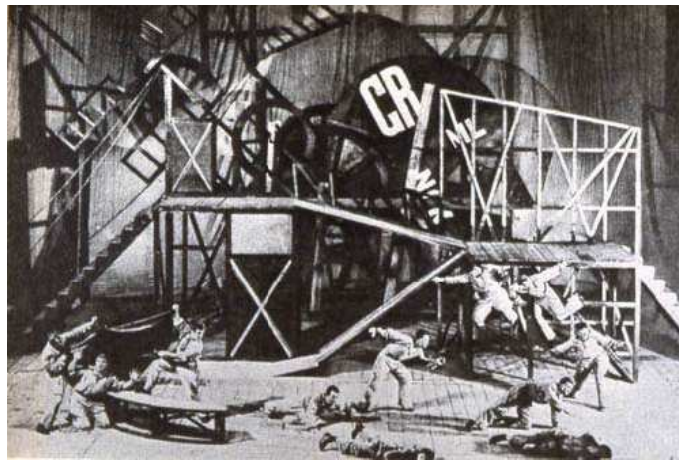
The creation of a virtual historical performance in as many as possible of its details is one of the most striking and spectacular examples of the current application of digital technology to historical research, but certainly not the only or even the most typical one. Another important development is the linking together of material into large

relational databases, so that the researcher is not limited to the traditional linear model of analog information but may explore a vast range of possible related material connected through digital hypertext. The study of theatre can particularly profit from such a development because any given performance involves multiple creators, creations, and trajectories. Thus the study of a single traditional theatrical performance might involve considering the contributions of actors, musicians, authors, composers, choreographers, costume, prop, set, lighting and sound designers, directors and producers, not to mention technicians and for that matter, audience members. Not only do all these participants need to be considered in the understanding of a single performance but each should also be related to many other performances, social and cultural activities, and physical objects. In the past this has normally and necessarily been done in a primarily linear fashion, tracing certain threads through the activity and leaving others to other times or other researchers.

Even so limited a relational database as Wolcott's Philadelphia Project suggests how digital technology can revolutionize such investigation, since any part of any production can be linked to any other part as well as to a potentially infinite web of other data. As archives, libraries, and theatres around the globe are creating more and more repositories of digital material and more complex webs interrelating this material, theatre research increasingly can operate within the sort of network for which Wolcott provided only a very preliminary and rudimentary study. Among the many groups involved in developing such a network is the Global Performing Arts Consortium (GloPAC), an international organization of institutions and individuals organized in 1998 and committed to using innovative digital technologies to create easily accessible, multimedia and multilingual information resources for the study and preservation of the performing arts. Participants include major universities, such as Cornell, where the project originated, museums such as the St. Petersburg State Museum of Theatre and Music, the Museum of the City of New York, and the San Francisco Performing Arts Library, and performing arts organizations such as the Chinese Opera Society in Singapore and the International Foundation for Arts in Japan.

GloPAC is currently engaged in two major types of projects, both dedicated toward assembling highly flexible resources for researchers in the performing arts. The larger of these is the Global Performing Arts Database (GloPAD), available to the

public online<sup>10</sup>. In this prototype database, a researcher can search for certain plays, for example, and find images of those plays along with detailed descriptive information, plus links to various productions. Further links allow the researcher to find information on actors and other people associated with each production, and in the case of actors images of those actors in other roles. Among the approximately 4500 images currently available, GloPAD contains over 600 images on the work of the Russian director Meyerhold from various theatres and is being extended to include non-Meyerhold material from each theatre.



Gradually more and more complex webs of data retrieval will be developed to enable a user to view further layers of detailed information according to his or her particular interest. There is also a browse function that allows a viewer to call up a range of material from a particular geographic region, such as Singapore or Japan, or a particular subject, such as the costumes of servants.

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<sup>10</sup> [www.glopac.org](http://www.glopac.org)



GloPAC's second major project is the creation of Performing Arts Resource Centers (PARCs), which are Web-based environments that combine scholarly content with technological sophistication and lead the user back to GloPAD for further layers of information. Each PARC has a particular focus, either geographic, temporal, ethnic, or thematic. Two prototypes of the PARCs have so far been developed, one focusing on Japan<sup>11</sup> and the other on the work of Meyerhold<sup>12</sup>.



The Japan PARC includes an interactive text of the Japanese Noh play Atsumori, which offers an English translation of this play in the middle frame, with

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<sup>11</sup> [www.glopac.org/Jparc](http://www.glopac.org/Jparc)

<sup>12</sup> [www.meyerhold.org](http://www.meyerhold.org)

Japanese text to the right, notes and glossary below, and interactive images to the left, which link to the glossary and to GloPAD. This PARC also includes such material as a slide presentation on "Costuming the Warrior in Noh" and an interactive 3-D model of a Noh stage. Such presentations promote a new, digitally-based process of "reading," enabling viewers to explore and combine material in a variety of ways, depending on their interests.

Given the ambition of these various representative projects, the work done so far is only a tiny part of what all hope eventually to offer, consisting for the most part of models and prototypes. It must be remembered, however, that the field of digital research in theatre is extremely young, the pioneering work of Wolcott going back only twenty years and all of the other projects I have described launched within the past few years. The first conference ever dedicated to the documentation of performing arts resources in a virtual environment, the proceedings of which were invaluable to me in preparing this report, was held as recently as October 10, 2003 at the New York Public Library for the Performing Arts at Lincoln Center. There more than a hundred archivists, curators, educators, librarians, practitioners, scholars, and students shared information on this rapidly developing new area of theatre studies<sup>13</sup>.

It seems almost certain that in the coming century these scattered test databanks and prototypes will prove indeed to be only the beginning of a quite new way of documenting performance as well as of studying it. At the same time, the brave new digital world presents very serious problems for future theatre researchers, by no means limited to the obvious one of the almost infinite amount of material that potentially could be included in any networked databank. By the mid-1990s the library community began to worry about a quite different problem arising from the increasing digitalization of archival material, the preservation of works stored in digital form. In December of 1994 the Commission on Preservation and Access and The Research Libraries Group created a Task Force on Digital Archiving composed of individuals drawn from industry, museums, archives and libraries, publishers, scholarly societies and government. Its charge was to investigate the means of ensuring "continued access indefinitely into the future of records stored in digital electronic form." The Task Force provided a series of alarming examples of important historical data already irretrievably

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<sup>13</sup> The proceedings were published in Schlesinger, *Performance Documentation*. See also the website <http://tla.library.unt.edu/symposium.html>



lost and warned that "Rapid changes in the means of recording information, in the formats for storage, and in the technologies for use threaten to render the life of information in the digital age as, to borrow a phrase from Hobbes, "nasty, brutish and short."<sup>14</sup> Similar concerns were expressed to a more general readership in a 1995 essay in *Scientific American* "Ensuring the Longevity of Digital Documents," written by Jeff Rothenberg, a researcher at the Rand Corporation<sup>15</sup>.

Howard Besser, a member of this Task Force, has become one of the leading authorities on this subject. He is now head of the Program in Moving Image Archiving and Preservation at New York University and has served on several National Councils on the preservation of electronic records. One of the most complete and succinct statements of the various dimensions of this problem can be found in Besser's article "Digital Longevity," which appears in a collection of essays, *The Handbook for Digital Projects*, published in 2000 by the Northeast Document Conservation Center<sup>16</sup>. In this article, Besser lays out the research and access problems that have developed with the emergence of digital technology. There is widespread awareness now in the research community of these problems and many attempts to address them, but so far with only limited success. Their persistence suggests that as archivists, researchers, and historians become increasingly committed to such technology, as seems inevitable, we must also remain aware of these problems, and the extent to which they qualify the short-term, and even more significantly, the long-term applications of digital technology.

The most obvious problem in the storage of all electronic information, familiar today to almost everyone, is the rapid obsolescence of the physical storage formats. In our offices and perhaps our homes we have seen in a few years the transition for 8-inch floppy disks to 5.25-inch diskettes, to 3-inch diskettes, to CD-ROMs, to DVDs. Recently, in buying a new laptop, I had to buy a special attachment to access 3-inch diskettes, which are clearly on their way to oblivion. This problem is compounded when we look not at conventional word files but at much larger image or video files which are so significant in theatre and performance research. This, along with economic forces, drives an unrelenting search for larger and more powerful storage instruments, often

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<sup>14</sup> <http://www.rlg.org/ArchTF/tfadi.index.htm#fragility>

<sup>15</sup> Jeff Rothenberg, "Ensuring the Longevity of Digital Documents," *Scientific American* 272, 1 (January, 1995), 42-47.

<sup>16</sup> Howard Besser, "Digital Longevity," in *The Handbook for Digital Projects*, ed. Maxine Sitts, (Andover, MA: The Northeast Document Conservation Center, 2000), 155-66.

incompatible with previous forms. The solution to this problem, proposed in the 1996 report, was what has come to be known as "refreshing," periodically moving material from one physical storage unit to another both to avoid physical decay (even CD-ROMs eventually deteriorate) and more important, to avoid the obsolescence of the medium. The most common form of refreshing is what is called "migration," simply regularly re-recording material onto new storage systems as they appear. This is perhaps the best solution available at present for projects like Theatron or the Virtual Vaudeville, but since both of these are conceived as pilot projects, clearly a time can be foreseen in which no new material could be added because all the time and efforts of the project coordinators would be spent in updating files. Still at this moment there is no clear alternative. Some theorists, most notably Jeff Rothenberg, are working to develop an alternative to "migration" called "emulation." This would involve the development of a software program that would mimic all other applications in any format and make them compatible with whatever the current computing environment is. The most extensive research into "emulation" strategies to date has been undertaken by the National Library of the Netherlands in connection with their work with the Networked European Deposit Library (NEDLIB). This organization has made great strides in making digital information encoded in a wide variety of formats accessible across its European-wide network, but so far has devoted little attention to the problem of preservation, essentially relying on some variation of the highly time-consuming "migration" process. In 1999 the National Library of the Netherlands commissioned RAND-Europe to begin a series of studies on the development of "emulation" technology. The results of the first phase of these studies can be found on the National Library website<sup>17</sup>. They suggest that by creating a kind of spiraling emulation program, which both reads new formats and by a kind of migration also retains access to its own earlier versions and so does not have to repeat any previous decodings, an ongoing operative emulation program is at least theoretically possible. The technical, and legal difficulties of this strategy are great, however, and while research continues, some form of migration seems to offer the only storage alternative for the immediate future.

The problem of refreshing affects any digitally based storage and research system, but when we turn from virtual theatre environments or simulated theatre events like Theatron or Virtual Vaudeville to large networked research databases like GloPAC,

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<sup>17</sup> [www.kb.nl/coop/nedlib/results/emulationpreservationreport.pdf](http://www.kb.nl/coop/nedlib/results/emulationpreservationreport.pdf)

the Philadelphia Project, or the Hemispheric Institute, an additional problem arises. The former are essentially self-contained programs, while the later, while they may possess certain base data banks, are most useful as guides into vast networks of inter-related material scattered throughout hyperspace. Any given web page typically contains links to other web pages, and these databases seek to extend that capacity to the fullest possible extent, connecting many aspects of the theatre experience to related information inside and outside the theatre. Here arises another electronic problem which Besser addresses in his article on "Digital Longevity" and which he characterizes there as "the inter-relational problem."<sup>18</sup> The problem here is that linked locations are extremely unstable. Internet archivist Brewster Kahle, the Director and Co-founder of the Internet Archive, a developing digital library of Internet sites and other cultural artifacts in digital form<sup>19</sup>, reported in the March, 1997 *Scientific American*, that at that time the average web document lasted only about 75 days<sup>20</sup>. The most common message today on the World Wide Web is "File Not Found" or "This Page Cannot Be Displayed," indicating that this link no longer exists. The compilation of very large-self-contained data banks like the Internet Archive, each of which will presumably remain responsible for keeping its external material electronically updated, offers only a partial solution to this problem, since projects like GloPAC cannot begin to achieve their goal of inclusiveness if they restrict themselves only to digital material actually contained within their own system.

Thus the present situation presents us with a challenging and mixed picture of the future of theatre research in a digital world. On the one hand, current technology clearly offers present and future scholars and researchers opportunities in access to materials and in historical model-building hardly dreamed of by theatre students even a generation or two ago. On the other, these enormous new possibilities also come with enormous new problems in how to access, manipulate, and even retain the vast amounts of information and insight these opportunities promise. The negotiations between these new opportunities and these new challenges will inevitably be one of the primary concerns of the theatre scholars of the coming century.

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<sup>18</sup> Besser, "Digital Longevity." 160

<sup>19</sup> www.archive.org

<sup>20</sup> Brewster Kahle in "Archiving the Net", *Scientific American*, 276,3 (March, 1997), 53.