LIVE MOVIES

A Field Guide to New Media For the Performing Arts

edited by

Kirby Malone and Gail Scott White

Documenting Multimedia Performance Studio's New Stage Technology Project

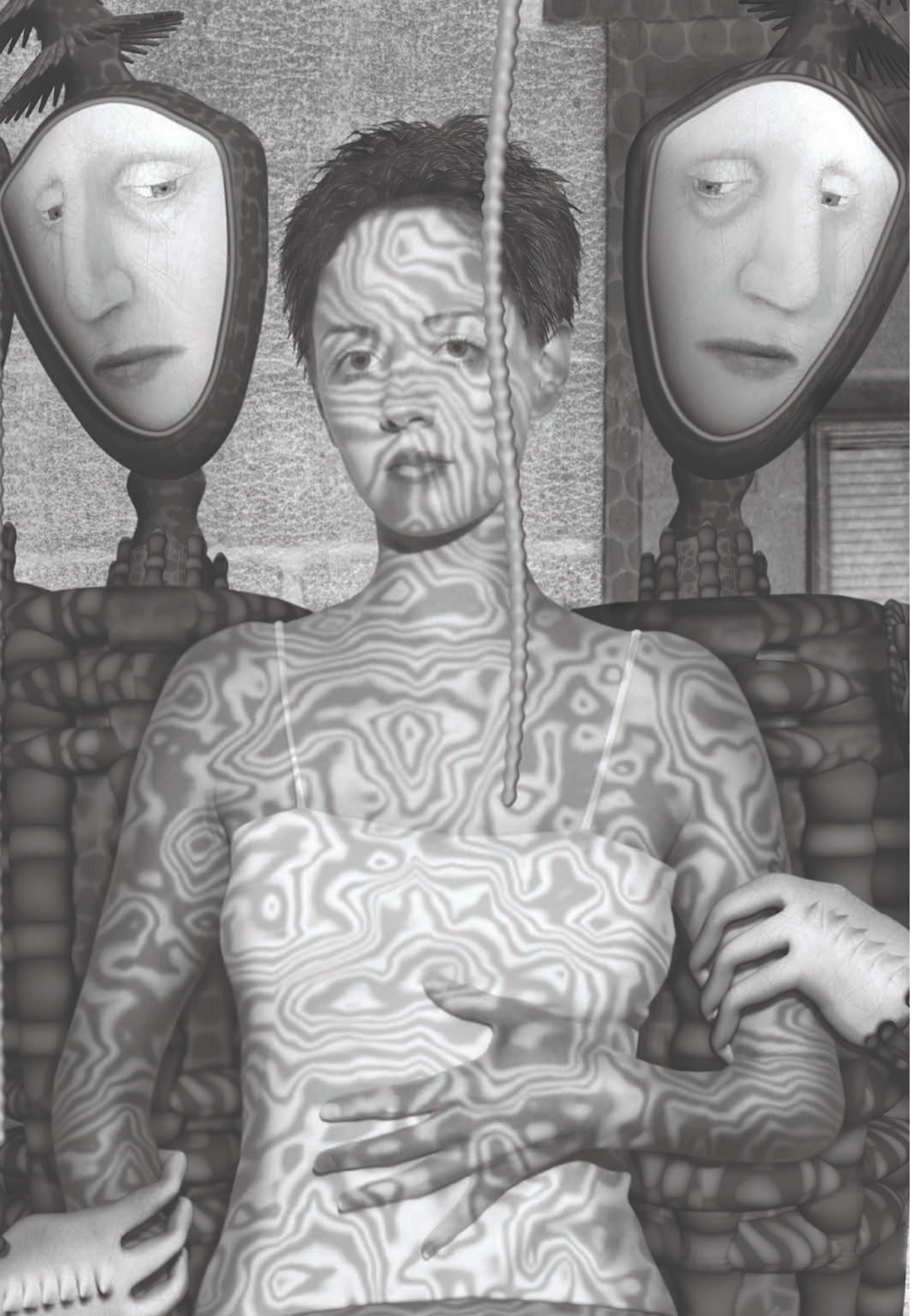
TECHNICS

If we awaken to our actual state, in full possession of our senses, instead of remaining drugged, sleepy, cravenly passive, as we now are, we shall reshape our life to a new pattern, aided by all the resources that art and technics now place in our hands.

— Lewis Mumford (1952)

Photo: Ioulia Kouskova.

Joshua McCarthy (animatronic Edison), MPS/Cyburbia's *Silence & Darkness*, MPS, 2004.



GAIL SCOTT WHITE

WELCOME TO THE Z: SYNTHESIZING THE SIMULATED WITH THE REAL

New Media Animations and Live Performance

It is a bold act to combine the inarguably complex practices of 3D modeling and animation with live performers on a stage in front of a live audience. It requires a critical awareness of the field, not just the vapid mimicry of popular 3D animations created to serve the advertising and entertainment industries. In order to shift the paradigm away from the roles of selling and escapism, 3D animations can be synthesized with live performers in the built theatrical environment, and employed as tools for illuminating and questioning real world concerns. Not for every new media artist, this practice requires a sincere and sustained commitment to acquire the fairly deep knowledge necessary to model, animate, texture, and render in simulated space. Although the work involved may be great, so are the payoffs.

Directors and new media designers, who choose to use 3D animation as an integral part of the scenographic environment, digitally open the innovation door. Imagine creating a visually rich, virtual 3D world, where almost anything a director/designer can envision is possible to build and to animate. This world can be experienced from any place that one could position a camera in the "real world" and from places where no camera can go. This ability to shift point of view and frame theatrical space is a powerful tool in the hands of directors/designers who understand cinematographic language, a language that their audience speaks, thinks, and dreams in. Context creates and changes meaning. In 3D simulated

Amelia Winger-Bearskin in *Transgenic Beings*, a series of digital prints by Gail Scott White, 2003/2004.

space, directors and designers can establish new media environments that dynamically shift point of view, changing not only what an audience sees, but from where they see it.

3D modeling and animation technologies can be used to create faux theatrical spaces, that is, simulated perspective spaces within real theatrical space. Actors can be placed inside objects and objects can be projected onto actors. 3D animations can camouflage or frame actors, depict multitudes, and create impossible scale shifts. Performers can interact with animated characters, act within "immersive" environments, and travel through space and time.

3D modeling and animation software programs also can be used as visualization and simulation tools. With 3D modeling software and a set of blueprints, a relatively accurate virtual model of the entire theater can be constructed. The set can be modeled, before it is ever built in the shop, and examined from any seat in the virtual house. Digital art and animations can be "virtually projected" onto set pieces and adjusted for intensity. Even simulated actors can be placed in this digital 3D theatrical environment, providing directors, designers and actors a glimpse of opening night.

Unlike filmmakers and painters, whose work inevitably ends up as an illusion flattened out on a 2-dimensional picture plane, where "X" represents the width of the picture and "Y" the height. New media scenographers' work embraces the third dimension, or the "Z" of perspectival depth, and because it takes place over time, the fourth-dimension. In this sense, new media scenographers are architects, engineers and artists. They work with others defining and transforming theatrical space into a dynamic, living environment for the ideas and actions of playwrights, composers, directors, and performers.

Animation: A Snippet of Past and Present Practices

Animation is the art of using movement to bring still images or objects to life. Animations can be political, humorous, or satirical, and they can mimic or defy reality. Animation art is a wide, diverse practice stretching around the globe, crossing time, cultures and societal applications. A case could be made that early cave paintings told stories that took place over time and are therefore the predecessors of contemporary animation art. The practice of animation, like the practice of painting, belongs not to a single country or group of countries, but to anyone, anywhere, who draws (with or without the help of digital technology) moving images. Modern day animation owes much to Emile Reynaud, whose invention, the praxinoscope, held up to 500 images on a gelatin strip and was hand-cranked to create fifteen-minute shows called *Pantomimes Lumineuses*. Reynaud's praxinoscope was developed and enlarged and rear-projected to live audiences in his *Théâtre Optique*.

At the turn of the 19th century, experimental artists were cultivating new forms of art by merging the practices of animation and still photography. These industrious, investigational animations were as varied as the people who created them and were inextricably married to the development of still photography and cinema. These early animators employed a range of techniques from hand-drawn animations, to stop-motion sequences, to animated silhouette cutouts. Many of these artists had their roots in theater, from J. Stuart Blackton, who toured the Lyceum circuit in a vaudeville two-act before creating his real-time animated *Enchanted Drawings*, to Lotte Reiniger, who was a theater student at Max Reinhardt's school in Berlin prior to using delicately cut paper, light, shadow, and motion to create her silhouette film masterpiece, *The Adventures of Prince Achmed*.

Animation practices dramatically grew over the previous century, and in hindsight, it is no wonder as the human eye is genetically drawn to moving images. Predator and prey (and humans are both) have to be able to detect motion for their own survival. As 20th century humans became less and less hunters and gatherers and more and more buyers and sellers, the art of animation was appropriated from independent artistic practices into the mainstream advertising and entertainment industries.

In the early thirties, Walt Disney began his lifelong effort to define, homogenize, and commercialize American-style animation. Coming out of the Depression, the cartoon entertainers, Betty Boop and Popeye, helped many temporarily forget their financial troubles. Asian, and Eastern and Western European animation artists tended to create works that were less mainstream, infusing their animations with poetics and politics. By the mid-fifties, cartoon animations had pushed their way onto American television and into the brain pans of the baby boomers. With the launch of *Tron* in the early eighties, computer-generated animation was introduced to mass audiences and began to influence cultural discourse and social practices.

Fast-forward to the turn of the 21st century and the practice of animation is undergoing a tremendous resurgence and international explosion. Animation is an international language that relies on moving images to communicate meaning and often reaches across traditional language barriers. The language of animation is spoken "with gusto" by the entertainment and advertising industries, and used for its persuasive and informative powers by educational, religious, and governmental organizations. Animation has infiltrated the arts and sciences to such an extent that architects, doctors, biologists, geologists, archeologists, mathematicians, and most other professionals use computer-generated 3D models and simulations to visualize, prototype, design, and explain their research and practice.

As new animation techniques and practices evolve, they exist in relation to culture, technology and the economy. In youth culture, highly-detailed, object-oriented, rule-based, nonlinear animations dominate the hyper-real environments of computer games. Gamers escape into their avatars and for awhile avoid the ennui of day-to-day real life (or "RL" as they prefer to call it). At the start of the 21st century, total revenue from the computer gaming industry surpassed total revenue from the film industry, which may come as a surprise to the over-35 club, but not to the under-35 club.

Add to all of this growth, the relatively new field of internet animation, where children are downloading freeware and making animated "gifs," while adults are book-marking the popular *JibJab* web site and forwarding links of their favorite animations to their friends. A virtual, visual myriad of animation subcultures flourishes online, ranging from primarily abstract animations called "demos," an artform where hackers program interactive animations to render in real time (and test hardware boundaries), to "machinima," 3D animations that appropriate and modify the virtual environments and characters found in popular computer games.

If the first digital divide is between those who have and do not have access to the internet, then the second digital divide is between those who can create, control, and interact with online "rich media" (video, sound, animation) and those who cannot. Rich media ranges from straightforward graphic images and icons to robust, time-based, interactive simulations and animations.

Mike Solo (John Titor) and Joshua McCarthy (James Walters), with 3D animated co-workers, Cyburbia's *Time Traveler Zero Zero*, an MPS workshop production, 2004.

What is 3D Computer-generated Animation?

Computer technology (a topless mountain of hardware, software and peripheral devices) has become indispensable to 2D animators and stop-motion animators. It has also opened up the magically real and esoteric world of 3D modeling and animation. A decade ago, high-end 3D computer-generated animation systems were unaffordable to most independent artists. Today, new media artists have a range of 3D programs to choose from, largely because of recent developments in digital technologies, both on the hardware side, with high-speed processors and real-time graphics cards, and on the software side, with sophisticated, icon-driven modeling and animation packages. Although there are some 3D animation programs that are intuitive and relatively simple to use, the more powerful programs are moderately to highly technical, and filled with terminology familiar to programmers and mathematicians, but unfamiliar to most visual and performing artists.

New media scenographers are often scared away by the technical complexity of 3D modeling, yet perhaps they shouldn't be. Most of the digital artists coming out of today's schools, colleges and universities have had some exposure to 3D animation, and quite a few have developed a firm understanding of the art and technology of 3D animation. New media scenographers often work with other digital artists in creating images, videos and 2D animations, so it is a logical extension that they also work with 3D animators when appropriate.

3D modeling and animation take place in the XYZ coordinate system, a simulated mathematical space where virtual objects have height, width and depth. 3D objects can be viewed with virtual cameras giving the animator the ability to digitally look at an object from any point of view. Most 3D programs start with four scene views, the top, front and side views are orthographic views. They each display information on two axes, for example, the front view displays objects flattened out onto the X and Y planes, while the top view will show the same objects on the X and Z axes. By looking at any two views, an animator can visualize what an object will look like in 3D.

The perspective view, however, is the viewport most animators consider to be their creative studio. In the perspective view, objects are displayed in full XYZ space. The animator can dolly in or out, track and tumble around objects. These objects can be examined in minute detail or from a distance. They can be displayed with their assigned surface textures. Even the effects of added lights can be viewed in real time. The 3D simulated space of the perspective view provides animators with the ability to build their models from multiple points of view, just as a sculptor will move to different vantage points in the process of creating a sculpture.

Add the timeline, which gives animators the ability to set keyframes for events, and 3D animators have a new tool for creating digital art that conveys meaning through movement. The what-if possibilities of building faux-

living characters, environments and objects seem limitless. When combining live performance with 3D computer-generated animation art, it is important for the new media scenographer to have a clear view of what is needed and the ability to put it down on paper if they hope to have 3D scenes built with efficiency and accuracy.

What Are the Components of 3D Computer-generated Animation?

3D computer-generated animation, like other art forms, begins with idea generation and continues on a desire/discovery path until the work reaches an audience. If done right, 3D animation combined with live performance can be enriching. If done wrong, it can be mind-numbing. The process of making new media 3D animation is subjective, as it calls on directors, designers, actors and artists to simultaneously work with what they know and expand their reach. This process is broadly brushed below:

1) idea generation

2) research and concept development

3) art production using materials, tools and techniques

4) critical visual analysis, applied to work in process and to finished work

5) public presentation of the work.

Although 3D animators are primarily focused on art production (#3 listed above), they are bound at the hip, heart and head to the entire process. Once concept drawings and storyboards are complete, the work of 3D animators is normally broken down into the activities that follow below. The better directors and designers understand the components of 3D animation, the better they will be able to think about what, when, where, and how to use 3D animations in new media scenography.

Modeling Characters, Objects And Environments

Modeling is the art of building geometry, that is, constructing wireframe characters, objects, and environments. Most 3D software programs ship with predefined 3D objects, and these primitive objects can then be modeled into more complex forms. This geometry can be organic or geometric. Spline-based modeling and polygonal modeling are both used to create detailed and flexible forms. The tools for modeling number in the hundreds and they can be used at a component level or on entire objects.

It is important for directors and designers to remember that every 3D object must be built. That is, every rock and tree, every doorknob and telephone, every everything must be built. The more realistic the goal, the more geometry that has to be built. 3D animators create unique objects and lush environments, yet for many 3D animators, creating animated characters is their true passion. The phrase, 3D character animation, has been co-opted by the cartoon and advertising industries. Although 3D characters in a live theatrical performance could be cartoons, that is certainly not all that they can be. The art of character animation is the art of creating distinctive and imaginative individuals, with distinct personalities. These characters are not limited to mindless Barbie and Ken clones. Rather they can be complex characters, replete with strengths and weaknesses, built to interact with live performers.

Because 3D modeling is vector-based and utilizes high-speed algorithms, the resulting geometry is exceedingly scalable. This means that an animated 3D puppet could be thirty feet high (with actors dancing in it's belly behind a scrim) in a live performance and then just the puppet's eyes could fill the stage and shift as they follow the actions of live performers. This extreme scale shift happens in 3D space without any pixilation or loss of detail. Once a 3D object is created, then it becomes part of the show's scenographic archive. These 3D objects (visual metaphors) can be pulled from one scene and placed in another scene where they can be modified, duplicated, and even destroyed.

Mike Solo (John Titor), Cyburbia's *Time Traveler Zero Zero*, an MPS workshop production, 2004.
A time machine is lowered into the virtual bed of a 3D animated truck driven by a live actor.

Creating Surfaces

Once characters, objects and scenery are built, they are then "skinned" with a surface. The possibilities in 3D surface texturing are virtually limitless as any surface can be wrapped around any object, both inside a 3D computer animation and on the stage itself. Objects in the physical world are normally clothed in their natural textures. These objects and their surfaces carry associated meanings. For example, a brick wall looks like a brick wall and is usually thought of as a solid structure. If a wall is instead cloaked in honeycomb and flying bees, then the viewer's response to the wall will change. The 3D animator must assign a surface to every object and define the surface attributes such as color, highlight, transparency, reflection, bump, luminance and glow. Still photographs, drawings, "tileable" textures and even videos or other animations can be digitally painted (mapped) on an object's surface.

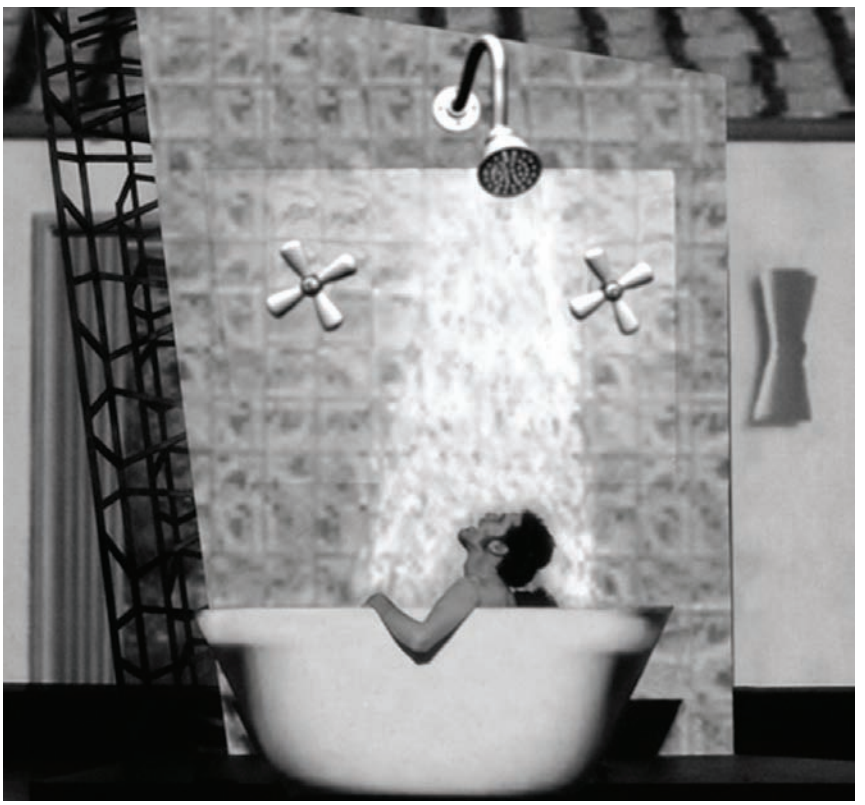
Creative and skillful texture mapping provides the 3D animator with ample opportunities to add layers of meanings to the surface of objects and to create portals to other worlds, real and imagined. This is particularly significant in 3D animations intended for use with live performers. Suppose the walls of a simulated room could change to reflect or reveal an actor's interior thoughts. These animated or living walls might be covered with butterflies that gradually fly away and expose a wall pasted with old newspaper clippings.

Building Scenes

To build a scene, a 3D animator imports all objects and characters, and places them in a virtual environment made of modeled geometry and matte paintings, and sets digital lights and cameras to illuminate and view the scene. The assembled 3D scene must correspond exquisitely with the actors, the set and the stage lighting. The placement, scale and timing of animations must always work with, never against, the live actor. This relationship between actor and animation can take many forms. At one end of the spectrum, the 3D environment serves as a rather static background environment for a scene. At the other end of the spectrum, 3D animations can become virtual actors and literally share a scene with a live actor.

Lighting in 3D animation should correspond to the stage lighting. Colors, levels and directions should match. Illumination, shadows and different kinds of light can be simulated in 3D space. As lighting designers know, without proper light, the actors won't be seen. Lighting is a complex, subtle and imaginative practice. Just as a lighting designer must be able to create the illusion of overhead fluorescent lighting or daylight filtered through

a Venetian blind, so must the 3D artist. 3D lighting has become a highly refined and specialized practice. Global illumination, caustics, high dynamic range imagery and ray tracing provide 3D artists with the ability to create and manipulate imaginative and realistic lights and shadows that far exceeds the capabilities of standard print and motion graphic technologies.



Mike Solo (John Titor), Cyburbia's *Time Traveler Zero Zero*, an MPS workshop production, 2004.
A live actor bathes inside a projected bathtub and a 3D animated shower.

Animating Geometry

Bringing a 3D object or character to life is perhaps the most important and difficult aspect of 3D animation. Characters must have body kinesthesia, be able to anticipate motion, exaggerate motion, and convey meaning through movement. They must also relate and react to live actors and to the stage scenography. 3D animators spend much of their time setting up animation controls and character expressions. They also create motion paths and keyframe events. Timing is as critical in animation as it is in theater. An experienced animator will have (or develop) a sense of timing and be able to synthesize the art of 3D animation with the art of live performance.

High-end 3D software programs contain features such as skeletons, kinematics, deformers, expressions and dynamic curves. These features help animators create realistic and hyper-realistic motion. With dynamics, animators can create and control hair, cloth, and fur. Fluid effects can be used to create substances (smoke, fog, clouds) that change shape over time and react to environmental forces. Since any object can be defined as a "particle" and become subject to the influences of virtual gravity and wind, a 3D animator can make it rain water droplets or rain cats and dogs. Once they clearly understand the capabilities of 3D animators, directors and designers should not hesitate to ask for the wild, the unusual, or the seemingly impossible.

Photo: Ioulia Kouskova.

Kelly Wilson (Elektra), Cyburbia's *Time Traveler Zero Zero*, an MPS workshop production, 2004.

Animating Cameras and Lights

Anything that can be moved in the real world can be moved in 3D space, with and without respect to the laws of physics. Cameras, with custom lenses, can pan, track, dolly, tumble, and zoom. They can have different focal lengths, depths of field, and focus (soft versus hard). Each shot, with its point of view and framing, contextualizes the 3D animation and the live actors. For example, if a director wants an adult on stage to be five years old, then the 3D animator might lower the point of view to a child's-eye view looking up at a room full of mundane objects that appear to be monumental.

Cameras can be assigned to follow motion paths. Directors, designers, and animators should avoid flying through time and space just because they can. Moving cameras should be used sensibly. If the scene requires dashing through the woods, walking through walls, journeying down an esophagus or compressing and expanding time and space, then animating a camera may be a fitting choice.

When done right, 3D lighting gives meaning to objects and characters and creates an environmental atmosphere. The magic of lights in 3D space is that any (or all) of their attributes can be altered at any point in time. Hue, intensity, fall off, and penumbra can be changed with a few keystrokes. Lights can automatically shift location and direction, and with features such as caustics and global illumination, they can be natural, dramatic or otherworldly. 3D animators know that without lights, there is only dark. They also understand that lighter and darker areas can help compose the scene and guide the audience's eyes towards, or deliberately away from, the live actors.

Rendering Images

To render is to draw. In 3D animation rendering is a process where once all of the modeling, texturing, lighting and animation work is done, and rendering parameters are established, the software and hardware crunch away, performing thousands upon thousands of complex calculations as they "draw" each frame for every scene.

Long before the rendering begins, the new media scenographer must determine the final rendering size for each animation. A projection grid, animation template, and in most cases a mask, will need to be made for each projector, and in some cases for each animation, prior to animating and rendering. Unlike video, which is of a fixed and relatively low resolution, 3D animations can be rendered without loss of detail in different formats. Additionally, animations can be rendered at different frame rates depending on the desired output. If an animator chooses a frame rate of twenty-four frames per second, then each minute of the animation will require rendering 1,440 frames. Rendering takes time and animators must carefully calculate their expected rendering times and plan their projects accordingly. Rendering can be spread across multiple machines to speed up the process and additional time must be allotted for quality assurance testing and media compression.

The use of alpha channels, where animated objects can be rendered against transparent backgrounds, is key to integrating animations with live actors. Animated characters and objects that are rendered with alpha channels can literally float in a layer(s) above the background environment. By using show control systems, animations with alpha channels can be scaled and placed in concert with the stage action. These animations can be timed in response to an actor's performance. Live performers can concentrate on the timing of their own performance instead of worrying about having to synch themselves to time-based media.

Compositing, Post-processing and Final Output

After each 3D animation is rendered, shot by shot, then all of the final renders, and in many cases, sound tracks, must still be put together and gotten out to an audience. 3D animators frequently use either video editing and/or motion graphics editing programs for final compositing. These programs can handle a wide range of specialized editing and processing requests, and are relatively easy to use. There are also several extremely high-end compositing and effects programs for those who have the time and the money.

Since the advent of show control systems that support layers of media, it has become not only possible, but extremely practical, to render out the masks for each animation on a separate alpha channel. What this means is that the projected animation can be cropped in relation to the set. The masks can then be adjusted to ensure that the projection precisely hits the surface(s) that they are intended to strike and no part of the image spills onto unintended surfaces. Precise and flexible masking of animations is a basic requirement if projections are to fit seamlessly into theatrical space.

What Is The Future of Live Movies or Digital Theater?

> We don't know who discovered water, but we're certain it wasn't a fish.
>
> — John Culkin, cultural theorist

Artists are quick to put new materials, tools and technologies to creative uses. Since humans first crushed pigments and drew on cave walls, artists have made work reflecting and questioning the events of their lives. New media work requires open experimentation, complete commitment and genuine collaboration. There are no formulas to follow, as each space and each production will present unique creative and technical challenges. With the prevalence of video and motion graphics, many new media scenographers may feel that they have enough tools to use, but others will turn to the art of 3D computer animation as a way of creating extremely expressive and responsive scenography.

Above and beyond the technical aspects of creating 3D animations, lies the experimental practice of merging actors, the built theatrical environment, and 3D computer animations to create a theatrical experience that can be more powerful than any of these art forms alone. If thoughtfully done, the viewer experiences a cohesive whole, a seamless integration of live performance, stage design, 3D animation, and show control technology. These "live movies" inform, anchor, underscore, and shape live performance, as they reflect and expand on human culture.

What makes 3D computer animations such a valuable tool for new media scenographers? The answers lie in the numerous ways 3D animations can be used to simulate real and imagined objects, the ways these objects exist in perspective space, and the ways they can move dynamically in relation to live performers. Since 3D animation is done on a computer, there is often a focus on the technical, yet many animators started as either visual or performing artists prior to entering the field of computer animation. 3D animators must strike a balance between artistic concerns and technical skills. If directors and new media designers grasp the core concepts of 3D animation, then they can productively explore the creative possibilities of combining 3D animation with live performance. Digital artists know that knowledge of the technical brings both artistic freedom and responsibility. The freedom allows for new theatrical worlds to be imagined and realized. The responsibility is to create scenographic worlds that bind the audience to the live performance, and reflect, expand, and in some cases, shape world cultures.

Over the past couple of decades, digital video technology has opened up possibilities for independent artists to create movies, and now that 3D computer animation is within the reach of experimental animators, new areas of creative practices such as "live movies" and "digital theater" are popping up on the global landscape. Yet, most directors, designers, and actors who work with new media theater are not technophiles. Many are acutely aware that one side of the new technology coin can be used to save lives and enrich minds, while the other side can used to destroy lives and numb minds. Rather than using technology for technology's sake, they turn to new media technologies as a means of persuading audiences to think about who humans are and who/what they might become.

3D animation is at the center of the hyper-real, simulated, televisual world that most Americanized humans experience on a daily basis. 3D animations are used in high-end advertising campaigns, feature films, TV shows, cartoons and computer games. They surround us and we consume them, and their covert and overt messages, without much critical awareness or thought. They seduce us with their illusion of perspectival space, rich textures, and hyper-reality, and often make us temporarily forget the past and the present. Then why bring 3D animations into the inner sanctum of live performance? Because 3D animations are part and parcel of the mile-wide, inch deep, media-crazy world most theater-going audiences live in.

In live theater, 3D technology can be used to inform and critique (not just entertain and sell). Directors and designers recognize that new art forms can provide them with new artistic freedoms, but that with these freedoms comes mindful responsibility. Instead of creating mindless entertainment, they hope, by combining elements from the popular digital technosphere, from 3D animations to robotics and sound sampling, to open doors for 21st century spectators into the historical, social and philosophical concerns with which most good theater has always been preoccupied.

For sources see "3D Animation" in Suggested Reading, page 224.

KIRBY MALONE

PROJECTION AND PROJECTORS: NATURE, DREAMS AND TOOLS

Would Shakespeare have used projections? They would have made his ghosts and storms and battles and moons a lot easier to stage. They can bring nature indoors, so to speak, but that's not what they're best at. What they are best at is poetic suggestion, ambiguous characterization, radical juxtaposition. They can make it rain, televisually, but they can also crawl inside a character's body, or dreams.

It has only been over the past ten years that video projectors have become capable of operating artistically on the stage; until then, their images were so muddy, and their light so dim, that they were all but useless. We happen to live in the "interesting time" when advances in projection fortuitously coincide with the same in image and video creation and processing. So how do we turn this confluence into tools of art?

Because with the exception of the Multimedia Performance Studio and a few other programs across the country, there are not many places where you can study and train in the art of projection for the stage, and because there are very few (if any) books on the subject (yet), *you have to teach yourself*, you and your friends and collaborators. To greater and lesser extents, you'll have to become a filmmaker, a lighting designer, a video technician and a new media artist of digital "applications" (this makes it ever clearer why and how this field is as collaborative as they come). And where will you turn to begin to teach yourself? To the World Wide Web, of course.

On the next page is a series of web links that should get you started. If you read, absorb, and follow the links in these articles and web pages, delve into some of the titles in *Live Movies*' Suggested Reading bibliography, read the essays in the "Production/Practice" and "Technics" sections, and research the vendors listed at the end of this book, you will have what amounts to the beginning of a course in Projection for Live Movies 101.

When you begin to look into projectors, you will find they are made for two "markets": "home theater" or "professional." You will also find that projectors are grouped mostly into two types, LCD (liquid crystal display) and DLP (digital light processing). A new third format, LCOS (liquid crystal on silicon) is beginning to appear. Projectors usually are ranked by lumens (brightness), and, increasingly, contrast ratio (this latter refers to the comparison of the black and white extremes of the projected image — without high contrast ratio, there's no such thing as anything like a true "blackout" onstage; instead you get a sort of sickly digital gray, in which actor entrances and exits, and scene changes, are excruciatingly visible).

Photo: Ioulia Kouskova.

Maria Rio (Mary), Cyburbia's *Time Traveler Zero Zero*, an MPS workshop production, 2004.

Throughout the 2000s, Evan Powell at Projector Central has been updating a series of excellent articles which analyze and compare LCD and DLP:

www.projectorcentral.com/lcd_dlp_update7.htm

You can also find out more about DLP, by going to the source, Texas Instruments (who invented and proprietarily develop the technology):

www.dlp.com/dlp_technology/dlp_technology_overview.asp

As you evaluate LCD vs. DLP, always keep contrast ratio in mind. Until recently, most LCD projectors have had paltry contrast ratios of something like 250 or 400:1, while DLP projectors typically have much higher contrast ratios (see the XD300U below). You will also find features such as resolution, aspect ratio, inputs, machine noise, zoom lens range, etc., that you will have to take into account in making your decisions. The projector manufacturer Christie has a very good set of web pages (which they call Projection 101) that will provide you with details on these features, and how to think about projectors and projection in general:

www.christiedigital.com/projection101/theProjector/introduction/introduction.asp
www.christiedigital.com/projection101/glossary/index.asp

Christie is one of the largest manufacturers of video projectors; another is Barco, whose web site also contains useful information: <http://barco.com>. Since your head will swim when you begin to decide which projector(s) to buy, while I hesitate to give a plug to any particular manufacturer, I think it would be helpful to recount MPS's experiences with one that we've found very useful as a "studio" projector, the Mitsubishi XD300U. The XD300U is only ranked with 2100 lumens, but it more than makes up for this with its staggering 2000:1 contrast ratio (and its unheard of 4000 hour lamp life). While not strong enough to fill a 30-foot wide stage satisfactorily (for which you most likely will need a projector of *at least* 4000-5000 lumens), we have found it quite impressive for many other purposes (demonstrations, rehearsals, and as what we have come to call a "special" projector, borrowing the term from lighting, used to project onto small sections of the set, or on actors' bodies). You can find out more about this projector at:

www.mitsubishi-presentations.com/
www.projectorcentral.com/mitsubishi_xd300.htm

If the (or a) future of theater features projections, the future of projections is the moving projector, pioneered by High End Sytems with the invention of its DL1 (now DL2) fixture (which does for projection what so-called "intelligent" moving lights did for lighting). <http://www.highend.com/products> The DL2 operates with the Catalyst media server, which leads us to the subject for our next session: media servers. And the suggested reading for that session is Bob and Colleen Bonniol's June 2004 overview at *Live Design*:

http://livedesignonline.com/ar/lighting_media_frenzy

The Bonniols do not cover the workhorse of current practice in projection control for theater, Dataton's Watchout , <www.dataton.com/products/3150/#3150> (see Eric Brody's "Show Control" in this book), and some of the servers they do cover (with their high price tags and banks of "canned" cyberdelic imagery) seem more suited to VJ's in a dance club than to multimedia theater designers, but this article will help you begin to develop the tools of thought with which to process all the info that will be coming at you.

MULTIMEDIA PERFORMANCE STUDIO

NEW STAGE TECHNOLOGY PROJECT RESEARCH LOG

2001-2005

This log documents the research conducted by Multimedia Performance Studio (MPS) for its "New Stage Technology Project," awarded a Resources for Change grant from the National Endowment for the Arts, in September 2001. The research detailed here was conducted between September 2001 and November 2005. The focus of the final six months was creating and assembling this field guide, *Live Movies*.

The activities outlined below were carried out by more than 150 artists, designers, scholars, technicians and others. These include MPS resident artists, guest artists, and faculty, staff and student artists (both graduate and undergraduate).

MPS's work is by nature interdisciplinary, both among the arts, and between the arts and other disciplines, and is grounded in collaboration and collective creation. MPS takes as its models such groundbreaking experiments in art-making and arts education as the Bauhaus and Black Mountain College. Artistic, technical, social and historical research provide the basis for experimental workshops and productions that merge new media technologies with live performance, for theater, opera, music theater, dance theater, performance art and "live movies."

The research conducted for the New Stage Technology Project was directed toward the creation of this book as a resource offered to a field that is still feeling its way, as we can all benefit from each others' discoveries if we're able to convey them, and hear each other's, too. From this research we have assembled this multimedia expression (in book form, online and on disk) of our findings, and, more importantly, our questions. These questions inspire us to continue to focus on the creation of new stage forms for the 21st century. We welcome your feedback, and your participation.

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SUMMARIES OF PROJECT COMPONENTS

• **Multimedia Opera Workshop**: director Kirby Malone, multimedia designer Gail Scott White, stage manager Kira Hoffmann and production manager Dan Hobson, in collaboration with Russian-American painters Komar & Melamid, New York composer (and Columbia professor) Dave Soldier, German conductor Sybille Werner, Italian librettist Maita di Niscemi, a small chamber orchestra and an ensemble of singer-actors. Harris Theatre, Fairfax VA. (Fall 2001)

> Experimentation with digitally animated oil paintings interacting with a conductor, musicians and vocalists, and moving scenery; "show control" testing of miniDV decks for image sequencing and live mixing.

• **Multimedia Dance Workshop**: multimedia designer Gail Scott White in collaboration with choreographer/dancer Jane Franklin, multimedia theatrical adviser Kirby Malone, and production manager Dan Hobson, Center for the Arts Concert Hall stage, Fairfax VA, and Dance Place, Washington DC. (November 2001)

> Exploration of dancers in shadowplay filmed in digital video, projected in montage with roadside location video, interacting with live dancers.

• **Research Trip to Duke University to Observe Multimedia Theatrical Adaptation of Don DeLillo's Novel, *Mao II*:** project directors Kirby Malone and Gail Scott White attended performance, observed technical configuration of the excellent multiple projections onto unconventional surfaces (wire mesh, crumbled plaster). Met (and continue to correspond with) the production's adapter/producer/director, Jody McAuliffe, and the video designer, William Noland, who has traveled twice in reciprocal visits to Fairfax for further ongoing discussions, a comparing of multimedia designers' notes, so to speak. Both McAuliffe and Noland are professors at Duke, Theater/English and Visual Arts, respectively. Duke University, Durham NC. (April 2002)

• "**Bodies-as-Screens" Multimedia Workshop**: multimedia designers Gail Scott White and Kirby Malone, in collaboration with actors Liana Camper-Berry, Chris Parsons and Amelia Winger-Bearskin. Multimedia Performance Studio, Fairfax, VA. (Summer/Fall 2002)

> Experimentation with digitally filming and photographing actors with video projected onto their bodies, creating prototypes for interactive "projected characters."

• **Multimedia Performance Scenographic Research and Brainstorming Sessions** with artistic director Benny Sato Ambush, director Rick St. Peter, set designer Ron Keller (of Virginia Commonwealth University), and multimedia designers Gail Scott White and Kirby Malone. TheatreVirginia, Richmond VA. (Summer/Fall 2002)

• **Extensive and intensive research into the state of the art of video projectors** by Kirby Malone and Gail Scott White, including consultation with Sid Lissner of Audio-Visual Washington, a local media equipment supplier, and with projections designer Ruppert Bohle (who lived in N. Adams MA, but has now returned to Germany): comparisons of LCD (liquid crystal display) and DLP (digital light projector) systems, lumens (brightness), contrast ratio and other features (as they relate to the use of projectors in the performing arts, particularly companies and ensembles working with limited budgets, one of our chief concerns in all our research). AudioVisual Washington, Sterling VA; Mason Media Lab and Harris Theatre, Fairfax VA. (Ongoing 2002-present)

• **Multimedia Scenography/Lighting Design Research Sessions** with lighting designers Richard Winkler and Eric Chenault, director Kirby Malone and multimedia designer Gail Scott White, at Winkler's studio in New York City. (Jan. and May 2003)

• **Discovering High End Systems' Catalyst and DL1:** at the introduction of lighting designer Richard Winkler; project directors Kirby Malone and Gail Scott White, and lighting designers Winkler and Eric Chenault, met with Lee Magadini, NY Regional Manager for High End Systems, one of the premiere manufacturers of theatrical lighting equipment (especially so-called "intelligent" moving lights) in the world. The goal of this visit was to research and work with High End's new Catalyst and DL1, "dream machines" for multimedia performance: the Catalyst instrument combines the kinetic flexibility of an intelligent light with video projection; with the DL1 media server, moving images can travel across a stage, rotate, scale/zoom, change color and intensity, and are stored and controlled through a "dedicated" Apple Mac G5. We also began discussions of mutual creative and technical interests, laying the foundations for possible future arrangements to work with the system in George Mason's Harris Theatre, where MPS regularly creates and develops new work and research projects. High End Systems, New York City. (Jan. 2003)

> Experimented with image control and processing, brightness, contrast ratio, mobility, operation, projection onto a range of surfaces, media server controls, synchronization with imported applications, etc. At Lee Magadini's request, we presented documentation of MPS productions and projects with innovative projection systems.

• **Multimedia Opera Workshop**: multimedia designers Gail Scott White and Kirby Malone in collaboration with Encompass New Opera Theatre, director Nancy Rhodes, set designer John Scheffler (Brooklyn College), and a chamber opera ensemble. Scheffler's studio and Encompass, Brooklyn, and Connelly Theatre, Manhattan, NYC. (Winter 2003)

> Experimentation with DVD players, video switchers and LCD monitors, for image show control, with projections onto multiple set elements and the studio floor, interacting with singer-actors.

• **Opera America's "New Media for New Opera" Forum:** Opera America's Executive Director, Marc Scorca, invited project directors Kirby Malone and Gail Scott White to showcase and discuss some of the findings and discoveries of the research outlined here. Plaza Hotel, New York City. (Spring 2003)

> This forum was organized by Opera America in order to educate a gathering of producers of "new opera" from across the country about the scenographic and dramatic promise which "new media" hold for groundbreaking stagings of, and approaches to, innovative opera and music theater.

• **Multimedia Performance Research Session** with Whit MacLaughlin, artistic director of New Paradise Laboratories, multimedia designer Gail Scott White, director Kirby Malone, Philadelphia PA. (Spring 2003)

> Discussed prospects for development of multimedia production in the context of ensemble theater. (MacLaughlin was a founding member of the Bloomsburg Theatre Ensemble in Bloomsburg PA.)

• **Multimedia Scenographic/Montage Research Discussion** with Peter Greenaway, British director of film and opera; Peggy Parsons, Film Curator, National Gallery; Kelly Gordon, Film Curator, Hirshhorn Museum; project directors Kirby Malone and Gail Scott White. Hirshhorn, Washington DC. (Spring 2003)

> Discussed Greenaway's mammoth film "project," *Tulse Luper*, an ongoing development of interactive multimedia modules that connect film, history, and popular (especially visual) culture. Also discussed his earlier films, his narrative and montage structures and experiments, his collaborations with composer Michael Nyman and others, and his theories on visual culture.

• **"Avant Beyond" Multimedia Performance Series**: project directors Kirby Malone and Gail Scott White conducted research for, and annotated compilation of, a series of more than thirty companies, ensembles, solo performance artists, musicians and others engaged in multimedia performance, such as Meredith Monk, Robert Lepage's EX MACHINA, Anne Bogart's SITI, Ping Chong, John

Kelly, Theodora Skipitares, DJ Spooky, PJ Harvey, New Paradise Laboratories, Michael Franti and Spearhead, Janie Geiser's Puppets and Ridge Theater. This series is conceived for the Center for the Arts complex's Concert Hall, Harris Theatre and Theaterspace; it is intended to increase and enrich the audience for these adventurous artists creating the future(s) of the performing arts, by presenting and producing the work in a series, "Avant Beyond," rather than as isolated, individual events among more "mainstream" fare. (Summer/Fall 2003)

• **Multimedia Scenography Workshop** with lighting designer Dan Hobson, stage manager Kira Hoffmann, director Kirby Malone, multimedia designer Gail Scott White, assistant director Chris Parsons, and an ensemble of eight singer-actors and seven musicians, Harris Theatre, Fairfax VA. (Jan. 2004)

> Exploring the integration of moving scenic elements (wagon stages, scrims, etc.) with multiple-projector video animation and live performance. Experimentation with plotting set design coordinates for aligning projections to set units. Developed and refined projection grid prototypes, tested color contrast on a range of projection surfaces, and investigated moving images in real time, in response to performers' movements.

• "**Community of Practice" Web Site**: web designer Pat Kelly, director Kirby Malone, and multimedia designer Gail Scott White began developing a template for a web site designed to serve as an interactive tool for the collective creation and design of complex, multimedia projects. This template is adaptable to performance art, new opera and theater, multimedia dance and installations, films and videos, etc. The site will enable multiple teams of artists to communicate with each other, and exchange storyboards, schedules, shot lists, rehearsal notes, contact sheets, images, sound files, scripts, etc.

This site is complemented by the ongoing development of a cyberculture web site, archiving annotated entries on theater, performance, new media and music, films and literature, as a tool for enriching cultural/visual literacy for artists, scientists, engineers, scholars and technicians creating new forms of multimedia performing arts. Mason Media Lab, Fairfax VA. (Ongoing 2003 to the present)

• **3D Animation Set Model Workshop**, directed by animator/multimedia designer Gail Scott White, in collaboration with animator Tate Siev Srey, and in consultation with director Kirby Malone and lighting designer Dan Hobson. Mason Media Lab and Harris Theatre, Fairfax VA. (Winter 2004)

> Employing the 3D application Maya (the same technology used by such Hollywood films as *Toy Story* and *Finding Nemo*), developed new approaches to, and examples of, "pre-visualizing" numerous versions of scenic designs in "cyberspace," in concert with miniature tabletop models and storyboards, before actual construction begins.

• **Multimedia Architectural and Design Discussions** with architects Geoff Pingree, Ben Kishimoto and Steve Ziger, and designer/engineer Warren Arbogast, Fairfax VA. (Spring 2004)

• **Animatronic Research**: in order to explore the possibilities of incorporating robotic or animatronic characters and creatures into live performance, which could be programmed and triggered to perform in a lip-synched manner, director Kirby Malone met with Sean Luke, Tate Siev Srey and Chad Nelson of the Robotics Club (of George Mason University) to research the basics, logistics and challenges of "low-tech" robotics. Researched the mechanical, hydraulic, electrical, computer and other systems which typically make up the basic robot. (Spring 2004)

• **Multimedia Costume Workshop** with New York costume designer Paul K. Stolen, experimenting with costumes, wigs and special makeup as projection surfaces. Fine Arts Gallery and Harris Theatre, Fairfax VA. (Spring 2004)

• **Digital Audio Workshop** at The Basement Recording Studio (Fairfax VA) with producer Chris Andrews, producer/director Kirby Malone, composer/sound designer Sean Lovelace, composer/soprano Amelia Winger-Bearskin, and actors Mike Solo, Joshua McCarthy and Brianna Moran. (Winter/Spring 2004)

> Experimenting with compositions and sound designs incorporating sound samples, electronic instruments, acoustic instruments and vocals. Also developed new techniques for performing dialogue among live, recorded and lip-synched voices, creating and developing an aural "cinematic device" for theatrical performance.

• **Research Discussions with Rosco, Inc.**: project directors Kirby Malone and Gail Scott White met with Josh Alemany, lighting designer and Director of the Lighting Division for Rosco, Inc., a leading manufacturer and supplier of theatrical supplies (gobos, gels, scrims, other soft goods, etc.). Josh expressed his interest in our feedback as he helps chart Rosco's ventures into the "digital age," developing new theatrical products and services. A prominent subject of the discussions with Josh, and with lighting designer Richard Winkler, has been the development of a superior scrim for today's (and tomorrow's) video projections, which would retain the semi-transparent qualities of traditional scrims and gauzes, while providing a much brighter projection surface. We have theorized coating fibers with movie screen paint and possibly fabricating prototypes. Washington DC. (April 2004—discussions are ongoing.)

• **Multimedia Scenography Workshop** with lighting designers Richard Winkler and Dan Hobson, stage manager Kira Hoffmann, director Kirby Malone, multimedia designer Gail Scott White, soprano Kelly Wilson,

assistant director Chris Parsons, and an ensemble of ten singer-actors and five musicians, Harris Theatre, Fairfax VA. (May/June 2004)

> Exploring the integration of scrims, gobos and other scenic/lighting effects with multiple-projector video animation and live performance.

• **Multimedia Costume Workshop** with Richmond designers Terral Bolton and Stephanie Lundy, and project directors Gail Scott White and Kirby Malone; further experimentation with costumes as projection surfaces. Fine Arts Gallery and Harris Theatre, Fairfax VA. (Summer/Fall 2004)

> Tested projections onto an array of costume materials, from matte to reflective, and explored possible designs for costumes that can conceal and reveal projections.

• **Ventriloquist Dummy/Sampled Voice Workshop**: Sculptor Robin Hernandez created a life-size ventriloquist's dummy, modeled on Alexander Graham Bell, for MPS to experiment with as a lip-synched character; with director Kirby Malone and composer/sound designer Sean Lovelace, experimented with vocal sound samples synched with the dummy's jaw mechanism, and other movable parts. Such a "character" or "performer" holds promise as a counterpart or foil to live and projected characters. Yellow House Studio, Falls Church VA. (Summer/Fall 2004)

• "**Show Control" Workshop** with German projections designer and programmer Ruppert Bohle, director Kirby Malone, multimedia designer Gail Scott White, and multimedia artists Pat Kelly and Eric Brody. Mason Media Lab, Fairfax VA. (Summer 2004)

> Comparative testing and exploration of the interactive media server Dataton Watchout, DVD players, and miniDV players for projection show control. Research into media development, compression, serving and live streaming.

• **Digital Sound Sampling Workshop** with composer Sean Lovelace, director Kirby Malone, multimedia designer Gail Scott White, and soprano Kelly Wilson. Mason Media Lab, Fairfax VA. (Summer 2004)

> Exploring the integration of sampled sounds with live instruments and vocalists amplified by wireless microphones.

• **3D Animation Workshop**: directed by multimedia designer Gail Scott White, collaborating with assistant multimedia designer Rebecca Kimmel, director Kirby Malone, and a team of twenty multimedia artists and animators

that included guest artists, undergraduate and graduate students, and seven student animators from Ewha Women's University (Seoul, Korea). Mason Media Lab. (Summer 2004)

> Experimented with approaches to combining 3D animation with live performers, including interaction, settings and backdrops, projected texts, shadowplay, dreamscapes, etc. Developed simulations and prototypes for working with alpha channels, particle dynamics, interactive 3D characters, and digital storyboards.

• **Multimedia Scenography/Performance Workshop** with director Kirby Malone, multimedia designer Gail Scott White, lighting designer Dan Hobson, stage managers Kira Hoffmann and Liz Welke, assistant director Chris Parsons, composers Kelly Wilson, Sean Lovelace, and Grant J. Wylie, and an ensemble of eight singer-actors and three musicians, Fine Arts Gallery and Harris Theatre, Fairfax VA. (Summer/Fall 2004)

> Exploring the integration of moving scenic elements (front and rear-projection, revolving turntables, rolling screens, scrims, globes, suitcases, costumes, etc.) with multiple-projector video animation and live performance.

• **Multimedia Venues/Network Research Discussions** with Olga Puntus, Belorussian theater artist; also a lawyer at the World Bank (Washington DC). She is meeting with MPS to explore European, Asian and other festivals, centers, theaters and other venues for future tours of MPS productions, and to begin to create a database of such venues for the project's web site-in-the-works. Meetings in DC and Fairfax. (Fall 2004)

• **Multimedia Performance Research Sessions** with John Spitzer, Artistic Director of Fraudulent Productions (Washington DC), multimedia designer Gail Scott White and director Kirby Malone. MPS, Fairfax VA. (Fall 2004)

> Discussed historical precedents for multimedia performance, particularly Russian and German Theater of the 1920s.

• **Multimedia Scenographic and Performance Workshops**: ongoing, periodic workshops continuing the research conducted thus far, involving director Kirby Malone, multimedia designers Gail Scott White, Rebecca Kimmel, Eric Brody and Pat Kelly, lighting designer/production manager Dan Hobson, stage managers Kira Hoffmann and Liz Welke, lighting designer Richard Winkler, composers Sean Lovelace, Kelly Wilson, Grant J. Wylie, Matt McGarraghy and Viraj DeSilva, actors Mike Solo, Prince Rozario, Chris Parsons and Jen Haefeli, and other guest artists, graduate and undergraduate student artists, and alumni artists. Mason Media Lab, Fine Arts Gallery and Harris Theatre. (Jan.-August 2005)

• **Prototype Design for a Multimedia Theater**: MPS artists Kirby Malone, Dan Hobson, Gail Scott White, Kira Hoffmann and Mike Solo researched, and collectively speculated at length on, ideas for an "ideal" Multimedia Theater. [See Diorama plans.] (May 2004-September 2005)

• **Multimedia Research Sessions** with Darlanne Fluegel, actress, and professor in the School of Film and Digital Media at the University of Central Florida in Orlando, multimedia designer Gail Scott White and director Kirby Malone; focused on ways in which new media performing artists can help bring together other artists and educators in Film, Theater and Digital Media Programs, MPS, Fairfax VA. (Summer 2005)

• **Broadway Projection Master Classes (BPMC):** projection designer Wendall Harrington invited MPS directors Kirby Malone and Gail Scott White as guest artists to the first annual session of BPMC, sponsored by *Live Design* (formerly *Entertainment Design/Lighting Dimensions*) and modeled on the Broadway Lighting Master Classes. Malone and White's multimedia work for MPS and Cyburbia was featured in Harrington's video, *Projection Design: An Overview*, which was screened at the conference, perhaps the first such gathering of projection and multimedia designers and new media artists, from across the country and abroad. Also at the conference, Malone and White met with Craig Burross of High End Systems, reviving past discussions exploring possibilities for MPS to experiment with High End's Catalyst and DL1 (now DL2). Tribeca Performing Arts Center, New York City. (June 2005)