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Project Number: SV DT45 -53

Monster Technology:

The Creation of Theatre Technology for Stage Adaptation of *Frankenstein*

An Interactive Qualifying Project


submitted to the Faculty

of the

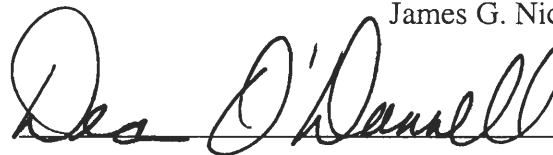
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## **1. Abstract**

MONSTER TECHNOLOGY designed and created the technical effects for the B term 01 WPI production of Frankenstein. Appropriate technology was researched, employed, and often, new technology was created to achieve the effects for the world premiere production of Joseph Romagnano's original adaptation of Mary Shelley's novel. The results section of the project report describes, and offers electronic access to each technology cue for the production. The necessary personnel may then apply the effect as offered in this project when the performance debuts in November.

## 2. Introduction

The Frankenstein IQP made use of several of the most current and state-of-the-art sources to create brand new technology in the theatre field. The goal of the project was to define, create, and in some cases invent the technology needed to produce the award winning MQP adaptation of Mary Shelley's *Frankenstein*, completed by Mr. Joseph Romagnano. The challenge of the project was to create the live presence of the monster in the story, without an actor cast in that role; the monster was created solely through the use of theatre technology.

So how does one go from a written script with a sizeable role for the nameless monster, to a live performance of the same script, without casting an actor in that role? This was completed using four basic steps. First, the design of the set to be built for the performance was made, as many of the effects created are dependent on the set design. Next, after the set design was complete, a list was made of all cues that needed to be created, based on the script. A cue is any reference made in the script to some kind of effect (change in lighting, a sound, etc.) or any other place in the script where the director feels an effect is needed. Each cue was discussed with the director and director of technology; then each cue was created. Finally, all of the cues have been created, and they must be divided up and given to the appropriate implementers, such as the master carpenter, master electrician, lighting designer, etc. It is important to note that at the completion of the project, the number and types of implementers will have to be carefully examined to determine whether the creation of new technology will also require the creation of new production positions to manage that technology.

The technological tools that were at our disposal to create this monster are lighting, sound, projections, and also technology previously used in modern and all prior periods of theatre history, including ancient, medieval, Elizabethan, and 19<sup>th</sup> and 20<sup>th</sup> century innovation. In order to incorporate the era in which *Frankenstein* was written, the newest technologically-based effects created in this project had to be balanced with those that are historically accurate for theatre of the 19<sup>th</sup> century. Eventually the results of our project will be shown to the WPI community in the performance of the show during B term 2001.

This script, and the novel originally written by Mary Shelley, both provide an intriguing topic for this IQP because of the issues raised in the story relating to the creation new technology, and the advancement of previous work. In the story Victor *Frankenstein*, in his overwhelming desire to advance the works and realize the dreams of his role models and professors (Cornelius Agrippa, Albertus Magnus, and Professor Waldman, to name a few), he loses sight of what he is creating and the consequences of creating it. He unleashes a monster upon the world. This monster destroys not only Victor, but also everything that he loves. This gripping tale raises important questions to consider when doing this project or any project involving the advancement of technology: What will be the effect of the work be? Will my work really enhance the field of study? Does newer technology necessarily mean better technology? What will the work be used for? These are the questions and issues that are relevant anywhere, but especially here at WPI, where technology becomes such an accepted part of the everyday lives of the students, faculty, and staff. For a WPI student it is easy to learn the material needed to go out into the work world and get a job. Yet sometimes the same student never learns the

ability to take a step back and look at how that work fits into the big picture, or how it affects those around him. That is in essence was one of the main challenges of this project. The knowledge is there, the technology was created, but figuring out the right balance, one that will benefit the entire production, remains the major work of this project.

### 3. Literature Review

The literature for this project is organized into three sections: 1. the script and materials relevant to it, 2. theatre technology literature, and 3. our own theatre experience through both outside performance activities and Department of Humanities and Arts academic productions. Each section is important in its own right and all of the sections combine as preparation for this project.

#### 3.1. The Script

The WPI Masque and Department of Humanities and Arts major academic production for the year 2001 is Joseph Romagnano's play adapted from the novel by Marry Shelley, *Frankenstein*. All of the technology for the world premiere production shall be produced by this Interactive Qualifying Project. Therefore the script is the most important piece of literature to be familiar with in preparation for this project.

The adaptation was created as part of Romagnano's Major Qualifying Project under the advisement of Dr. Susan Vick. The abstract read:

The primary goal of this project was to adapt Mary Shelley's *Frankenstein* into a first draft play script. The script must also contain as much of Shelley's original language as possible. Three versions of the text were used in conjunction with appropriate background material. Drawing from these sources a thorough adaptation of the novel was executed.<sup>1</sup>

The project won second place in the Provost's MQP Awards for Humanities and Arts. Suffice it to say the project achieved its goals. The script lends itself very easily for use as the basis for our project. In fact, the project produced a play that was:

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<sup>1</sup> Joseph F Romagnano, (*Frankenstein A Play Adapted From the Novel*. Worcester, MA: 2000), ii.



Written to deliberately exploit a relative newcomer to the theatre: the cinema. The use of digital video, audio, and projection allows for scenes to take place that would normally be difficult or impossible to replicate on the stage... Among the theatre community at WPI the use of digital media has come to be known as “virtual reality” or “VR.” The combination of VR along with traditional effects allows the audience to be immersed in a sea of sensory images.<sup>2</sup>

That’s all well and good, but this project group will be trying to avoid the “intentional fallacy,” the criticism term used to describe the error of assuming a text means what its author intended it to mean or assuming intention from the playwright at all. Wimsatt and Beardsley suggest “that even when we have statements about the author’s intentions (such as diary entries, critical essays, or new works from living authors), the text means only what it says.”<sup>3</sup> This is taken to another level for our situation because the author is a simple phone call or email away. As our IQP group is working on an academic project, we will take the previous project’s recommendations (from the author) under advisement, but only advisement. Our IQP goal will involve inductive reasoning from clues in the script and through the advice and consent of our project advisors.

### **3.1.a. Synopsis**

*Frankenstein: A Play Adapted from the Novel* introduces Mary Shelley into the larger frame of the story.<sup>4</sup> The play begins when a group of five friends sit around a blazing wood fire. The weather outside is particularly nasty this day and the five resort to

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<sup>2</sup> Ibid, iv.

<sup>3</sup> Jack Lynch, *Glossary of Literary and Rhetorical Terms*. Available via internet at: <http://www.english.upenn.edu/~jlynch/Terms/Temp/intentional.html>. [May 31, 2001].

<sup>4</sup> Romagnano, v.

reading German ghost stories to amuse themselves. Upon suggestion of one of them, the five agree to a contest. The winner of the contest will be the one who creates the most horrific tale.<sup>5</sup>

Mary Shelley belongs to this group of friends sitting around the fireplace, and later that night she begins to dream. She dreams of a man driven by scientific passion to bestow life upon a corpse. The yellow, watery eyes of the creature stared at his creator, in fact looking right at Mary. The true horror of the story lies in the actions of not only the monster, but also the creator. Soon after he creates the monster Victor runs away and hides, abandoning the monster.<sup>6</sup>

From the point of the monster's abandonment, the script then follows the paths of both monster and his creator, and we see the pain that each is capable of inflicting upon the other. The monster eventually observes a small family and learns to speak, read, and, through watching their interactions, about morality, something his creator never taught him. That morality is destroyed as the monster encounters more people and loses some of his innocence with each interaction.<sup>7</sup>

The adaptor has woven together three different levels to dramatize the work. The first level contains Shelley and her friends around the fire and subsequently the creation of the story of an icebound ship headed for the North Pole. Upon this icebound ship the second level takes place. The ship serves as the location for Victor's recollection to the ship's captain of creating the monster and the events that followed. This recollection of events comprises the third level of *Frankenstein*, and contains the events of the monster's

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<sup>5</sup> Ibid, vi.

<sup>6</sup> Ibid.

<sup>7</sup> Ibid, vii.

journey. Shelley creates Victor who creates the monster, a story, within a story, within a story.

When the level of the icebound ship and Victor and the monster’s journey intersect, the play reaches a climax, Victor dies, the monster flees, and “we hear flames and screams as the Nameless Monster dies and the stage is filled with fog.”<sup>8</sup> The play ends as Mary and Victor’s level interact and “smoke begins to rise up out of the embers”<sup>9</sup> followed by a technical montage as the finale.

### 3.1.b. Cue List

Working from the script, the project group has derived the following list of cues that will need to be created for *Frankenstein*.

Cue #	Page #	Name	Type (Audio/Projection/Montague)
1	4	Opening Tech Effect	M
2	4	Prologue Open	A
3	5	Prologue->Scene 1	M
4	6	Figure/Dogs dying	A/P
5	7	Crashing Shake	A
6	7	Scene 1 -> Scene 2	A/P
7	8	Start of Victor's Dreams	M
8	8	Dream Transition	M
9	9	Dream Transition	M
10	9	Monster's First Appearance	M
11	11	Van De Graf	A/P
12	11	Monster Whisper	A
13	13	Scene 2 -> Scene 3	P
13a	14	Voice over Narration	A
14a	15	Move Voice Over	A
14	15	Scene 3 -> Scene 4	M
15	15	Long Knocking	A

<sup>8</sup> Joseph F Romagnano, (*Frankenstein A Play Adapted From the Novel*. Worcester, MA: 2000), 72.

<sup>9</sup> Ibid.

16	19	Scene 4 -> Scene 5	M
17	19	Monster --- BIG!	M
18	20	More Monster	A
19	20	Eyes	P
20	20	Floor boards	A
21	20	Monster running.	A
22	21	Scene 5 -> Scene 6	M
23	21	Voice over	A
24	23	Move Voice Over	A
25	23	Scene 6 -> Scene 7	M
26	26	Monster Eyes	P
27	26	More Monster Eyes	P
28	27	Footsteps/Shadow Monster	M
29	27	Fleeing Shadow	P
30	28	Monster Eyes	P
31	28	Thumping	A
32	29	Projection of cottage	P
33	30	Horses	A
34	31	Monster talking/Hand	M
35	32	Monster and old man	A
36	33	Torch light/wind howl	A/P
37	34	Scene 7 -> Scene 8	A
38	35	Horses	A
39	36	Monster and Victor	A
40	38	Court Room	A
41	41	End Act 1 "curtain closer"	M
42	42	All of Scene 1	M
43	47	Scene change from night	P
44	47	Carriage Kiss	A
45	49	Clock Chimes	A
46	50	Voice over	A
47	52	All of Scene 4	M
48	54	Scene 4 -> Scene 5	P
49	55	Scene shift/Body	M
50	58	Scene 5 -> Scene 6	M
51	58	Monster Voice	A
52	60	Monster Eyes	P
53	64	Scene 7 -> Scene 8	M

54	66	Victor/Monster	M
55	68	Scene 8 -> Scene 9	A/P
56	68	Monster Laugh	A
57	71	Monster and Roger Walton	A/P
58	72	Final Montague	M
59	72	Ending Technical Effect	M

## 3.2. Theatre Technology Literature

### 3.2.a. Audio

“Audio can be used as a tool to set moods and evoke feelings. It can add realism to a production which can help to further immerse an audience member in the theatre experience.”<sup>10</sup> The text of *Frankenstein* lends itself very well to a rich audio design. In fact, the very first technical effect that the script calls for is “*Outside it is pouring rain with flashes of lightning and thunder in the distance.*” (see section 3.1.2 – Cue list for details) Indeed, the audio design and audio effects we create for the premiere production of *Frankenstein* will be very important.

Audio effects enhance a production primarily in three ways:

1. *Documenting time, place and action.* This includes the city, country, and location of the scene; the specific climate conditions; the time of year and day; the specific events in the dramatic action.
2. *Providing specific atmosphere.* This enhances the believability of the environment. Street sounds, fog horns, bird sounds, and similar effects are often used for this purpose.
3. *Giving emotional reinforcement.* This includes music or other sound beneath the dialog or sounds of short duration used to punctuate the pauses of dramatic speeches.<sup>11</sup>

<sup>10</sup> Stephen Richardson, (*WPI Technical Theatre Handbook*. Worcester, MA: WPI IQP, 1996), 90.

<sup>11</sup> Richard L Arnold, (1994. *Scene Technology 3<sup>rd</sup> ed.* New Jersey: Prentice Hall.), 336.

The text of *Frankenstein* gives us ample opportunity to use sound effects in each of those three ways; from the first technical effect of pouring rain and lightning, to the talking crowd in the courtroom, to the Nameless monster whispering “Victor” as Frankenstein discovers and emotes upon Elizabeth’s deathbed. (see section 3.1.2 – Cue list for details) Finding opportunities to use audio technology in *Frankenstein* is the easy part, but the challenge lies in implementation.

Creating a realistic sound environment for the audience requires an understanding of how sound is produced, how we hear it, and the nature of the sound system that will reproduce it in the theatre itself... Sound is the back and forth motion of the air in response to the vibration of some physical object.<sup>12</sup>

That’s a pretty broad description, because the human voice, a door slamming, a gun shot, a sack of potatoes falling off the back of a truck, obviously all produce sound. The type of sound we are concerned with is sound that is produced by a loudspeaker, “a device which converts electric signals to audible sound.”<sup>13</sup>

The loudspeaker converts electric signals into a series of vibrations, when these vibrations reach the human ear the process of localization begins. The vibrations, or sound waves, bounce off of multiple objects on the way from the speaker to the ear and these bounces are heard at different times. “By combining left/right relative loudness information with left/right relative time information, we can assign directionality to the reflection.”<sup>14</sup> Directionality is where the sound is perceived to be coming from. A good example of this is in movies when a car speeds by the field of view; the distant sound of a

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<sup>12</sup> Jim Brown, (2000. If A Tree Falls In the Woods... Recording Live Effects for the Theatre. *Theatre Design and Technology* 1: Winter), 46-51.

<sup>13</sup> Internet. Available via internet at: <http://www.dictionary.com/cgi-bin/dict.pl?term=loudspeaker>. [May 31, 2001].

<sup>14</sup> Ibid.

car revving its engine is heard far off to the right, it passes the center of the picture and the sound is really loud with that “whoosh” sound. This directionality along with many other factors outside the scope of this report combine in our brain to create localization. Localization is the process which answers the question “Where did that come from?”, “Am I in a cave?”, and “What the hell was that?”

Localization is what can be used to create the intimate felling of the first technical effect, “*Outside it is pouring rain with flashes of lightning and thunder in the distance.*” (see section 3.1.2 – Cue list for details) Using localization we can give the impression of rolling thunder reverberating off in the distance behind the audience and the cozy intimate feeling of being inside on a dreary night. Of all the factors that make up localization, directionality will be the easiest for us to control, because a goal of this project is to determine the design of the audience seating area which includes placement of all audio equipment.

Theatre playback systems should provide a stable aural image for as many audience members as possible and allow for the movement of such images during playback. The system should also allow the sound designer to control the location of each sound cue while other cues play concurrently. Ideally the sound system could create aural images for each cue anywhere within the theatre and perhaps also imply positions outside the limits of the theatre space. Within this general principle it is singularly important that sound systems be able to generate aural images which are synchronized to visual images on stage, allowing the natural assumption in the audience’s mind that the aural and visual worlds of the play are one.<sup>15</sup>

Stereo sound is nothing new in the theatre as means of providing a stable aural image. “Unfortunately, theatre sound exposes the principal limitation of stereo playback: the stereo image only works for a small group of people near the center line of the

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<sup>15</sup> Jonathan Darling, (1999. Aural Authenticity in the Theatre. *Theatre Design and Technology* 1: Winter), 12.

house.”<sup>16</sup> The world premiere of *Frankenstein* is a large event, hardly a small group of people near the center line of the house. The anticipated audience for opening night is around 250. This problem was actually solved in the cinema as early as 1941 for Disney’s *Fantasia* by adding a center channel speaker.<sup>17</sup> This center channel speaker attempts “to keep the audience’s aural focus synchronized with the visual images on the stage.”<sup>18</sup> By the 1950’s stereo in cinemas was using at least than four channels, with some theatres using as many as seven.<sup>19</sup>

This obviously means that the audio design for *Frankenstein* should contain a center channel. We plan to take this design a *couple* of steps further. In order to completely envelop the audience with a realistic soundscape we are going to make use of Dolby Digital technology.

(Dolby Digital) is an audio technique developed by Dolby Laboratories to compress as many as 6 channels of crystal clear digital surround sound... With a maximum of 6 separate or ‘discrete’ channels (speaker), the left, center, and right channels located in front of you provide precise, clear positioning... Two separate channels (speakers) located behind you deliver immersive ambient sound whilst the subwoofer channel sends an explosive punch during action sequences.<sup>20</sup>

As a result of using Dolby Digital technology, there are going to be a lot of speakers *all* over Alden Hall for *Frankenstein*. Another step to be taken is overhead reinforcement.<sup>21</sup> Overhead reinforcement was used in WPI’s production of *Henry V* and

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<sup>16</sup> Ibid.

<sup>17</sup> Joseph Hull, *Surround Sound Past, Present, and Future*. Available via internet at: <http://www.dolby.com/ht/430.l.br.9904.surhist.pdf>. [May 31, 2001].

<sup>18</sup> Darling, 12.

<sup>19</sup> Hull.

<sup>20</sup> Creative Technologies, *Soundblaster.com -- What is Dolby Digital 5.1?* Available via internet at: <http://www.soundblaster.com/resources/read.asp?ArticleID=4>. [May 31, 2001].

<sup>21</sup> Afonso, Mangiarelli, Martins and Weisleder. (*Theatre Technology Options Explored and Expanded for the 1995 Production of William Shakespeare’s The Life of King Henry the Fifth, Alden Hall, November 16-18 1995*. Worcester, MA: WPI IQP 1995), 45.



was implemented as part of an IQP project. The authors of the IQP stated that overhead reinforcement through the use of speakers hung above the audience gives a “globe of sound” and that it is the “perfect setup for simulating rain and thunderstorms.”<sup>22</sup>

All this technology could easily become difficult to control. The solution is in the consumer computer market: the Sound Blaster Live! The Sound Blaster Live! can “decode Dolby Digital streams to 6 discrete analog channels,”<sup>23</sup> meaning that any digital signal from a computer source can be piped right into the Dolby Digital Surround Speaker setup. This will prove to be more than adequate for all of the above mentioned requisites for a theatrical sound setup.

The Sound Blaster Live! computer audio card also allows for another aspect of control: MIDI. Starting with the Fall 2000 academic production of *Nobody Knows You're a Dog* a MIDI keyboard was used to produce the effective technological soundscape. MIDI was also used for *New Voices 19* the following spring.<sup>24</sup>

In keeping with the continuing effort to expand the use of new technologies in live theatre, we are using a MIDI keyboard to produce the soundscape required for *Nobody Knows You're a Dog*. While MIDI keyboards have been around for quite some time, their use in the theatre is generally restricted to pre-production sound mixing. A large portion of the sounds you hear tonight will be created and mixed on the fly, not only allowing the director and sound designer increased flexibility, but creating a performance aspect for the sound designer herself. The MIDI keyboard acquisition represents a major investment in the future of sound design at WPI and reaffirms our commitment pushing the boundaries of technology in performance.<sup>25</sup>

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<sup>22</sup> Ibid.

<sup>23</sup> Creative Technologies.

<sup>24</sup> Matt Trachimowicz, (WPI Theatre Tech User's Guide for the Korg N364 & Sound Blaster Live! Worcester, MA: WPI Sufficiency 2001).

<sup>25</sup> James Nichols, (*Producing Academic Theatre*. Worcester, MA: WPI MQP, 2001), appendix G.

For *Dog* the WPI Department of Humanities and Arts purchased a Korg n364 MIDI keyboard. The producer and sound designer then hooked the keyboard into a computer via MIDI cables connected to the Sound Blaster Live! Vienna SoundFont Studio Version 2.3 was then used to map each of the keys on the keyboard to WAV files. Thus, when the Audio Designer pressed middle-C the sound of a gun shot was played instead of a musical tone. This allowed the designers and the technician operating the sound setup for the performance a lot of flexibility and total control over synchronization between live action on stage and audio effects.

Using all of this technology will create a soundscape for *Frankenstein* that will truly be an immersive and enveloping technical showcase. This soundscape will bring the audience into the mind of Mary and will prove to be truly horrifying.

### **3.2.b. Projection**

“The illusion of theatre performances is enhanced through the use of new technology such as Virtual Reality.”<sup>26</sup> The premiere of *Frankenstein* can certainly be enhanced through the use of VR and, similar to WPI’s *One Flew Over the Cuckoo’s Nest*, some elements of *Frankenstein* aren’t readily feasible without VR.

The question LaGreca sought to answer in her MQP project was, “How does one create a set, a place, that’s not really there, to present another world within the one already presented on stage, without taking time for a huge set change?” The solution became “to project the new set over the existing one.”<sup>27</sup> While this is similar to what the script requests as it’s first transition from Prologue to Act 1, Scene1: “*Projection of a sea of ice.*” (see section 3.1.2 – Cue list for details) This transition specifically requests a

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<sup>26</sup> Melissa LaGreca, (*Virtual Reality And Performance*. Worcester, MA: WPI MQP, 1997), 1.

<sup>27</sup> Ibid, 14.

projection, we as producers of technology are not forced to use a projection because of this request. But how else are we going to convey a sea of ice in the theatre? That answer is not clear. But what is a projection? "Projections supplement and in some cases replace traditional scenery."<sup>28</sup> A projection is an image shown on some surface. The technical setup up to do this:

will depend on what you want to feed through the projector. Basically, all you are doing is plugging your multiple media (i.e. VCR's, computers, and cameras) into the projector and selecting what you want to use. With a computer, you take the output for the monitor into the projector. If you want to still have a monitor to use, you need to get a video splitter. Mostly all other inputs are just plugging in RCA connectors.<sup>29</sup>

WPI's method of projecting is an ordinary PC connected to a projector which shows the image on some surface of the set. For *One Flew Over the Cuckoo's* projections of "the new worlds on a scrim attached to the top of the set."<sup>30</sup>

In the 1997 major academic production *Medea/Media* not only was the set projected upon, but the designer extended this idea even further by projecting onto areas other than scrim or screens. This was to give versatility to the staging area and not have to depend on scrim.<sup>31</sup> An example of a non-standard surface that was attempted to be projected upon was the "wall of fog" which never actually worked, but was an interesting idea.

Virtual Reality is being used in the theatre to much a greater extent than simple projections. Mark Reaney at the University of Kansas is attempting to use polarized

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<sup>28</sup> Arnold, 344.

<sup>29</sup> Steven Hocurcak and Jason Lamb, (*Interactive Theatre Technology Reference Manual*. Worcester, MA: WPI IQP, 1997).

<sup>30</sup> LaGreca, 18.

<sup>31</sup> Ibid, 30.

glasses as the next step to bring 3D images to the theatre.<sup>32</sup> Due to the nature of the text we are working with, we want the audience to be drawn in, not isolated through the use of glasses or any other Head Mounted Displays.

LaGreca suggests that, “Virtual Reality in the theatre, when used wisely, has many advantages to a performance. The theatre needs to separate the ideas of movie theatres and prerecorded scenes to enjoy the full benefits of this technology.”<sup>33</sup> The advantages to *Frankenstein’s* use of VR is very clear: not only does the script specifically call for it, but certain aspects might not be possible without its use. LaGreca’s warning of separating ideas of prerecorded scenes is the fear of the technology spoiling the live performance aspect of theatre. It is this project’s intent to make use of prerecorded scenes in order to bring the audience further into the world of *Frankenstein*. This intent means that we are trying extend work done in several academic projects and to push beyond what is currently done for Virtual Reality as part of WPI’s Theatre Technology curriculum.

### **3.2.c. Other**

#### **3.2.c.i. Fog**

The first transition from Prologue to Act 1, Scene 1 of *Frankenstein*: “*The time is early morning and fog should make the scene take on a hazy dreamlike appearance.*” (see section 3.1.2 – Cue list for details) Producing fog is hardly a new piece of technology used in the theatre. There are multiple options for creating fog or smoke, a dry-ice fog or a chemically produced fog.

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<sup>32</sup> Reaney, Mark. (1996. *Virtual Scenography: The Actor/Audience/Computer Interface. Theatre Design and Technology* 1 - Winter), 36.

<sup>33</sup> LaGreca, 26.

Chemically produced fog is the most commonly used in theatre, it's simple, inexpensive, and quiet. Unfortunately, most chemically produced fog smells absolutely horrible and while supposedly completely safe and non toxic, these "fog vapors may be irritating to people with asthma or respiratory ailments."<sup>34</sup> The last thing we should want to do is irritate our audience. Another drawback to chemically produced fog is that "High-volume machines (to produce chemical fog) are the most costly."<sup>35</sup> This is a problem because for *Frankenstein* a lot of fog will need to be produced as several times the script contains "*stage fills with fog*" (see section 3.1.2 – Cue list for details).

The alternative to chemically produced fog is dry-ice fog. This fog is carbon dioxide, a gas which is normally in the atmosphere, which of course "is completely nontoxic, odorless, and harmless and also believable in appearance."<sup>36</sup> Creating the fog is a simple task, a commercially built machine can be used, but WPI Theatre has a "rumble pot" to produce dry-ice fog.

A rumble pot is basically a big steel drum with a cord and a big hose coming out of it. Inside a basket of dry-ice is lowered into hot water and, voila!, fog is produced through the big hose. The drawback to rumble pots is that they are very noisy. Another alternative to producing fog that has been explored at WPI is the "Fogginator."<sup>37</sup>

The fogginator was first conceived as part of the wall-of-fog experiment during the 1997 academic production of *Medea/Media*. Then, it consisted of a simple garden hose taped to a fly rail with a line of holes punctured into it. One end of the hose was

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<sup>34</sup> Arnold, 333.

<sup>35</sup> Ibid.

<sup>36</sup> Ibid, 331.

<sup>37</sup> The origin of the term "Fogginator" is unofficially credited to Wendy Kogel and Josh Black who, in a Virtual Reality Performance Lab, coined the term to describe any type of fog-dispersal device which creates (or tries to) a "wall of fog" for the purpose of projecting upon it.

closed off, and the other was connected to the dry-ice machine (there isn't any literature that specifically mentions it, but this machine was a rumble pot). This experiment was a failure, plagued by problems of the smoke condensing, air tightness problems, and various other technical difficulties. At the time, the project group suggested using a different gas that would dissipate quickly, not clog the hose, and is safe to use.<sup>38</sup> These suggestions were considered and problems from previous experiments were analyzed for the second creation of the fogginator. The Fogginator was created as part of a Virtual Reality Lab ISP with Instructor O'Donnell. This incarnation of the fogginator didn't really work either, "it just looked stupid"<sup>39</sup>, although this second version of the fogginator did solve problems of previous attempts. The fogginator 2 did manage to use a different gas, chemically produced fog, which was cooled through the use of dry ice to make the fog hang low to the ground, and avoid clogging problems. Similar to some commercially available chemical fog machines, which "provide a basket accessory in front of the nozzle for dry ice, which converts the vapor into a low-hanging fog."<sup>40</sup> Perhaps version 3 of the fogginator will be devised and created for use in *Frankenstein*.

### **3.2.c.ii. Scenography**

The set is the physical place where theatre takes place. The set can simply be the ground itself for a minimalist Shakespeare in the park production, or it can be the sprawling grandeur exhibited in the 2000 academic production of *Nobody Knows You're a Dog*. It frames the action and even can become in an actor in the production. The design of the set is to be created out of carefully looking at the requirements of the text

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<sup>38</sup> LaGreca, 23.

<sup>39</sup> Nichols at the unveiling of the "Fogginator" during the VR Performance Lab (see note 34).

<sup>40</sup> Arnold, 333.

and discussions with the actual production staff like the Director and the Director of Technology.

Production philosophy places emphasis on the need for a synthesis of all design and technology areas to a single and commanding design goal. The term *Scenography* embodies this concept.<sup>41</sup>

A goal of this project is to create all technological aspects, or the Scenography, for the 2001 major academic production of *Frankenstein A Play Adapted From the Novel* by Joseph Romagnano. Therefore, keeping the above statement in mind, the project team must also create the scenic design. For instance, the fact that there will be VR projections demands a place to project them upon. Also, it is very important that everything involved with the production have a common artistic vision or aesthetic.

There are several components which may be used to communicate a scenic design: a colored prospective sketch or a three-dimensional model, sight-line drawings, a ground plan, a front elevation and maybe detail drawings. The sketch or 3-D model is a full rendering of the set; it helps everyone involved with the production get a true visualization of what the designer is trying to accomplish.

Sight-line drawings are diagrams of what the audience will be able to see in the physical space of the theatre. They aid the designer in creating a set that will be able to be seen by all of the audience members. Sight-line drawings are not very much used in WPI Theatre at this time, we only produce theatre in one space: Alden Hall. Designers at WPI pretty much know what possibilities exist in the performance space.

“The ground plan and front-elevation drawings are indispensable drawings for the designer.”<sup>42</sup> The ground plan, called the floor plan at WPI, is a top-view drawing of the

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<sup>41</sup> Ibid, 25.

entire theatre, it includes all scenic elements, their measurements and also a house design for audience seating. The house design aspect is specific to WPI because the space we use isn't devoted only to theatre and the house or audience seating must be erected for each production. The ground plan is used extensively by almost all other technical designers and the director for the production. The ground plan will determine where VR can be projected, lights shown, and speakers placed.

The front-elevation is the front view of the set, how it will "look" to the audience. For "The Wave" by Jim "Roy" Nichols, the scenic design competition winner for New Voices 19, the front-elevation was used extensively. The designer used it to determine all of the proportions in a quick easy manner as the front-elevation is two dimensional and easier to draw and change than other perspectives.<sup>43</sup>

This IQP group is producing all technological aspects for *Frankenstein* and designing the set. This is very good aesthetically because it will create a look and feel that is consistent for the production. The "vision" for both the technology and the set will be derived through close work with the script, Director, and Director of Technology.

### 3.3. Theatre Experience

Collectively this IQP group (including project advisors) has an incredible amount of theatre work experience through both outside performance activities and Department of Humanities and Arts academic productions. The group and the project advisors regularly attend academic theatre productions at WPI, including club-sponsored performances and other non-affiliated productions, such MW Repertory Theatre Company Also attended

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<sup>42</sup> Ibid, 27.

<sup>43</sup> Nichols is a group member for this project.



have been professional productions in Boston, London, and Broadway, just to name a few. Even with all this experience the group still hopes to be able to attend a professional production during the course of this project as part of the research process, as one can never see too much theatre.

The following is a list of productions that the group members have either read, viewed, or been part of the cast/crew for:

Anonymous	Noah and His Sons
Arlen, Harold and Harburg, E. Y	Wizard of Oz, the Musical
Anonymous	Noah and His Sons
Ashman, Howard	Little Shop of Horrors
Beckett, Samuel	Happy Days
Bock, Jerry, Harnick, Sheldon, and Stein, Joseph	Fiddler on the Roof
Brecht, Bertolt	The Good Woman of Setzuan
Casey, Warren and Jacobs, Jim	Grease
Chase, Mary	Harvey
Durremat, Freidrich	The Physicists
Goldoni, Carlo	The Servant of Two Masters
Goodrich, Frances and Hackett, Albert	The Diary of Anne Frank
Gotanda, Phillip Kan	Yankee Dawg You Die
Guare, John	Six Degrees of Separation

Henley, Beth	Crimes of the Heart
Hughes, Holly	Clit Notes The Well of Horniness
Ibsen, Henrik	A Doll's House
Kaufman, George S.	You Can't Take It With You
Korder, Howard	Boys Life
Larson, Jonathan	Rent
Lenner, Alan Jay and Loewe, Frederick	Brigadoon
Lorca, Federico Garcia	Blood Wedding Dona Rosita, the Spinster The House of Bernarda Alba The Love of Don Perlimplin Three Puppet Plays Yerma
Mamet, David	American Buffalo Edmund Glengarry Glenn Ross Oleanna Speed-The-Plow
McOnuff, Des and Townshend, Pete	Tommy
Miller, Arthur	The Crucible Death of a Salesman
Moliere	Tartuffe
Nichols, Jim "The Roy"	Baseball
O'Donnell, Dean	Nobody Knows You're A Dog For the Team Legwork Little Messages Monopoly

O'Neill, Eugene	A Long Day's Journey Into Night "The Hairy Ape" The Iceman Cometh
Pirandello, Luigi	Six Characters in Search of an Author
Rabe, David	Hurlyburly
Rice, Tim and Webber, Andrew Loyd	Cats Evita Jesus Christ Superstar Phantom of the Opera
Rodgers, Richard and Hammerstein II, Oscar	Carousel Cinderella Oklahoma The King and I The Sound of Music South Pacific
Sanchez–Scott, Milcha	Roosters
Shakespeare, William	Anthony and Cleopatra Hamlet, Prince of Denmark Julius Caesar Macbeth The Merchant of Venice Much Ado About Nothing Othello Romeo and Juliet The Taming of the Shrew The Tempest Titus Andronicus
Shaw, Bernard	Saint Joan
Simon, Neil	Biloxi Blues Lost in Yonkers Rumors The Odd Couple Plaza Suite The Sunshine Boys
Sophocles	Oedipus Rex

Strouse, Charles and Adams, Lee	Superman
Tucker, Matt	as seen through a coffee shop window How long live the king? What goes around.
Vick, Susan	When I Was Your Age
Vogel, Paula	And Baby Makes 7 How I Learned to Drive
Wasserstein, Wendy	An American Daughter
Wilder, Thornton	Our Town
Williams, Tennessee	A Streetcar Named Desire Cat on a Hot Tin Roof The Glass Menagerie
Wilson, Meredith	Here's Love
Wolfe, George C.	The Colored Museum

## 4. Methodology

The procedure followed for this project will be seemingly simple. Saying *exactly* what was needed to be done at the start of the project was next to impossible. Guiding the IQP group as we produced technology for *Frankenstein* was the research of our literature review, including the script and materials relevant to it, theatre technology literature, and our own real-world theatre work experience through both outside performance activities and Department of Humanities and Arts academic productions.

### 4.1. Pre-Technology

Before any technology could be created, it was necessary to first discuss the script with the Director, Professor Susan Vick, and Director of Technology, Instructor Dean O'Donnell to determine exactly what cues the group would be responsible for creating and what the desired effect of the cue is. Once we had created a list of the cues we then divided them by the type of cue and used that information to aid in the creation of the scenic design. This foundation was necessary this early in the project because most effects either depend on or make use of the scenic design.

The dependency of other aspects of the production on the scenic design carries a lot of importance and brings up an important point. Not only is there a dependency, but the technological effects we created, and the scenic design we fabricated to present them must come together on an artistic level, a common artistic vision. This pre-technology time-period was where a common artistic vision had to be realized between the Director, the Director of Technology, and the project group. This vision, or overall aesthetic, for the production meant that everything involved in the world-premiere production of

*Frankenstein* must have some sort of complete look and feel, including the technology we must created.

#### **4.2. Cue Production**

The heart of this project was to create the cues, this is where all of the magic happened. The group, Director, and Director of Technology had to critically analyze each cue artistically, technically, and then devise a way to create the effect needed.

The group had all forms of technology available to it to aid in this process, including but certainly not limited to:

- An audio system that will be capable of full surround sound, including overhead-reinforcement through the use of a Dolby Digital speaker setup to give total control over directionality. This setup will be powered by a PC with a Sound Blaster Live!, connected to a Korg n364 MIDI Keyboard. This configuration will allow for total control of all audio effects, and the enhancement of the production by the giving us the ability to document time, place, and action, provide specific atmosphere, and to give aural emotional reinforcement.
- The audio effects themselves were and will be created through live recordings, live microphones, stock audio effects, and other process that have been devised along the way.

- The projection setup will most consist of at least four LCD projectors connected to an assortment of computers, VCR's, and live-feed digital video cameras.
- The projection sources for these projectors come from cinema, custom filming, computer creations/animations, and photography.
- A wall-of-fog to project upon through invention/modification of a *Fogginator*, and purchasing a new commercial Carbon Dioxide fog machine. This fog machine will be used extensively for creating normal, ground covering, ominous, scary fog as well possibly powering the *Fogginator*.

The challenge was not only in simply creating the effects, but in assessing several ways to create an effect for any given cue. We had to then determine which method best suited that particular cue, most importantly taking into account the overall aesthetic for the production, as well as where the cue is in the script, how the story has progressed thus far, and what other effects we have already created.

### **4.3. Presentation and Preparation**

Once all of the cues had been created, they were made ready to be given to the appropriate implementer for the production. These people are the production staff: lighting designer, master electrician, master carpenter, sound technician, and other positions that have been created to run the technological effects during the production of *Frankenstein*.

Preparing the cues involved making them accessible to the production staff, as they will not have had any involvement or knowledge of the technology used until it is given to them. This meant documentation for the cues, demonstration and instruction. The method depends on the complexity of the technology used and the individual experience and knowledge of the production staff. Finally the cues had to be presented to the directors for their approval and, if necessary, some last minute tweaking was done to some cues to get the technological effect just right for performance.



## 4.4. Results

### 4.4.a. Scenic Design

- The set design went through several design stages.
  - The first stage, arguably the most difficult, was starting from scratch and proposing a first design. Each group member individually presented preliminary ideas, these were then discussed in detail outlining the desirable and undesirable traits of each.
  - The individual designs were then re-evaluated by the group and altered accordingly. After several individual designs were proposed the group then had enough information to create a single design.
  - In order to preserve the artistic freedom of both group members, the stage was effectively cut in thirds, stage right going to one member, stage left to the other, and the middle third being the bridge which will be discussed in more detail below. (See: Scenic Design- The Bridge )
  - A few final revisions were made before the final design was accepted, but the end result was a design satisfactory to all group members and directors. Important considerations were flexibility of staging areas, having multiple projection surfaces, creativity balanced with needs for other cues. Once the design was completed, hand drawings were made as well as 3-D computer generated drawings .

#### 4.4.a.i. The Bridge

- An important idea that was discussed at length was the desire for the set, or some part of it, to be able to transform in some way, adding an impressive and dramatic accent at one or more points in the script.
- The group recently was involved in a workshop in which they became certified to use the rigging system in Alden Hall. This knowledge opened up many more possibilities for the transformation of a set element.
- After several ideas were discussed, the idea of having a bridge to connect the two halves of the stage was agreed to be the ideal solution. This would allow the two sides of the set to be designed individually, while also giving the director many options for staging and transformation. The details of the bridge design were left in the hands of the group.

- The group created three different options for the bridge and presented them to the directors. The design that was chosen was the draw bridge design (*See Design 2 on: [Set Illustrations - Bridge Options](#)*). This design is a bridge in two pieces that can be lowered or raised in the center, a feature that will get put to full use for one of the effects in the show (*See: [End of Act 1 - The Hanging of Justine Moritz](#)*).
- Multiple illustrations of the set can be seen in the file [Appendix- Set Drawings](#).

#### 4.4.b. Opening Technical Effect

#1 - page 4: *Before Prologue*

- Generated a landscape in 3Ds Max 4 of Switzerland. Several different shots of the landscape were created, each with rain in the background, flashing lightning in the distance, lightning bolts up close, and even the house where the prologue takes place.
- The creation of the rain was particularly innovative. In 3Ds Max 4 rain can be created using a "particle system" object, which are very resource-intensive and somewhat difficult to work with. After several failed attempts an alternative was devised.
  - In Photoshop an image was created which simply consists of several psuedo-random white lines drawn vertically on a black background seen here:

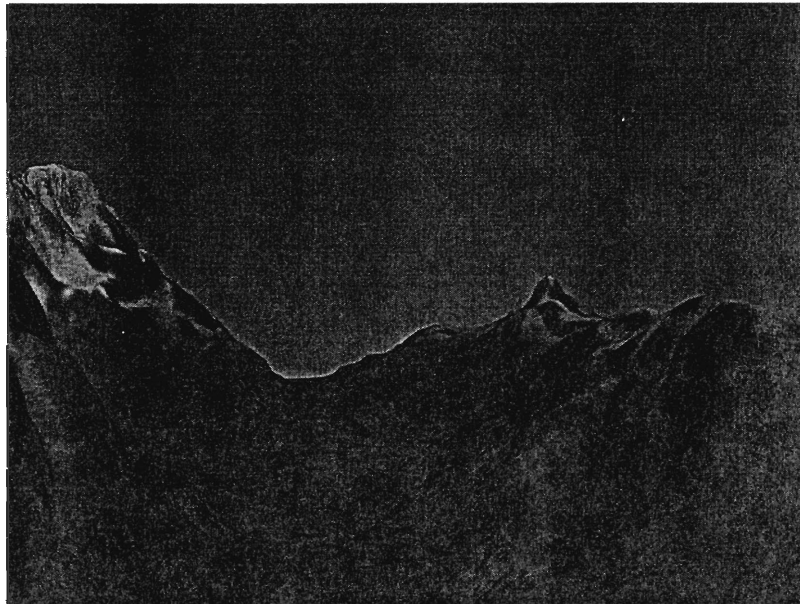


- A plane was then created in 3Ds Max 4 with a special material applied to it. This material was special because it used the Rain Map as a transparency map where the material (and subsequently the plane) was only solid and visible where the psuedo-random white lines are.
  - The plane was then animated -- creating streaks of rain falling in the background.
  - Some problems were encountered, such as the glow of the lightning bolts not appearing "through" the plane (although it was invisible -- which is a quirk of 3Ds), but it was solved by scaling the plane, placing it behind the lightning in 3D space, and excluding the plane from catching light from the bolts.
- Superimposed on these images is a scrolling text graphic which sets up the story. The text reads as follows:

*In 1814 Mary Wollstonecraft Godwin, daughter of well known atheists and supporters of women's rights, eloped with Percy Shelley, poet, and advocate of free love. Shelley left behind a pregnant wife and young daughter. The following year Mary gave birth to their first daughter, who died two weeks later. At the time, Shelley was having an affair with Claire Clairmont, Mary's stepsister.*

*In 1818 Mary gave birth to their first son, William, and Claire decided she needed a poet of her own. She decided on Lord Byron, since he was the most famous writer of the day. Byron customarily summered in Switzerland, and Mary, Percy, and Claire pursued him there to a villa by the lake where Byron was in residence with his personal physician, Polidori. Shelley and Byron became fast friends. Claire became Byron's lover. Polidori began work on a Byron's biography and developed gout in his ankle. Mary was 18 and already the mother of two. They expected a summer of sailing and relaxing by the lake.*

*But it rained, and rained, and rained...*



- The final effect can be seen in the file Media- Opening Clip in PowerPoint. The clip itself is an AVI file that is inserted in a PowerPoint file, to aid in the cueing process during the live performance. Complementing this effect in performance are the Mechanical Sound Effects.

#### **4.4.c. Prologue Opening**

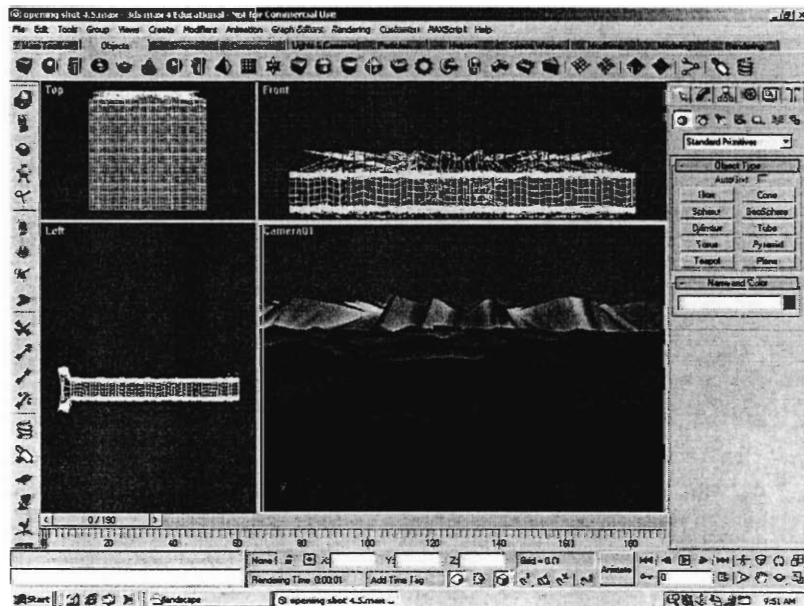
#1 - page 4: *Outside it is pouring rain with flashes of lightning and thunder in the distance.*

- Mechanical Sound Effects will be used here, creating sound while the Opening Technical Effect is being played. This will aid in building an aesthetic for the show, where the effects that occur during Shelley's scenes are mechanical, old-style 19th century effects. Thus "saving" the computer generated sound effects for the other levels in the story.
- Details on these mechanical sound effects and plans for their construction can be found in the Mechanical Sound Effects section.

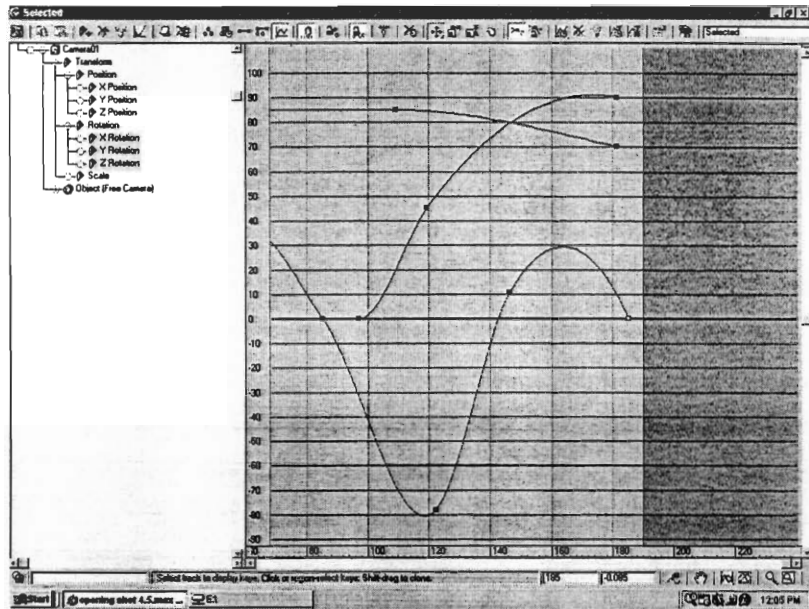
#### 4.4.d. The Ice

#3 - page 5: *Projection of a sea of ice. The creaking of a ship's rigging can be heard all around. The faint echoing sound of many dogs barking can be heard. A speck appears in the distance and can be seen moving between the blocks of ice. The time is early in the morning and fog should make the scene take on a hazy dreamlike appearance.*

- Another landscape, this time of an ice field, with glaciers/mountains in the background, a model of ship, and a black speck in the distance.
- This was the first attempt at using 3Ds Max 4. The techniques for maneuvering the camera, used later on in the project, were learned though creating this effect. Here are several screen shots of this process.
  - Working with the landscape geometry:

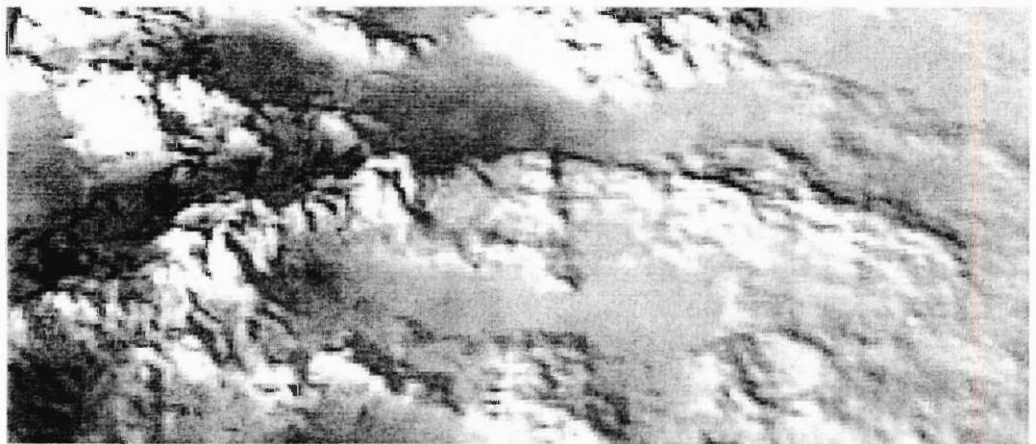
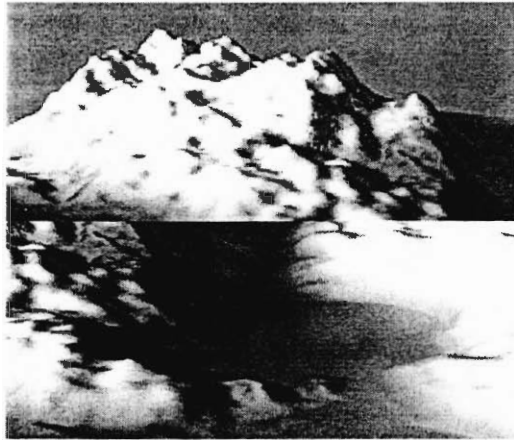


- Working with the movement of the camera in 3Ds "Track View." The resulting movie can be seen in the Ice Camera



- There were several versions of Ice, each varying in complexity and creation method.





- Some of the height maps, used as displacement maps on a plane to create the above images:



*Note: the final displacement map is a standard one included with 3Ds Max 4, which was subsequently modified.*

- Several sample movies of *very early* ice: [Early Ice #1](#) [Early Ice #2](#) and [Early Ice #3](#)
- The final effect can be seen in the file [Media - The Ice in PowerPoint](#). The clip itself is an AVI file that is inserted in a PowerPoint file, to aid in the cueing process during the live performance. Complementing this effect in performance will be a transition from the [Mechanical Sound Effects](#) to the computer generated audio effects of [ships rigging](#) and [dogs barking](#).

#### **4.4.e. Audio Effects**

- Making the effects.
  - The audio effects used in this project were all made in a similar fashion. Both cost and specificity in the script made the job of gathering audio for Frankenstein more difficult. Available audio files were gathered for each cue and were edited and mixed using audio editing programs such as Sound Forge and Creative Wave Studio.
- How they work.
  - The final audio files are show ready. That is they are mixed and re-recorded so that no further work needs to be done to the actual audio files before production of the show. The files can be heard using any .wav player, including Win Amp and Windows Media Player.

#### *The Effects*

(To hear an audio file, click the link under the description)

- **Dogs Barking**

#3 - page 5: *The faint echoing sound of many dogs barking can be heard.*

[Media- Sled Dogs Barking W/Wind Howling](#)

#4 - page 6: *By now the figure should be fading & the dog sounds dying away.*

Media- Sled Dogs Fade

- **Crashing Shake**

#5 - page 7: *Suddenly a great crashing, shattering noise is heard. The sound should be so powerful that the very seats shake the audience awake from that last diatribe.*

Media- Big Crash

- **Floorboards creaking, monster movement**

#13 - page 20: *The rhythmic sound of creaking floorboards is heard. We hear inarticulate grunts and groans.*

#13a - page 20: *Grunts start again, floorboards start creaking walking towards Mary Shelley.*

Media- Footsteps

#13b - page 20: *Sound of the Nameless Monster turning and fleeing.*

Media- Fleeing footsteps

- **The Cottage**

#18 - page 23: *During the following scene furtive movements of Nameless Monster should be seen and/or heard where appropriate.*

#21 - page 27: *After a bit of quiet the sound of lumbering uneasy footsteps is heard.*

These effects are the same ones used for Audio Effects - Floorboards creaking, monster movement. Using the same effects will give a consistent theme of what the monster sounds like.

#36 - page 33: *The wind starts to howl as a torch light is struck...the whole cottage is consumed in a towering inferno*

Media- Fire Starting



- **Horses**

#24 - page 30: *Sound of horse's hooves and a carriage pulling to a stop.*

#29 - page 35: *To the sound of thundering hooves attached to a cabriole.*

#33 - page 47: *We hear the sound of a carriage door closing and horses pulling away.*

Media- Horse

Also see: Mechanical Sound Effects

- **Thunder and Rain**

#29 - page 36: *We next hear the ominous rumbling of thunder*

Media- Storm

- **Clocks Chiming**

#34 - page 49: *A clock chimes in the background*

Media- Clock Chime

- **Shuffling of Monster**

Media- Footsteps

- **Waves lapping shore**

Media- Surf

- **Wind**

#39 - page 68: *As we hear the wind whipping and the leaves blowing...*

Media- Wind

- **Mechanical Sound Effects**

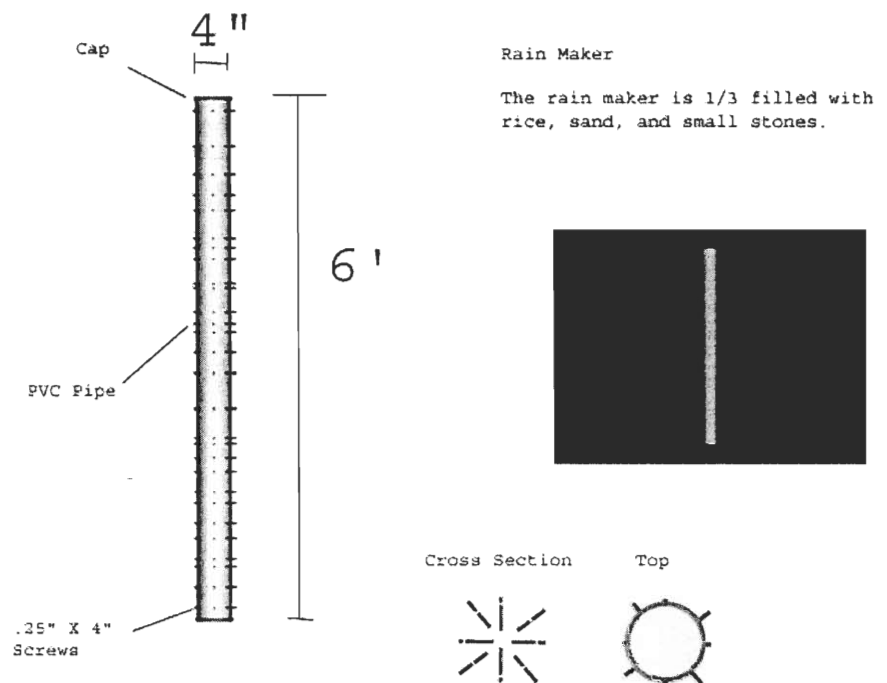
To aid in building an aesthetic for the show, the effects that occur during Shelley's scenes are mechanical, old-style 19th century effects. Thus "saving" the computer generated sound effects for the other levels in the story.

Not shown is the mechanical effect of banging coconut shells on a board to imitate horses' hooves.

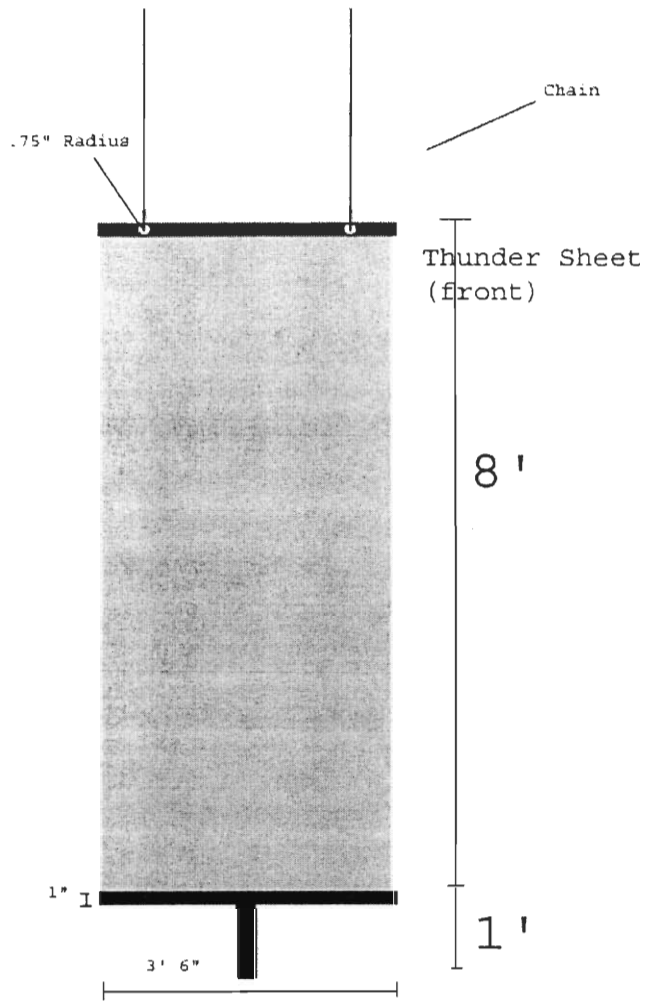
It is suggested that these effects be run from the Hemp Line rail, on the Stage Left side of the stage. There are exposed beams overhead to hang the thunder sheet (which has sharp edges), a clear view of the stage, and plenty of room to run the effects.

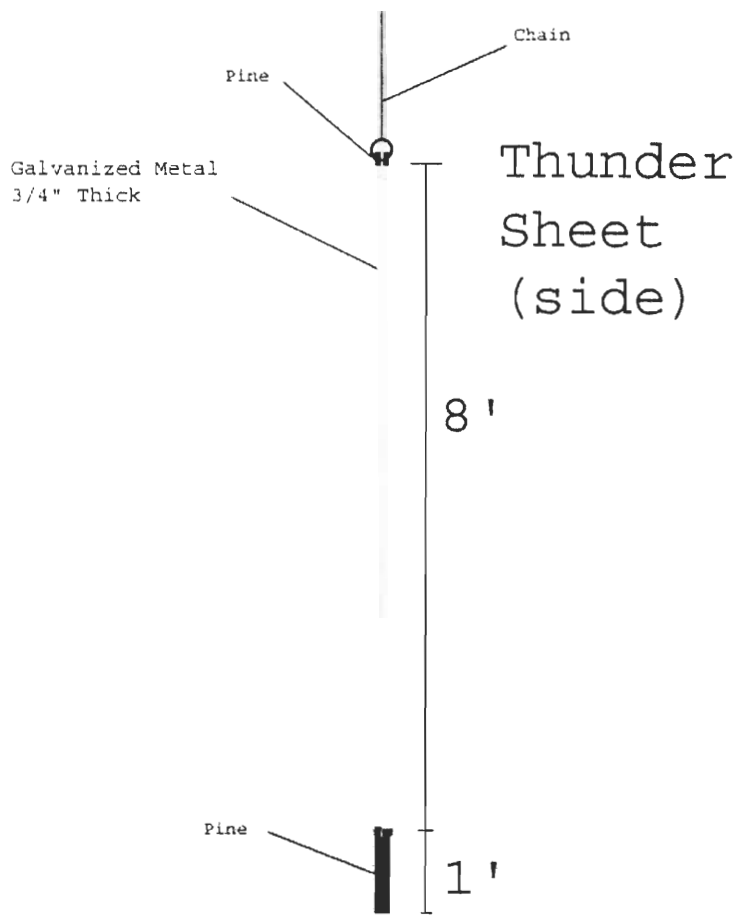
*Note: To get a larger image of the plans, or to print, right click the image and save it, then open it in any graphic viewing software, such as Paint.*

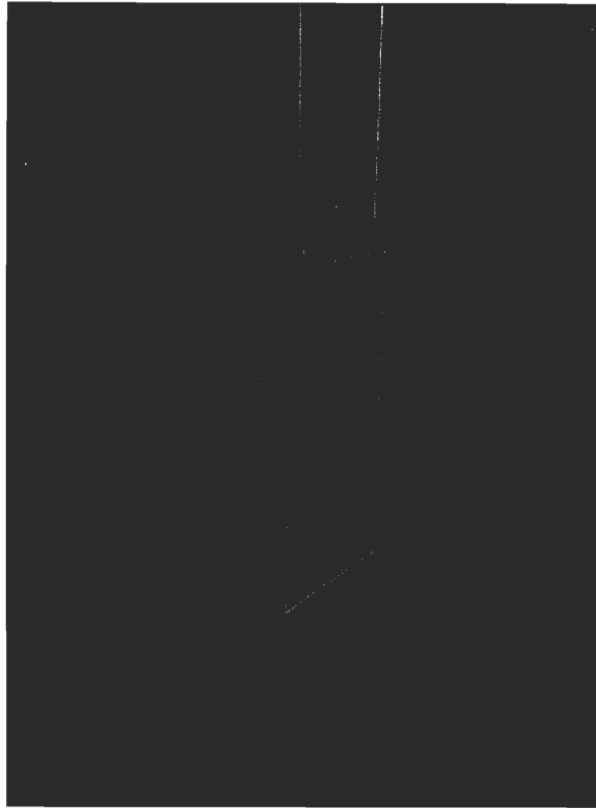
- **Rainmaker**



- **Thunder Sheet**







#### 4.4.f. Monster's Voice

- Making the effect.
  - The Monster Voice effects were made using temporary voice recordings and computer software that emulates several audio effects including reverb, pitch shifting, chorus, and ring modulation. Several options were created for the monster voice, including some recordings that were edited using Sound Forge to add breath-like hissing, heartbeat, and reduce the other noise picked up in the recording.
- How it works.
  - The files submitted with the project are options from which the director will choose the Monster's voice from as well as recordings of every monster voice cue which can be used in the event that the decision is made to not use an actor for this part. The types and amount of each effect for each option are preserved so that the effect can be reproduced whether applied to a live performance using a microphone or the recordings submitted. All samples are in .wav format and can be played using any .wav player including Win Amp and Windows Media Player.

## *The Effects*

Samples of the Monster's voice can be found on the "Monster Voice CD."

- **Monster's First Appearance**  
#7 - page 9
- **Monster Whispers**  
#9 - page 11
- **Monster's Cry**  
#15 - page 20
- **My Creator**  
#25 - page 31
- **Pardon this intrusion**  
#27 - page 32
- **Victor...**  
#29d - page 36
- **Act 2 Scene1**  
#32a - page 42
- **The Laboratory**  
#35a - page 52
- **Delirious moaning and Monster Voice**  
#36 - page 58
- **The Wedding Night**  
#38 - page 64

- **Devilish laughter of the Monster**

#40 - page 68

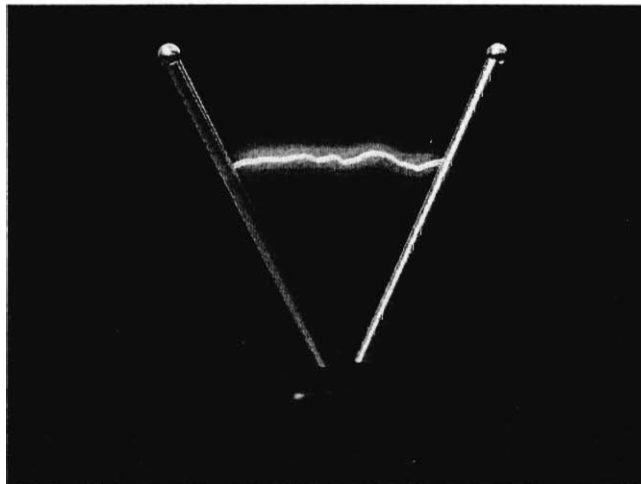
- **Sorrowful monster voice**

#43 - page 69

#### 4.4.g. Psuedo Van De Graf generator

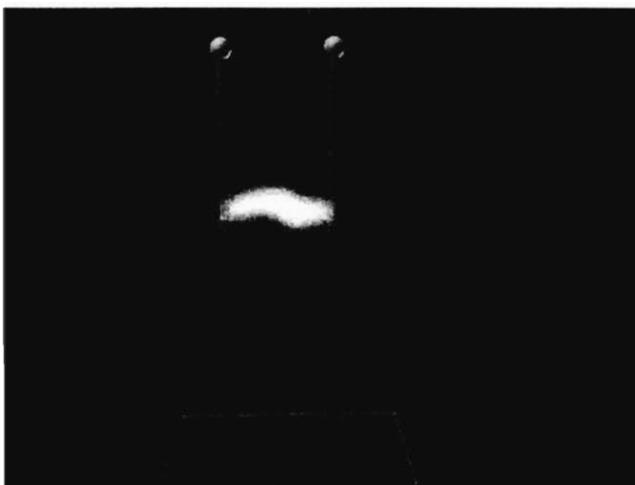
#8 - page 11: *Alphonse is showing a hand-cranked Van de Graf generator.*

- Several electrical devices where created in 3Ds Max 4.
  - The first, dubbed the "Antennae" is the end result from the tutorial used to learn the creation process of the lightning (as seen in Opening Technical Effect)



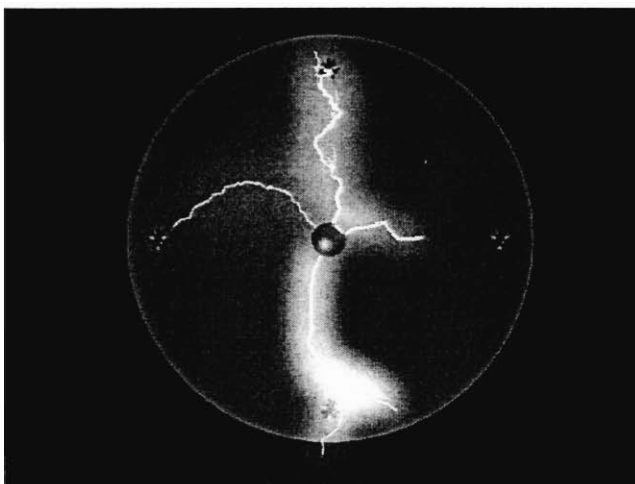
A sample movie of the Antennae

- The second, the "Poles", which is created in a way similar to the Antennae.



A sample movie of the Poles

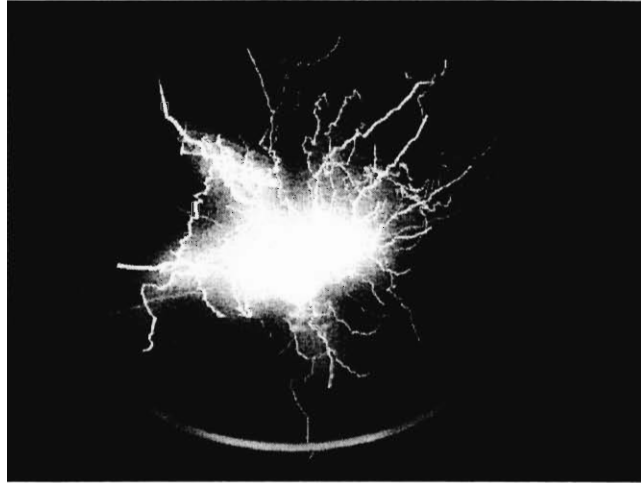
- The third, "A lot of Poles", also the end result of a tutorial.



A sample movie of a Lot Of Poles

- Finally, the "Globe".





A sample movie of the Globe

#### 4.4.h. The Creation

#12 - page 19: *Great explosions are heard coupled with blinding flashes of light. Images of volcanoes erupting and lightning flashing can be seen. Fires raging through a forest can be seen followed by huge waterfalls. A wind whips across the audience and the entire playing area causing papers to fly and havoc to ensue. Flames whip higher and higher. A howling moan vaguely sounding like NOOO, DEAD, DEAD, THOU SHALT NOT. As a final large blast of the volcano is seen everything dies down to a dead quiet.*

- The major part of this cue (and the only part this project is concerned with) is a video montage of several natural disasters with audio. The montage was created by gathering clips from many movies containing natural disasters. Both documentary and popular films were used. The clips were then edited and mixed with audio using Adobe Premiere with the desired length being approximately 30 seconds. The audio used for the cue was a portion of Holst's "Mars-The Bringer of War"
- The final video is .avi format and can be viewed in the file Media - Creation Movie using any .avi movie player such as Windows Media Player.

#### 4.4.i. The Eyes

#14 - page 20: *A flash of light and we see two large, yellow, watery eyes looking incoherently down at Victor Frankenstein.*

#16 - page 23: *Projection of Nameless Monster's eyes behind Henry Clerval.*

#17 - page 23: *During interior cottage action the eyes of Nameless Monster should clearly be seen watching the actions of the cottagers.*

#19 - page 26: *We see tears coming from Nameless Monster's eyes as they look away from the scene.*

#20 - page 26: *Reading from the large Bible by candlelight... Nameless Monster's eyes return.*

#23 - page 28: *Eyes of Nameless Monster are seen in the background, watching.*

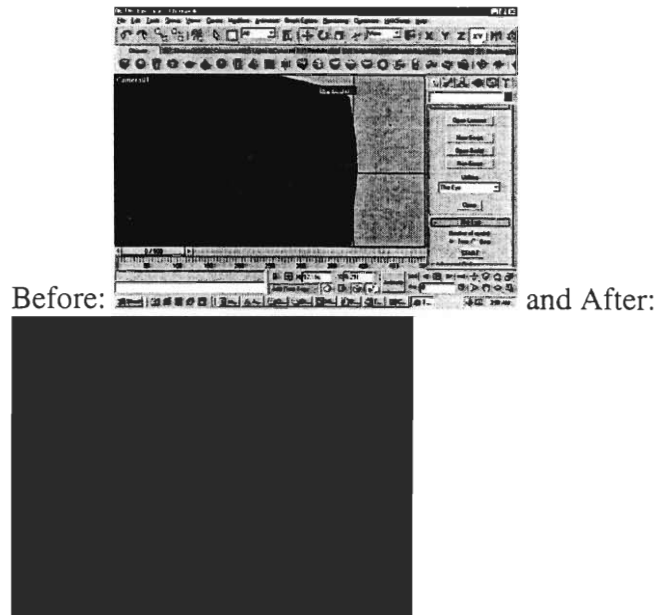
#37 - page 60: *At "a friend" the eyes of Nameless Monster seem to appear above Mr. Kirwin.*

- The effect along with use instructions can be found in the file The Eye.
- Designed several different options of flat images for eye color, cornea effects, and eye sockets. Results can be seen in the file "Appendix - The Eyes Have It"
- Extended these options by building a fully anatomically correct 3-dimensional model of a human eyeball in 3Ds Max 4. The model, as well as several still images and animations of the model can be seen in the file "Appendix - The Eye Model."
  - Working lens, cornea, iris, and pupil.
  - Combination of Lighting and model materials used to produce stunning visual effects, including high specular levels on the lens, an overall glossy look to the cornea, a light-catching iris, and a pupil that responds to varying degrees of light by dynamically changing size.
  - Slick model geometry, with multiple real-time controls on parameters such as face-count, smoothness, texture mapping, and visibility vary the speed of interactivity while working with the eye. For example, lowering the face-count makes moving objects faster, but gives the model a square look.
- Incorporated "The Eye Model" into another anatomically correct model of two eye sockets created in 3Ds Max 4. Results can be seen in the file "Appendix - The Eyes In Sockets."

- Fully functioning eye sockets complete with blinks and eyebrow changes.
- Synchronized eyeball movements, where both eyeballs "look-at" an invisible focal point object.
- Morphing sockets, where through the use of box modeling and mesh-manipulation, several different "emotions" can be displayed through a simple interface. For example, to make a "shocked" model, simply blend the "angry" mesh at 50% with the "eyes open" mesh at 75%. Note: this morphing process was facilitated by fully modeling a head, which was subsequently destroyed, leaving just the eye sockets and part of the brow. This was to avoid giving a definite form to the monster, a goal of the project.
- Successfully made the model fully interactive, for use in a performance situation. This was done through the use of MaxScript, the programming language that is included with 3Ds Max 4, which is dialect of Lisp. The image that audience sees is made by 3Ds Max and the program screen itself is simply projected. Several concerns needed to be addressed to make effect usable in a performance, these decisions were made through the use-cases, beta-testing, course work in both CS and HU, and familiarity with 3Ds Max. The code can be found in the file The Eye, along with screen shots of it in use.
  - Decisions were made with great difficulty over the trade off between fully rendered eyes and interactive eyes, which have varying degrees of visual polish.
    - Alterations had to be made to the lighting, as certain lighting effects would not be visible when the model was interactive.
    - Similar transformations were made to materials, textures, and geometry.
  - Several options were explored on how to make the eyes actually move. This was all done through the use of MaxScript.
    - First a function was used that allows the user (the operator) to pick several points on a plane by simply clicking on to the eyes themselves. The eyes "look-at" an invisible focal point object, which was then moved along the line connecting the points. Eventually normal vectors were drawn along the line, with the image updating at each location. This had several benefits.
      - The normal vectors could be multiplied by a scalar factor, making the eyes move faster or slower.

- The operating jerking the mouse would have no effect as the eyes "rolling up" into the back of the head is undesirable, at least if it is not on purpose.
- Next a different function was used, which tracks the movement of the mouse over a surface and utilizes a callback function which takes as arguments: the object over which the mouse is moving, the normal to the objects face at that point, whether or not shift/control/alt are being pressed, if the user clicked the mouse, etc.
  - This method provided some more flexibility, although upon further investigation the first function would have allowed many of the benefits of the second.
  - Because of good planning in the beginning, the model was very keyframe-animation friendly and it was determined at this point that it was feasible and beneficial to integrate it into the program. This animation technique was used in conjunction with the morpher interface described above. Several blinks, and expressions were coded in to allow the operator to blink the eyelids by simply clicking and holding a key or combination of keys down to produce other movements.
  - The problem of the eyes being jerked around by the operator losing control of the mouse is still a real possibility, although some restrictions on movement were made. In a performance situation there all sorts of possibilities, the computer could crash, the script could crash (not likely), 3Ds could crash (more likely), but then again, actors fall down, lighting instruments fail, sets break, and the power can go out.
- The interface was fine tuned to allow one click start-up of the program, with options to display one eye or two as called for in the text, operator definable options such as blink-speed, setting of the expressions, mouse tuning, crossing of the eyes, as well as more advanced functionality such as changing the object that the program is moving in response to the mouse from the focal point to, for example, the eyelids. Also, all 3Ds Max interface

components were removed or blacked out at runtime so they would not be projected.



#### 4.4.j. Fog

#15 - page 20: *Everything has a misty dreamlike quality to it (in other words, flood the place with fog.)*

#28a - page 34: *The area once again become flooded into a foggy dreamscape.*

- Many options were explored on what to do for fog as can be seen in the both the [Literature Review - Fog](#) and in the special appendix prepared by Angela Ruel [Appendix - Fog Portfolio](#).
- The decision that was made was to go with the recommendation of Ruel, to use a chemical fog, output by several machines.

#### 4.4.k. Torching the cottage

#27 - page 33: *We hear the shuffling of Nameless Monster as a shadowy figure rustles through the cottage. The wind starts to howl as a torch-light is struck and proceeds around the cottage. As the whole cottage is consumed in a towering inferno Nameless Monster lays his curse upon all mankind.*

- The effect is several movie clips that were edited in Adobe Premiere. The final effect can be seen in the file [Media- Inferno Movie](#).

*Also See:*

- [Audio Effects Section - Cottage](#)

#### 4.4.1. End of Scene 8 Montage

#29 - page 36: *We next hear the ominous rumbling of thunder as the playing area becomes dark with the images of clouds, mountains and trees. Flashes of lightning illuminate the mountains and woods.*

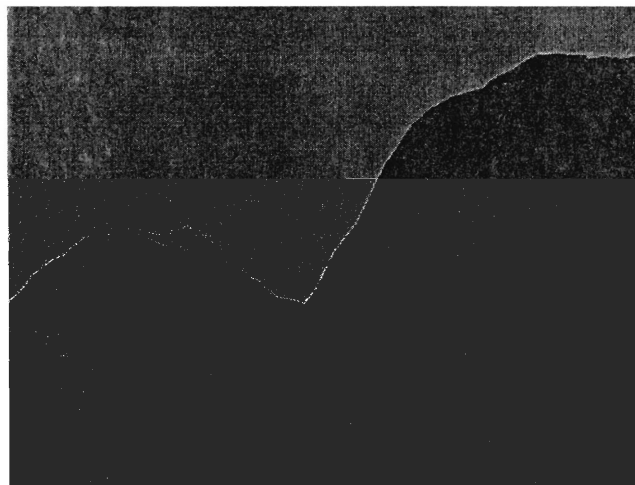
#29a - page 36: *Rain starts to fall and vision of the playing area is generally poor.*

#29b - page 36: *A multiple flash of lightning reveals a large shadowy figure with yellow-glowing eyes, such as the glaring eyes of a wolf staring at its prey, is seen detaching from a clump of trees.*

#29c - page 36: NAMELESS MONSTER: *(insidious whisper) Victor.*

#29d - page 36: *Nameless Monster turns and flees into the darkness, flashes of lightning reveal the figure of Nameless Monster moving, as a speck, impossibly fast up the side of a mountain. Amid pouring rain and loud thunderclaps the lights on the scene fade.*

- Mountains, Forest, and Lighting were created in 3Ds Max 4, using the same landscape as the Opening Technical Effect of Switzerland to be consistent. A figure was added running up the side of the mountain, along with some camera movements for dramatic effect.



- The final effect can be seen in the file Media - End Of Scene 8. The effect is a PowerPoint file, which when started displays a black frame and successive presses of the enter key display each piece of the effect.

*Also See:*

- Audio Effects Section - Thunder and Rain
- Monster Voice Section - "Victor"

#### **4.4.m. End of Act 1 - The Hanging of Justine Moritz**

*#31 - page 41: Justine Moritz rises and begins to walk offstage... Justine Moritz is now off the stage. Amidst a growing cacophony we hear a piercing scream echoed by a guttural howl. The body of Justine Moritz swings down from above...*

- No effect was created for this moment, it is all live action. Justine stands on stage, the "executioners" cover her head with a black bag and drag her offstage. The actress playing Justine continues to do her lines, but the executioners carry a dummy onstage and up to the bridge. A noose is lowered from above, they tie the noose around the dummy's neck, then remove the pins holding the bridge and the dummy is "hung".

#### **4.4.n. The Laboratory**

*#35 - page 52: Victor Frankenstein is alone in a room that, although rather dilapidated, has one large window in the background through which the ocean is visible. It is the evening and the moon is setting high over the water casting a patch of light onto the floor of the area...*

*A silhouette crosses the path of the moonlight. The two glowing eyes and ghastly grin of Nameless Monster are seen at the window...*

*The position of the moonshine changes so that the light angles away from the door. The moon is now sitting above the water...*

- Created a visual effect using 3Ds Max 4. The effect consists of a window, a simple one with modest "lab" like materials. Looking through the window the ocean can be seen with the moon hanging over head. The water is animated with a gentle lapping motion. The technique used for animation was to linearly increase the phase of the noise function used to give the water it's rippled

appearance. This is the same technique used to animate the water in [The Wedding Night - Lake Geneva](#), but with very dissimilar end results as the water in the Wedding Night effect is much choppier.

Light levels are also animated. The darkening of the moon followed by a brief flash of the The Eyes certainly enhance the effect; along with the eerie sounds shuffling of the monster and the aqua psychedelic waves lapping the shore. Note that the eye is not the operator controlled eye, but a still image contained within the effect.



- The final effect can be seen in the file [Media - The Laboratory](#). The effect itself is an AVI file that is inserted in a PowerPoint file, to aid in the cueing process during the live performance.

*Also See:*

- [Audio Section - Shuffling of Monster](#)
- [Audio Section - Waves lapping shore](#)
- [Monster Voice Section - Laboratory](#)

#### **4.4.o. The Wedding Night**

*#38 - page 64: The moon is shining through the window onto a comfortable bed. The other half is a balcony area overlooking Lake Geneva. The moon is visible upon the water. A storm is forming in the distance. Victor Frankenstein and Elizabeth are out on the balcony. Elizabeth has changed into a nightgown while Victor Frankenstein is still armed.*

*The shining of the moon grows dim as a thundercloud closes in. A raging thunderstorm now ensues. Between several flashes of lightning we see the shadowy figure of Nameless Monster approach the window. A few more flashes of lightning and Nameless*

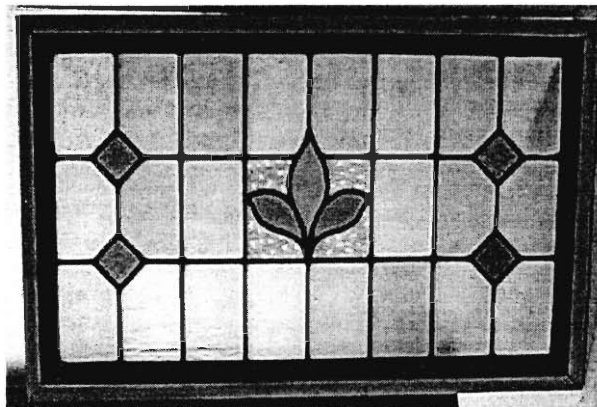


*Monster is beside Elizabeth. After several loud cracks of thunder we hear two piercing screams. A few strokes of lightning followed by tremendous thunderclaps reveal the body of Elizabeth sprawled out from her bed.*

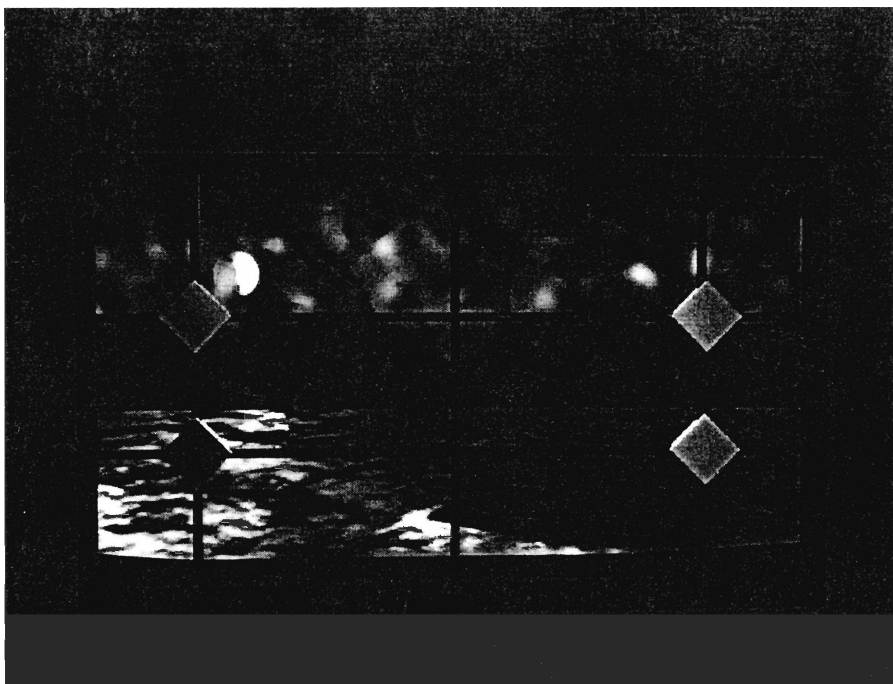
*Victor Frankenstein looks up and a flash of lightning highlights the silhouette of Nameless Monster glowing eyes and a ghastly grin are apparent. Nameless Monster begins a howling terrible laughter.*

*On the balcony side we see the figure of Nameless Monster plunge into the lake and begin swimming towards Geneva. The thunderstorm has died to a hard, windy rain.*

- Three separate visual effects were created, each of a 19th Century Window based on this photograph:



- Through this window Lake Geneva can be seen. Hanging over the water are several storm clouds, created out of volumetric fog, and the moon. There are flashes of lightning illuminating the window frame, to complement the onstage lighting (lightning) effects. The first contains no lightning bolts, but in the second they appear as the water becomes choppy. The third visual effect is similar to the second, with a figure symbolizing the monster plunging into the lake.



- The final effect can be seen in the file [Media - The Wedding Night](#). The effect is a PowerPoint file, which when started displays a black frame and successive clicks display each piece of the effect.

*Also See:*

- [Audio Section - Thunder and Rain](#)
- [Monster Voice Section - The Wedding Night](#)

#### 4.4.p. The Graves

#39 - page 68: *As we hear the wind whipping and the leaves blowing...*

- [See Audio Section - Wind](#)

#### 4.4.q. The Monster and Roger Walton

#43 - page 69: *A scuffle is heard by the window of the room. Quietly the form of Nameless Monster is seen entering the room. Nameless Monster draws back the cover over Victor Frankenstein and begins to sob over his body.*

*NAMELESS MONSTER: (sorrowfully) Oh, Frankenstein! Generous and self-devoted being! What does it avail that I now ask thee to pardon me?*

*Also See:*

- *Audio Effects - Floorboards creaking, monster movement.*
- *Monster Voice Section - Sorrowful monster voice*

#### **4.4.r. Final Montage**

*#44 - page 72: Roger Walton springs at Nameless Monster, firing a shot in the process. Nameless Monster has jumped through the window, his figure disappearing into the darkness. We hear flames and screams as Nameless Monster dies and stage fills with fog. Enter Victor Frankenstein, and Mary Shelley. Projection of the arctic ice floes predominate with a large, possibly starry sky space. The aurora borealis should be seen flickering above. In the middle of the projection there are the glowing embers of Nameless Monster's funeral pyre.*

*Smoke begins to rise up out of the embers. We begin to see a series of projections showing how the Frankenstein legend has changed over time. At the end of the montage we see a book clearly labeled Frankenstein rise up and open, the pages flipping in the wind. The book closes and with a strong wind the apparition vanishes as do Mary Shelley and Victor Frankenstein. Close lights, close all.*

- This was decided to be a montage similar to the one created for the moment of creation. The theme for this montage was to be man-made disasters, however, instead of natural disasters, including the changing of the Frankenstein legend over time. The running time for this cue was to be up to 3 minutes. The final video is in .avi format and can be viewed in the file "Final Movie.ppt", located on the second CD. There is also a still projection of "The Ice" with a star filled background that can be seen below and in the file Media-The Ice with Stars.



## 5. Conclusion

Creating technology for the world premiere at WPI of Joe Romagnano's adaptation of *Frankenstein* was a daunting task. The production will be the academic showcase of the WPI Department of Humanities and Arts Theatre Technology program for the 2001 Academic year and will be seen by almost 1500 people. The audience members must be influenced in some way by seeing the production.

This IQP group had at its disposal a wide array of technological tools and experience to create the technology needed for the production, but the influencing the audience was the truly difficult part. There are certainly many factors on our side, mainly the original work of literature that all this is based upon is Mary Shelley's *Frankenstein*. This work of literature has withstood the test of time and remains emblematic and relevant in today's society.

This relevance is exhibited greatly at WPI where we as students should be asking ourselves: What will be the effect of the work be? Will my work really enhance the field of study? Does newer technology necessarily mean better technology? What will the work be used for? These are questions Victor never asked himself as he created the monster. Everyone that has been in the new Campus Center, checked email, left a campus phone system voicemail, and registered for classes knows that technology is an integral part of everything we do here at WPI. It is scary to wonder if WPI is Mary Shelley, creating Victors, who will possibly create monsters, or if WPI is Victor, creating the monsters.

Like Victor *Frankenstein*, many students at WPI are going to be entering tomorrow's work force and will most certainly be involved with the creation of new technology and

the advancement of previous technological work. This project has done the same thing as it endeavored to create/reinvent all the technology needed for the production. Hopefully unlike Victor, students leaving WPI to enter society (and the project group as it worked) won't be unleashing monsters into the world. What if the next monster computer virus released onto the internet is created by a WPI student? What if the opening technological effect for the world premier of *Frankenstein* proves to be too complex and unlikely to be successful in a performance situation? These are intriguing questions.

We must keep all of these things in mind even now after creating technology for this world premiere of *Frankenstein*. We will and have endeavored as students and artists to tame the technology we created, and undertake a most important goal of any artistic creation: to influence the audience members that will attend the performances. By achieving our goals we will have influenced the audience, prompting them as students: future engineers, scientists, and business people to ask themselves the questions that Doctor *Frankenstein* never asked himself. Perhaps the performance will also impress the asking of these questions on the other audience members, faculty, staff, parents, children, and other members of society in attendance as well, not just as creators of technology like ourselves, but as the users of technology.

## 6. Budget

### BUDGET SUMMARY REQUEST FORM

BUDGET REQUEST for (project named below)

Title:

Monster Technology: The Creation of Theatre Technology for Stage Adaptation of *Frankenstein*

1. Type of Project IQP
2. Department (MQP) or Division (IQP) T T
3. Faculty Advisors' Initials S V, D M O
4. Project Registration Number D T 4 5

5. STUDENTS UNITS	BOX #	MAJOR	YEAR	TERM AND
James Nichols	1838	CS & HU	02	E00 1 Unit
Christopher Cenotti	1280	CS & HU	02	E00 1 Unit

6. Total Cost of Project (see itemized expenses)

\$1925.95

7. Total Amount of Support Request \$1925.95
8. Total Amount of Support from all other Sources \$30
9. Will any funds in addition to the above be required later in the project? Yes \_\_\_\_\_ No X

10. Brief statement of objectives and procedures.

The Frankenstein IQP will use several of the most current and state-of-the-art sources to create brand new technology in the theatre field. The goal of the project will be to define, create, and in some cases invent the technology needed to produce the award winning MQP adaptation of Mary Shelley's *Frankenstein*, completed by Mr. Joeseeph Romagnano. The challenge of the project will be to create the live presence of the monster in the story, without an actor cast in that role; the monster will be created solely through the use of theatre technology. This will include the use of Dolby Surround Sound Audio, Digital Video editing, projections, fog, and other technology.

11. I have reviewed the project proposal and budget detail which are attached to this Budget Request for approval.

Project Advisor's Signature

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## Itemized Expenses

### **Compaq Deskpro P3-1Ghz, 128MB Ram, AGP Graphics – \$1,135**

Computer system to run projectors and audio system. The project will require a new computer to be purchased for three reasons: project will require new specialized hardware to be installed into the computer (i.e. SoundBlaster Live!), also requires specific software installed on computer, and Theatre Technology does not have a suitable system. It will be impractical to perhaps borrow from the IMC due to the fact that we need the computer for a lengthy period of time (now until November 25<sup>th</sup>) and we require specialized hardware/software. A suitable system, with all the computing power we require is available from buy.com, a up-to-the-minute price can be found at:

<http://www.us.buy.com/retail/product.asp?sku=10266107&loc=13711>

### **DV500+ Dual Stream Native DV W/Analog and Digital Video Input/Output with Adobe Premiere 6 - \$673.95**

This packages solves multiple problems, it allows the group to be able to edit digital video for projects on the fly. It also includes an expansion card to GREATLY speed up the process of getting Digital Video onto the computer. Also, it includes Adobe Premiere, which we need to do transitions. Some other features of use to us:

- Real-time multi-track audio mixer with VU meters and volume adjustments
- Real-time 16:9 wide screen video processing of effects, transitions and titles
- Real-time image correction for saturation, contrast and brightness changes
- DV<sup>2</sup> Speed Codec with dual processor support for ultra fast DV mastering
- Export formats: MPEG-2 (DVD compliant), MPEG-1, MP3, Real Media, Windows Media, QuickTime

An up-to-the-minute price can be found at:

<http://www.us.buy.com/retail/product.asp?loc=14617&sku=10274138&PageFormat=7#product>

### **Stand for MIDI Keyboard - \$37.00**

This is needed to put the keyboard on during production of audio effects/editing/performances.

### **50 Blank CDR's - \$25.00**

The project will be putting all data, such as Audio effects, projected graphics, and digital video on CDR's.



**Materials for set model - \$55.00**

This includes:  
hot glue gun  
2 pieces of foam board  
package of balsa wood

**Total: \$1925.95**

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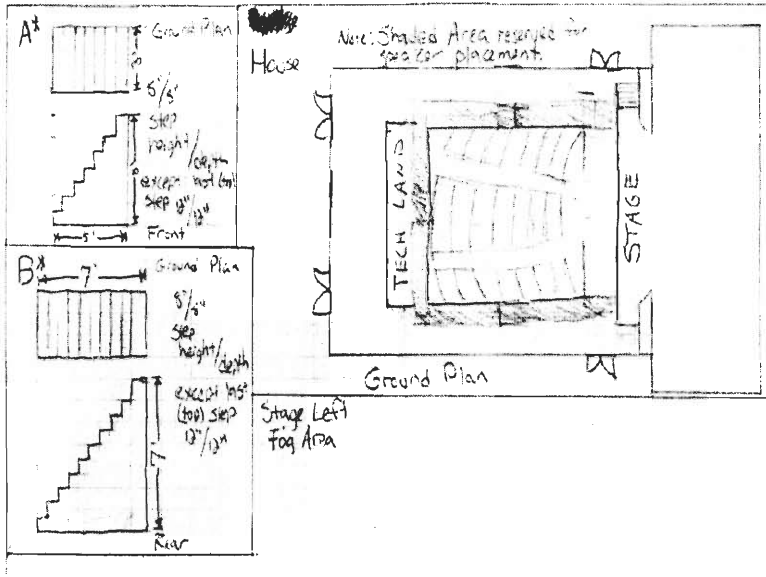
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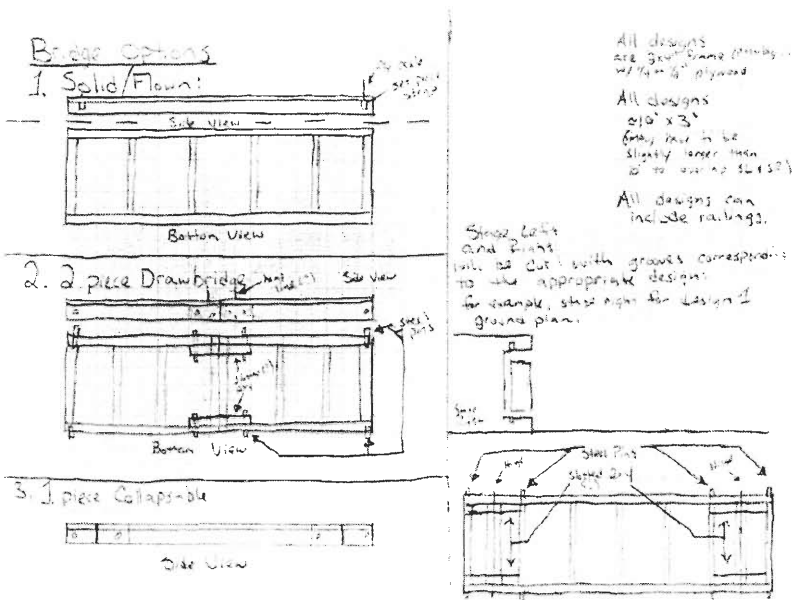
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### 8.3. Miscellaneous Details



### 8.4. Bridge Options



# 9. Appendix - The Eyes Have It

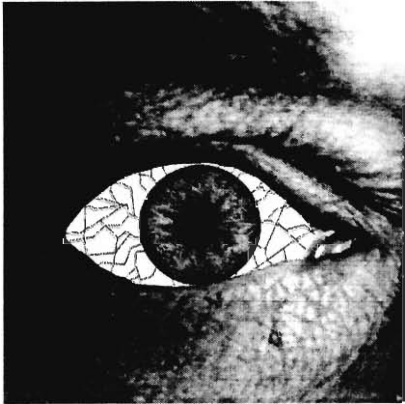
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Example: eye3socket3.jpg = eye layer 3 with socket 3.

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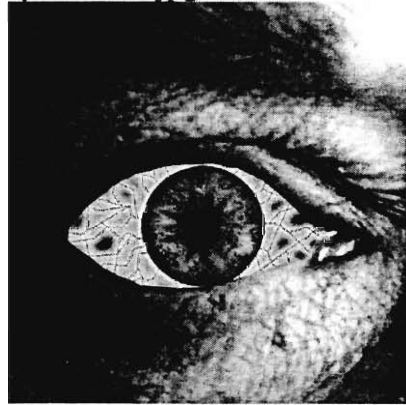


eyesocket.jpg



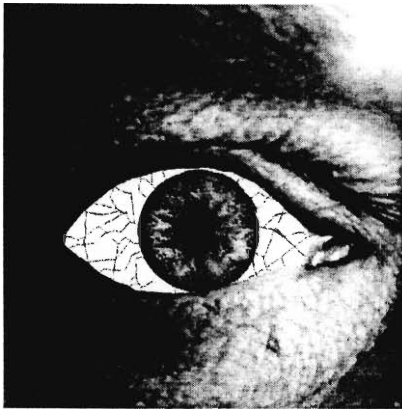
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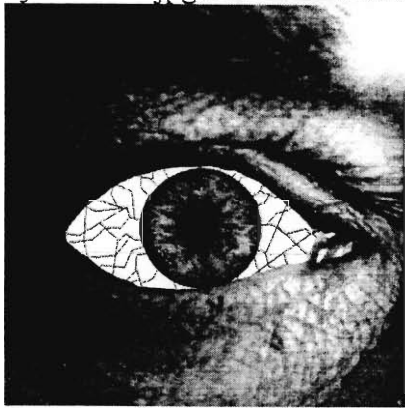
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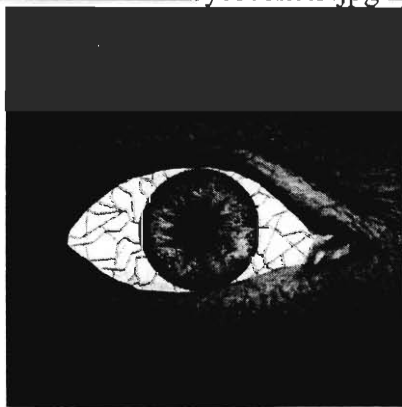
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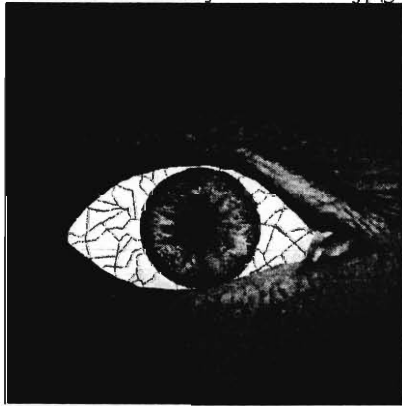
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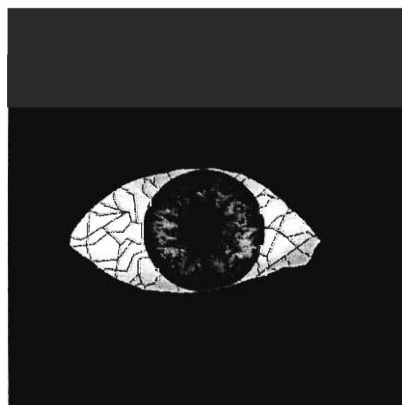
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eye6socket3.jpg



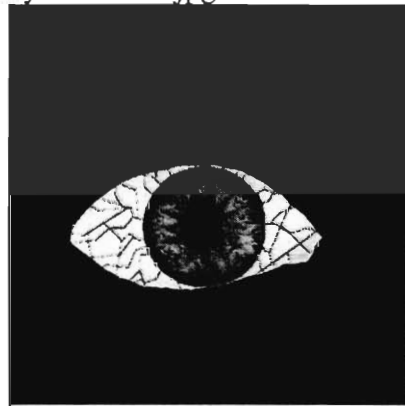
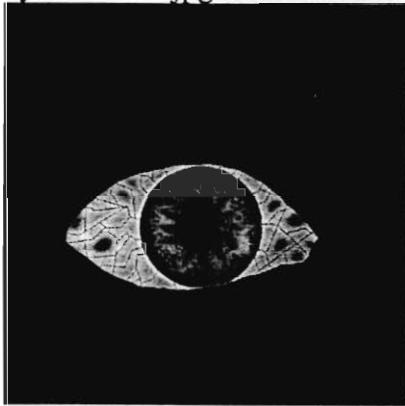
eyesocket2.jpg



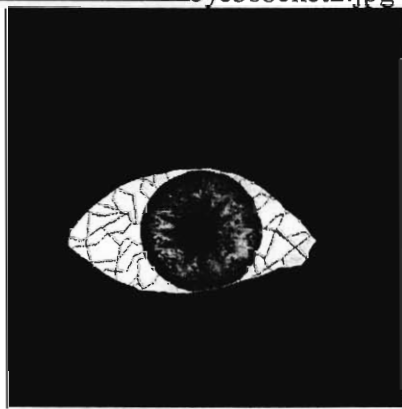


eye1socket2.jpg

eye2socket2.jpg

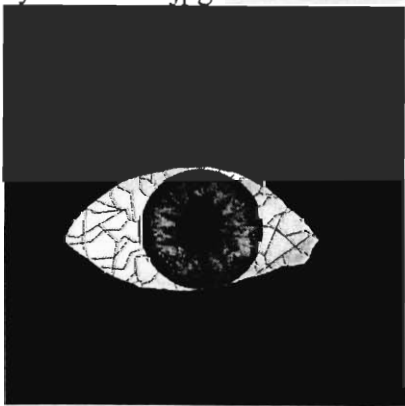


eye3socket2.jpg



eye4socket2.jpg

eye5socket2.jpg

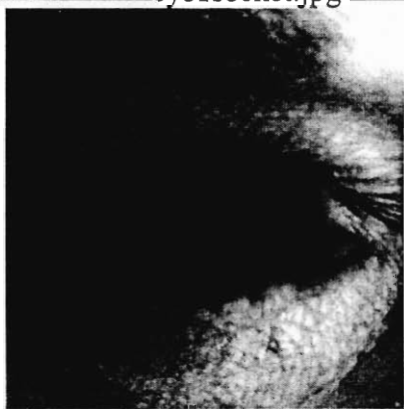


eye6socket2.jpg

Some blinking --



eye1socket.jpg



halfblinksocket.jpg

closedsocket.jpg



eye1socket3.jpg

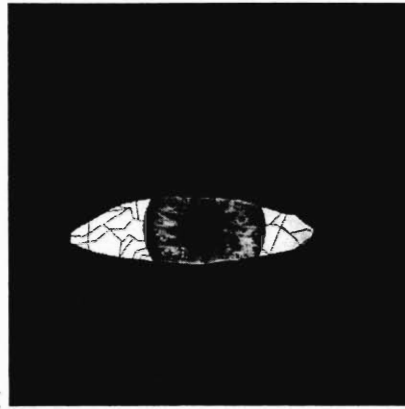


halfblinksocket2.jpg

closedsocket2.jpg



eye1socket2.jpg



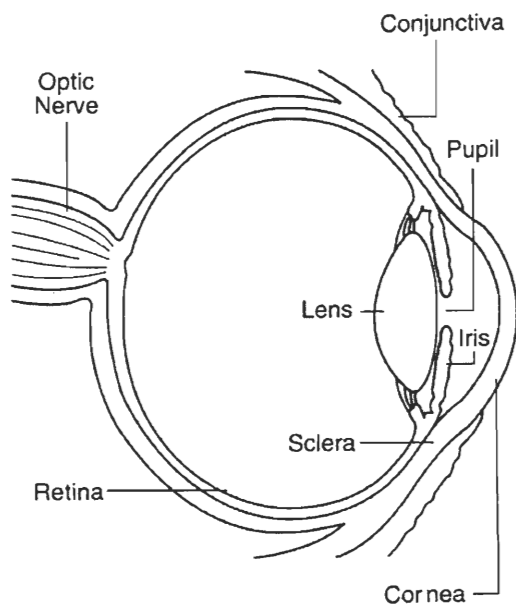
halfblinksocket3.jpg



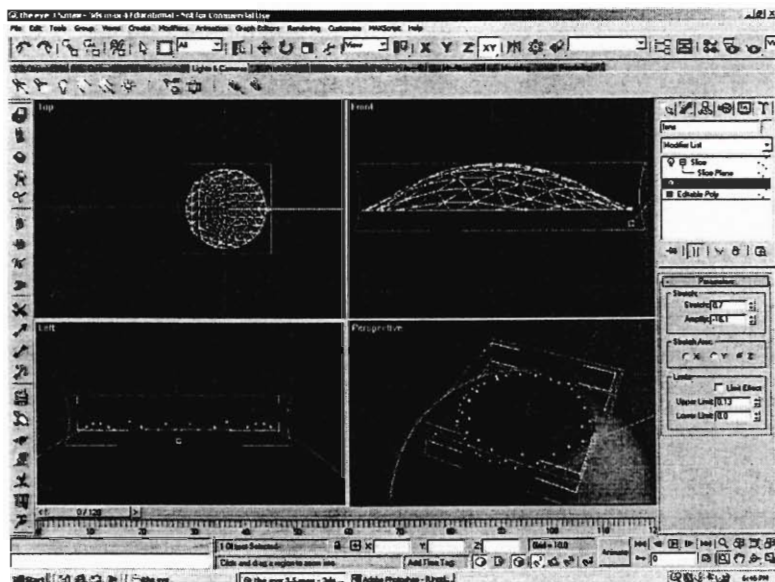
closedsocket3.jpg

## Model

The anatomy diagram used to model the eye:



The model of the eye includes a raised "lens", a screen shot of the modeling process:

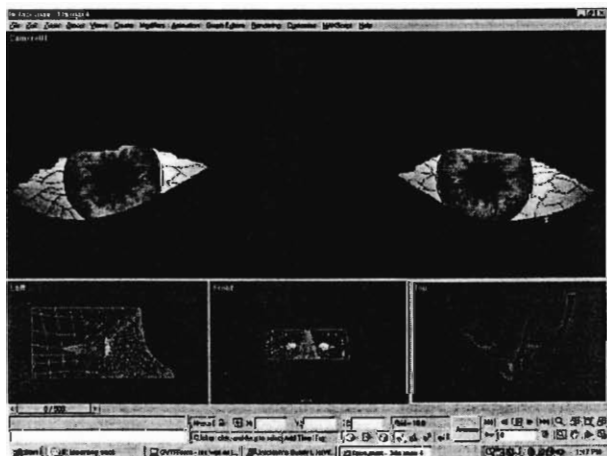


A movie of the eyeball, used to test material settings.

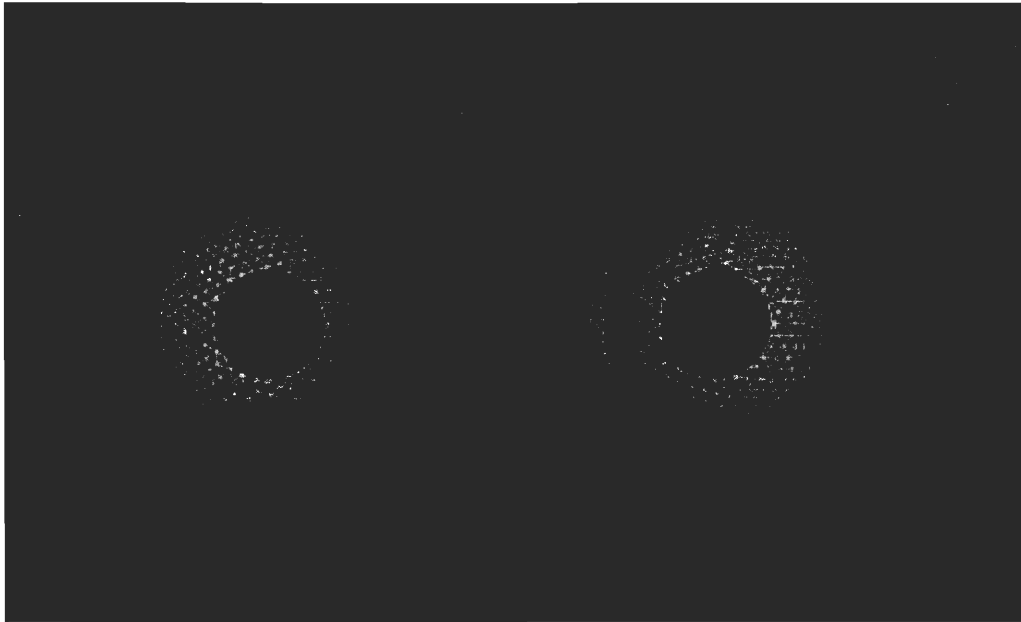
Another movie of the eyeball, used to test the glare level settings.

## The Eyes In Sockets

Screen shot of the modeling process:



Wireframe rendering of the finished model:



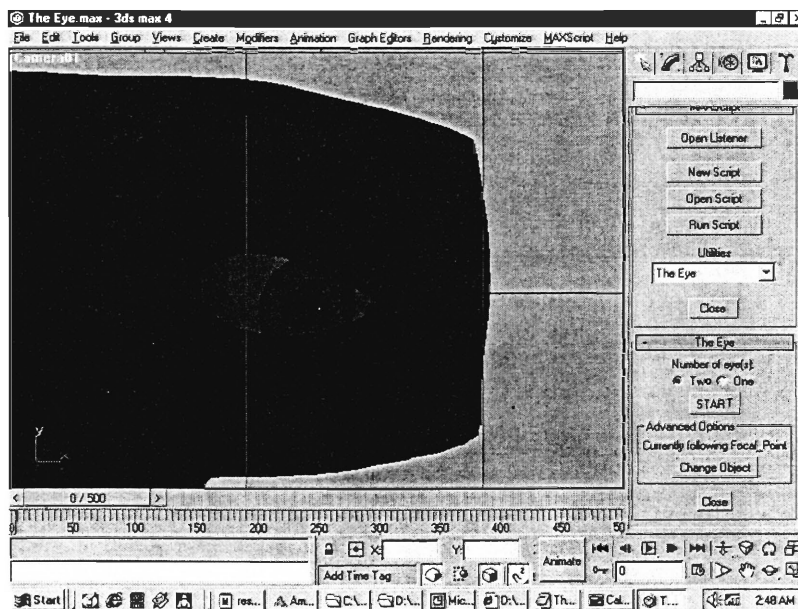
A cool movie of the finished model. The same movie, but in wireframe.

## The Eyes - Interactive

The eyes were made interactive through the use of a MaxScript, the programming language included with 3Ds. The script can be seen in Appendix - Eye Script.

Instructions on use can be found in Appendix - The Eye.

A screen shot of the program in use:



## 10. Appendix - The Eye

- First copy the script file to the scripts directory of 3Ds Max 4 (usually C:\3dsmax4\scripts).
- Open The Eye file.
- Click the icon of a hammer in the upper right hand corner. Select Run Script.
- In the dialog that appears direct it to "EyeScript.ms". TheEye will appear in the utilities list. Select it.
- Choose one eye or two and configure any other options (for setting prior to performance).
- Click "start"
- The eyes will follow the mouse. Click to make them blink and hold shift or ctl for other effects.

## 11. Appendix – Fog Portfolio



# Fog Portfolio

Angela Beth Ruel  
EN 1222 – Page and Stage  
Summer Session 2001

Fog effects have many popular uses. They are utilized every day in clubs, skating rinks, concerts and productions. Whether they are found on stage or off they add a great element of detail. The effect of fog can be created in two different ways, one is through the use of dry ice and the other uses a fog machine that vaporizes "fog juice".

Fog machines have very basic mechanisms. The fog juice is moved into a heat exchanger by a pump. The exchanger maintains a high temperature at which the fluid vaporizes in a process known as "flashing". As the fluid is "flashed" it rapidly expands and that expansion forces the vapor through the nozzle of the machine. When the vapor reaches the cooler outside air it instantly forms an opaque aerosol, this would be the fog. When the fog leaves the machine it will be very hot so it will rise, a chiller is needed to make it remain closer to the ground level.

There are many different machines available on the market today. All offer different features and fog levels. Many can now be controlled with remotes that not only start the machine running but can go so far as to control the volume of fog produced. Different machines make varying levels of noise as they generate the fog. The pump is the main cause of this and also when the fog comes out of the nozzle of the machine. None of the machines produce inordinate amounts of sound but all produce a little. Basically the better the machine the less the noise. All these machines vary in price and have different outputs of fog. Smaller ones start at \$100, these can only output a small amount of fog and are great for effects needed in a Haunted House. On stage larger machines are needed and these can go up to \$2,500 each. This pricing doesn't even include the fog fluid, which is usually around \$50-60 per gallon. With the larger the machine the more fog fluid will be used; therefore this can create quite an expense. The output of fog from a machine is measured in cubic feet. Each machine states how many cubic feet it can produce in a minute. This would be great information if it was completely reliable, but unfortunately it isn't. There are no set industry standards on what a cubic foot of fog is or how dense it is, therefore some machines that say they can produce more than another number wise may not really. The outputs given should be used as a rough guideline, ask around about different machines as much as possible.

Fog fluid or juice is made up of the same basic ingredients a series of glycols mixed with water, typically distilled water. Various manufacturers use different glycols

and amounts so each fluid should be checked before usage. Most fluids have between 15% and 35% glycols, the rest is water. The different configurations of glycol and water produce fluids that deliver different effects. Some fogs can be thick and have a longer hang time while others may be thinner and dissipate quicker. There is also an affect in the residue leftover by the fog. The less glycols used in the fluid the lesser the stickier residue. Glycols are one of the most widely used chemicals. They can be found in everything from food to make-up products.

There are questions about the safety of fog produced chemically. People have complained it causes breathing problems for them. There was a case in Washington where an employee sued her employers stating that the glycol based fogs they used made her asthma far worse. In 1991 an opera singer, Will Roy, filed a lawsuit in Ohio against Opera/Columbus claiming the fog they used permanently damaged his ability to sing. The fog had supposedly caused a "marked decrease in his ability to take in large amounts of air and hold it, which you need to do to be an opera singer". Roy won his lawsuit and collected a six-figure settlement. This is not how most of the cases go though. Fog currently is considered safe and harmless. In a report published by the National Institute for Occupational Safety and Health in 1994 no evidence has been found that artificial fogs are "a cause of occupational asthma", however they do have "irritative and mucous membrane drying properties". The National Actors' Equity Association claims otherwise. They sponsored a study that concluded the chemical fog "does pose a health threat to fog-exposed performers." There have been few complaints and until this changes things will remain. Many people enjoy the effects of fog and as long as people are warned that it may cause their asthma to act up it will continue to be used. More studies will need to be performed before any clear and concise answer can be given. So far though, the evidence indicates that artificial fog can be used safely.

For the effects needed in the production of Frankenstein I think we are going to need more than one machine, some on the stage level and some above the stage. In order to project on the fog there will need to be a high density of it in the location where the projection is. This will need to be maintained with the machines and possibly a fluid that has a slightly higher level of glycols, since the more glycols the more hang time in the air. The machines are needed in both locations so that the fog can be created fairly

quickly and form a projection area. If they are only placed at one level the fog may dissipate too quickly and there won't be enough area to project on. The only difficulty is that whatever machine is hung needs to have a chiller so that the fog generated will float down. The other machines on the stage will be fine as is because the fog needs to rise. It is possible to direct the fog around through the use of ductwork. If this needs to be done the ductwork needs to be a minimum of 4 inches in diameter and of heavy construction, which could prove to be difficult to work around in the show.

I researched dry ice but I don't think it is a possibility for this production. This is due to the noise created and the fact that dry ice fog remains low to the ground and is a thinner fog. It is cheaper, but such large amounts would be needed that it would also prove costly in the end.

There are a lot of possibilities; mainly what it is going to come down to is money. It is possible to make this happen but clearer delineations will be needed. How large the area needs to be for the projection, how the effects are wanted in other scenes and how much available space is there? Is it possible to tie the machines in with the stage design? These questions as answered will help make clearer options. There is no doubt this can be done; it is going to take some time and much more research. Companies would need to be contacted, demonstrations of machines would need to be seen, experiments performed, etc.

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