Sustainability in Theatre

An honors thesis for the Department of Drama and Dance

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Introduction

"A person has to be an unreasoning barbarian to destroy what cannot be re-created. Human beings are endowed with reason and creative faculties in order to enhance what is given to them, but so far they have not created but destroyed. Forests are fewer and fewer, rivers dry up, wildlife is wiped out, the climate is spoiled and every day the earth grows more impoverished and ugly." - Uncle Vanya, Anton Chekhov[1]

At the turn of the 20th century, Astrov, Chekhov's environmental antagonist, poses the observation that that natural world is going to ruin but is unable to explain why. In the 1960s Garrett Hardin replied with "The Tragedy of the Commons", a piece that posits that as humans share the same common space, their personal gain will outweigh the needs of the environmental, eventually rendering the resource useless. Hardin observes, "Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all."[2] This mentality is what leads to the destruction of nature and is leading humanity into dangerous ecological change. Hardin uses the word tragedy in a deeply theatrical sense;

We may well call it "the tragedy of the commons," using the word "tragedy" as the philosopher Whitehead used it (7): "The essence of dramatic tragedy is not unhappiness. It resides in the solemnity of the remorseless working of things." He then goes on to say, "This inevitableness of destiny can only be illustrated in terms of human life by incidents which in fact involve unhappiness. For it is only by them that the futility of escape can be made evident in the drama.[3]

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1 :Chekhov, Anton. *The Complete Plays.* Translated by Laurence Senelick. New York: W.W. Norton and Company , 2006.

2 :Hardin, Garrett. "The Tragedy of the Commons." *Sciencemag.org.* December 13, 1968. http://www.sciencemag.org/content/162/3859/1243.full (accessed May 2 , 2011).

3] Hardin, "The Tragedy of the Commons".

This is theatre's response to the tragedy of the commons. Hardin calls for a change in mode of thinking and therefore, theatre needs to build for a sustainable future. The difficulty is that theatre is an inherently wasteful event. Large sets and costumes are built specifically for a production, only to be thrown out when the show is over. The inspiration for this project came from a simple question during a production strike; “Do we recycle any of the wood?”. The answer was no. The aim of this thesis is to explore the different options that theatre has to reduce its carbon footprint, its waste, and to promote the process of recycling in the production process.

The first chapter discusses the evolution of the American environmental movement, bookmarked by two large scale media works, Rachel Carson’s landmark book *Silent Spring*, published in 1962 and Al Gore’s *An Inconvenient Truth,* produced in 2006. Both these works caused a major shift in environmental awareness. Exploring the policies and attitudes over this strain of time will give the reader a sense of where the theatre fits into the larger environmental movement that has occurred over the past 50 years. It will then move to demonstrate where theatre fits into that movement. Theatre is a large industry with the heart of an individual. It is a constantly growing and changing art form and has the power to change in a sustainable direction.

The second chapter is an amalgamation of green theatre practices, from a variety of sources. This chapter includes ideas for going green in set design and construction, costume design and construction, lighting, and theatrical venues. It also contains a detailed look at the Tufts drama department through interviews with the design and technical faculty. This establishes exactly what the department is doing in their specialties, with recommendations on how to improve sustainability in both the short-term and the long-term. The most important changes for each department are; a welding room in the scene shop to work with steel and other metals,

special attention paid to dry cleaning for the costume shop, an understanding of how we are using energy for the light shop, and an overall increase in storage for the drama department.

The third chapter traces the efforts of New York and London to promote sustainability on Broadway and in the West End. It includes an interview with the Broadway Green Alliance (BGA), a subset of The Broadway League, an extended look at the Green Theatre Programme in London, and the Arcola Theatre's efforts to build a new, sustainable theatre space. This chapter compares and contrasts two different strategies to change theatre. The first is the grassroots approach of the BGA and the second is the government approach of London. The conclusion is that the BGA, with its grassroots organization, is a more effective method than that of London's. Both these cities serve as a model for other theatres and, due to the large trickle-down effect of theatre; the efforts made in major metropolises will then be seen in smaller regional theatres in the future.

As a culmination to this project, I was able to attend the Staging Sustainability Conference at York University in Toronto. This was a meeting of academics, professionals, and theatre enthusiasts in order to discuss the role of sustainability in theatre and other areas of performance and visual art. It was a wonderful opportunity to meet with people who had the same passion that I did and to engage in stimulating dialogue about the role of sustainability in theatre. An overview of the panels I attended at the conference is included in Appendix B.

Chapter One

This chapter will discuss the evolution of the American environmental movement, bookmarked by two large scale media works, Rachel Carson's landmark book *Silent Spring*,

published in 1962 and Al Gore's *An Inconvenient Truth,* produced in 2006. Both these works caused a major shift in environmental awareness. Exploring the policies and attitudes over this span of time will give the reader a sense of where the theatre fits into the larger environmental movement that has occurred over the past 50 years. It will then move to demonstrate where theatre fits into the environmental debate.

By 1960, America had transformed into a consumerist society. World War II had lifted the American economy along with mass consumption and the rise of technology. The natural resources available seemed endless. It was generally believed that science would be able to fix any future problems and changes in behavior were therefore not necessary. General Electric's motto in the 1950s demonstrates this mentality; "Progress is our most important product". The environmental movement saw the current situation differently and proposed the neo-Malthusian theory which states that "the natural resources humans need for survival cannot last forever because of society's overconsumption".[4] This marked one of the first cries for sustainability in society. It was acknowledged that the resources would not be available forever and human behavior would have to change in order to meet future needs of generations.

In 1962, Rachel Carson debuted her extremely influential work, *Silent Spring*. The book brought on the idea that environmental problems were not confined, but rather spread throughout the entire ecosystem. Focused on pesticides, it chronicled the spread of DDT through the food chain, resulting in the deaths of robins. As the premiere of its time, Carson's book chronicles the dangers of a technological society that was moving faster than nature. The book resulted in the banning of DDT as well as the birth of the modern environmental movement.[5]

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4 Kline, Benjamin. *First Along the River.* Third . Lanham: Rowman and Littlefield , 2007.

5 Ibid. Pg 73.

This new awareness of natural dangers spreading throughout the land prompted some of the first environmentally friendly legislation from John F. Kennedy. His work pioneered ways to cut down on pollution through government spending. The Land and Water Conservation Fund used federal revenues from offshore drilling to acquire land for national parks. This was followed by the Clean Air Act, which as its name suggests, helped to regulate air pollution. Furthermore the Wilderness Act preserved a shrinking national wilderness system.

Grassroots organizations also started to take hold during the 1960s and environmentalism found a niche in the counter-culture of the time period. The movement spoke to those who would do away with the consumerism that plagued the older generations. New forms of media, such as television, were able to reach wider audiences. Books following up *Silent Spring* became increasingly visible and people started to change their own attitudes towards the environment before waiting for the government to do something radical.

In 1969 the major effects of pollution were seen when the Cuyahoga River, near Cleveland, set fire. This was a major turning point for the American people. The river had become so polluted that the trash, covered in oils, burned right on top of the water. Other environmental disasters, mostly dealing with pollution, started to materialize all over the country, with resulting responses that were remarkable. On April 22, 1970, a little less than a year after the fire, the first Earth Day was held with around 20 million participants.[6] The leader of Earth Day was Senator Gaylord Nelson. The grassroots activists, especially those on college campuses, were mobilized to increase awareness of the dangers pollution present to the earth. Earth Day solidified the grassroots movements and helped to usher in a new age of environmental policy in American politics and has been celebrated annually since 1970.

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6 Ibid Pg 81.

Under Richard Nixon, post-Earth Day legislation started to take foot. One of the key movements of Nixon's administration was the National Environment Policy Act. This established the Environmental Protection Agency (EPA) that was headed initially William D. Ruckelshaus. Now the government had a method to enforce laws the federal government put in place to protect the natural environment of the United States. However, the EPA was not just limited to the forests, lakes, and wildlife, but was concerned for the health of the people. The first issue the EPA took on was air pollution. Congress originally passed the Clean Air Act in 1963, yet smog and acid rain continued to be a problem in industrial cities. The revised Clean Air Act, passed in 1970, effectively cleaned up the fuel industry through scrubbers for coal burning factories and reduction of the emissions from vehicles. The Clean Water Act soon followed in 1972, protecting recreational water areas and later, drinking water. Congress also banned the pesticide DDT, the antagonist of *Silent Spring.* One of the major accomplishments of this time period was the Endangered Species Act in 1973. This move was applauded but would later become controversial when it came to saving species at the cost of human development.[7]

Soon after the development of the EPA, America experienced the oil shock of 1973. OPEC's oil embargo deeply affected the American economy and people shrank away from the initial excitement of environmental progress. [8] This loss of enthusiasm will become one of the cornerstones of the environmental debate. When the economy is down, industry becomes driven by the short-term rather than the long-term. While investing in alternative energy might have seemed like a proper response to rising oil prices, industry would have rather turned to a cheaper resource such as coal, even if it adds to problems such as air pollution, a solution that remains

7 Ibid Pg 94.

8 Ibid Pg 95.

appealing to this day. When the economy is down voters do not want to think about the environment, they want to ensure that their future is monetarily secure. When the economy is thriving, then voters turn to a more sustainable future.

When Jimmy Carter was elected President after Nixon, he ushered in a new age of hope for environmentalists. He was one of the first leaders to realize that America could not live off oil forever and therefore, in 1977, he created the Department of Energy (DOE). It was an amalgamation of a few different government agencies in order to create a cabinet department. The role of the DOE, as defined by Benjamin Kline was "to set energy prices, enforce conservation measures, allocate fuel, and research new energy sources".[9] Carter also decreased the national speed limit to 55 miles per hour. It seemed like a new era of progressive environmentalism would come out of Carter's administration.

One of the major environmental policy changes at the end of the 1970s resulted from a disaster. Love Canal was a situation where residential homes were built on top of a chemical waste site and ordinary people suffered. Due to heavy flooding, the chemicals began to leach from the ground. Hazardous materials were everywhere, children were born with birth defects and several women miscarried.[10] The result of this toxic tragedy was the creation of Superfund. There was no precedent set for any environmental disaster outside of those that occurred naturally, but now there was a fund specifically for toxic waste sites. This brought money to help clean up the area and relocate families in order to keep people safe. Overall, this was a time of pollution control for the government, but this was soon going to change under the conservative era of Ronald Reagan.

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9 Ibid Pg 177.

10 Beck, Eckardt C. *The Love Canal Tragedy.* http://www.epa.gov/history/topics/lovecanal/01.htm (accessed May 2, 2011).

The election of Ronald Reagan and the subsequent development of Reaganism led the environmental movement to a standstill against the government. Reagan was devoted to getting government "off the backs of the people"[11]. The mentality of free market economics and limited government governed the 1980s and weakened the state of the environment in the process. Reagan's goal was to take environmental concerns out of business. Anti-pollution laws passed in previous decades were seen as interference to profits rather than as a necessary protection of natural resources. In fact, natural resources were allowed to become a commodity under Reagan. James Gaius Watt, the Secretary of the Interior, began to transfer public lands to private enterprises. Known for his extreme Christian fundamentalist based politics, Watt once went before the House Interior Committee to discuss his current policy and stated; "I do not know how many future generation we can count on before the Lord returns".[12]

The leadership of the EPA, Anne Burford, also promoted Reagan's pro-business stance. The leaders of the pollutions and destructive industries surrounded the EPA and who had little regard for conservation. These were some of the worst years for the EPA. It did very little to regulate industry's impact and ignored Superfund laws. Burford left the EPA disgraced after being found in contempt of congress and Ruckelshaus, the first EPA administrator, returned to revive the reputation of the agency[13]. Other environmental agencies, such as the Occupational Safety and Health Administration, were denied funding in order to render them ineffective. At one point, it was advised that natural parks would be better off being privately run, for their benefit.[14]

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11 Shabecoff, Philip. *A Fierce Green Fire.* 2nd Edition . D.C.: Island Press, 2003. Pg 202.

12 Ibid Pg 204.

13 Ibid Pg 207.

14 IbId Pg 210.

Privatization was the key to reducing the budget deficit, and the environment, to Reagan, was unnecessary excess.

In terms of renewable energy, Reagan promoted domestic oil and nuclear energy over wind and solar power. This was an attempt to become uninvolved with the politically unstable countries that produced oil, the Middle East, specifically. This motivated the attempts to increase drilling on the Outer Continental Shelf, The North Slope of Alaska, and federal wilderness areas. Fuel-efficiency standards were ignored. When attempts to drill in the above mentioned areas failed, dependence on foreign oils only increased.

Another method used by the Reagan administration to block environmental legislation was cost-benefit analysis. This was used on almost everything and often slowed down legislation. The costs of environmental regulation are usually very clear but the benefit is harder to quantify. There are often no clear or immediate benefits to cleaning up a hazardous waste site or limiting logging in national forests. Rather, the benefits are long term, health-related, and ensure resources for future generations.[15] With regards to risk assessment and management, Reagan ignored the science behind known carcinogens and rolled back their limits. This is an example of something that cannot immediately be regulated, but the negative effects of the not acting are not seen until it is too late and people become diagnosed with cancer.

There were some minor victories within the Reagan administration. A bipartisan congress expanded the Clean Air Act, Superfund, and the Resources Conservation and Recovery Act.[16] Many proposed "Reaganomics" inspired legislation were either vetoed or voted down. However, when Reagan left office, the environment was severely affected by eight years of inaction. Acid

15 Ibid Pg 213.

16 Ibid Pg 221.

rain and smog remained strong urban issues, the National Park System and the state of the parks were in shambles, nuclear waste was rampant, and government agencies had had their staff and funds cut to debilitating levels.[17] The public responded to these cuts by an increase in membership in national and grassroots organizations. However, these were reactionary due to government inaction rather than inspiration from a growing environmental movement.

George H.W. Bush campaigned as an environmental president but acted differently after elected. Bush's term in office marked a very important change in the environmental debate. During this time, pollution and conservation became background to the increasing threats of climate change and ozone depletion. The culprits of ozone depletion are chlorofluorocarbons (CFCs) and climate change is often associated with the greenhouse effect. CFCs are a man made product that was easier to regulate than the gases associated with the greenhouse effect (GHGs). The Montreal Protocol determined to phase out CFCs by 1999, and the hole in the ozone layer has begun to improve. However, control of GHGs has not, and global warming remains a major environmental concern.

There were two marked ecological problems that plagued the first Bush administration. The first of which was the Exxon-Valdez oil spill in March of 1989. Today the oil spill has been eclipsed by the vast BP oil spill of the summer of 2010, however, at the time; it was the worst oil spill the nation had seen. The spill had disastrous effects on the ecosystem of the area. The second problem was that of the Northern Spotted Owl. This returns back to the economy versus the environment argument. The Northern Spotted Owl was an endangered species whose habitat in the Pacific Northwest was a prime spot for logging. The owl's habitat was protected under the Endangered Species Act and therefore the government could not allow logging. The protest came

17 Ibid Pg 221.

up from citizens of the area whose livelihood was dependent on the logging industry. Without the ability to work, the government put the lives of the owls ahead of humans. It is possible that the jobs in the logging industry were already in decline due to advancements in machinery.[18]

In the early 1990s there was also a shift toward green marketing. Due to the growth of environmental NGOs an awareness and increase in advertising made it trendy to "go green". Recycling, a key part of environmental sustainability became wide spread as the amount of trash among Americans grew.[19] Corporations began to see the value in going green and saw the money that could be made by producing sustainable and environmentally friendly products. The same consumerism that created the environmental problems could now be used as a solution. Advertising specifically green products will draw consumers drawn to purchase these products. It is easy to make a green choice when that choice is easily available. Consumers often was to be environmental but do not know how. Additionally, an increase in demand for environmental products will create a larger supply and the prices will go down. For the theatre industry, if designers and technicians are presented with an environmental choice in a product as well as the benefits to the environment, they will hopefully make the sustainable choice. As these choices increase, then the prices will go down and theatre industry will start moving towards a sustainable future.

In 1992, the Earth Summit was held in Rio de Janeiro. It was the first time an international conference was held to address environmental issues that spanned across borders, such as largely invisible pollution. 170 countries attended the conference; however, no clear solution was set. Bush blocked all forms of progress coming out of the conference. He feared that regulating

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18 Kline. *First Along the River.* Pg 107.

19 Ibid Pg 109.

American industry to the levels needed to help stop climate change would greatly affect the economy being too costly and cumbersome for Americans to adopt. This also was one of the first times the problem shifted to north south from the previous east-west tensions felt earlier. Less developed countries, most of which were found in the southern hemisphere, could not afford to create sustainable alternatives to help curb GHGs and other environmental problems. Instead, they looked to the developed countries to take responsibility for their industries' actions. The Rio Conference, as it is also known, ended in an agreement to help curb emissions but there was not sufficient ongoing commitment to the cause.

Environmentalists heralded the election of Bill Clinton to presidential office. Not only was there a Democrat as President, but also his Vice President, Al Gore, was an outspoken environmental advocate. Clinton started strong, signing the Rio Conference treaties. Kline quotes Bill Clinton's speech from Earth Day in 1993:

> "If there is one commitment that defines our people, it is our devotion to the rich and expansive land we have inherited. From the first Americans to the present day, our people have lived in awe of the power, the majesty, and the beauty of the forest, the rivers, and the streams of America. That love of the land, which flows like a might current through this land and through our character, burst into service on the first Earth Day in 1970". [20]

Clinton appeared to be the first President since Carter to recognize that there could be a balance between sustainability and industry.

Outside of the government, two new ideas in environmentalism arose. The first was the not-in-my-backyard campaigns. This was against waste and landfills around residential areas. The NIMBY protests mostly concerned a mentality that waste should be dumped anywhere but middle class neighborhoods. The early 90s also saw an increase in the fight for environmental justice that concerns environmental problems in poorer areas and cities that go unnoticed by most of the country. Problems of landfills and pollutants leading to children with higher asthma rates or

20 Ibid Pg 117.

shorter life spans often go unnoticed in these areas. Usually, it takes action from those directly affected by the pollutants to call attention to the issue. Organization within the community can be crucial to eliminating problems of environment injustice.

1997 marked an important shift in international environmental politics. Climate change was now undeniable. Human activity added an unnatural amount of GHGs into the atmosphere and the greenhouse effect was uncontrollable. If human behavior went unchecked then the results would be disastrous. Therefore one of the first conferences specifically dealing with climate change was held in Kyoto, Japan in 1997. The goal was to figure out an international agreement concerning reduction in GHGs. Bill Clinton came to the conference with the Joint Implementation Plan. Kline quotes the plan:

> "Joint Implementation (JI) is an innovative, market-based, approach for addressing global climate change that uses international partnerships to achieve low-cost reductions in greenhouse gas emissions. Under JI, a company in the United States invests in a project that reduces emission in another country and uses those reductions as a less expensive means of meeting its own target. The U.S. has proposed the formal regime that gives credit for JI project to be part of the new climate change agreement."[21]

This credit trading system often seems like an effective plan for industry changes in GHG emissions. If a company (or country) can come in under target, then they can sell their credits to another company (or country). Overall, the amounts of GHGs are reduced and sustainability becomes profitable. At Kyoto, the north-south divide once again came between international progresses. The developing world needed industry to develop, but they were often some of the worst polluters. It is difficult to blame any specific country for climate change. As a global issue, it means global responsibility as well as personal responsibility. The Kyoto Protocol agreed that developed countries would cut emissions to 1990 levels but exempted developing countries. Bill

21 Ibid Pg 134.

Clinton signed the protocol in 1998 but the Senate never passed the treaty because it was viewed as too detrimental to industry.

Without government support for environmental issues, the individual must step up in order to create a sustainable future. After the Kyoto Protocol, the environmental justice movement picked up. The efforts made against environmental injustice are proof of how far grassroots and community based organization got in effecting change. Kline tells the story of a Spanish-speaking working-class community in California that fought for four years to get a giant pile of concrete debris, dubbed la montana, removed from their community. He attributes their strategy: "By making it a political issue linked to environmental racism, they were able to obtain the assistance of environmental groups and mount a campaign against the city council members who supported the ARS." [22] The community eventually won the battle and ARC, the company responsible for la montana, was forced to remove it. Small success stories such as this promote the notion that a few can overcome environmental issues in a way that the government, speaking for millions, cannot. These smaller groups are able to stay focused on smaller, local issues that directly affect their well-being. This focus is similar to scenic painters changing the paint used because of toxicity levels. This change directly impacted the health of the scene painter, elongating their life span expectancy; however, it was not a government decision to make these changes.

Environmentalism also experienced, along with the rest of the world, the emergence of the Internet. With the powerful new tool environmental groups had the chance to reach farther than it could ever imagine. Websites containing information were accessible to anyone who looked for them. Groups could attain new members through email subscriptions and online advertisements. Additionally, it was paperless, helping to protect the nature that each group intended to preserve.

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22 Ibid Pg 136.

The Internet was not only a revolution for environmental groups but for the government as well. As the government went online it was able to post more information and create a better consumer. People were now easily able to track government progress through their webpage. Furthermore, companies from the other side of any environmental issue were able to join the debate. They were able to defend themselves through their own websites, letting people make an educated decision for themselves. The internet now serves as a powerful environmental tool. Information about sustainability is abundant on the internet. Groups such as the Broadway Green Alliance use the internet to post updates for environment-conscious theatre makers and patrons alike. Detailed plans for sustainability in all areas of life, including the arts, can be found through websites such as sustainablepractice.org for the Center for Sustainability in the Arts. These websites hosts forums and areas for information exchange. This increases the power of the educated consumer and helps to promote sustainable goals.

George W. Bush never made any claims that he was a conservationist. He ran against Al Gore, who was known for environmental agenda, but Gore was defeated in one of the closest elections in history. At the dawn of the new century, it seemed as if the environment would be one of the most important issues even if the president were not supportive. However, the world changed after the terrorist attacks on September 11th, 2001. The War on Terror was declared and the environment was pushed to the side as all resources needed to go into the war. Part of the fight was lessening dependence on foreign oil and Bush wanted to start using the limited reserves the United States had, such as those is Alaska. This move was unproductive as it would cause more harm and the supply would run dry in a few months. Bush continued to deregulate and set back the environmental agenda. He chose not to ratify the Kyoto Protocol, fundamentally disagreeing with it. Bush came from the oil industry with skepticism towards global warming and was aware

of the economical incentives not to regulate the oil industry and push for renewable energy sources.

After losing to Bush, Al Gore revived his environmental agenda. Accompanied by series of lecture tours and book, Al Gore produced the movie *An Inconvenient Truth,* one of the most watched and influential documentaries of the past decade. Similar to *Silent Spring* from 45 years earlier, *An Inconvenient Truth* changed the environmental debate. By using a popular medium and engaging storytelling, the dangers of climate change spread throughout the nation. Many people became concerned for the first time, and since its release in 2006, people have been taking personal action. The potential disaster of climate change was thoroughly brought to life and promptly scared the American public into changing personal lifestyles. Indeed, it is almost fashionable to "go green".

Kline sums up the current state of environmental debate the best:

> "Unfortunately, it may take the environmental equivalent of the 9/11 Twin Towers disaster to shift the public's attention toward a global and national threat which promises to make the present human vs. human conflicts irrelevant.... Time is the currency we are using in our gamble that the potential environmental disaster we face will wait until our debating, negotiating, and inter-species squabbles abate long enough to allow us to turn our attention to energetically dealing with these issues. If times runs out and the bet is lost we may be forced to turn our resources toward solving these environmental issues only after a monumental and catastrophic crisis occurs." [23]

The environmental movement has grown and changed tremendously in the past half a decade. Everyone is aware that a change in lifestyle and production is the key to creating a sustainable future, but making a fundamental change in lifestyle is not an easy task to accomplish.

As with *Silent Spring* and *An Inconvenient Truth*, media can be a powerful tool. Theatre is categorically part of the world of literature and film, all under the greater umbrella of the arts.

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23 Ibid Pg 167.

Theatre is not just a cultural phenomenon, theatre is an industry, and treating it as both can help create a sustainable future. Theatre is a collaboration of many individuals who are working to achieve art and entertainment. Keeping in mind the initial dilemma that theatre is a temporary phenomenon; it can fit within the larger environmental movement on both an individual and an industrial level. Theatre has a place where the government has failed. Grassroots movements have proved some of the most successful models for motivating industry and government. Seeing change within the industry through the efforts of individuals can help theatre reach important levels of sustainability. There are several ways that theatre can help the environmental movement. It can fill a void where the government has not enacted strict enough legislation. Theatre can adapt to grassroots mentality in order to make change. Theatre can use its long established reputation and large reaching audiences to help enact change. The people involved in theatre can also be enlisted, everyone from the actor to the stitcher to the producer, relying on the assumption that theatre people tend to be more politically progressive. However, theatre is faced with many obstacles that some major parts of industry are not. Identifying these obstacles is an important step forward in making change. Yet, theatre is a constantly evolving art form. Using this, theatre practitioners can experiment until finding a reasonable way forward as part of the growing environmental movement.

After reviewing the brief history of environmentalism earlier, it is not hard to see how often the government falls short in environmental policy. Attempts at making progress have often been thwarted by industry lobbyists. The fear of the effects on industry in reducing emissions and making overall changes to production intimidate industrial leaders. The government has made attempts to reduce emissions through incentive-based programs rather than mandating the changes necessary to reduce the effects of climate change. This failure is what makes theatre's

role all the more pressing. As theatre moves towards a more progressive future, they will serve as a model for any group looking to make change in their modes of thinking. A successful greening up of theatre will also lead to a positive impact on the environment. The changes made will not only affect the health and safety of the individuals involved in theatre, but will ensure that necessary resources remain for future generations.

Theatre is a definite industry. According to The Broadway League the 2009-2010 Broadway season grossed $1,020 million and almost 12 million people attending a show on Broadway.[24] Of course, this is just the major entity of Broadway; the most commercialized and organized theatre institution in the United States. There are theatre centers all throughout the United States, including large communities in Chicago, Los Angeles, and Boston. While theatre is often seen as an unstable industry, it can be approached as industrial. There are unions representing all areas of theatre makers. Examples include Actor's Equity Association, the Stage Directors and Choreographers Society, The International Alliance of Theatrical Stage Employees, and many more, even local organizations that help support the theatre industry's workers. The influence of these organizations is strong and effectively can even shut down Broadway if necessary. Because of its unification its role as an industry, theatre is able to take the initiative to enact change even when the government does not force it.

Change in theatre can come not only from the industrial level but it can emerge from the grassroots level as well. Theatre is produced through the efforts of several sets of individual: it is the director, the stage manager, the lighting designer, the audience, the list goes on. A full production, even at the smallest levels, employs and engages many people. It can be these people

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24 The Broadway League. *Broadway Season Statistics.* http://www.broadwayleague.com/index.php?url_identifier=season-by-season-stats-1 (accessed May 2, 2011).

taking individual strives forward that can help to transform the industry. The grassroots movements have not gone unnoticed throughout the history that has already been recounted. The environmental justice movement, specifically citing the already described la montana case, proves that many people working together can make a change. These changes are not the sweeping reforms that confront industry, but their individual efforts are what make a change. Grassroots leadership in theatre, such as the Broadway Green Alliance, an organization helping Broadway with environmental initiatives, are the people who can help experiment with new methods that could become industry standard. This works with the assumption that every little thing helps, as many environmentalists have promoted in lieu of government inaction. Smaller individual and community-based groups can affect change. Additionally, theatre is inherently a community. These individuals can find support by sharing their personal actions with other practitioners of the same field.

Theatre has established itself as a powerful tool of social change; throughout history it has been an influential cornerstone of society. Theatre can be revolutionary, not just through words, but through actions as well. By creating one standard in sustainable theatre, it is highly likely that it will trickle down through the rest of the theatre industry. When someone makes a decision as practitioner and that decision works better than the old standard other people can take on this new idea and progress forward. As Broadway turns greener and experiences the benefits of these changes, other smaller models will change as well. Even theatrical modes from other nations can trickle into American theatre.

When theatre becomes sustainable and advertises as such it reaches an audience. This audience can be local patrons of a community theatre, the tourists of Broadway, or the students of a collegiate theatre. By promoting the work within, the theatre audiences can strive to make

changes in their own lives as well. Seeing an artistic model striving to look ahead in terms of a sustainable future can inspire people to use the same tools in their home. Awareness has been one of the keys goals of environmental groups. Knowledge is empowering. Many people who have seen *An Inconvenient Truth* or read about the ecological problems are unaware of how to proceed and help. By giving the audience a model and using them as an agent of change, theatre can help to bring sustainability into more homes.

Making the necessary changes in theatre will not be easy. Theatre is faced with many challenges without considering the environmental factor. The biggest two obstacles against a sustainable change are budgets and time constraints. At the heart of the budget issue lies the often-noted short term versus long benefits. Each production has a budget that does not necessarily roll into the budget of the next show. Investing more money in green technology at the start does not have the long-term payoff that industry can enjoy. One of the major incentives for other industries to go green is that their energy bills will decrease. Apart from the maintenance of the theatre house itself; this does not have the same implications for say, a lighting designer. Buying new instruments, such as the energy efficient LED lights, is a very costly endeavor. If a designer were there for just one show, his/her budget would seemingly be better spent putting together the artistic vision for the production, rather than focusing on the long-term goals of reducing energy consumption. Creating a sustainable theatre has a greater chance with a set production staff that is willing to move forward with new technological changes. Furthermore, some of the options presented later will provide an immediate payoff for many areas of technological theatre.

The second obstacle for theatre is time. Many productions, professional or amateur, are faced with time constraints. Productions are constantly loading-in or out. When faced with such

difficulties, it is easy for the environment to get pushed to the side in favor of quick fixes. Additionally, it is much easier to work with what you have, rather than spend the time (and money) going out to procure new, more sustainable materials. With these time restrictions, it becomes easier for various designers and shop crews to focus on what they know how to do well. Going back to the lighting design example, if designers decide to switch to LED lights and are not trained in how to use them, they must use that time figuring out a new system and how the lights work. They then must build a lighting plot around these new instruments. Later, the electrics crew needs to become familiar with the LED instruments and potentially take the time to convert the entire light plot. During technical rehearsals for a production, they must then take the time to see how these new lights work with the stage and the actors. Overall, it appears that the trade-off for a sustainable lighting system also involves a strong investment in time. It is noting this time and working it into a production schedule that will allow for change. By making a conscious choice to change things, designers will be able to move forward.

Despite these obstacles, theatre has some strong qualities that will allow for sustainable changes from the box office to the strike that marks the end of a show. The history of theatre shows a constantly evolving art form. Some norms prevail for a while before something new and exciting captivates the audience. What the world needs is this change to move in a sustainable direction. Theatre has the size of an industry but the heart of an individual. The individual efforts of people and communities can help create a sustainable industry. The theatrical community must make a concerted effort where the government has fallen short. As theatre propels itself forward, and with budgets on Broadway steadily increasing, there must be awareness in the industry for a sustainable future. This awareness should not just remain in people's homes, it must move itself center stage.

Chapter Two

Considering the notion that theatre is inherently wasteful, various organizations and people have come up with alternatives to reduce this waste and begin to turn theatre into a sustainable art. The three main sources for this chapter are Larry Fried and Theresa May's book, *Greening Up Our Houses,* The London Guide for Green Theatre, and The Broadway Green Alliance. However, ideas from other sources and individuals for specific parts are included. This chapter condenses these various sources as a way to understand the changes that theatre practitioners can make in order increase their own sustainability in their specific field. The main areas for change are set design and construction, costume design and construction, lighting, and theatrical venues, including rehearsal spaces and the front of house. This chapter will also explore, in turn, the various design and technical departments here at Tufts University. This was done by conducting interviews with each member of the design/tech faculty to explore how exactly each department is run with the intention of increasing sustainability and creating an awareness of the environmental impact of the his or her own specialty.

Set Design and Construction

Set design and construction appear to be one of the most obvious places to start when trying to produce a sustainable piece of theatre. Massive sets are built for a production and then are destroyed during strike. It is a cyclical process and each set must be different artistically. What will work for one show might not obviously work for another. Theatres often using different designers for different productions and there is little consistency in planning for a season. Designers may not think about what happens in the scene shop in order to build their sets. Scene shops in turn have to respond to the artistic vision of the designer. However, an overall look at the

production process for set design shows the ability of designers and technical directors to adapt a more sustainable attitude when designing and building sets.

A set designer who has the ability to think of the whole season can accomplish much more than a person just designing one show. It is possible to design a set that can be reused throughout multiple shows in order to reduce waste. Set items may be repainted in order to reduce wood use. The ability to think in the long term is a valuable quality when looking at designers for a season. Theresa May describes a theatre department that was able to do just that: "Chairman Joel Greenberg hired a highly motivated and imaginative scenic designer to develop a unit set for the six-play 1993/94 season. The modular set, designed for a thrust stage, involves mostly risers with a limited number of vertical pieces. The pieces work much like a jigsaw puzzle".[25] Designing for an entire season creates a unity in each production that can be a bonus. It also presents a unique challenge to the designer as he or she thinks of ways to produce interchangeable set pieces. However, the downside to this approach is that it is restricting to the designer. Not only are plays unique, but also the set must respond to the creative needs of that specific production. If there is a set for the entire season, then the play is conforming to the needs of the space rather than the emotional response of the creative team.

The next step involves acquisition of materials. One way to effect change is to only buy from suppliers that are environmentally friendly. This can range from non-toxic paint to sustainably harvested wood. The Broadway Green Alliance provides a materials scorecard that references individual materials and how environmentally sustainable they are. The list provides a comprehensive guide to materials used in set building, as well as other areas of theatrical

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25 :Fried, Larry K., and Theresa May. *Greening Up our Houses* . New York: Drama Book Publishers , 1994.Pg 28.

production. (The scorecard is attached as an appendix.) For sustainable timber, Forest Stewardship Council certified wood is an option endorsed by the NRDC. As described in their website:

> "The Forest Stewardship Council is an international agency that tracks and certifies sustainably harvested wood and wood products. Wood that has been certified by the Forest Stewardship Council has been harvested in a more sustainable manner with a reduced impact on wildlife habitat and indigenous cultures. FSC is the only certification system acknowledged by the world's leading environmental groups, including NRDC, to provide adequate protection for the world's forests."[26]

The NRDC's website provides resources for finding a variety of sustainable wood sources. Other options include buying from suppliers that you know are environmentally friendly. Many companies will brand themselves as sustainable, but one must first check to see what makes an organization sustainable.

Materials that can be sourced locally are also useful to sustainable set construction. If items are not being shipped all over the country, then they are reducing the amount of emissions involved in transportation. Furthermore, creating comprehensive shopping lists to cut down on the amount of trips to the hardware store or lumber depot can be useful for reducing fuel usage and is also cost-effective. Using old materials in new creative ways is another way to incorporate recycling into set construction. For example, the chandelier in *Bloody Bloody Andrew Jackson* was made entirely of cat food tins. This provides another way for technical directors and set designers to get innovative with design elements.

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26 National Resources Defense Council. Forest Stewardship Council Certified Wood. 2 May 2011 <http://www.nrdc.org/enterprise/greeningadvisor/cri-wood.asp>.

During the building process, paint can become a major source for environmental change. For instance The London Green Theatre Guide lays out a method for preserving paintbrushes so it saves water during the painting process:

> "Paint brushes and rollers used in an ongoing project can be saved overnight, or even up to a week. Simply wrap the brush or roller snugly in a plastic bag, squeeze out air pockets and store away from lights. The paint won't dry because air can't get to it. Simply unwrap the brush or roller the next day and continue to the job. (This works for water and oil-based paint and stains. It does not work for varnishes or lacquers). Turpentine, mixed with a couple of drops of washing-up liquid, is an environmentally friendly solvent that is excellent for cleaning brushes used for oil-based paints."[27]

Paints should be non-toxic as paint toxins have been a major problem for scenic designers in the past. (Please refer to the appendix for a guide to the toxicity of painting materials.) Additionally, ensure that you only buy and mix only enough paint for the job currently being worked on so to not bring about unnecessary waste.

It is possible to build in a way that allows set pieces to be used later. Common theatre practice promotes stock such as flats and platforms. These can be reused multiples times in different productions, constantly being modified for what is necessary. Having ample storage for these sets and flats can be an issue as storage space in many theatres is low, but looking to rent out additional storage space can be cost effective in the long run as building costs can be lowered. May also cites a method for building reusable pieces even when the scenery is unique, from Bill Meyer, technical director at Cal State Fullerton: "If you have a strange piece of scenery, when you plan framing it and before covering it, build a triangular frame in it. On strike night run a skill saw over it, and you will have a nice backing piece for the next show you are doing".[28] This might

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27 :Mayor of London. "Green Theatre ." 2008. Greening Theatres. 2 May 2011

28 :Fried and May. *Greening up our Houses.* Pg 28

add more time to the building and strike process, but if a TD is aware of it s/he can budget the necessary time appropriately.

The last step in set construction is the striking of a set. There are many options available outside of deconstructing the set and then throwing it out. Sets can be exchanged with other programs. Professional sets may be donated or rented to amateur productions. A *New York Times* article on the fate of sets post-production cites that one set was sent piece by piece to the Hartford Stage for use in their production. The *Spring Awakening* set was sent to Austria to be used in the production there. The article also mentions productions that sent their designs to storage for undetermined use later.[29] Materials can be donated for later use in New York City through the organization Materials for the Arts. This organization collects unwanted goods from organizations in order to give them to education and community organizations in need of donated materials to sustain themselves. This is an excellent way to reduce waste and to give back to the community simultaneously. The BGA website provides an excellent list of resources for theatres in the New York area in order to ensure reuse or recycling of sets after strike.

The greatest advantage of Tufts' scene shop and scenic designer are leaders who are already thinking green. Ted Simpson, our resident set designer, John Mulligan, our technical director, and Meredith Miller, the assistant technical director, all spoke to me about specific ways the scenic construction, paint, and design are all focusing on greener materials and methods. This green mentality starts with design and moves through to strike.

The concept of designing one set for a season was discussed in the previous section. While Simpson disregarded this idea as being antithetical to the design process, the idea of thinking of a season more holistically is a viable option for the department. The problem Simpson

29 :David, Cara Joy. "Old Sets Live on as Broadway Embraces Recycling ." 11 Feburary 2009. New York Times. 2 May 2011.

brought up was the emotional connection to the play, one of the first lessons taught in design classes. A set should respond to the specific needs of a production, rather than forcing the production to fit into a pre-designed set.[30] Rather, Mulligan presented to the options of play selection and cohesion in a season from the beginning. By creating a theme for season, Mulligan would be able to specify certain problems and deal with them consistently throughout the season. For example, deciding whether or not to use the trap at the beginning of the season, and then continue to use it for the other productions. This would imply trapping the floor once and then not having to do it multiple times. Another example would be decided to take out sections of the Arena, and leaving them out for as long as possible. This would require less building and energy spent and would create a unifying artistic season. By thinking ahead through the entire season, then detailed plans could be made at how to reuse certain aspects of the previous production. However, this can be difficult in the academic season. Student designers and time make it problematic to think so far ahead in the design process. For example, a student designing the set for the spring show will not be able to create his design over the previous summer.

During the design and planning for the construction of sets at Tufts, the small stock of items that we do have are considered before thinking to build anything new. There are multiple platforms for the vohms in order to extend them if necessary. When section three of the Arena is removed, there are already all the platforms needed for that changeover. Overall, the department tries to use as much stock items as possible however; the problem that arises is the unusually shaped arena. While it is possible to build as much out of stock as possible, it becomes difficult

30： Ted Simpson, Scenic Designer, Tufts University, March 2011

when thing will not fit appropriately in the arena. This will causes more individualized design that will suit the Arena.

The set department makes a concentrated effort to shop locally. Simpson stated that it was good to support local businesses and often does his shopping at Backstage Hardware, a local small independent theatrical supply store. Simpson acknowledged that while this does cost more money, it is worth it. Mulligan also uses local vendors for materials but often goes to Home Depot for lumber. Mulligan stressed that it was about getting the cheapest materials, but some consideration is given to the future when purchasing supplies. For example, Mulligan buys double tempered hardboard. While this is more expensive, he can get multiple uses out of one piece by painting both sides. This creates both less waste and is cheaper than consistently buying new pieces of hardboard. According to Mo'olelo materials scorecard (Appendix I) hardboard is a number two-grade material. This is because the adhesives used can release free formaldehyde, a known carcinogen.[31] I would advise looking to buy both formaldehyde free and double tempered hardboard. This will cost a bit more but reduces the toxicity levels of the set.

While the reuse of materials is commendable, some of the materials used for construction have very low ratings from the Mo'olelo guide and should be reconsidered or used in very minimal amounts. Of these items is lauan, which is being harvested unsustainably and causing habitat destruction[32]. Other highly used woods include the domestic softwoods and engineered woods. Both of these currently hold a two rating on the Mo'olelo scale. The two alternative options could include wood products with content greater than 75% or Forest Stewardship Council certified woods discussed earlier. While these might be more expensive, if stock items

31 : Mo`olelo Performing Arts Company. "Green Theatre Choices Toolkit ." 12 November 2009. Broadway Green Alliance. 2 May 2011

32 : Ibid.

are built out of sustainably sourced wood, then the theatre would be getting great use out of them. Additionally, if more stock items are built, then there will be more money for building later. In contrast, Homasote is another commonly used product in the scene shop and it currently holds a 4 rating on the Mo'olelo scale. This is because it is made up recycled paper products and is held together through non-toxic glue[33]. Homasote is the products most frequently used for making the floor for productions.

With regards to student productions, Miller spoke to the ingenuity of student designers and technicians to recycle items. Student productions are on much tighter budgets than department shows. Therefore, students resort to "dumpster diving" to salvage materials for free. Miller commented that this does not affect the quality of the sets. Rather, it creates comparable products to the faculty productions but with different resources.

One of the strongest projects for the scene shop comes from Mulligan. He is attempted to convert the backroom of the scene shop, which is currently used for storage, into an appropriate welding room. This would reduce the need for sheet goods within the department greatly. Steel frames would replace wood for the general structure of a set. Steel, which was discussed earlier, is a cheaper, more sustainable approach to set construction. Mulligan applauded the ability of steel to do things that lumber cannot. He also stressed that steel is becoming increasingly standard in the theatre industry. He cited a personal example. In 1997, when Mulligan was just out of school and working at the Huntington Theatre, a facet of Boston University, about 80-85% of items coming out of the scene shop were made of wood. Just last year, Mulligan was working there again and about 90-95% of set pieces produced were from steel. It took a little over ten

33 ：Ibid.

years from the shop to switch completely, but change was demanded by the artistic needs of the industry.[34]

The backlash to the conversion of the backroom comes from the University's fears of welding due to fire hazards. It is not the materials they are worried about, but rather the process. Mulligan stressed that there were many complicated hoops to jump through in order to get a welding permit. He is attempting to emphasize to the University the long terms goals of allowing a spot for welding in the scene shop. Mulligan explained that the quality of wood products has decreased as deforestation continues. Wood products are just not as durable as they used to be. Steel offers a cheaper, more durable product. Mulligan is stressing safety to the University. He would instate a welding course that he believes would be popular not just among the drama majors, but also students from The School of Engineering.

With regards to painting, Simpson ensures that he avoids environmentally damaging paints. He would like to see a better ventilation system for painting, such as a spray booth. Currently, there is nothing that to help ventilate the Arena when painting is done. It is all done backstage and when necessary, outside. During washing of brushes, little can be done to prevent paint from going down the drain, but the current sink that is used for painting is disastrous. There is not filter system to help prevent what is going back into the environment, and therefore Simpson does as much as possible to ensure that paints get used. One of the short-term goals Simpson has focused attention on is improvement of the sink backstage.

Two other areas within the Tufts theatre are the props stock and furniture stock. There are two separate areas for this storage. Props stock is located backstage and furniture stock is located in a different building on campus. The props stock here contains a large amount of items that are

34： John Mulligan, Technical Director, Tufts University, March 2011

constantly being reused. One of the problems with the propstock is its organization. It can be hard to find items occasionally, and it is easy to assume that something is not in stock and must be purchased. However, dedicating time to searching through stock can prevent unnecessary purchases. Simpson cited a recent example with *The Importance of Being Earnest.* While it would have been faster to go out and purchase the many silk flowers that were used, Simpson went through all the silk flowers and greenery already in stock in order to use as much as possible from stock. It is a small effort, but it cuts down on trips to the supply store and the cost of purchasing new items. However, Simpson pointed out that props are often purchased in order to add to our own stock so that things do not have to be borrowed in the future.

The furniture stock in Hodgen is the other large stock area associated with the scenic department. This stock is available to rent out, but this happens infrequently. Miller noted that filmmakers and alumni are the people who rent from stock outside the theatre department. There is a nominal fee for the time it takes to pick up and drop off the items. The furniture stock is very crowded. There is an index of items on CD that is available. However, many items are unique to the show and may never be used again. However, with a specific effort, these items may be modified for future use.

During strike, Mulligan is focused on salvaging as much as possible. During strike at Tufts University, facilities leaves a large green dumpster outside the loading dock for non-salvageable materials. Mulligan explained that these dumpsters are then hauled away by facilities and then are sorted for steel, which is recycled. Everything else then ends up in a landfill. Therefore, no wood products are being recycled. Mulligan's goal is to have nothing in the dumpster to begin with.

Mulligan has met with the recycling coordinator at Tufts to create a better plan for scene shop recycling, starting with basic recycling in the shop. When Mulligan started this year, there were no recycling bins, even for paper. There are university trash and recycling receptacles in every room elsewhere, and it was commendable for Mulligan to seek out recycling for the scene shop. However, there is a still a regular brown dumpster outside the shop which is dealt with in a similar fashion to the large green dumpster set up during strike. Mulligan is also looking to install rolling totes that are used to recycle natural wood products. Small lumber goes into the barrel and then is donated to a company that recycles them.

During the strike process, Mulligan is ensuring that even the most unique items may be salvaged for use later. A recent example from *The Importance of Being Earnest* involved the benches used to be broken down for later use. Mulligan even keeps custom molding for future use. Miller believes that more things are indeed salvageable during strike however; there is little time to do this. Often, strike needs to be completed in about 3 hours after the show closes in order for another production to load in the next morning. Miller thinks that if there were more time, and then it would be easier to break things down for future use. This would require a change in schedule however, which becomes difficult with the high turnover of student productions in the Arena.

During all three interviews, I posed the idea of donating our sets to local theatre productions. Simpson said that it would not be feasible for our theatre because of its unusual shape. He posed that if we had a proscenium house, this would actually be a feasible source of income. Miller said that even the children's summer camp run at Tufts couldn’t use our sets, even when they have been offered. Mulligan had an individual experience with this while he was at Boston University. A group of students were proactive at finding a small theatre to donate a set to

after it was done being used. When it came to for the actual donation, no contact came through because of the difficulty of transporting the set. The labor was too involved in order for it to be beneficial to anyone. This is one of the problems of being a smaller theatre community than New York. The set recycling options are not comparable to the resources of New York.

Overall, the department is taking a lot of positive steps forward to increasingly sustainable set construction. The introduction of welding will be a powerful tool that will cut down costs in the long run, and will therefore allow for other changes to emerge over time. An improved sink backstage will help decrease the amount of toxins being returned to the environment. Lastly, a working knowledge of Tufts recycling program will help to ensure that materials thrown into the dumpster are being properly recycled.

Costume Design and Construction

Many of the issues associated with the costume shop also double as issues of health and safety in costume production. There are many chemicals that are used in the process of creating textiles, dying fabrics, and cleaning them after their use. However, methods for greening up a costume shop have been one of the most difficult areas to find written works about. For this section I interviewed Sharon Swingle from Siskiyou College in Northern California and Natalie Maynard who worked at the University of Texas Costume Shop. Both are individuals committed to the green theatre movement and are taking various steps to increase sustainability in costume production.

One of the main causes for concern for both environmental reasons and health and safety reasons is the use of dry cleaning in order to launder soiled costumes. Dry cleaning has been

marked as a major cause of concern for environmental and health and safety reasons. The EPA has noted the problems associated with dry cleaning and are working on methods to find alternatives to the current way dry cleaning is done. Perchloroethylene, also known as perc, is the main chemical solvent used in dry cleaning. Constant exposure to the chemical has been shown to lead to cancer. Another concern is the effect that perc has when released into the environment. The EPA clearly states the dangers of perc and the environment on their website.

- "Outdoor Air - Most of the perc used by the dry-cleaning industry escapes into the outdoor air through open windows, vents, and air-conditioning systems. In older dry-cleaning systems, perc may still be vented directly to the outdoors as part of the dry-cleaning process. Fortunately, many drycleaners now use new machines that control or eliminate the amount of perc that escapes during the cleaning process. Once outdoors, perc can remain in the atmosphere for several weeks, and although small amounts are always in the air, perc itself does not deplete the ozone layer of the atmosphere. After a few weeks, perc breaks down into other chemicals. Some of which are toxic, and some of which are suspected to deplete the ozone layer.
- Ground - Perc is known to be toxic to plants. It can enter the ground in liquid form through spills, leaky pipes, leaky tanks, machine leaks, and from improperly handled waste. Significant amounts of perc have been found in the waste resulting from dry-cleaning, which is considered a hazardous waste by the EPA. Most of the solid waste materials, which are filters used during the dry-cleaning process as well as residual solvent and soils, are picked up by hazardous waste management companies for recycling and/or incineration.
- Water - At the end of the cleaning process, the cleaning fluid is separated from wastewater by distillation. In the past, the wastewater was often poured down floor drains. In newer equipment, the wastewater is collected and evaporated, or removed by hazardous waste handlers and disposed of through EPA-approved methods. Perc can seep through the ground and contaminate surface water, groundwater, and potentially drinking water. A small amount of perc can contaminate a large amount of water and people can be exposed by drinking or using the water. EPA has a limit on the amount of perc that is allowed to be in drinking water. Well water can be tested to be sure it is below the EPA standard. Small amounts of perc in the water have been shown to be toxic to aquatic animals who can store the chemical in their fatty tissues."[35]

35： Environmental Protection Agency . *Frequently Asked Questions About Drycleaning* . January 5, 2010. http://www.epa.gov/dfe/pubs/garment/ctsa/factsheet/ctsafaq.htm (accessed May 2 , 2011).

Alternatives to dry cleaning are beginning to appear as perc begins to be banned from certain states. Wet cleaning uses water as the main solvent along with a few other detergents and additives. These alternative cleaners are now located in several areas and costume shops should make a concern effort to seek these shops out. Another option is to build costumes that do not need to be dry-cleaned. This takes a conscientious effort by both the designer and the costume shop to design in a way that can loan itself to an easier cleaning process.

Similar to the purchasing of sustainably sourced wood, the choice of textiles used can also have a positive impact on the carbon footprint of a theatre. Some examples of these products include certified organic cotton and linen or textiles with recycled content greater the 75%. (A complete list of textiles is found in Appendix I). These are often harder to find and can be more expensive purchase, however, when thinking about costumes budget for a show, there can be tradeoff between building and renting costumes. Perhaps a sacrifice can be made in terms of building one costume by locating where to rent it and then being able to build the second costumes out of materials with less of an environmental impact. Overall the demand for these materials also remains low. Once people begin to purchase more of these specific fabrics, then the price will begin to drop and stores will be providing more options for costume designers.

One of advantages the costume shop has towards reaching a lower carbon footprint is through lending programs. Theatres often keep large costumes stocks of their own that can constantly be used in order to build and buy fewer costumes. This helps ease the budget of the shop but it also helps the environment as costume pieces become recycled. Furthermore, when costumes get rented out to other theatres, then the recycling pattern continues. During my interview with Natalie, she acknowledged that designers will need to accept a less perfect design

if they want to work with renting rather than building, but this constant exchange does have a positive impact on the overall footprint of a costume shop[36].

Water consumption is another issue within a costume shop. Costumes are constantly being cleaned. Investing in energy efficient washers and dryers, such as those LG donated to Broadway during the 2009 Tony Awards, will cut back on both water and energy bills as well as decreasing the amount of water consumed during the run of a production. Also, limiting the amount of times that items get cleaned can help reduce this waste as well. Check if things may be spot cleaned rather than going directly into the laundry. Many articles of clothing can be worn several times before needing to be laundered.

Swingle described many other small actions that can be added up to a sustainable costume shop. These include shopping at thrift stores. While a designer may not find the exact item they are looking for, the materials found at the thrift store could be converted into something new. For example, Swingle once found a bed skirt that she later transformed into a vest. While this is a more challenging choice to make, the creativity of a designer can come through when looking through secondhand stores. Other options for costume shops include reusing old muslin for making mock-ups and or using the material from the mock-up in the lining of a costume. Swingle also started using wigs in place of dying people's hair.

The costume department at Tufts University has many advantages towards becoming sustainable. One of these includes a resident costume designer and our use of stock. When discussing costumes with Linda Ross, our resident costume designer, she emphasized that she knows what materials we have and is able to think about the long term when designing a show.

36： Natalie Maynard, Graduate Student. Phone Interview March 23rd, 2011

The constant building of our costume stock facilitates less need to build later. Most of this is done in attempt to save money rather than conserve energy. For example, if Ross orders extra items that she later decides will not be used for that specific show, rather than sending it back it can be saved and put into stock for later use.

Within our department, renting costumes is a common practice. Renting also decreases carbon footprint, but it is important to keep in mind where these costumes are coming from. A costume rented for Oregon Shakespeare has to travel much further than a costume rented from Emerson. We rent out our costumes as a free service to other colleges. This can serve as an example to other area colleges. Renting becomes a low cost alternative to building new costumes, thus having less of an impact on the environment. Additionally, if costume rental becomes free to even more theatres, then costume shops will have more money to spend on more sustainable items such as the more expensive organic or recycled textiles. Through this, shops can work together to create an increasingly sustainable stock individually, which then is shared by the community.

Our stock is also a large, constantly growing collection of shirts, shoes, dresses, and other costumes pieces. Everything that is made unique for a production goes into costume stock for further use. Therefore, there is little waste let after strike for the costume department. After strike, nothing is broken down and disposed of. Rather, costume pieces enter the cycle of stock until they are no longer wearable, and even then, maybe broken down to for scrap fabrics. Therefore, our costume stock is one of the most valuable sources of sustainability in the costume shop.

With the regards to costume dying, our ventilation system in the costume shop is fairly poor. There is a hood that helps ventilate a room in the back of the costume shop. Currently, the costume shop along with the paint shop is looking to purchase a spray booth to help facilitate a

healthier environment for Tufts' productions. The downside of this process is that it is an expensive purchase, however, I believe the trade-off for the safety of students and staff that work regularly within the theatre would ultimately benefit greatly from this addition.

To get a feel of each show, I asked Pinnette about what the general proportions of building original costumes, borrowing from other theatre stocks, and pulling from our own stock for each production. The estimates were, 10% is built, 50% is borrowed, and 40% was pulled. This changes depending on whether it is a period piece or a modern piece. Period pieces often require building more and use more resources. A modern piece will have more available items and this may even be bought secondhand.

When it comes to needing to build items, Ross makes the decision of what materials to use. This is decided by the wear and tear of a fabric. The goal is to build something durable that will survive multiple shows and then stock. Ross expressed that she would be open to purchasing more sustainable fabrics however, they have been hard to find. There are two fabric companies in-between Boston and New York City (where Ross travels for fabric often) that sell organic options. Fox-Rich located in Danbury, Connecticut, offers a wide variety of organic options as well as promoting their involvement with theatrical textiles. They even offer organic muslin as an option. Jasco Fabrics, located in White Plains, New York, also offers a wide range of organic textiles including wool, cottons, and blends. However, the color options for these fabrics are limited and they are more expensive than ordinary fabrics.

As mentioned earlier, dry cleaning is one of the most detrimental elements of costuming. Pinnette told me that one of the dry cleaners that we frequently used is named Royal White. I researched their website and found nothing on environmental precautions in dry cleaning. I called

them to ask if they used wet cleaning as an option and they said no. I am determined to find us new dry cleaners, and have put out initial contact to a few green dry cleaning services in the area.

For cleaning done within the shop, Tide and All Free and Clear are the current brands of choice. I suggest switching to Seventh Generation for laundry detergent. It is a highly regarded brand that is low is phosphates, which can be detrimental to the environment. For the long term, it would be advisable to get new efficient laundry machines. In the long run, it would save the department both money and cut down on energy use within the department.

Lighting

A first look at the statistics behind theatrical lighting gives an intimidating impression of the wastefulness of lighting systems. Mike Lawler, in an article published in *American Theatre*, calls for a sustainability by citing some rough estimates of the energy being used during theatrical productions. His inspiration came from seeing his wife in a local music concert. At that small, community based space, there were 30 ETC Source Fours, almost all at full intensity. ETC Source Fours are one of the most commonly used lighting instruments in theatre, and with wattage of 575 they are of the better quality when it comes to energy efficiency in lighting. Because every kilowatt-hour burned, approximately 1.34 pounds of CO_2, those 30 instruments produced 58 pounds of CO_2, according to Lawler, the equivalent to about three gallons of gas used by a car. This community theatre does not seem to be doing so badly. However, he thought about the larger picture and the dozens of theatre productions currently on Broadway using much more than 30 ETC Source Fours. Lawler estimates with 3,000 instruments being used for 4 hours every day, Broadway was releasing about 3 million pounds of CO_2 into the atmosphere every year. This is

the equivalent of 173,755 gallons of gasoline.[37] These numbers are staggering. Lighting systems are one of the most difficult areas to tackle in theatre because it is reliant on what technology is available as well as what theatres can afford.

At the time of Fried and May's writing, 1994, the technology was only starting to change. Therefore, there is little in *Greening Up Our Houses* on lighting. Their best recommendation is to evaluate what little amount of lights can be used to get the optimal amount for a lighting design. However, technology has changed a great deal since then. In 1992, Electronic Theatre Controls (ETC) introduced the Source Four. Ian Garrett wrote a detailed paper on the sustainability of theatrical lighting in 2008, and discusses the breakthrough of ETC as such:

> "The Source Four not only included features that made huge steps in the usability of theatrical luminaries, it also introduction new reflector and lamp technology. Due to filament design and the integration into more efficient aluminized (now dichroic) reflectors, the High Performance Lamp or HPL is able to produce the same luminous flux, or perceived power of light, as most 1kw lighting instruments with only 575w (ETC). Future strides, within the same product line included the introduction of a 375w lamp and continued improvements of reflector and optic technology. But, as far as these strides advance the state of the art, each lamp is still an incandescent source and is still losing 90% of the energy consumed to heat, as opposed to the 30% -40% of fluorescents." [38]

Since the introduction of ETC Source Four, the light has become one of the standards of lighting stock in theatre. These lighting devices make up most standard lighting plots and are abundant in stock. While they decreased the amount of electricity needed to make light, it is important to note that they only use 10% of that energy to produce light, losing the other 90% to heat.

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37 :Lawler, Mike. "Toward a More Sustainable Theatre." *American Theatre* (Theatre Communications Group), September 2008: 58.

38 :Garrett, Ian. "The Ecological Sustainability of Theatrical Lighting." *The Green Theater Intiative.* December 21, 2008. http://www.greentheaters.org/ecological-sustainability-theatrical-lighting/ (accessed May 2, 2011).

The inefficiency of incandescent lights, of which ETC Source Fours are included, has not gone unnoticed by the government. The government, including an outright ban, has limited their use. Through the Energy Independence and Security Act, incandescent lighting will be phased out of by 2014.[39] However, there are exceptions to this ban, and theatrical lighting falls into this category. Garrett quotes Tom Littrell of ETC: "Most of the energy stuff – ASHRAE, California's Title 24, etc. exempts "portable" lighting, i.e. stage fixtures that you re-hang every now and then, from the watt-per-square-foot guidelines that govern the rest of the buildings. But a lot of Source Fours get used in general architectural ways – so we are really conscious of this stuff."[40] Garrett explains that banning incandescent lights would essentially halt the theatrical lighting industry. In it too ingrained in the economy and system of lighting to ban it all together.[41]

Having established that the current lighting methods are not optimal when it comes to sustainability, it then remains to look at what other options are available. While there are other possibilities for direct sources of lights, many come with limitations. The four alternatives to ETC Source Fours are fluorescent lights, company fluorescent lights (CFL), high intensity discharges (HID), and lighting emitting diodes (LED). In his article, Garrett discusses their positives and negatives of these alternatives. First and foremost, all the instruments described use a much lower wattage than traditional Source Fours. They help reduce the overall energy consumption of a theatre greatly and many theatres do use a mixture of intelligent lights such as the ones described above along with Source Fours.

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39 Ibid.

40 Ibid.

41 Ibid.

A light in theatre functions as much more than just a luminary source; it is part of the larger design and therefore must be controlled and focused. There are limited options when it comes to controlling these lights. A dimmer that dictates the amount of intensity the light gives out controls traditional theatre lighting. Dimmer systems change when the light source is changed. Switching to a new light source can mean changing the entire electrical grid of a theatre, a move that costs thousands of dollars. One of the other drawbacks is the ability to focus. While some lights can be focused, such as HIDs, fluorescents, for example, cannot be focused at all. Sometimes it will take larger amounts of LEDs in order to focus on an object, and that inherently defeats the purpose of using less lighting sources. Color options are also limited on LEDs, as they make light from a collection of red, green, blue and occasionally white lights. The last negative of these lights is that they are expensive. For instance, a HID instrument similar to a Source Four can cost twice as much.[42] These are the costs that must be considered in a cost benefit analysis. Garrett discusses the need for a greater demand for sustainable lights. If the use of these lights increases then the cost will go down. He says it is up to designers to make the demand for better lighting instruments.[43]

However, it is possible for theatres to make change using the materials that they already have. The London Guide and Lawler both cite examples of smaller things theatres can do to improve sustainability in lighting. One of the first steps from the London Guide is to know the efficiency of electrical equipment, which can be done through utility providers. The London Guide also recommends turning off the lighting rig when not in use, referred to as the Big Switch Off. Most rigs remain on for fear that turning them off will result in electrical problems during the

42 Ibid.

43 Ibid.

show. The guide calls for turning them on at the half hour call giving them sufficient time to warm up. The National Theatre used this technique for their production of *War Horse* and had no problems with the new practice, now making it their standard. This saved about 30% of their typical energy use. The Lawler article recommends solar and hydrogen fuel cells to power electrical equipment, an idea further discussed with the Arcola Theatre in chapter four. Another option is a carbon offset program, where productions pay a company, such as Native Energy, to reinvest in greener technology such as wind and solar power.[44]

The inherent problem with lighting at Tufts is the same problem laid out by Garrett; introducing energy efficient lights is unfeasible because of costs. When I interviewed our resident lighting designer, Margo Caddell, about our lighting system, she bluntly stated that it was not going to happen, as it was not financially feasible. She was aware of the potential of energy efficient lights, but it was not an option within our own department. Furthermore, Margo noted that the technology was constantly changing and every year something better comes out on the market. It then becomes hard to justify purchasing new equipment if it is to become outdated only a year early.

The instruments that we mostly have in stock are 575w lamps and ETC Source Fours. Many of these were purchased when they were first introduced and are still in perfect working conditions. This is one of the other problems. It is hard to justify such a large cost when you have an instrument that is functioning. Our dimmers must be left on at all times along with the fans for these dimmers because of their age. Unlike what the National Theatre was able to do with their lighting rig, turning it off, Margo explained that this was because they were using intelligent lights, such as LEDs rather than conventional lights such as ETC Source Fours.

44 :Lawler, Mike. "Toward a More Sustainable Theatre." (Baluch 2008)

One of the things I believe the lighting department would benefit is a survey of their electrical equipment. Being as old as it is, Margo and I both agreed that there could be better ways to use the electricity, if we knew were the problems were. An overall change in the lighting system would cost thousands of dollars and that is not money that the department has available. A survey would help to find how to use the equipment that we have more efficiently and will not only benefit the environment but the department as well. As for a long-term goal, I believe Tufts University would highly benefit from a change in the lighting system here. However, that will take a certain amount of time and patience in order to raise sufficient funds for an overhaul of the electrical system in the Arena. This could include proper rigging for intelligent lights saving the university electricity costs and helping to reduce the carbon footprint of the overall university.

Venues, Rehearsal Spaces, and Front of House

Having a green production space is one of the key factors to a sustainable theatre. The London Guide attributes almost three quarters of GHG emissions to theatre offices, rehearsal spaces, and the front of house. These three areas of a theatre share many overlapping qualities, such as the same heating and ventilation systems (HVAC). These are often some of the easier options and many of them are practical applications that can carry over to other areas outside of the theatre.

One of the overarching concepts that apply to all three of these areas is heating and cooling. Both the London Guide and the BGA offer ways to ensure that the space is being properly heated and cooled but doing so in a sustainable way. One of the first steps is to know the energy that the venue is using. An energy auditor can help to give a basic assessment of the

capacities and limitations of the theatre's current system. It will often take a large amount of energy to properly regulate a large venue, but lights and people often increase the natural heat generated in the space. Methods to ensure the proper regulation of temperature include simple tasks such as checking the thermostat regularly for the intended temperature. Space heaters use a lot of electricity and should be avoided. Temperatures may be set lower in high activity areas such as workshops and rehearsal spaces. Thermostats should also be placed away from anything that could affect their readings such as sunlight. Ventilation systems can become clogged and ineffective, so should be checked these regularly to guarantee that airflow is consistent throughout the building. Boilers should be serviced regularly to ensure they are working properly. Insulation can be installed throughout the building. If possible, green roofs and rainwater harvesting systems can be installed. This is specifically relevant when building a new theatre. [45]

Office spaces have many options for increasing their sustainability. Going paperless whenever possible is an easy choice for offices. It takes time to get used to it, but many recent online platforms make interoffice work easily accessible online. Google Docs, for example, can be a powerful collaborative tool. The website allows for editing by multiple viewers without ever sending out a paper copy. When printing must occur, 100%-recycled paper should be used, but if not, at least 30% post-consumer recycled paper should be the minimum. Offices may set up areas where paper may be reused. For example, failed or discarded copies with nothing on the backside can be used to print out other materials. Offices may go as far as mandating double sided printing and photocopying. The staff should be given reusable coffee mugs and water bottles. Paperless direct deposit methods can be set up to reduce the amount of paper used in paychecks. Office products and supplies can be bought locally and keeping accurate shopping lists can result in

45： Mayor of London. "Green Theatre ."

making fewer trips to the office supply store. Provide ample storage space within the office for items such as reusable shipping boxes. Office managers can check that appliances are energy star rated for their energy efficiency. Employees may use washable dishes and utensils in the office kitchen. Video conferencing can replace going long distances for meetings. [46] Additionally, CFLs or LEDs may light workspaces, photocopiers should be set to energy saving mode, and all electrical equipment is turned off at the end of the day.[47]

One of the most visible areas that sustainable change can be affected is the front of house space. This is an area where audiences can get the full impact of the environmental work of a theatre. If a production is working to be sustainable, then it should be advertised as such. Theatre patrons often enjoy seeing the process behind a production. Fried and May suggest a wide variety of options to promote a theatre's eco-friendly efforts. Photo displays can highlight the rehearsal and production process. Including descriptions and explanations of these processes can help persuade patrons to take up more sustainable practices in their own homes.[48] Outside of self-promotion, venues can take their part through multiple method including labeled bins for recycling and reusing programs and motion sensors for lighting to be switched off without additional labor. Waterless urinals, low flow sinks, and high efficiency hand dryers all can be installed in a theatre's bathroom. Also, water taps should be checked for any dripping water. These simple changes that many older theatres can make and have an impact without challenging structural integrity.

46： Broadway Green Alliance. *Broadway Green Alliance.*

47： Mayor of London. "Green Theatre ."

48： Fried and May. *Greening up our Houses*.

Concessions are often a major source of income for a theatre. Audience members also enjoy the chance to socialize and refresh themselves during intermissions. The choice of food product and the way that it is served can all have an impact on the environment. Theatres can sell reusable mugs and water bottles that might even have a theatre's logo on it at intermission and can offer a discount to theatergoers who use their own mug or water bottle. Canvas bags with the logo can also be sold through the concession stand. They are becoming a common trend among grocery shopping and will therefore promote a theatre at the different places a bag is used. The items being sold as concessions can also promote strong ecological choices. Alternative sweeteners to sugar, such as stevia or honey, can be offered. These products are less processed and often can be harvested in increasingly sustainable methods. Coffee and tea should be fair trade and organic. If beer and wine are served, the recent boom of small brewed craft beers make an excellent option and promote both local agriculture and business, as do local wines that are also often available. Local and organic food should likewise be an option if food is being served.[49] Selling local and organic items will not only benefit the environment, but the consumer as well. As audience members sample new items they may continue to purchase them at their own will. This continues to promote sustainability even after the audience member leaves the venue. Additionally, all items can be served with recycled paper napkins and cups with well placed, appropriately labeled recycling bins for disposal afterwards.[50]

The Arena Theatre here at Tufts University is run through the box office with Joanne Barnett as the theatre manager. Many of the decisions regarding the use of the building are actually made through the University facilities management rather than being controlled by the

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49： Fried and May. *Greening up our Houses*.

50： Fried and May. *Greening up our Houses*.

space itself. This affects various areas of running the theatre however many things are under the discretion of Joanne.

One of the areas the box office succeeds in is its paper use. Recycling paper is always done. There are university-recycling bins located directly next to the copier. Additionally, recycled paper is standard for printing and copying. Business items are rarely printed out and if anything does need to be printed out, Joanne makes a conscious effort to print on the backside of unused paper. This is kept in an easy to find stack right by the printer. Additionally, all staff must have electronic deposits in order to get paid.

When stocking the office, most items are ordered directly to the box office. The university decides the vendors and Joanne does try to keep track as to only make large orders and cut down on delivery times. All the ordering is done online and is therefore paperless. Additionally, deliveries and errands done on campus never require driving.

One thing that Joanne does control is the budgets of the department shows. These productions usually come in just on budget with very little wiggle room. I asked this with the intention of understanding where money could be found for greener techniques within the department. If something does cost more, Joanne informed me that there would be little room to make those decisions. If the greener choice is affordable however, Joanne related that she would be happy to make it. I would therefore recommend that department actually seek out other university funding for greener initiatives. The Tufts Office of Sustainability is the leading resource for this on campus. They work to ensure that Tufts is doing its part in becoming an environmentally sustainable campus. The office has already helped the department change the light bulbs used in the box office and the lobby and I believe that creating a connection with them

will help provide additional funding and support for several changes such as switching to a greener dry cleaning service or working on getting the welding room installed in the scene shop.

One of the other issues within the venue is the heating and cooling of the building. Joanne discussed how the department has no control over the HVAC system. This results in the building constantly being too hot or too cold. It is regulated by the facilities department, who are not the people frequently using the building. If the control came from those who used the building than the setting might become more reasonable and start using the appropriate amounts of energy. I have also noticed the temperature extremes with in the building, often wearing t-shirts in the winter and sweaters in the summer because of the uncomfortable temperature levels in the building.

The one reoccurring thread throughout all my interviews with the design/tech faculty at Tufts University is that lack of storage available to the department. This was a consistent problem through all areas, however, mostly affecting costumes and set, which both use large amounts of stock. For set, this limits the amount that is salvaged after strike. Many items that would be useful in the future have nowhere to be stored and are therefore discarded. The same is true for costumes. According to Pinnette, all costume pieces are put into stock after strike, but there is little room for them. Therefore more things must be rented or built because there was limited stock to begin with.

The limited storage capacities of the department start with the Arena itself. The storage available backstage has the potential to become fairly hazardous according to Simpson. Materials end up so crowded that it becomes difficult for people to maneuver backstage. This then extends to an overcrowded furniture, props, and costume stock. Ross feels unable to make impulse

purchases as a secondhand store because there is nowhere to store these items. Furthermore, things start to get difficult to find, and more purchasing is done as these difficulties increase.

There are several solutions to an issue of storage, short of building new areas for stock altogether. One option being discussed by the department is use of a POD storage container. This would be conveniently dropped off at the theatre and could be used for various storage activities. I believe that having one for both the scene shop and the costume shop would be extremely valuable. Mulligan would like to explore the foot or so of dead space between the stage floor and the permanent floor. The idea would be to store materials underneath. These items would be easily accessible and already in the Arena. I believe that one of the key elements to increasing sustainability in the Tufts University department is increasing the amount of storage space.

Many of the items suggested might appear small, however it is important to keep in mind the aggregate sum of what a theatre does. Environmentalists often discuss the small changes in behavior that result in massive positive changes. When designers or shop workers change their overall attitude and starts to think about sustainability then many of these changes will come easily. They might seem difficult to implement at first, but once a routine is established, many of these practices can become the norm for a theatre. Numerous of these changes come at little or no cost at all to a budget, such as print double sided pages and recycling programs, however, some do come at a much bigger price, such as new lighting systems. It is the goal of the theatre to figure out how they can do the most sustainable work within their means. If the demand for greener materials increases and more sustainable technologies are released to the market, then eventually the prices will begin to drop. It is this aggregate demand that a theatre must keep in mind when trying to go green. It must then promote these ideas to others in order so they might make informed greener choices as well. The theatre industry has the power to influence its own

supply and demand and by turning to greener materials and practices, it can change its own marketplace.

Chapter Three

Due to the trickledown effect of theatre, what happens in major cities can later affect the entire community. The two biggest theatre centers in Western theatre, London and New York, have started to notice the importance of the theatre industry in going green. This chapter will outline and examine the eco-friendly institutions of both New York and London. The two environmental theatre initiatives from these metropolises are the Broadway Green Alliance in New York and The London Mayor's Environmental Programme in London. By focusing on these two distinct efforts of the theatre community, it can be shown that theatre is moving towards a more sustainable future.

The Broadway Green Alliance is an organization working through several committees to promote environmentalism in the biggest sector of New York's theatres. Their website introduces the organization as follows: "The Broadway Green Alliance (BGA) is an industry-wide initiative that educates, motivates, and inspires the theater community and its patrons to adopt environmentally friendly practices in theatre production and everyday life".[51] I had the opportunity to sit down and interview members of this organization about their thoughts on sustainability and theatre.

The BGA was a direct result of *An Inconvenient Truth,* the film that inspired so many individuals to go out and start taking personal action to curb global warming. David Stone, a

51 Broadway Green Alliance. *Broadway Green Alliance.*

producer of the sensational musical *Wicked*, saw the movie and decided that theatre should answer Gore's call to action. Stone wanted to see what could be done backstage, how theatre could be greener. Therefore, in June of 2008, *Wicked*, under the guidance of Stone, organized a town hall meeting and invited the National Resources Defense Council (NRDC). The meeting was held at The Gershwin, a theater in New York City and the Broadway League volunteered to convene another meeting in August of 2009. An ad hoc committee of the Broadway League was formed entitled "Broadway Goes Green" with Susan Sampliner and Charles Duell, of Clark Transfer, as co chairs. The NRDC and the mayor Michael Bloomberg both supported the project, which gave the founding committee a good amount of press coverage when they started their green initiative.

The new campaign even got an article in the *New York Times*, entitled "The Great White Way Goes Green", announcing the reduction of the Broadway's carbon footprint. The article quotes Bloomberg, " By this time next year the lights on Broadway will burn just a little bit brighter, but our energy bills will be a little bit lower, and our carbon footprint will be as well".[52] The article also goes into details about the founding of the committee and discusses Stone's efforts in reducing waste in the theatres where *Wicked* is currently running. The *Times* quotes Stone, "The theater community has always been at the forefront of social change, and we have been left behind on this one a little bit."[53]

The article goes on to highlight some of the measures immediately attainable by the new committee. For example, BGA switched over from regular light bulbs to compact fluorescents or LEDS on one of the marquis that light up Broadway. Outside of Broadway, it discusses the challenges of touring. Duell, one of the people I sat down with to discuss the BGA along with

52 : McElroy, Steven. "The Great White Way Tries to Turn Green." *New York Times.* November 25, 2008.

53 : Ibid.

Donyale Werle, is cited in his efforts to offset touring company's carbon footprint. Clark Transfer had done what it could to make their fleet of trucks more sustainable. However, this proved difficult so Duell created the group Touring Green, which allows companies touring with Clark Transfer to purchase credits to offset their emissions. These credits are usually invested in Native Energy, which supports solar and wind energy projects.

The article ends on a note that I have also found repeatedly in my research. Big changes will take time, but small ones are also vital. In nearly a dozen interviews with people directly involved in Broadway Goes Green, Duell pointed out one theme kept resurfacing: "One of the NRDC's main points, and one of the things I deeply believe, is that climate change will be done through the cumulative effect of a lot of small actions...This is about working for continuous improvement rather than thinking we've ever reached the green destination."[54] Other problems the article cites includes the problems producers feel when thinking about the long term and the difficulty of budgeting. However, the BGA, in its first step forward, created a cohesive base for the industry to get involved in at what was fundamentally a grassroots level. The founding is the work of a few people to make an impact on many. However, the article does note that this is not an attempt to limit artistry. From Bloomberg's office the article reports, Rohit T. Aggarwala, director of the mayor's Office of Long-Term Planning and Sustainability, "The idea is not to turn off the lights and sit in the dark…. A main theme, he said, is to attack waste first and not chip away at valuable aesthetic and commercial elements." [55]The idea of a valuable aesthetic is important to this debate, and it keeps in mind that this is just not an industry, but also an art form and as the BGA started out, it worked to eliminate the gap between the two.

Since BGA's inception, it has evolved from a committee of the Broadway League to a system

54 : Ibid.

55 : Ibid.

of several committees overseeing all aspects necessary to helping theatres go green. Originally, the group focused more on tackling postproduction but has since expanded to include several facets of creating a sustainable production process from start to finish. Each committee is headed up by an individual theatre professional. Everyone working also has another job in the theatre community (e.g. actor, stage manager, etc) and this continues to add to the grassroots level of the BGA. It highlights the efforts of the community to help Broadway achieve sustainable goals.

These committees include education and outreach, membership, preproduction and postproduction, production, touring, and venues. Education and outreach focus on reaching out to audiences and affecting change outside of Broadway. For example, going to Mayor Bloomberg's office. Membership deals with incorporating as many Broadway based organizations into the BGA network of venues, unions, and production companies. Preproduction and postproduction pay attention to the building of a show such as the materials used for sets and on the removal and disposal of production materials once a show closes. Production focuses on what happens in a production from the rehearsal process through the run of the show. Touring works with groups travelling across the country with a focus on getting them to buy carbon offsets through Native Energy. Venues covers theaters themselves and their efforts to make a greener facility. Each of these areas helps to create a cohesive organization for change. Additionally, green captains are planted at several productions to monitor activities during the run of a show. Meeting quarterly, they focus on recycling backstage, providing information through bulletin boards, and giving tips for helping to green up a show. During my interview they were described as part of the larger BGA family, helping to ensure that each production is doing its part to help the cause. The structure of the BGA is an important attribute to its success. By separating and focusing on the

work that helps theaters go green, the BGA is able to accomplish a lot more in the short amount of time they have existed.

During our interview Duell said to me "The only way to be green is to be dead and frozen".[56] Becoming 100% eco-friendly is not actually a possible way to live. Accomplishments must be small scale and incremental. Effecting climate change will be the result of several small steps rather than a vast overhaul of the system. Keeping this small change idea in mind, the BGA has many tangible successes. One of the first is 97% of the bulbs on the marquees on Broadway have been switched to energy efficient compact fluorescents or LEDS. The energy used to light up Broadway has since been cut to 15-20% of what it was two years ago. This is a major impact on the electrical grid of midtown New York City. Another major accomplishment was the 2009 Tony Award ceremonies in which BGA worked directly with the awards ceremony in order to produce a more sustainable show. The red carpet was 100% recycled materials. According to the *New York Daily News*, the playbill for the evening was printed on 30% recycled papers and 500 reusable water bottles with filters were given out to guests. Guests also arrived in hybrid limousines and received energy efficient light bulbs as gifts. [57] Another major accomplishment of the Tony's was the 45 energy efficient washer and dryer donated to theatres by LG and using a fraction of the water of older models. LG promoted their donation on their own website: "On average, a Broadway theater does six loads or 54 pounds of laundry each day. High-efficiency laundry pairs can help theaters save up to 146,000 kilowatt-hours of electricity and 1.5 million

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56 Charles Duell and Donayle Werle, Broadway Green Alliance, New York City, November 12th, 2010

57 Boyle, Christina. "Spotlight on the environment: Tony awards go green ." *New York Daily News.* June 05, 2009. http://articles.nydailynews.com/2009-06-05/entertainment/17925893_1_tony-awards-recycled-special-theatrical-event (accessed May 2 , 2011).

gallons of water annually, for a total savings of $23,000. According to the BGA, that's enough to light all the marquees on Broadway for three months"[58]. The efforts that went behind the Tony ceremony speak to the power that the BGA has acquired and highlighted sustainable practices to the entire theatrical community. By teaming up with LG, they were able to have not just an impact on the carbon footprint of that one night, but also set up way to reduce it in the future. Those washers and dryers will remain a reminder of the work that needs to be done.

Other accomplishments have been on a slightly smaller scale, but are still important nevertheless. The trickle down effect was highlighted during my interview to show how small incremental changes can branch down to become new standards. Touring shows have had 8,000 tons of their emissions offset by investing in Native Energy. Recycling has increased backstage due to the green captains of each show. Reusable batteries have replaced disposable ones. Many shows have started using water filtration systems in replacement of water bottles. Postproduction has seen a big change as well. Traditionally, after a show closes, the electronic are returned to a rental company and the sets are taken off in trash trucks. The BGA introduced the concepts of reduce and reuse into the strike process and now 85-95% of postproduction materials are being reused. The change was so great that *The New York Times* wrote up the BGA's efforts in postproduction in an article describing the fates of sets from recently closed shows. Instead of going straight into a landfill, sets are now being stored for future use, disassembled and reused under a different production, or given to university and amateur productions.[59] BGA has become a part of Broadway Cares/Equity Fights Aids. This further solidifies their role in the Broadway

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58 : LG. "Broadway Cleans Up." *LG.* 2009. http://www.lg.com/us/laundry/tonyawards.jsp (accessed May 2, 2011).

59 : David, Cara Joy. "Old Sets Live on as Broadway Embraces Recycling ."

community, bringing in the green aspect to every show willing. Furthermore, BGA has reached out internationally, including London, where an attempt has been made to set up a program for sustainable change in the West End.

Change cannot come easily to an industry as deep-rooted in tradition as theatre can be. However, when I pressed about the difficulties that the BGA had faced, the response was the usual challenge of budgets and times, but the conversation did not end there. Rather, I was instructed on how to overcome those difficulties so that the answer is always positive. It is hard for a community as open as theatre to shut down a beneficial idea such as environmentalism. The mentality of the BGA is one of never taking no for an answer; if you continue to people then nothing is insurmountable. The incremental approach becomes the most useful when facing difficulties. First it is targeting the low hanging fruit, as the BGA put it. When those things become integrated, then you start to see a change. The next step is making the choice to go green easy for the one who has to make it. One of the obstacles is that theatre practitioners do not know where to start or what options are available to them. By making these options an easy and visible choice, the BGA is able to spread the word throughout the theatre community. If the BGA does the difficult part, the cost-benefit analysis and the plan to implement greener policies, then it will make people much more open to discussing change that might take up time and money. The Tony awards were an example of this type of success. Those planning the awards did not have the time to think about going green, so the BGA was there to give them the necessary ideas and therefore checking more off their to-do lists. Using a hybrid limousine service, for example, was not necessarily a more expensive choice to make, but no one had ever made that option available.

Our interview continued onto the problems in production specifically. In production mode, people are doing as much as they can with all that they have and no one feels like they have

excess time or resources. No one is looking for an extra thing to do, and the BGA is watchful that its efforts do not become interference to production teams. The constraints of theatre are very real, but as Werle put it, "people generally want to do good things, they just want it to be provided in a format that won't cost money".[60] She discussed the example of set designer (she is a set designer herself). The first step was obvious, recycling. The next step becomes salvaging materials locally and then finally education on exactly how to create a sustainable set. Werlye was the set designer for *Bloody Bloody Andrew Jackson,* a new musical that was originally opened at The Public Theatre and then transferred to Broadway. The set was constructed entirely out of salvaged materials. I saw the production myself, and it was an elaborate array of red curtains, each which were pieced together from leftover materials salvaged from other theaters. The statues used were donated and there was a chandelier made entirely of cat food tins. However, the product created was not second-rate. Rather, it was an elaborate piece of design. It was impressive to see how sustainability does not necessarily imply that you are taking away from the artistic merit of the show, but just means that you must get increasingly creative to reach sustainable goals.

During my research, it seemed to me that the only way to create a 100% platinum LEED certified theater was to start building from scratch. Many of the theaters on Broadway are very old and that is what gives them their charm. There is a legacy to Broadway that is expected when patrons come to a show. The shows might be modern, but the theaters are not. I presented this problem to BGA to see what they were doing about addressing some of the older venues on Broadway. The response was positive. The Shuberts, Jujamcyn, or Nederlanders own many of

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60 : Charles Duell and Donayle Werle, Broadway Green Alliance, New York City, November 12th, 2010

theaters on Broadway and they have all showed enthusiasm for the work of the BGA. These older theaters have both restrains and they have opportunities. They all have replaced their marquee lighting, they periodically upgrade their air conditioning and heating systems, and some even have changed their roof color after the BGA started researching ways for venues to green up their roofs. The New Amsterdam renovated its bathrooms to include waterless urinals and improved hand-dryers. While it is possible to close down these theaters, completely gut them, and then rebuild them for platinum certification, it is much easier to implement change on the small-scale level. Most theaters already have some advantages as they are built next to each other and do not lose heat out of their sides. As theaters do go into renovations, such as Lincoln Center underwent recently, they find that financial incentives also correspond with green incentives. Venues are one of the key places for green reform because the theatre itself has the long-term existence that the rotation production does not. Installing an efficient HVAC system saves money over the long term, such as the next 5 years, while a production is only focused on perhaps the next 5 months.

Overall, the BGA has created an effective grassroots organization to effect change in the theater industry. Their focus on changing Broadway does indeed have a trickle-down effect on the rest of the theatre community. What Broadway does increasingly becomes standard among regional and amateur theaters. By working with the NRDC sustainability in theatre becomes an important and tangible issue. Not all the work that the BGA does is tangible. Weryle discussed the viral effect during our interview. When you get a cold, and then spread it to another person, you have no idea who has the same cold three months later. It is the same when it comes to sustainability. You have no idea who was in the audience one evening and was affected by what they saw another theater doing. They may bring it to their own theater and start an initiative in an entirely different production, and the cycle continues. Every different initiative the BGA brings to

the theater community can have that effect. It ranges from bottle cap recycling projects to encouraging people to bike to the theater, but it is a definite start for the theatre community as it progresses forward.

In September of 2008, the Mayor of London announced a plan to bring sustainability to the London stage. The West End theatre industry is comparable to that of Broadway. What is done on one side of the Atlantic influences the other greatly. The two centers for Western theatre feed each other immensely, sharing productions, stagecraft, and the same need for industry-wide change. According to the Society of London Theatre around 14 million attended 52 theatres in London, in 2009.[61] Theatre is an important part of London and its economy. Theatregoers all over the world watch what happens in London. There is a main difference between the London program and the BGA. The aspirations for changes come from the government, rather than from those within the community. In a stark contrast to United States policy, England has taken a more proactive stance to help curb climate change, and this is reflected in the decisions of the Mayor of London, Boris Johnson.

In his foreword, Johnson discusses the role of London theatre before pledging a 60 per cent reduction of its greenhouse gas emissions from 1990 levels by 2025.[62] The plan is the method for reaching this goal. Johnson comes off as optimistic during his foreword, stressing the cost-reduction as an important part of going green. The foreword also contains commentary from Moira Sinclair, Executive Director London of the Arts Council England, which is the main source of funding for theatre in London. It is a centralized, powerful, government organization that

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61 : The Society of London Theatre. "The Report of the Society of London Theatre 2009." *Society of London Theatre.* 2009. http://www.solt.co.uk/downloads/pdfs/reports/2009-annual-report.pdf (accessed May 2, 2011).

62 : Mayor of London. "Green Theatre ."

greatly differs from the producers of Broadway. Sinclair applauds the work of Johnson, with the aims for London to become a powerful force in making change in theatre. The outright government support for this program from the beginning marks a very different approach from the BGA. While the BGA is a grassroots organization working to make change from the bottom up, the London program is a change from the top down. It is a mandate in a way, to ensure that London continues to be a progressive center for artistic communities.

One of the benefits of the government approach appears to be the ability to collect data from a wide range of sources. The London program started with an assessment of the total carbon footprint for London's theatre industry. That gave the program an idea of where to start in order to help green up the industry. The study concluded, "the total emissions from London theatres (excluding pre-production and audience travel) are approximately 50,000 tonnes a year".[63] The program notes the rise of the highly technological spectacle on the West End stage. Productions are getting larger and more complicated technically and therefore often require more energy. If the industry continues to go on without a plan to counteract this growth, then GHG emissions will continue to grow. It is interesting to note the distribution of emissions, given in a pie chart in the guide. The front of the house is the source of 35% of emissions with rehearsal space trailing behind at 28%. Therefore, while much can be done about instituting greener technical aspects into production, one of the main targets of changing theatre is to change the venue itself.

The guide then goes on to describe the general ways that theatres can reduce their carbon footprint. This section generalizes to allow the reader to understand that the entire production process can be improved without sacrificing artistic integrity. It also contends that a large expensive overhaul of theatres is almost impossible. The guide stresses that the changes that can

63 Mayor of London. "Green Theatre ." Pg 5.

be made are small and will benefit in the long run, such as reducing electricity and recycling. The carbon calculator is also mentioned at this point as something that generates the expected footprint of a production based on the materials used, labor hours, and several other factors. It has been used in my project for the assessment of a Tufts production and is discussed elsewhere. The guide also talks directly to theatrical leadership. It emphasizes again the idea that change should come from the top down. It actively lists way that those in charge can take proactive roles in order to increase sustainability. Some of these actions include calculating the carbon footprint of their organization, involving staff, making a detail plan, writing green policies, and creating financial incentives. By explicitly stating what people can do to improve sustainability, the guide makes it easy for leadership to make responsible decisions. The rest of the guide discusses specific ways for productions to go green, along with encouraging success stories, and most of these tactics are discussed in detail in the chapter on green practices.

While it was easy to discover the London Green Theatre plan, little follow up appears to have been done after the initial launching. The two biggest outcomes of the Green Theatre plan was the efforts of the Arcola Theatre to become a zero-emissions theater and the Julie's Bicycle efforts to consolidate the Green Theatre efforts, similar to the work of the BGA. The latter, the Julie's Bicycle organization appears to be the centralizing force for the green theatre movement in the UK. Julie's Bicycle was founded in 2008 for sustainability in the UK music industry and launched their specific theatre program in summer of 2010, almost two years after the publication of the Green Theatre Guide. Their mission is described on their website as, "We have embarked on a UK-wide programme for theatre which will bring together the commercial and subsidized theatre industry in England, Scotland, Wales and Northern Ireland in a collective effort to improve the environmental sustainability of our work and help it to flourish in a low-carbon

economy."[64] Essentially, it appears as if Julie's Bicycle is filling in the community-based gap that the Green Theatre programs lack. It has become clear that government action does not necessarily mean change. However, the bridging of these two groups may help to accelerate changes in the West End in order to meet the goals originally stated by Mayor Johnson.

The Arcola Theatre, independent and located in North London, aims to become the first carbon neutral theatre in the world. To help do this, the theatre established Arcola Energy, which focuses itself on sustainability in the arts. At its inception, the project was spearheaded by Ben Todd, and in an interview for *The Stage* he explains some of the motivations behind the theatre's initiative: "The arts have a crucial role to play in elucidating and motivating the changes in lifestyle necessary to deliver an equitable future for all humankind. Through Arcola Energy, Arcola Theatre is demonstrating that bold changes can be made and that making them offers exciting opportunities for new creative partnerships"[65]. The first step towards this was the installation of an environmentally friendly hydrogen fuel cell that powers the theatre's bar and some productions. According to the London Green Theatre Guide, the fuel cells sits in the foyer of the theatre, proudly exhibiting the theatre's efforts to go green as well as spurring conversations amongst theatre audiences. The Guide says that the energy source "operat[ing] almost silently and produces nothing but electricity and clean water."[66] The bar also sells organic and fair-trade items. [67]

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64 Julie's Bicycle. *Julie's Bicycle.* http://www.juliesbicycle.com/ (accessed May 2, 2011).

65 Baluch, Lalayn. *Arcola Becomes First Hydrogen Fuel Cell-Powered Theatre.* February 13, 2008.

66 Mayor of London. "Green Theatre ."

67 Baluch, Lalayn. *Arcola Becomes First Hydrogen Fuel Cell-Powered Theatre.*

Arcola Energy made additional early efforts to improve sustainability through a production of *The Living Unknown Soldier*. The show was the first to be powered by the fuel cell that was mainly used for lighting. LED lighting was used to "consume 60% less energy than traditional lighting installations"[68]. Other policies for the production are also chronicled in the London Guide:

- Using energy saving products reduced water and energy consumption, in particular. This included reducing unnecessary wattage of stage lights and using energy saving lights throughout the theatre (including stages).
- The use of materials was reduced wherever possible. For example, by reducing the amount of white space, pages were saved in the unstapled programme.
- Adopting a policy of 'zero waste to landfill' resulted in more recycling, composting and reuse.
- Material was sustainably sourced, from the pulp in programmes to the wood used in sets.[69]

The biggest project for the Arcola Theatre is Future Arcola. This plan, launched in December 2009, is a theatre space built entirely with sustainability as its main focus. Boris Johnson speaks of the project:

> "As world leaders gather in Copenhagen, Arcola Theatre is at the forefront of how London's arts organizations can champion the environment. We have to take robust yet practical steps to make our city more energy efficient. This has the added benefit of playing a pivotal role in the wider redevelopment of this part of the city, making the urban realm more pleasant. Three cheers for Arcola for raising the bar."[70]

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68 Baluch, Lalayn. *Arcola Becomes First Hydrogen Fuel Cell-Powered Theatre.*

69 Mayor of London. "Green Theatre ."

70 Todd, Ben. "Arcola Theatre Launches New Eco-Theatre Plans ." *Arcolaenergy.com.* December 14, 2009. http://www.arcolaenergy.com/contribute/2009/12/14/future-arcola-launch/ (accessed May 2 , 2011).

The project incorporates sustainability in the arts from the literal ground up. The improvements in technology have made green technical theatre practices more feasible, but building a new structure is one of the most efficient ways to make a model for change.

The Future Arcola contains many dynamic aspects that come together to house a truly artistic space. The main feature of the space is a 350-seat theater for mid scale and opera performances in addition to 150 and 80 seat black box spaces. There also will be a large foyer with a bar and cafe that can be used for performances or meetings. The cafe will be eco-friendly containing many of the same items sold in the current eco-cafe. The new technology energy incubator is a unique space that will sit at the top of theater. Here, new sustainable technologies will be tested and perfected. A bicycle hub that promotes efficient transportation options will be included close to the road. Additionally, a public garden roof garden will sit on top the building.

The BGA and the London guide are two very different entities that share the same goal of greening up theater. The BGA embodies the grassroots evolution of environmentalism. It is change that is coming from the people of the theater and is supported by individual enthusiasm. The London guide is different; it is government action to affect change. However, one of the problems with the London guide is that while it pledges to reduce GHG emissions it does not take any direct action to enforce it. It is one of the same problems that all industry faces when dealing with government sanctions. Government becomes unable to monitor every action of the people, and therefore relies on the integrity of industry leaders to make the appropriate changes. I believe that is where London has failed when compared to New York. The Broadway Green Alliance is a growing organization. They have active members taking on roles in all areas of theatre and the enthusiasm is coming from within. It is easy to follow the progress of the BGA through their website, Facebook, e-newsletter, and even a twitter account. Recently, the BGA announced that

they had collected over 7,000 pounds of e-waste during their most recent campaign. This information is then dispersed among any who follow them. By constantly keeping the public updated about its work, the BGA is constantly promoting awareness of the issue. I have been unable to find much follow up after the London guide was released outside of the work at the Arcola theatre. However, it should be noted that many of the initiatives taken by the Arcola started along with the development of the London guide, not as a result of the study. I would therefore pose that community based; grassroots movements are the better method for increasing sustainability in theatre. The success of the BGA speaks to the ability of a few people to make a serious impact on climate change.

Conclusion

During Ian Garrett's keynote speech at the Staging Sustainability conference he expanded upon the 3 Rs to make them specific for theatre: retain, rehabilitate, adapt, repurpose, recycle, and discard. These are values that must be added to the theatre in order for it to progress towards a sustainable future. Designers, technicians, directors, administrators, even actors, need to plan and act with an eco-conscious attitude. By changing the way that the theatre industry thinks then the theatre industry will help decrease the burden on the planet. It will take a change in the way we budget, build, and strike but these changes can be made incrementally. The conference taught me that this is just the beginning for the theatre community. These issues are only just coming to find a place in the larger arena of theatrical productions. It will take a constant dialogue between everyone in order to continue discovering new methods for decreasing theatre's ecological footprint.

This thesis contains a large amount of information for a theatre looking to go green. I have compiled my own list of the ways that I think will have the most impact both in the long term and short term.

1) Reduce energy consumption of the front of house by monitoring light use and HVAC systems. Referring back to the London Green Theatre Guide, the front of house amounted to 35% of carbon emissions for theatres.[71] I believe that theatres should start to look into alternative energy systems such as solar panels to help defray energy costs and reduce energy consumption. Solar panels are an investment in the long term, but will pay off for a theatre venue more than they will for an individual production. Other options include energy sources such as the hydrogen fuel cell used by the Arcola or installing motion sensor, CFLs or LEDs in the lobby.

2) Switch to an environmentally friendly dry-cleaner. The dangers of the dry cleaning industry are well laid out in chapter two. They damage to the environment as well as industry workers is enormous. It is unfair to continue to demand a service that is known to be so toxic to people's health and environment. Costume shops should be investing in costumes that do not need to be dry-cleaned or if they do, look to wet cleaning as an alternative to dry cleaning.

3) Lengthen the time of strike to ensure that all possible materials are saved or salvaged. Time constraints are one of the largest obstacles for sustainability in theatre and strike was a constant topic of discussion at the conference. If strike

71 Mayor of London. "Green Theatre ."

is too short and understaffed than it becomes unfeasible for a theatre to make the proper choices regarding which materials are worth saving and too many materials ultimately end up in landfills. By carefully planning a strike, several aspects of a production can be saved and reused later.

4) Invest in purchasing greener materials that will allow for stock materials to be built and last as long as possible. The other large obstacle for theatre is money. Theatre never seems to have sufficient funding to do the production that is imagined and changing towards a greener theatre will cost money. However, a constant demand for greener materials will drive the cost of materials such as LED lighting instruments and sustainably forested wood down over time. Additionally, investing in better quality products will allow costume, set, and prop pieces to last longer and encourages reuse. This will save costs in the long run, as stock items do not need to be constantly repurchased and rebuilt.

5) Increasing storage space in order to save, salvage, and reuse as many materials as possible. This was the largest concern with the faculty and staff here at Tufts University. People want to save as much as possible, but with nowhere to put it, it becomes easier to just throw it out. Increasing storage space allows for a constant building of stock materials that can not only be reused by a specific theatre but can also be shared with the entire community.

I started this paper with a quote from Uncle Vanya, a play and a playwright who have had an immense effect on me personally. I first read Uncle Vanya right before coming up with the initial seeds of this thesis. The power of theatre is that words written 110 years ago can alter the

way a person thinks, and that is what Chekhov has done for me. He created a character, Astrov, who cared deeply about the environment, and his passion inspired me to observe the state of the theatrical world today and comment on the ways that it can change to better serve an increasingly volatile future. This thesis has changed the way that I view theatre. I can no longer be a passive spectator when I see a show. I am now constantly analyzing the structure around me, the materials used, the lighting rigs, and I am able to make an informed decision on the environmental aspects of a production just by being an audience member. As a theatre technician, I will no longer approach theatre with a conventional perspective but rather push each production I am involved with to this new level of eco-consciousness. Lastly, as a scholar, I hope to pursue further research regarding sustainability in theatre. The discussions held during my three days in Toronto ignited my interests in two possible areas for further research. These include a study of the difference between the UK and US approach (and potentially Canada) to greening up theatres. I have already noted the difference between the grassroots approach of the US and the government approach of the UK, but I believe this field could be explored even more in depth as new projects are constantly being developed in both countries. Second, I believe creating a rating system for theatres and productions will be a powerful tool in helping theatres develop their own sustainable strategies. Some of these systems are already in place, specifically in the UK, and I think further study will allow the theatre community to see the impacts that evaluation and guidance can have on making sustainable changes. The facts about the future of climate change and natural resource use are terrifying and easily accessible. I believe that if I can get even a handful of people to starting thinking ecologically, then I have made an impact on the future of the Earth. Continuing dialogue is vital to moving forward as theatre continues to be a powerful force of change in the world.

Appendix A

The Mo'oelo Green Theatre Toolkit may be accessed at

http://www.broadwaygreen.com/cms/images/content/GX5G6GCZ4Gmaterials_scorecard_from_mo'olelo.pdf

Appendix B

Staging Sustainability was a conference held at York University in Toronto from April 22nd-24th, 2011. It was a meeting of theatre technicians, academics, performers, and all other different forms of performance artists. It was a great forum for the exchange of ideas and practices that will help theatre towards a sustainable future. I was thrilled for the chance to attend and discuss my ideas for this thesis with other people who share the same concerns. The appendix below outlines the relevant panels I attended and the material covered there.

Panel 1: Processes of Creation: A Look Behind the Scenes

This panel, the first one I attended, involved both theatre and the visual arts. The first presentation was by Annet Baumast, from Switzerland, and she spoke on environmental management in the theatre. She specifically came from a German-speaking theatre background and spoke specifically to that structure, but many of the same fundamental ideas can be applied to any types of theatre management. The main difference is the public funding of German theatres and the private business structure of the United States. While the source of funding is different, the dispersion of money usually remains the same. The link between the environment and

theatrical management lies in funding, according to Baumast. With public funding, money could be given to theatres for environmentally specific initiatives.

The goals laid out by the German government for theatre are; instrument of transferring knowledge and experience, theatre as a medium of reflection, influencing the audience, and entertaining the audience. The three main directors of a theatrical institute are: the artistic director, the business director/administrator, and the technical director. These are the people who influence how the money is spent in order to reach the previous stated goals. Theatre management is influenced by a variety of factors and each person may have a specific agenda. The final product is different from a commercial good, as it is not sold.

Baumast then spoke to environmental management in the theatre. She stated that environmental measures can and should be seen as investments in the framework of economic performance goals. She added; benefit from environmental management systems in administration is an adequate instrument to make work more efficient, save time and money and provide a noticeable increase in prestige. Environmental measures can be taken in all three areas of the theatre. Baumast argues that the largest impact can be found in the technical process, with the aid of the administrative process for adequate funding. However, it takes a support artistic director with specific vision to really affect change. A constantly shifting artistic director will change the mission of the theatre constantly.

Braumast then commented on the specific nature of theatre, as an art and that it should be treated as such. No two plays will be alike; therefore it gets difficult to apply broad concepts to theatre in general. It the mode of thinking that must be changed in the management rather than the individual goals of the designers. These are subject to, as Braumast puts it, the “primacy of art”. This ideas is that theatre is subject to art and therefore, hard to put the environment before art. A

proposed solution to this is putting is including environmental aspects into production processes. This implies working only with designers and technicians who want to work with you the management in order to produce sustainable works of art.

Braumast then described specific initiatives within the German-speaking theatre. The Ökoprofit Programme was founded to start looking at what environmental measures can be taken within an organization. However, less than 1% of theatres have joined this program. One of these theatres, the theatre that Baumast represents, is the Deutsches Schauspielhaus Hamburg. With 1,200 seats, around 400 employees, in-house workshops, and storage space, it is one Germany's largest theatres. In the 1990s, they started taking simple environmental measures such as conserving water and changing house lights. In 2006, after joining the Ökoprofit Programme, they progressed these measures even further, including switching to electronic press reviews, listing hazardous substances (a law in the US), and started taking measures for stage lighting. The latest developments for this theatre are focused on energy and include; improving insulation through the roof, windows, and doors, investments into the building management system for optimal control of the HVAC system, and moving the box office out of the lobby into a smaller, separate area, so that the lobby can remained closed during the day, dramatically decreasing energy costs.

Paul Brunner, technical director for Indiana University, presented A Case for Wood: Wood as our most sustainable theatre material. The three concepts to using wood sustainably, according to Brunner, are; observing what worked in the past and what theatre already does well, using the right type of wood, and the effective use of strike. Re-use in theatre has been a constant in history. Brunner explained how flats used to be washed and then repainted, allowing for constant reuse. This was done using the toxic dry pigment process, however, re-evaluating this concept could be

useful in moving forward. The other idea Brunner emphasized was the use of stock platforms and flats in theatre and the modular design that lets us constantly reuse materials. The important idea for change here is to build these items out of better materials so that they will last longer. Strike also factors largely into this process. Technical directors should take the appropriate measures during strike so that these materials may be saved for later use.

Brunner then argues that the use of wood is scenery can be good for the environmental and sustainable. Many of the materials he suggested are easily available to scene shop. Wood-based composites are manufactured to specific and tight tolerances and are ideally suited to scenery design. These materials use efficient use of tree fibers, up to 95% of fast-growing trees. Fiberboard, particleboard, MDF, Masonite, and especially Homasote are all examples of these materials. Lauan, a widely used material is an industry evil. While it does have characteristics ideal for stage scenery, it is made of limited tropical forest products, which are currently over-forested. There is still no exactly alternative to lauan. Some close options include poplar based materials and MDF. Brunner comments that trees are 100% renewable, because we can continue to plant trees. Steel, aluminum, and plastic are not. Additionally, steel, a very attractive alternative to wood, has a yields a high water and carbon output during its production. Wood pulp alternatives can also be unsustainable as they increase the need for farmland and many of the crops are grown in non-native regions. Concluding the case for wood is strong regulation of North American forests. Foresters are starting to recognize and balance what the ecosystem needs in order to survive.

The next step for Brunner is a detailed study of strike. How scenery is disassembled is an important part of preserving natural resources because that decides how much is actually saved for reuse. Many of the materials used in scenery building, such as some adhesives and fasteners,

prevent wood from recycled. Additionally, strike usually needs to be as fast as possible and ready for the next show to load in immediately. Prolongating a strike will result in more saved materials, but often involves paying people more, which is a luxury many theatres cannot afford. Brunner's goals include extensively studying strike in order to understand how strike will help theatre move towards sustainability.

Workshop 3: Sustainable Costume and Dye and Paint Techniques by Sylvia Defend

The first practical workshop I attended at the conference was on sustainable dye techniques by Sylvia Defend, from a large costume center in Toronto. Her presentation focused on her personal experimentation with natural dyes and whether or not they could be applied a theatrical setting. These were experiments that she produced in her own home and the results gave an interesting approach to how small-scale theatres, i.e. regional or university, could use alternative dye methods. Commercial dyes are toxic. Some have been known to cause cancer, allergic reactions, and illnesses such as the flu or bronchitis. The best way to use these dyes is to wear protective clothing and use of a room with a strong ventilation system, however, the materials that Defend worked with for this workshop did not cause her the same adverse effects in the dye room that commercial dyes have. This prevents a safe, natural alternative to costume dying. The advantages to these dyes are that they are more natural and the color tended to be closer to what is found in nature, however, the process is more time consuming and still involves a level of experimentation.

Dyes require mordents in order to adhere to the fabric. Natural mordents can be made from easy to find materials. These include metallic compounds; alum, iron, and copper and planet

based materials; tannin and oxalic acid. Alum is easily available at supermarkets and is added to boiling water to create the mordent. Iron water can be made from rusty nails and screws, items easily available from the scene shop, soaked in water and vinegar, and then strained. Copper water can be made from boiling a copper pipe in water, however, copper has it's own toxicity problems and can be dangerous. Tannin can either be purchased or made from soaking oak leaves for a while. Boiled rhubarb leaves will give you oxalic acid. The different mordents create different hues when added to the pigment.

There are many sources for natural pigments these include, shellfish, insects, plants, leaves, bark. Roots, seeds, fruits, and various other sources. Defend gave a list which items give which colors.

1) Yellow: Weld, fusstick. Buckthorn, onionskins, safflower, dyers broom, marigold, golden rod, chamomile, dahlias, carrots tops, turmeric root, iron.
2) Green: Difficult to find in nature, needs to be a mix of yellow and blues.
3) Blue: Indigo.
4) Lavender, grey, and purple: Logwood, elderberry, cochineal, and safflower.
5) Pink and red: Cochineal, safflower, madder, and madder root.
6) Orange, rust, and brown: Annett, henna, lichens, onionskins, and black walnut leaves.
7) Black: Black walnuts

Water is also important to the final products, as the minerals in the water affect the pigments. There are other color modifiers that may be used to help change the color of the dye such as white vinegar, citrus, and washing soda.

Defend and the group then discussed if we thought that these dyes could be applicable to theatre. The conclusion we came to was that they are very good alternatives to commercial dyes for smaller theatres with shorter runs of shows. Defend still had not tested out the various muslin scraps she dyed under lights and did not know how long the color would hold over continued wear. If a production has a limited run, such as a most university theatres and regional theatres, then this might work. However, this would not be a viable option for large, commercial theatres.

Another difficulty was the availability of the dyes. Many of the natural pigments used were not in season or not available in Toronto and Defend had to order a kit from Vancouver.

Workshop 6: Sustainable Practice in the Paint Kitchen by David Rayfield

This workshop was led by David Rayfield, the paint supervisor at the University of York, and focused on cleanup methods that limit water waste and minimize the amount of paint going back into the water supply. He emphasized that cleanup is 2/3 of painting and if is not rushed, then can be a powerful tool in reducing waste.

One technique used by Rayfield is to mix sawdust shavings into leftover paint and water and letting it dry. It can then be properly disposed of preferably, in a hazardous waste site, but also potentially in a landfill. This is still optimal over sending the paint materials down the drain. This saw dust could come from the scene shop which would be disposed of anyway. Another technique is not washing out trays and bucket constantly. If there is a build up of dry paint then it will not affect the paint if another color is used within the same material. When it dries, then paint may then be peeled off after a thick layer has formed, and disposed of properly.

For cleaning brushes, Rayfield emphasized using a multi-tool to squeeze excess paint off of a roller and into the tray. He then showed us his grey water bucket. This bucket gets used for about a week that is made up dirty looking water, but it is actually effective for cleaning. The dips paint brushes or rollers into the water several times to clean them out, rather than putting them under the facet and letting the water constantly run. By continuing use of the multi-tool or a comb, paint materials can be cleaned as much as possible before dipping them in an already set up rinsing station, which may last as long as the grey water. With the grey water, heavier

materials will settle on the bottom, leaving the top of the water clean for rinsing. Buckets and trays may also be soaked in the rinsing water easing the removal of the layered paint later.

Workshop 7: Sustainable Staging Techniques

This workshop focused on applying sustainability to the stage. The speakers included Victor Wolters and Gwen Dobie. Marie Zimmerman and William Mackwood, from the Ventura Hillsides Music Festival, and Seema Sueko from Mo'olelo Performing Arts Company. The overall theme of the workshop was to discuss the practical applications of some of the sustainable ideas that have recently been developed.

The first presentation, from Wolters and Dobie, focused on the application of lighting to the production, *Opera Erotique,* from Out of the Box Productions. Wolters served as lighting designers while Dobie directed the show. The show originally ran in 2004 and was a success. Its revival in 2010 led Wolters and Dobie to explore adding sustainable techniques to the new production as a comparative study. The main change was the use of LEDs for lighting the acting areas. The techniques attempted turned out to be a success for their production.

The production used two types of LED lights, color punches, which hold red, green, and blue, and color block 2s, which also include amber. Previous work with the color punches where not idea. The shadow that the light casts on the actors is in streaks of color and is distracting. However, the color block 2s proved to be a very successful tool, creating an even tone on the actors.

Another advantage to the use of LEDs where their transportability, they are small, light, and stackable. This made them easy to move during the touring production, taking up less space in the truck and therefore downsizing the amount of vehicles needed to transport a production.

The use of LEDs also allowed for easier use of power in found spaces. Instead of need extensive rigging to use the lights, the LEDs were mounted on a simple lighting rig in each space.

As established earlier, LEDs do consume less power than conventional lights. For this production, the LED rig consumed 29% of the power than the original rig. It also reduced the needs of the HVAC system in the building, as the lights do not overheat the same way as conventional lights, also making the LEDs less of a fire hazard. The actors also found themselves at a comfortable temperature in the lights rather than overheating and sweating. This puts less demand on the maintenance of the costumes as well, and could decrease the amount of cleaning and water used. The director commented that she enjoyed using the lights because they were easily to change. If something was not working, it was possible to fix the color of the light without replacing gels multiple times. They built their own shoot for the lights in order to increase focus. The color was very saturated and Dobie liked that it put the production into various states. However, LEDs also have their downsides such as the inability to add texture, shuttering, and creating a fine line with the lighting source. The two concluded that if you were able to accept a different type of design then LED lights were a great alternative to a production.

The Ventura Hillsides Music Festival is held annually at Ventura Hillsides Conservancy, in Canada. It is an ideologically founding organization run by volunteers and focused on altruism, peacemaking, conservation, and environmentalism. They spoke about several of the environmental initiatives brought into the festival over the past 26 years. I will not go into detail to their presentation, as it is not entirely relevant to this thesis, but many of these initiatives would be interesting experiments for theatres festivals. The environmental programs include dishwashing, group transportation to the festival, and the encouragement of biking. The main stage has a living roof and sun stage generates energy through solar panels.

The third presenter was Seema Sueko from Mo'oelo in San Diego. Sueko spoke to the development of the Green Theatre Toolkit, which is used extensively in this paper (see Appendix A). This was an exciting opportunity to hear about the development and use of an important tool to sustainable theatre, as it is the only material of its kind. The Mo'oelo works on two principles. One, that every play must have roles for actors of color and two, that the production can outreach to community groups that do not normally attend the theatre. They start outreach 6-18 months before each performance. They took on environmentalism in 2007, seeing it as an issue of social justice. They first attempted to look at how LEED accredited guidelines would apply to the theatre (more on this later) and when they decided it would not work, they came up with their own toolkit to measure and qualify the materials used by theatres. This was done through a grant from The MetLife/TCG Think It, Do it Mo'oelo worked with Brown and Williams, an environmental consulting group, to come up with a ratings system for materials. A complete list of those materials and the scoring are found in Appendix A. After Sueko's presentation, we engaged in a lively discussion of environmental justice. This raised new issues in terms of theatre, as in what audiences are we reaching with a sustainable message, how can theatre help to create environmental awareness and decrease the gaps in environmental justice? It is just the beginning of these types of debates.

Workshop 8: Creating a Sustainable Rating System for Theatre

This workshop contained three presentations by Ian Garrett, Robert Usdin, and Ian Theacker. Much of Garrett's presentation was later restated in his keynote speech the next day, and so I will recount his work in the next section. Theacker was instrumental in putting together

the LEED standards for new construction in Canada through the Canada Green Building Council. LEED is a complex rating system for new construction and will also be explained in greater detail in the next section. Theacker provided a unique perspective coming from a non-theatre background and therefore did not know the details of a theatre structure, however, he did provide some interesting insights on creating a rating system.

Theacker noted that LEED does provide an incentive for new theatre construction but it is not any architect who can build a sustainable theatre space. The focus goes to the front of house and performance space rather than the workspaces. This means that little attention it paid to windows for daylight and proper ventilation systems. While the LEED certification program has been very successful in Canada due to low feeds to certify a building and mainstream industry thinking green it has to bring this exact model to a non-profit. Most of these buildings incentive in going green is economical, green branding attracts eco-conscious consumers. The downsides of using LEED for theatres is that it is expensive comparatively for theatres and it can take up to ten months for certification to go through. It also involves hiring outside help to ensure that buildings are designed and built with the proper certifications in mind. The cost of certifying a production has the potential to engulf the entire budget of a production, up to $1500.

Rather than imposing already defined standards on the theatre, Theacker provided his own alternatives to green theatre productions. Collaborative research is just starting to take hold in academic theatre. I think that the conference was a testament to the new ideas circulating through research circles. This includes production life cycle assessments. This is tracking a production from its inception through strike. An thorough assessment would also include where the materials where coming from as well as how they are used and how they are disposed of. Theacker also stressed education of the environmental and health impacts of materials. The listing of hazardous

materials in the theatre is law in the United States but not Canada. The next step is shared metrics and measurements of greenhouse gas emissions, energy, waste, water, and materials. By calculating the use of these materials it is easier to figure out how to reduce, reuse, and recycle the same materials. The last item is shared resources. This presented an interesting concept of stocks larger than just individual theatre's. A shared storage space could provide more opportunities for salvaging and recycling items from other productions. This would lower costs of a theatre looking to increase their storage space and provide incentive for more props, costume, and set sharing.

Robert Usdin, from Showman Fabricators, is a co-chair of the pre-production/post-production committee of the Broadway Green Alliance along with Donayle Werle, who I interviewed earlier. His goal is to create a green budgeting tool for theatres, especially scene shops. Since LEED is only for permanent buildings, theatre needs to figure out their own rating system for the temporary productions. Usdin stressed understanding embodied energy when choosing sustainable set materials. Embodied energy is the amount of energy it takes to make extract a make a material before it is sold.

Usdin works on Broadway and TV set construction and therefore has detailed accounts of the amounts of materials used in a production. He was able to do analysis to discover the amount of energy used by *Driving Miss Daisy*, recently on Broadway. Amount of energy just to build the set was equal to energy used by 11.6 houses in the United States for one year. Usdin did comment that the theatre industry is driving itself forward and practioners are figuring out how to make the production process better. For example, the Portland Stage Company recently built a LEED certified building but still held to traditional practices in stage productions.

Overall, the general idea of the panel was that a sustainable rating system was possible for theatre; it would just take time to develop. The systems already in place are not applicable to the temporary, fast paced nature of the theatre. Rather, theatre professionals and academics must work together in order to create a rating system for both the theatre spaces we occupy as well as the production process. This will take some time and experimentation, but it should be done.

Keynote Presentation: The Performing Arts and their Carbon Footprint by Ian Garrett

Ian Garret is the co-director of the Center for Sustainability in the Performing Arts (CSPA), an organization focused on the sharing of information and research concerning sustainability in the arts. It is fantastic resource, mostly through their website, sustainablepractice.org. Garret comes from a background in lighting design and used to teach at CalArts.

Garret's presentation started with difference between the concepts of sustainability and the concepts of dramaturgy. He stated, “A house is not *A Doll's House*”. The ideas behind sustainable development in housing and theatre are very different. Houses are built to last while performances even the longest running productions on Broadway are only for 20 years. Most performances outside of Broadway are only a few weeks. Buildings also use a variety of materials while theatre mostly uses wood to build faux interiors and exteriors.

Speaking to education, Garrett then pointed out the education programs focused on sustainability in theatre including; Calarts, The University of Indiana, The University of Oregon, and York University, home of the conference. He then cited an interesting statistic about the amount of production spending. 0.26% of the GDP was spend on non-profit production spending

in the United States in 2005. This was equal or greater than forestry and fishing, rail transportation, and waste management along with several other industries. This emphasizes the power that theatre has for change.

Garret then went into how this change is being measured within the general sustainable movement, starting with LEED. Garret quotes the US Green Building Council, a part of the National Resources Defense Agency, and not a part of the government:

> "LEED is an internationally recognized green building certification system, providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts. Developed by the U.S. Green Building Council (USGBC), LEED provides building owners and operators a concise framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions. "Intro – What LEED Is" USGBC.org."

It is applied to a variety of new buildings ranging from hospitality services to office buildings. It is based on a points system that results in a rating of certified, silver, gold, and platinum. Points are given out on based on a number of criteria such as access to public transportation, waste management, and heating systems. Green Globes is an alternative rating system to LEED. It was developed in Canada by the Green Building Initiative and then brought to the United States for American developers. There is about an 80% overlap between the two rating systems. LEED focuses more on the design of the building while Green Globes emphasizes the efficiency of the building. Breeam is an environmental assessment method from the UK and focuses on European practices and carbon units. The Oregon Museum of Science and Industry created a basic scoring system for museum exhibits that is based on the LEED standards, but easy for a museum curator to follow. BS 8901 is for large event management such as LiveEarth and creates a framework for sustainable events management but is expensive just to obtain the document.

These established rating systems do not quite seem to be the right fit for theatre. Therefore, Garrett then turned his attention to the research being done for sustainable theatre. The first example was the Mo'oelo Green Choices Toolkit discussed earlier. Julie's Bicycle in the UK is discussed in Chapter 3 as a monitoring system for UK theatres. Industry Green is a certification system working with Julie's Bicycle to apply a certification scheme for the creative industries to measure carbon and greenhouse gas output. This includes a calculator specifically for theatre by SMEasure. Julie's Bicycle stresses a cycle of engage, measure, reduce, and report with the idea that there is no end to being green. Ecovenue is an initiative by The Theatres Trust to survey 48 venues across London. It measures energy consumption and then rates the theatre. It also provides an advisory report on ways to move forward so the theatre may attain a higher rating in the future. Garrett then did some math as a representation of the research of the CSPA and realizes that by filling a theatre they are actually producing carbon offsets of the time people would be spending in their home. Childsplay, from Arizona, received the same grant as Mo'oelo to research sustainable staging techniques. Their research has created some interesting results such as:

- 50% purchase 100-500 sheets of lauan plywood per year… roughly 75,000 linear feet of wood that is sourced primarily from tropical rain forests.
- 58% of participants throw away most or all of their scenic material at strike. Most shops estimated filling at least one large container per strike.
- Most common reasons for not saving materials are lack of storage space and the labor costs associated with dismantling/moving materials.
- 30% of participants are already researching or implementing “green” material alternatives: using MDF in place of lauan wherever possible, looking for less toxic materials, etc.
- 66% of participants report re-using at least some stock pieces.
- 50% of participants would be willing to budget 5-10% more to purchase sustainable materials.
- 55% of participants would partner with other theatres for bulk purchasing of sustainable materials; another 42% would consider it for specific projects.
- Less than 20% of participants recycle wood during a strike. There is a common misperception that the wood and steel from flats or other structures cannot be recycled unless they are dismantled and stripped of hardware

Other examples of application of sustainable techniques include the Arcola Theatre and Touring Green, both discussed in Chapter 3.

Garrett then went on with his conclusions for a sustainable theatre. This starts with investment in deconstruction. This takes a bit more time to figure out how something is going to be taken apart rather than just throwing it away, but it is worth it. Garrett expands on the 3 Rs of conservation to include retain, rehabilitate, adapt, repurpose, recycle, and discard. By preserving something you can then reuse it and repurpose it. Incandescent lights are not necessarily a bad thing and a full house creates offsets as mentioned earlier. Transportation is also an important consideration of theatres, such as bike storage, and accessibility by theatre education. While stage time is bright, all the lights are on for a relatively short time. Communication is key to moving forward according to Garrett and I am inclined to agree. Information sharing was abundant during this one conference. As more people learn about the possibilities of sustainable theatre, than those changes can be made.

Personal Interviews:
Charles Duell and Donayle Werle, Broadway Green Alliance, New York City, November 12th, 2010
Joanne Barnett, Theatre Manager, Tufts University, March 2011
John Mulligan, Technical Director, Tufts University, March 2011
Linda Ross, Costume Designer, Tufts University, March 2011
Margo Caddell, Lighting Designer, Tufts University, March 2011
Meredith Miller, Assistant Technical Director, Tufts University, March 2011
Natalie Maynard, Graduate Student. Phone Interview March 23rd, 2011
Penney Pinette, Costume Shop Supervisor, Tufts University, March 2011
Sharon Swingle, Costume Designer, Phone Interview, March 23rd, 2011
Ted Simpson, Scenic Designer, Tufts University, March 2011

Participated in Staging Sustainability Conference at York University, April 20th-22nd.