
Pauline and Irving Tanner Dean's Scholar Summer 2008 Research Proposal

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**From Computer Screen
To Opening Night:
Architectural and Theatrical
Automated Lighting Design**

Abstract:

In the past quarter century, the lighting industry has been revolutionized by the introduction of intelligent lighting – lighting fixtures that have mechanical capabilities far beyond those of traditional stage lights. These lights are capable of independently moving, changing color, focusing, and altering beam characteristics to create what amounts to an entirely new medium for lighting designers. The control of these fixtures is a mixture of computer science and art, blending the aesthetics of design and mathematical logic to orchestrate breathtaking displays of light. Intelligent lighting has dramatically changed the lighting available to concerts, clubs, theatrical productions and architectural installations.

I am interested in developing my abilities as a lighting designer and programmer through work on two distinct projects over the course of the summer. With the guidance of Ed Intemann, the lighting designer for Cornell's Department of Theatre, Film and Dance, I will work towards selecting and implementing a moving light installation outside of the Schwartz Center for the Performing Arts that will be used to advertise shows and to enhance the visual impact of the building. This will culminate in a computerized model of the Schwartz Center and a simulated 3D rendering of the lighting installation around the building. In addition, I will be creating a 3D model of the department's 475 seat Kiplinger Theatre and using it to design a moving light show for Leonard Bernstein's *Mass*. The architectural project should facilitate the actual implementation of the exterior lighting in time for the building's 20th anniversary, and the work on Bernstein's piece will translate into the actual design used in lighting the Schwartz Center's production of *Mass* in the spring of 2009. The culmination of this project will include the development of my skills as a designer and programmer in the fields of architectural and theatrical lighting as well as leaving lasting benefits for the Ithaca theatre community.

Background:

My interest in science and technology has lasted my entire life, but my interest in the theatre is much more recent. I went to Thomas Jefferson High School for Science and Technology in Northern Virginia, an extremely competitive magnet school in which the arts were frequently marginalized at the expense of the sciences. By my junior year in high school I felt the profound desire to explore something else, and so I auditioned for the school's production of *Romeo and Juliet*. Ever since, I haven't been able to shake theatre from my blood. I spent my early years acting, but quickly branched out into doing scenic design, construction, and eventually even directed my high school's senior show. Cornell is where I first touched a lighting instrument, and since then lighting design has been my primary academic and artistic passion.

Since arriving here I have completed 48 credits of theatre work and am enrolled in another 8, have acted, worked on lighting crews, run light boards, programmed moving lights, and been an assistant stage manager and assistant lighting designer in department shows. In addition to my involvement with the theatre department, I have also founded and been a director for Cornell's only Shakespeare Troupe (currently in its 3rd semester),

am the general manager of Risley's 81 seat black box theatre. I have been the lighting designer for over half a dozen student productions that have taken place in Risley.

In all of my theatrical travels, my greatest interest has been automated lighting. The process of sitting down at a keyboard and programming an array of independent mechanical fixtures to create a synchronized piece of art is a fantastic blending of both the logical side of my brain and my desire to be creative and expressive. The process of brainstorming and visualizing the movements of the lights and then translating that into a series of precise computer commands to achieve the result is an extremely unique and rewarding endeavor, and one that I could see myself pursuing in my years beyond Cornell.

Statement of Purpose:

The entire world of lighting design is new – with technology to effect lights progressing beyond watching the weather and lighting fires coming only within the past century or so. The biggest change to the field came just about 25 years ago when a band decided to try out some lights with attached motors for a concert. Originally intended to simply allow fewer lights to be hung to achieve many different looks, the unique ability of these lights to dance across the stage while changing shape and color has revolutionized the world of lighting design and allowed it to become a more dynamic and engaging medium. My own experience with these lights is deep given the resources on campus but still just scratching the surface of what is available. I've programmed moving lights for a show at the Schwartz center, several at Risley, and for several private parties in addition to taking a class on automated lighting – but have yet to control more than 5 fixtures at once while modern performances often have dozens.

The key to accessing the world of moving lights is the control software. Several different manufacturers have come out with extremely complicated 'light boards' that allow for dozens of moving lights to all be carefully programmed and cued at once – but nearly all of these manufacturers also create software versions of their product and computer-light interfaces that allow any PC to become a fully functioning light board. In addition, visualization software that is referred to as "WYSIWYG" – What You See Is What You Get – allows for these computer programs to control virtual lights set in a three-dimensional virtual space. The accuracy of these programs is tremendous – they are designed to allow a lighting designer to program without needing access to the performance space or any of the expensive fixtures. This is a necessity in the fast-paced world of concert lighting where there simply wouldn't be time for a to program a show between when the venue is set up and the act is to begin – but it also allows novice programmers the ability to practice their craft using the exact same tools as the professionals on a budget several orders of magnitude smaller.

To that end, I intend to spend the summer honing my skills as a designer and a programmer by using lighting control and visualization software to tackle two projects which are markedly larger than anything I have yet come across. The first will be to use 3D modeling software (AutoCAD) to create a model of Cornell University's Schwartz Center for the Performing Arts and then import it into an automated lighting programming/visualization program (Martin Light Jockey). From here it will be possible to experiment with the placement of the virtual lighting fixtures and to program several

different light shows on the exterior of the building. These looks will range from a standard and subdued look for during normal evenings to vibrant and dynamic light shows signaling auditions, show openings, and other major events. The culmination of the work in this area will be a striking visual that will compliment the Schwartz Center. Currently, an actual grant proposal is being written to request the purchase of a set of moving lights to replace the current architectural lighting installed at the Schwartz Center as part of the building's 20th anniversary – meaning the virtual design stands a good chance of being implemented in reality.

This phase of the project will also entail a tremendous level of personal growth. My experience in lighting includes very little 3D modeling – an important skill to an aspiring programmer given the rarity of finding a venue that already has a 3D computer model of its space, much less one in the appropriate format. Perhaps most importantly, however, it will be my first foray into the world of architectural lighting. I have done extensive lighting work in theatre, concerts, and dance – but have no experience in architectural lighting design. This would make it an area of pronounced personal growth, and help to round out my skill and experience set.

The second portion of the project will be far grander – a model of the Schwartz Center's large Kiplinger Theatre and a complete automated design for Leonard Bernstein's *Mass* – a nearly two hour piece of musical theatre written for the opening of The Kennedy Center in Washington, DC as a sort of requiem for the assassinated John F. Kennedy. The Schwartz Center will be putting on a production of *Mass* in 2009 as part of its 20th anniversary celebration. A healthy budget for either renting or purchasing a moving lights package to compliment the piece has already been approved by the department. Creating the moving light show in the visualization software will be a difficult process – synchronizing every movement of the light with the music. By means of example, the final project for the course on automated lighting that I took was similar – to create a visualization for a short piece of music. The final four minute design wound up taking nearly two dozen hours to complete from creating the model of the stage to finishing the final cues¹

On a personal level, this will allow me a tremendous level of freedom in working on a much grander scale than has ever before been possible. While some respect will be paid to the lights we will actually be able to rent or purchase for the concert, I will have the freedom to use as many lights of as many different kinds as I want in the simulation. It will also require a great deal of thought into how the lights will work with the piece – four minutes of lights for a concert need to be vibrant and engaging, but two hours worth of lights for a complicated piece of theatre need to be far more coherent and thought out. The final project will then serve as a spring board for the actually lighting design of the piece – as enacted by the Schwartz Center's lighting designer, possibly with my help with the programming as part of a senior Advanced Undergraduate Theatre Program project.

To work on these projects, I will live in the Ithaca area and have weekly meetings with Ed Intemann, the Schwartz Center's resident lighting designer and a senior lecturer at Cornell. On some portions of the project he will be teaching me directly – for example, how to use CAD software. On others (such as most of the actual programming and visualization) I will be self taught with the help of books and trips to see shows in New

¹ Piece available online at <http://video.google.com/videoplay?docid=-5470401291830150559> under the google video title 'Automated Lighting for Franz Ferdinand - Take Me Out'

York City that make heavy use of automated lighting. Due to the great expense of the equipment, there is little to see in Ithaca that will be comparable to the scale we're hoping to achieve with *Mass*, so several trips to see shows with large budgets will be an enormously useful pedagogical tool. For my time in Ithaca, I have secured access to some equipment and to lab space within the Schwartz Center to do my work. I have also worked out a preliminary schedule for the development of the two projects with my advisor, which appears below.

The culmination of these projects will yield several important and lasting benefits – not the least of which will be my own artistic growth. I am seriously considering a career in lighting design, particularly the programming of moving lights, and this summer experience would be a unique and immensely valuable tool to refine my skills. In addition, the two computer models I create will be extremely useful for future visualization work for other designers. The building model will be immediately available – not only for lighting design modeling, but also for department publicity or mock ups of other projects. Similarly the model of the theatre will find great use in future lighting or even scenic designs for main stage productions. The architectural visualization will hopefully be translated into reality as the Schwartz Center applies for funding to purchase the lights used, and the lighting for *Mass* will serve at least as the basis for the show's design and potentially wind up directly translated directly into the department's staging of Bernstein's work.

Tentative summer schedule:

Week	Date	Activity	Work Completed
1	05/18/08	Move from dorm to apartment, set up space in the Schwartz Center's light lab, begin to work with CAD, read about CAD.	
2	05/25/08	Work with CAD to finish creating the Schwartz Center model.	Schwartz Center CAD model
3	06/01/08	Begin to create visualizations for the architectural installation, read about architectural lighting, see first show in NYC.	
4	06/08/08	Complete architectural installation visualization, work completed materials into department grant application .	Architectural Visualization
5	06/15/08	Begin modeling the Kiplinger Theatre in CAD.	
6	06/22/08	Complete the Kiplinger theatre model, begin programming, see second show in NYC.	Kiplinger Theatre model
7	06/29/08	Program moving light show for <i>Mass</i> , see third show in NYC, complete at least one full-length draft version to be carefully edited and revised with professor Intemann along the way.	
8	07/06/08		
9	07/13/08		<i>Mass</i> visualization first attempt
10	07/20/08		
11	07/27/08		
12	08/03/08		<i>Mass</i> visualization

Bibliography:

(Asterisk indicates books that I have been recommended but have yet to obtain a copy of)

*Bernstein, Leonard. (1971). *Mass: A Theatre Piece for Singers, Players, and Dancers*. Schirmer / Amberson

Cadena, Richard. (2006). *Automated Lighting: The Art and Science of Moving Light in Theatre, Live Performance, Broadcast, and Entertainment*. Focal Press;

*Egan, David M.(2001) *Architectural Lighting*. McGraw-Hill Science/Engineering/Math.

*Millet, Marietta S. (1996). *Light Revealing Architecture*. Wiley.

*Ripley, David. (2005). *AutoCAD - A Handbook for Theatre Users*. Entertainment Technology Press Ltd

Schiller, Brad. (2003). *The Automated Lighting Programmer's Handbook*. Focal Press

*Steffy Gary. (2001). *Architectural Lighting Design, 2nd Edition*. Wiley

Budget:

Rent and Utilities: at the location in college town I'm currently looking at, this would come to around \$375 per month over the 3 months of the summer for a total of \$1,125. ✓

Following my spending for the past month, I estimate that I can eat for around \$75 per week, for a total of \$900 over the ~12 weeks I will be working.

Software, hardware, and equipment costs would be around \$1,500. I'm looking to obtain CAD software, USB-DMX computer interface hardware to allow control of lighting, and a copy of Martin Light Jockey. I am aware that the grant cannot cover the cost of equipment, but I am seeking funding from Risley Theatre and may apply for assistance from the Schwartz Center with the stipulation that the equipment and software be left with the respective funding sources following the project.

Some of the books I would need for the project I have already purchased for previous classes and others are available from instructors at the theatre department, but the otherwise scarce nature of the specialized books on lighting design means several will have to be ordered. I also will need drafting supplies – tracing paper, pencils, triangles, etc – some of which I have, but many I'd need to buy on a somewhat weekly basis. I estimate the total cost for books and disposable supplies will be roughly \$150 (including shipping when necessary).

The expense of moving lights systems means that there aren't many in Ithaca to either work with or see in action, so I plan to take several trips to New York City in order to see shows that rely heavily on automated lighting. The cost of these trips will be greatly reduced by staying with friends, getting student tickets, and traveling by bus (~\$80 for a round trip) but will still cost on the order of \$125 per trip for bus fare, food, tickets, and other expenses for an estimated 3 trips totaling \$375.

The cost of the lights to be purchased and installed in the Schwartz Center and used in Bernstein's *Mass* total nearly \$75,000 – but the funding for that element of the project is being sought through other channels.

Total Personal Expenses for the Summer:

\$1,125 – Lodging OK
\$900 – food OK
\$150 – books and disposables OK
\$1,500 – software and equipment
\$375 – tickets, travel, and miscellaneous expenses OK

Total expected summer costs: \$4,050

I am aware that this amount is in excess of the maximum awardable by the grant and that some of these items do not fall under the criteria of the grant. For those reasons I am also seeking outside funding from Risley Theatre, the theatre department, and Cornell Council for the Arts (as a last resort). I am also willing to contribute from my personal savings and to work part time over the summer to help defray the remaining costs of the project.