

# THEATRE DESIGN & TECHNOLOGY

FALL 2022

## Rediscovering Costume History

Instead of giving  
students all the  
answers, show them  
how to ask the right  
questions



usitt

# TEACHING LIGHTING



# DESIGN

## WITH COMPUTER MODELING

A lighting challenge, projections and scrim, *Assassins* | Image courtesy of the author.

**W**hen the pandemic began, classes in beginning lighting were being taught on their usual schedule. Like others, University of Kansas faculty members were working remotely via on-screen video conferencing technology, which required retooling the usual methods of teaching lighting. Paradoxically, lighting, perhaps the most ephemeral of the scenographic elements, most requires hands-on, in-the-theatre, experiences for students to understand basic concepts and to benefit from the class. Conversely, scenic and costume design students can more easily complete sketches and drafts, which can be shared with teachers and colleagues on-screen and at distance. Although lighting benefits greatly from sketches and storyboards in addition to drafting, it's one scenographic practice that is best taught in situ.

## Creating a design in a computer simulation more closely mimics the steps to create a stage design than paper assignments

Grasping basic concepts of lighting requires holding on to an instrument, pointing it at something, and watching the effect. There's no substitute for working in a theatre or lab space, and physically lighting an object. The effects of lighting from different angles and with various colors can be described, but a picture, particularly a live one, is worth a thousand words. Seeing two, three, or four colors mixed on flat and three-dimensional objects imparts a level of understanding that cannot be achieved through the best lecture or by examining drafting,

How, then, are we to proceed with the task of giving students a more tangible and tactile experience of focusing instruments and using them to light various scenes? For me, with decades of experience in computer modeling, mainly from the standpoint of a scenic designer, computer simulation was the most obvious avenue to explore. After all, after

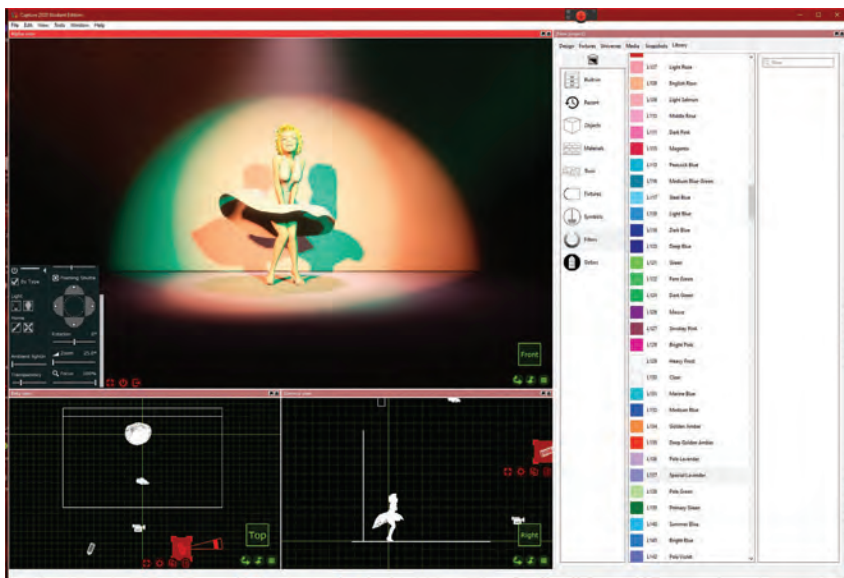
designing many shows with CGI tools, I knew there was a ready cache of CGI models that could be used as subject matter to be lit by students using computer tools and techniques. But which tools and which techniques?

### Software Choices

A variety of software packages and workflows are available for designers. Many were examined before the semester started for their features and usefulness in a theatre setting. 3D-modeling programs, online modeling sites, and all-in-one lighting visualization programs all got a look. The lighting features offered, ease of

BY MARK REANEY

Note: The simulation assets mentioned in this article are available at [www.ievr.org/teaching](http://www.ievr.org/teaching).



Sim 1, a first exercise in using virtual lighting.



Sim 2, colored light on colored materials.



Sim 3, simulating natural light onstage.

use, system requirements, the quality of rendering, and cost were weighed in the decision.

Of course, the selection of technology was based primarily on the pedagogical goals of the class. In this case, we were focusing on early visualization, preliminary lighting sketches, and storyboards. Working this basic visualization illustrates fundamental principles and allows students to experiment through positioning, focusing, and coloring virtual instruments. Had the goal been late-process visualization, rendering scenes from a nearly finished plot, or writing cues to be exported to a board, the deciding factors would have been much different.

When first used in scenic visualizations, the existing models were created primarily in mainstream modeling programs 3DS Max and Cinema 4D. One reasonable solution would be to keep the models in these formats and have students use the lighting tools built into these all-purpose modeling, rendering, and animation programs. This option is attractive as these professional-grade programs are very powerful, offer very sophisticated lighting options, and produce photo-realistic rendering. Moreover, they are available at no cost to students and faculty.

Cinema 4D has an added advantage. Light plots created in Vectorworks can be output directly to the Cinema 4D format. After a few experiments, we knew that this technique very accurately places the instrument in the model space and gives them the proper characteristics. One small problem is that while colors are assigned to each instrument in the form of gel numbers and translate well into C4D, any work afterward with color must be done in the RGB (red, blue, green) or HSV (hue, saturation, value) formats. This is common in modeling software. One method of using gel numbers in non-theatre software is to note the XY value of a gel, then convert it to RGB using tables available from most gel manufacturers.

It might be easier to deal with a visualization package that was designed specifically to visualize lighting in the theatre. Several were examined to see if they met the prerequisite of being free or very inexpensive for students and faculty. WYSIWYG and Vectorworks Vision were examined. Finally, we decided to use the student version of Capture by Capture

Visualisation ([www.capture.se](http://www.capture.se)). Capture is an all-in-one application that contains visualization, drafting, and paperwork capabilities. A user can start by working with a plot, then see the design rendered or, conversely, place instrumentation in the visualizer and have it automatically added to the plot.

Capture's advantages are that it is free, has an intuitive interface and an easy learning curve, allows cues to be set, recorded, and rendered without watermarks, albeit in lower resolution, and automated fixtures can be rendered as animated sequences. The importance of an easy, intuitive interface cannot be overstated. In foundational classes, our aim is to teach the use of light, not software.

The main limitation of Capture is that the student version only makes a modest sample of commercial fixtures available. Fortunately, that sample includes Source4 zooms which can be adjusted to whatever angle meets the need. A variety of other instruments, fresnels, cyc-units, pars, moving lights, etc., are also available. Capture has a built-in plot generator, so it does not collaborate well with an outside drafting program like Vectorworks. But Vectorworks plots can be imported with a little work (see sidebar). Imported designs will need to use the fixtures available in the student version.

## Simulations

The following simulation resources were used in class and are available to USITT members to use for free in whole or in part at [www.ievr.org/teaching](http://www.ievr.org/teaching). The simulations can be altered or converted to any form. A course of study or lesson plans have been deliberately omitted. These are tools with which teachers and students can set up a virtual light lab. Because they can be used as foils for either simple or complex lighting problems, they can be valuable to both novice and experienced designers. The original intent behind the use of each might be divined by its design, but it is fervently hoped that others will invent imaginative new applications. (If it ain't broke, break it.)

In the same location, a Quick-Start guide to Capture can be found.

Packages can include:

- Scenic model in several formats, Cinema 4D, FBX, and obj.
- All texture files used in the model

## The Plot Thickens: Exporting Vectorworks Lightplots to Capture Visualizer

### In Vectorworks:

SAVE YOUR WORK

Reset the origin to the intersection of the plaster line and the centerline.

Use a "User Field" to assign instruments to groups.

Export the fixture information

MENU: FILE > Export > Export Instrument Data

If instruments don't need to be pre-focused, X, Y, and Z locations may be all that is necessary. Otherwise, export the Pan, Tilt, and Z-Rotation data as well.

In order to have all of the instruments correctly focused after import:

1. Designate a focus point for each instrument in Vectorworks before exporting.
2. Open the exported .txt file in Excel.
3. Convert the numbers in the "Pan" column to the opposite negative/positive. (Multiply by -1)
4. Do the same for the "Z rotation" column.
5. Add the values from the inverted Pan and Z rotation columns into a new column called something like "New Pan".
6. Save and Import into Capture, as usual, using the X, Y, Z Locations, Tilt, and New Pan in the Pan field.

### In Capture:

Import the theatre and set model using the "Place at Original position" option.

While the model is still highlighted, group it all together.

MENU: Edit > Group

Import the edited instrument data from Vectorworks.

MENU: FILE > Import Fixture Data...

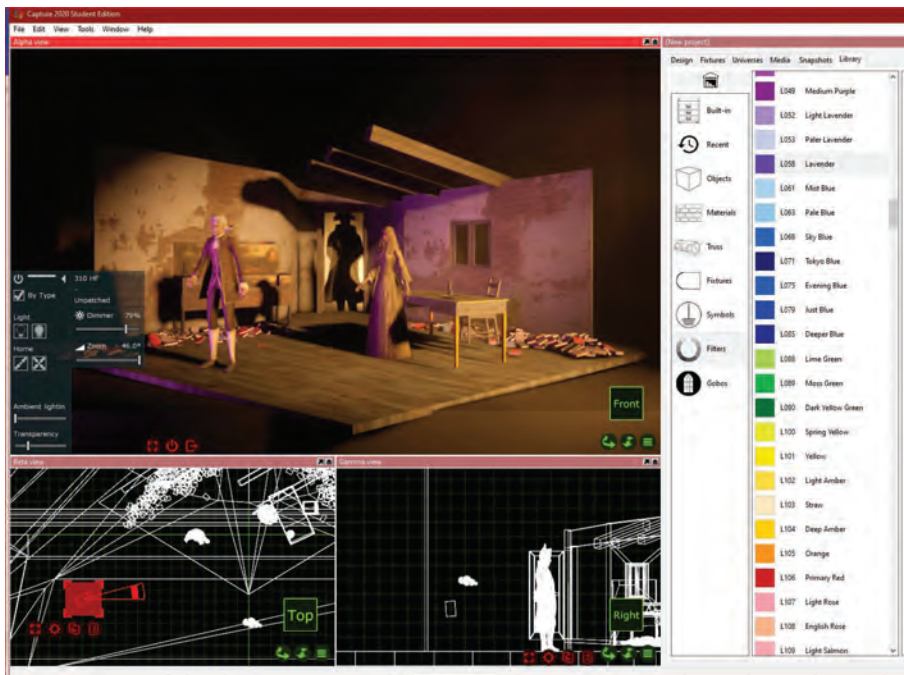
If an imported plot uses instruments that are not in the capture student edition library, a dialog box will pop up., asking that a substitute be chosen.

- Ground plan in Vectorworks format
- Line drawing of the set for making lighting storyboards
- Color rendering
- Script or partial script if available

**Simulation No.1:** The first simulation is a simple studio with a white floor and rear wall. This provides a simple surface for learning a visualization program, adding and aiming some lighting instruments, and mixing colors. A character is included that can be used as a foil for mixing angles and colors on a three-dimensional object. Marilyn is wearing her signature white dress to keep the first simulation simple. An instructor could

rely on the obligatory photos of a white mannequin that can be found in any lighting textbook but allowing students to create the pictures themselves should be worthwhile.

**Simulation No. 2:** No. 2 is similar to the first but goes a step further by including colorful textures that can be added to the rear wall and Elvis' jacket. Several textures are included in the simulation package, but any image file can be used. In addition to discovering the effect of light on colored surfaces, this simulation could be used in a more practical fashion by adding scans of fabric or wallpaper patterns being considered for an actual production.



Sim 4, a small scene, *Mozart and the Gray Steward*.



Sim 5, a more complex problem, *Comedy of Errors or The Boys From Syracuse*



Sim 6, sightlines, the problem of a thrust stage.

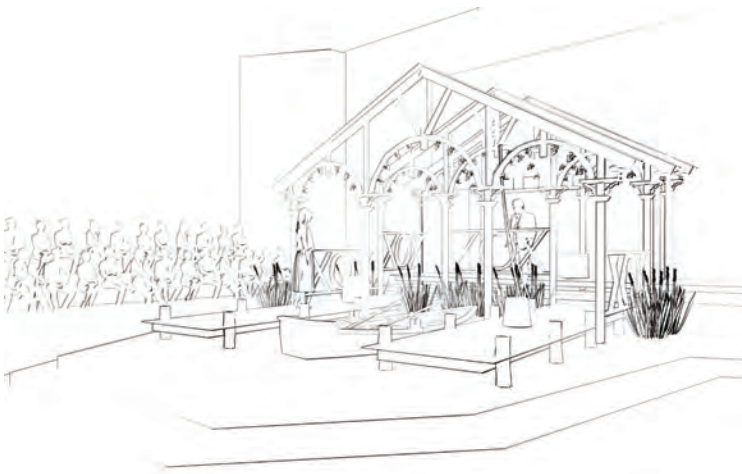
**Simulation No. 3:** This one includes some model haystacks similar to those found in Monet's famous series of paintings. As Monet explored the different colors of light and shadow throughout the day and year, students can have a turn at recreating his observations. This could be an exercise in simulating natural light or interpreting it in a more poetic vein.

**Simulation No. 4:** The next simulation contains a rough set model for Thornton Wilder's four-page play, *Mozart and the Grey Steward*. This tiny set is placed in an overly large proscenium arch theatre, but it could be moved into any venue students might be familiar with. The set has been left mostly open at its top. The odd ceiling beams or walls could be removed for simplicity. There really has to be a door up center for the Grey Steward's entrance. Most visualization programs allow for the easy creation of stage fog. Students seem to have a good time creating special effects.

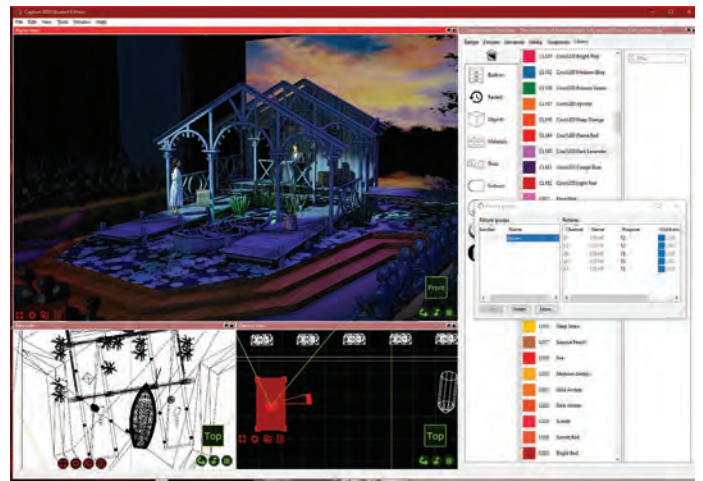
**Simulation No. 5:** This simulation is a more complex setting that was used for both *The Comedy of Errors* and the musical, *The Boys from Syracuse*. There are only a few small changes between the two. The set is colorful and open to lighting from many angles. Shakespeare's script is easy to come by. The book for Rodgers and Hart's musical, less so. But everybody needs to dig up a copy of the 1940 movie version and watch it. It's hysterical.

**Simulation No. 6:** Another lab exercise; in this one, a new character is standing before the white wall. The purpose here is to set up lighting solutions that will work in a thrust theatre configuration. This illustrates the usefulness of a 3D-lighting simulation. After different looks are created, the viewing position can be moved around the character. In addition to the usual renderings, animation sequences can be created. Students have a lot of fun with this, but rendering animations typically requires more time and computing power.

**Simulation No. 7:** Here, we put the lab experience of number six to the test. This is a model for a production of Lanford Wilson's *Talley's Folly*. The model has been placed in a theatre space with a grid over the thrust and several surrounding front of house positions. There is a small rear projection screen at the back of the set and a tricky, reflective



Sim 7, an example of the included line drawings, *Talley's Folly*.



Sim 7, a full thrust stage production, *Talley's Folly*.

stage floor pretending to be water.

**Simulation No. 8:** Another lab situation, this time the goal was to light an arena stage. This is a rather small, neutral playing space with the audience on four sides, watching Marty and Doc make a scene.

**Simulation No. 9:** This one is a bit of a twist on the practice of lighting different stage configurations. Here, Dan LeFranc's *The Big Meal* was produced using "transverse staging." Similar to an arena stage, this "alley staging" allows for the addition of some booms or light ladders at either end of the playing space.

**Simulation No. 10:** A final simulation was added to the group mainly because there happened to be an extra scenic model that called for some special lighting. This production of Stephen Sondheim's *Assassins* included a rear projection screen, a full-stage painted scrim, and front-projection on large flats at stage right and left. Setting up a model that has this type of virtual stagecraft can be done using a few options. Most visualization software allows the user to add images to lighting instruments, thereby converting them to image projectors. (Gobos are handled the same way.) In the *Assassins* model, another technique is also available: An additional set of flats were created that are mostly transparent but with "projected" images that are translucent. Using these pseudo-projections may be more straightforward than setting up virtual image projectors but still create a challenge for a lighting designer. The sharkstooth scrim effect may be achieved differently in different programs. Simply reducing the opacity of the object may be enough. Some



Sim 8, a generic arena stage simulation.



Sim 9, a transverse, or alley stage sim, *The Big Meal*.

"With simulations, a student can place instruments in appropriate positions and even program them with all the features of moving lights."

may want to add a texture to simulate a rough surface, or it may be necessary to add a mesh into the scrim's alpha channel to create alternating transparent and opaque areas.

Teaching lighting design through the use of computer visualization can be extremely effective. Creating a design in this method more closely mimics the steps in the experience of creating a stage design than doing assignments involving paperwork alone. With simulations, a student can place instruments in appropriate positions, focus them accurately in the scene, assign commercially available gel colors, give them gobos, use them to project images, or even program them with all the features of moving lights. Instruments can be assigned to universes, groups, or channels. Cues can be written and recorded. The beautifully illuminated scene can be rendered as a still image or video clip. If the pre-visualized design checks out, it can be converted to a plot. After having used the process and seeing the results, these tools have proven to be valuable for design students

whether they are being taught remotely or in person, pandemic or not.



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*Theatre and Dance. He pioneered the use of CGI in scenography and virtual reality as a scenic medium. He has spoken and written extensively on the subject, including numerous sessions at USITT conferences and articles in TD&T, beginning in 1988. The Institute has supported this work on several occasions, which is gratefully acknowledged. Work with Theatre/VR continues. Current projects include new VR recreations of historic theatres. Long afflicted with MS, Reaney is always exploring ways in which digital tech can aid scenographers with disabilities.*

*Documentation of the work in CGI/VR/Theatre, projects, productions, and publications can be found at [www.ievr.org](http://www.ievr.org)*

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