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# Union Station

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# Union Station

Thesis submitted in partial fulfillment of Honors

By

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*Honors-in-Discipline*

East Tennessee State University

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[Note: Signature of mentor **is required**; listing and signatures of faculty readers are suggested, since they like to be included, but optional at the discretion of the student]

Union Station in Washington, D.C., is one of my favorite buildings that I saw during my summer interning in that city. For my thesis project, I decided to recreate it in 3D as a short film. The interior of the main hall has a golden light that I sought to recapture with lighting and indirect lighting in Maya and Nuke. This golden light is the result of over 70 pounds of gold leaf on the Beaux Arts style coffered ceiling. I decided to recreate the main hall as it was up through the 1950s, when its main purpose was to serve as a waiting room for train passengers who sat on custom made solid mahogany benches.

Today Union Station is a multifaceted destination, with many shopping and dining vendors, as well as serving local and long distance train services. Not only is Union Station a beautiful building, but it has been the home to many events throughout American history. It's been the home to five presidents' inaugural balls, the host to foreign dignitaries such as King George VI, Queen Elizabeth II, and King Albert of the Belgians. The station's canteen (now closed) had many prominent American women work in it, such as Eleanor Roosevelt and Mrs. Woodrow Wilson, who famously once made her husband the president wait for her outside until she had finished her canteen duties.

The building is a historical landmark in the district, finished in fall of 1907. It was designed by Daniel Burnham, the principle architect of the 1893 World's Fair in Chicago. The building was inspired by the Roman Baths of Caraculla and the Arch of Rome. The arches were a symbol of the station's purpose as a gateway. The exterior's white granite from Bethel, Vermont set the mode for Washington's iconic architecture for the next four decades, through the construction of the Lincoln and Jefferson memorials, the Federal Triangle, and the Supreme Court building. On October 27, 1907 at 6:50 AM the station officially opened when the Baltimore and Ohio Pittsburgh Express pulled into the station.

The main lobby measures 120 by 119 feet with a 96 foot high barrel vaulted ceiling. Around the room are 36 legionnaires hollow cast in plaster, originally nudes but with added shields for modesty to keep from offending the public.


Union Station until the 1950s
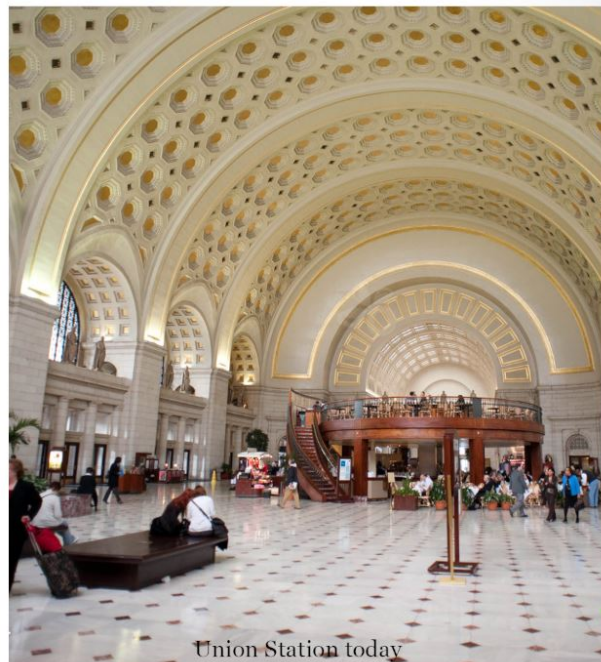

Union Station today

## Modeling

I set about modeling the interior of the station's main waiting room without much drama, but in order to get the ceiling tiles of the main hall to the level of detail I wanted, it would have been too many polygons for the software Maya to handle. Each octagonal and square ceiling tile has three tiers, all with decorative plaster trim. Upon trying to make an entire arch of 63 of these tiles, Maya would continually crash from the amount of polygon information from the details.
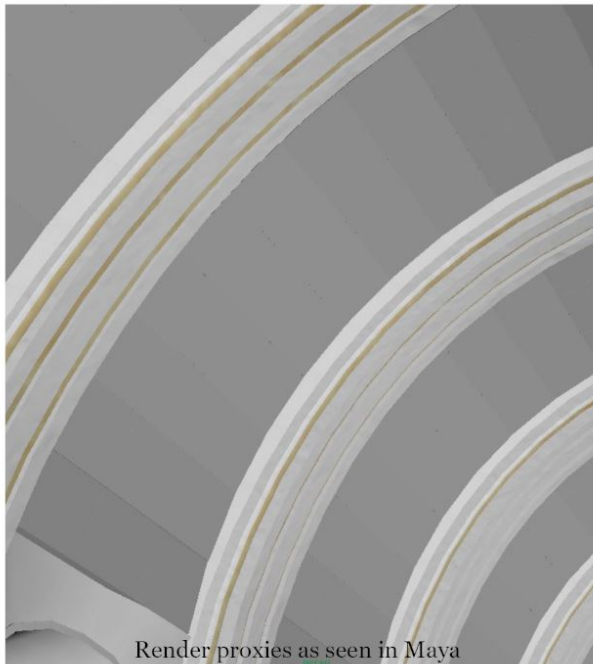
## Render Proxies

My first attempt at getting around this issue while still getting the look I wanted was to experiment with render proxies, which allowed me to work in Maya more easily, while rendering out the tiles how I wanted. In order to do these render proxies, in a separate Maya scene file I modeled completely one whole ceiling tile, and exported it as a .mi file. Then, in the scene where the geometry of the actual station was, I created a cube and put that .mi file in under the render proxy section of a plain cube in Maya, which makes the cube the size of the actual modeled tile I created and links it to that file, so that what looks like a cube in Maya renders as a completed, textured ceiling tile. The cube now being the dimensions of the finished tile meant that I could go through and place them in the room where they belonged and render them out.



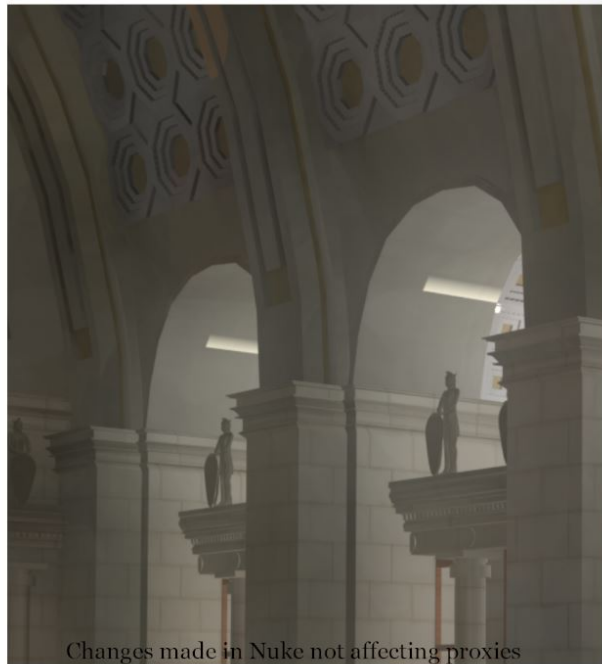Render proxies as intended                Render proxies with geometry, without texture
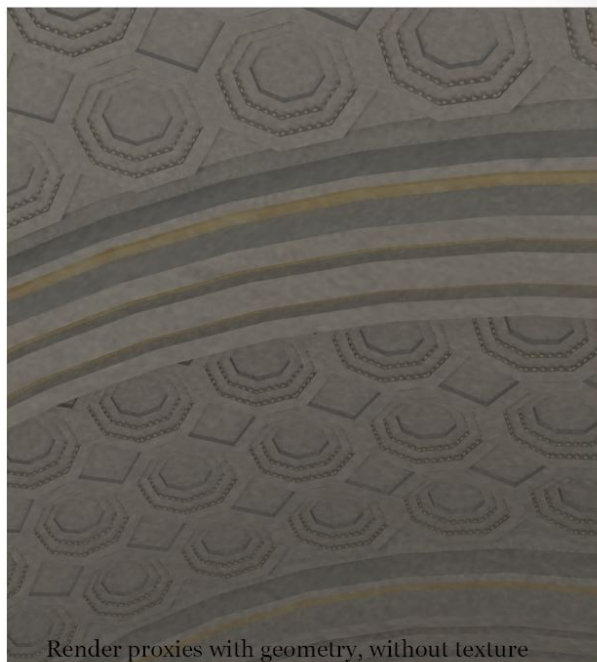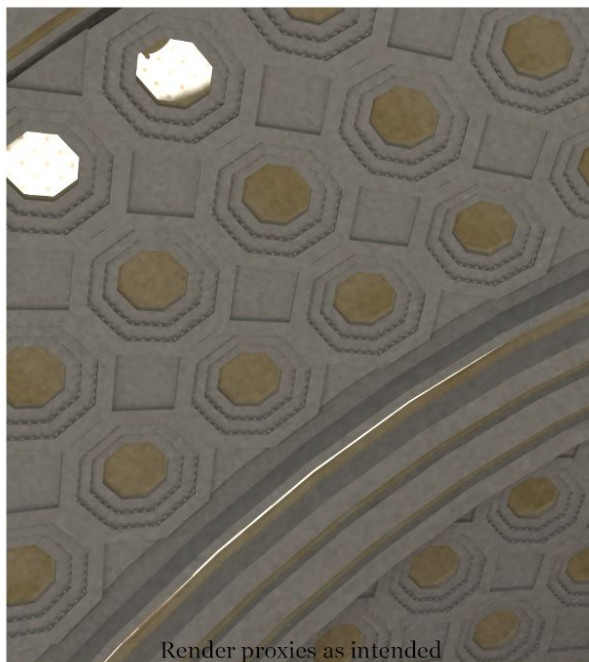
While these proxies seemed to work with still renders, whenever I tried to render out multiple frames, the proxies would glitch. In some of these renders, the geometry from the .mi file would render, but the textures would not. (as seen above) This seemed to happen at random the renders frame to frame, which was strange because the geometry and the textures on the render proxies were from the same .mi file.

Another similar issue with the render proxies, was when I would take my renders into Nuke to adjust shadows, indirect light, reflections, etc. none of the changes made would apply to the render proxies. (as seen below)

Render proxies as seen in Maya | Changes made in Nuke not affecting proxies

**Scene Assembly**

After trying and not succeeding in getting the render proxies to work properly, I decided it was time to try another solution to get the ceiling tiles, the room's main feature, to work. I decided to try a feature fairly new to Maya, scene assembly.
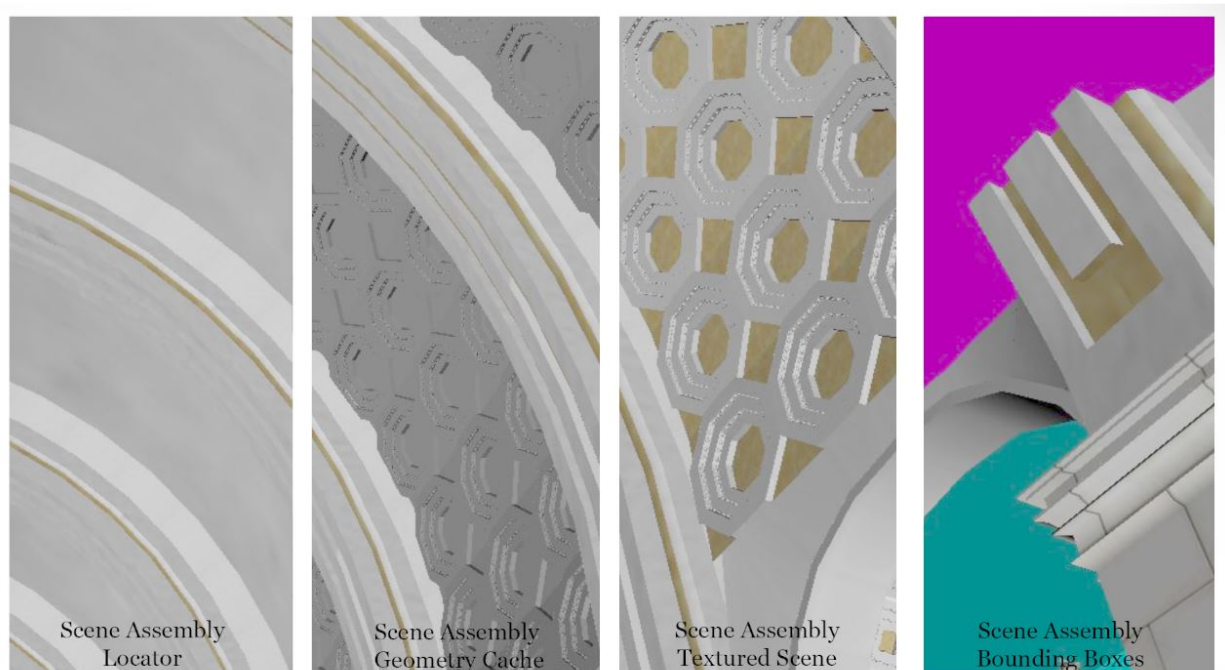
The main workings of scene assembly are fairly similar to the render proxies, except there are more options on how to view the geometry in Maya. In a separate Maya scene from the main station, I created a complete textured ceiling tile again, and duplicated it to make one whole arch. I created an alembic cache of the geometry of the arch, and converted the finished arch into a bounding box in the dimensions of the finished arch. In a separate Maya scene again, I created a scene assembly dimension, which is basically just a locator. Then I added to the locator the cache file, the bounding box scene and the finished textured scene. In the render settings of Maya, I can tell it which of these I want it to actually render, so I type in the name of the finished textured file.

**Nuke**

Starting in January, I began rendering my cameras from Maya with render passes, with which I can bring my footage into Nuke and control factors of the shots individually. With Nuke I can control light, shadows, reflections, depth of field, etc. so that I have more control of the finished product without having the time investment of re-rendering the frames from Maya. Working with Nuke was a challenge since before this point in my thesis I had never used the software, but after weeks of struggle I was finally able to coax the software into getting the effects I wanted.

Also with Nuke, I was able to bring the sky into my shots outside the windows. The renders from Maya just had black outside the windows, since putting a sphere with a sky texture outside in Maya didn't have the look I wanted. With Nuke I was able to create a sphere with a sky texture on it, and have it visible through the windows using alpha channels. I had issues

getting this process to work on a few of the cameras, but re-doing the sphere and its connections to my shots finally gave the illusion of a sky being outside the windows.



Scene Assembly Locator  Scene Assembly Geometry Cache  Scene Assembly Textured Scene  Scene Assembly Bounding Boxes

### Script and Recording

Writing and recording a script for a short film was a new process for me as well. I wrote and re-wrote the script in an attempt to keep it as succinct as possible so that the architecture of the hall would be the main focus of the finished product. I ended up needing a narrator as a placeholder until I found a "real" one, eventually deciding to keep Chris as my narrator, and re-recording the narration to a higher quality for the finished product.

### Editing

Throughout the editing process this spring, I used a workflow that allowed the video to be always "done," with all the shots in Premiere in the correct order, so that I could simply replace each shot when it had been improved upon. I used shots of smaller details around the room before finally using a camera shot that makes it feel like the viewer is looking up into the room to experience as you do when you're really there.