# Creating and integrating matte paintings for set extension

Working on set extension and creating the illusion of parallax for a short film requires a lot of experimenting, troubleshooting and problem solving. It tends to be a process that changes on a shot-by-shot basis, as you must consider the camera angle and movement of the shot, as well as the lighting direction and the kind of environment needed for the shot. Depending on the complexity of the shots you're dealing with, all these changing factors can make it seem very daunting when starting to strategize for set extension. However, set extension can also be a very satisfying part of the production of the film as it allows you to try many different methods to try tackle a single problem.

## Key things to consider for set extension

When working on set extension for your film, you should keep in mind that the goal of set extension is to be seamless and not noticeable by the audience. You want to keep the audience immersed in the story and make them believe in the world where your film is taking place.

Therefore, you want to focus on addressing the things that can break the illusion of that world first. The most challenging aspects of set extension we have found while working on Tippy Topper have been creating plates that have the correct perspective for the shot and creating the illusion of parallax.

*Important concepts:*

- **Parallax: "**the apparent displacement of an observed object due to a change in the position of the observer." In other words, objects that are far from the camera seem to move slower than objects that are closer to the camera.
    - o A good way to understand this concept is to hold one finger in front of your eyes, just a couple inches from your face. Then hold another finger as far away from your head as you can, with your arm fully extended. While having both fingers up, move your head

left and right and notice how both fingers seem to move at different rates. This is the optical illusion we call 'Parallax.'

- **Linear perspective:** "refers to how distance affects the shape of things and makes objects appear smaller as they recede into the distance." This is what we generally think of when we talk about 'perspective,' however, there is also what we know as atmospheric perspective.

- **Atmospheric perspective:** "refers to the effect the atmosphere has on the appearance of objects when you look at them from a distance." We see objects in the distance less clearly and their color changes in value, hue and saturation.

## Creating matte paintings for set extension

As mentioned previously, the types of approaches you can have to set extension are as varied as the types of shots you can have in a film. So, we will limit the example to a simple scene where the camera tracks from left to right, following Philip on the conveyor at the beginning of Tippy topper.



The camera movement is simple, moving in one direction with no tilts, pans, or any other type of camera movement mixed in.

For our factory environment, the goal was to create the illusion of an endless food factory that continues beyond what the viewer or Philip can see. Moreover, this factory is filled with conveyor belts, pipes, and machinery all over. Taking this into account, we decided to mix in 3D render plates (for the midground) and matte paintings (for the background).

I used mainly photoshop for concepting and to make our matte paintings, substance designer and substance painter to develop the procedural textures of our machines and adobe premiere pro to test out the animated parallax prior to rendering things out fully.

## Developing the look of our background factory environment

To develop the concept art and general shapes of the background assets I started out by going into our Maya files for each of the assets in our production and turning on the 'use all lights' button in the Maya viewport without adding any lights to the scene. By doing this, the asset will change in the viewport from a 3d model into a 2d black silhouette that I can then screenshot and paste into Photoshop to turn into a custom brush after adjusting its black and white values. *See screenshots below:*

*Before turning on 'use all lights' button (left) and after turning on 'use all lights' (right)*
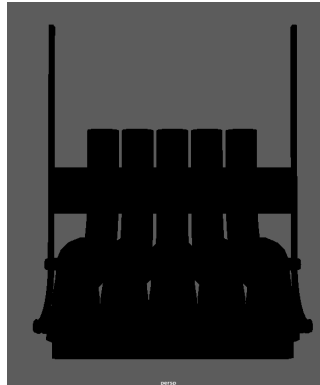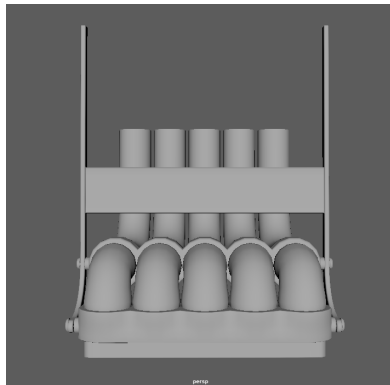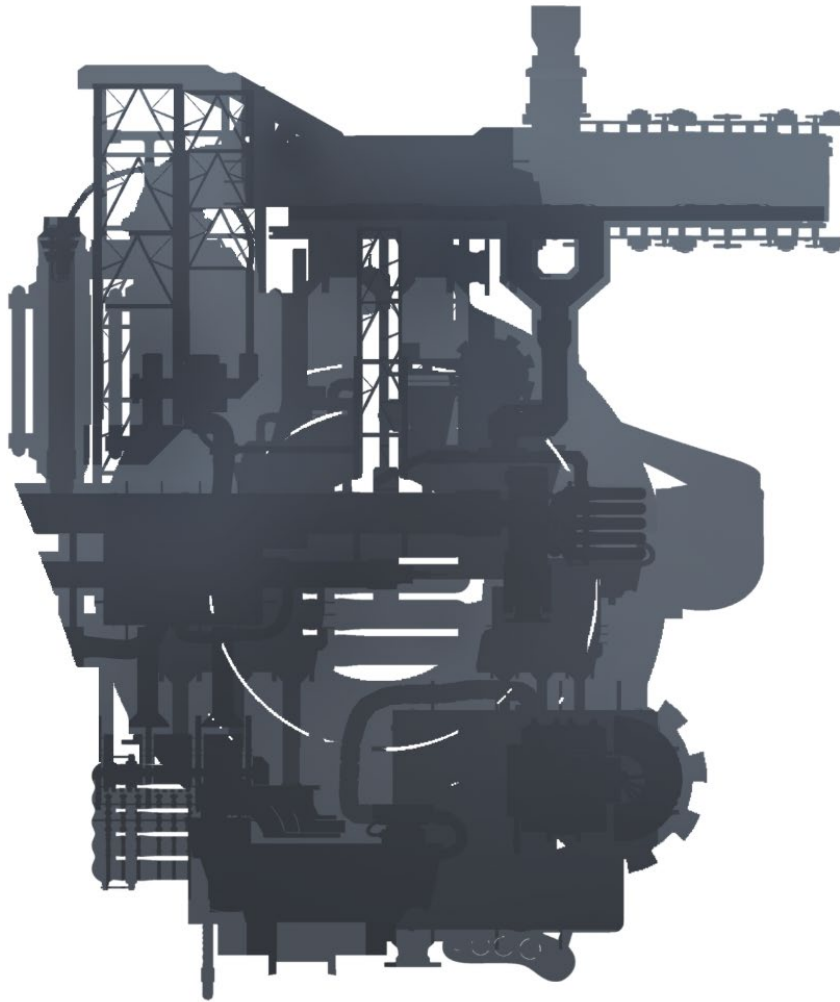




*Brushes made using this method:*
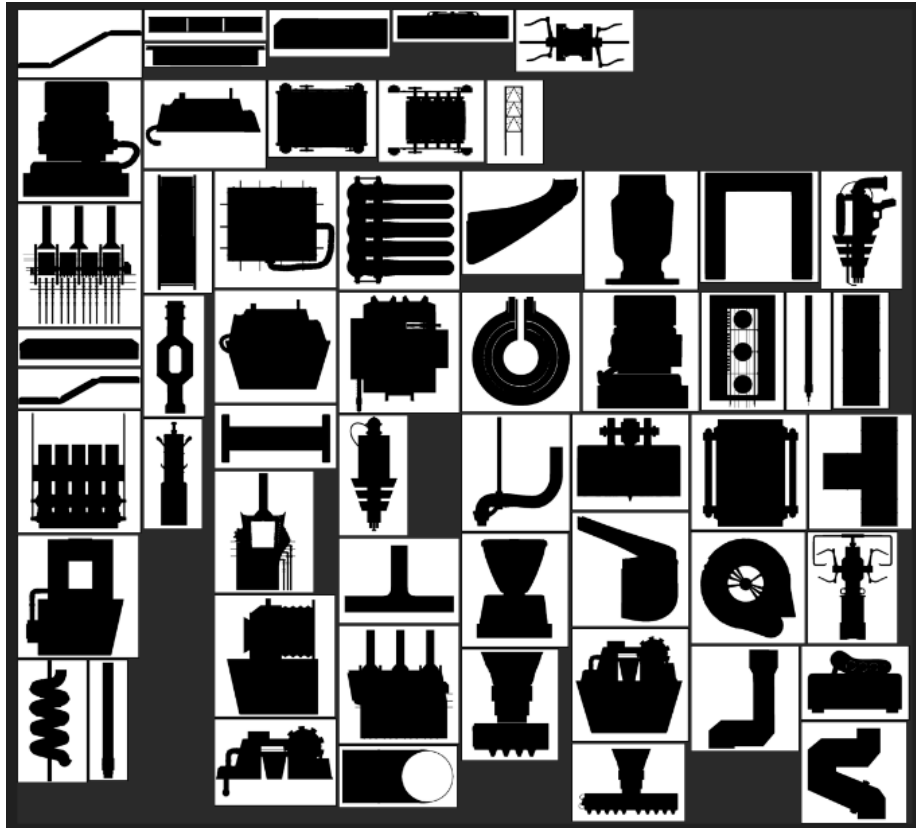
After creating the custom brushes, I can pick the shape I want to use and stack them on top of each other using different layers and opacity levels to create modular 2D machinery plates that can be rotated, masked and reused over and over to create more machinery silhouettes.

*Modular 2d machinery example created in photoshop:*

By creating our 2d background plates using this workflow, we are ensuring that our background machinery has a cohesive shape language that will match the style of our already modeled environment assets.

After creating multiple machinery plates, we can use photo bashing techniques to push and pull the level of detail to the desired level that matches the style we want for our backgrounds.

Before                                        After
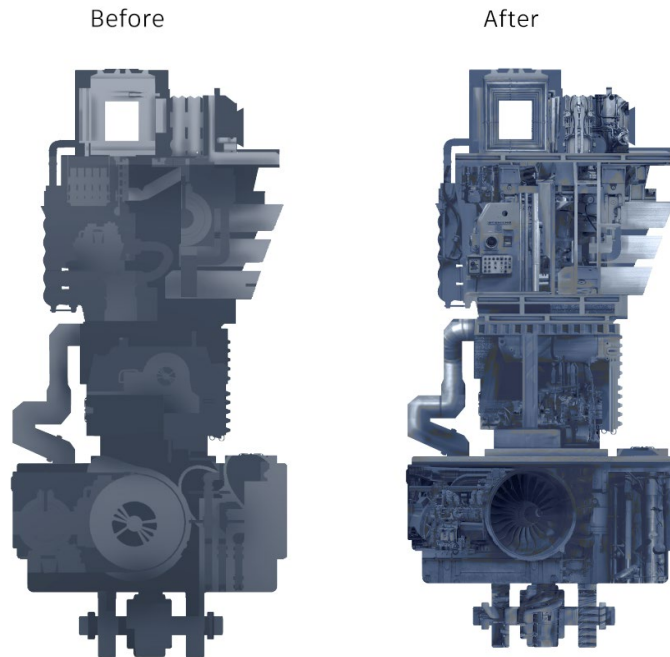


As seen above, I experimented with different levels of detail to determine the direction we wanted for our backgrounds. After multiple different iterations, we decided to stay with the simpler look of the plate on the left.

The next step was to put together a concept background piece to see how the different machinery plates would look side to side, with pipes and conveyor belts in between.

*Concept environment for the scene:*

## Animating concept art in premiere pro

After developing a concept piece, the next step was to make a proof of concept in Premiere Pro to test the look of the parallax effect. In order to take my concept from Photoshop to Premiere Pro and animate the parallax effect, I had to group my layers in Photoshop according to how far the layers would be from the camera (layer 01 being the farthest and layer 12 being the closest). It is very important to label them according to the order in which they will be arranged to save time later when importing them in to Premiere and Nuke.

After preparing my layers, I hid everything except for one layer at a time and then exported the layer as a PNG to get the alpha information and be able to re-assemble my scene inside of premiere pro.

*Grouped layers and exported PNG files:*
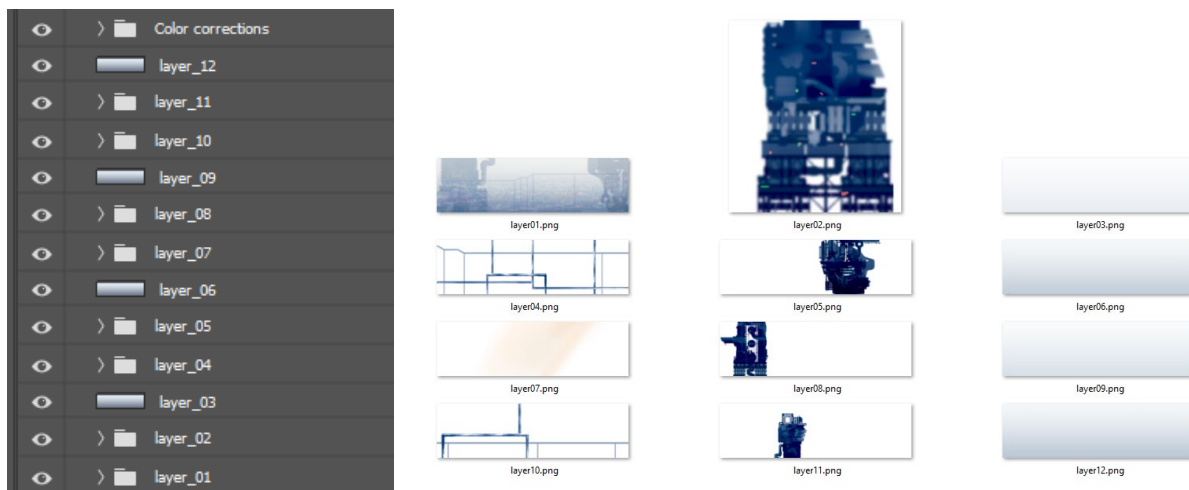
Notice that Layer 01 is filled in its entirety since that would be the furthermost layer and I don't need to see anything behind it, while the others have transparency (alpha channel) enabled, since I want to make sure to be able to see past them in the empty areas.

I also included a couple blue gradient layers (layers 03, 06, 09, and 12) to put in between my other layers inside of premiere to desaturate my layers as they recede in the background and create the illusion of an atmospheric perspective.

After preparing all my layers, I imported them into premiere pro and organized them in order according to the number I gave them earlier when I exported them from photoshop. After getting all my layers into premiere pro, I changed the size of my scene to hide part of the image and then I set keys to the position values of each layer to move them across the screen from right to left.

To simulate the parallax effect, it is important to set the background layers to move slower and in smaller distances than the top layers. For this step it is just a matter of tweaking it back and forth to achieve the desired effect

## Taking matte paintings from Photoshop to Nuke

This is what our Nuke tree looked like for this scene:
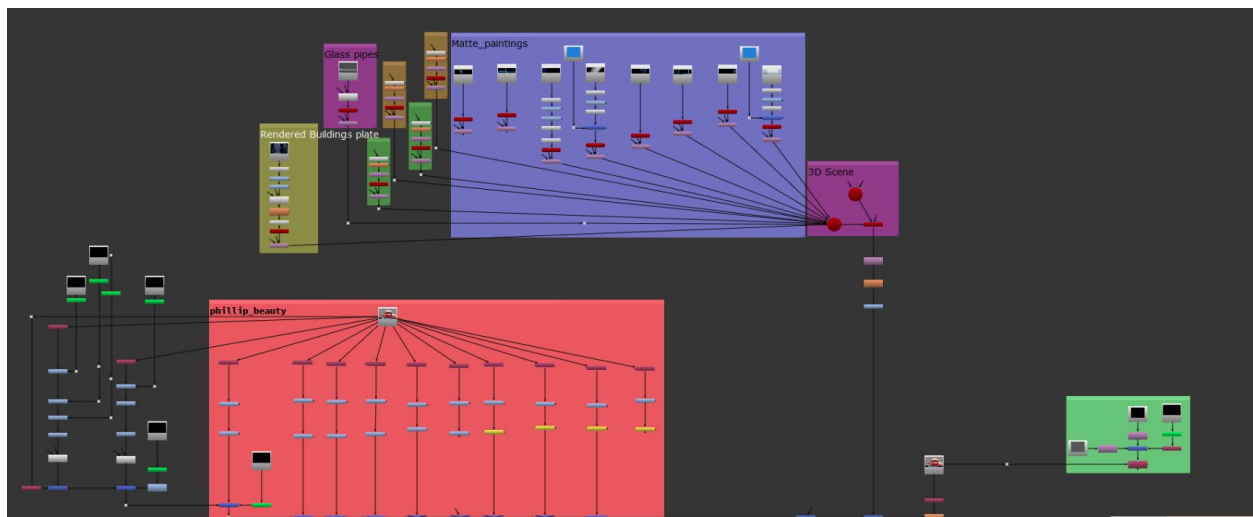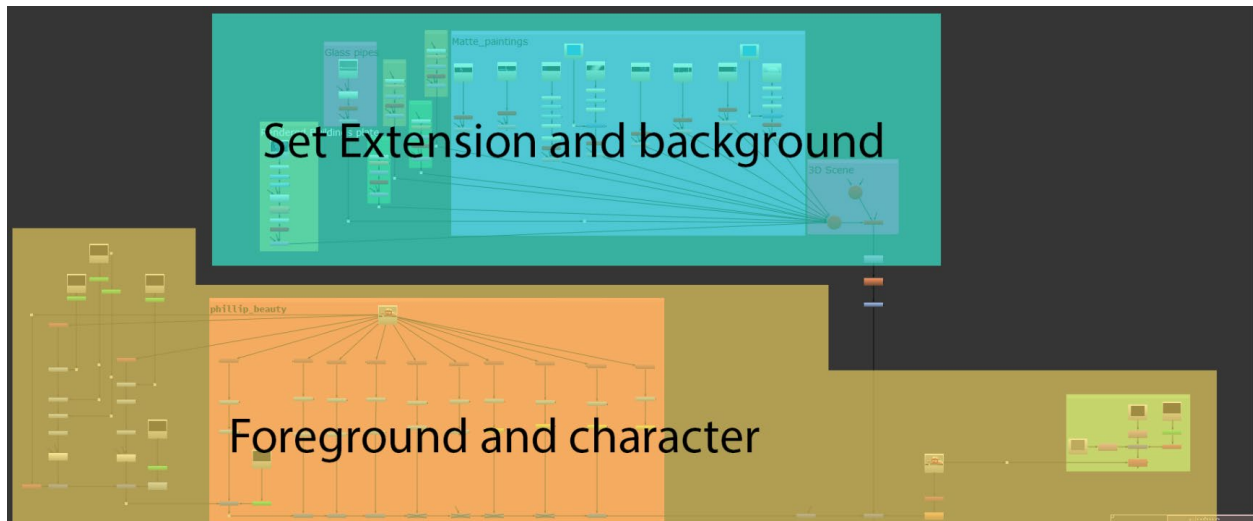
As you would expect, the graph corresponding to the background and set extension goes first in the Nuke tree, before your character and foreground plates.

That being said, the first thing you need to create the parallax effect and integrate your matte paintings into your scene is a 3D scene nuke graph with a scanline render node, a 3d scene node and a camera node connected as seen below:
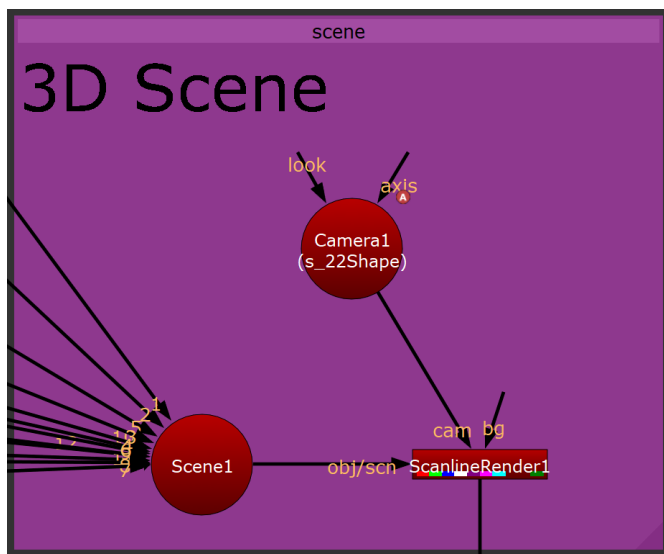


You will then export your camera from the Maya scene and import it to your Camera node in Nuke as an alembic cache file. You can do so very easily by selecting your camera in the Maya file and going to **cache > alembic cache > export selection to alembic**

After exporting your camera from Maya, you just have to select your alembic cache for import within the camera node in Nuke.
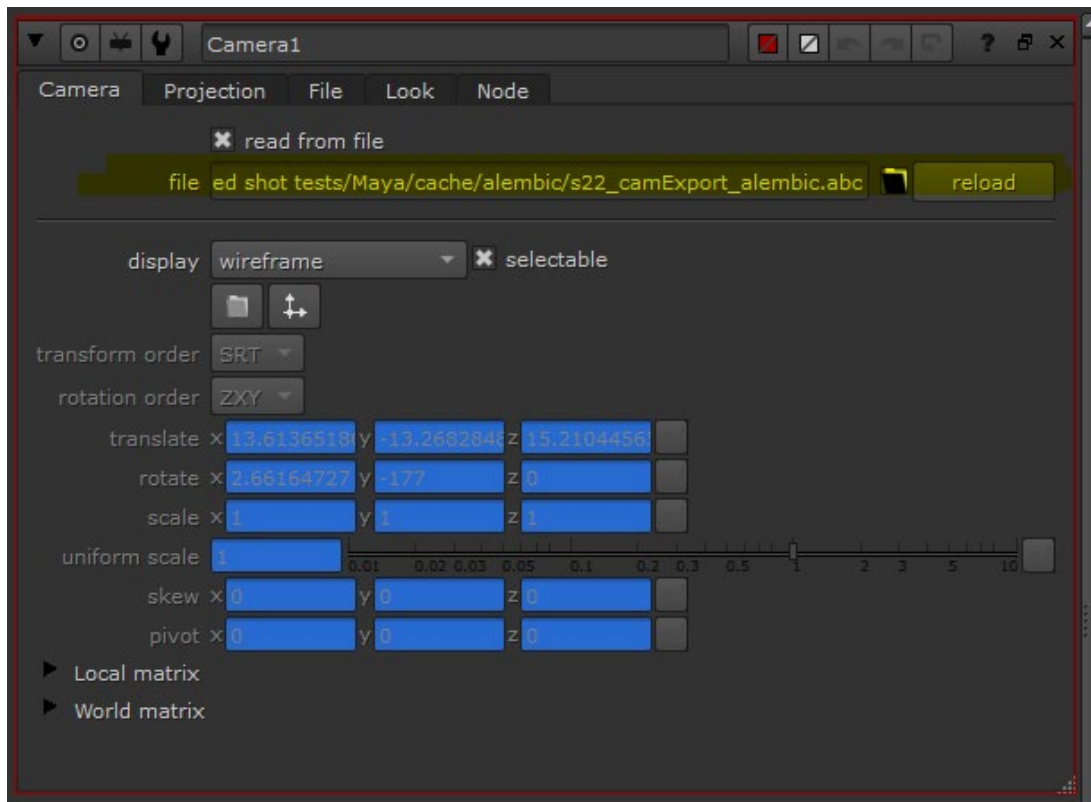


Next, you just have to place your matte paintings inside of your scene by 'reading' them in using the Read node in Nuke and selecting the PNG file you want to import to your scene. Your setup for the matte painting should look like this:
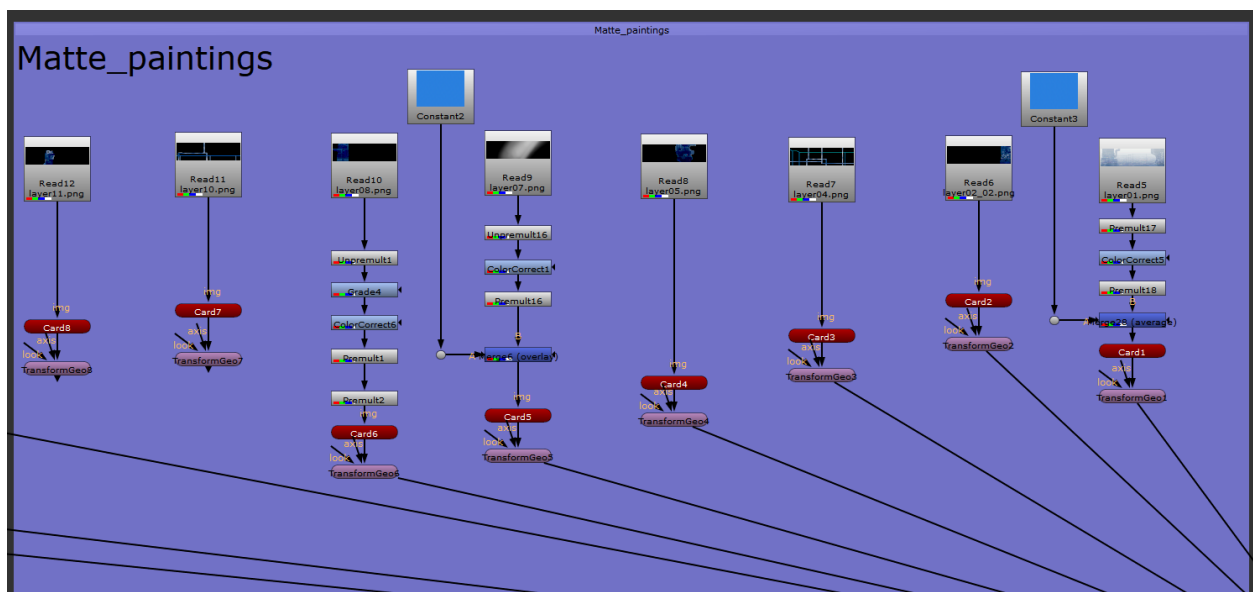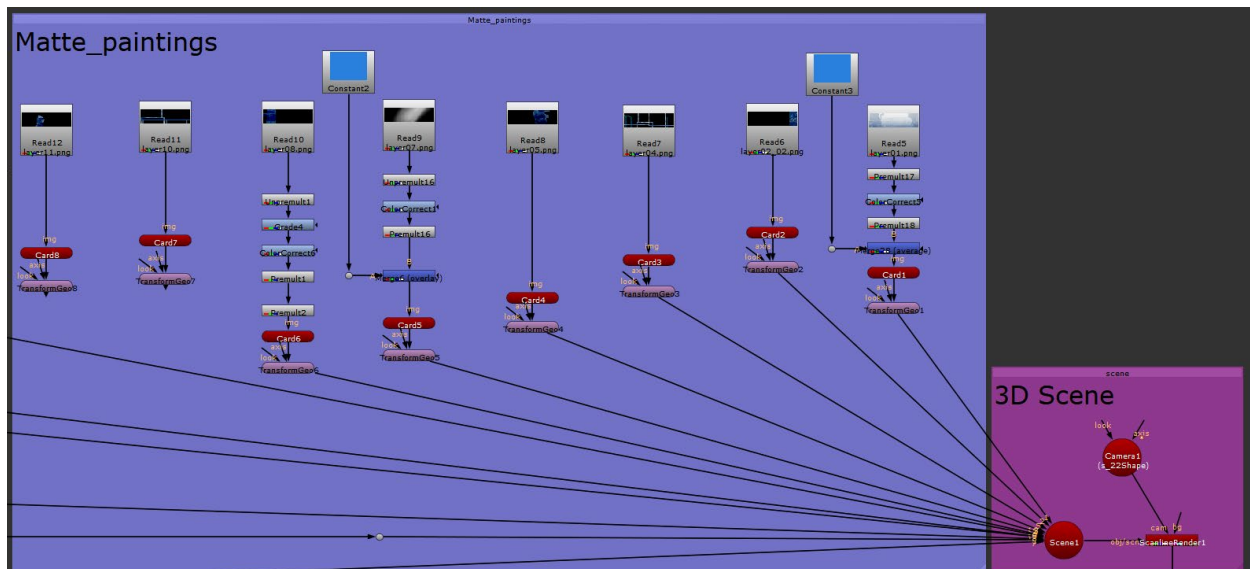
We connect our matte paintings in this order: Read node > Card node > Transform node > 3D scene node. The read node 'reads' the file in, the card node displays the matte painting on top of a card/plane, that goes into a transform node which we use to scale and move our cards around and then it all connects to the Scene node so Nuke places it into the 3D scene we created within our file.

Note: you can also color correct your individual plates by placing 'Grade' nodes and 'ColorCorrect' nodes in between the 'Read' and 'Card' nodes and adjusting the parameters.

After connecting our plates, we go into Nuke's 3D space by clicking in the view selection button at the top of our viewport and selecting "3D."
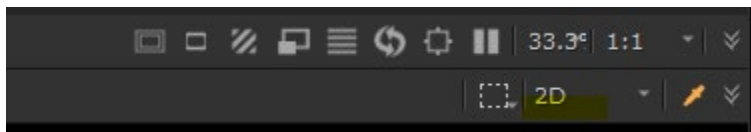


Once we are in our 3D scene we can use the transform node to move around our plates in the right position in front of our camera.

At this point it is a matter of tweaking the scale and position of the plates and playing the sequence to see what it looks like and achieve the desired look of our scene.

## Resources:

says:, Anonymous, et al. "Atmospheric Perspective - Creating Mood and Feeling in the
    Landscape." *Virtual Art Academy*, 17 Sept. 2021,
    https://www.virtualartacademy.com/atmospheric-perspective/.

"Set Extension." *Walt Disney Animation Studios*, https://www.disneyanimation.com/process/set-
    extension/.