

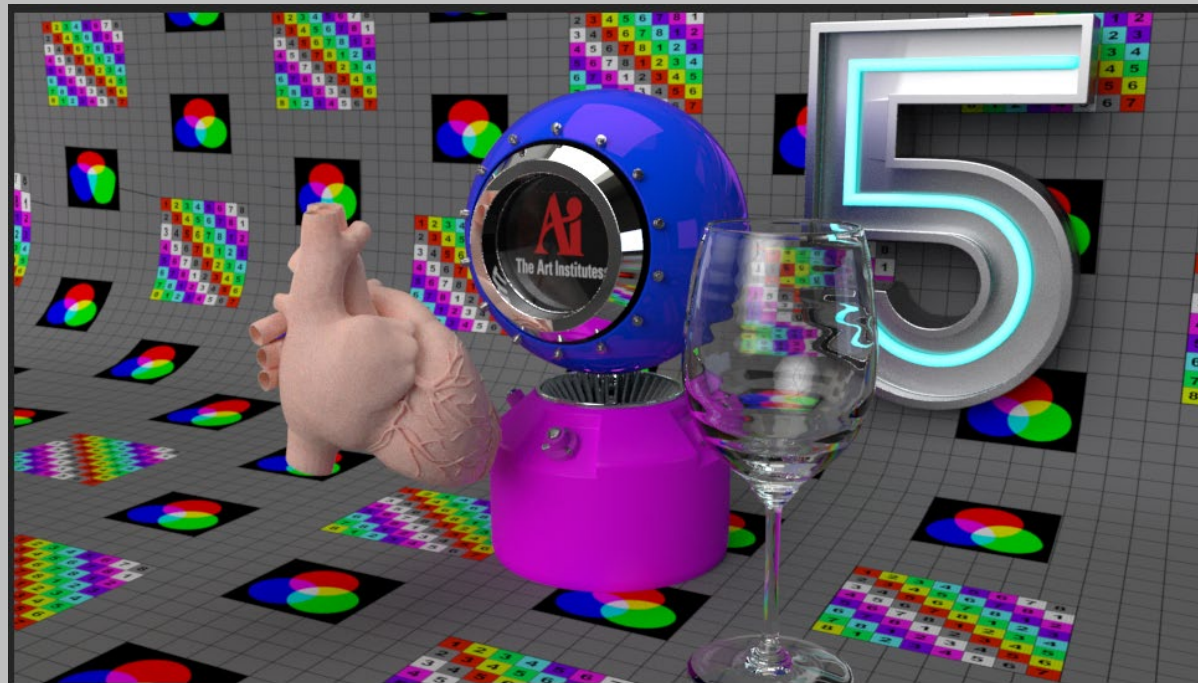
AOV'S

This is both a refresher on AOV's and a how-to on the new workflow with the revamped standard surface— AOV's if you have never used them before are arbitrary output variables, basically a fancy name for render passes...

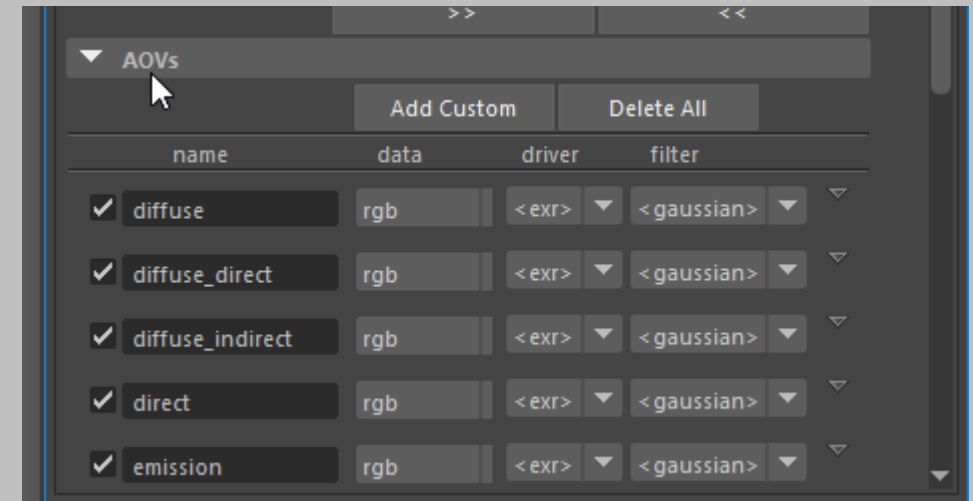
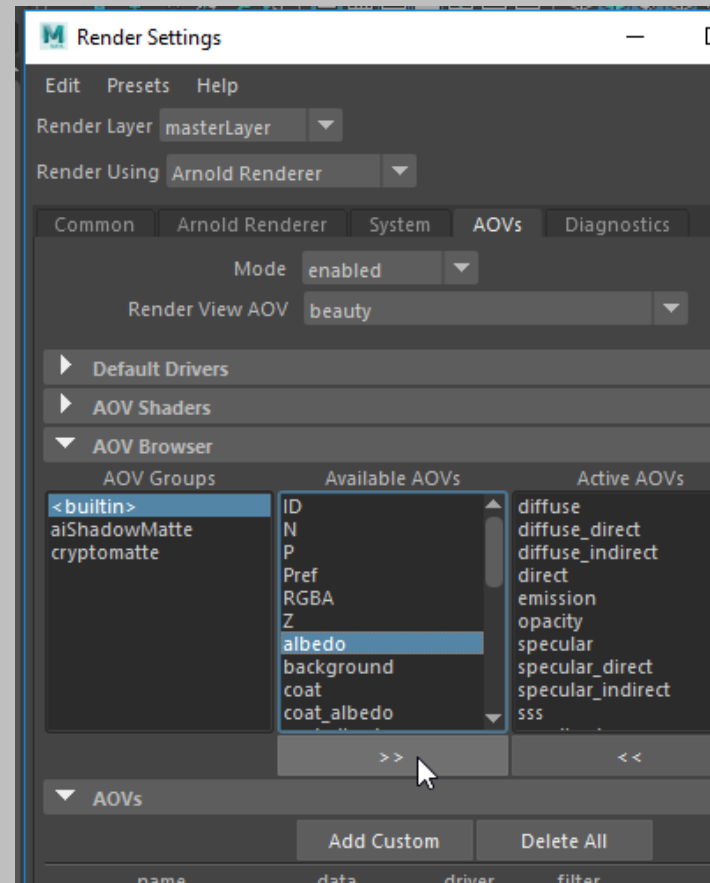
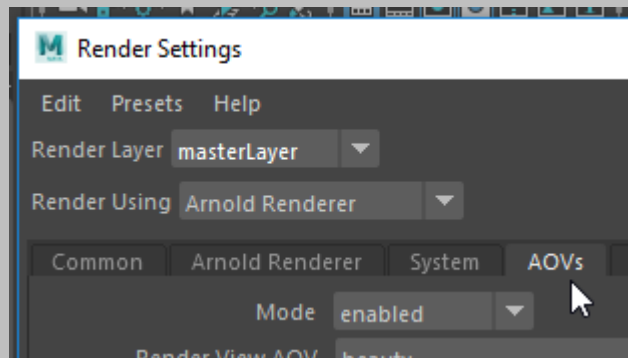
They are super-helpful for mograph work, product shots, etc because they break your scene up into separate elements that can be individually edited in a compositing package such as AE, Photoshop, Nuke, etc.

If you don't create the CORRECT AOV's, the process will not work.

To set up AOV's I have an example scene that has surfaces such as dull plastic, glass, neon, specular highlights, skin, etc. So this is a good example of how to use a range of AOV's--



To set up AOV's choose from the render settings—choose the AOV you need, hit the arrows to add them to the render list—they will appear at bottom--



What do the AOV's mean?

This describes the basic ones—for info on others see:

<https://support.solidangle.com/display/A5AFMUG/AOVs>

- **ID:** Random number value derived from the name of the shape. You can also add specific ID numbers via the user options string field for an object. ie 'id 1'.
- **N:** Smooth normal at the shading point (in world space).
- **P:** Position of the shading point (in world space).
- **Pref:** Reference position of the shading point.
- **RGBA:** Beauty AOV, containing the full rendered image.
- **Z:** Depth of the shading points as seen from the camera.
- **albedo:** Reflectivity, the surface or volume color without lighting or shadowing.
- **background:** Emission from the background and skydome lights visible to the camera.
- **coat:** Coat reflection.
- **coat_albedo:** Coat color without lighting or shadowing.
- **coat_direct:** Coat direct lighting.
- **coat_indirect:** Coat indirect lighting.
- **cputime:** This layer contains the CPU time (measured in "ticks") to evaluate the samples in the pixel.
- **diffuse:** Diffuse reflection.
- **diffuse_albedo:** Diffuse color without lighting or shadowing.
- **diffuse_direct:** Diffuse direct lighting.
- **diffuse_indirect:** Diffuse indirect light.
- **direct:** Direct lighting from all surfaces and volumes.
- **emission:** Lights and emissive objects directly visible from the camera.
- **indirect:** Indirect light from all surfaces and volumes.
- **motionvector:** 2D vector representing the motion in screen space of the shading point during the given time interval (the shutter start and shutter end of the camera). If output to an RGB format, the vector is contained in the R and G channels.
- **opacity:** RGB AOV with fullthree channel opacity (as opposed to single channel alpha).
- **raycount:** Total number of rays traced for samples in the pixel.
- **shadow_matte:** Shadows in the scene, computed as the ratio of occluded direct lighting over unoccluded direct lighting.
- **specular:** Specular reflection.
- **specular_albedo:** Specular color without lighting or shadowing.
- **specular_direct:** Diffuse direct lighting.
- **specular_indirect:** Diffuse indirect lighting.
- **sss:** Subsurface scattering and diffuse transmission.
- **sss_albedo:** SSS and diffuse transmission color without lighting or shadowing.
- **sss_direct:** SSS and diffuse transmission direct lighting.
- **sss_indirect:** SSS and diffuse transmission indirect lighting.
- **transmission:** Specular transmission (refraction).
- **transmission_albedo:** Specular transmission color without lighting or shadowing.
- **transmission_direct:** Specular transmission direct lighting.
- **transmission_indirect:** Specular transmission indirect lighting.

What do the AOV's mean?

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- **volume:** Volume scattering.
- **volume_albedo:** Volume color without lighting or shadowing.
- **volume direct:** Volume scatter direct lighting.
- **volume indirect:** Volume scattering indirect lighting.
- **volume opacity:** RGB AOV with the fullthree channel opacity for volumes only.

The other AOV groups correspond to the shader nodes being used (assuming those shader nodes support AOV). For example, Shadow Matte provides:

- **shadow:** Direct light shadow.
- **shadow diff:** A difference AOV which can be used to eliminate the shadow from the direct component.
- **shadow mask:** This AOV can be used in comp to localize and tweak the shadow.

Lets breakdown the most important:

Diffuse=direct and indirect

Direct=main light rays

Indirect=Bounce light rays

Emission=glowing objects or lights

Specular=highlights/reflections (can also be broken down into direct and indirect)

SSS=subsurface scattering (can also be broken down into direct and indirect)

Transmission=Basically refraction (can also be broken down into direct and indirect)

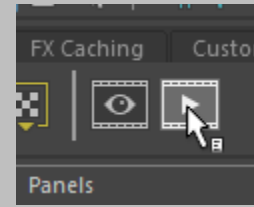
Volume=volume scattering info (can also be broken down into direct and indirect)

AO=ambient occlusion

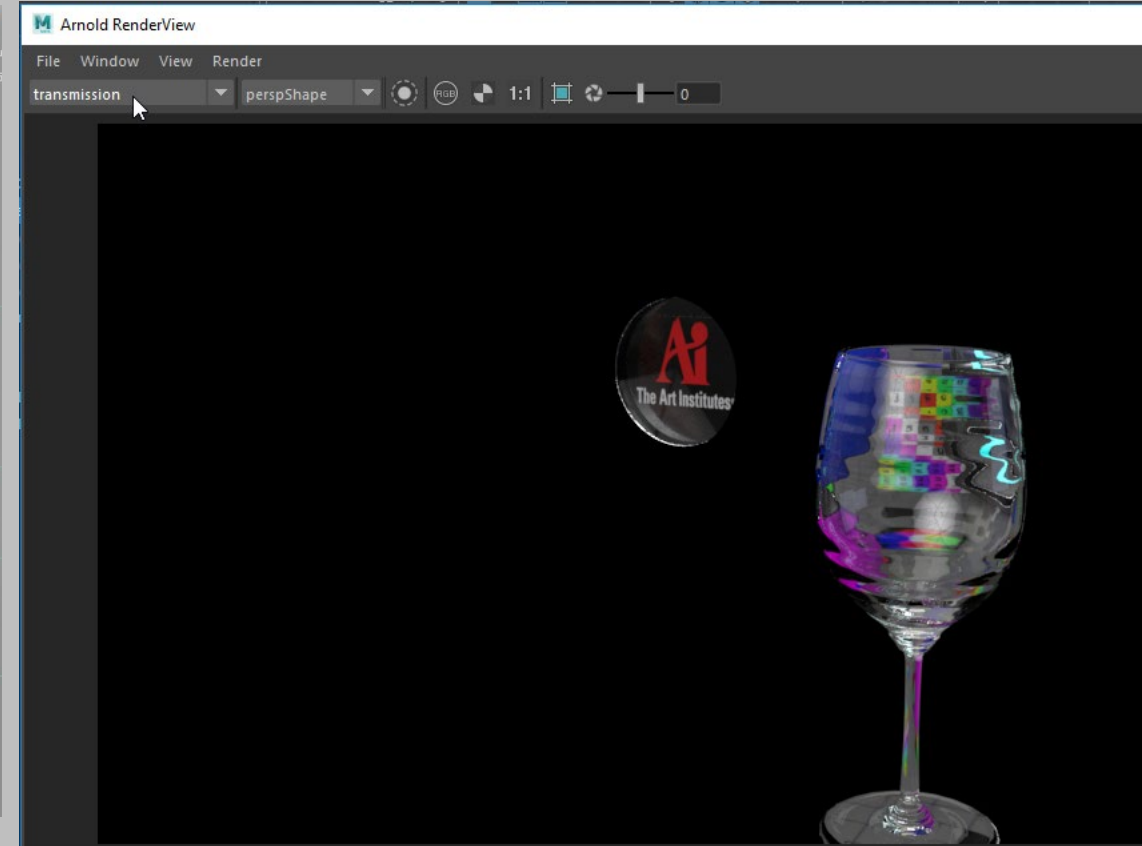
ID=basically a matte color for every object

Z=Z depth (distance information for depth of field)

So once the AOV's have been chosen, hit the render button, “no, Mr. Trump, not that one...”

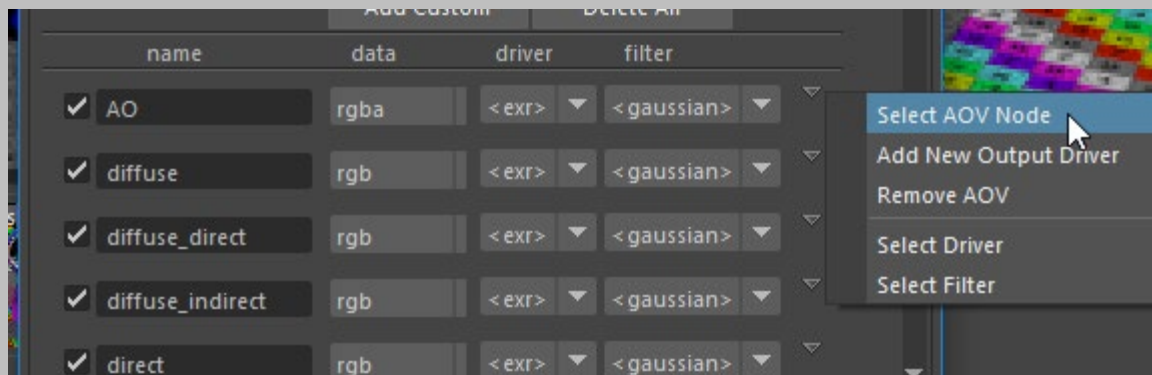
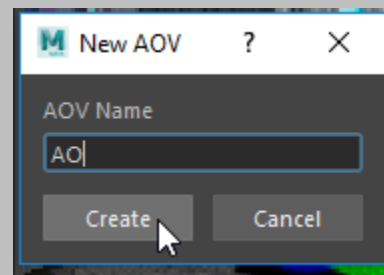
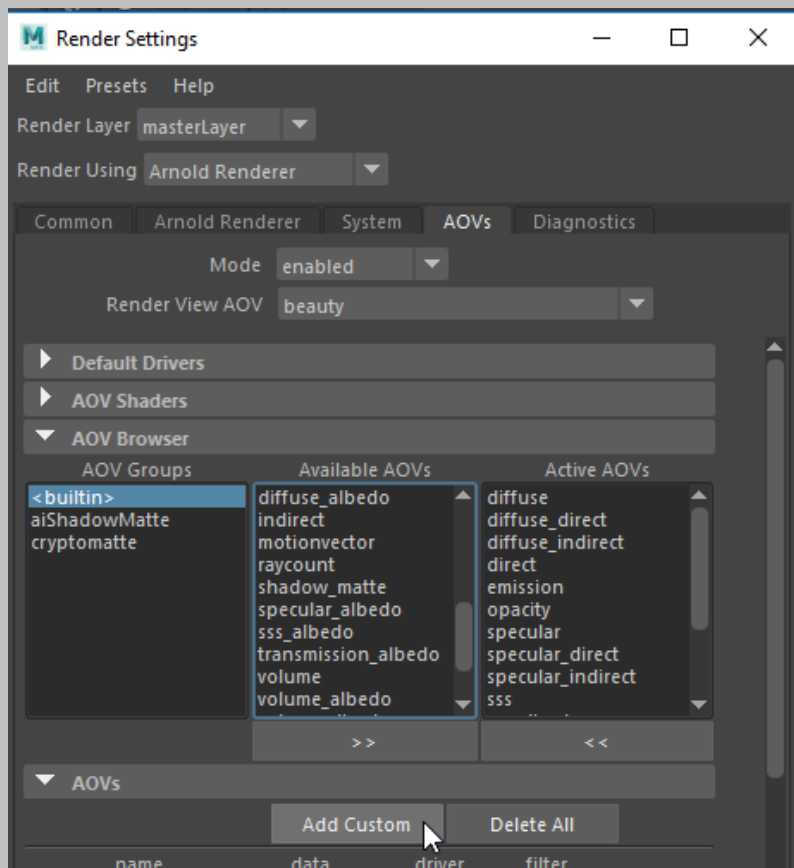


Press the dropdown to see any of the passes once rendering is completed--

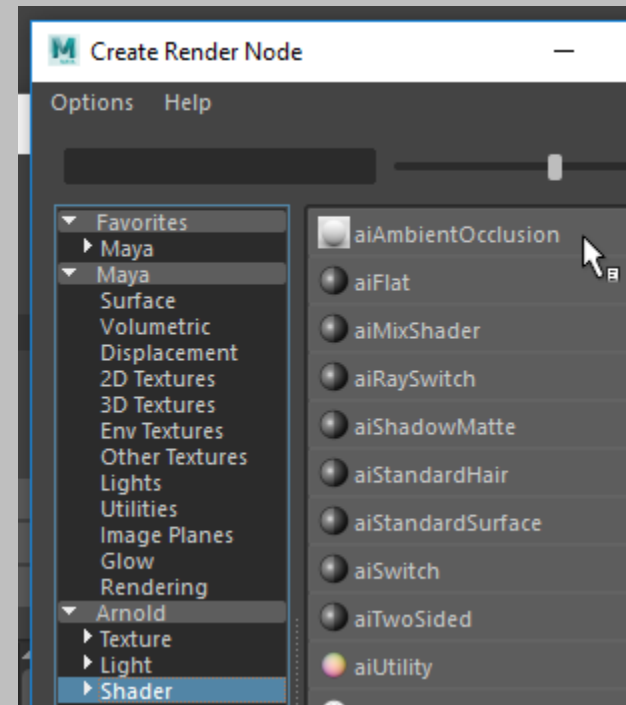
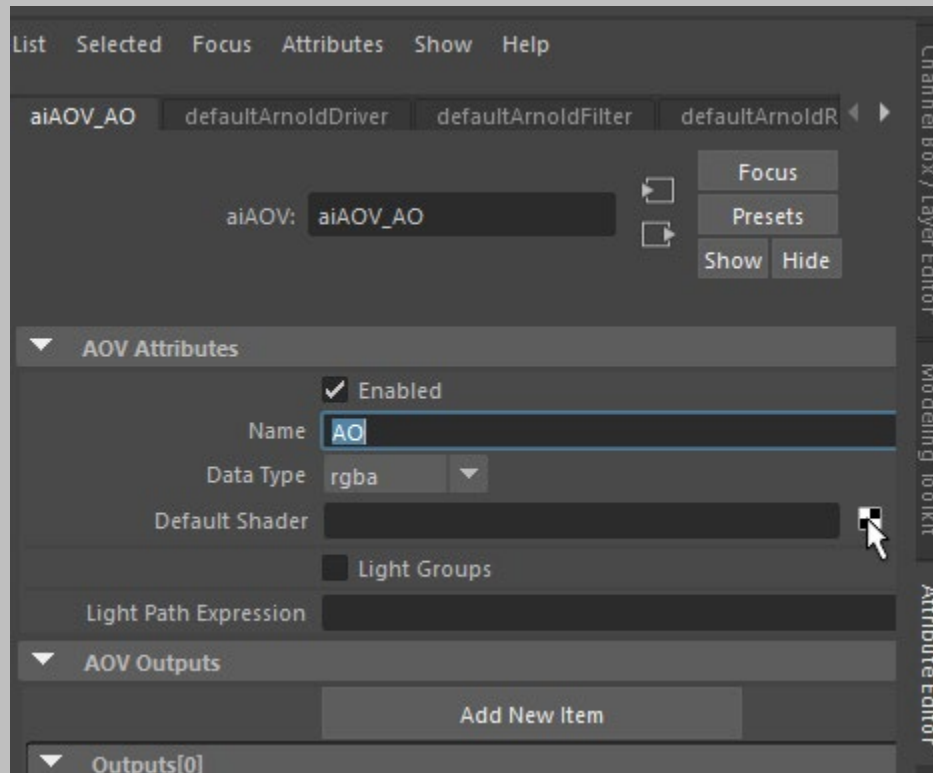


You will need to set up custom AOV's for passes not found in the default list—for eg lets set up AO, and wireframe (2 vital passes for demo reels/mograph etc)—

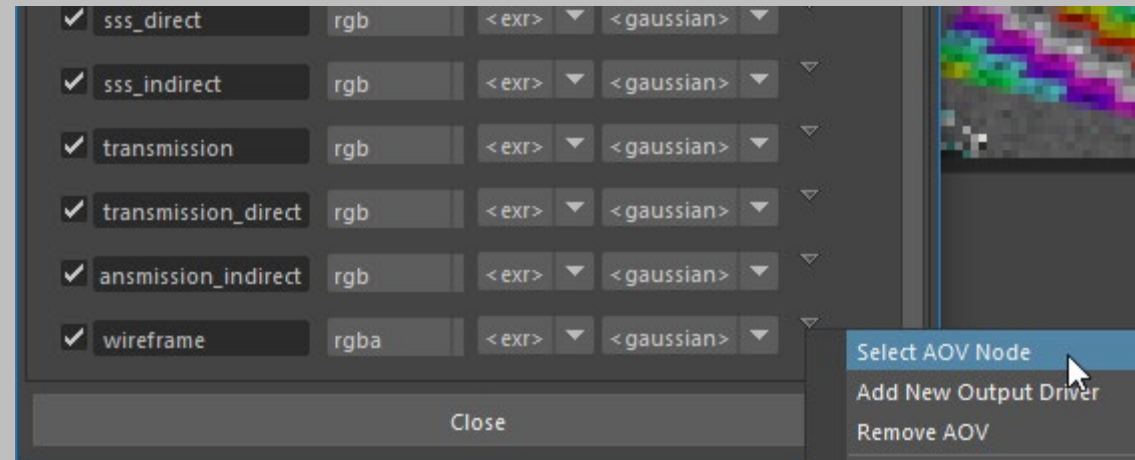
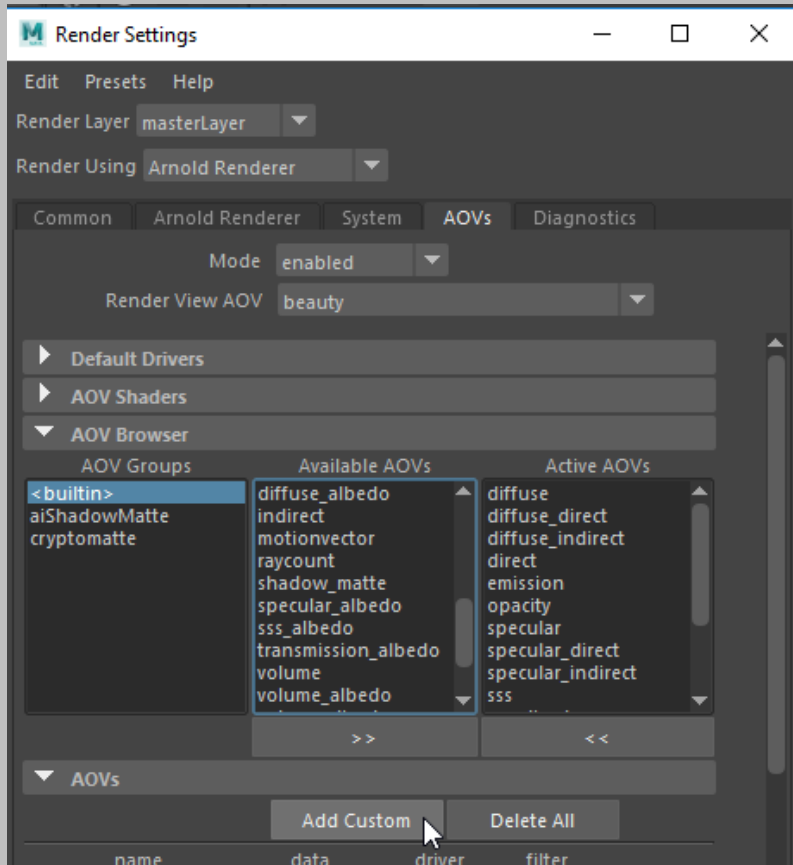
hit the Custom shader btn, new AOV, then select the aov node at bottom of render settings window--



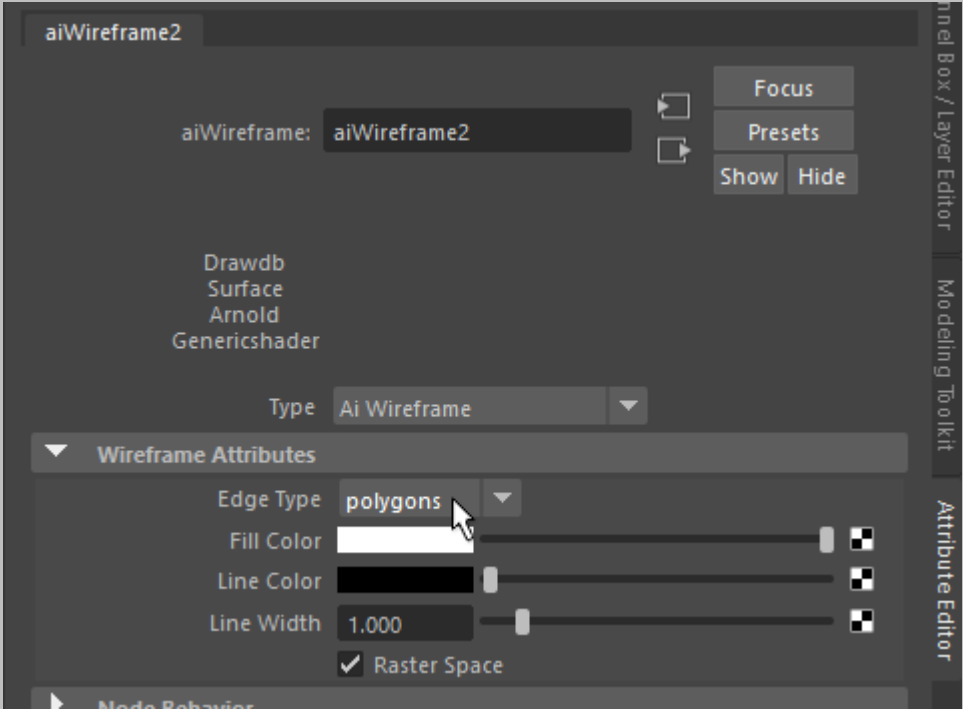
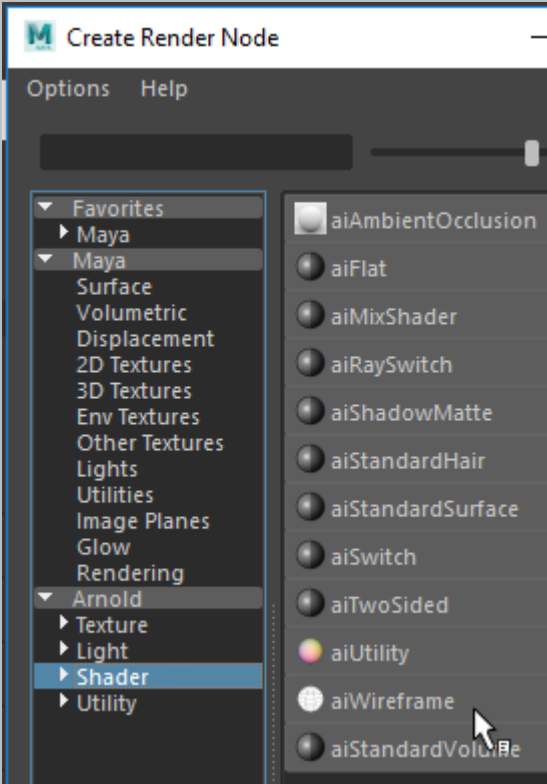
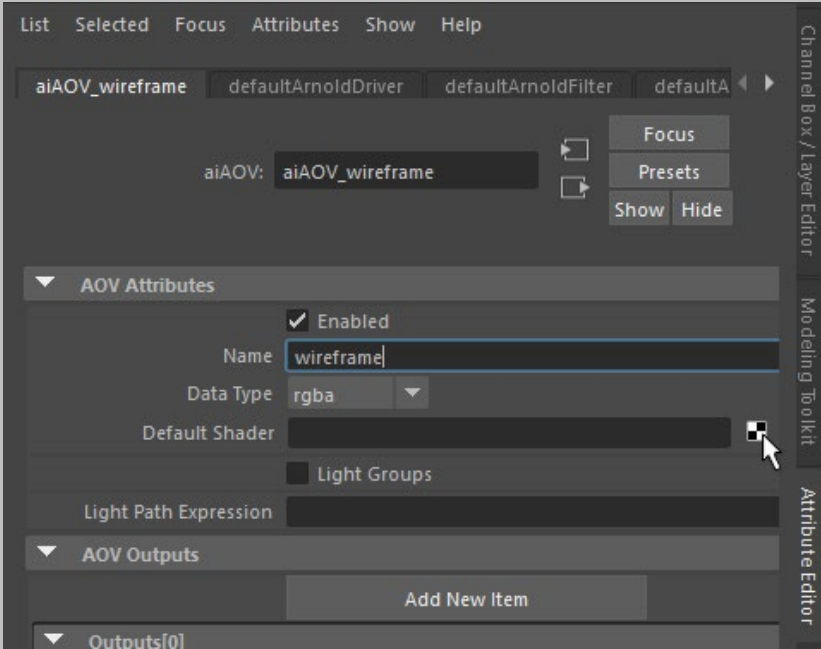
Name the AOV, and add an AO shader--



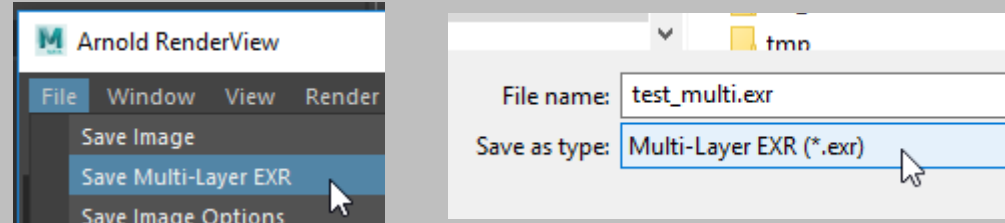
Same process for a wireframe (or any other shader you want to create)—start with a custom aov--



Add the shader--



To save the multi-pass renders (we will deal with batch rendering later), choose save multi layer exr--
Then lets open the exr in AE, and composite the layers together to bring our beauty render back--



There are many ways to combine multiple layers in AE, Solid Angle says--

i Composing the Beauty AOV

The RGBA beauty AOV can be split into smaller AOVs where each contains part of the lighting. In compositing, these AOVs can then be individually modified and added together to get the full beauty AOV.

More AOVs give more control in compositing, but also extra work to handle, and they take up more memory and disk space, especially combined with light groups.

Some example sets of additive AOVs for the full beauty AOV are:

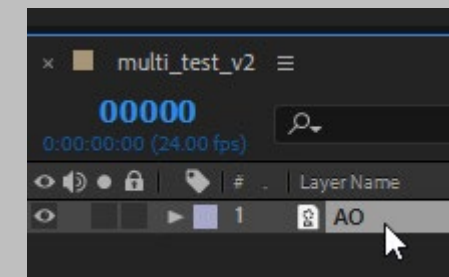
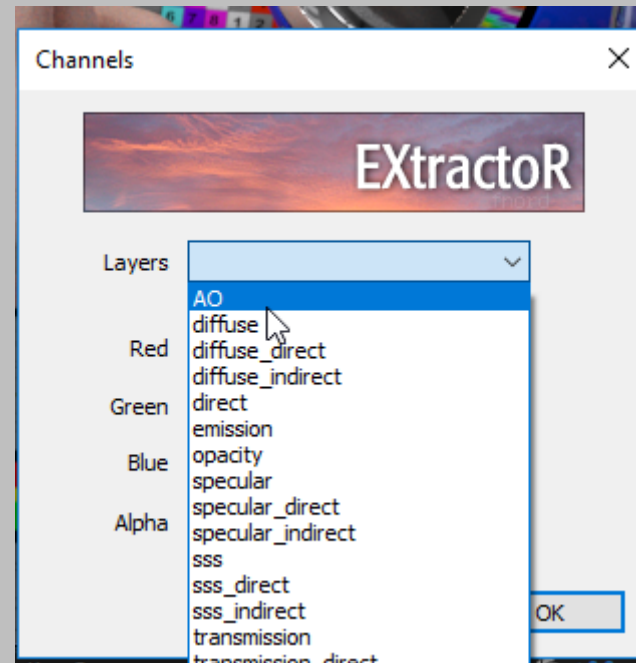
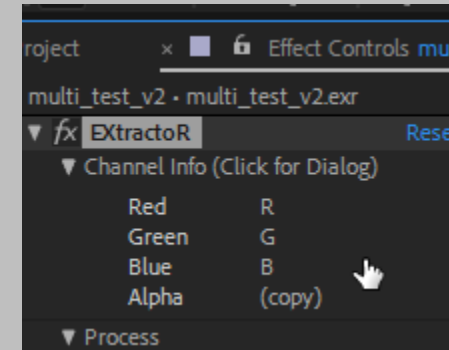
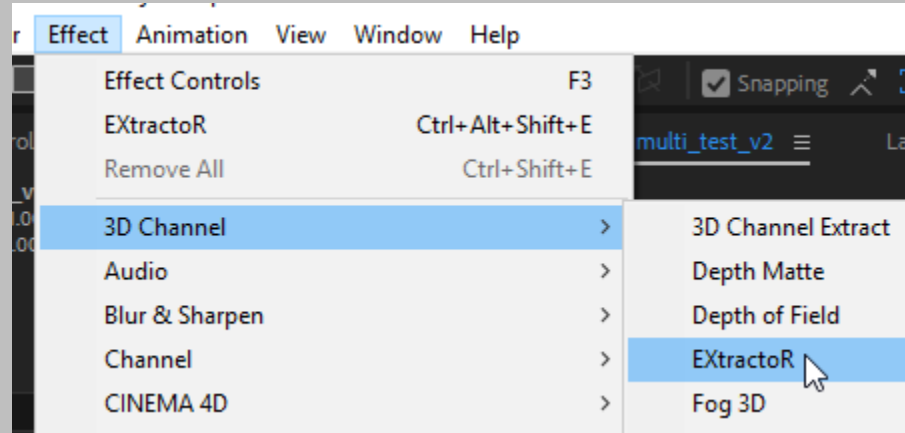
- direct, indirect, emission, background.
- diffuse, specular, coat, transmission, sss, volume, emission, background.
- diffuse_direct, diffuse_indirect, specular_direct, specular_indirect, coat, transmission, sss, volume, emission, background.

Simply adding together such AOVs is all that is needed for the beauty AOV. The albedo AOVs are not needed to reconstruct the beauty AOV but may be used for example to get just the lighting without the surface texture, by dividing diffuse by diffuse_albedo, or for denoising just the lighting while keeping the texture detail intact.

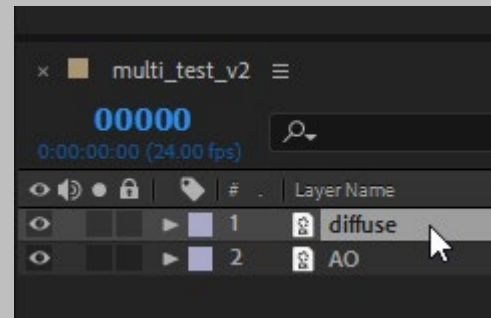
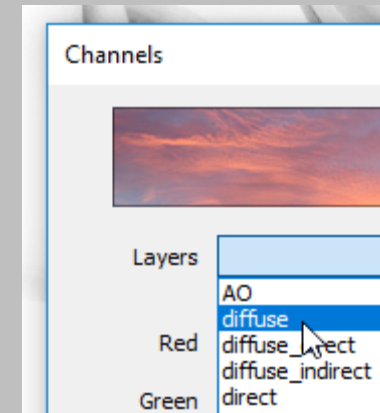
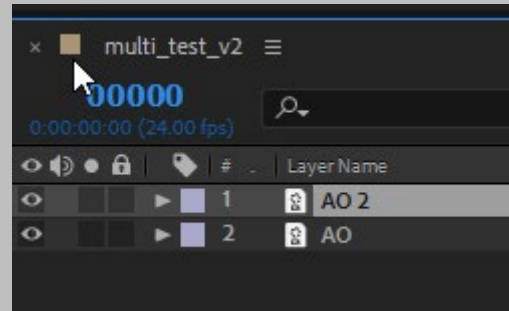
Here is an example with just the basic passes, more can be added as you wish—

Bring the multi layer exr into AE—I suggest working at 32bpc—

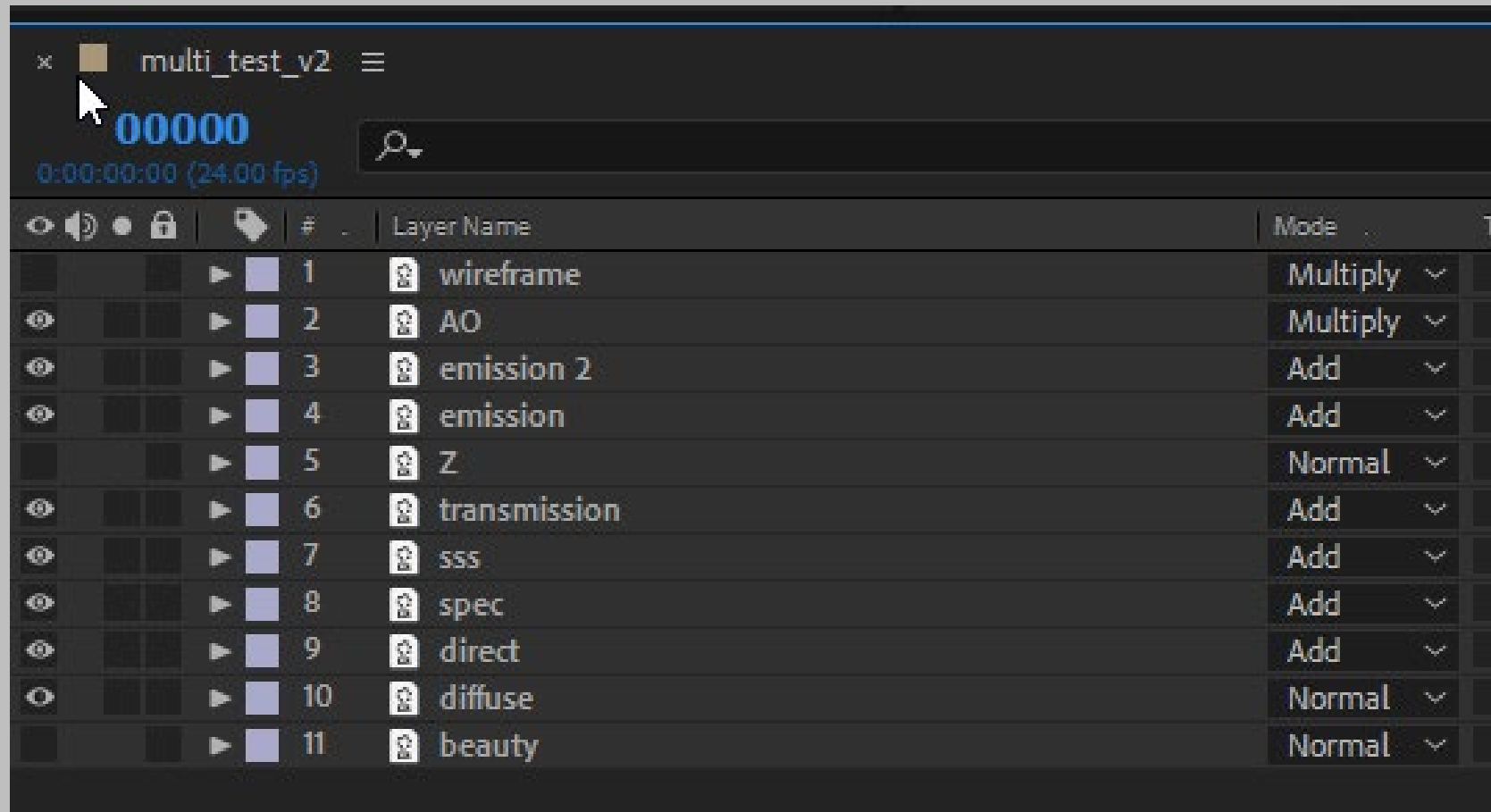
Then add the extractor effect to the layer—then click in the RGB area—choose the channel you want, then name the layer--



Duplicate that layer—
Then click in the RGB area—choose the channel you want, then name the layer—
THEN RINSE AND REPEAT FOR THE LAYERS YOU WANT--



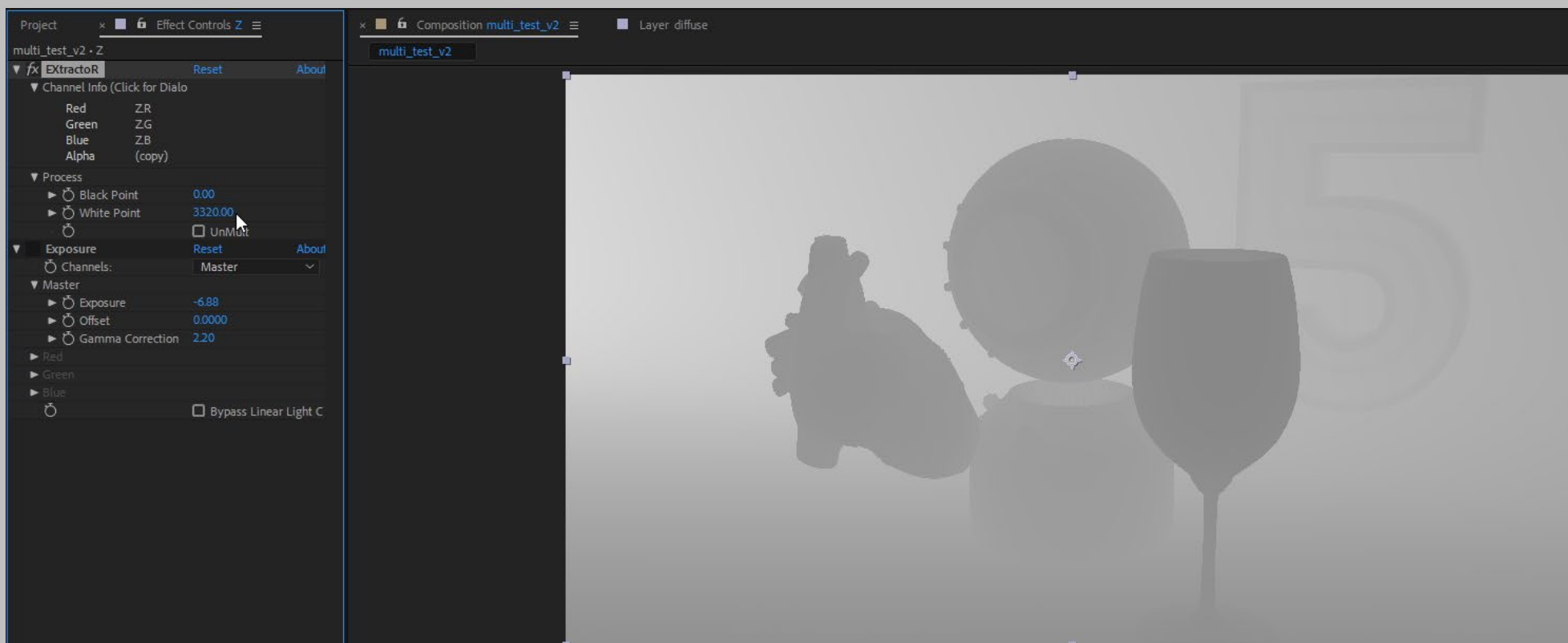
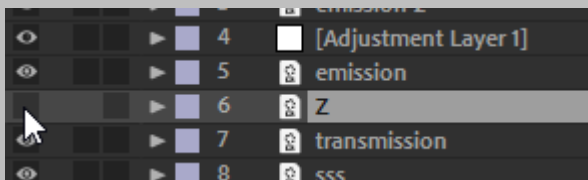
The final setup will look similar to this—depending on what layers you choose—
AO is usually in Multiply, the others should be in ADD, Wireframe is an added pass usually rendered separately—
Beauty is not necessary (it is a duplicate of the value of all the combined passes)--



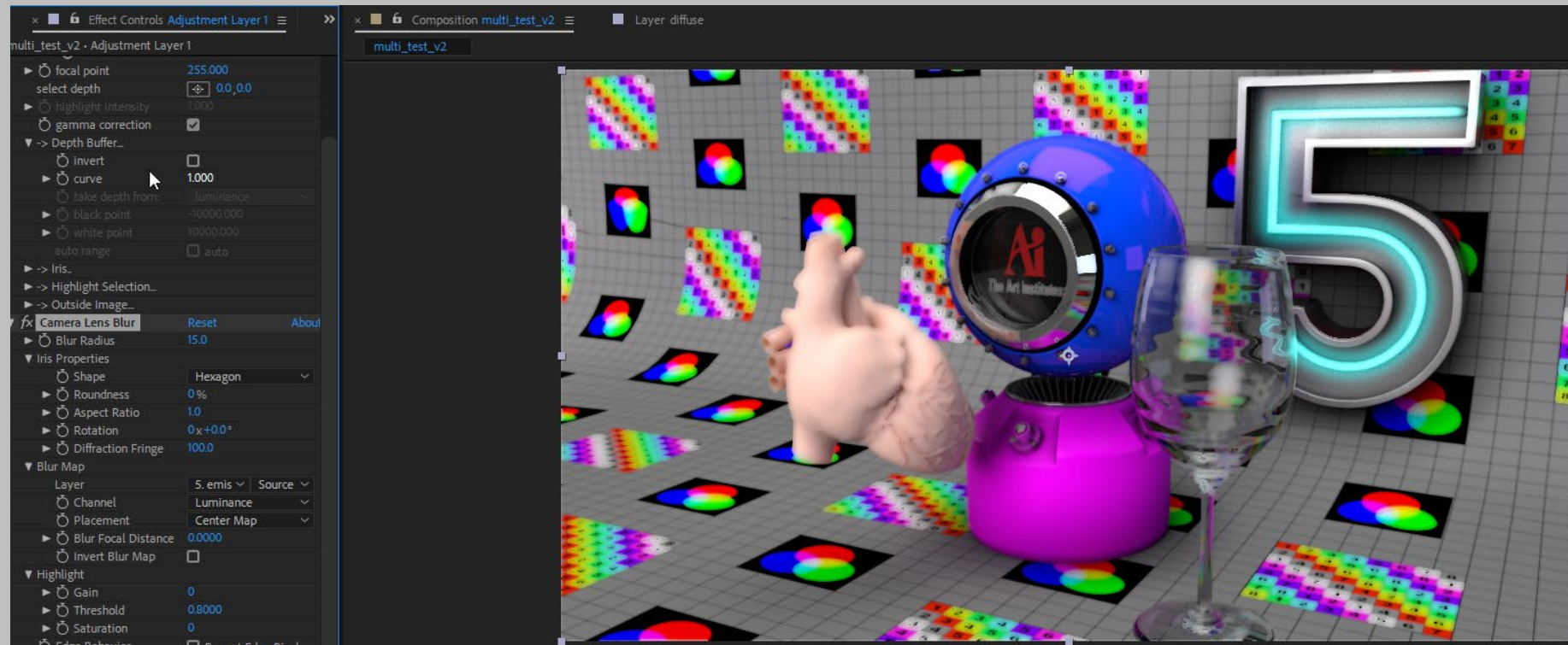
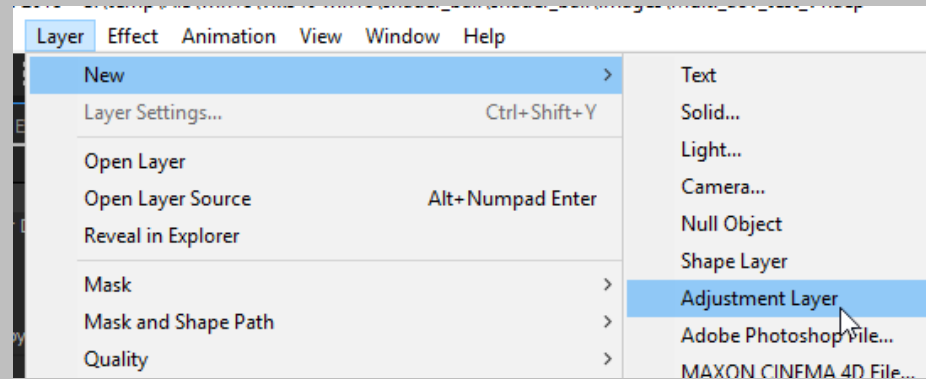
Z-Depth is a little different—I don't like the AE camera blur feature, Frischluft is better—I will show both—

--first bring in the z-depth layer—turn its VISIBILITY off

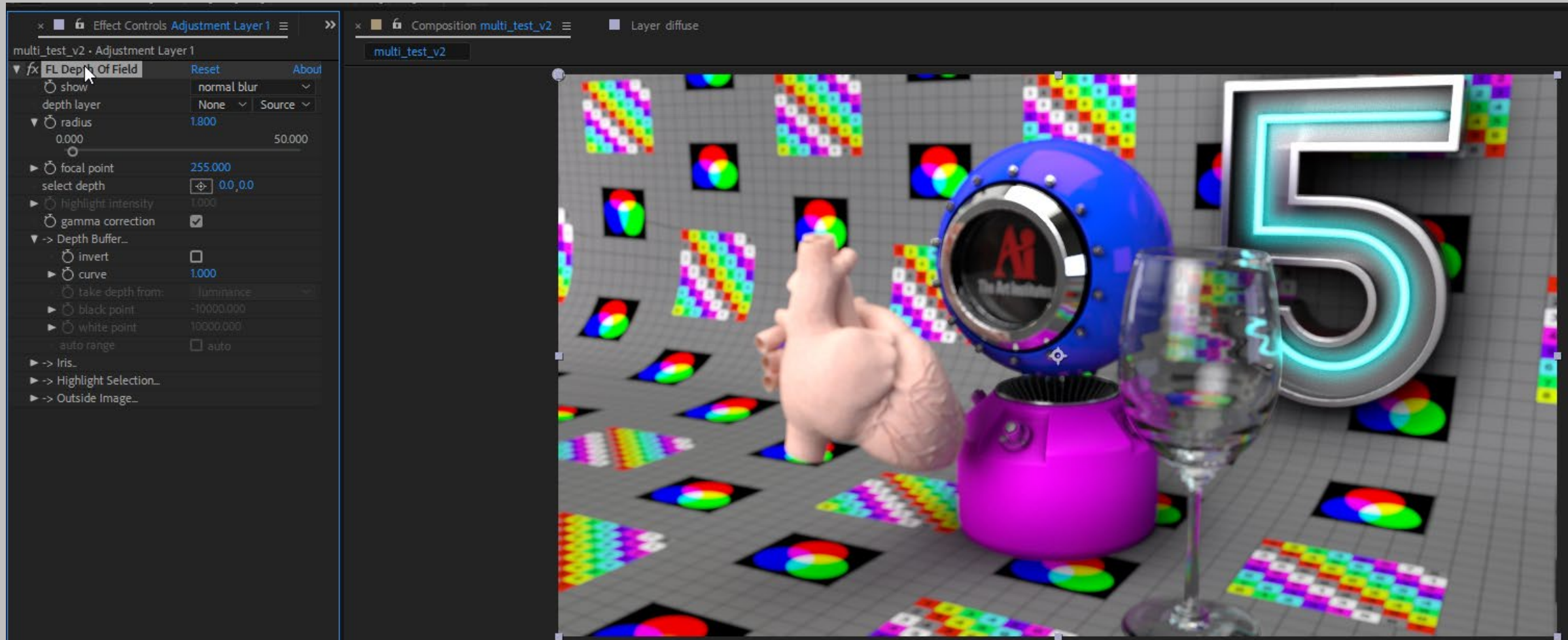
The Z depth will be too bright, so clip the values with the white/black point, or use something like an exposure node--



Add an adjustment layer, apply the Camera depth blur to the adjustment layer, using the z depth Layer as the blur layer (in 32bpc I get some banding)--



This is mine with the Frischluft filter, much cleaner—Nuke would also give you a better DOF effect
Remember that Arnold has native DOF (not post) which is an alternative.....post is faster...



Next week, among lighting and rendering some cool VFX scenes in Arnold, we will also look at batch rendering, render setup, and, wait for it, hold on.....the farm where old files go to be rendered...

