

# Unity Post Processing



## **Unity Post Processing Course: Concepts, Steps and Challenges**

By ISRAEL BECKER PILAN

# Unity Post Processing

## Table of Contents

Introduction to Unity Post Processing	4
Setting Up	7
Ambient Occlusion	8
Auto Exposure	9
Bloom	10
Chromatic Aberration	11
Color Grading	12
Depth of Field	13
Grain	13
Lens Distortion	13
Motion Blur	14
Screen Space Reflections	14

# Unity Post Processing

## Table of Contents

Vignette	16
Post Processing - Before and After	16
Exercises	17

# Unity Post Processing

## Introduction to Unity Post Processing

### Ambient Occlusion

The Ambient Occlusion post-processing effect darkens creases, holes, intersections and surfaces that are close to each other.

The Ambient Occlusion effect in this package has two modes:

- Scalable Ambient Obscurrence
- Multi-scale Volumetric Occlusion

This is a standard implementation of ambient obscurrence that works on older platforms. If you need to target a compute-enabled platform, use the Multi-scale Volumetric Occlusion mode instead.

### Anti-aliasing

The Anti-aliasing effect gives graphics a smoother appearance. The Anti-aliasing algorithms are image-based, which is useful when support for traditional multisampling is not available, such as the deferred rendering shading path, or HDR in the forward rendering path in Unity 5.5 or earlier. The Editor's Quality settings window is home to these options.

The algorithms available in the post-processing stack are:

- Fast Approximate Anti-aliasing (FXAA); a fast algorithm for mobile and platforms that don't support motion vectors.
- Subpixel Morphological Anti-aliasing (SMAA); a high-quality but slower algorithm for mobile and platforms that don't support motion vectors.
- Temporal Anti-aliasing (TAA); an advanced technique which requires motion vectors. Ideal for desktop and console platforms.

### Auto Exposure

The Auto Exposure effect dynamically adjusts the exposure of an image according to the range of brightness levels the image contains.

In Unity, this effect generates a histogram on every frame and filters it to find the average luminance value. This histogram and the Auto Exposure effect requires Compute shader support.

### Bloom

The Bloom effect creates fringes of light extending from the borders of bright areas in an image, contributing to the illusion of an extremely bright light overwhelming the Camera.

You can also use Lens Dirt to apply a full-screen layer of smudges or dust to diffract the Bloom effect.

### Chromatic Aberration

The Chromatic Aberration effect mimics the effect a real-world camera produces when its lens fails to join all colours to the same point. Unity provides support for red/blue and green/purple fringing, and you can define fringing colours by using an input texture.

# Unity Post Processing

## Introduction to Unity Post Processing

### Color Grading

The Color Grading effect alters or corrects the colour and luminance of the final image that Unity produces. The Color Grading effect comes with three modes:

- Low Definition Range (LDR): ideal for lower-end platforms. Grading is applied to the final rendered frame clamped in a [0,1] range and stored in a standard LUT.
- High Definition Range (HDR): ideal for platforms that support HDR rendering. All colour operations are applied in HDR and stored into a 3D log-encoded LUT to ensure a sufficient range coverage and precision (Alexa LogC El1000).
- External: for use with custom 3D LUTs authored in external software.

### Deferred Fog

The Fog effect overlays a colour onto objects depending on how far away they are from the Camera.

The Fog effect creates a screen-space fog based on the camera's depth texture. It supports Linear, Exponential and Exponential Squared fog types. Fog settings are on the Scene tab of the Lighting window (menu: Window > Rendering > Lighting Settings).

### Depth of Field

Depth of Field is a post-processing effect that simulates the focus properties of a camera lens. To learn more about the Depth of Field effect, see the Depth of Field documentation in the Unity manual.

### Grain

The Grain effect emulates the effect that real-world cameras produce where small particles in the camera's film give the image a coarse, unprocessed effect. The Grain effect available in Unity is based on a coherent gradient noise.

### Lens Distortion

The Lens Distortion effect simulates the shape of a real-world camera lens by distorting or undistorting the final rendered picture.

### Motion Blur

The Motion Blur effect blurs an image when GameObjects are moving faster than the camera's exposure time.

# Unity Post Processing

## Introduction to Unity Post Processing

### Screen Space Reflections

The Screen Space Reflection effect creates subtle reflections that simulate wet floor surfaces or puddles. Screen Space Reflection is an ideal effect to limit the amount of specular light leaking.

### Vignette

The Vignette effect darkens the edges of an image, leaving the centre of the image brighter. The Vignette effect in the post-processing stack has two modes:

- Classic
- Masked

# Unity Post Processing

## Setting Up

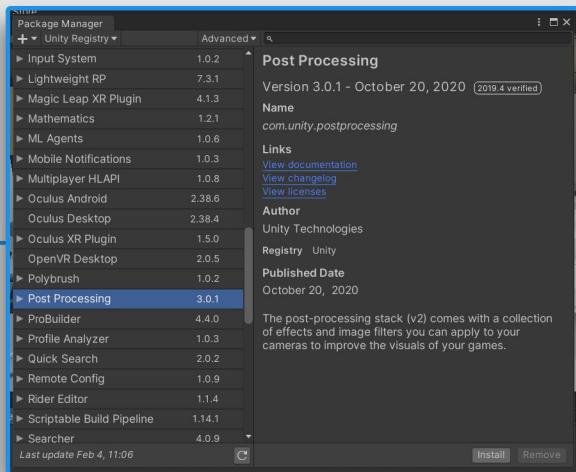
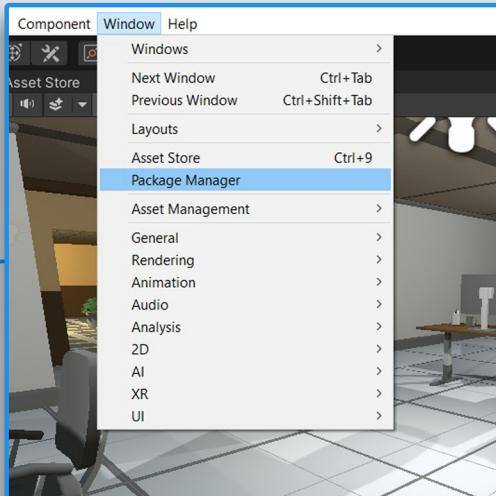
First, after opening your Unity Hub, search for the PostProcessingCourse project and open it.

We will use this project throughout this course.

### Projects

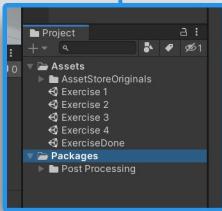
Project Name	Unity Version
PostProcessingCourse E:\Projects\PostProcessingCourse Unity Version: 2019.4.15f1	2019.4.15f1

To start using the Post Processing package you must first install it on your project. To do so, you must open Window > Package Manager. After finding the Post Processing package, install it.

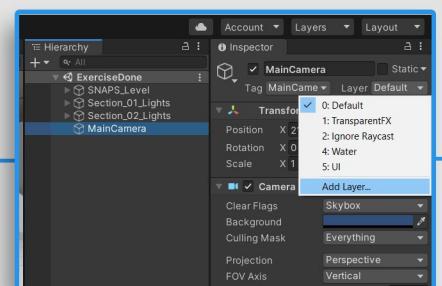


After installing the package, close the Package Manager window.

Back to the Project, the folder Packages should have appeared. Inside, there should be a folder named Post Processing. The package is now installed on the project.

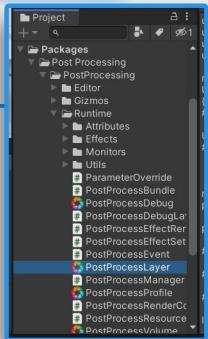
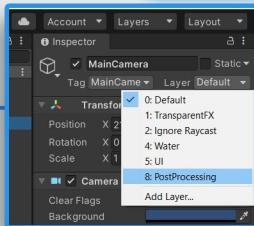


To set up the Post Processing package on your scene, you must first create a new layer and apply it to the Camera. For the sake of organization, the layer will be called PostProcessing.

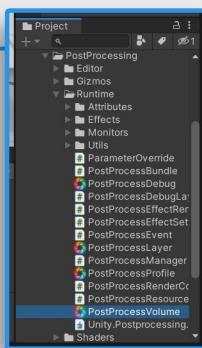
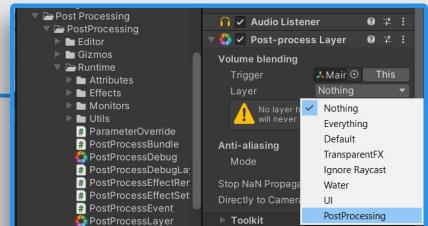


# Unity Post Processing

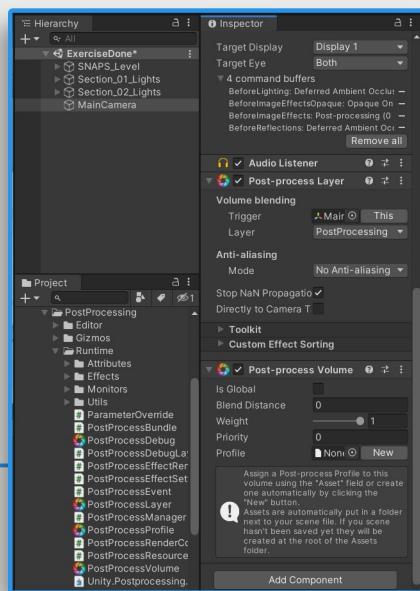
## Setting Up



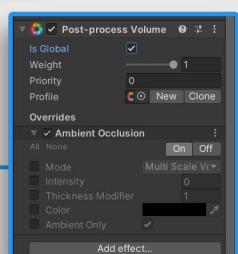
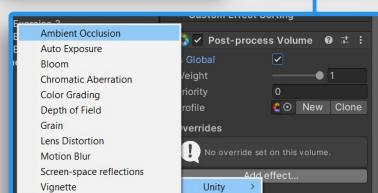
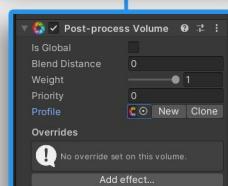
In the Post Processing folder, assign PostProcessingLayer to the camera as a component and assign the PostProcessing layer to it.



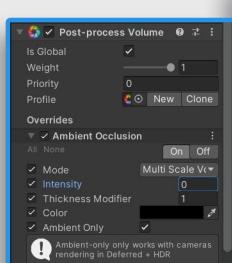
Assign Post-Processing-Volume to the camera as a component.



Create a new Profile. Toggle Is Global to apply the effects to the whole scene. Then add the effect Ambient Occlusion and select “All” to toggle all options. All effects will require experimentation to find the perfect balance between quality and performance.



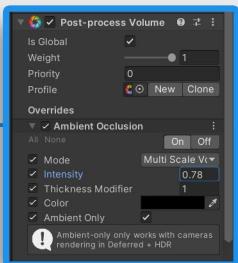
## Ambient Occlusion



After enabling all options, nothing should happen at first to the scene. Only when increasing the intensity from 0 that changes should appear.

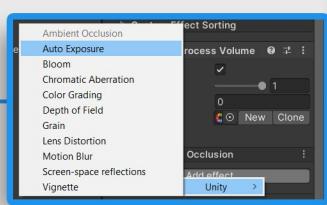
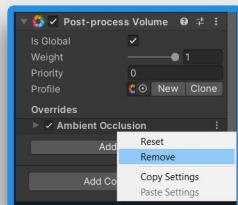
# Unity Post Processing

## Ambient Occlusion



It is also possible to change the colour of the occlusion, select a different mode and modify the thickness.

## Auto Exposure



In Auto Exposure, you may limit the extreme bright and dark pixels through Filtering, Minimum and Maximum.

You may also use Exposure Compensation to alter the exposure of the entire scene.

The Adaptation is used to simulate the slow, or fast, adaptation of the eyes or camera to the light/darkness, creating a smoother transition.



# Unity Post Processing

## Auto Exposure

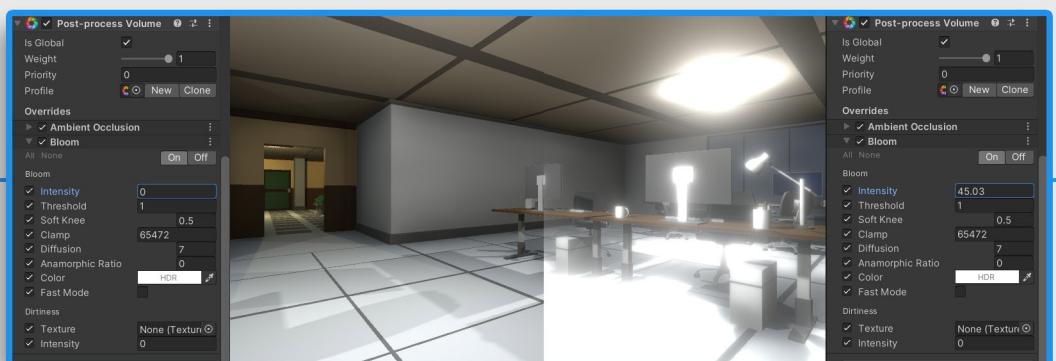
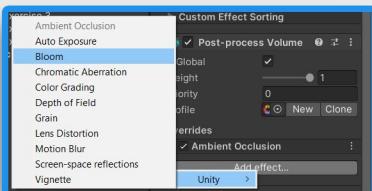


When using Adaptation, you may choose one of two modes: Progressive and Fixed. When Progressive is selected, the Auto Exposure will become animated. When Fixed is selected, the Auto Exposure will not be animated.

When using Exposure Compensation, the changes will not bypass the limits set by Filtering, Minimum and Maximum. All limitations set will still be respected, including the animated adaptation parameters.



## Bloom



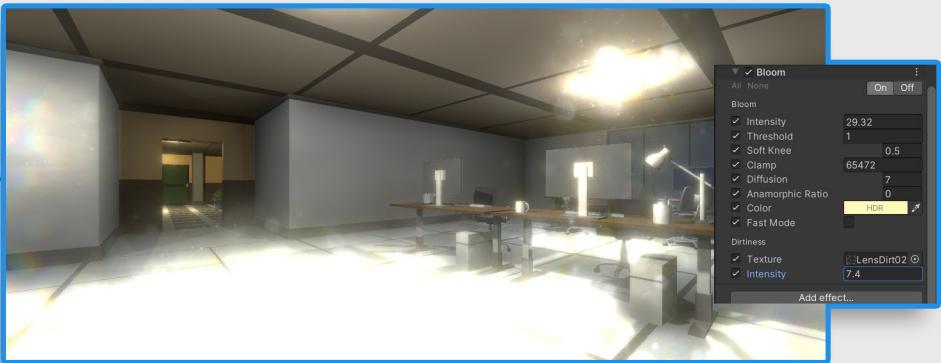
# Unity Post Processing

## Bloom

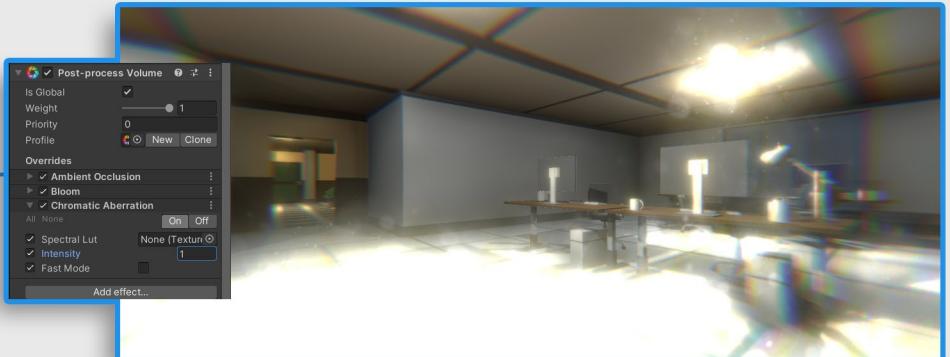
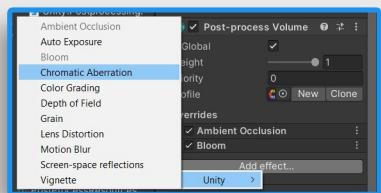


After adding the Bloom effect, nothing should happen immediately. Only when altering the intensity that the effect becomes visible. It is also possible to change the colour of the Bloom effect in Color. You should experiment with all the parameters for further understanding.

In the Bloom effect, it is possible to add smudges and dirt to the lens in Dirtiness. By using the LensDirt02 texture in Packages > Post Processing > PostProcessing > Textures and increasing the intensity of Dirtiness, you should be able to see the changes to the camera.

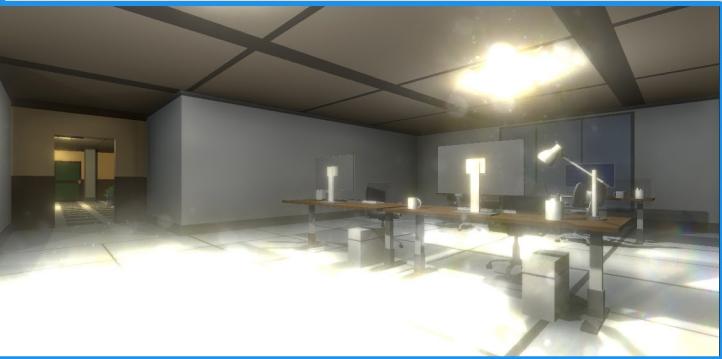
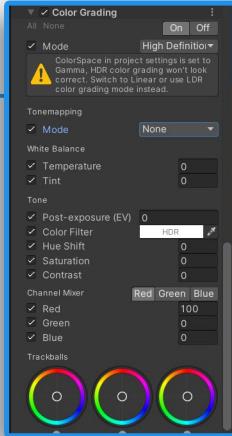
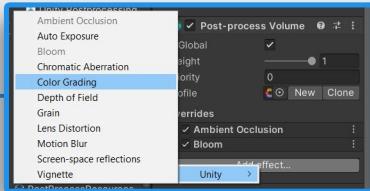


## Chromatic Aberration

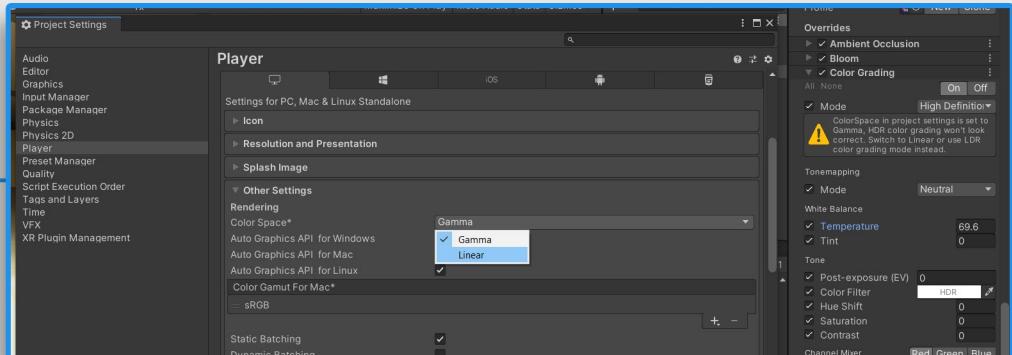


# Unity Post Processing

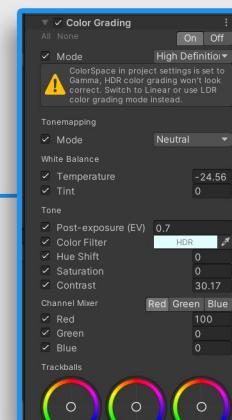
## Color Grading



Textures tend to be saved in gamma colour space, while Shaders expect linear colour space. As such, when Textures are sampled in Shaders, the gamma-based values lead to inaccurate results. To overcome this, you can set Unity to use an RGB sampler to cross over from gamma to linear sampling. This ensures a linear workflow with all inputs and outputs of a Shader in the correct colour space, resulting in a correct outcome.

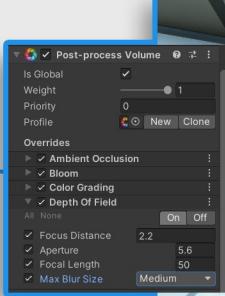
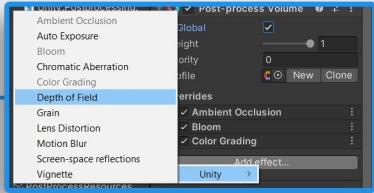


To specify a gamma or linear workflow, go to Edit > Project Settings, then select the Player category, navigate to the Other Settings, open the Rendering section, and change the Color Space to Linear or Gamma, depending on your preference.

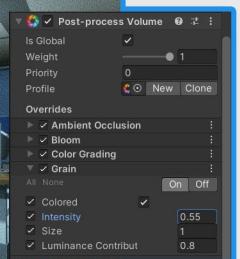
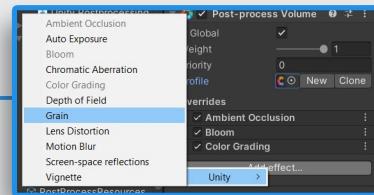


# Unity Post Processing

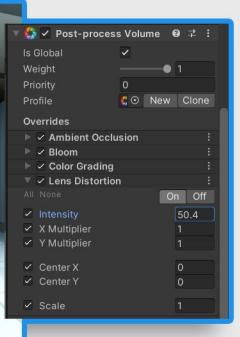
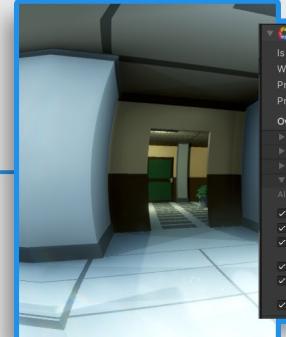
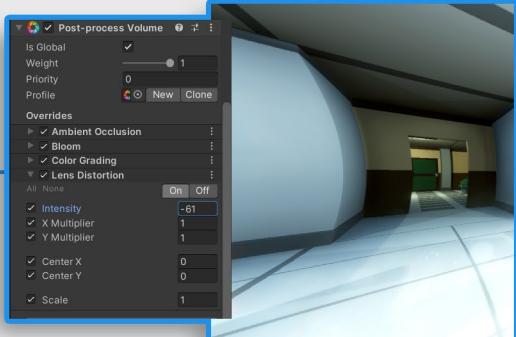
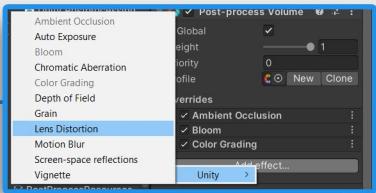
## Depth of Field



## Grain

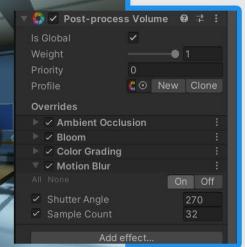
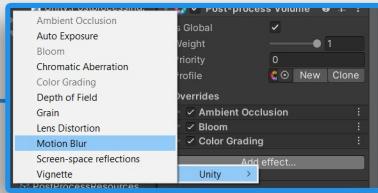


## Lens Distortion

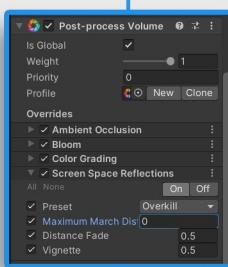
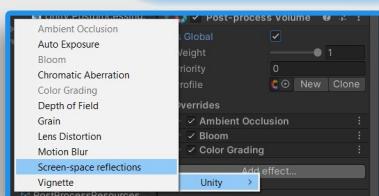


# Unity Post Processing

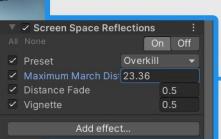
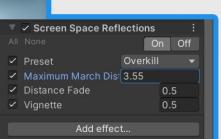
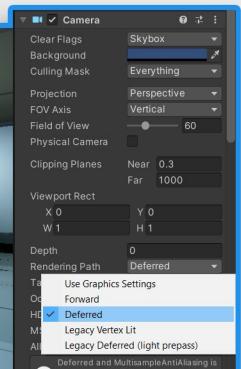
## Motion Blur



## Screen Space Reflections



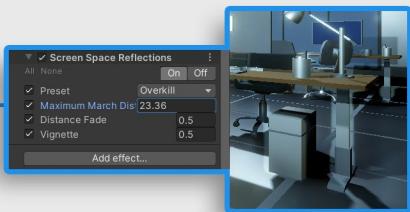
The Screen Space Reflection effect is tuned for performance over quality to make it ideal for Projects running on current-gen consoles and desktop computers. It's not suitable for mobile development. Because it relies on the Normals G-Buffer, it is only available in the deferred rendering path.



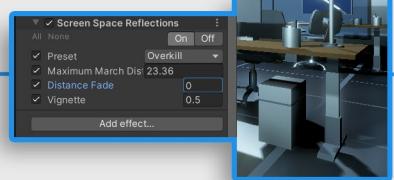
# Unity Post Processing

## Screen Space Reflections

Note: This effect requires reflections on the materials. A simple way is to modify the Metallic and Smoothness in the material.



The Distance Fade will fade the reflections close to the near planes.



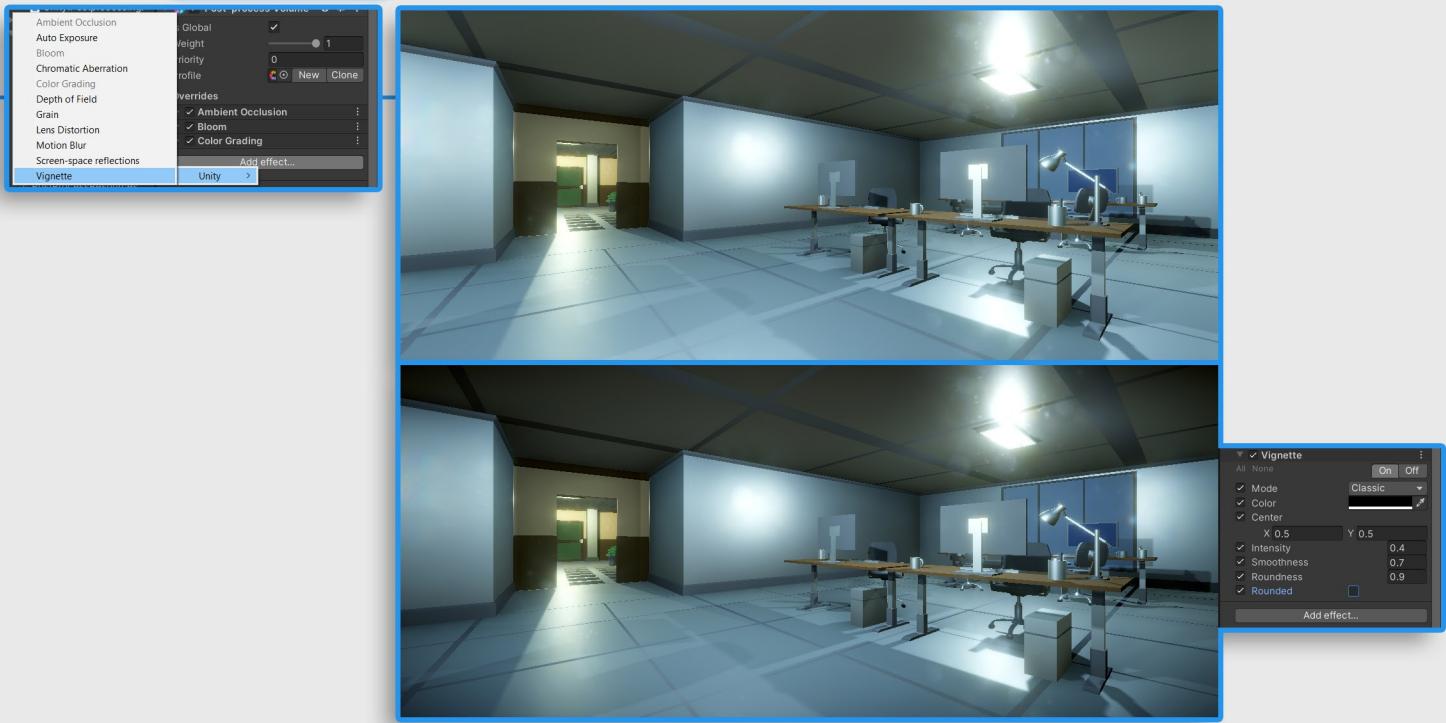
Controlling the Distance Fade will create more realistic scenes by adding smoother transitions to the fading effect.



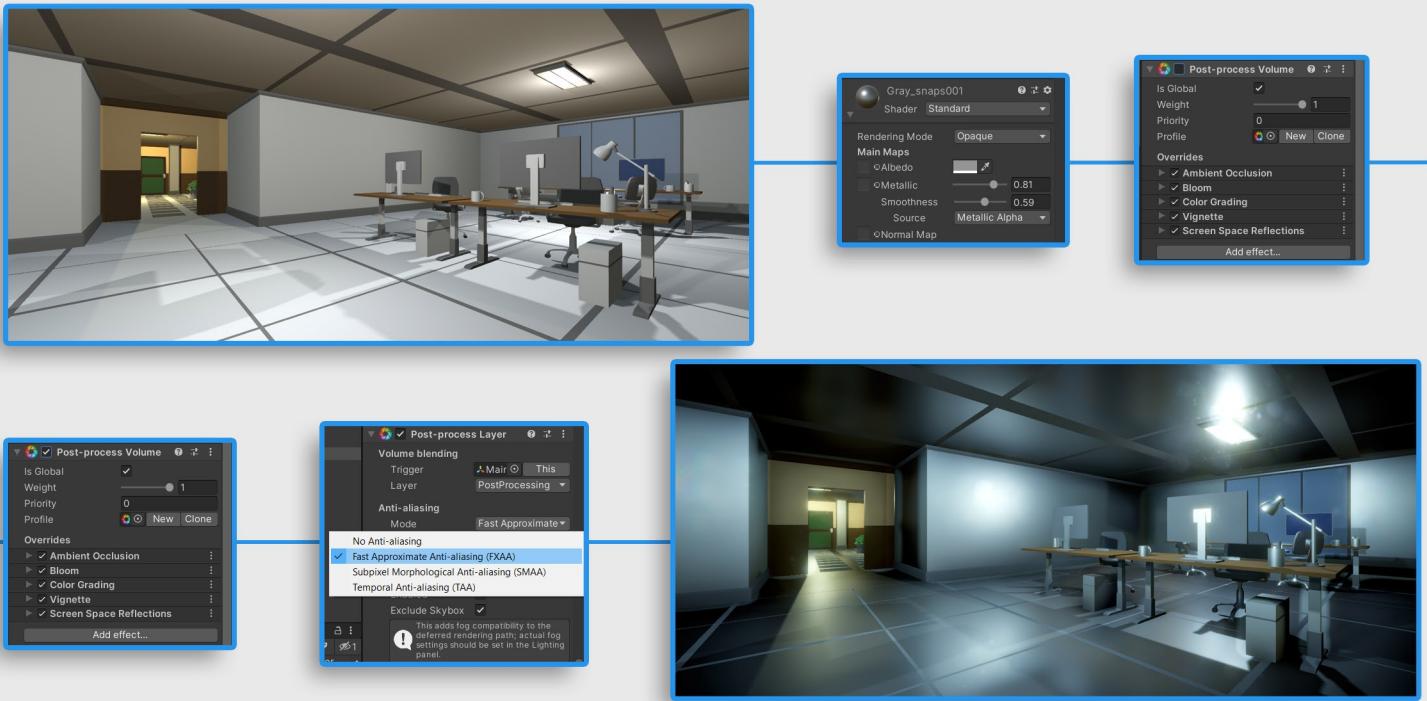
Vignette is used to fade the reflections, similarly to Distance Fade, but close to the edges of the screen instead of planes.

# Unity Post Processing

## Vignette



## Post Processing - Before and After



# Unity Post Processing

## Exercises

- 1 Demonstrate three different styles of usage of the Ambient Occlusion effect. You may use different effects in parallel but the Ambient Occlusion effect must be clearly visible.
- 2 Demonstrate three different styles of usage of the Auto Exposure effect. You may use different effects in parallel but the Auto Exposure effect must be clearly visible.
- 3 Demonstrate three different styles of usage of the Bloom effect. You may use different effects in parallel but the Bloom effect must be clearly visible.
- 4 Demonstrate three different styles of usage of the Color Grading effect. You may use different effects in parallel but the Color Grading effect must be clearly visible.
- 5 Using the Grain effect, demonstrate how it can be used to enhance the theme of the scene respecting the visual identity of the project. You may use different effects in parallel but the Grain effect must be clearly visible.
- 6 Demonstrate three different styles of usage of the Lens Distortion effect. You may use different effects in parallel but the Lens Distortion effect must be clearly visible.
- 7 Demonstrate three different styles of usage of the Motion Blur effect. You may use different effects in parallel but the Motion Blur effect must be clearly visible.
- 8 Demonstrate three different styles of usage of the Screen-space Reflections effect. You may use different effects in parallel but the Screen-space Reflections effect must be clearly visible.
- 9 Using the Vignette effect, demonstrate how it can be used to enhance the theme of the scene respecting the visual identity of the project. You may use different effects in parallel but the Vignette effect must be clearly visible.
- 10 Using multiple effects at the same time, create three different scenes with different themes and/or styles and/or visual identities.