

MY **BRIGHT** FUTURE

DSU Dongseo University
동서대학교

Unity 2018:

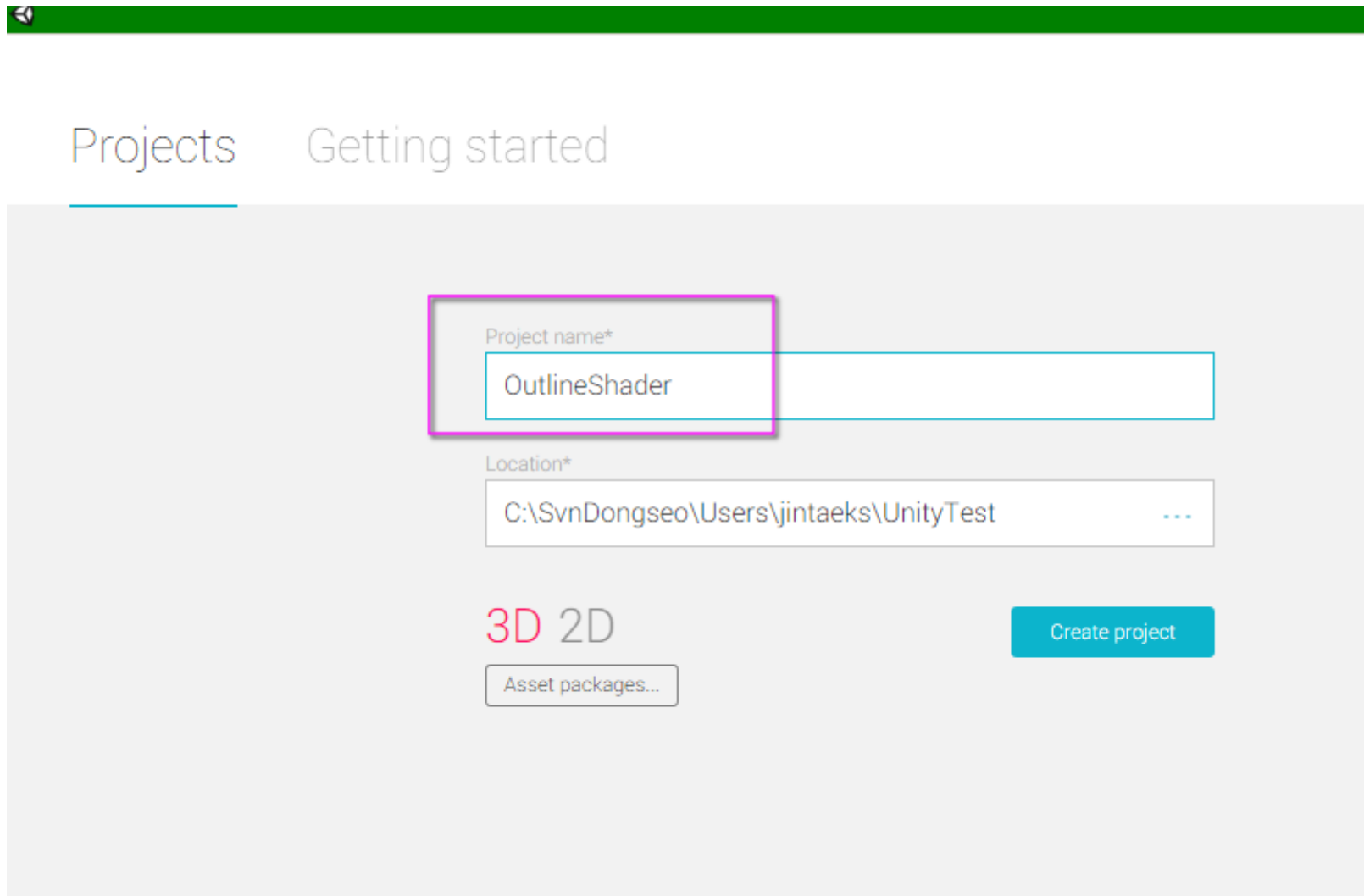
Unity3D Outline Shader

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Writing Custom Shader in Unity3d



The screenshot shows the 'Getting started' page in the Unity Hub application. The 'Projects' tab is selected. The form for creating a new project is visible, with the 'Project name*' field highlighted by a red rectangle. The 'Location*' field is also visible. The '3D' radio button is selected, and the 'Asset packages...' button is visible. The 'Create project' button is on the right.

Projects Getting started

Project name*

OutlineShader

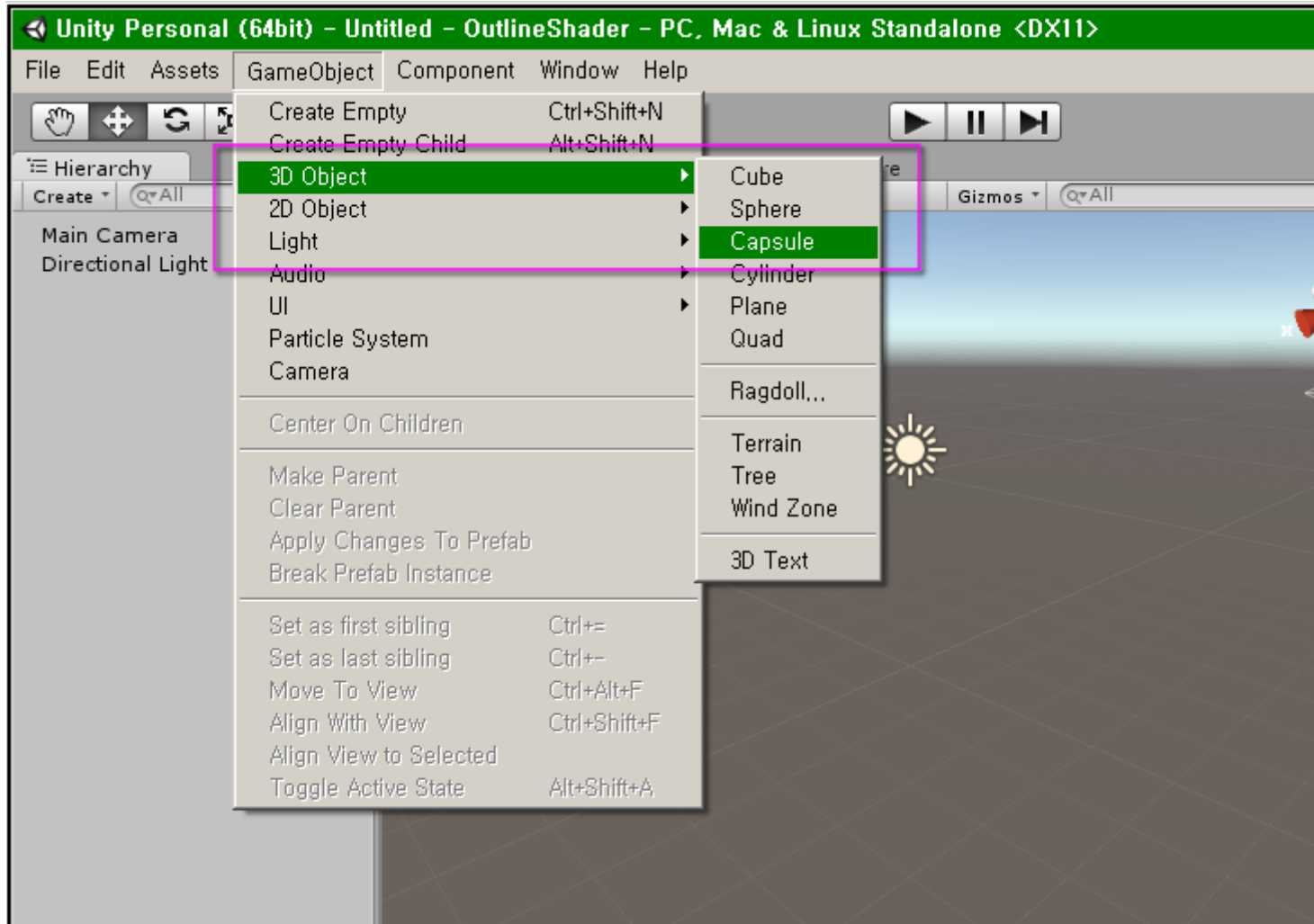
Location*

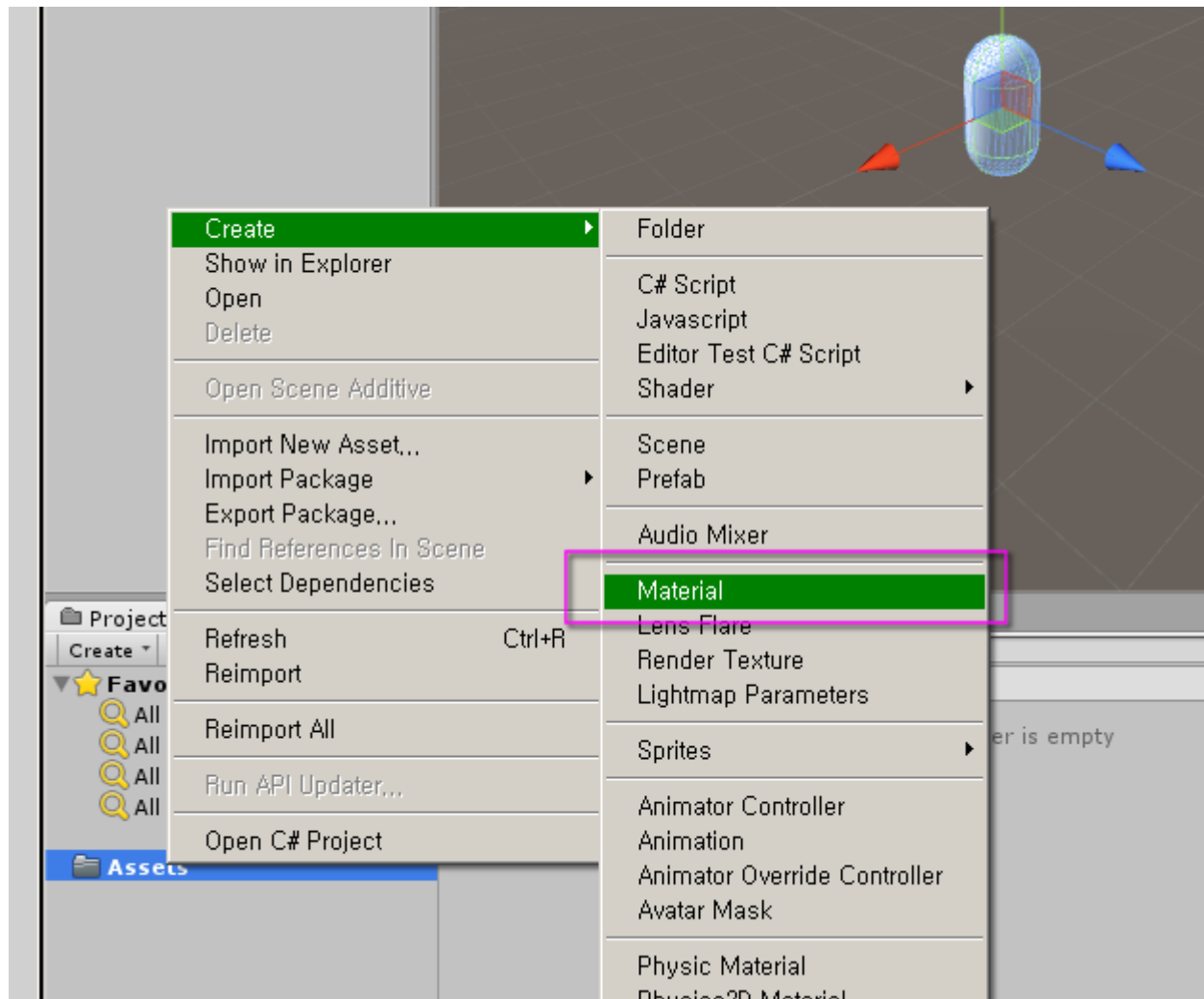
C:\SvnDongseo\Users\jintaeks\UnityTest ...

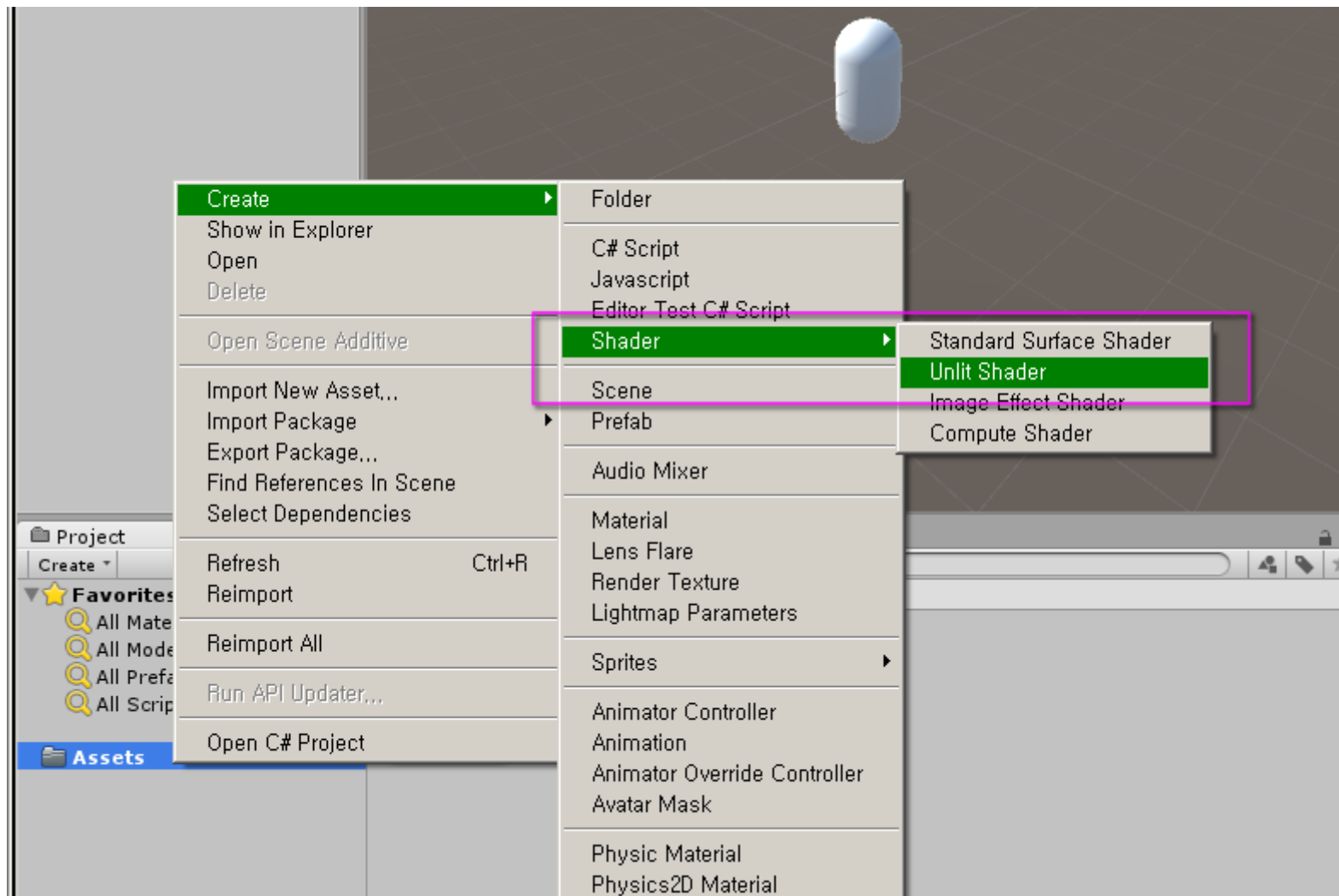
3D 2D

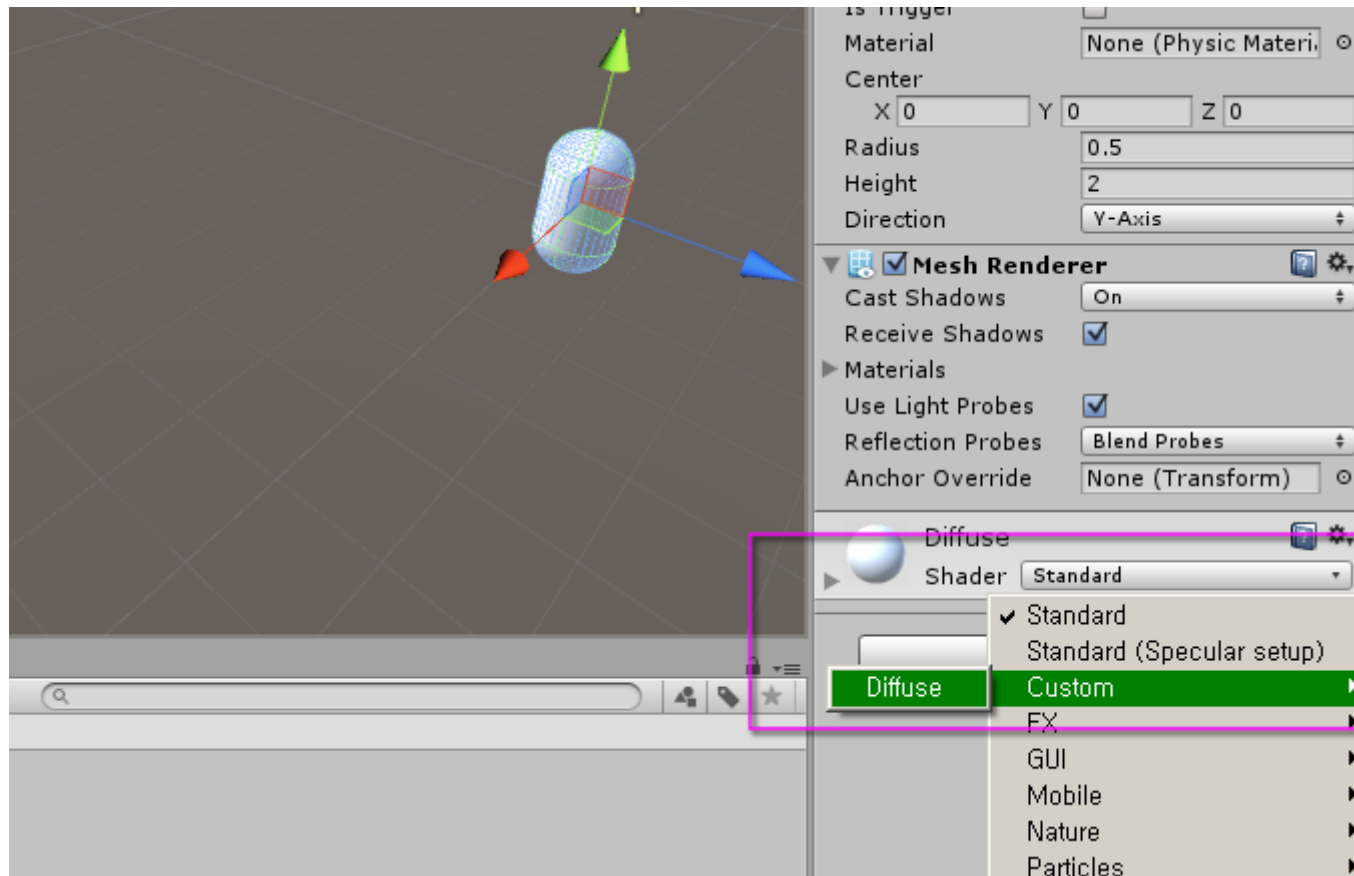
Asset packages...

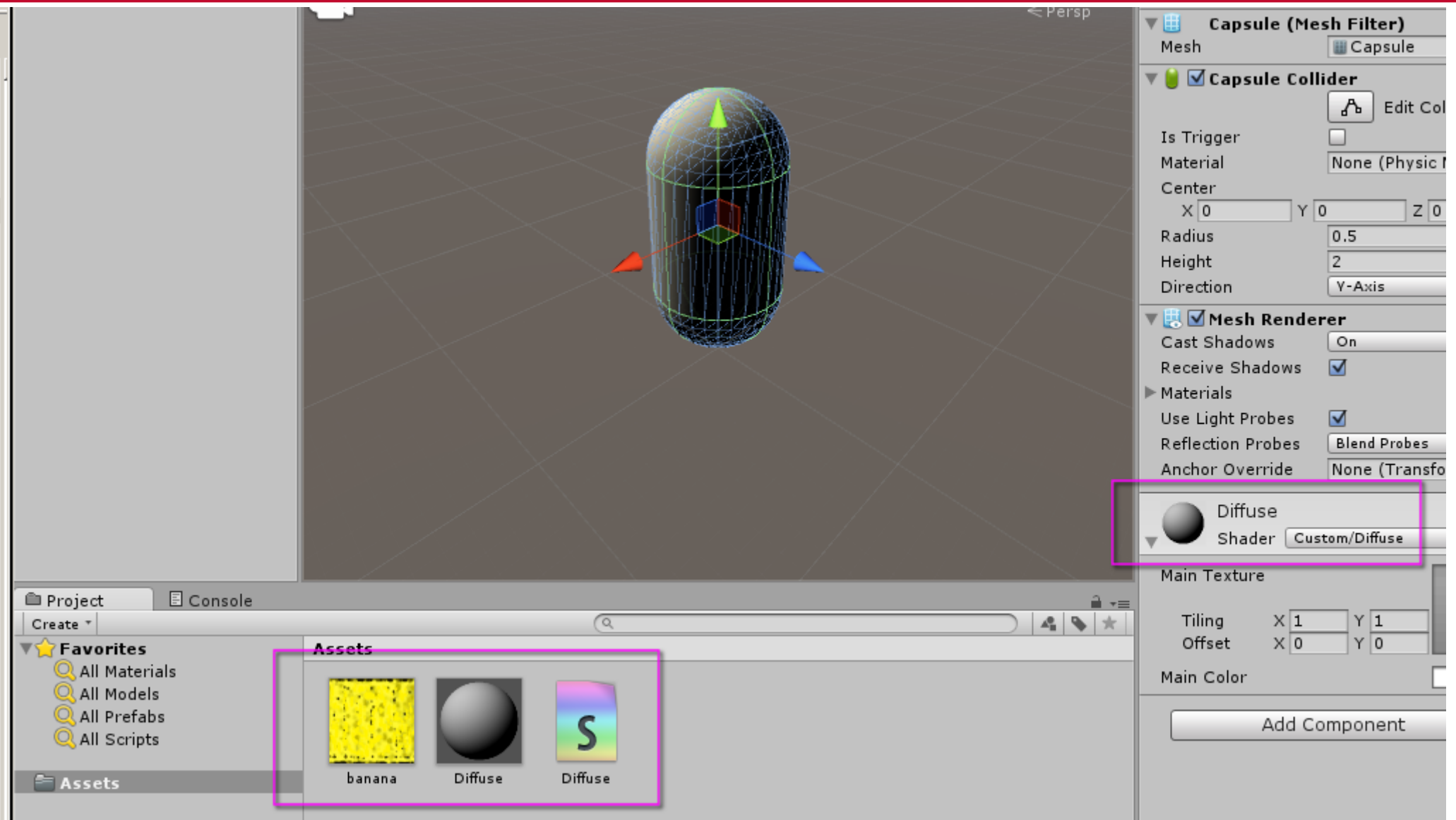
Create project











```

Pass
{
    Tags { "LightMode" = "ForwardBase" }
    ZWrite On
    ZTest LEqual
    Lighting On

    CGPROGRAM
        #pragma vertex vert
        #pragma fragment frag

        v2f vert(appdata v)
        {
            v2f o;
            o.pos = mul(UNITY_MATRIX_MVP, v.vertex);
            o.normal = mul(_Object2World, float4(v.normal, 0.0)).xyz;
            o.texcoord = v.texcoord;
            return o;
        }

        float4 frag(v2f v) : COLOR
        {
            float4 texColor = tex2D(_MainTex, v.texcoord);

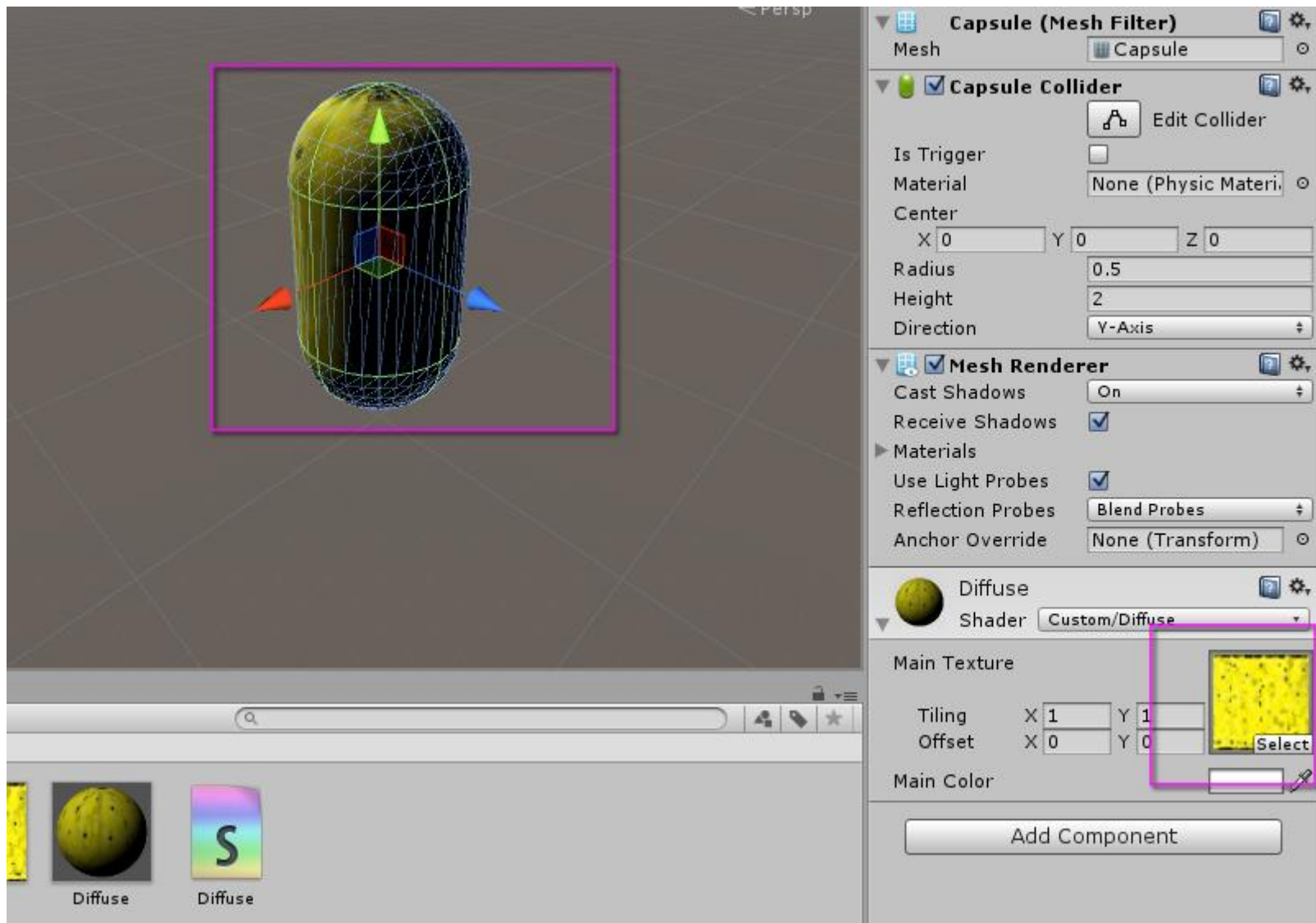
            float3 normalDirection = normalize(v.normal);
            float3 lightDirection = normalize(_WorldSpaceLightPos0.xyz);
            float3 diffuse = _LightColor0.rgb * _Color.rgb * max(0.0, dot(normalDirection, lightDirection));

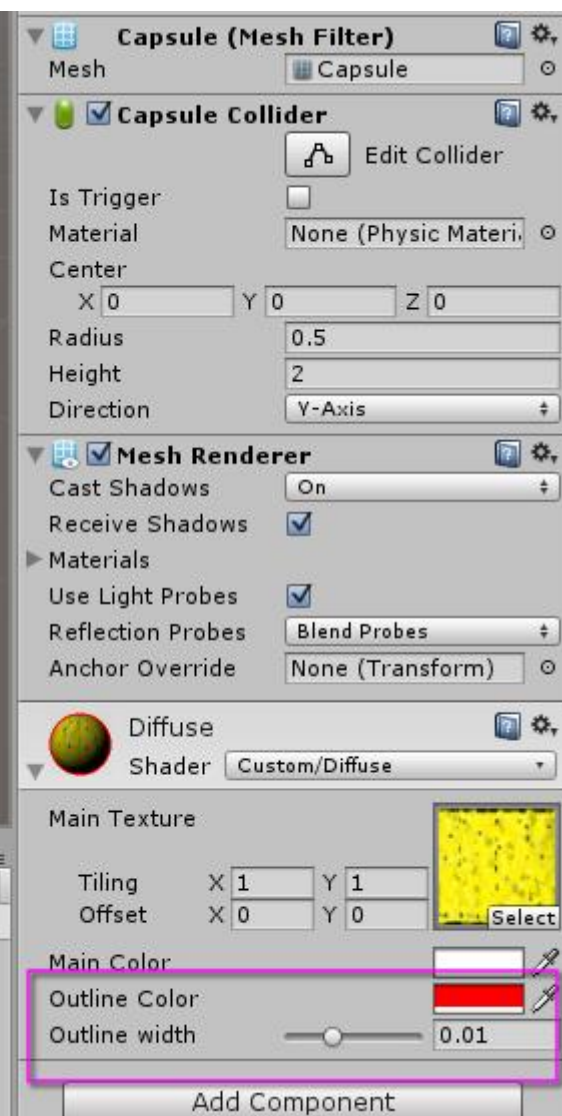
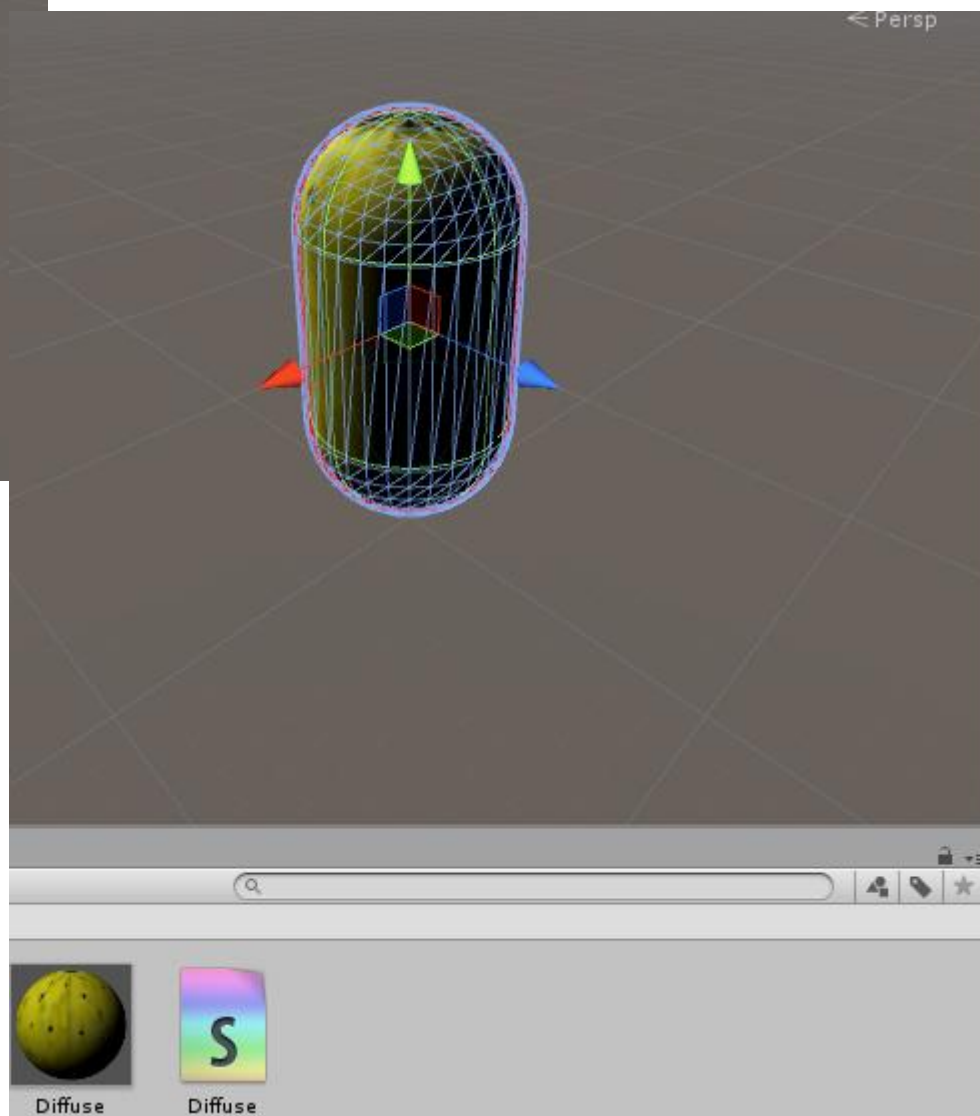
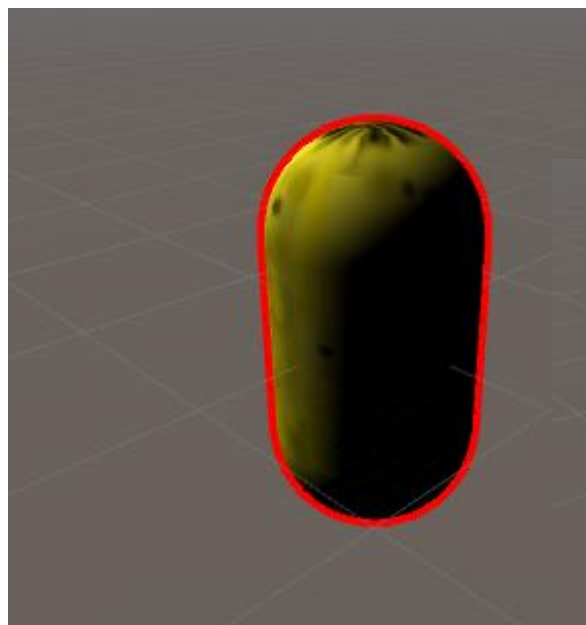
            return float4(diffuse,1) * texColor;
        }
    ENDCG
} //Pass
} //Shader

```


- Background - this render queue is rendered before any others. It is used for skyboxes and the like.
- Geometry (*default*) - this is used for most objects. Opaque geometry uses this queue.
- AlphaTest - alpha tested geometry uses this queue. It's a separate queue from Geometry one since it's more efficient to render alpha-tested objects after all solid ones are drawn.
- Transparent - this render queue is rendered after *Geometry* and *AlphaTest*, in back-to-front order. Anything alpha-blended (i.e. shaders that don't write to depth buffer) should go here (glass, particle effects).
- Overlay - this render queue is meant for overlay effects. Anything rendered last should go here (e.g. lens flares).

```
Shader "Transparent Queue Example" {  
    SubShader {  
        Tags {"Queue" = "Transparent" }  
        Pass {  
            // rest of the shader body...  
        }  
    }  
}
```





```
SubShader
```

```
{
```

```
    Pass {
```

```
        Cull Off
```

```
        ZWrite Off
```

```
        ZTest Always
```

```
        Lighting Off
```

```
    CGPROGRAM
```

```
    #pragma vertex vert
```

```
    #pragma fragment frag
```

```
    v2f vert(appdata v) {
```

```
        // just make a copy of incoming vertex data but scaled according to normal direction
```

```
        v2f o;
```

```
        o.pos = mul(UNITY_MATRIX_MVP, v.vertex);
```

```
        float3 norm = mul ((float3x3)UNITY_MATRIX_IT_MV, v.normal);
```

```
        float2 offset = TransformViewToProjection(norm.xy);
```

```
        o.pos.xy += offset * o.pos.z * _Outline;
```

```
        o.normal = v.normal;
```

```
        o.texcoord = v.texcoord;
```

```
        return o;
```

```
    }
```

```
    half4 frag(v2f i) :COLOR {
```

```
        return float4(_OutlineColor.rgb,1);
```

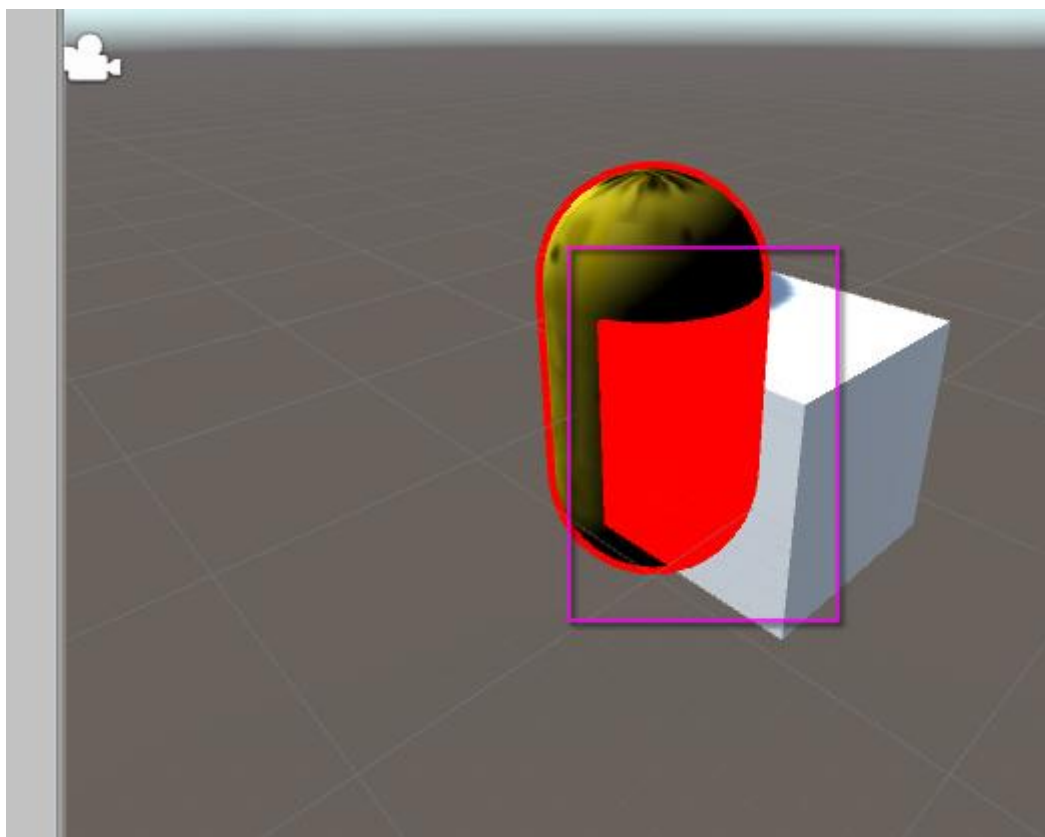
```
    }
```

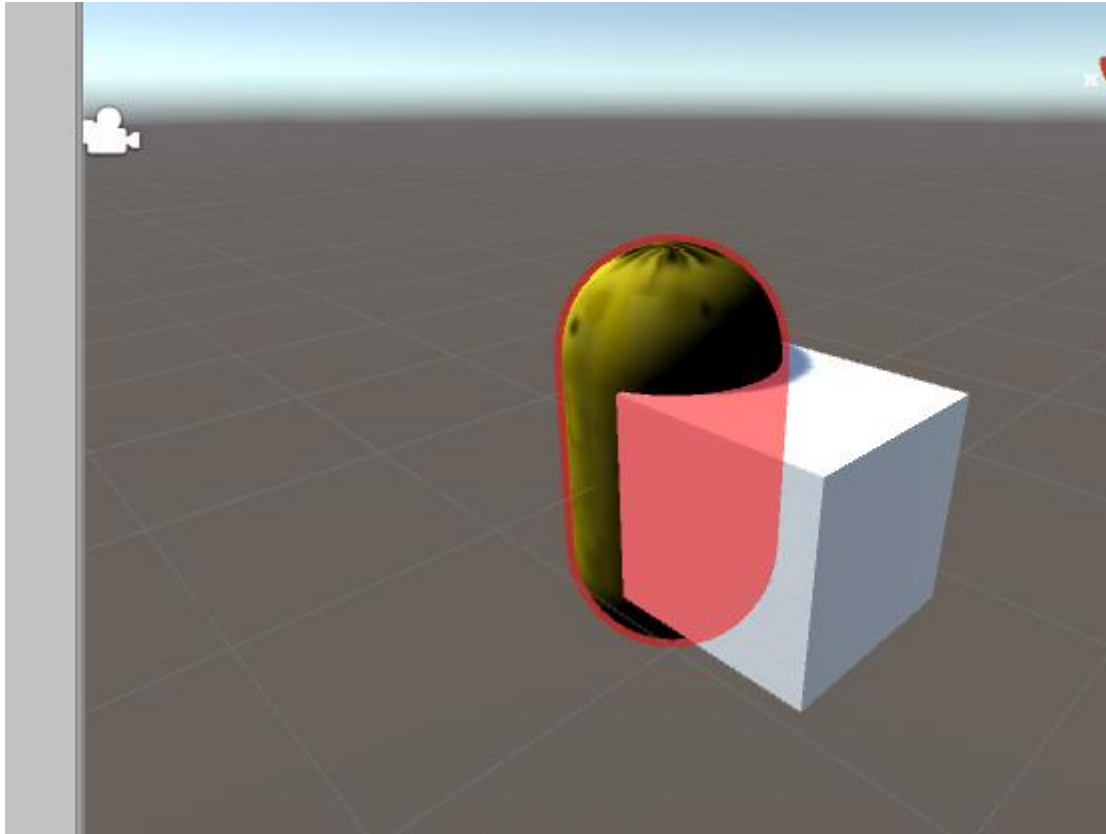
```
    ENDCG
```

```
    }
```

```
    Pass
```

```
    {
```





```
ZTest Always
Lighting Off
```

```
// you can choose what kind of blending mode you want for the outline
Blend SrcAlpha OneMinusSrcAlpha // Normal
//Blend One One // Additive
//Blend One OneMinusDstColor // Soft Additive
//Blend DstColor Zero // Multiplicative
//Blend DstColor SrcColor // 2x Multiplicative
```

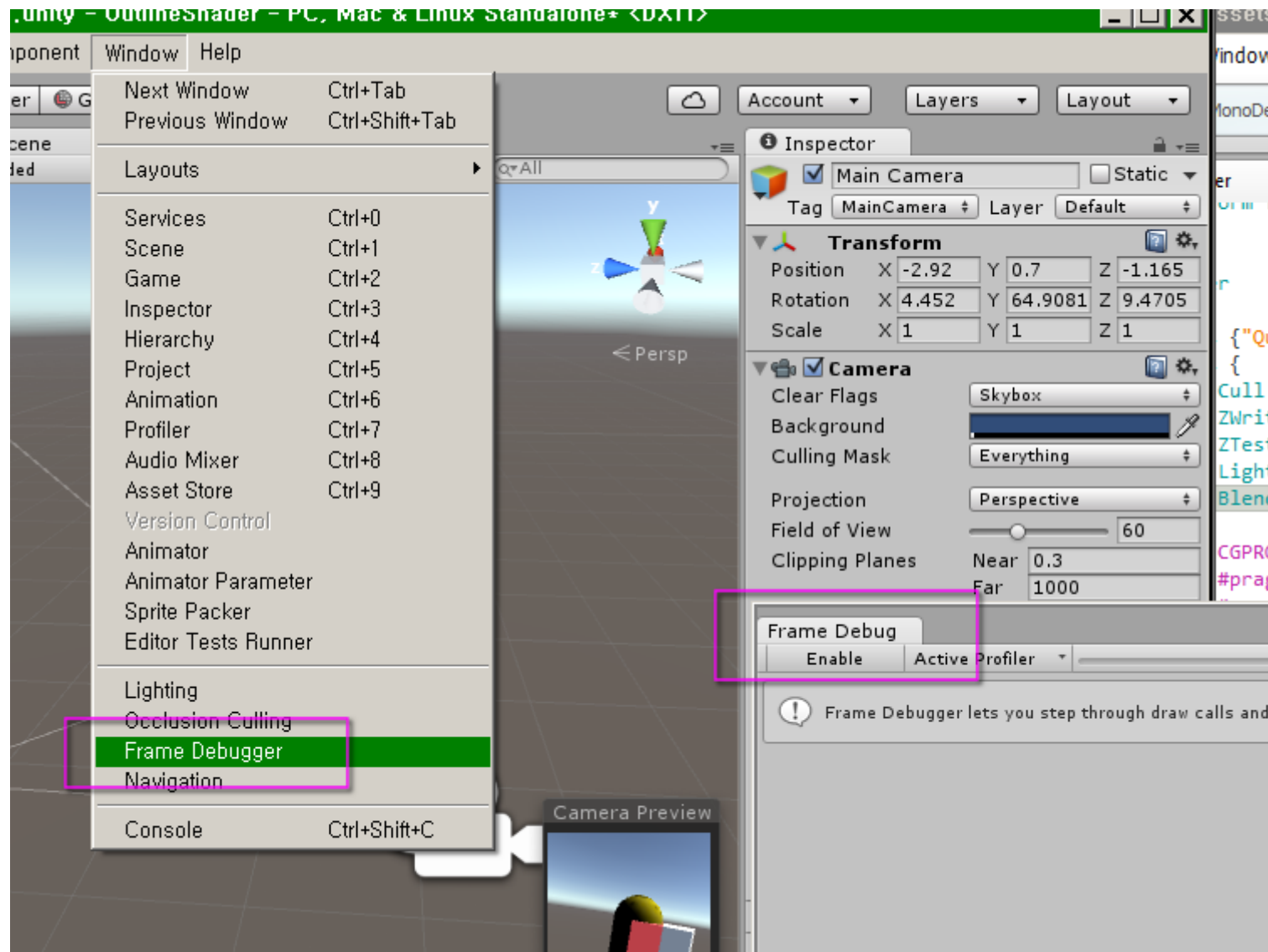
```
CGPROGRAM
#pragma vertex vert
#pragma fragment frag
```

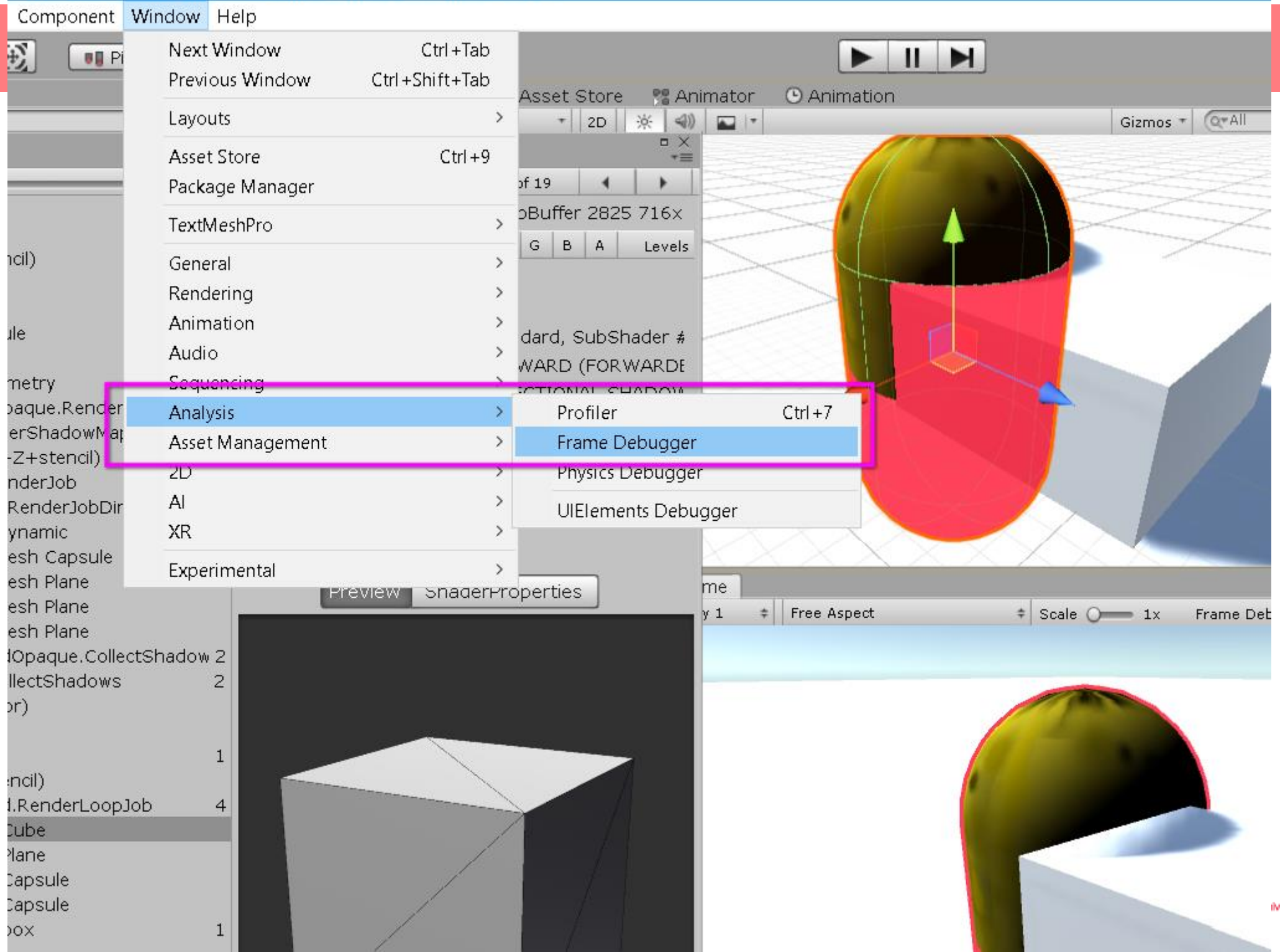
```
o.texcoord = v.texcoord;
return o;
}
```

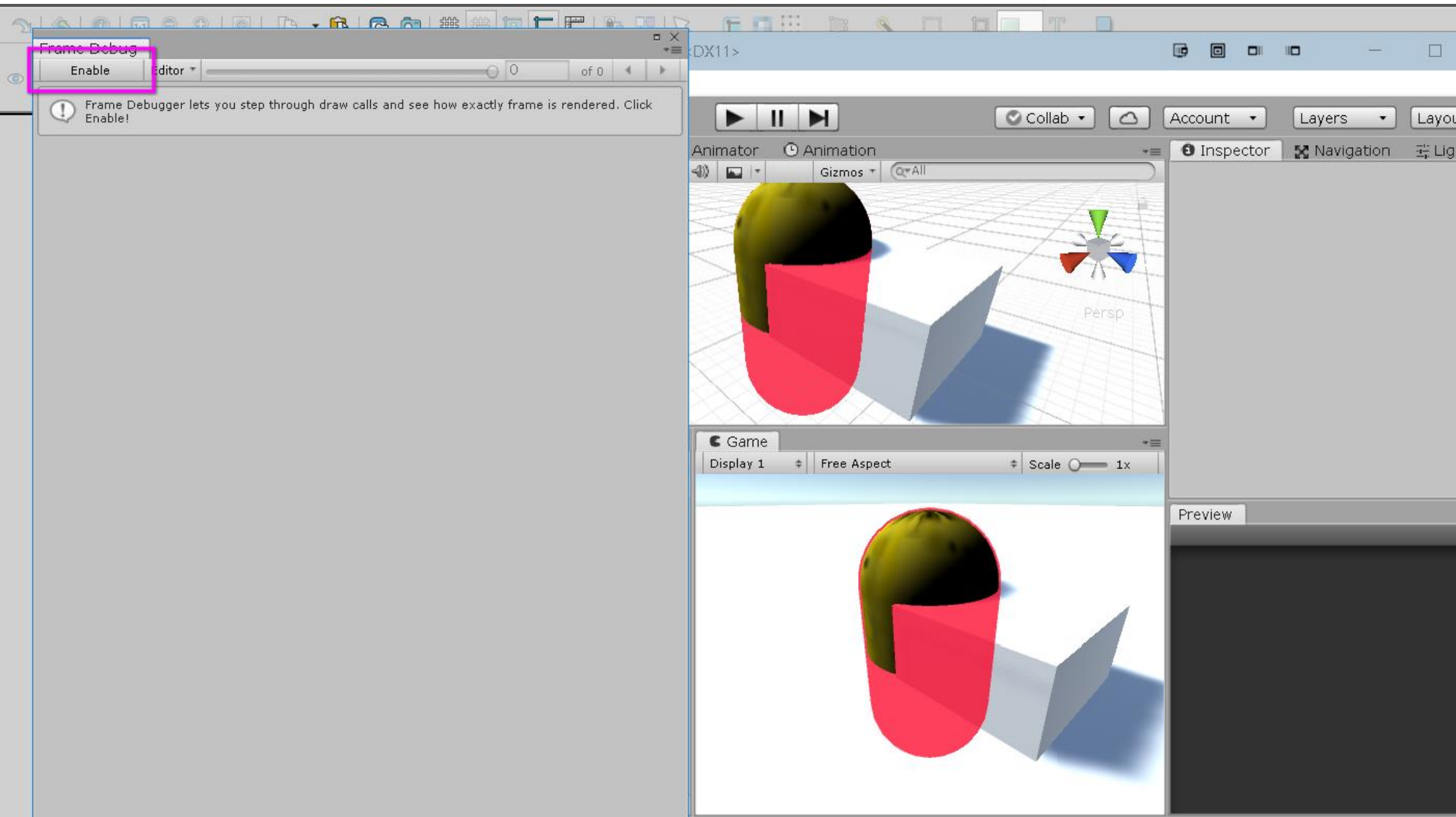
```
half4 frag(v2f i) :COLOR {
    return float4(_OutlineColor.rgb,0.3);
}
ENDCG
}
```

10 FILTERED LINES

Frame Debugger: Unity 5.x







Frame Debug

Enable

Editor

3

of 19

▼ Camera.Render

19

▼ UpdateDepthTexture

3

Clear (color+Z+stencil)

▼ DepthPass.Job

2

Draw Dynamic

Draw Mesh Capsule

▼ Drawing

14

▼ Render.OpaqueGeometry

13

▼ RenderForwardOpaque.Render

13

▼ Shadows.RenderShadowMap

6

Clear (color+Z+stencil)

▼ Shadows.RenderJob

5

▼ Shadows.RenderJobDir

5

Draw Mesh Capsule

Draw Dynamic

Draw Mesh Plane

Draw Mesh Plane

Draw Mesh Plane

▼ RenderForwardOpaque.CollectShadow

2

▼ Shadows.CollectShadows

2

Clear (color)

Draw GL

▼ Clear

1

Clear (Z+stencil)

▼ RenderForward.RenderLoopJob

4

Draw Mesh Cube

Draw Mesh Plane

Draw Mesh Capsule

Draw Mesh Capsule

▼ Camera.RenderSkybox

1

Draw Mesh

▼ Camera.ImageEffects

2

▼ RenderTexture.ResolveAA

1

Resolve Color

Draw Dynamic

RenderTarget

Camera

RT 0

Channels

All

R

G

451x328 Depth

Event #3: Draw Mesh

Shader

Custo

Pass

Shadc

Keywords

SHAD

Blend

One Z

ZClip

True

ZTest

LessE

ZWrite

On

Cull

Back

Why this draw call can't be batched

Objects have different materials.

Preview

ShaderProperties

Vectors

_WorldSpaceLightPos0

unity_LightShadowBias

Matrices

unity_MatrixVP

DX11>

▶

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▶

Collab

Account

Lay

Animator

Animation

Gizmos

Q All

Inspector

N

Persp

Game

Display 1

Free Aspect

Scale

1x

Preview

Frame Debug

Enable Editor 9 of 19

- ▼ Camera.Render 19
 - ▼ UpdateDepthTexture 3
 - Clear (color+Z+stencil)
 - ▼ DepthPass.Job 2
 - Draw Dynamic
 - Draw Mesh Capsule
 - ▼ Drawing 14
 - ▼ Render.OpacityGeometry 13
 - ▼ RenderForwardOpaque.Render 13
 - ▼ Shadows.RenderShadowMap 6
 - Clear (color+Z+stencil)
 - ▼ Shadows.RenderJob 5
 - ▼ Shadows.RenderJobDir 5
 - Draw Mesh Capsule
 - Draw Dynamic
 - Draw Mesh Plane
 - Draw Mesh Plane
 - RenderForwardOpaque.CollectShadow 2
 - ▼ Shadows.CollectShadows 2
 - Clear (color)
 - Draw GL
 - ▼ Clear 1
 - Clear (Z+stencil)
 - ▼ RenderForward.RenderLoopJob 4
 - Draw Mesh Cube
 - Draw Mesh Plane
 - Draw Mesh Capsule
 - Draw Mesh Capsule
 - ▼ Camera.RenderSkybox 1
 - Draw Mesh
 - ▼ Camera.ImageEffects 2
 - ▼ RenderTexture.ResolveAA 1
 - Resolve Color
 - Draw Dynamic

RenderTarget	Shadc
RT 0	Channels All R G
1024x1024 Shadowmap	
Event #9: Draw Mesh	
Shader	Stand
Pass	Shadc
Keywords	SHAD
Blend	One Z
ZClip	True
ZTest	LessE
ZWrite	On
Cull	Back

Why this draw call can't be batched

This is the first draw call of a new shadow cascade.

Preview ShaderProperties

Vectors

_WorldSpaceLightPos0
unity_LightShadowBias

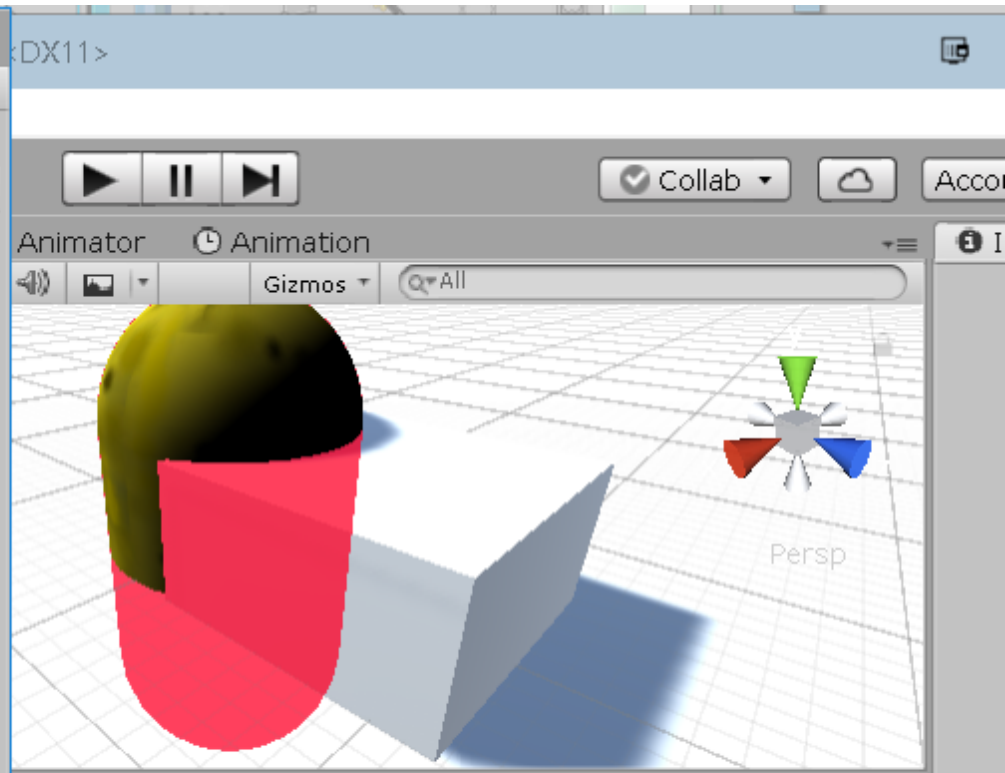
Matrices

unity_MatrixVP

DX11>

Collab

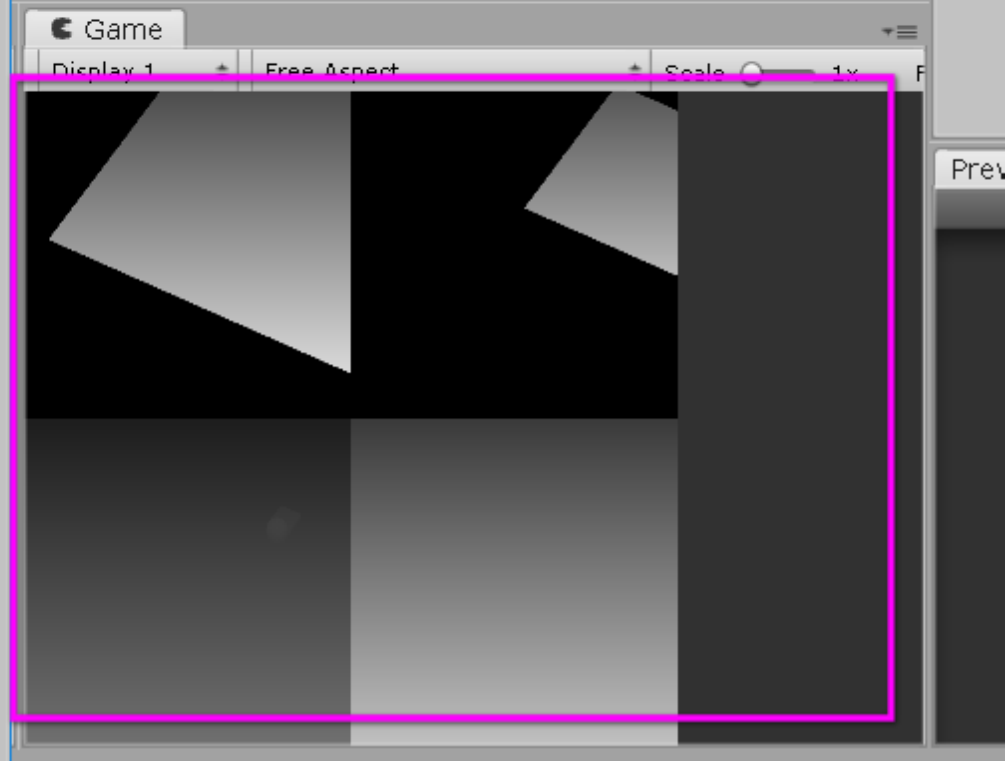
Animator Animation Gizmos All



Persp

Game

Display 1 Free Aspect Scale 1x



Game Debug

Enable Editor 11 of 19

Camera.Render 19

- ▼ UpdateDepthTexture 3
 - Clear (color+Z+stencil)
- ▼ DepthPass.Job 2
 - Draw Dynamic
 - Draw Mesh Capsule
- ▼ Drawing 14
 - ▼ Render.OpaqueGeometry 13
 - ▼ RenderForwardOpaque.Render 13
 - ▼ Shadows.RenderShadowMap 6
 - Clear (color+Z+stencil)
 - ▼ Shadows.RenderJob 5
 - ▼ Shadows.RenderJobDir 5
 - Draw Mesh Capsule
 - Draw Dynamic
 - Draw Mesh Plane
 - Draw Mesh Plane
 - Draw Mesh Plane
 - ▼ RenderForwardOpaque.CollectShadow 2
 - ▼ Shadows.CollectShadows 2
 - Clear (color)
 - Draw GL
 - ▼ Clear 1
 - Clear (Z+stencil)
 - ▼ RenderForward.RenderLoopJob 4
 - Draw Mesh Cube
 - Draw Mesh Plane
 - Draw Mesh Capsule
 - Draw Mesh Capsule
 - ▼ Camera.RenderSkybox 1
 - Draw Mesh
 - ▼ Camera.ImageEffects 2
 - ▼ RenderTexture.ResolveAA 1
 - Resolve Color
 - Draw Dynamic

RenderTarget Screen

RT 0 Channels All R G

451x328 ARGB32

Event #11: Draw GL

Draw Calls	2
Shader	Hidden
Pass	#0
Keywords	SHAD
Blend	One Z
ZClip	True
ZTest	Always
ZWrite	Off
Cull	Off

Preview ShaderProperties

Textures

- _CameraDepthTexture
- _ShadowMapTexture

Vectors

- _ProjectionParams
- _ShadowMapTexture_TexelSize
- _ZBufferParams
- unity_OrthoParams
- unity_ShadowSplitSpheres0 [4]
- unity_ShadowSplitSqRadii
- _LightShadowData

Matrices

- unity_CameraInvProjection

DX11>

Collab Account Layers

Animator Animation Gizmos Q All

Persp

Game

Display 1 Free Aspect Scale 1x

Preview

Frame Debug

Enable Editor 12 of 19

- Camera.Render 19
 - UpdateDepthTexture 3
 - Clear (color+Z+stencil)
 - DepthPass.Job 2
 - Draw Dynamic
 - Draw Mesh Capsule
 - Drawing 14
 - Render.OpaqueGeometry 13
 - RenderForwardOpaque.Render 13
 - Shadows.RenderShadowMap 6
 - Clear (color+Z+stencil)
 - Shadows.RenderJob 5
 - Shadows.RenderJobDir 5
 - Draw Mesh Capsule
 - Draw Dynamic
 - Draw Mesh Plane
 - Draw Mesh Plane
 - Draw Mesh Plane
 - RenderForwardOpaque.CollectShadow 2
 - Shadows.CollectShadows 2
 - Clear (color)
 - Draw GL
 - Clear 1
 - Clear (Z+stencil)
 - RenderForward.RenderLoopJob 4
 - Draw Mesh Cube
 - Draw Mesh Plane
 - Draw Mesh Capsule
 - Draw Mesh Capsule
 - Camera.RenderSkybox 1
 - Draw Mesh
 - Camera.ImageEffects 2
 - RenderTexture.ResolveAA 1
 - Resolve Color
 - Draw Dynamic

DX11>

Collab Account Layer

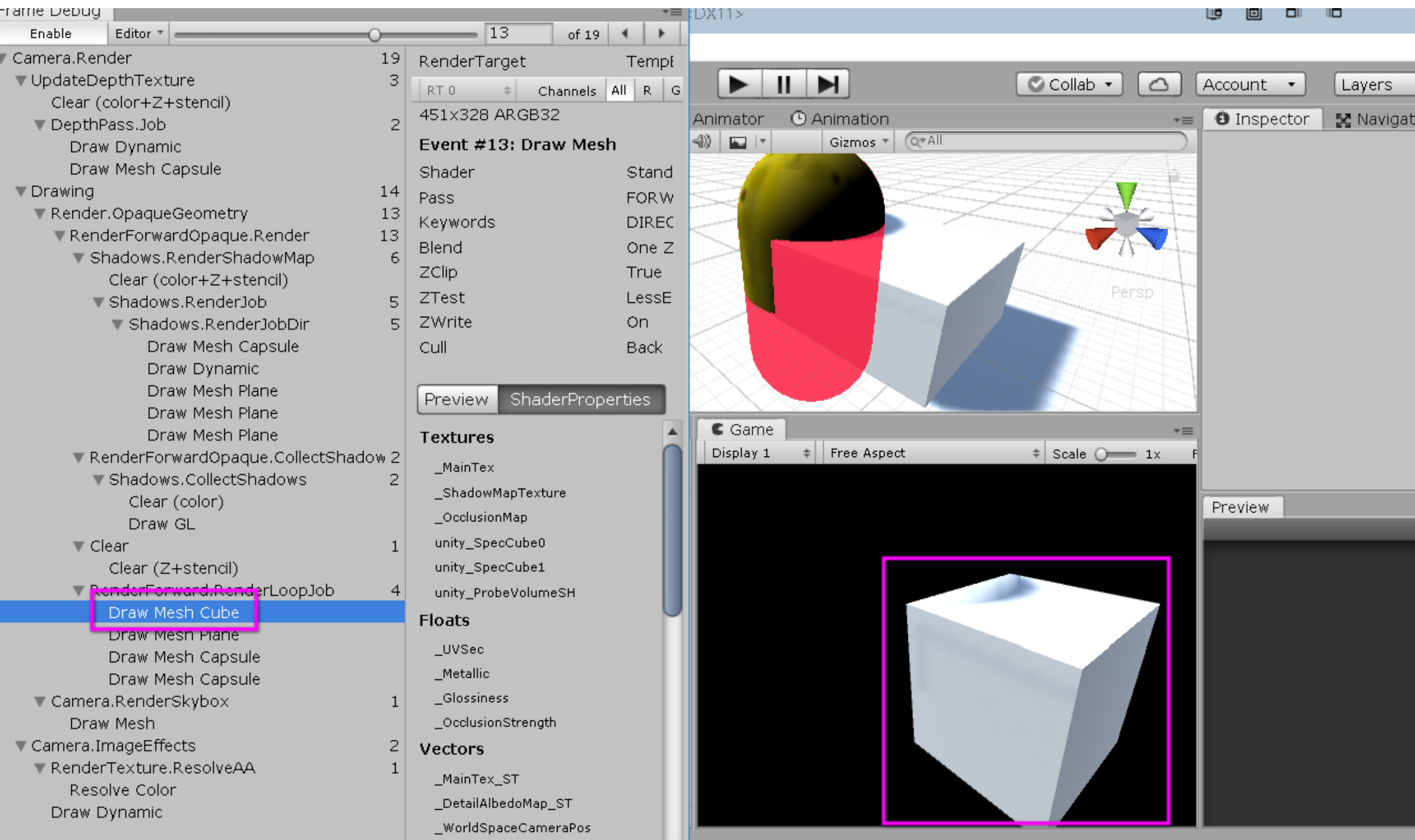
Animator Animation Gizmos All

Persp

Game

Display 1 Free Aspect Scale 1x

Preview



ame Debug

Enable Editor 14 of 19

Camera.Render 19

▼ UpdateDepthTexture 3

Clear (color+Z+stencil)

▼ DepthPass.Job 2

Draw Dynamic

Draw Mesh Capsule

▼ Drawing 14

▼ Render.OpaqueGeometry 13

▼ RenderForwardOpaque.Render 13

▼ Shadows.RenderShadowMap 6

Clear (color+Z+stencil)

▼ Shadows.RenderJob 5

▼ Shadows.RenderJobDir 5

Draw Dynamic

Draw Mesh Capsule

Draw Mesh Plane

Draw Mesh Plane

Draw Mesh Plane

▼ RenderForwardOpaque.CollectShadow 2

▼ Shadows.CollectShadows 2

Clear (color)

Draw GL

▼ Clear 1

Clear (Z+stencil)

▼ RenderForward.RenderLoopJob 4

Draw Mesh Cube

Draw Mesh Plane

Draw Mesh Capsule

Draw Mesh Capsule

▼ Camera.RenderSkybox 1

Draw Mesh

▼ Camera.ImageEffects 2

▼ RenderTexture.ResolveAA 1

Resolve Color

Draw Dynamic

RenderTarget Tempf

RT 0 Channels All R G

451x328 ARGB32

Event #14: Draw Mesh

Shader Stand

Pass FORW

Keywords DIREC

Blend One Z

ZClip True

ZTest LessE

ZWrite On

Cull Back

Preview ShaderProperties

Textures

_MainTex

_ShadowMapTexture

_OcclusionMap

unity_SpecCube0

unity_SpecCube1

unity_ProbeVolumeSH

Floats

_UVSec

_Metallic

_Glossiness

_OcclusionStrength

Vectors

_MainTex_ST

_DetailAlbedoMap_ST

_WorldSpaceCameraPos

<DX11>

Collab Account

Animator Animation

Gizmos All

Persp

Game

Display 1 Free Aspect Scale 1x

Preview

Frame Debug

Enable Editor 15 of 19

- Camera.Render
 - UpdateDepthTexture
 - Clear (color+Z+stencil)
 - DepthPass.Job
 - Draw Dynamic
 - Draw Mesh Capsule
 - Drawing
 - Render.OpaqueGeometry
 - RenderForwardOpaque.Render
 - Shadows.RenderShadowMap
 - Clear (color+Z+stencil)
 - Shadows.RenderJob
 - Shadows.RenderJobDir
 - Draw Mesh Capsule
 - Draw Dynamic
 - Draw Mesh Plane
 - Draw Mesh Plane
 - Draw Mesh Plane
 - RenderForwardOpaque.CollectShadow
 - Shadows.CollectShadows
 - Clear (color)
 - Draw GL
 - Clear
 - Clear (Z+stencil)
 - RenderForward.RenderLoopJob
 - Draw Mesh Cube
 - Draw Mesh Plane
 - Draw Mesh Capsule**
 - Draw Mesh Capsule
 - Camera.RenderSkybox
 - Draw Mesh
 - Camera.ImageEffects
 - RenderTexture.ResolveAA
 - Resolve Color
 - Draw Dynamic

RenderTarget Tempf

RT 0 Channels All R G

451x328 ARGB32

Event #15: Draw Mesh

Shader Custo

Pass #0

Blend SrcAlp

ZClip True

ZTest Always

ZWrite Off

Cull Off

Why this draw call can't be batched

Objects have different materials.

Preview ShaderProperties

Floats

_Outline

Vectors

_OutlineColor

Matrices

glstate_matrix_projection

unity_MatrixInvV

unity_MatrixVP

DX11>

Collab Account

Animator Animation

Gizmos All

Persp

Game

Display 1 Free Aspect Scale 1x

Preview

Game Debug

Enable Editor 16 of 19

Camera.Render 19

- ▼ UpdateDepthTexture 3
 - Clear (color+Z+stencil)
- ▼ DepthPass.Job 2
 - Draw Dynamic
 - Draw Mesh Capsule
- Drawing 14
 - ▼ Render.OpaqueGeometry 13
 - ▼ RenderForwardOpaque.Render 13
 - ▼ Shadows.RenderShadowMap 6
 - Clear (color+Z+stencil)
 - ▼ Shadows.RenderJob 5
 - ▼ Shadows.RenderJobDir 5
 - Draw Mesh Capsule
 - Draw Dynamic
 - Draw Mesh Plane
 - Draw Mesh Plane
 - ▼ RenderForwardOpaque.CollectShadow 2
 - ▼ Shadows.CollectShadows 2
 - Clear (color)
 - Draw GL
 - ▼ Clear 1
 - Clear (Z+stencil)
 - ▼ RenderForward.RenderLoopJob 4
 - Draw Mesh Cube
 - Draw Mesh Plane
 - Draw Mesh Capsule
 - Draw Mesh Capsule**
 - ▼ Camera.RenderSkybox 1
 - Draw Mesh
 - ▼ Camera.ImageEffects 2
 - ▼ RenderTexture.ResolveAA 1
 - Resolve Color
 - Draw Dynamic

RenderTarget	Temp
RT 0	Channels All R G
451x328 ARGB32	
Event #16: Draw Mesh	
Shader	Custo
Pass	#1 (F
Blend	One Z
ZClip	True
ZTest	LessE
ZWrite	On
Cull	Back

Why this draw call can't be batched

An object is using a multi-pass shader.

Preview ShaderProperties

Textures

_MainTex

Vectors

_LightColor0

_Color

_WorldSpaceLightPos0

Matrices

unity_MatrixVP

DX11>

Collab Account

Animator Animation

Gizmos All

Persp

Game

Display 1 Free Aspect Scale 1x

Preview

References

- ✓ Youtube, "Unite 2015 - Writing Shaders"

MY **BRIGHT** FUTURE

동서대학교

DSU Dongseo University
동서대학교