

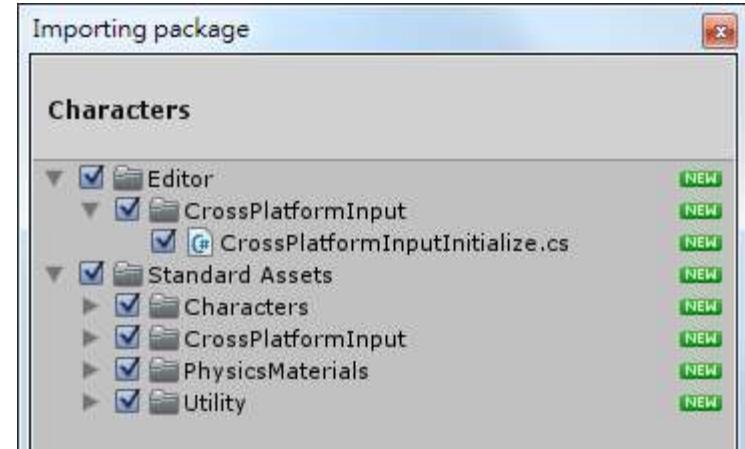
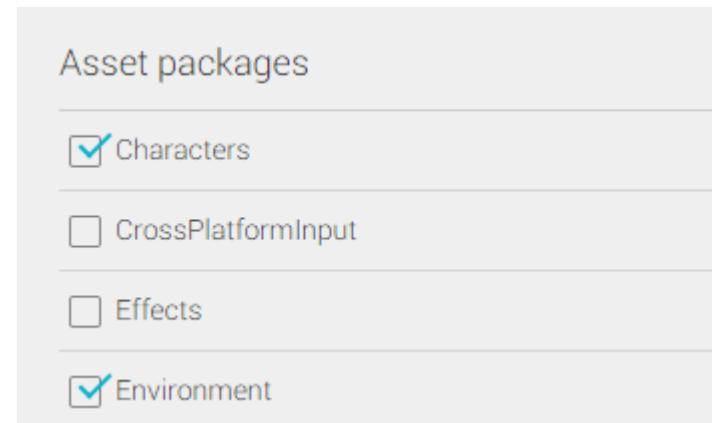
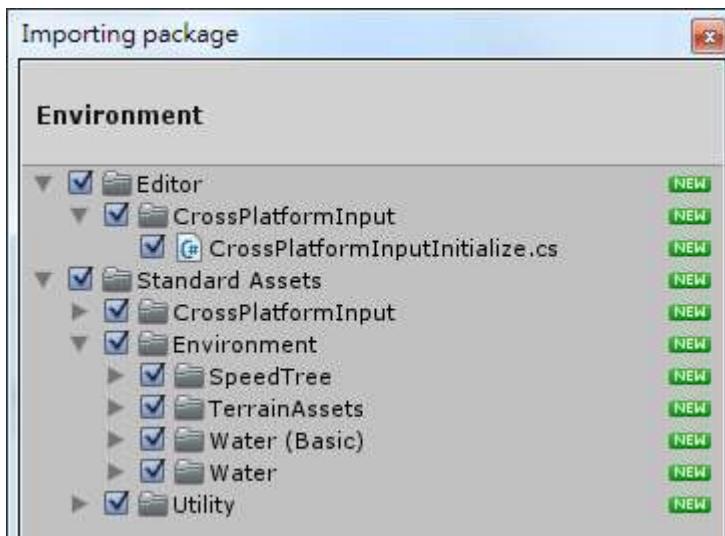
Topics

- Terrain
- Environment
- Rigidbody Physics

Terrain

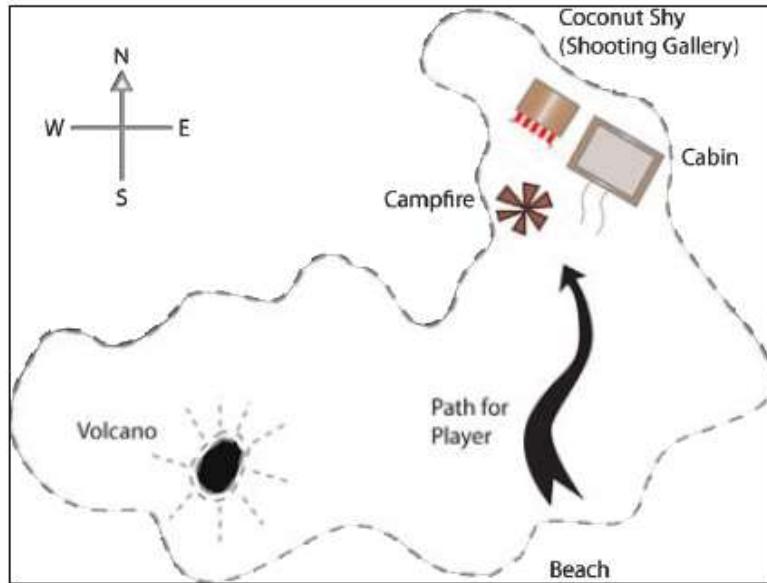
Terrain Project

- Create a new project including the following standard assets package
 - Characters
 - Environment



Designing the map

- Before creating the terrain, we should design the map with the indicator of different building and items

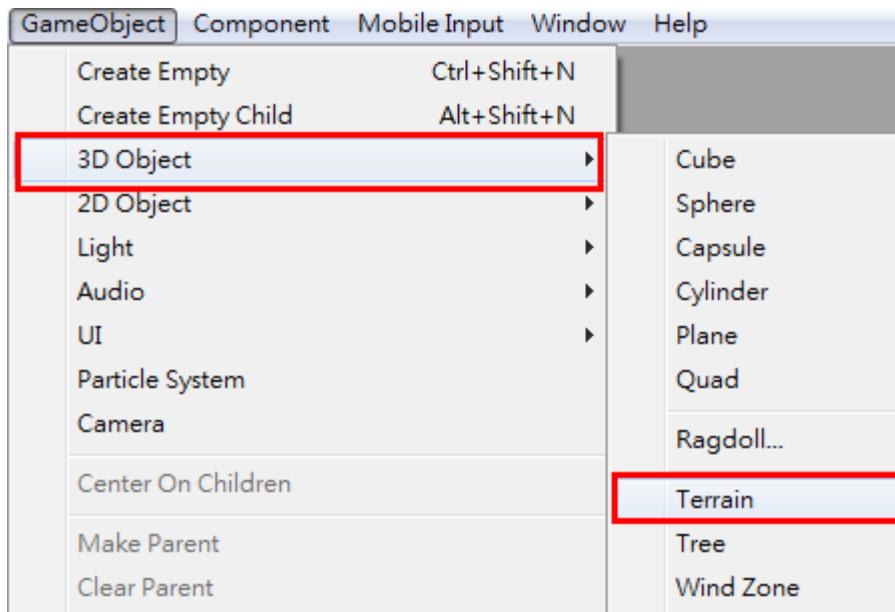


Terrain Setting

- Most of the game engine bundles with the terrain editor for fast generation of outdoor environment
- Multi layer texture can be added to the terrain
- For easy adding details such as trees, rocks, foliage and atmospheric effects such as wind

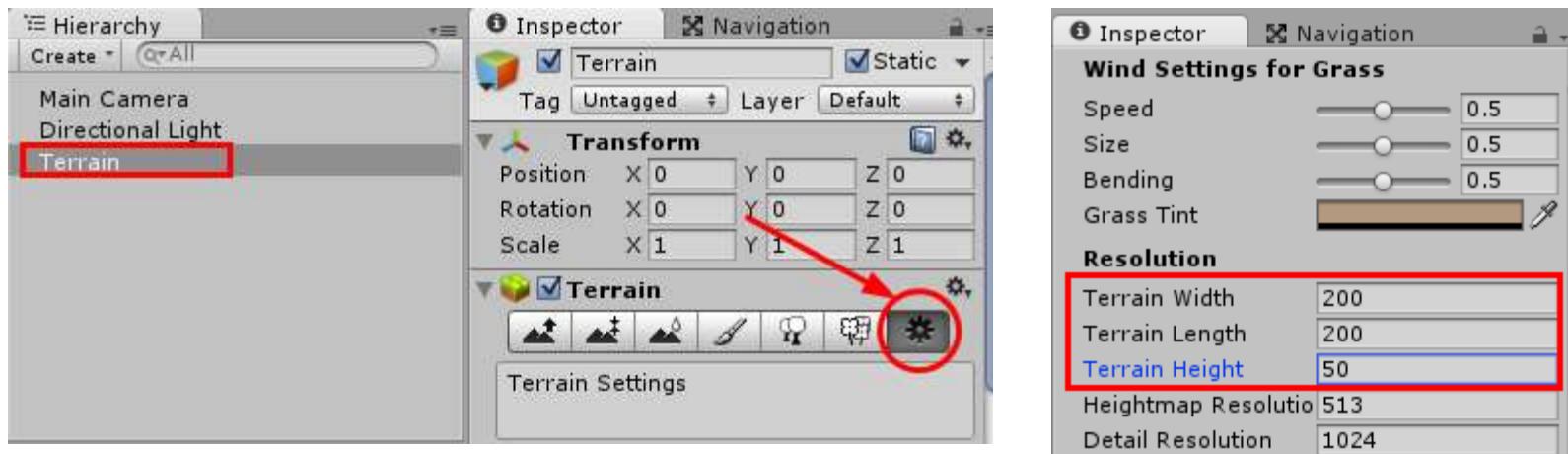
Terrain Setting

- Create a new terrain
 - GameObject → Terrain



Terrain Setting

- Setup the size of the terrain at the inspector
 - Width → 200
 - Length → 200
 - Height → 50



Terrain Setting

- **Terrain Width, Height, and Length**
 - Height is the max. height of the terrain
- **Heightmap Resolution**
 - Resolution of texture used to store the height details in pixels
 - Always add an extra pixel
- **Detail Resolution**
 - Defines how precisely you can place details on the terrain (e.g. plant, rocks and bushes)
- **Detail Resolution Per Patch**
 - Resolution of each patch of the terrain, that is, painted on

Terrain Setting

■ Control Texture Resolution

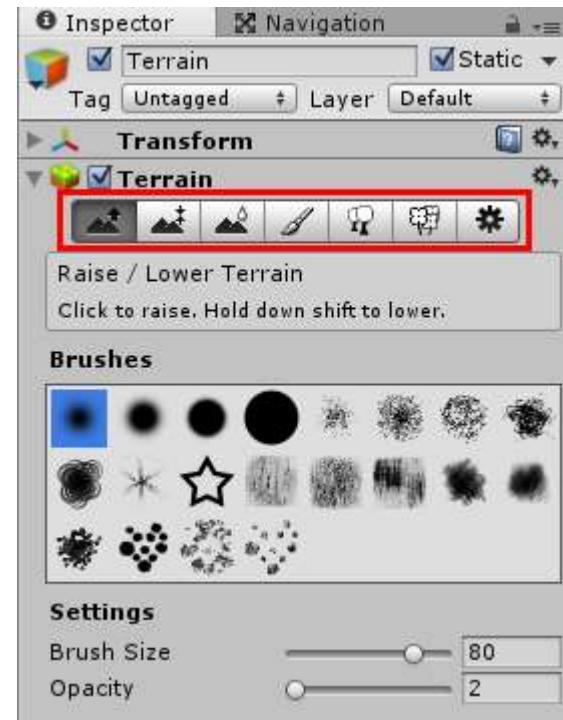
- Resolution of textures when painted onto the terrain
- The higher this value, the finer control you will get with edges between multiple texture sin the same area

■ Base Texture Resolution

- Resolution of the texture used by Unity to render terrain areas in the distance that are further from the in-game camera or on older performance hardware

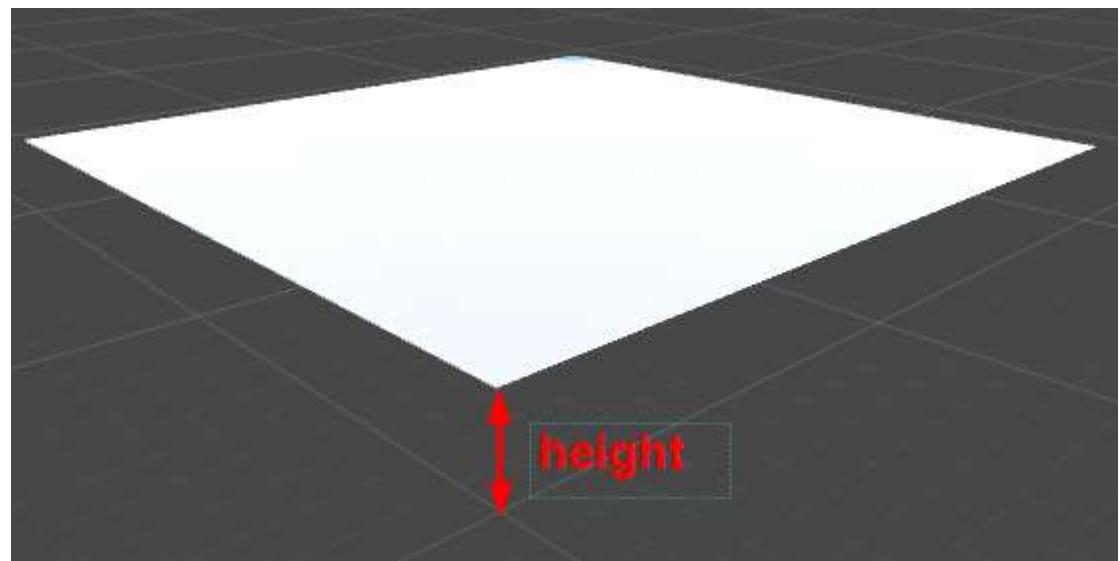
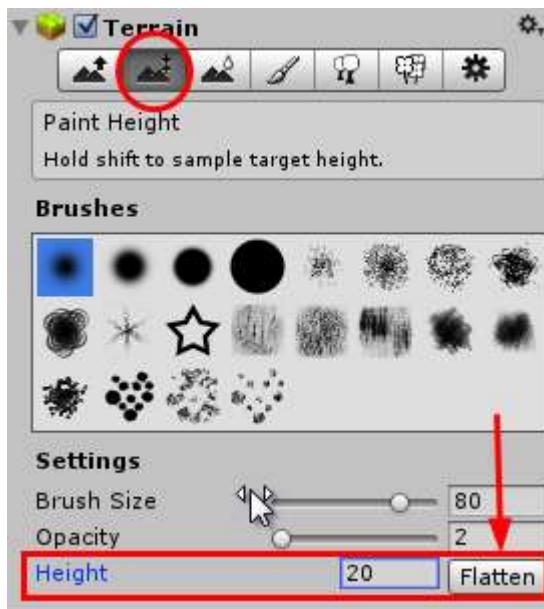
Raise Height

- Select the terrain, select the terrain script icon to change the height and shape of the terrain
- You can change the brush size and opacity together with different brushes shape
- Use the first icon to raise the terrain
- Hold the “shift” button to lower the terrain



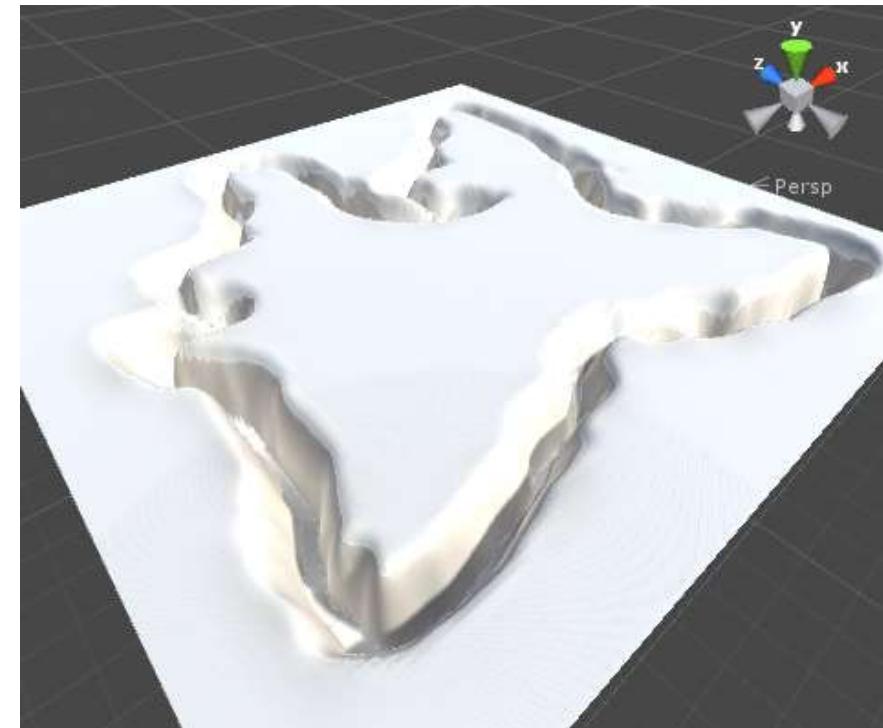
Flatten Heightmap

- By default, terrain height begins at zero, if you want to create seashore or lake, you have to raise the terrain to the certain height
- Select the “Paint Height” tool and type in the “Height” and press “Flatten” to raise the terrain to the certain level



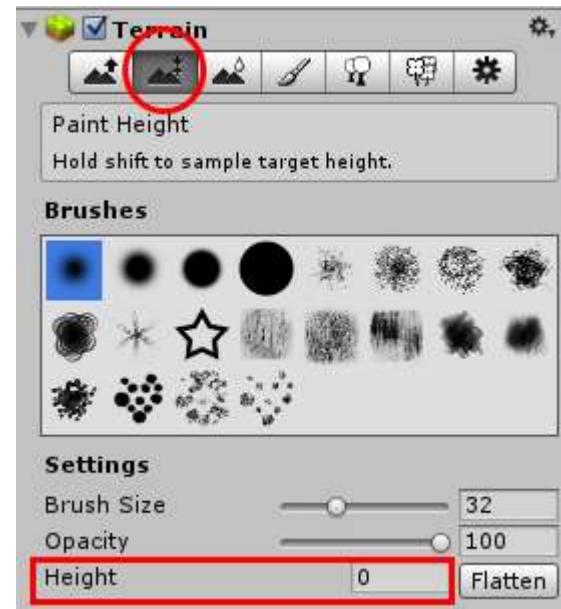
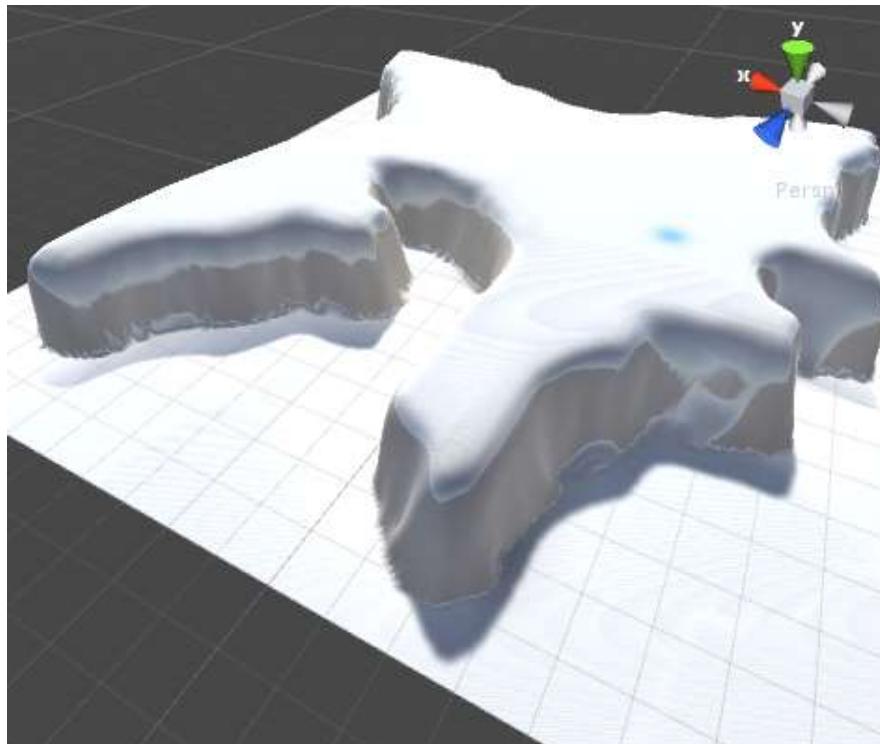
Raise Height

- Switch to the top view
- Select the “Paint Height” tool and set the Height to “0”
- Lower the terrain along the seashore



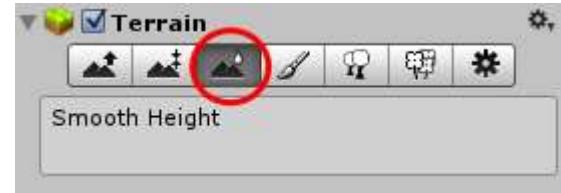
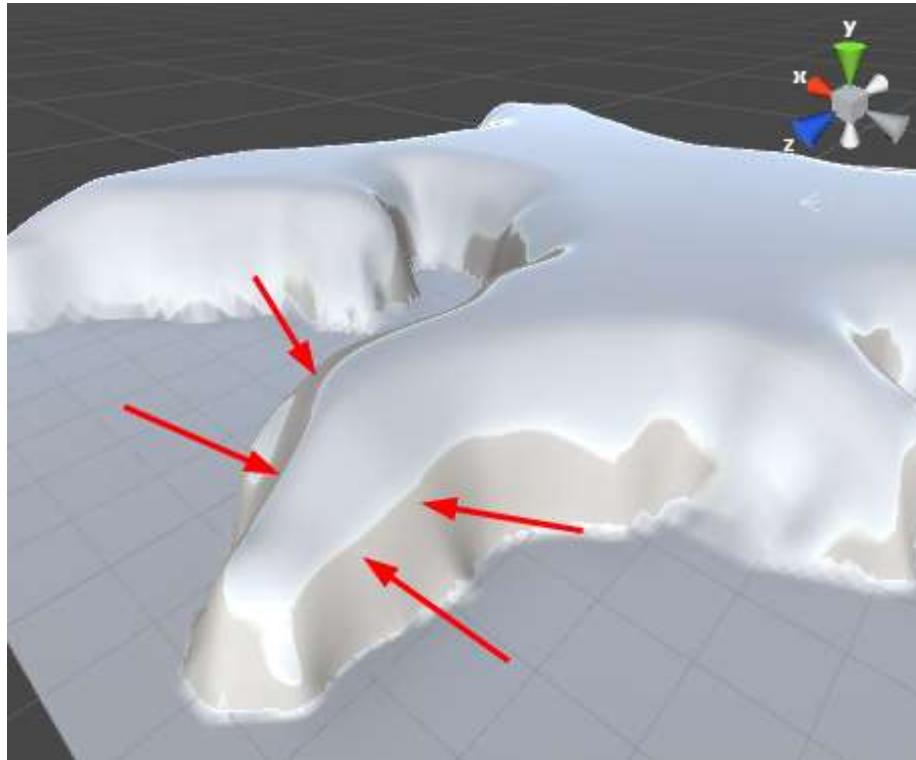
Raise Height

- Now paint the terrain height of the seabed to 0
 - Set the Height to 0 so that the minimum painted height will be 0
 - Paint height is also useful to create plateau



Raise Height

- Use the “Raise/Lower Terrain” and “smooth height” tool to refine the cliff and edge of the island and seashore
- Continue to refine the shape by different height tools



Create Plateau

- Set the following

- Brush size 100
- Opacity 20
- Height 40

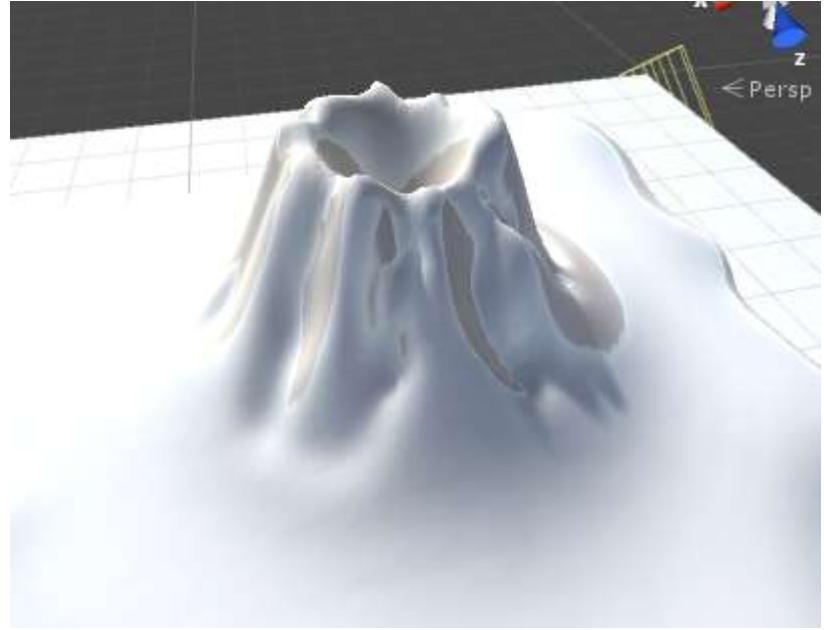
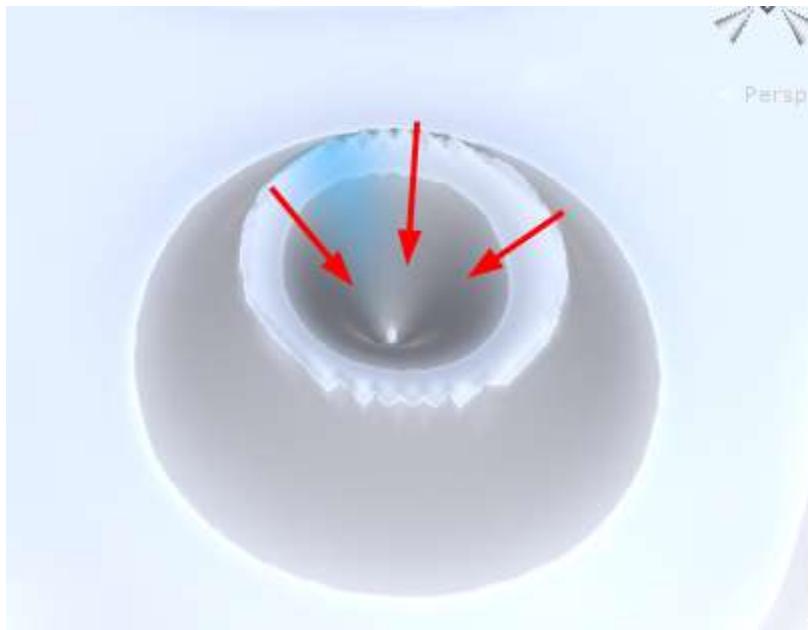


- Draw in anti-clockwise spiral shape from outside to center to create a plateau



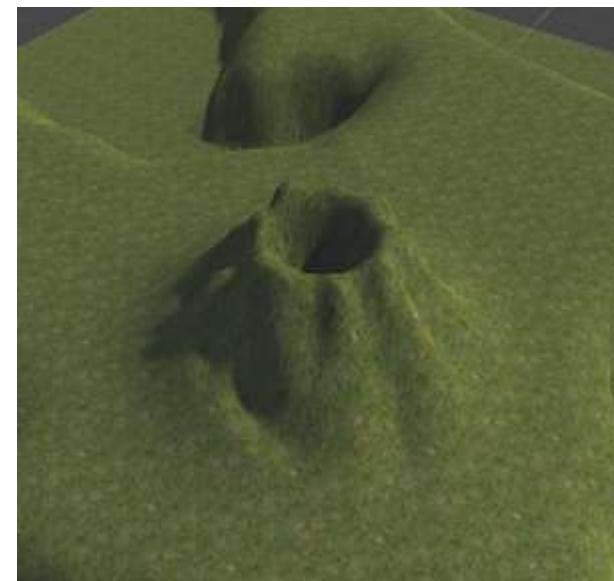
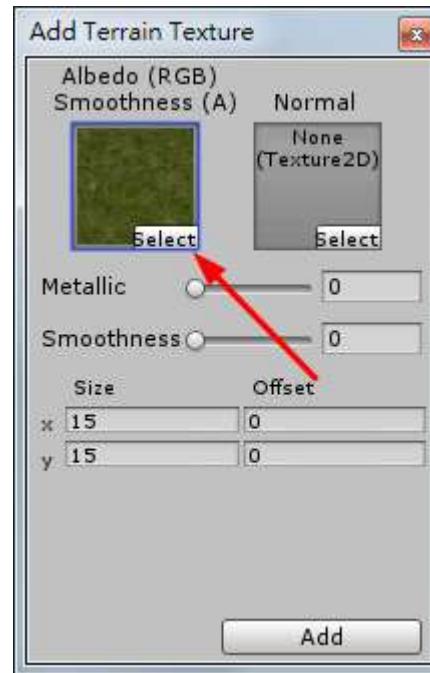
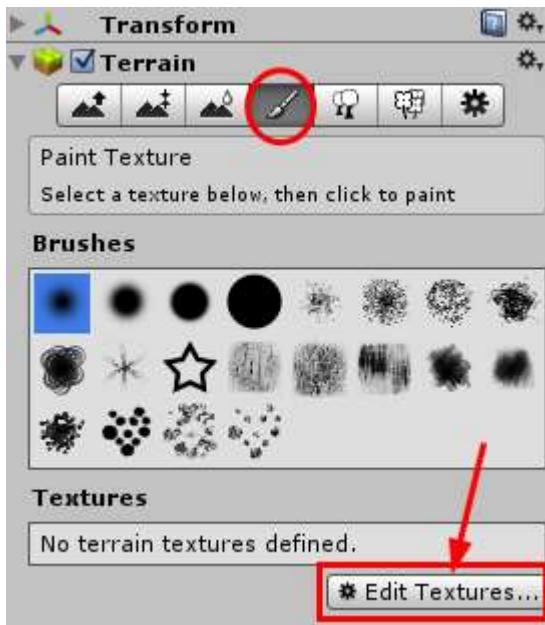
Create Volcano

- Lower the center part of the plateau to create a volcano
- Refine the shape of the volcano



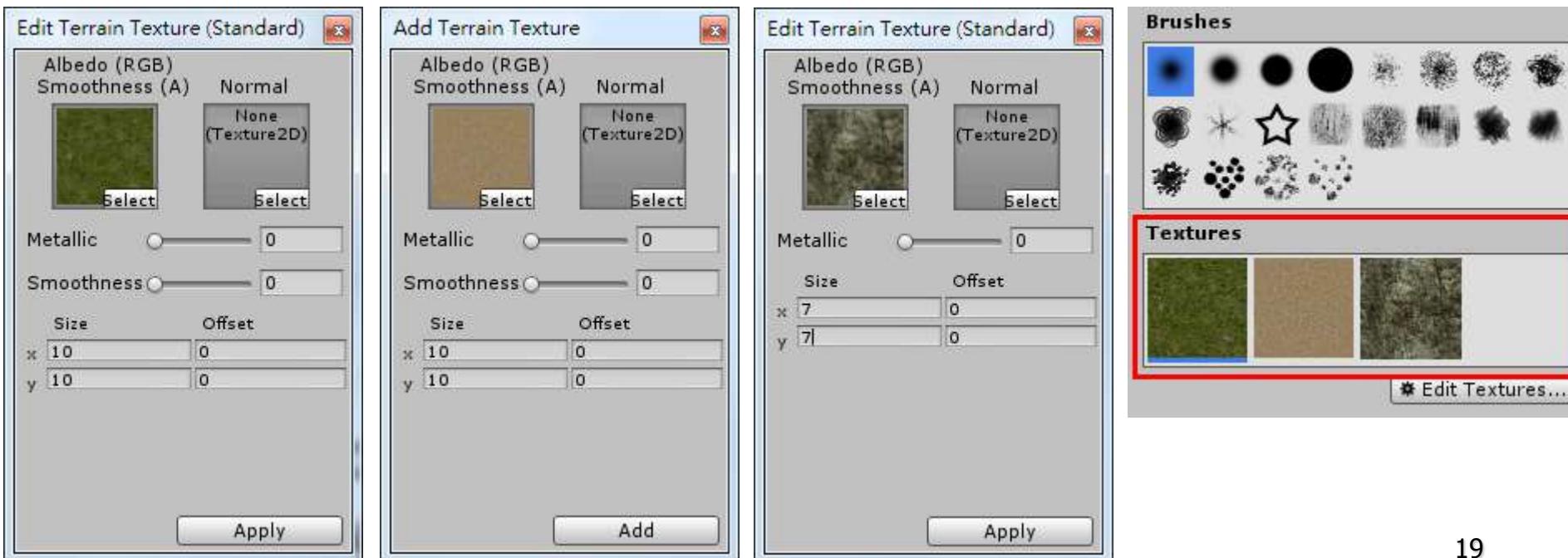
Adding Textures

- Select the “Paint Texture” tool and press “Edit Textures”
- Choose “Add Texture” and select the base texture that will cover most of the area
- The smaller the size, the more detail the texture will be



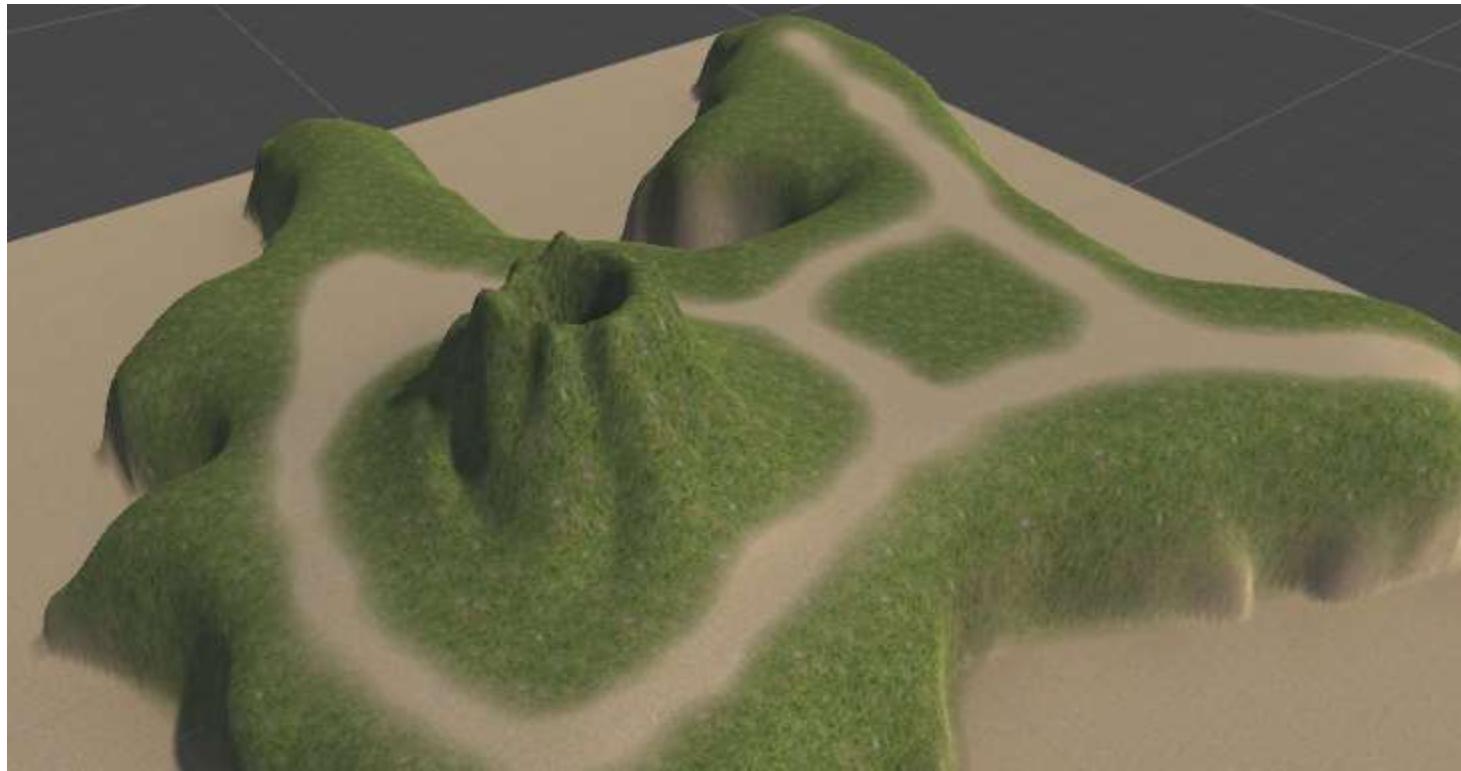
Adding Textures

- The Environment package includes the basic grass, sand and cliff textures, now add another textures
- Use the same size setting unchanged for all except Cliff (stretched area)



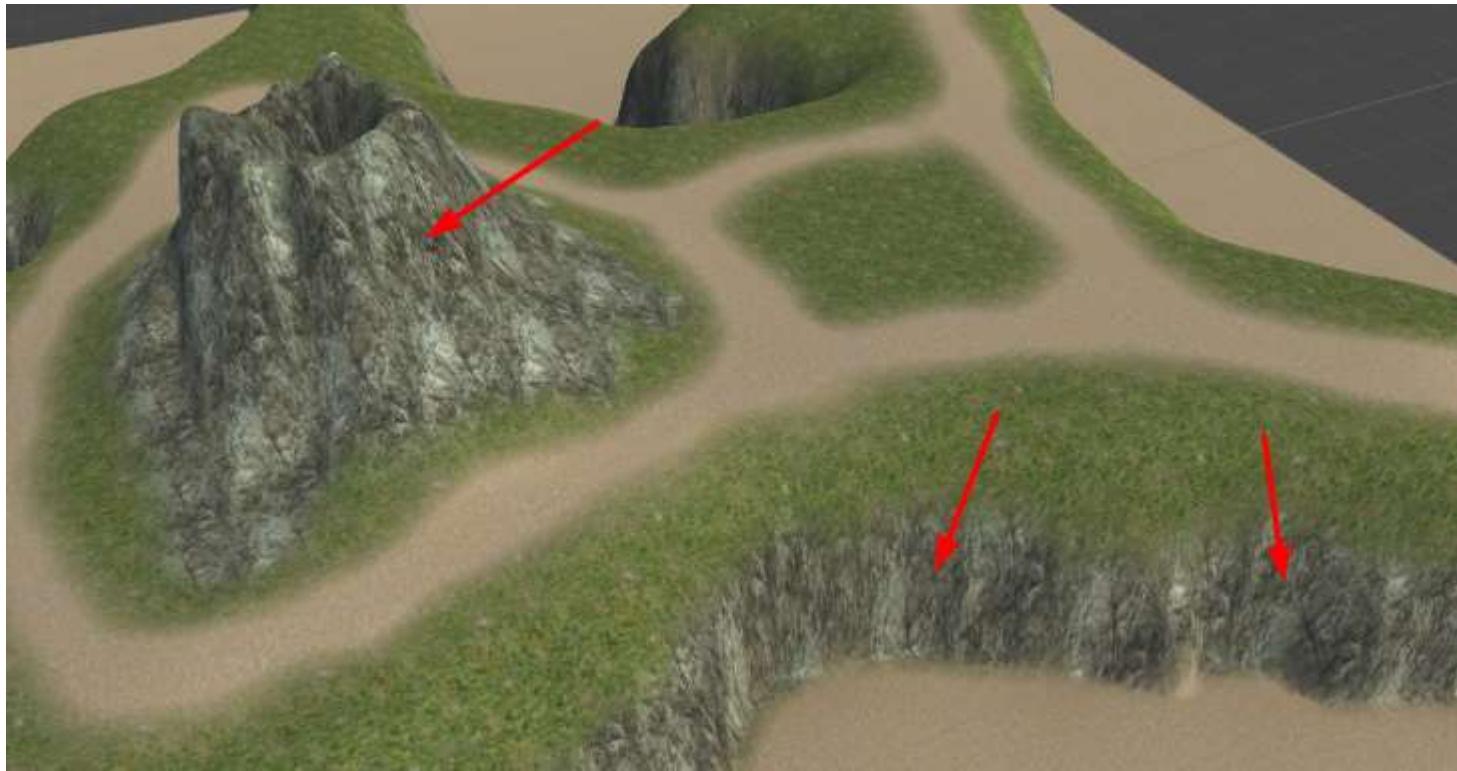
Texture Painting

- Draw the road and seabed with the sandy texture



Texture Painting

- Use the cliff texture to draw the cliff and volcano area



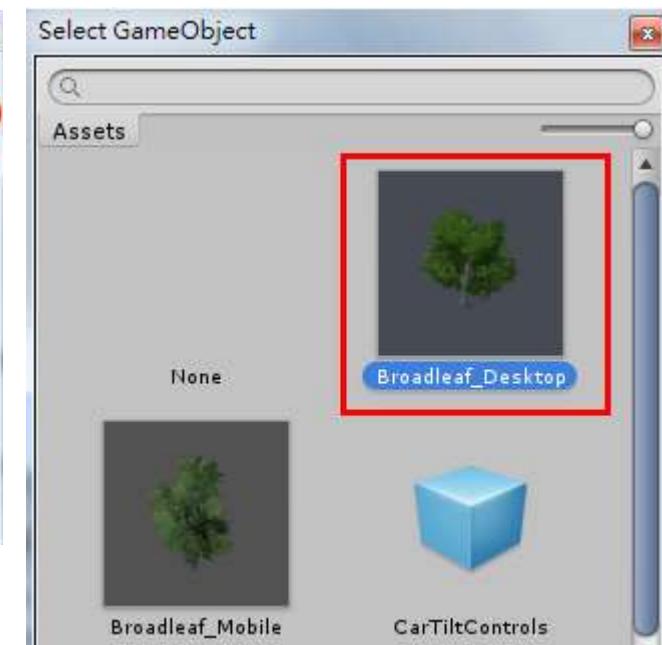
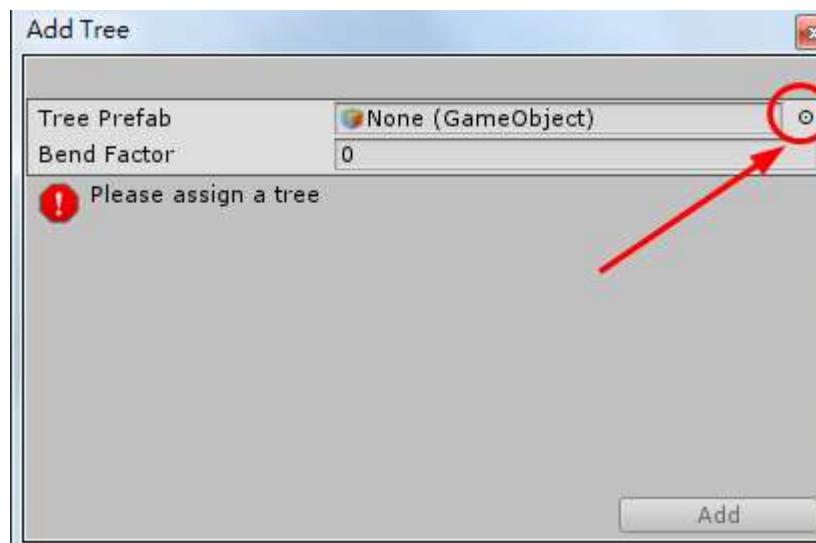
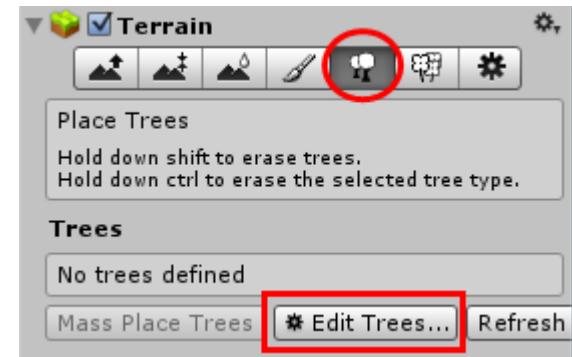
Refine

- Finally refine the shape according to the painted texture



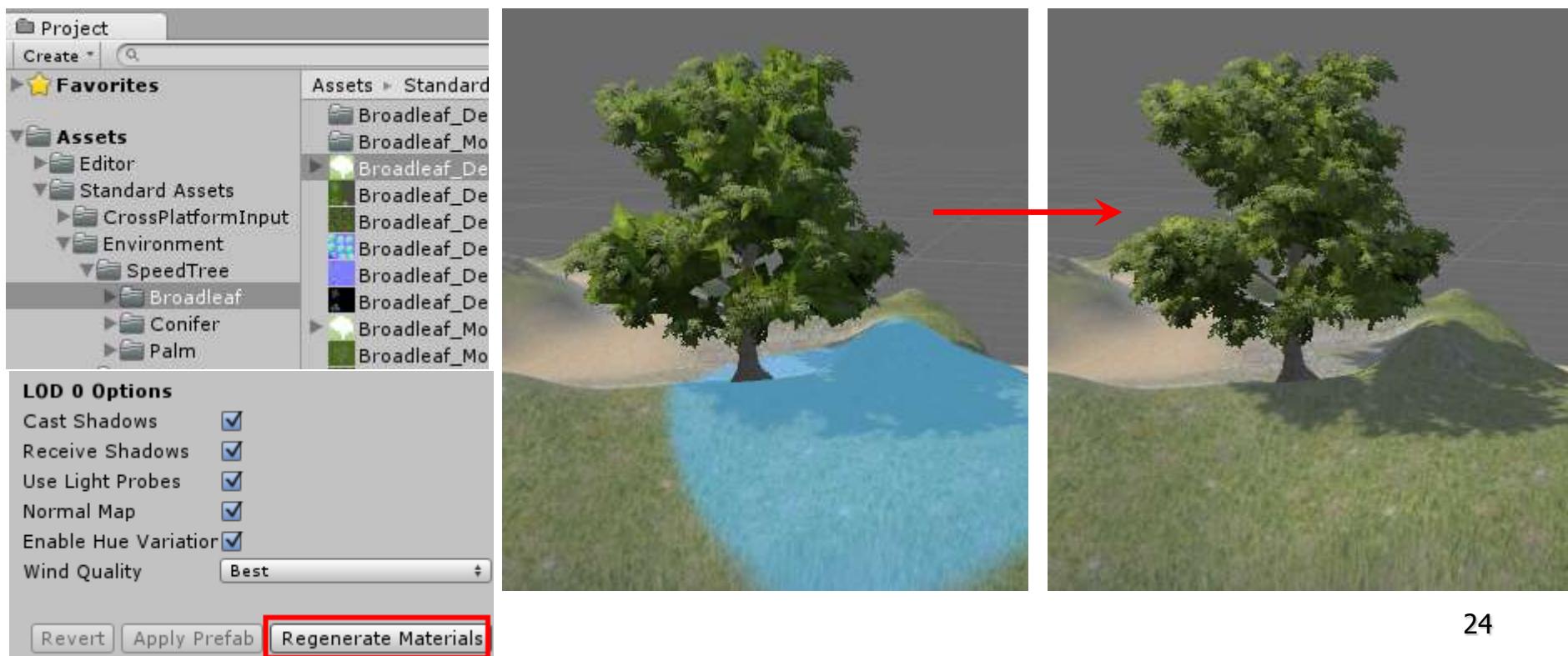
Tree

- Use the “Place Trees” tool to create tree
- Press the “Edit Trees” button to add tree



Tree

- Select the added tree
- Set the right brush size and paint on the terrain
- Select the original tree file and regenerate the materials



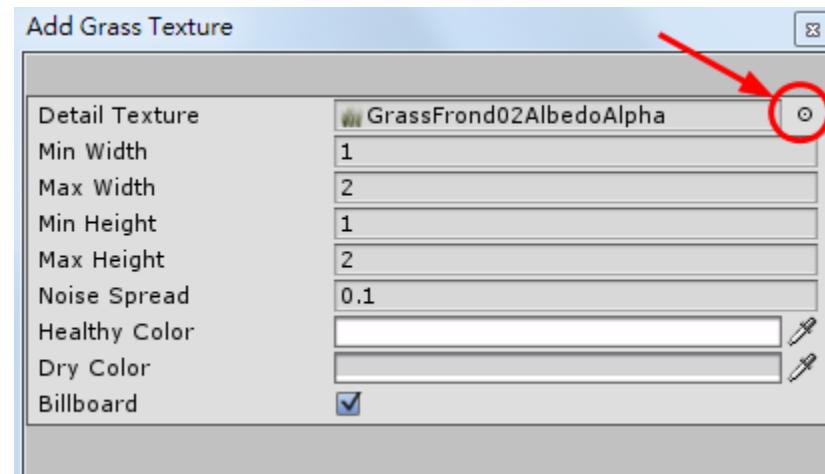
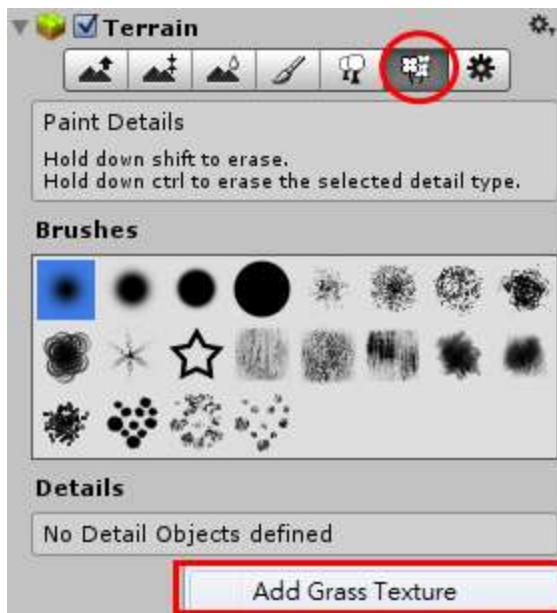
Tree

- Adjust the tree density as well as the tree height to paint on the terrain
- Hold the shift key to remove painted trees



Grass

- Add the grass by using the “Paint Details” tool
- Grass is made of billboard



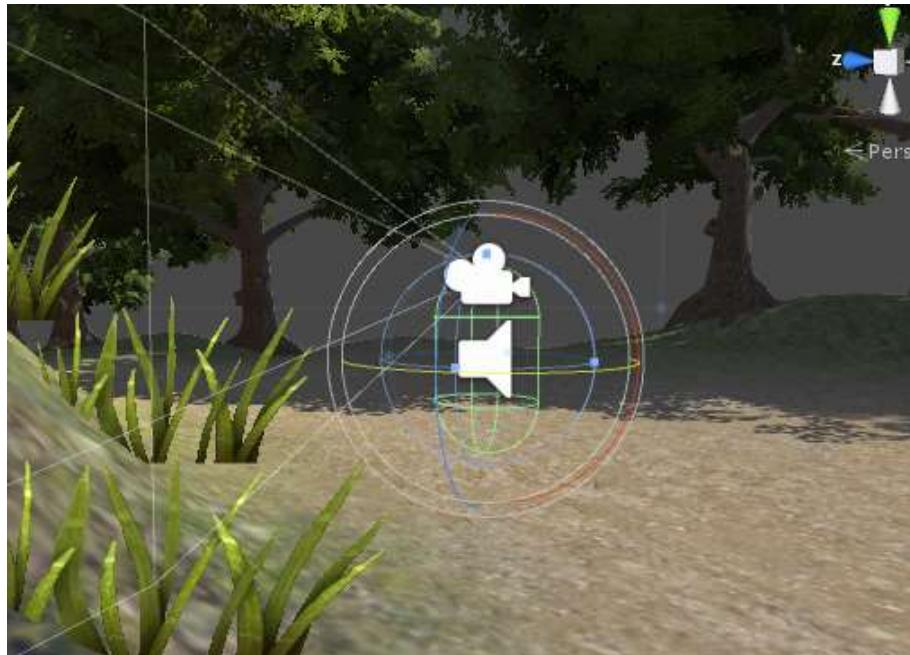
Grass

- Zoom closer to the terrain before painting grass
- Use lower size, opacity and strength to paint



Walkthrough

- Finally placed the FPS Controller to the scene



Scene view



Game view

Environment

SkyBox

- Unity 5 used a procedural skybox by default
- More skybox material can be found from the Asset store



SkyBox

- SkyBox material use the cube map texture
- Cube map textures can be in form of 6 faces or panoramic images



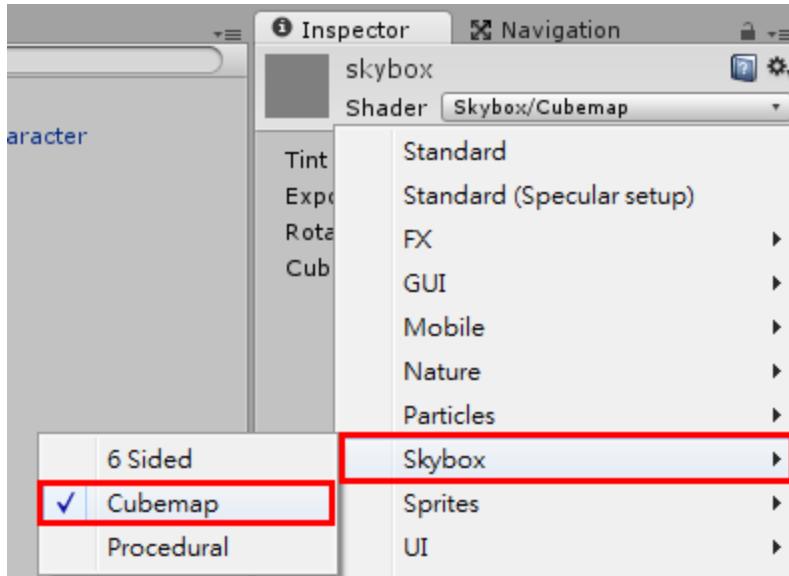
6 faces cube map texture



Panoramic texture

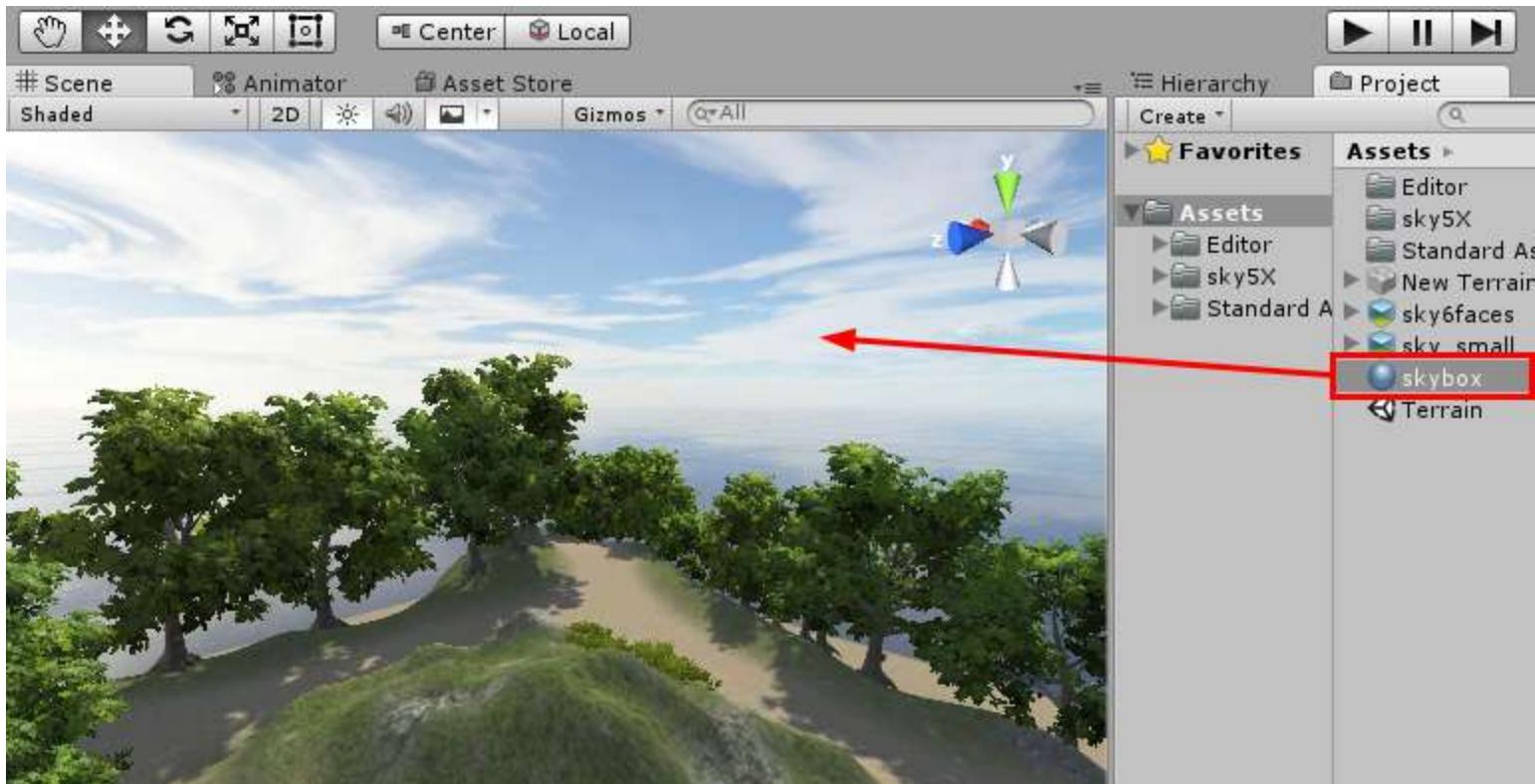
SkyBox

- Create a new material, change the shader to Skybox → Cubemap
- The imported map must be converted to cube map



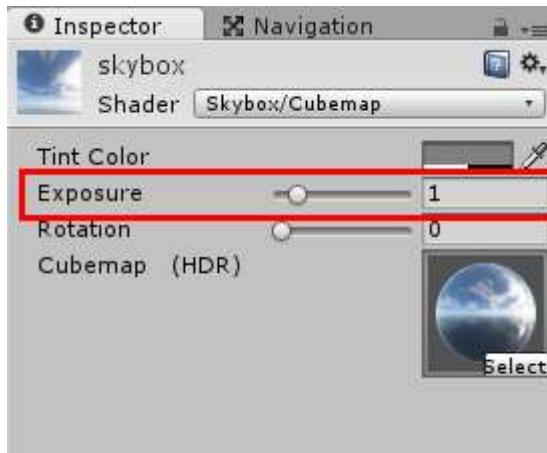
SkyBox

- Drag the skybox material directly to the scene
- Remember to adjust the light direction



SkyBox

- You may adjust the exposure of the skybox material



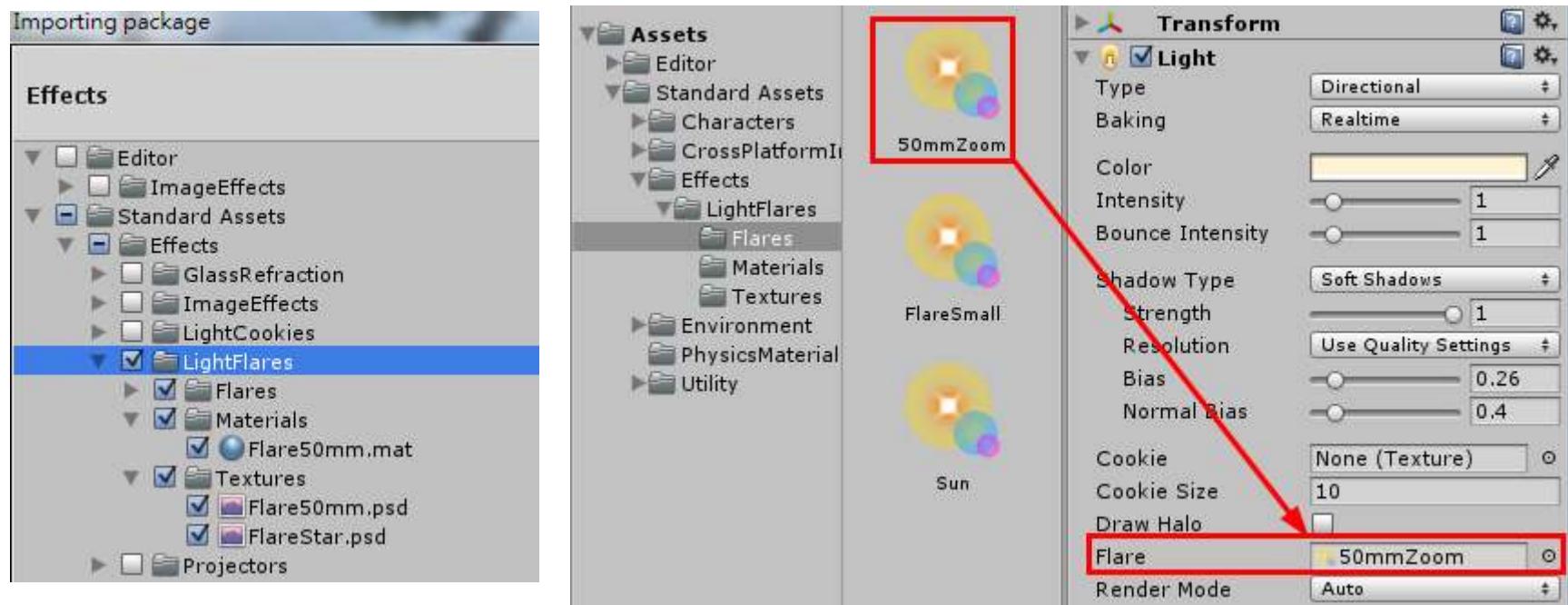
Exposure = 1



Exposure = 2

Light Flares

- Light scattered in lens systems
- Can be found inside the Effects package
- Drag it directly to the Flare slot of the light



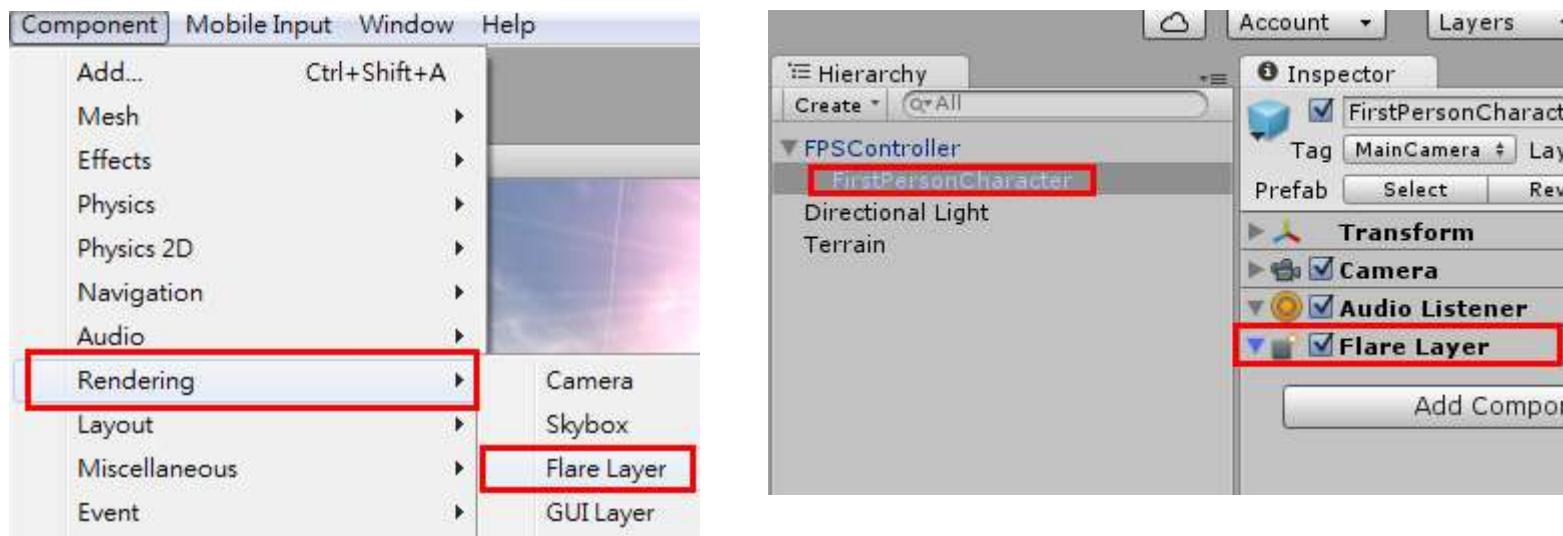
Light Flares

- Can be viewed when looking at the light direction in the Scene window



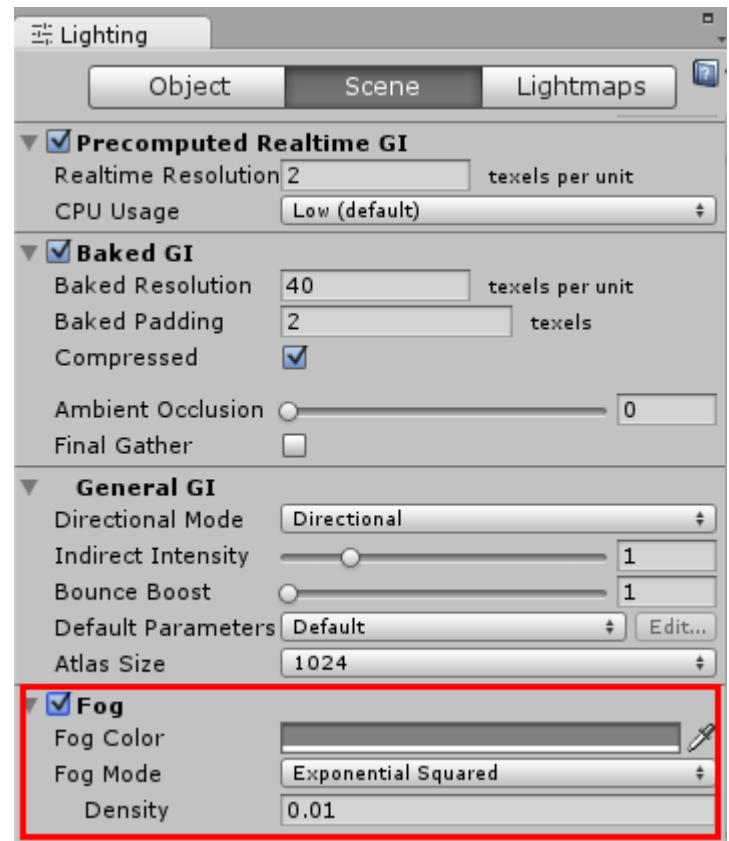
Light Flares

- In order to display light flares in game window, you need to add the “Flare Layer” component to the FPSController → FirstPersonCharacter



Fog

- Use to reduce the viewing distance
- Create mood of the environment
- Setting can be find from the light menu
 - Window → Lighting



Fog

- It's a good idea to match your Fog color to the color of the skybox



Saved Resources

Baked Padding: 2
Compressed:
Ambient Occlusion:
Final Gather:

General GI

Directional Mode: Directional
Indirect Intensity: (value ~0.5)
Bounce Boost: (value ~0.5)
Default Parameters: Default
Atlas Size: 1024

Fog

Fog Color:
Fog Mode: Linear
Start: 20
End: 80

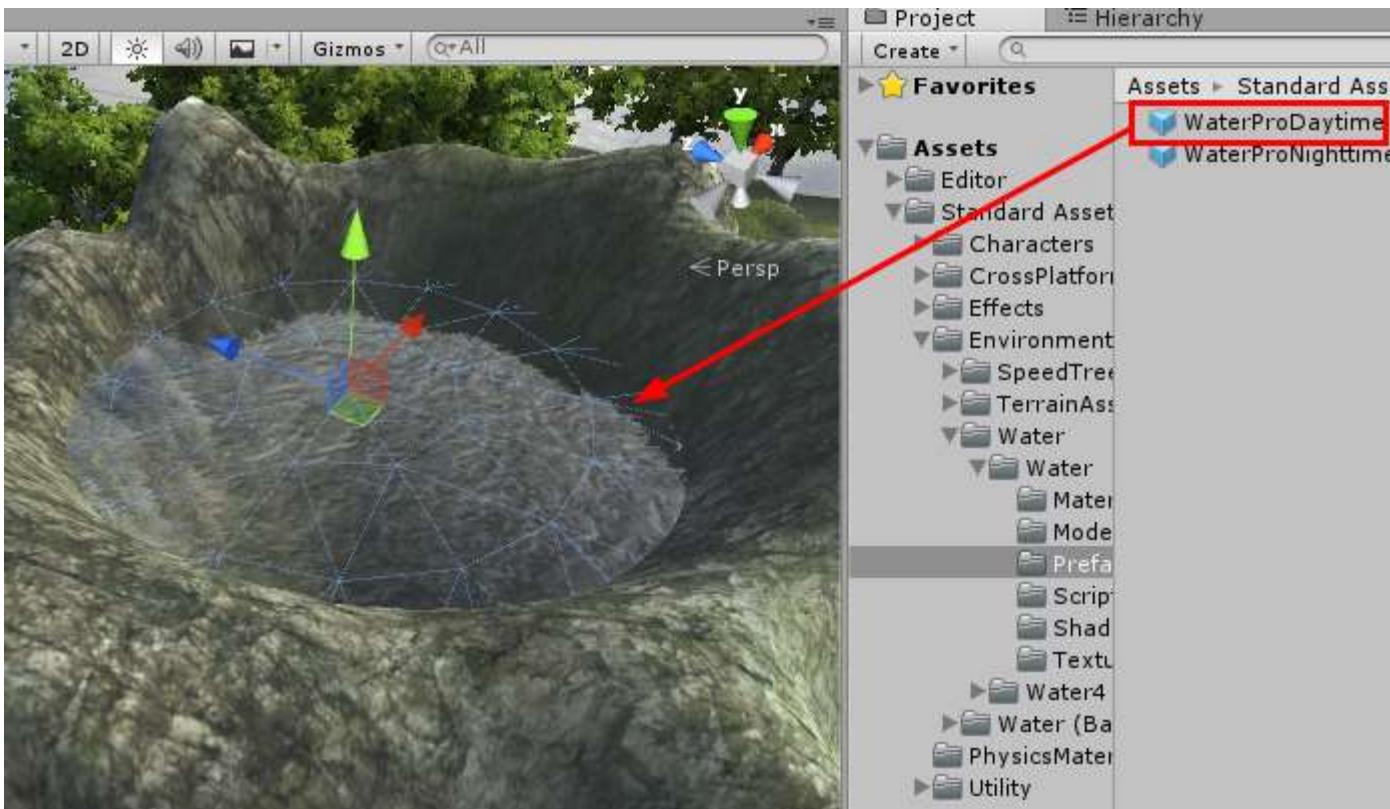
Other Settings

Baking of lightmaps is automatic because the 'Bake' button is set to 'Auto'. The lightmap data is stored in the .lmp file.

Auto

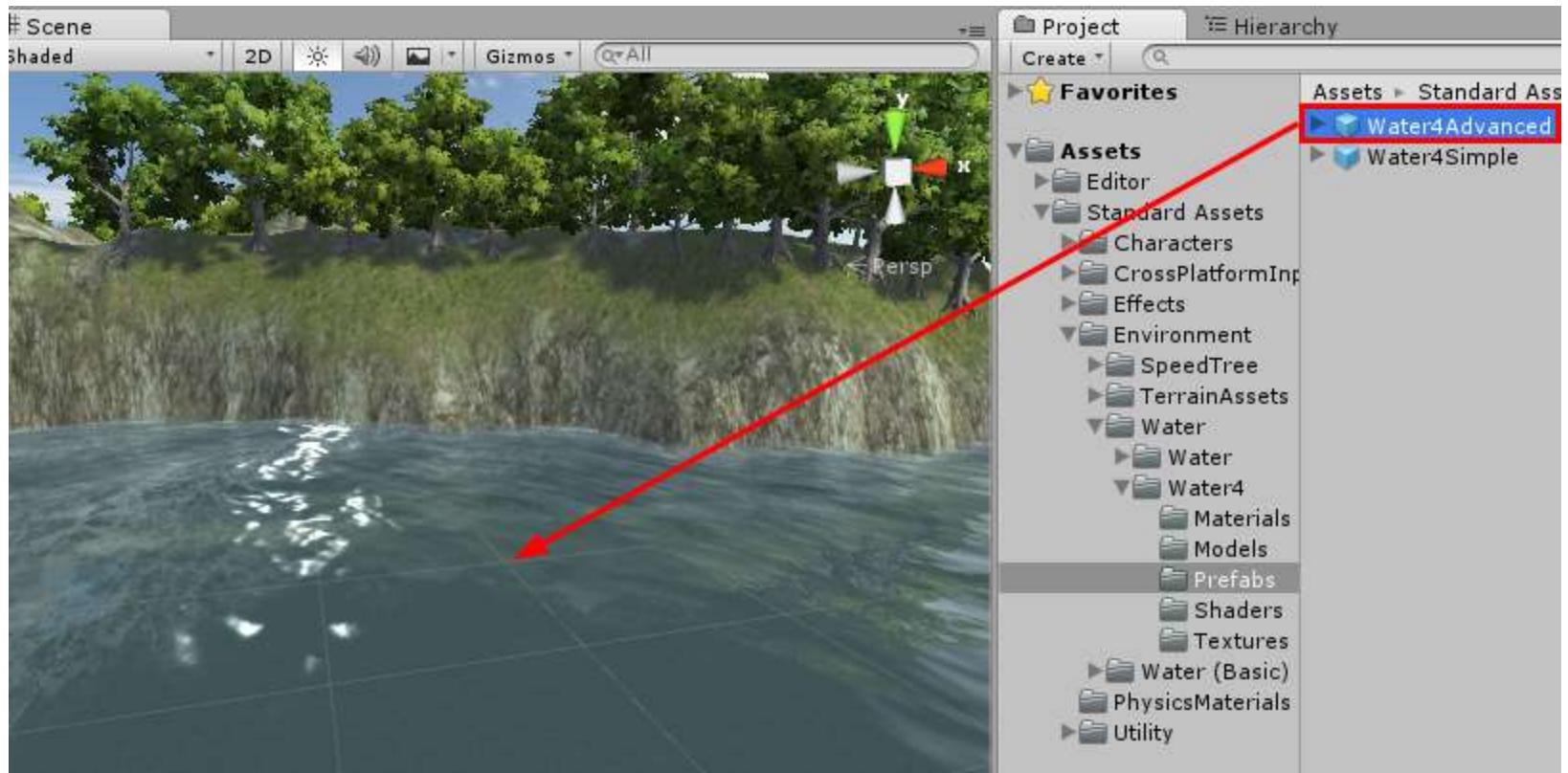
Water

- Can be found inside the Environment Package
 - Environment → Water → Water → WaterProDaytime



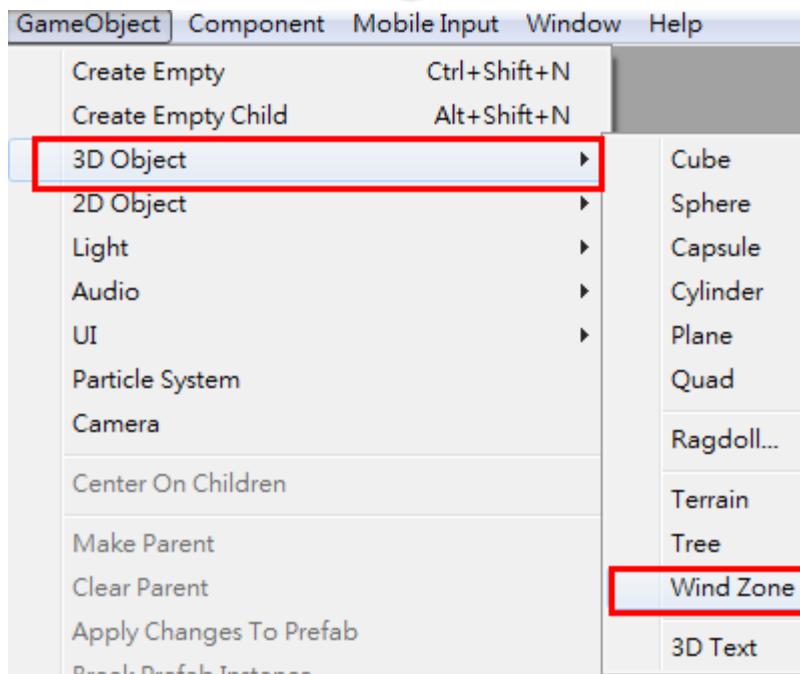
Water

- Use Water4 to create ocean
 - Environment → Water → Water4 → Water4Advanced



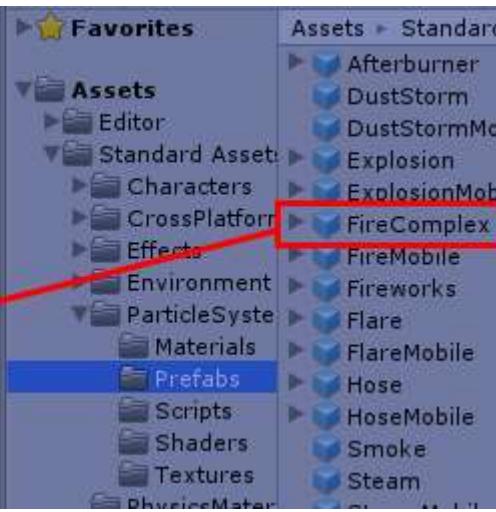
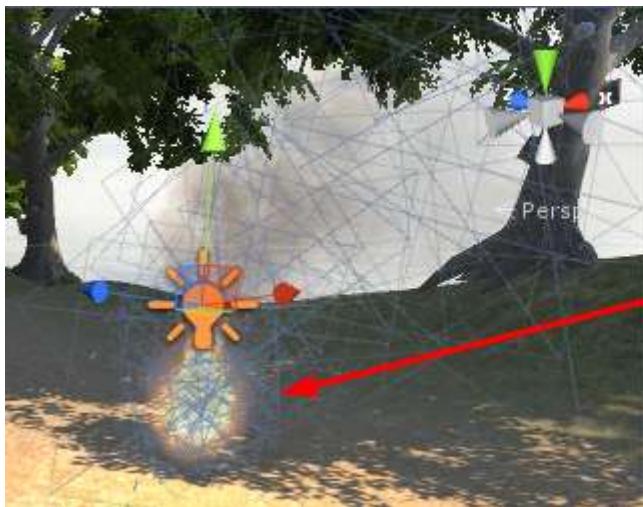
Wind

- Trees can be bended by wind
- Add the wind zone to control the wind direction and magnitude



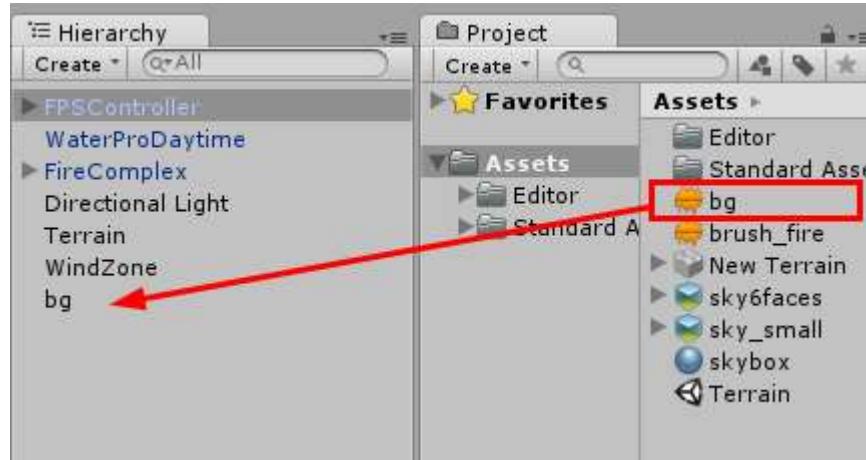
Particles System

- Particles are used to simulate moving liquids, smoke, clouds, flames and magic spells...
- Import the ParticleSystem package for premade particles



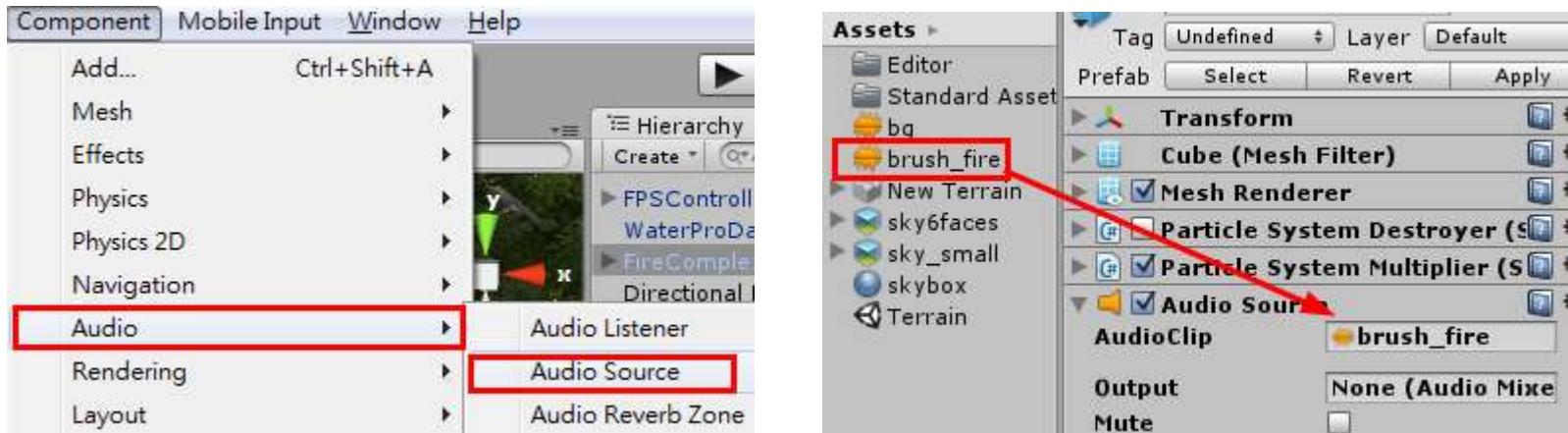
Audio

- Unity5 supports .aif, .wav, .mp3 and .ogg audio file formats
- Background audio can be added by dragging from the Project window to the Hierarchy window



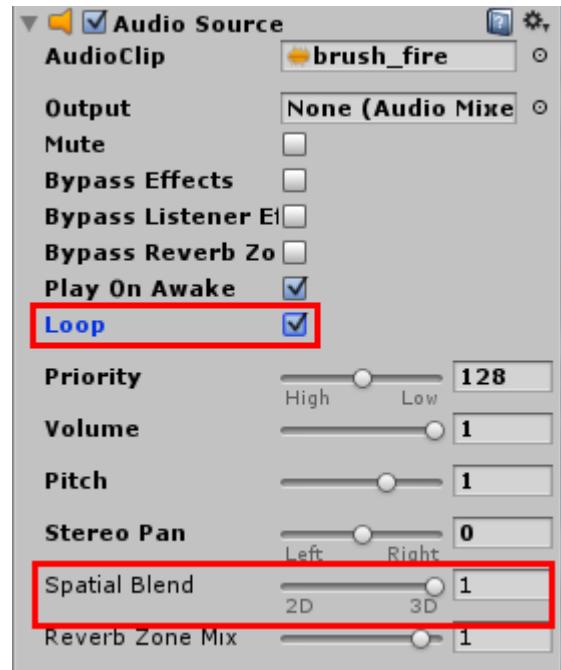
Audio

- If audio need to be comes from particular game object, you have to add the Audio Source component to that game object
- Drag the audio file to the AudioClip slot



Audio

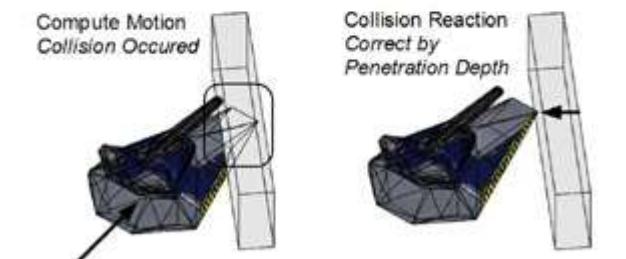
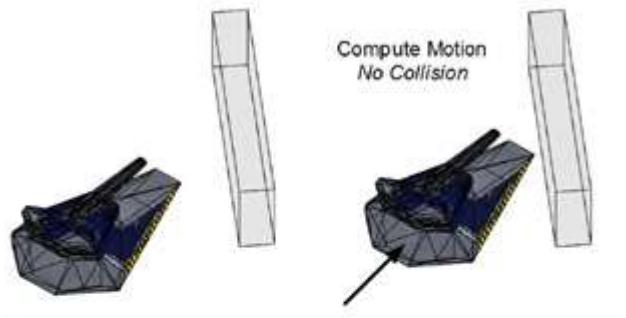
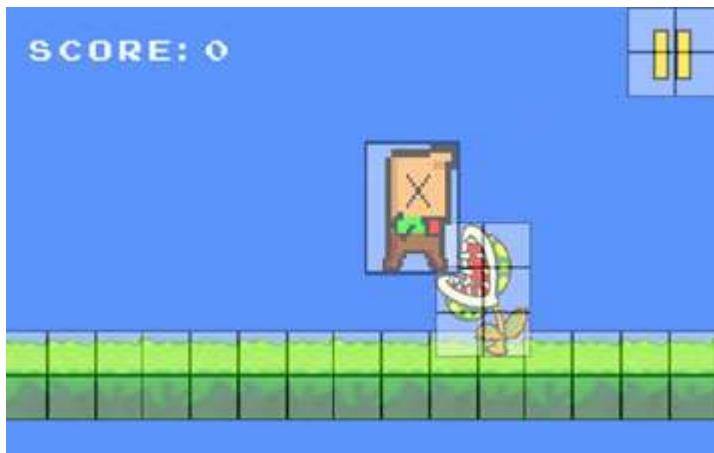
- Enable “Loop” if the audio need to be played repeatedly
- Change the “Spatial Blend” to 3D if the audio source is added to the game object rather than background audio



Rigidbody Physics

Collision Detection

- The calculations regarding the points of impact, e.g.
 - Bullet hitting object in shooting game
 - Walking and Stepping of the character on terrain / mesh
 - Boundary of the accessible area



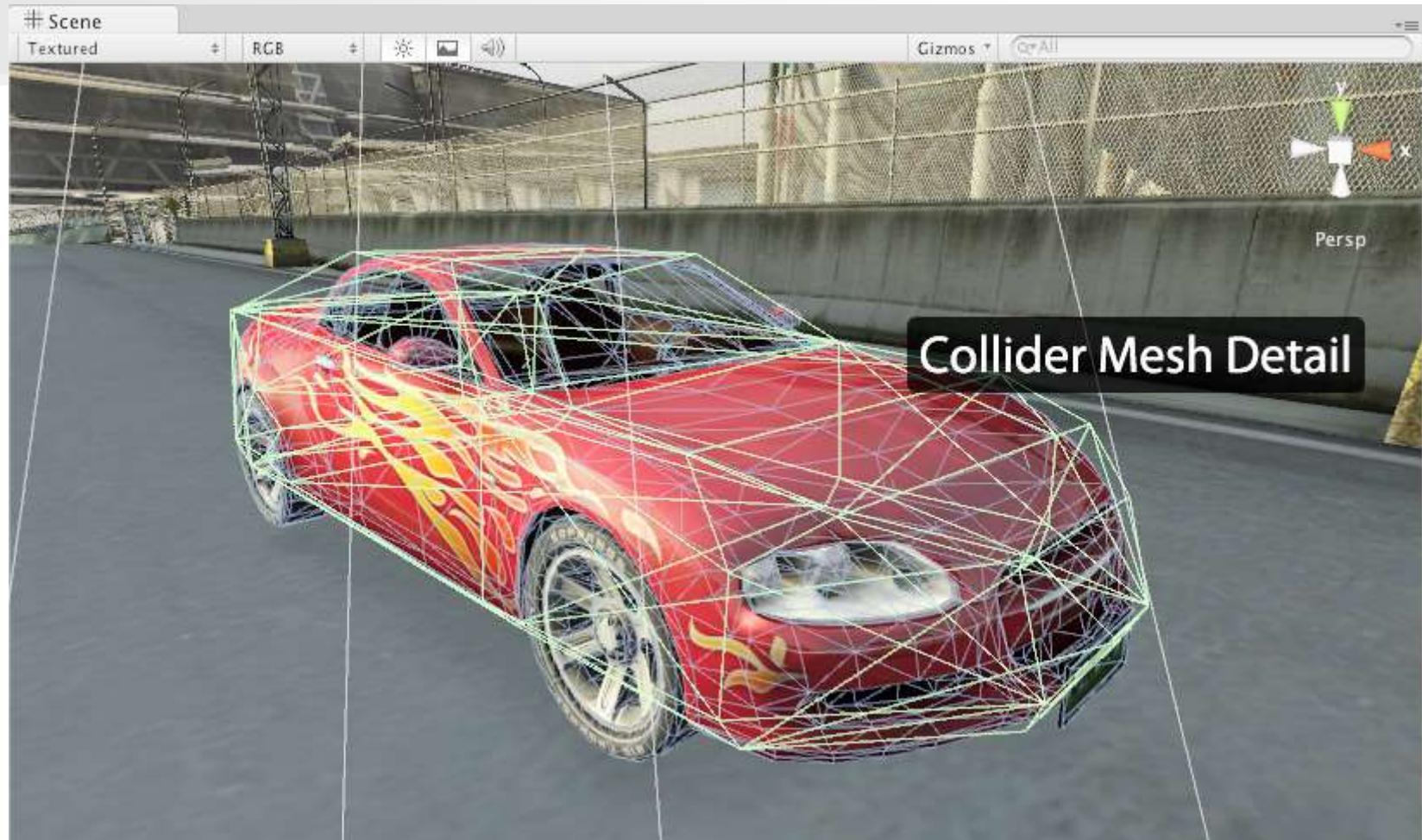
Collider

- Collider is the 3D shape used for detecting collision
- Game object usually use a simplified shape for collision detection rather than its own shape
 - Save computation time
 - Such as box, sphere and capsule (for character)

Collider

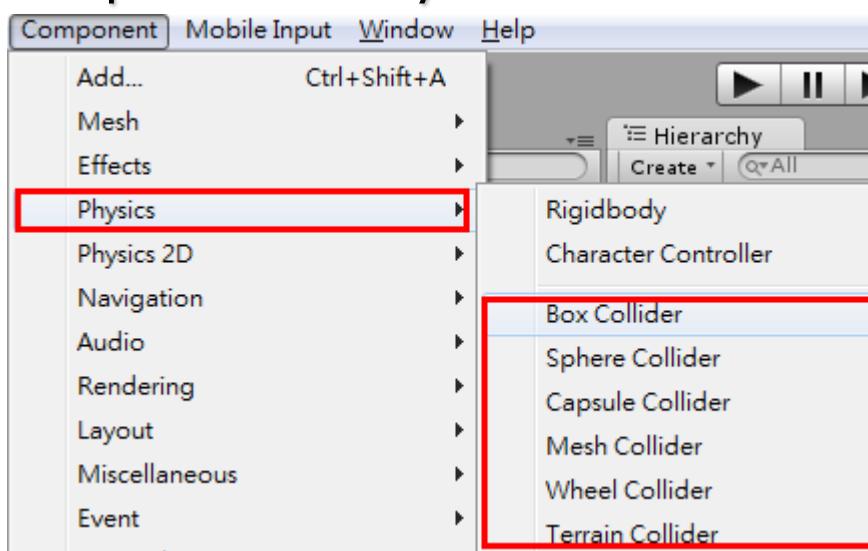


Collider



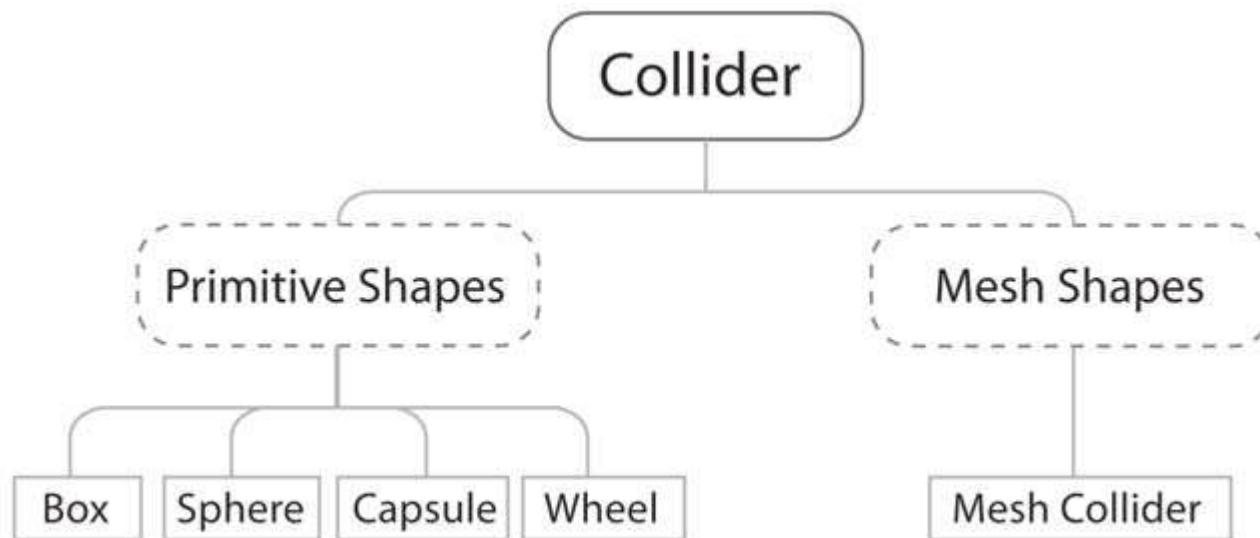
Collider

- Without collider, 3D object will not be involved in the physic calculation
- Unity provide colliders with different shapes
- To add the collider to the object
 - Select the game object
 - Component → Physic → ????? Collider



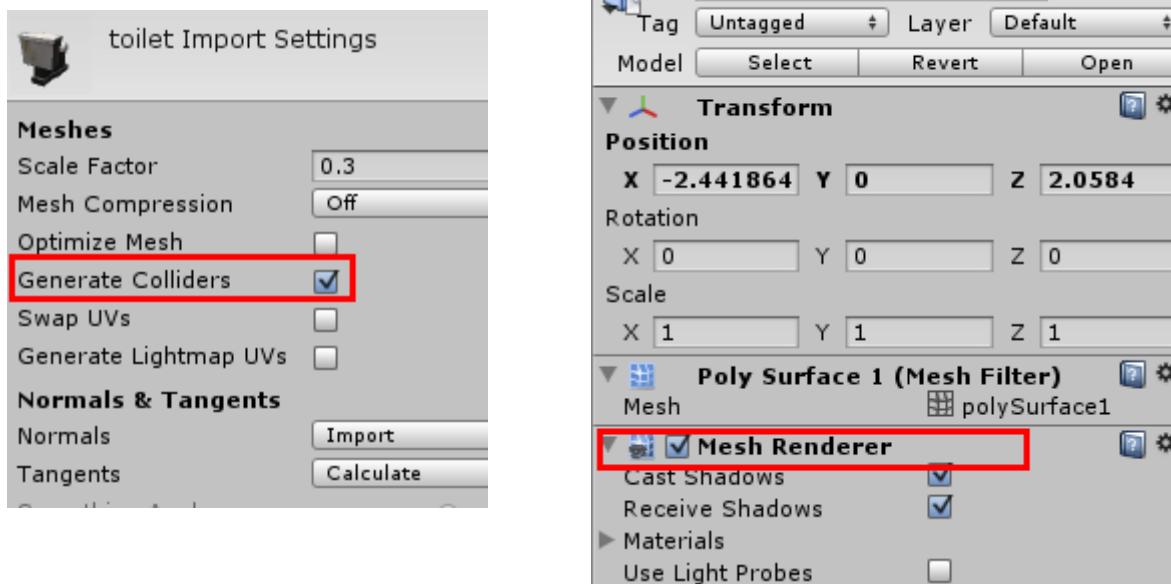
Collider

- The following diagram illustrates the various types and subtypes of **collider**:



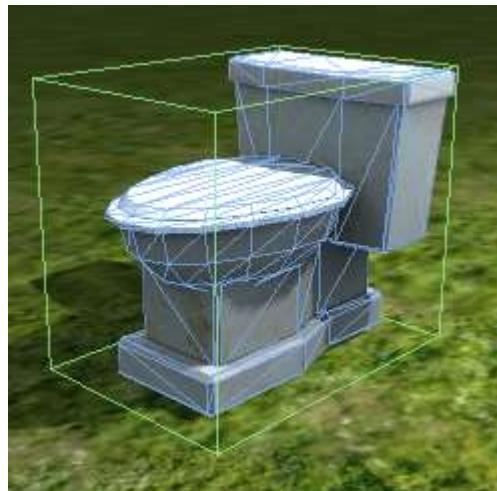
Collider Type

- You may use the object itself as the collider by adding the **mesh collider** from the inspector panel

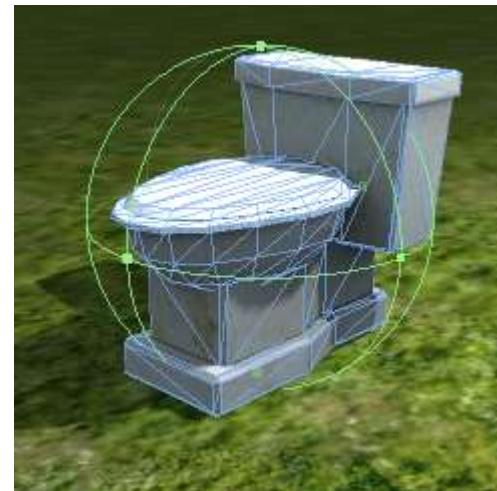


Collider Type

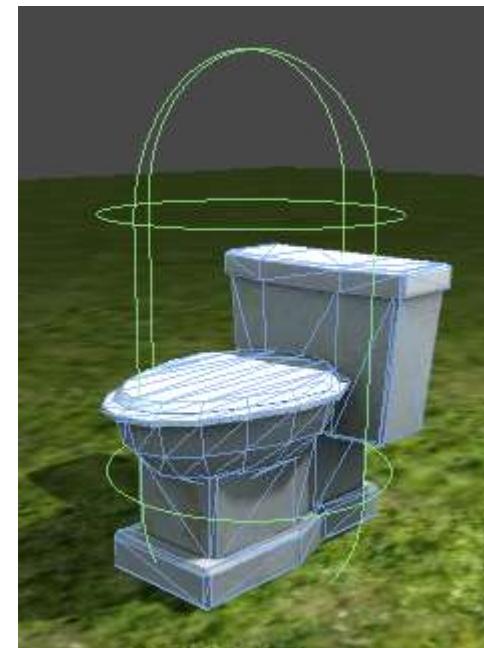
■ Different type of collider



Box collider



Sphere collider



Capsule collider

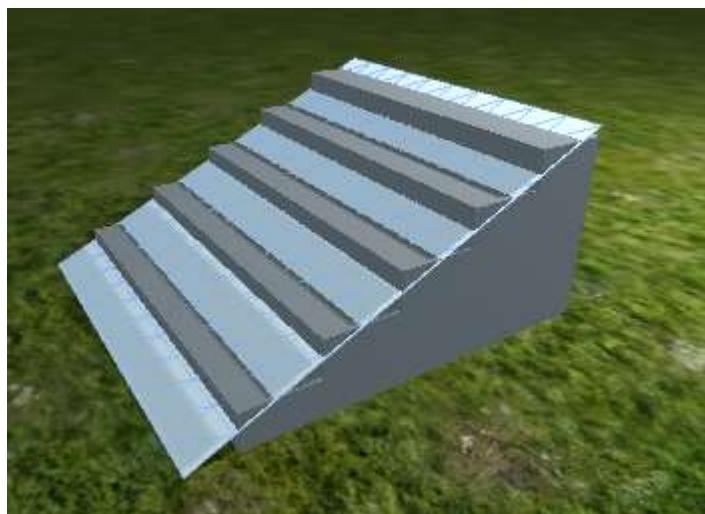
Stair

- Never use the mesh collider of the stair itself, otherwise the player need to jump many times
- 2 ways to solve:
 - Create a simple object for walking on the stair (e.g. plane)
 - Change the mesh collider to convex

Stair

Method 1

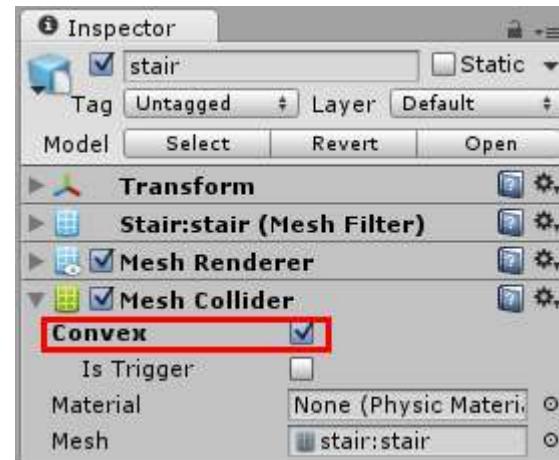
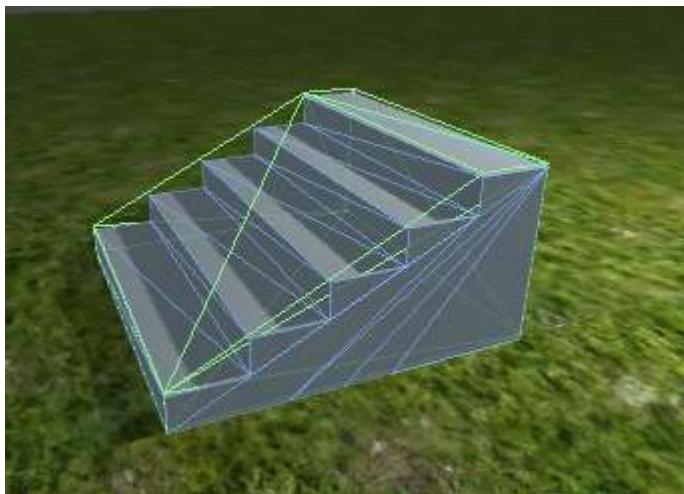
- Create a plane inside Unity or Maya
- Disable the “mesh collider” of the stair
- Disable the “mesh render” of the plane



Stair

Method 2

- Enable the “Convex” option under the mesh collider setting



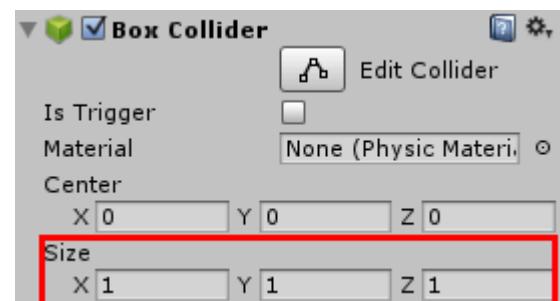
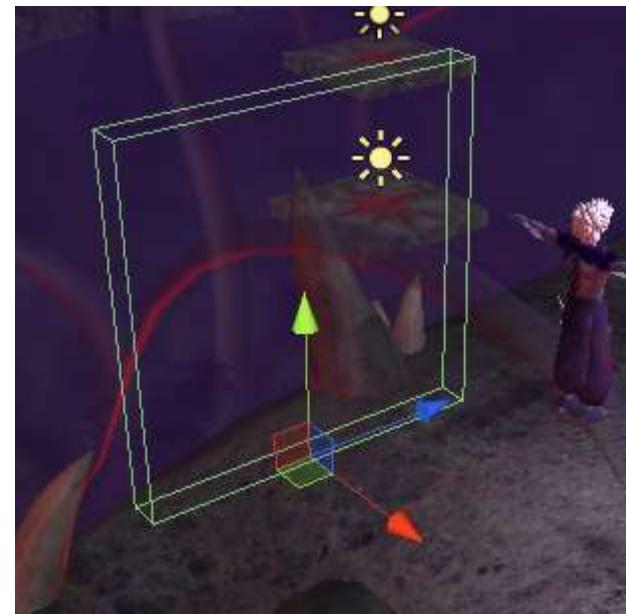
Bounding Area

- Sometimes we won't like to define the restricted area to prevent the access of the player
- We can create a number of box collider to block the passage of the player
- Collider must be created under the game object
- So we have to create the empty game object, you may also model the hidden border inside Maya

Bounding Area

Step:

- Create empty game object
 - GameObject → Create Empty
- Rename it as “bounding”
- Add the box collider to it
 - Component → Physics →
- Scale the box collider to the desired size



Bounding Area

■ Step:

- Use **Ctrl+d** to duplicate the “bounding” object and place it to the bounding border
- You may also create another empty object and parent all the bounding colliders to it for easy managing



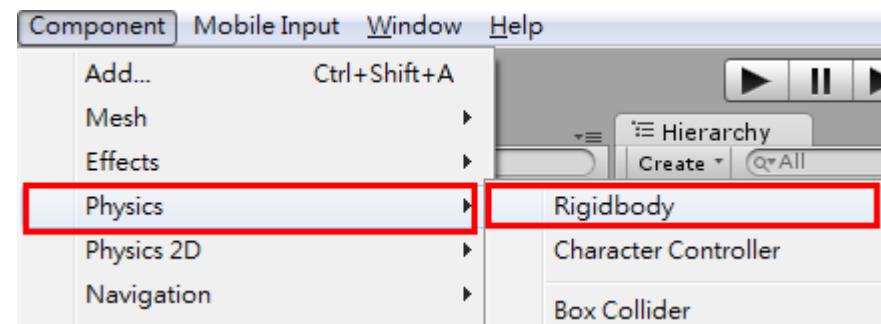
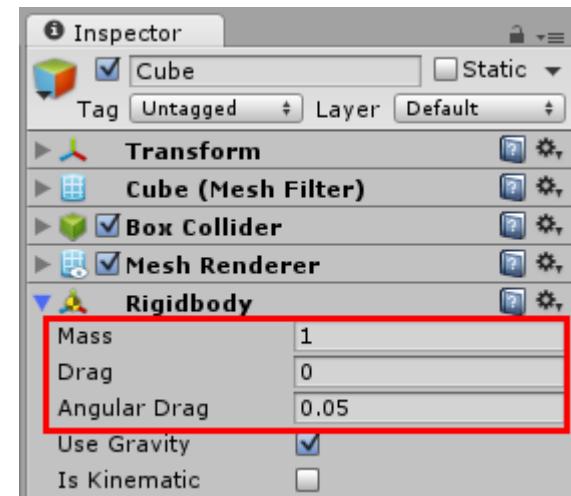
Physics

Rigidbody physics

- Physic engines are used to simulate the real-world responses for game object
- Unity uses Nvidia's PhysX engine
- Physics engines use the Rigidbody dynamics system of creating realistic motion
 - Object can have the properties such as mass, gravity, velocity and friction...

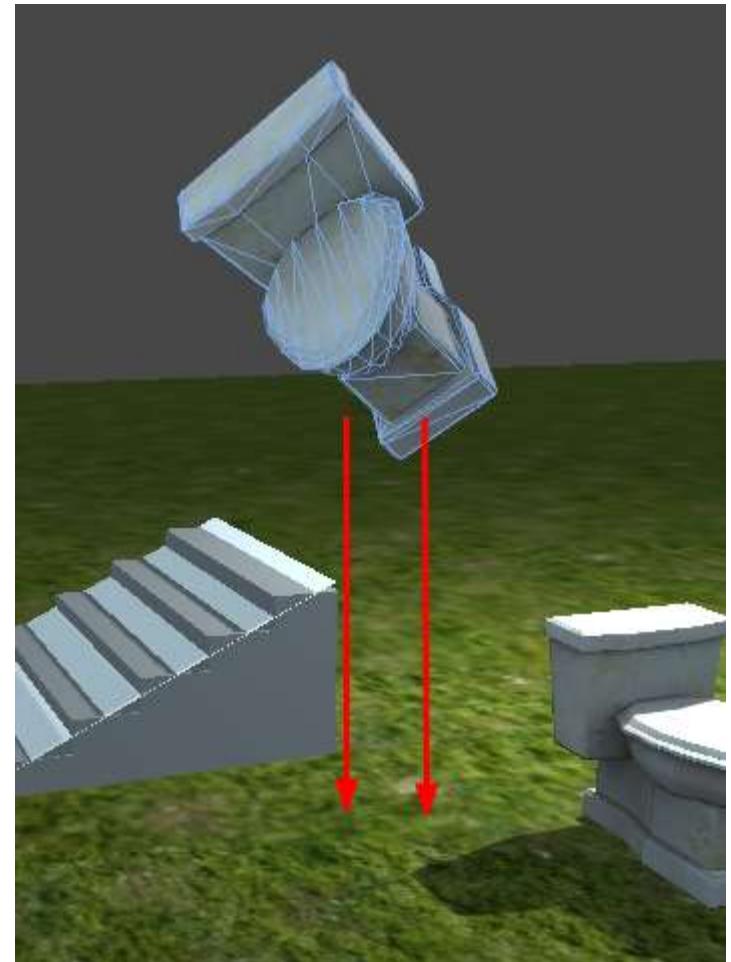
Basic Physic Setting

- Object must have collider for physic simulation
- Select the game object and add the rigidbody property
 - Component → Physics → Rigidbody
- Set the mass from the inspector panel



Basic Physic Setting

- Move the game object above the ground and start playing the game to see the result
- Now the game object will fall onto the ground, but no bouncing can be seen



Physic Materials

- To make the game object bounce, we have to give it the physic material
- Import the physic materials package
- Select the required material and drag it to the material property of the mesh collider

