CIS367 - Computer Graphics

Introduction to Unity

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Material from various Internet locations. Unity website, Yingcai Xiao (Game Development with Unity3D), Unity in 24 Hours

https://unity.com/

Wot is it?

Cross-platform graphics/game development framework

Comprises an engine and full-featured IDE

- C# / Mono

Develop applications for:

- PC
- Consoles
- Mobile
- Web
- ...

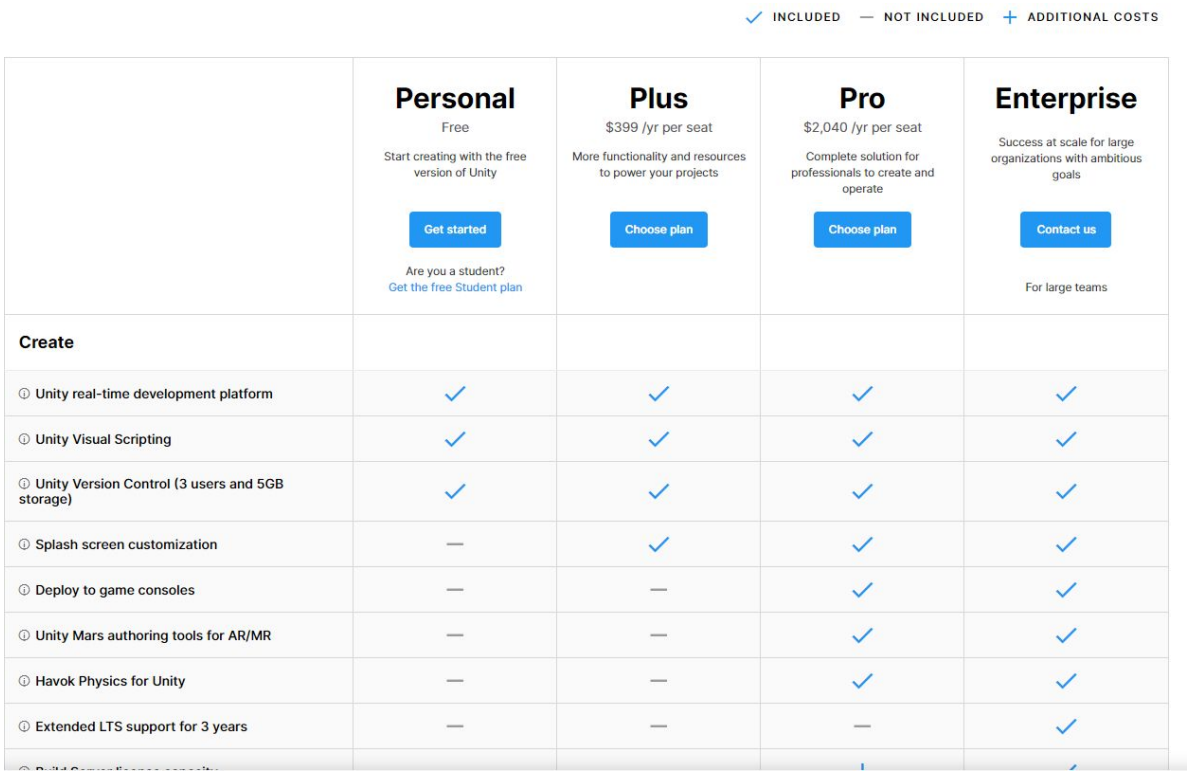
Based on what we know so far...

Think of it kind of as a mashup of Blender and WebGL

- Facilities for modeling objects in the Scene Editor
- Ability to script out actions (and everything)
- (plus much, much more!)

$$$

Unity Pro: not free
Unity Personal: free



✓ INCLUDED — NOT INCLUDED + ADDITIONAL COSTS

	Personal	Plus	Pro	Enterprise
	Free Start creating with the free version of Unity Get started Are you a student? Get the free Student plan	$399 /yr per seat More functionality and resources to power your projects Choose plan	$2,040 /yr per seat Complete solution for professionals to create and operate Choose plan	Success at scale for large organizations with ambitious goals Contact us For large teams
Create				
ⓘ Unity real-time development platform	✓	✓	✓	✓
ⓘ Unity Visual Scripting	✓	✓	✓	✓
ⓘ Unity Version Control (3 users and 5GB storage)	✓	✓	✓	✓
ⓘ Splash screen customization	—	✓	✓	✓
ⓘ Deploy to game consoles	—	—	✓	✓
ⓘ Unity Mars authoring tools for AR/MR	—	—	✓	✓
ⓘ Havok Physics for Unity	—	—	✓	✓
ⓘ Extended LTS support for 3 years	—	—	—	✓

https://unity.com/compare-plans

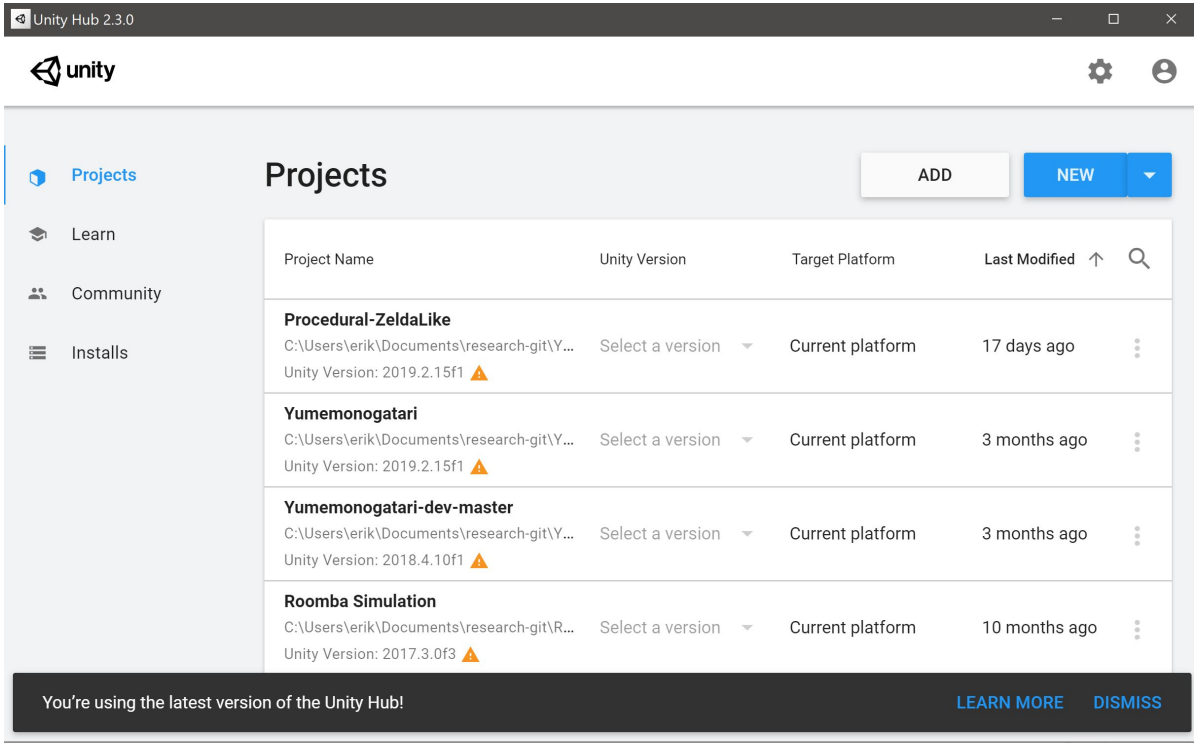
https://www.geekwire.com/2023/heres-why-so-many-video-game-developers-are-suddenly-abandoning-the-unity-engine/

Interested?

http://unity3d.com/learn/tutorials/modules

(Highly recommend the roll-a-ball video ... we'll be going through that one ourselves though)

Unity Hub


Unity Hub 2.3.0
unity
Projects
Learn
Community
Installs
Projects
ADD
NEW
Project Name
Unity Version
Target Platform
Last Modified
Procedural-ZeldaLike
C:\Users\erik\Documents\research-git\Y...
Unity Version: 2019.2.15f1
Select a version
Current platform
17 days ago
Yumemonogatari
C:\Users\erik\Documents\research-git\Y...
Unity Version: 2019.2.15f1
Select a version
Current platform
3 months ago
Yumemonogatari-dev-master
C:\Users\erik\Documents\research-git\Y...
Unity Version: 2018.4.10f1
Select a version
Current platform
3 months ago
Roomba Simulation
C:\Users\erik\Documents\research-git\R...
Unity Version: 2017.3.0f3
Select a version
Current platform
10 months ago
You're using the latest version of the Unity Hub!
LEARN MORE
DISMISS

2D or 3D?

Full 3D



Full 2D


2D gameplay with 3D graphics

https://docs.unity3d.com/Manual/2Dor3D.html

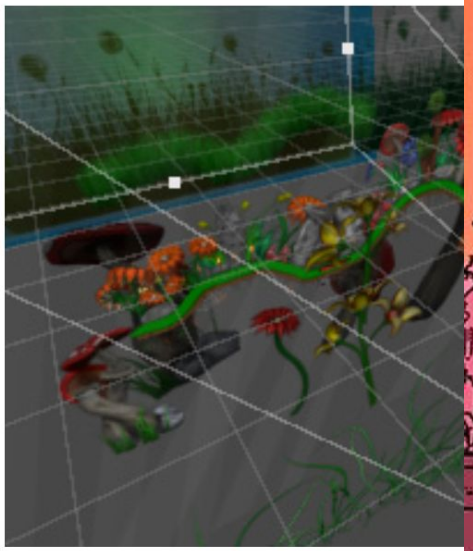
Can even do this!

2D gameplay and graphics, with a perspective camera

Creates a "parallax" effect!

Can even do

2D gameplay and grap



Creates a "parallax"

Let's dive right in

New 3D project

Basics:

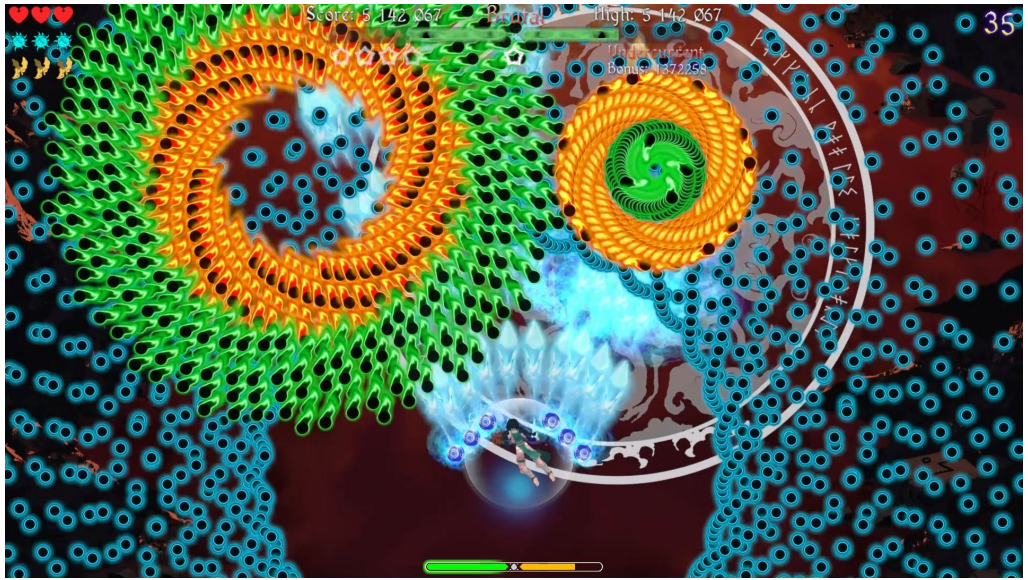
- Game objects
- Prefabs (a mind-blowing object ... we'll see how later)
- Physics
- Scripting

Make sure you save your 'scene' as you go

Assets

Can import various things as well (free or paid)

- Cameras
- Characters
- Effects
- Particle systems
- Physics
- etc.



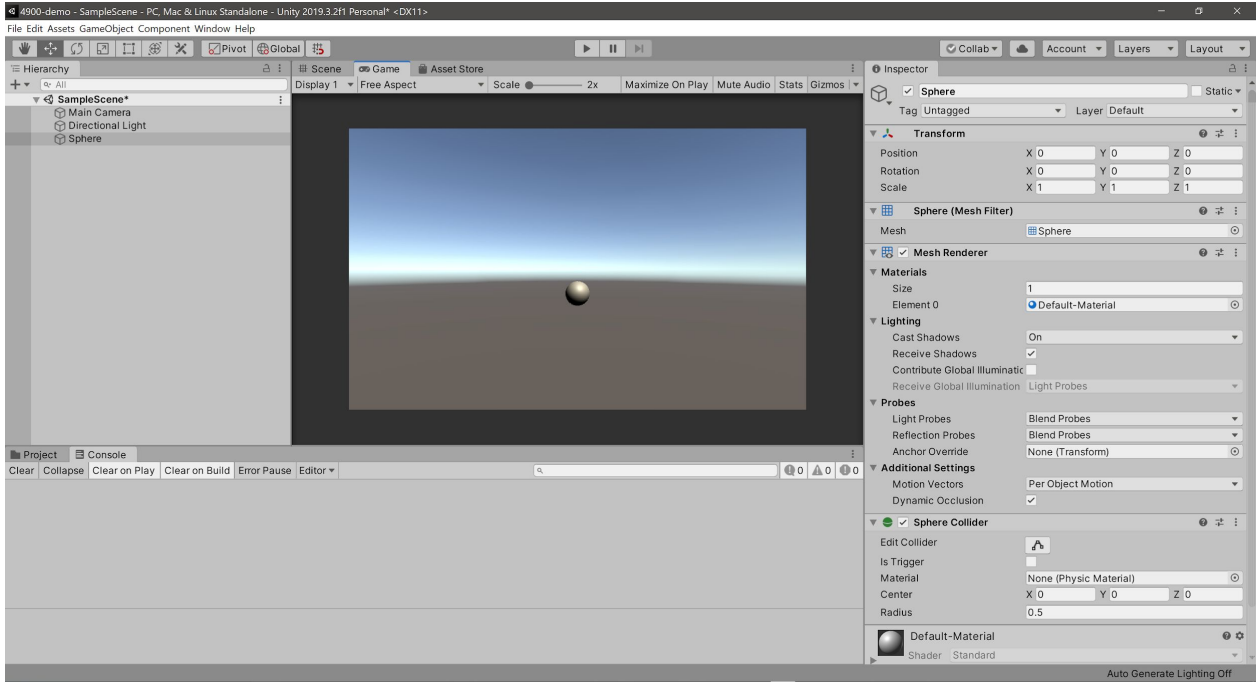
Let's create some objects

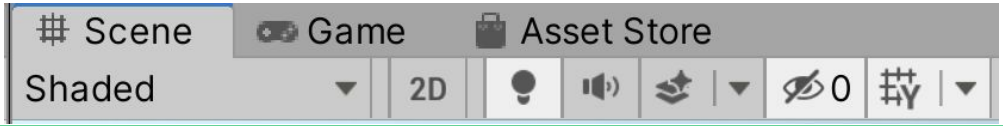
GameObject ➔ 3D Object ➔ Sphere (or your favorite polygon)

Can transform either by entering raw numbers or drag the **label**

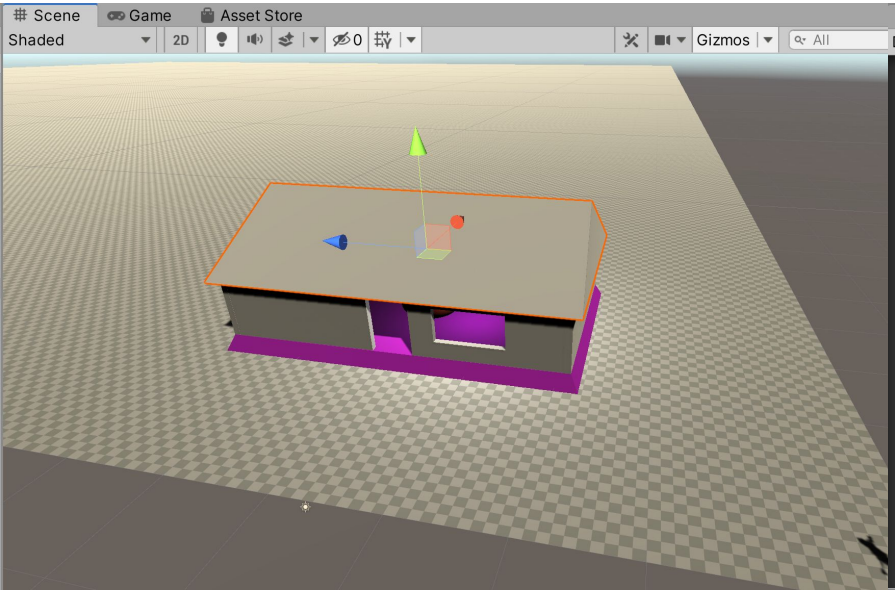
(Note, Y is up/down for the frame)

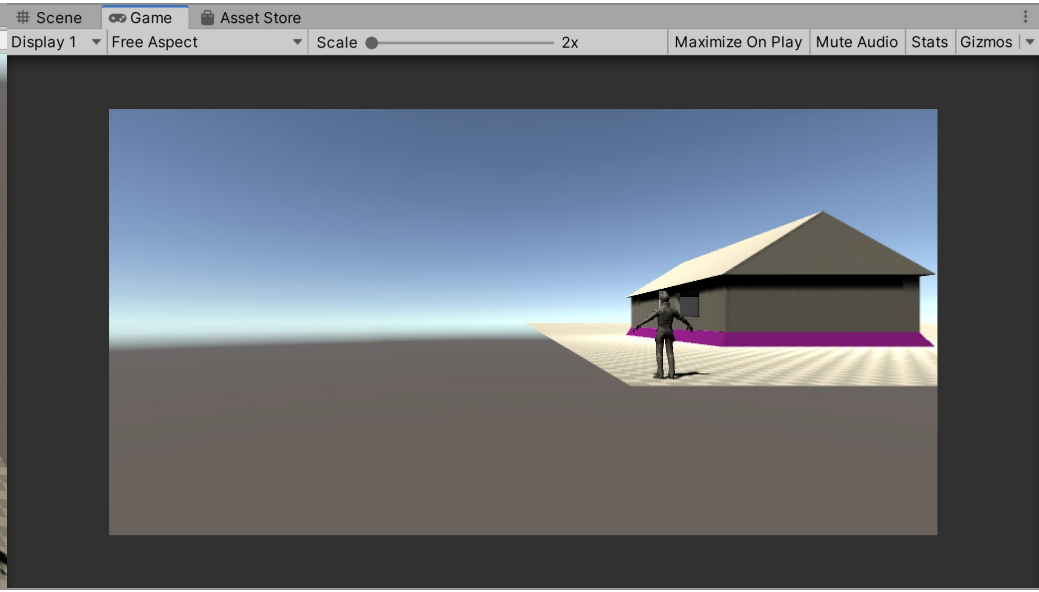
In Scene ➔ Frame Selected will orient camera to the 'frame'

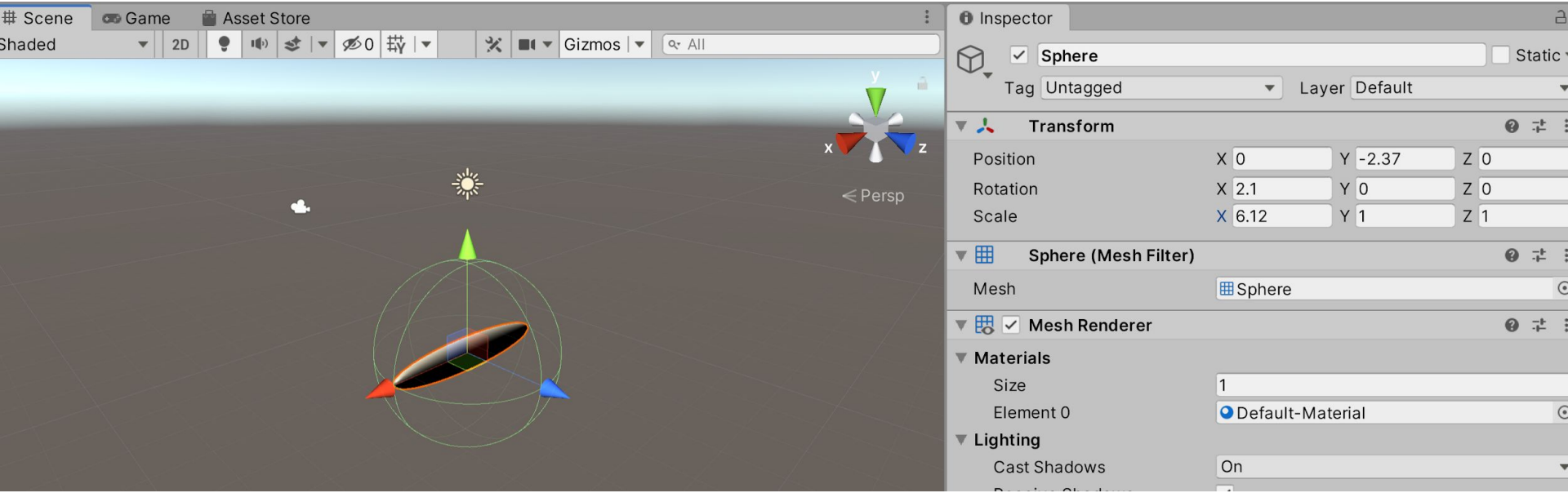




Scene vs. Game






Scene
Game
Asset Store
Shaded
2D
Gizmos
All
Persp
Inspector
Sphere
Static
Tag
Untagged
Layer
Default
Transform
Position
X 0
Y -2.37
Z 0
Rotation
X 2.1
Y 0
Z 0
Scale
X 6.12
Y 1
Z 1
Sphere (Mesh Filter)
Mesh
Sphere
Mesh Renderer
Materials
Size
1
Element 0
Default-Material
Lighting
Cast Shadows
On

We can turn our object into a **component**

Select the (object) and **Component → Physics → RigidBody**

Rigid objects:

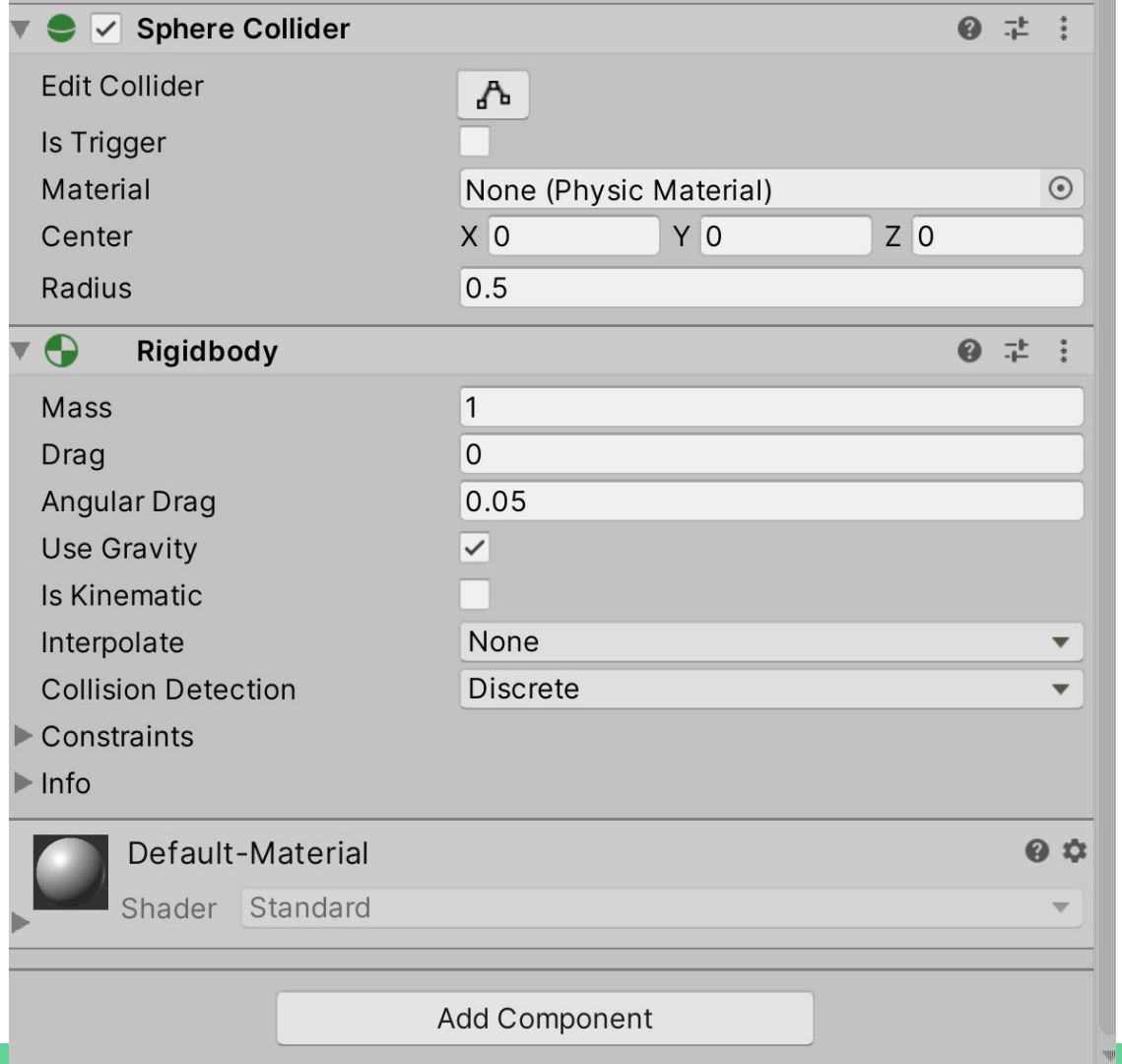
- Non-deformable
- Has physical properties (gravity, inertia, etc.)

Non-rigid objects:

- Deformable (geometry can change)
- Breakable (topology can change)

Intangible objects:

- No predefined shape
  - Fire, clouds, smoke, etc.


Sphere Collider
Edit Collider
Is Trigger
Material
None (Physic Material)
Center
X 0
Y 0
Z 0
Radius
0.5
Rigidbody
Mass
1
Drag
0
Angular Drag
0.05
Use Gravity
Is Kinematic
Interpolate
None
Collision Detection
Discrete
Constraints
Info
Default-Material
Shader
Standard
Add Component

Animation! (basic anyway)

Window ➜ Animation

Select object

Component ➜ Miscellaneous ➜ Animation

In Animation window:

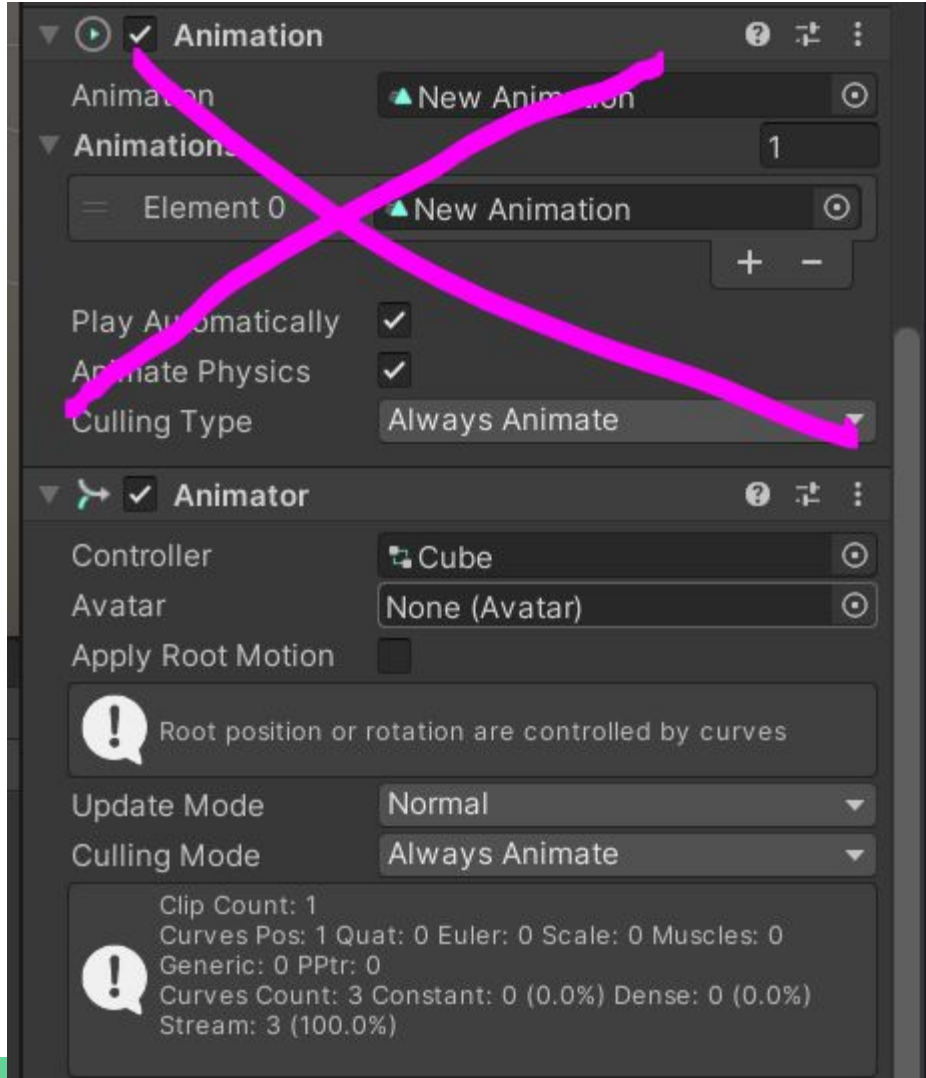
- Create new animation clip
- Record (enables keyframes)
- Curves (helps to visualize)
- Add transform property
    - Pick a new time, move around, and play!

Animation?

~~In Inspector → Animation, change name of 'Animation Clip' to what was just recorded~~ → LEGACY ANIMATION!

Drag the animation in your Project onto the object and it will add an Animator component

Now go to main scene editor and click Play → What happened?



???

Uncheck Animator ➜ Object disappeared?

IT HAS PHYSICS!

- Remove rigid body component and replay!

Lighting

Game Object ➔ Light ➔ (light) Directional Light

Translates as normal (similar to Blender really)

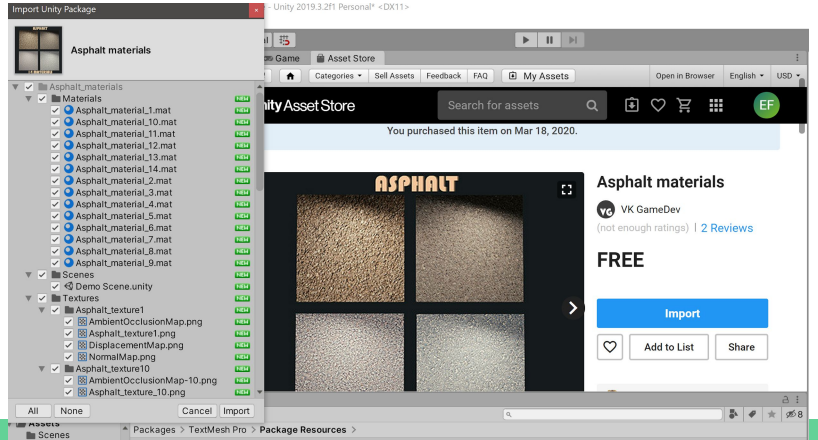
Material

Huuuuuge rabbit hole!

- Apply all our various strategies to make our objects look good
- Textures, UV maps, colors, normals, etc.

Simplest approach: add a Material component to objects

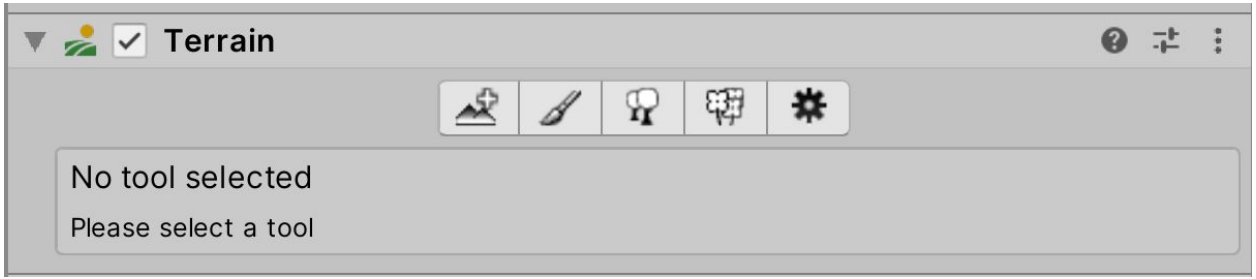
- Select an appropriate material
- Download one off the Asset store
- Make your own
- ...
- etc.!



Terrain

Game Object ➜ 3D Object ➜ Terrain

x = -5, y = 0, z = -5



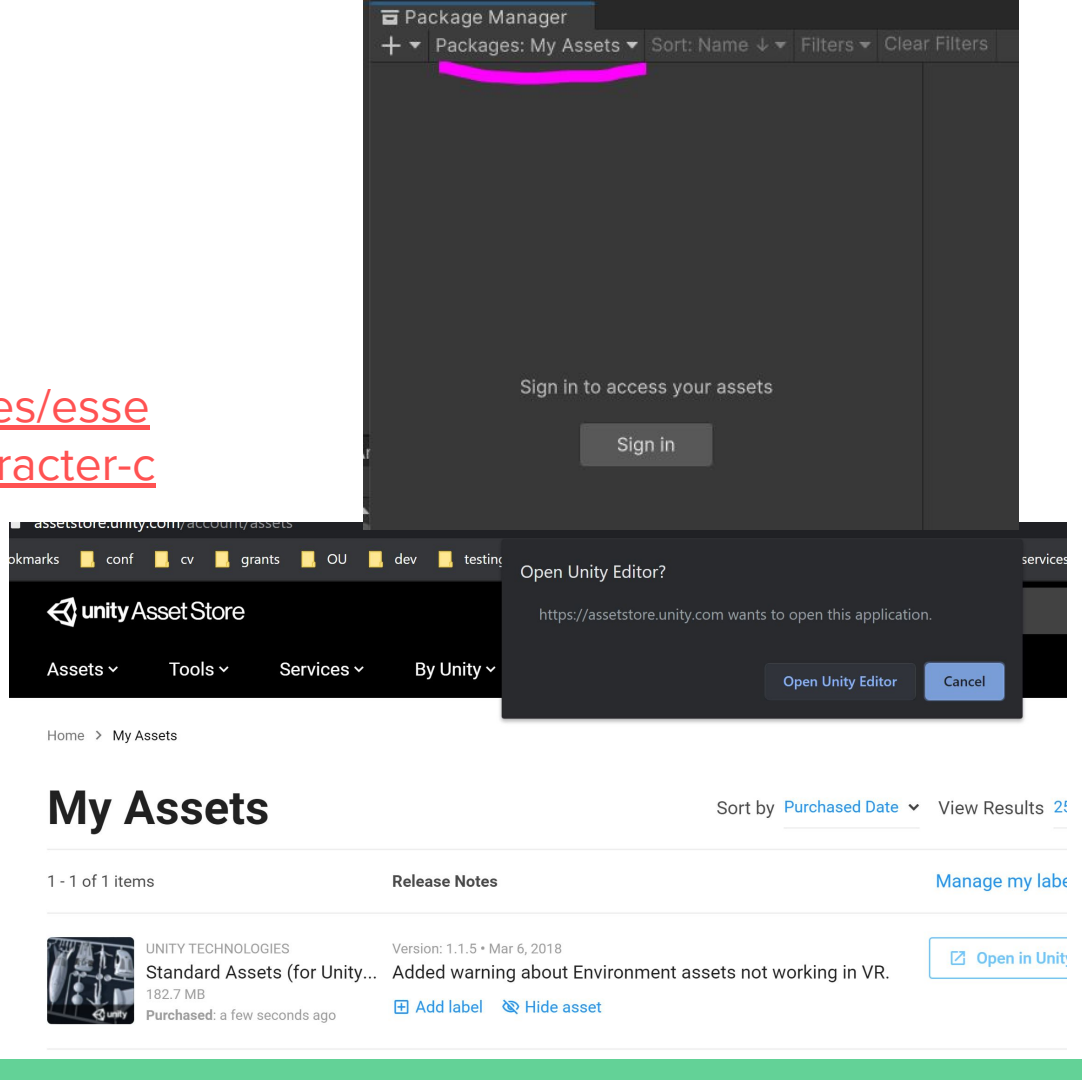
Raise/lower terrain (hold Shift to lower)
Paint height
etc.
➜ Brush size of 1!

Trees? Grass?

Need an object/texture!

https://assetstore.unity.com/packages/essentials/starter-assets-first-person-character-controller-urp-196525

Download and Import
Window ➜ Package Manager



Then we need to define a tree

Game Object ➔ 3D Object ➔ Tree

Then, in the terrain painter from before, 'Edit Trees'

- Pick the tree
- Paint! (or Mass Place)

https://docs.unity3d.com/Manual/tree-FirstTree.html

Tree Editor ➔ add branches, leaves, etc.

Physics

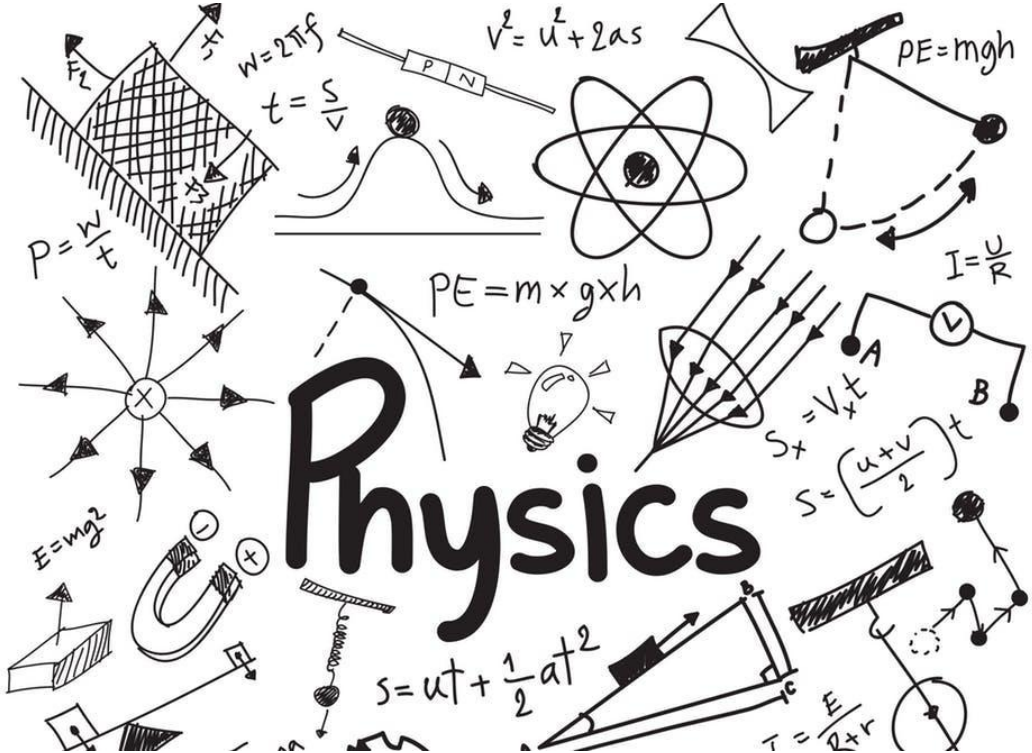
Library built into Unity!

- Rigid body
- Collider
- Joints
- Forces
- etc.

Rigid body ➜ has gravity

Collision detection callbacks:

- `OnCollisionEnter`
- `OnCollision`
- `OnCollisionExit`



Let's add a PC

Need to add the 3rd person character Asset ~~+ CrossPlatformInput~~

- Save Scene
- Asset Store ➜ Import 3rd person character asset
  - ~~Need CrossPlatformInput as well, otherwise you'll get compiler errors!~~
- Drag Prefab onto scene and move
- Make camera a child of the character to "follow"

Click Play and you can use your arrow keys!

➜ I ended up using https://assetstore.unity.com/packages/templates/systems/3rd-person-controller-fly-mode-28647

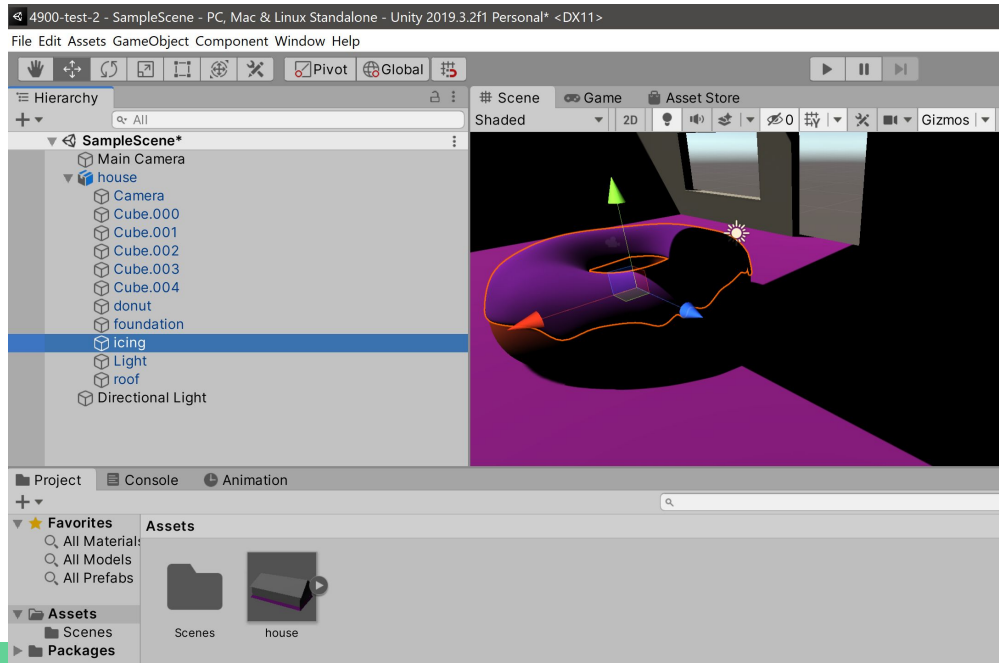
Importing Blender model

Save/copy .blend file into the Assets directory of your Unity project

- Imported automagically into the *Project View*
- Drag into *Scene View*

Or, import asset

- All objects editable!

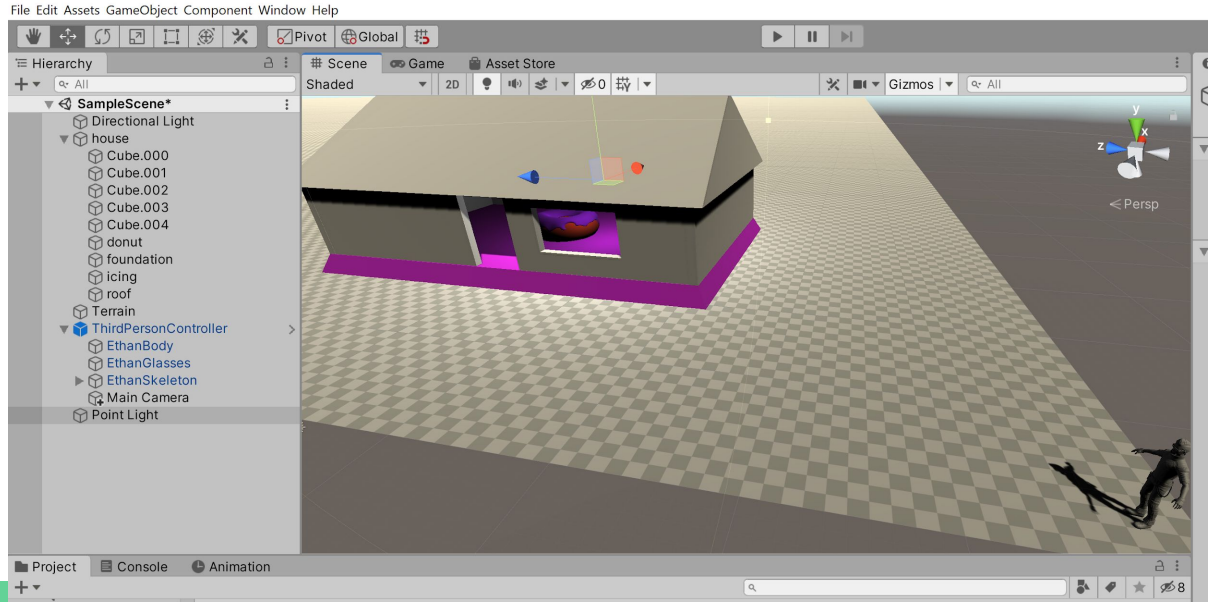


No collision?

Add rigid body / collider components!

Play with scale, jump power, etc.

Add a point light inside!



In-Class Work

You'll be eventually rolling a ball around a Unity 3D scene

- Sketch out a dungeon that you'd like to model
- What components do you think you'll need?