Daydreaming about Cardboards

Virtual Reality in Android

@MarioBodemann

- Please follow the slides at the given address.
- Wait some seconds to see if someone is writing down the address...

Audience

- Android programmer? 👋
- VR programmer? 👋

- 🔧: headless CMS: contentful.com
- 🐦: @MarioBodemann
- 📄: bit.ly/mbvrberlin
  - Please interrupt 👄 👅 !

Agenda

Daydreaming about Cardboards

Virtual Reality in Android

contentful

- 🔧: headless CMS: contentful.com
- 🐦: @MarioBodemann
- 🔗: bit.ly/mbvrberlin
  - Please interrupt 🙋🙋!

Cardboard

Google Cardboard

- easy to produce
- available from different companies
- in different styles/interactions
- You just need a phone™

How does Cardboard work?

- use 3D data and movement to draw two images
  - one for the left and right eye
- contains Lenses to move things away
- brain combines image to 3D scene

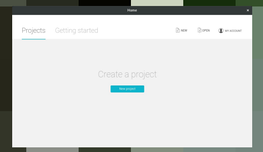
How do I write a Unity App?

Google Daydream Technical Preview

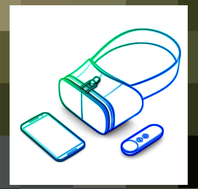
- special preview build from unity
- Out of the box, basic functionality

or Google VR Plugin

- Installer for Unity on 🍏+🖥 (or 🐧)
- Plugin gives full controller support and more



Daydream



Daydream SDK features

- Same as Cardboard SDK
- Controlling the controller
  - orientation/acceleration
  - input (Clickpad: x,y, clicked, App Button, Vol+/-)
- support for all Android architectures

Cardboard

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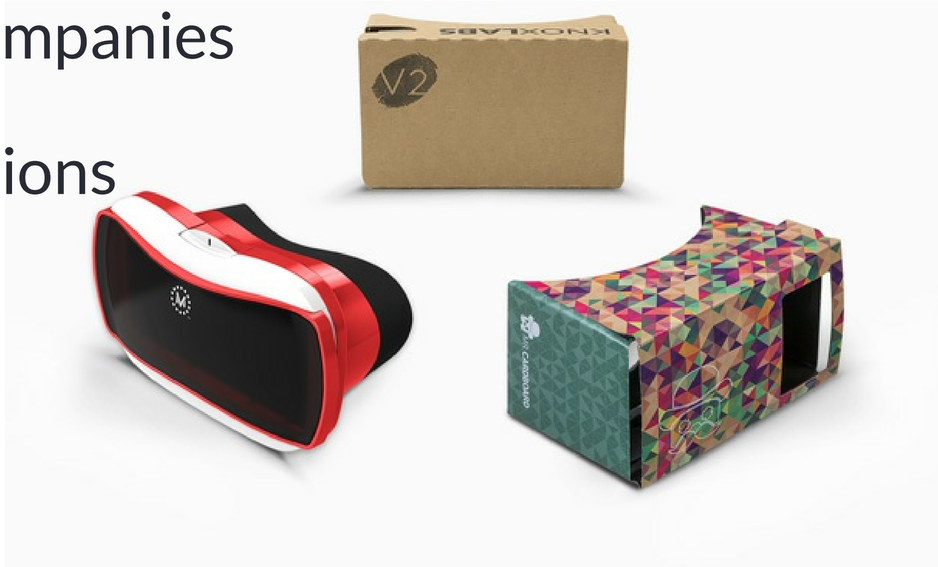

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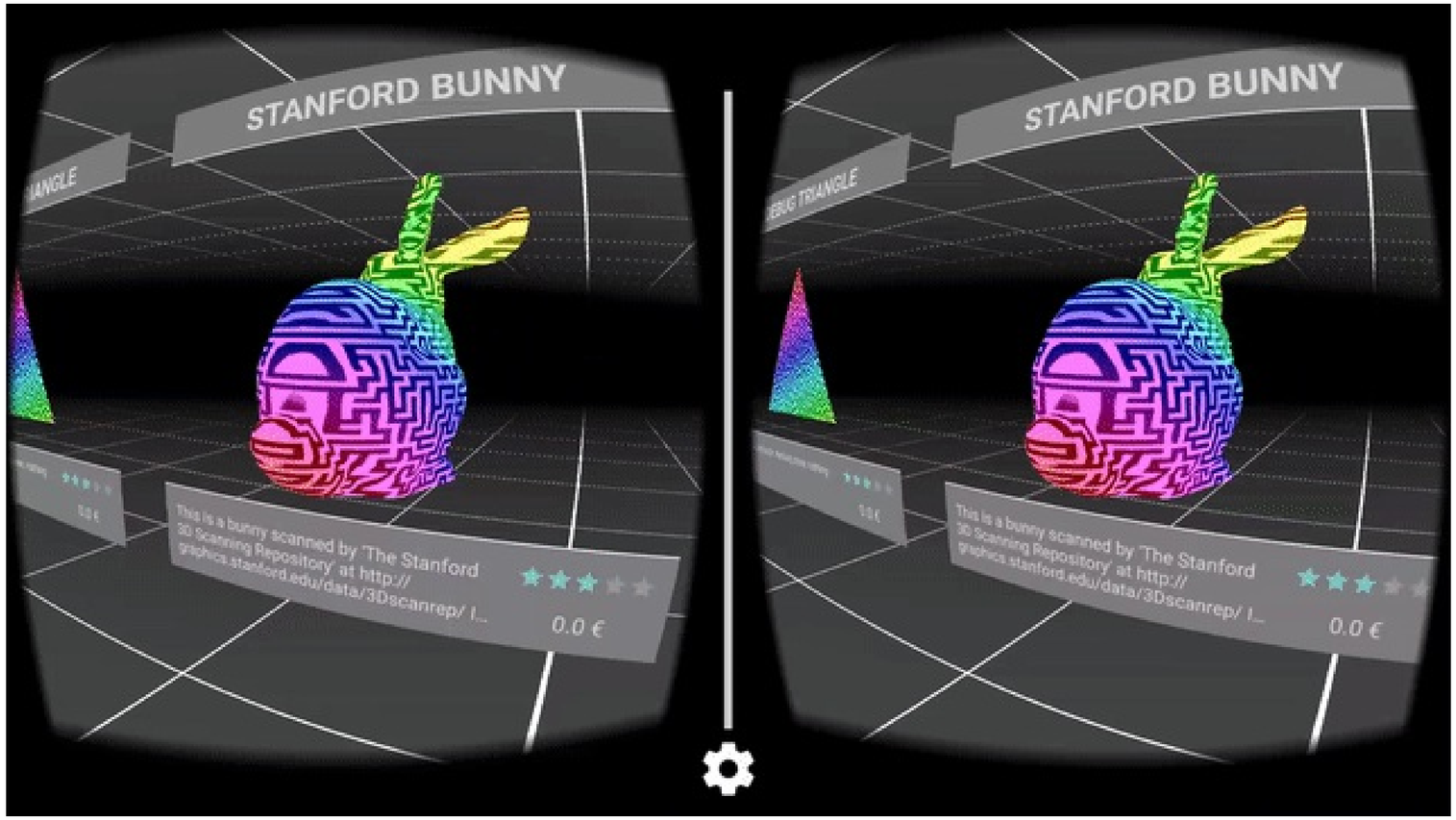

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How do you program for it?

Googles SDK are available for

- Android (OpenGL)
- iOS (Objective C)
- Unreal Engine (NEW)
- Unity Engine (C# /JS) x (, G, ,)

What do those SDKs provide?

- lens distortion correction
- spatial audio
- head tracking
- 3D calibration
- side-by-side rendering

What else do they provide?

- stereo geometry configuration
- user input event handling
- see https://vr.google.com/developers/

How do I write a Unity App?

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or Google VR Plugin

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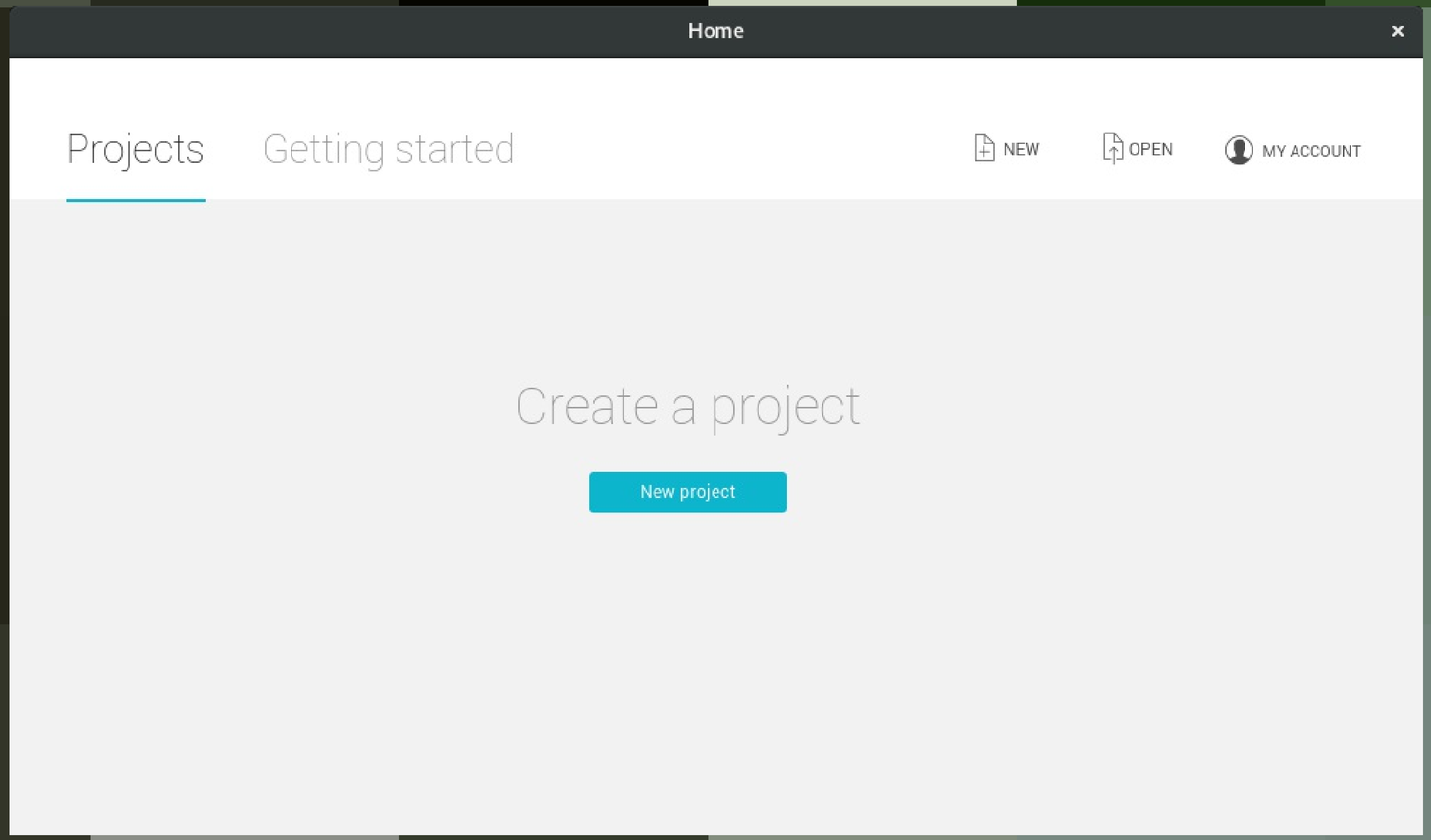
- Plugin gives full controller support and more

Create a new Project



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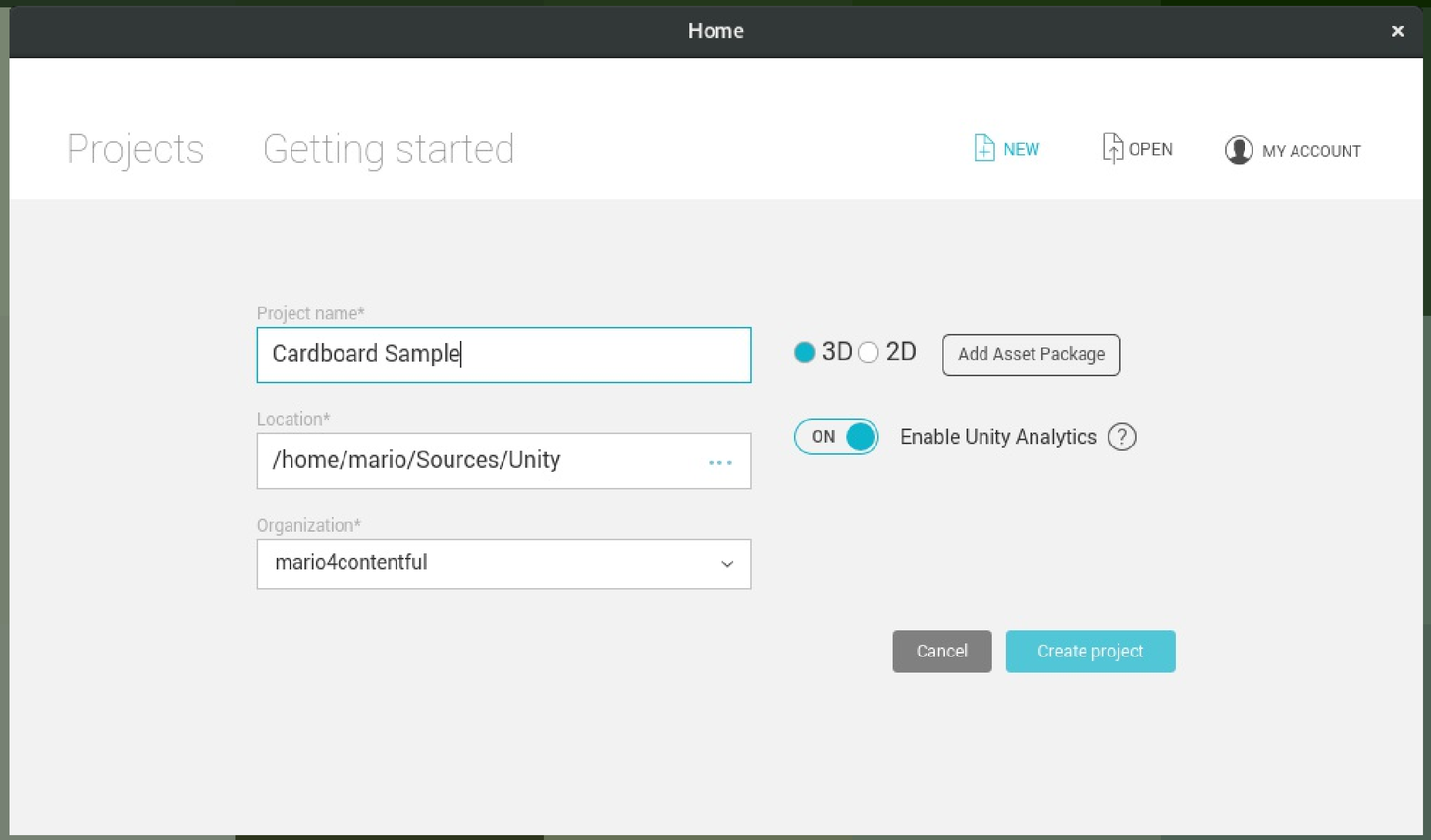
Name it



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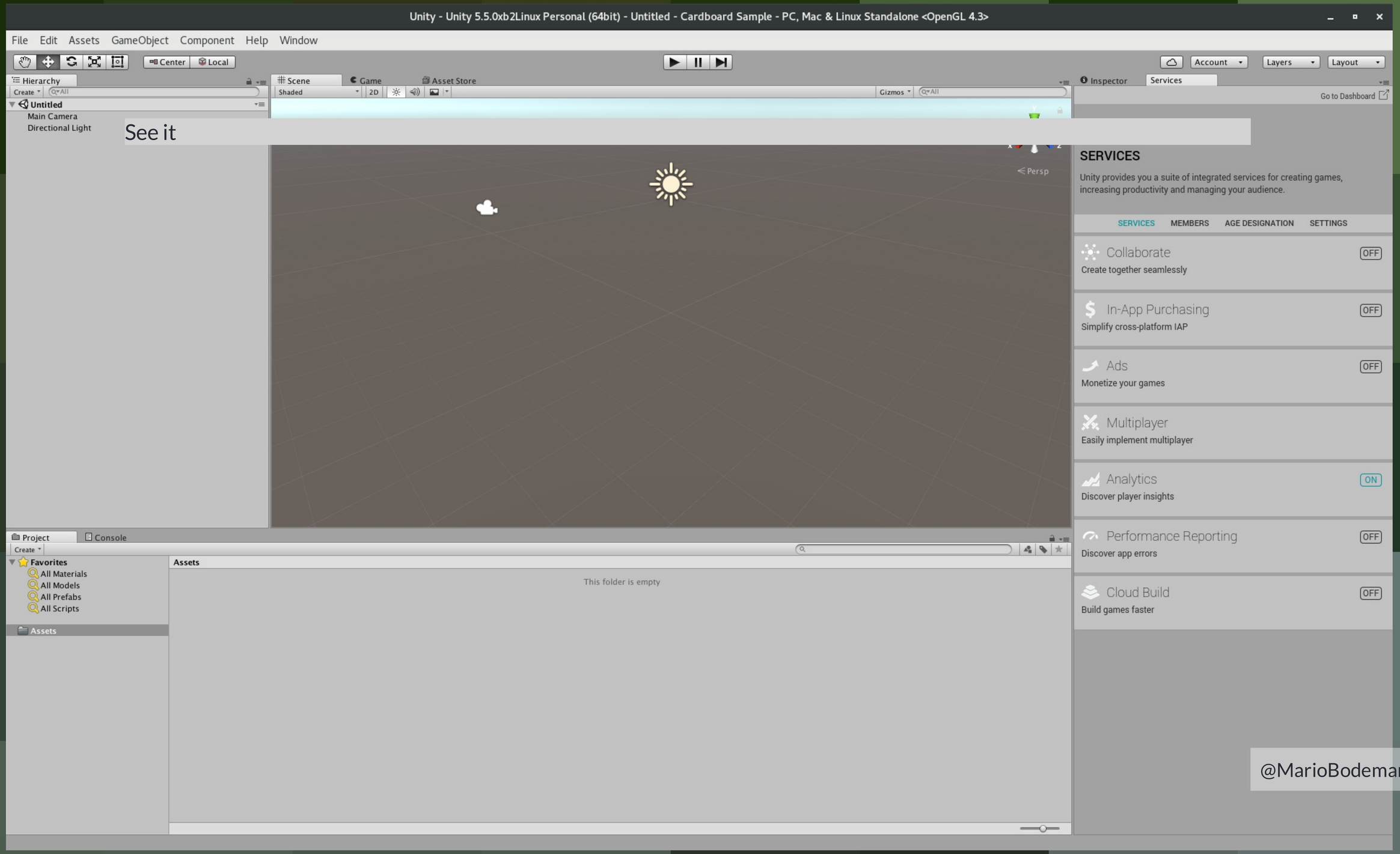

See it

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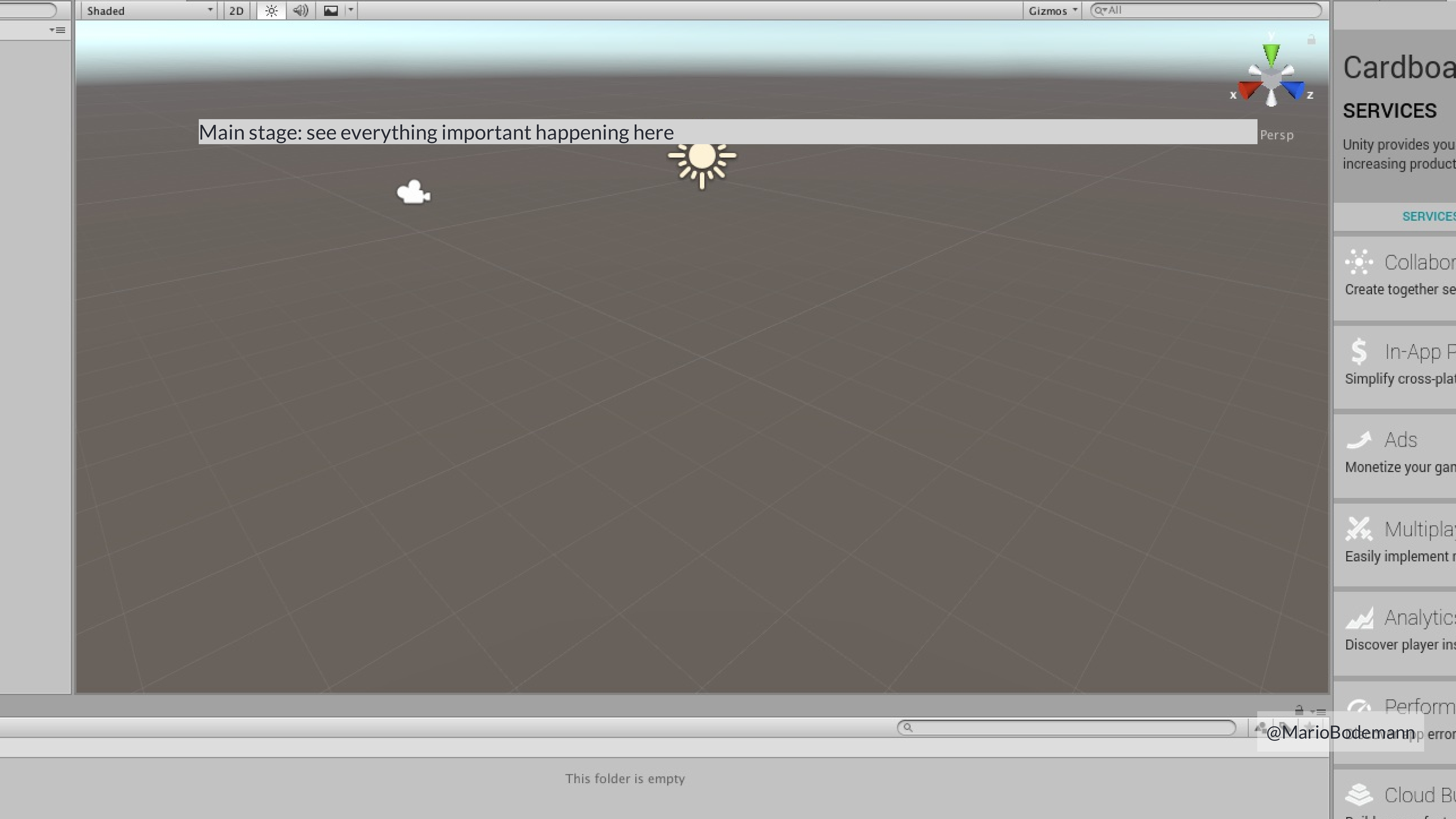
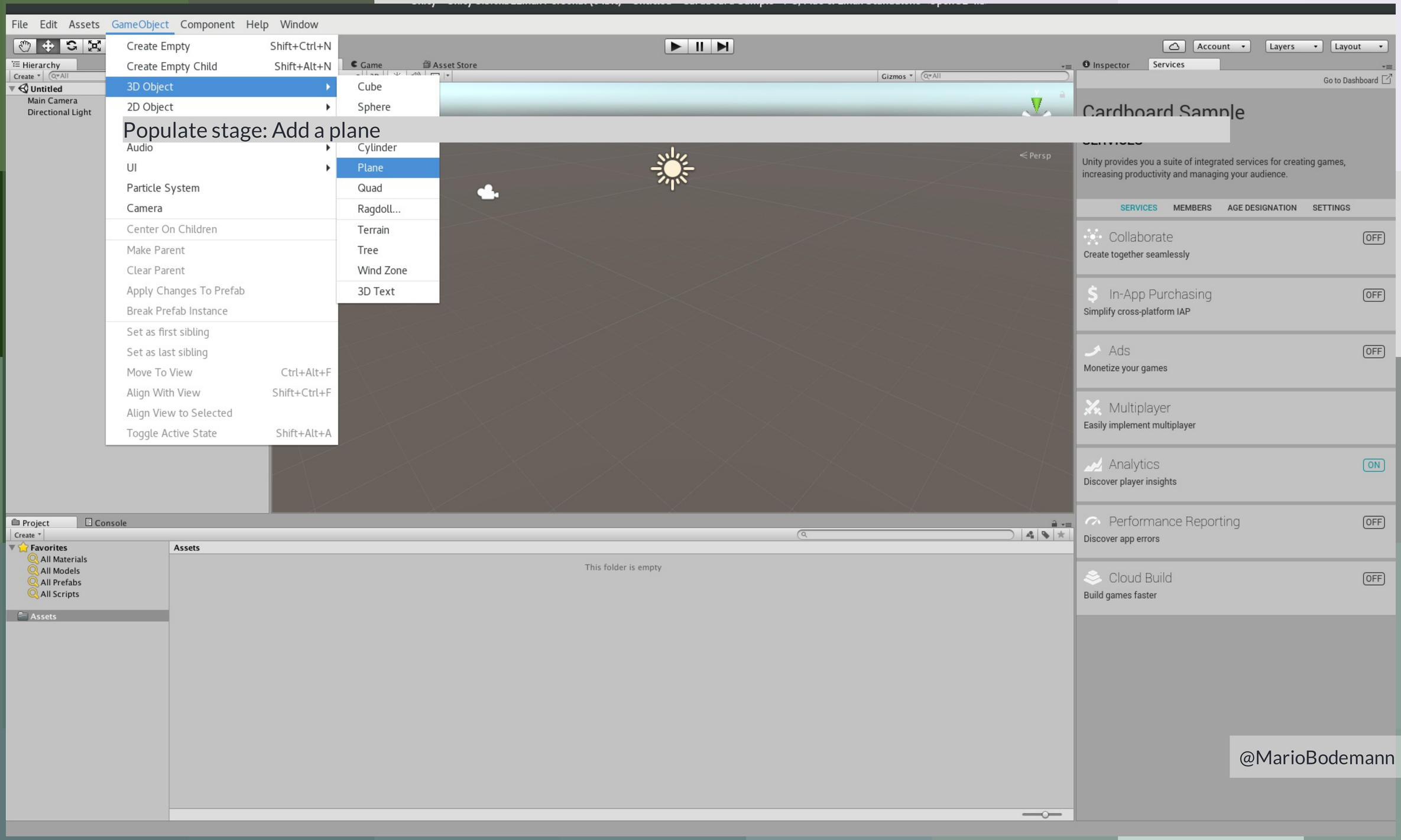

Shaded
2D
Gizmos
All
Main stage: see everything important happening here
Persp
Cardboa
SERVICES
Unity provides you
increasing product
SERVICES
Collabor
Create together se
In-App P
Simplify cross-plat
Ads
Monetize your gam
Multiplay
Easily implement
Analytics
Discover player ins
Perform
@MarioBodemann
This folder is empty
Cloud Bu

Populate stage: Add a plane



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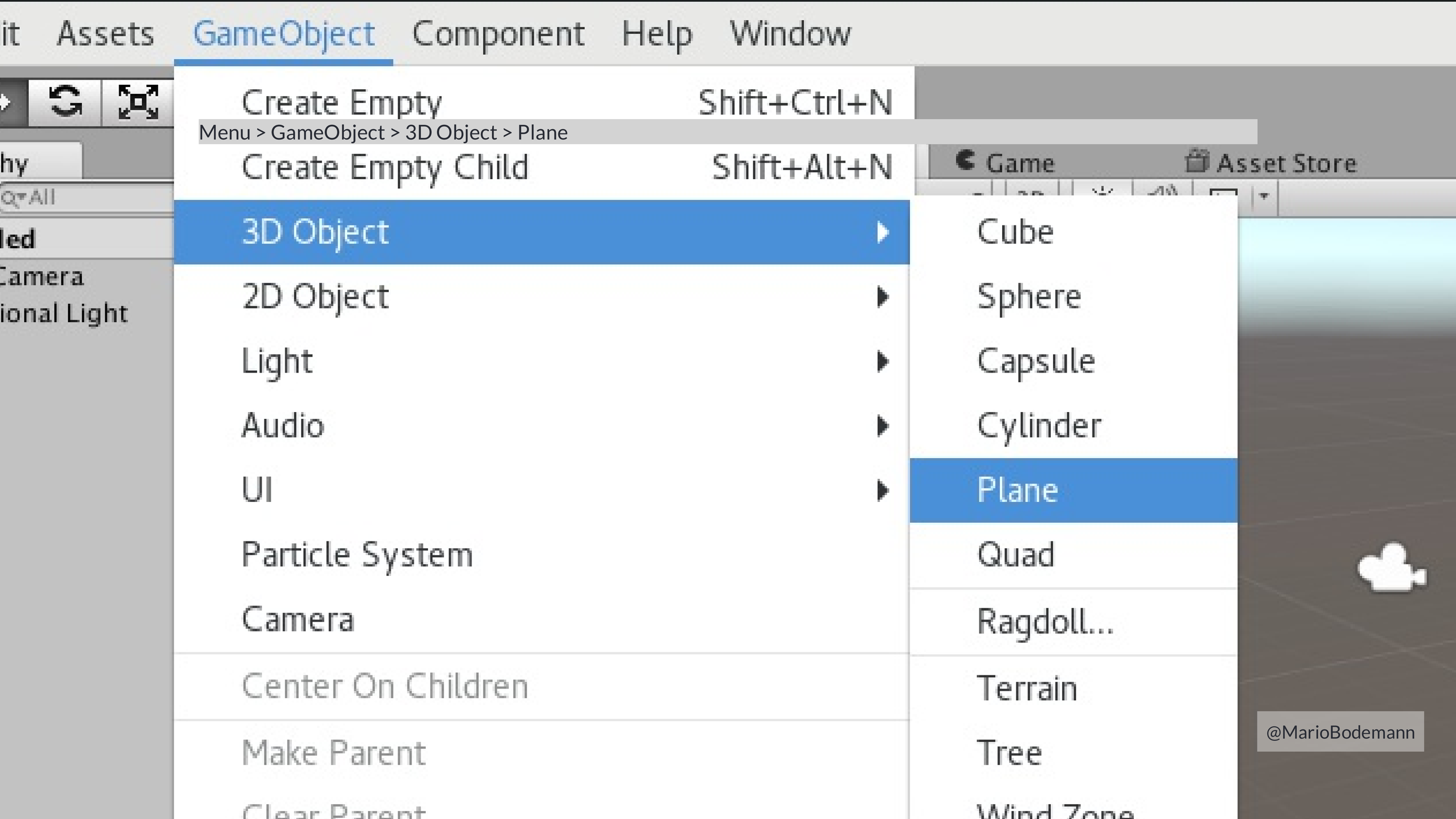
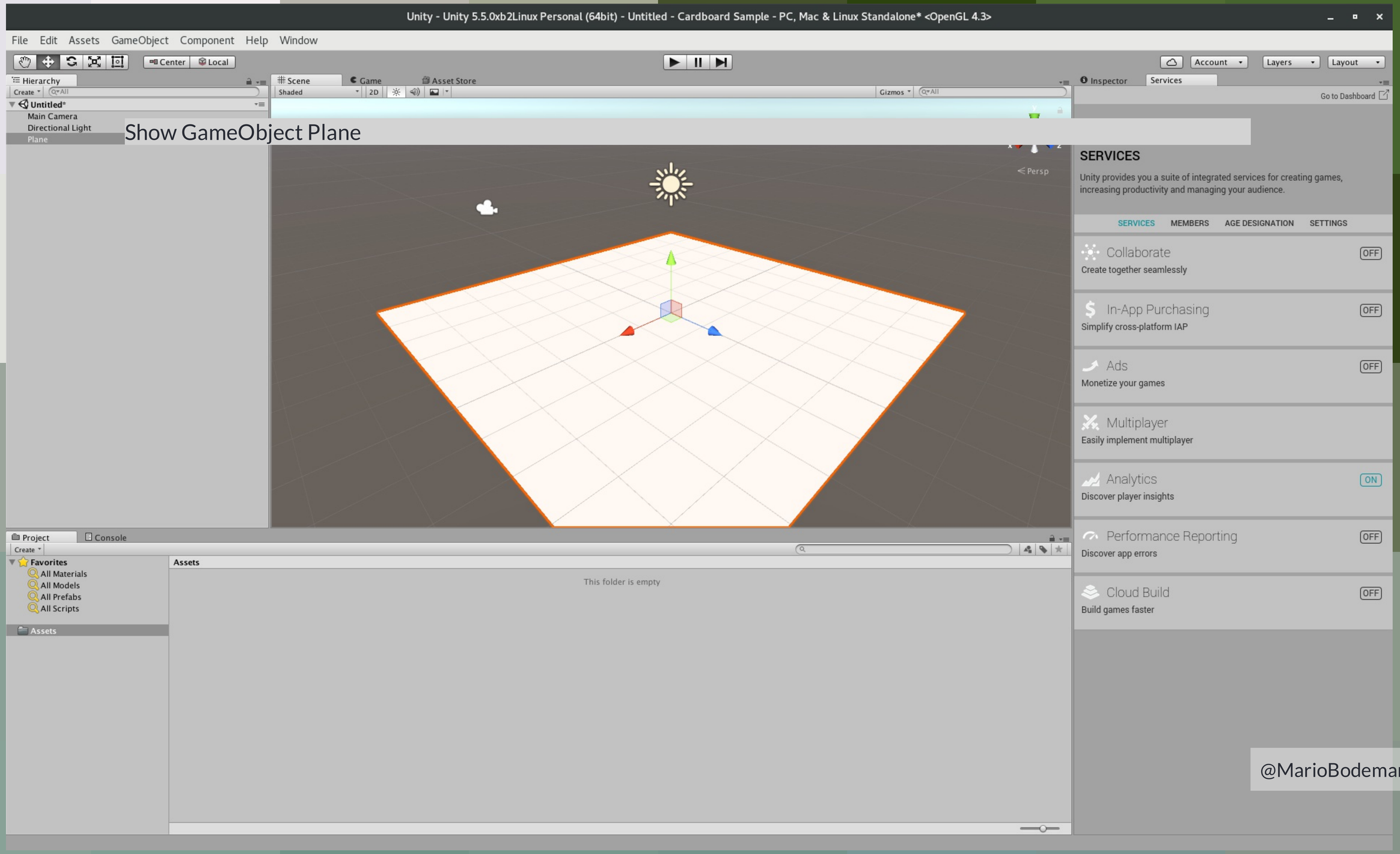

it Assets GameObject Component Help Window
Create Empty Shift+Ctrl+N
Menu > GameObject > 3D Object > Plane
Create Empty Child Shift+Alt+N
3D Object
2D Object
Light
Audio
UI
Particle System
Camera
Center On Children
Make Parent
Clear Parent
Cube
Sphere
Capsule
Cylinder
Plane
Quad
Ragdoll...
Terrain
Tree
Wind Zone
Game
Asset Store
@MarioBodemann



Show GameObject Plane

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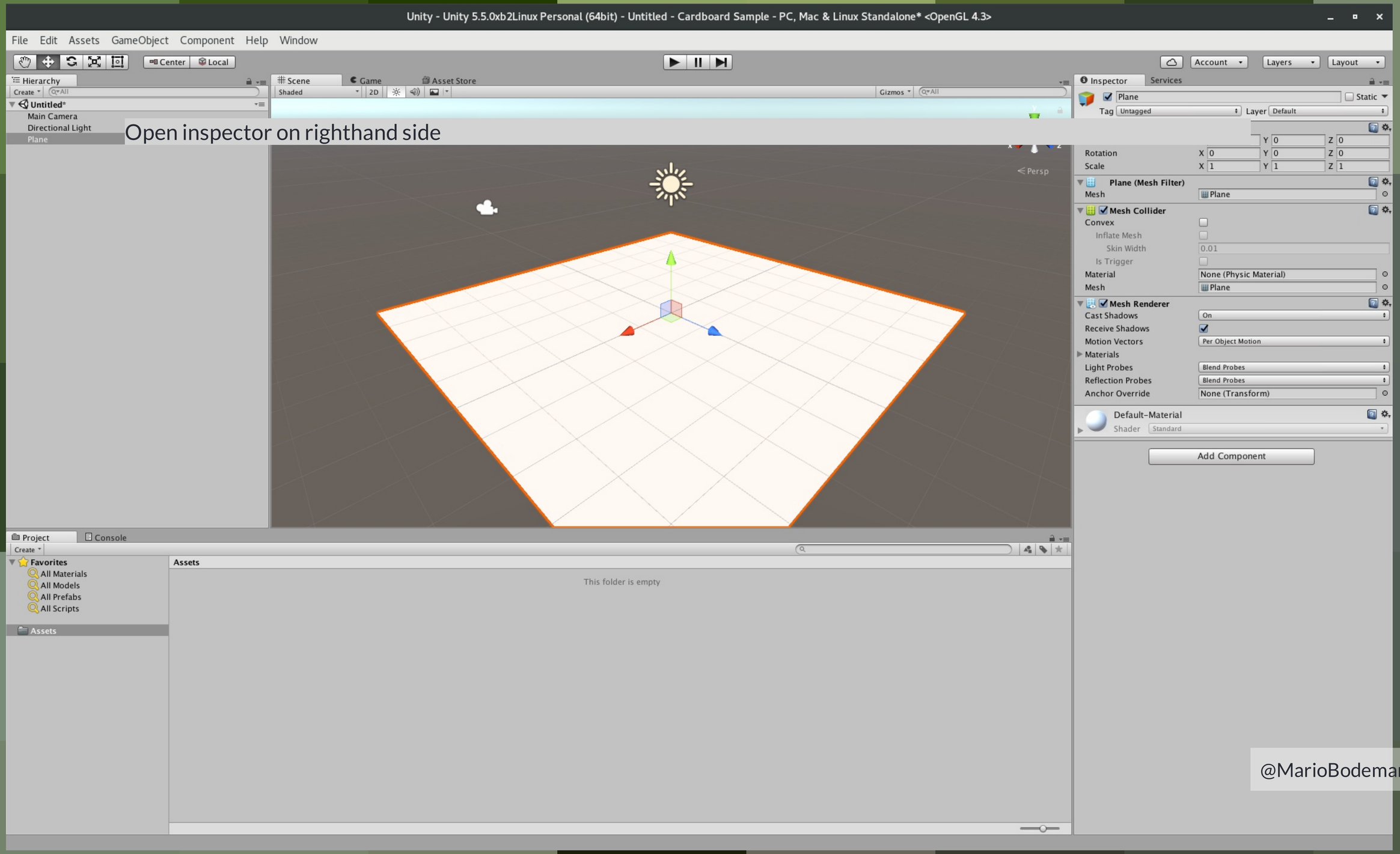

Open inspector on righthand side

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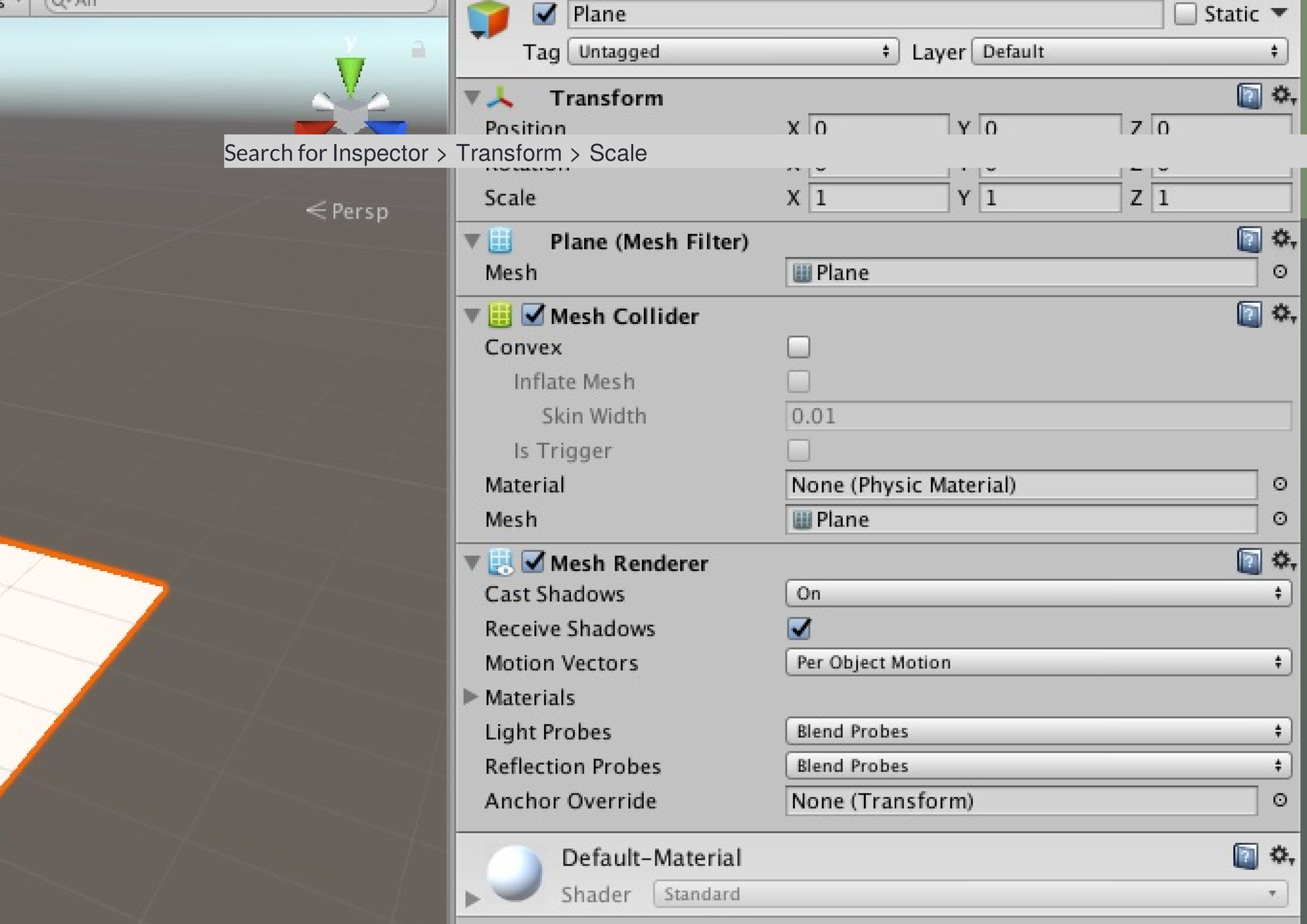
Search for Inspector > Transform > Scale



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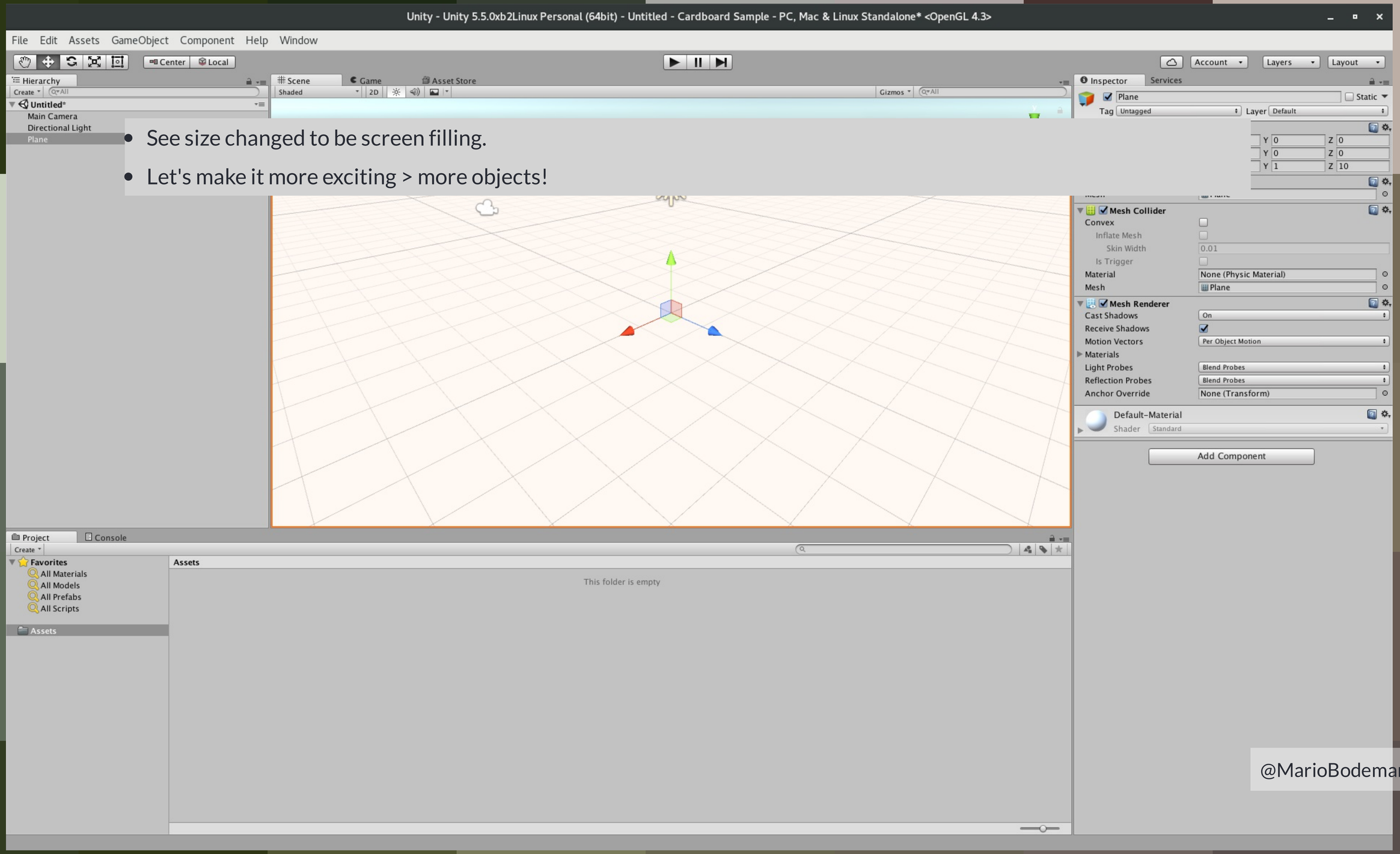

- See size changed to be screen filling.
- Let's make it more exciting > more objects!

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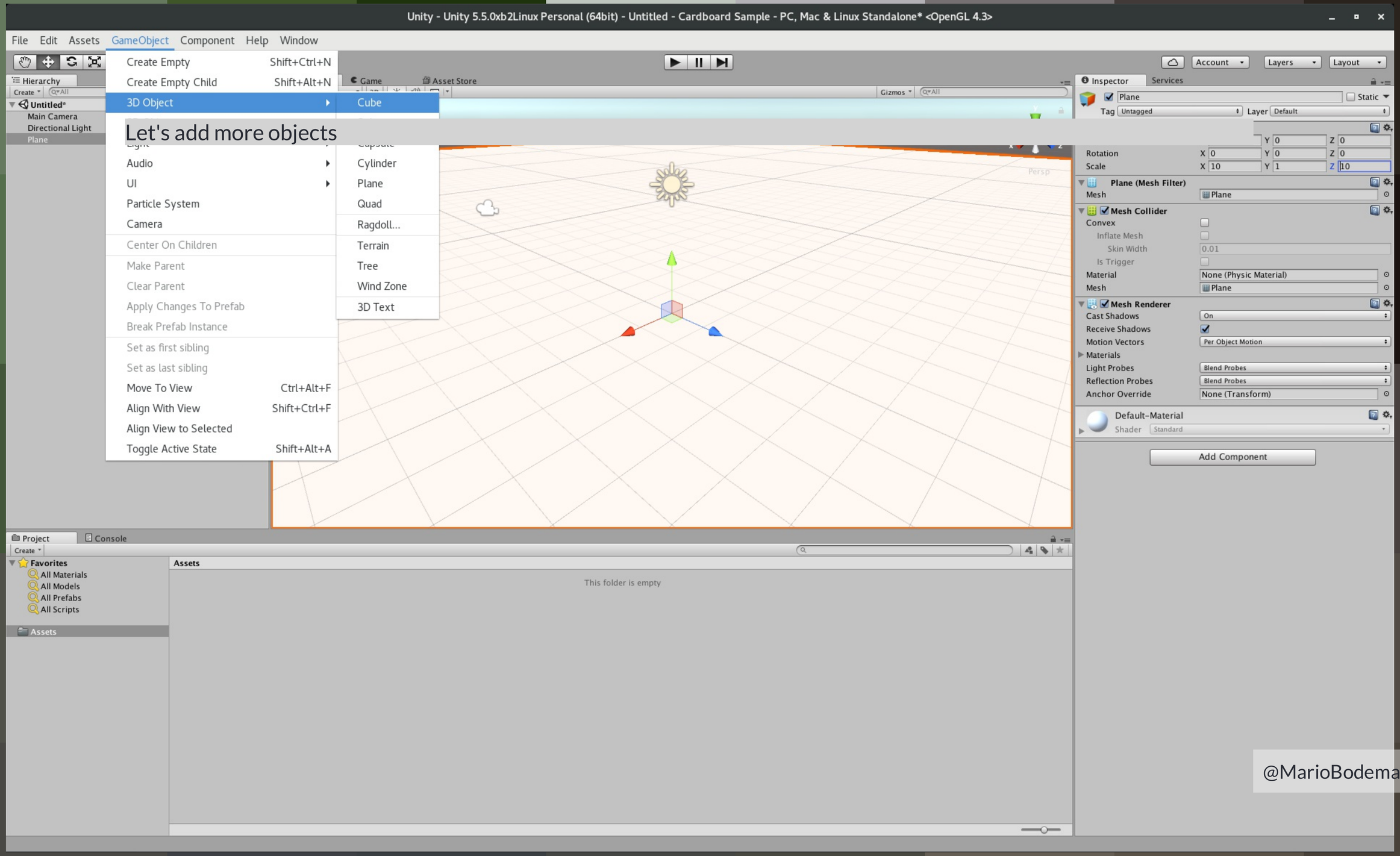

Let's add more objects

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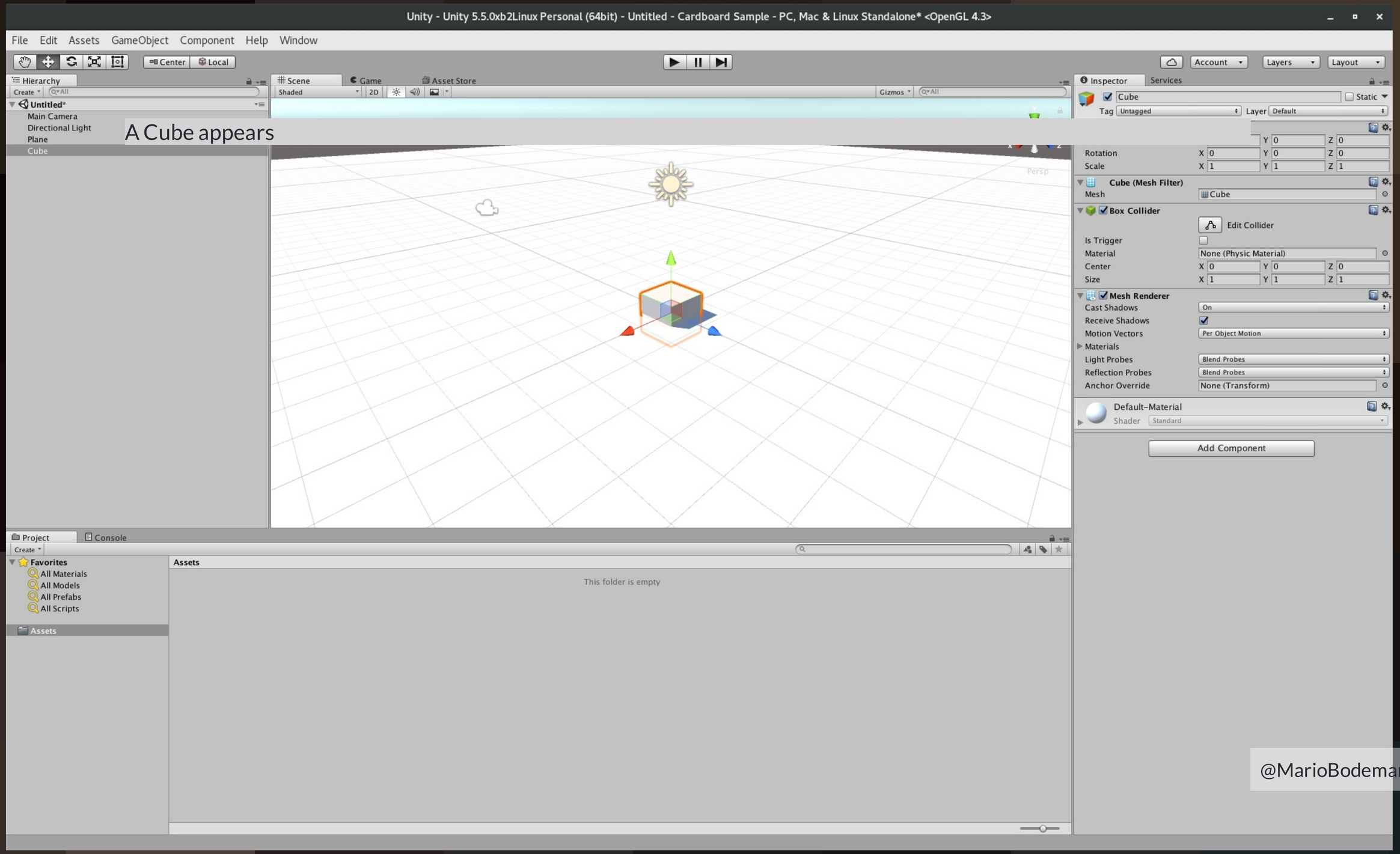

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Unity - Unity 5.5.0xb2Linux Personal (64bit) - Untitled - Cardboard Sample - PC, Mac & Linux Standalone* <OpenGL 4.3>

File Edit Assets GameObject Component Help Window

Center Local

Account Layers Layout

Hierarchy

Create

Untitled*

Main Camera

Directional Light

Plane

Cube

Move that cube.

Scene Game Asset Store

Shaded 2D Gizmos

Persp

Inspector Services

Cube Static

Tag Untagged Layer Default

Rotation X 0 Y 0 Z 0

Scale X 1 Y 1 Z 1

Cube (Mesh Filter)

Mesh Cube

Box Collider

Edit Collider

Is Trigger

Material None (Physic Material)

Center X 0 Y 0 Z 0

Size X 1 Y 1 Z 1

Mesh Renderer

Cast Shadows On

Receive Shadows

Motion Vectors Per Object Motion

Materials

Light Probes Blend Probes

Reflection Probes Blend Probes

Anchor Override None (Transform)

Default-Material

Shader Standard

Add Component

Project Console

Create

Favorites

All Materials

All Models

All Prefabs

All Scripts

Assets

Assets

This folder is empty

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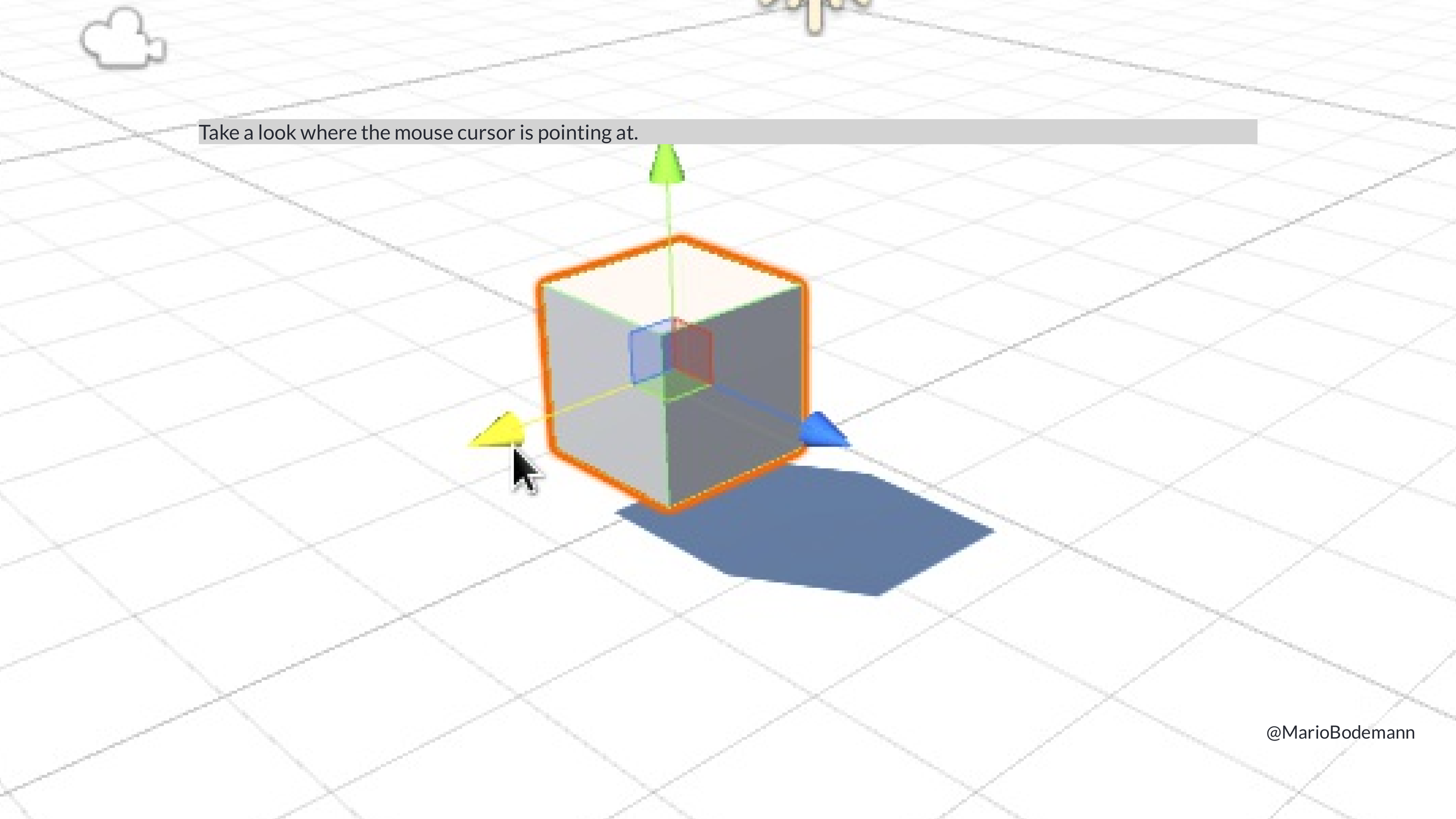
Take a look where the mouse cursor is pointing at.



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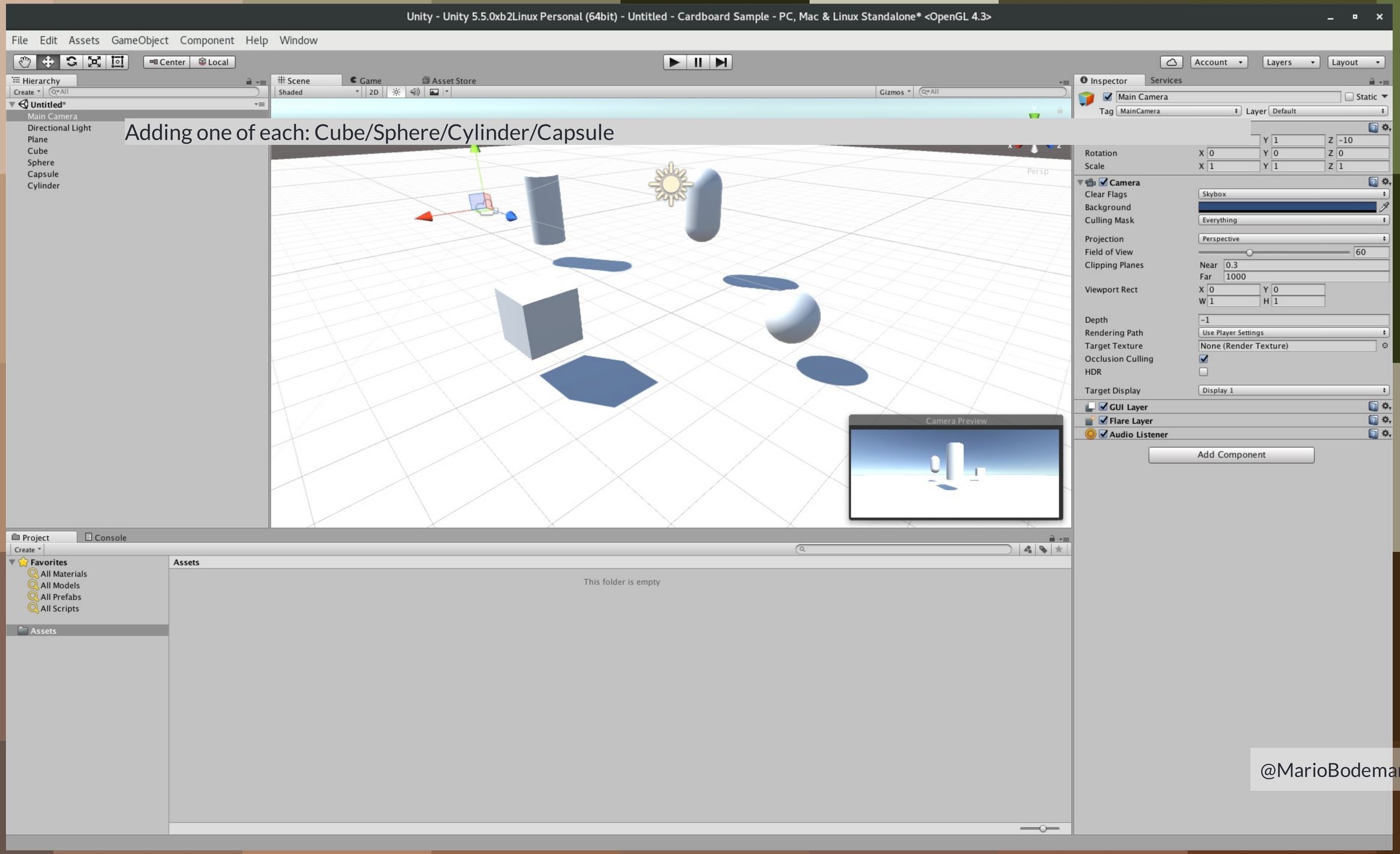

Adding one of each: Cube/Sphere/Cylinder/Capsule

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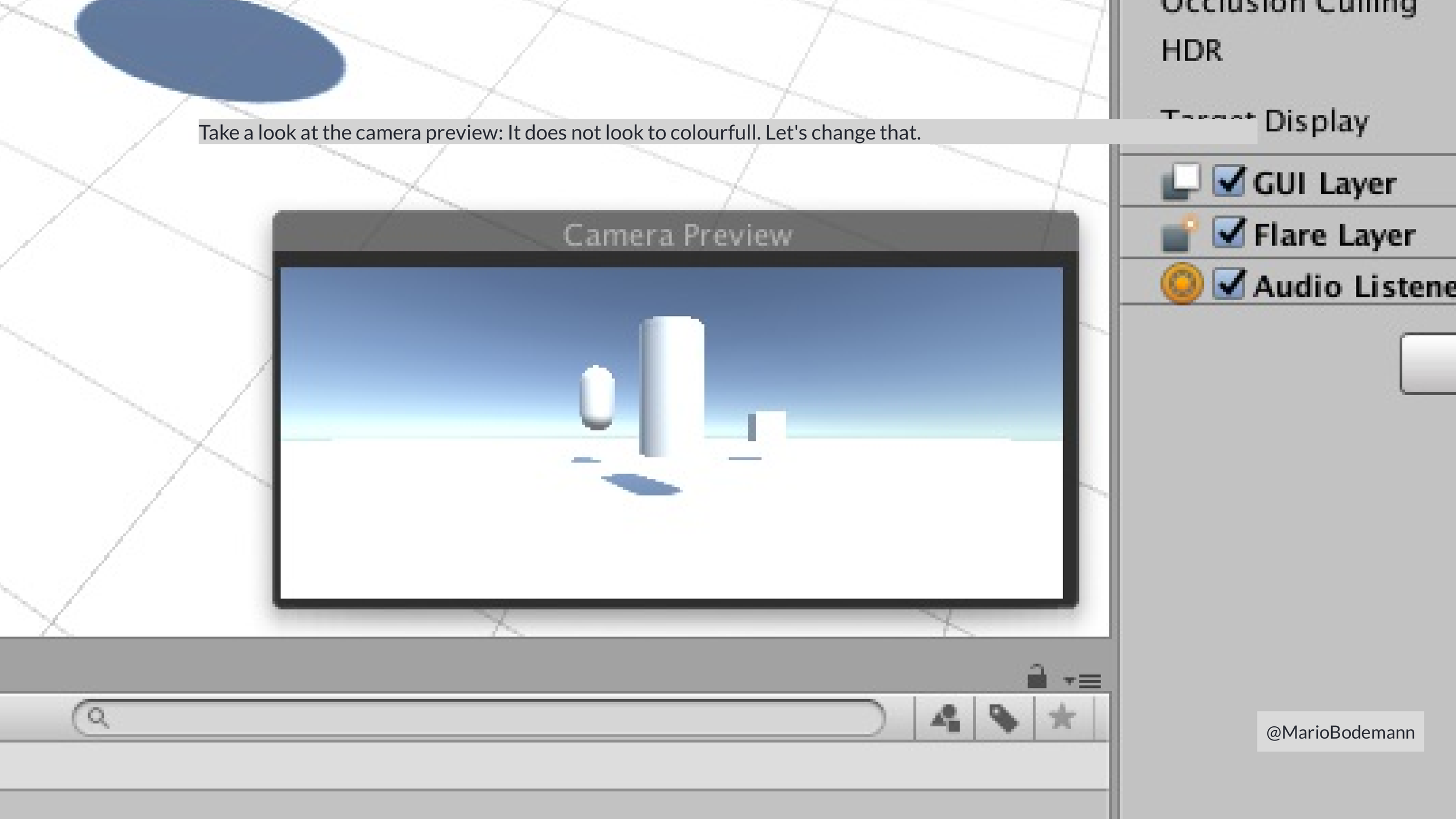
Take a look at the camera preview: It does not look to colourfull. Let's change that.



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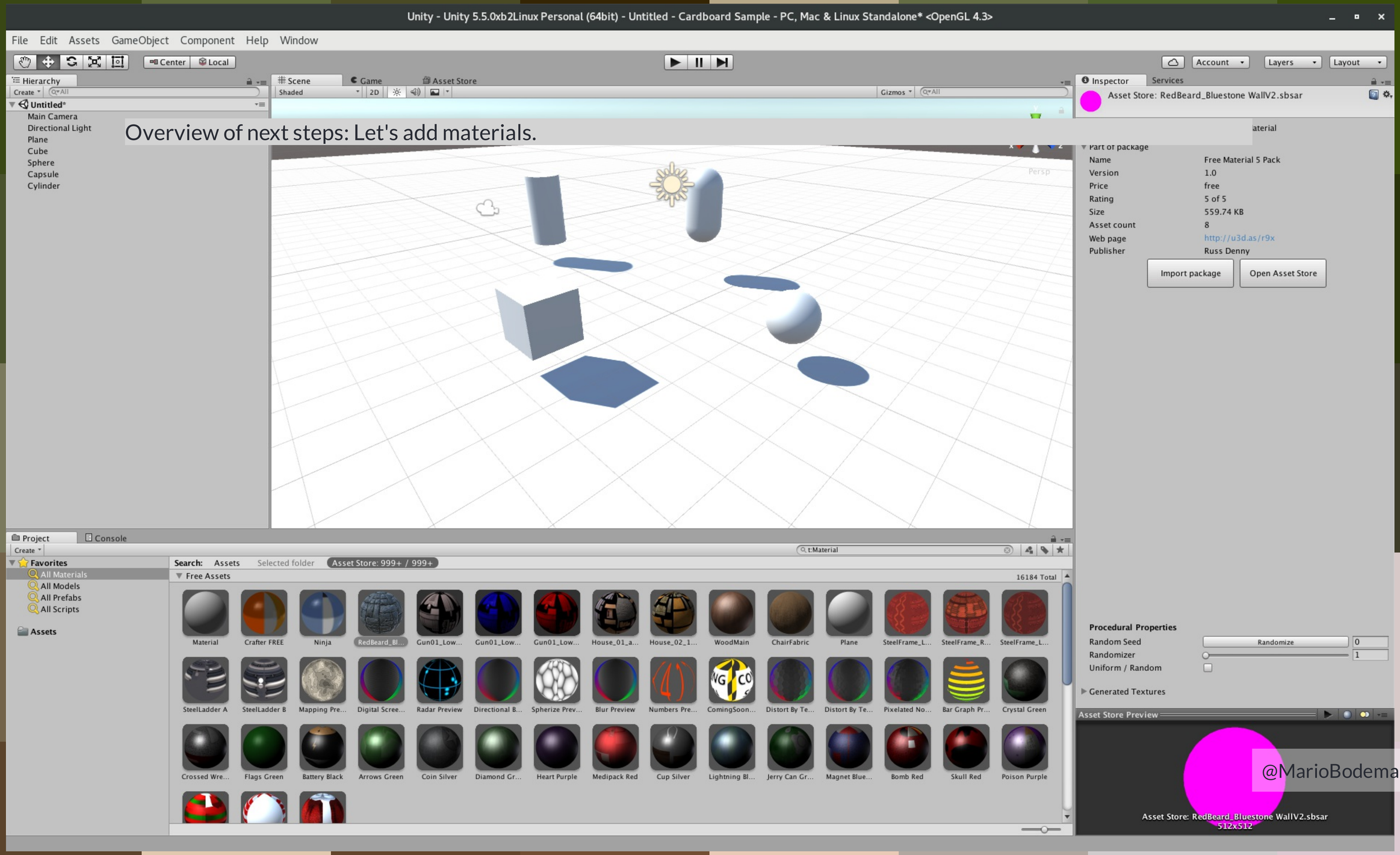
Overview of next steps: Let's add materials.



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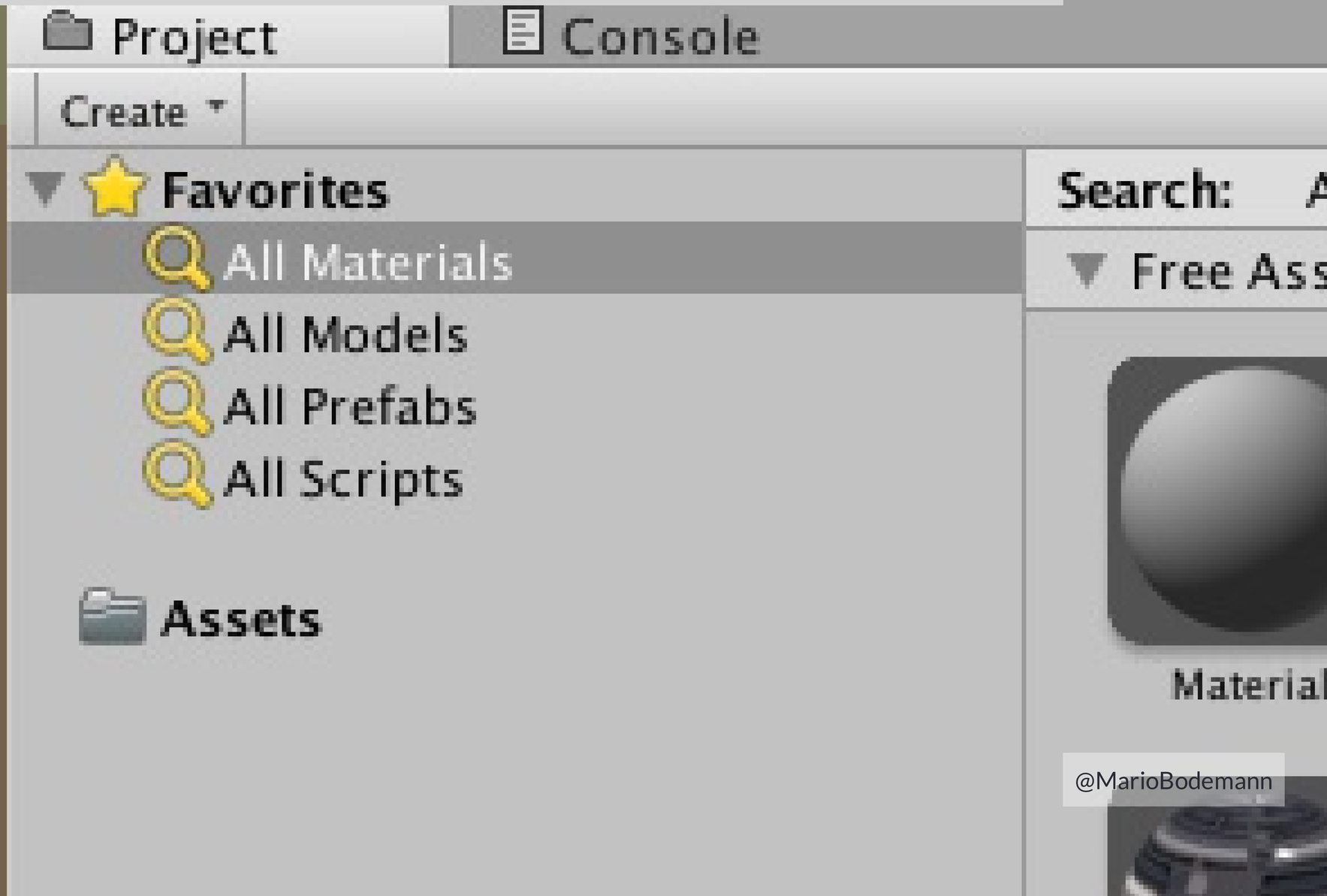
Click on Favorites\All Material



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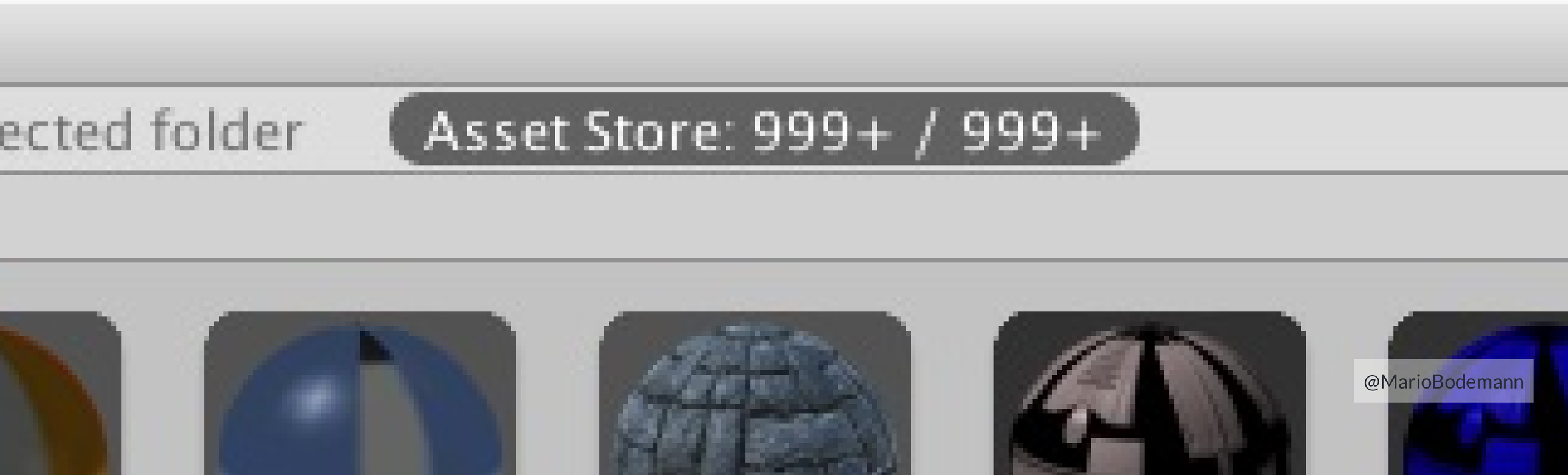
Click on Asset Store



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Click on an asset which is interesting/looks nice (RedBeard_Bluestone WallV2)

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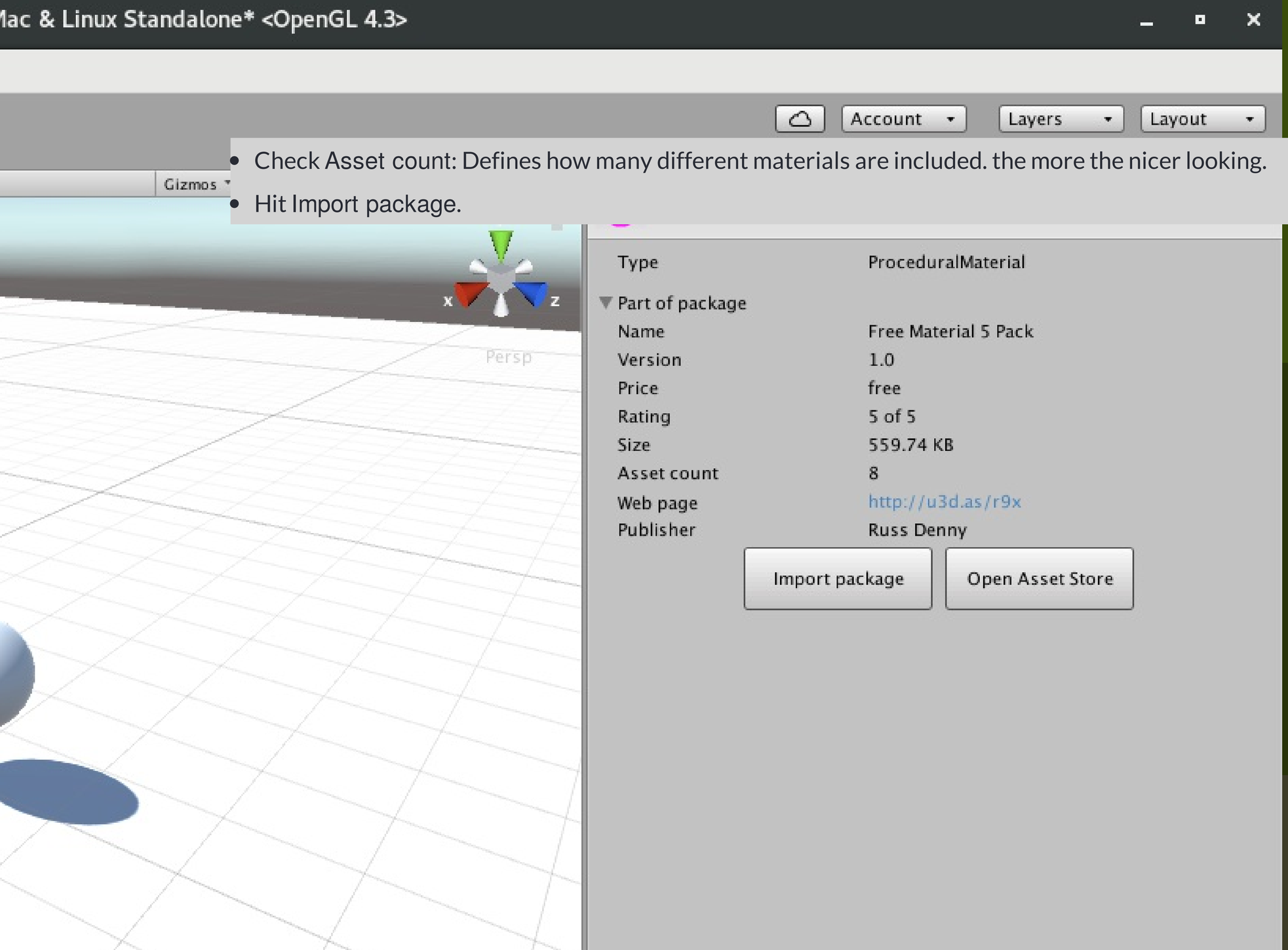
- Check Asset count: Defines how many different materials are included. the more the nicer looking.
- Hit Import package.



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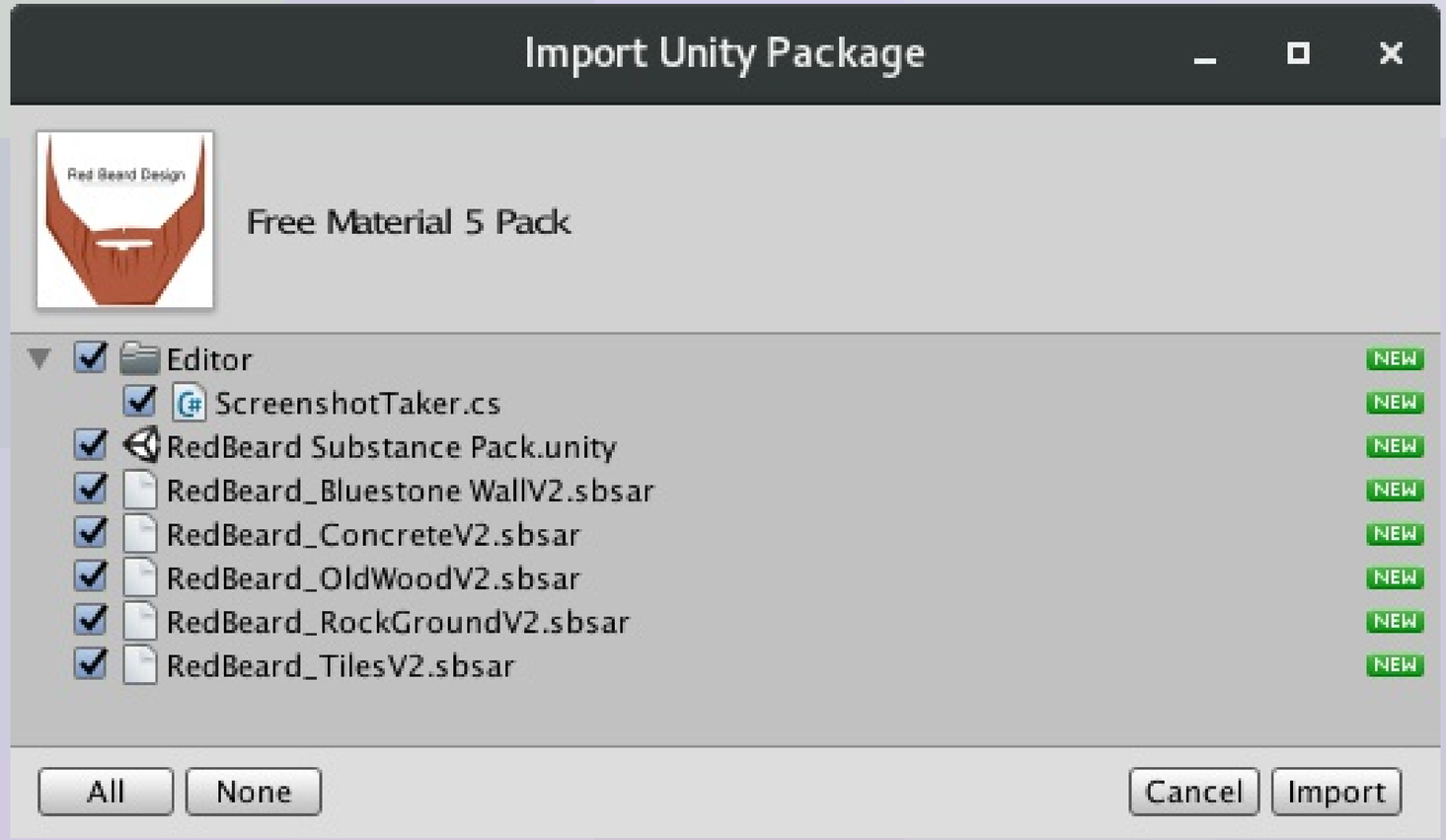
Hit import after checking all checkmarks (should already be the case)



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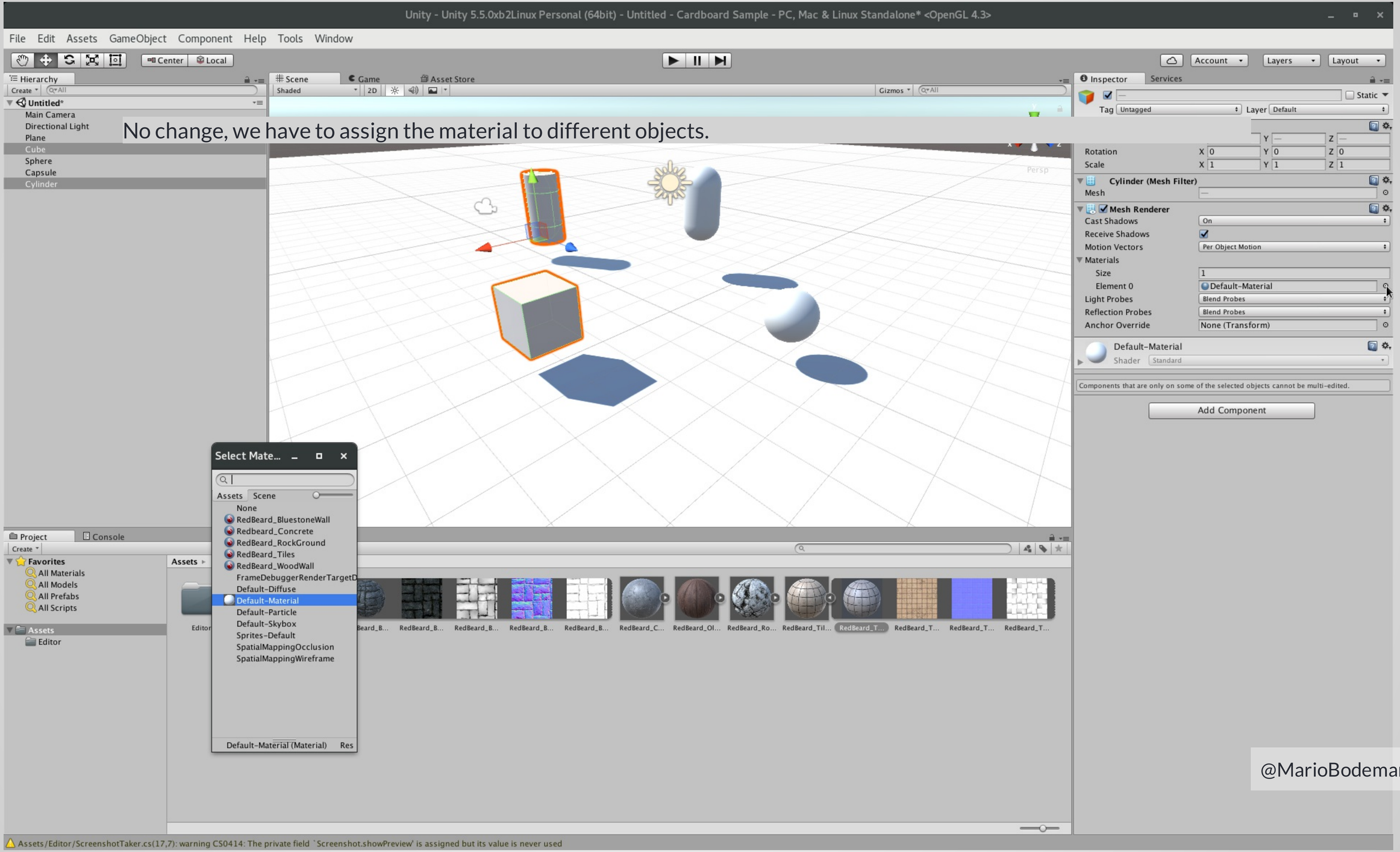

No change, we have to assign the material to different objects.

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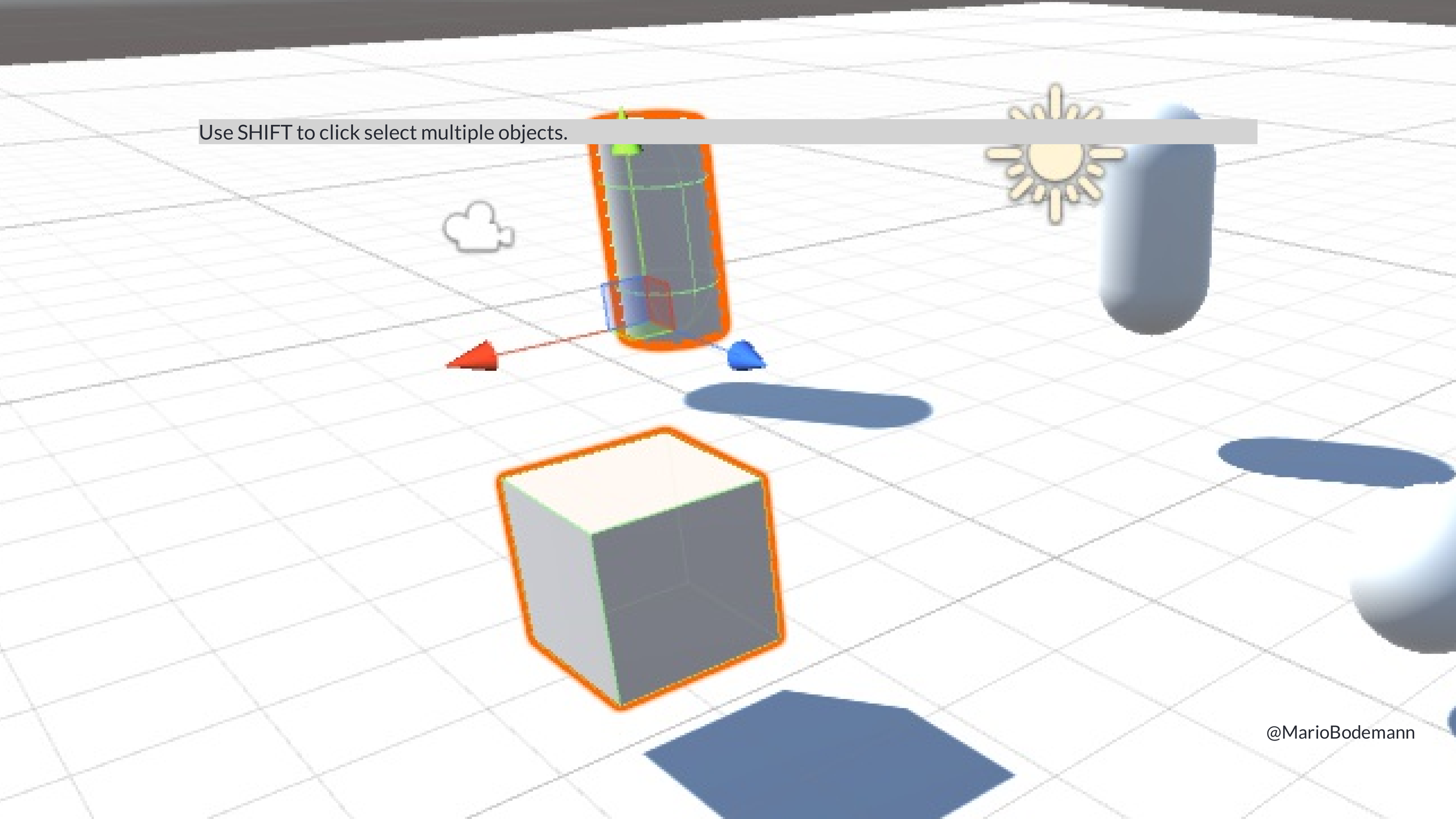
Use SHIFT to click select multiple objects.
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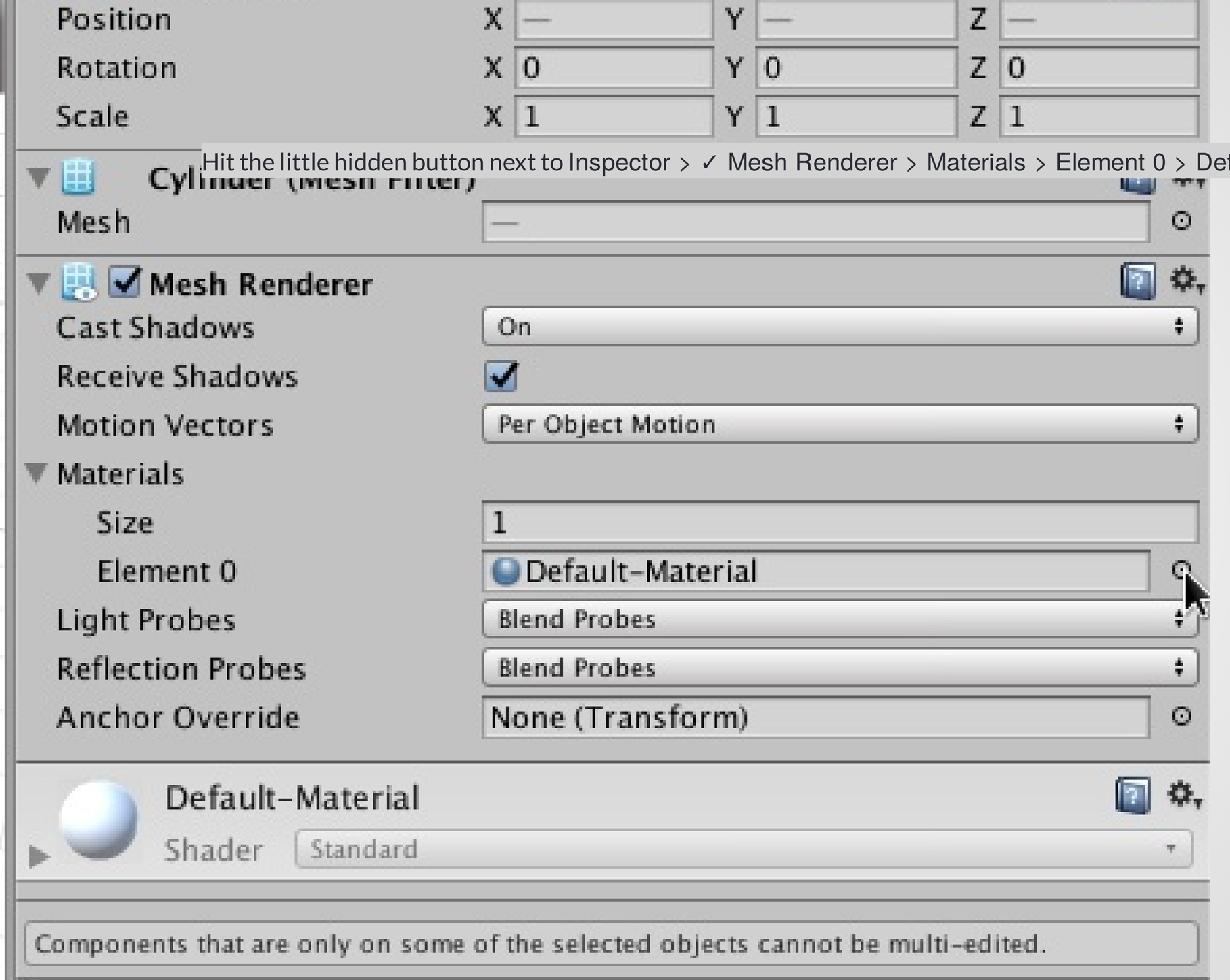
Hit the little hidden button next to Inspector > ✓ Mesh Renderer > Materials > Element 0 > Default Material … ○



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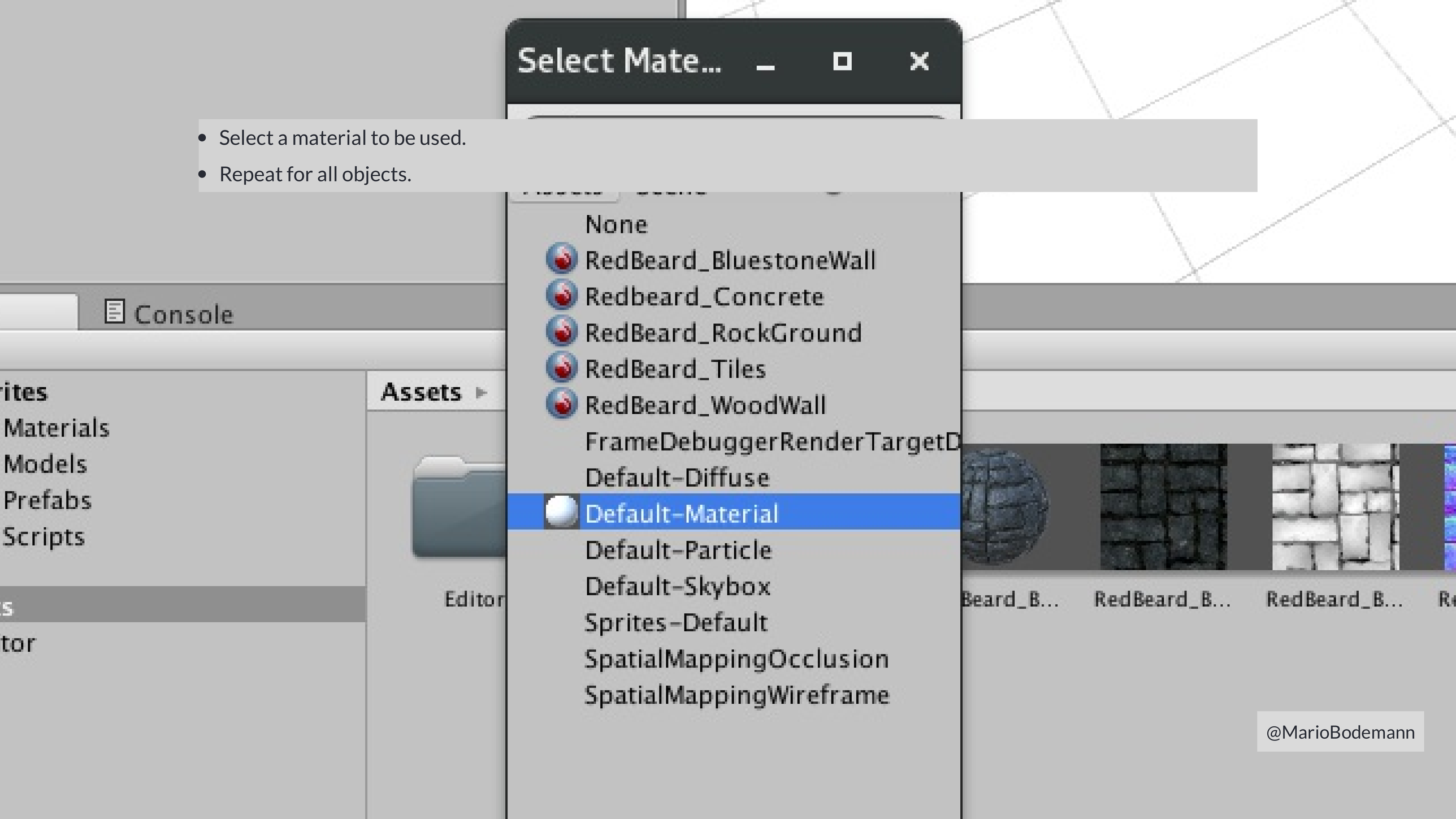
- Select a material to be used.
- Repeat for all objects.



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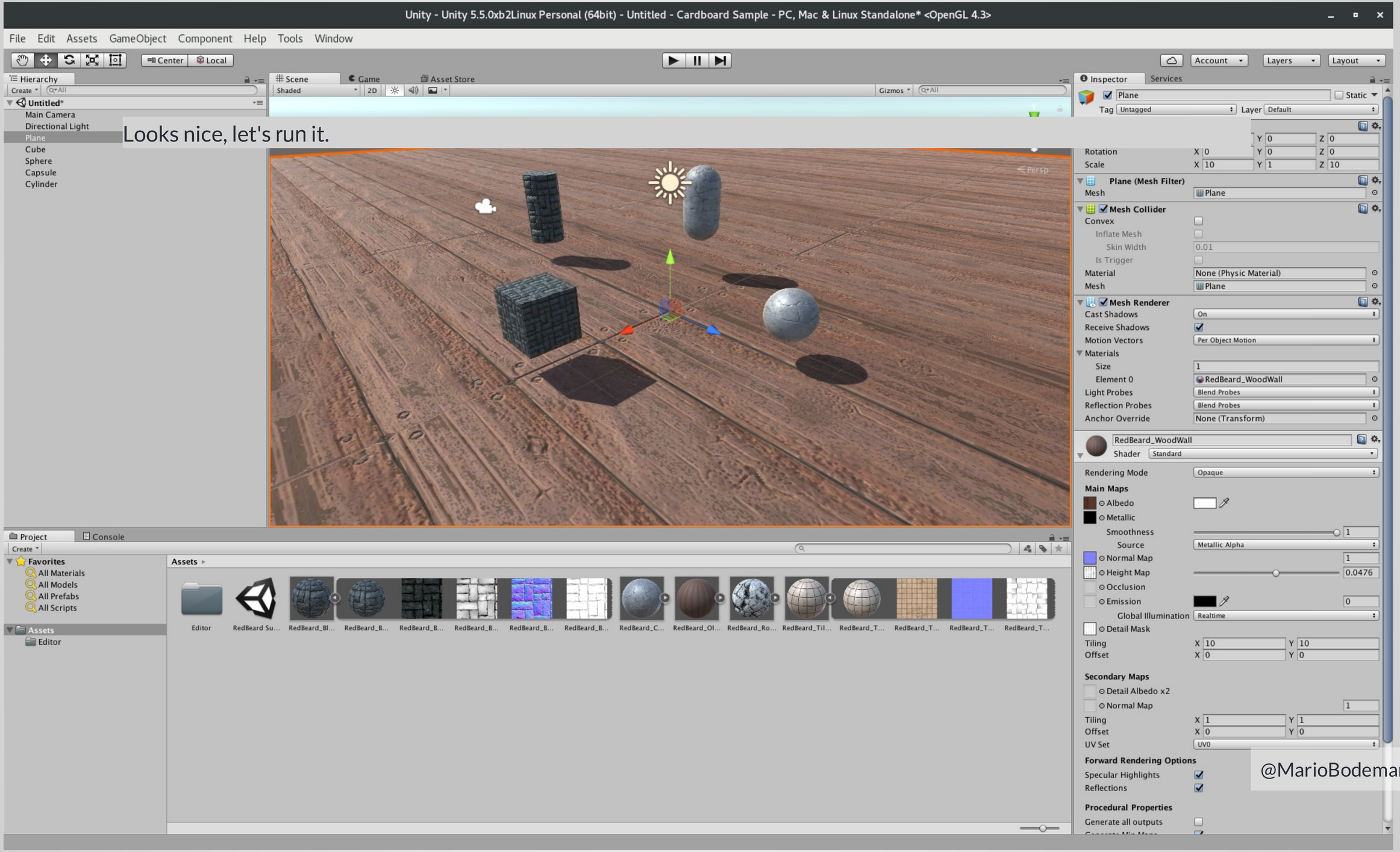
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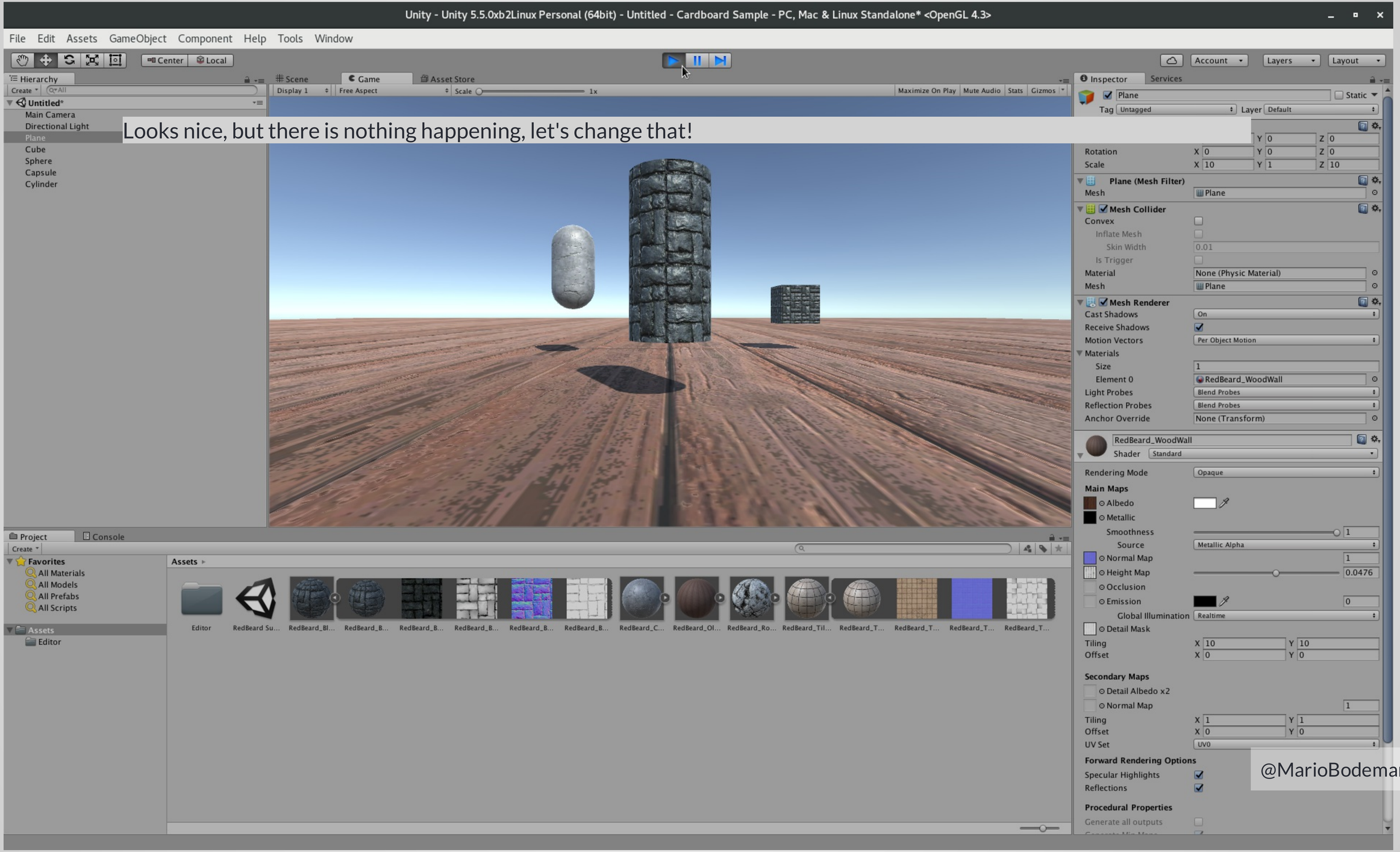
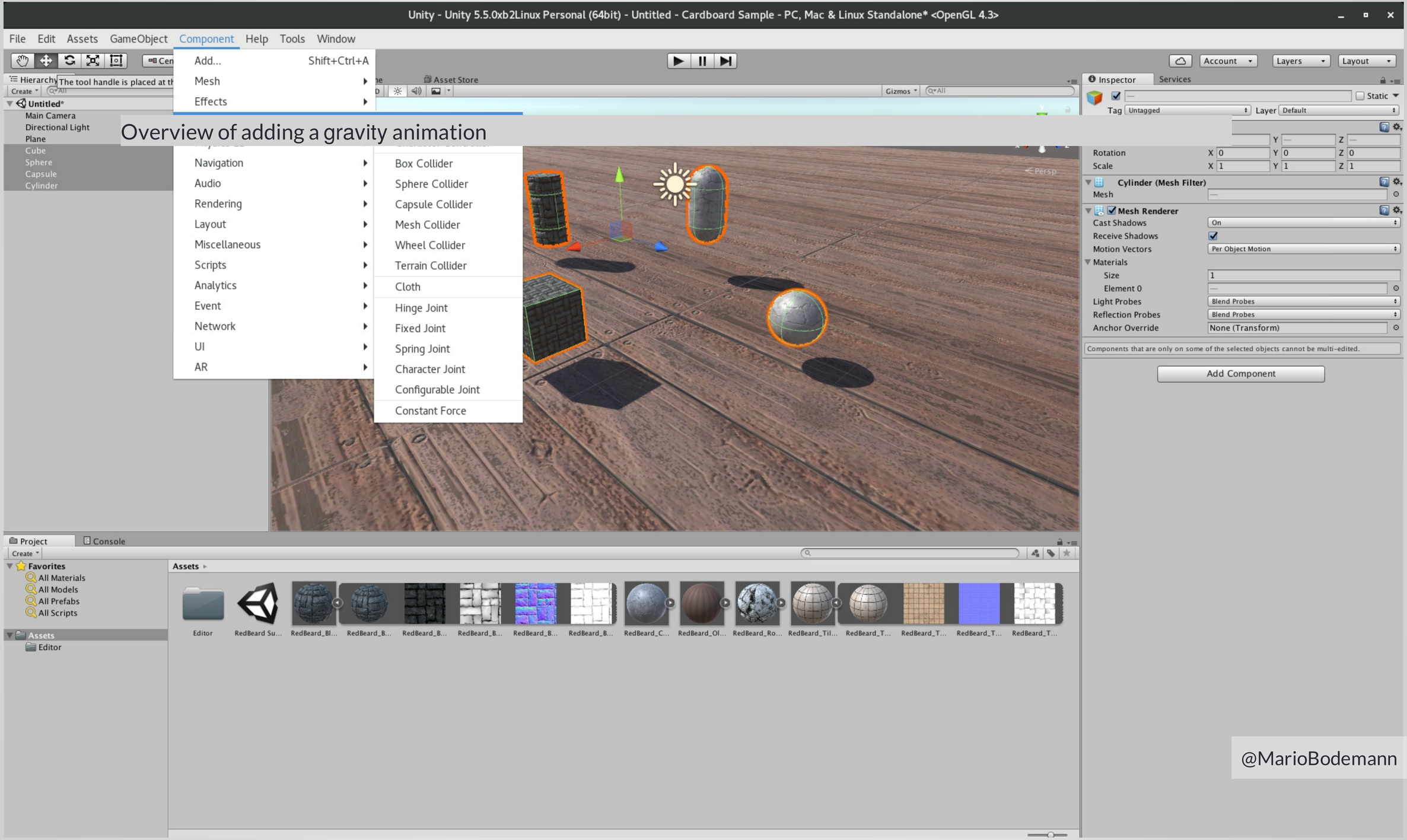
File Edit Assets GameObject Component Help Tools Window
Center Local
Account Layers Layout
Hierarchy
Untitled*
Main Camera
Directional Light
Plane
Cube
Sphere
Capsule
Cylinder
Scene Game Asset Store
Shaded 2D Gizmos
Inspector Services
Plane Static
Tag Untagged Layer Default
Rotation X 0 Y 0 Z 0
Scale X 10 Y 1 Z 10
Plane (Mesh Filter)
Mesh Plane
Mesh Collider
Convex
Inflate Mesh
Skin Width 0.01
Is Trigger
Material None (Physic Material)
Mesh Plane
Mesh Renderer
Cast Shadows On
Receive Shadows
Motion Vectors Per Object Motion
Materials
Size 1
Element 0 RedBeard_WoodWall
Light Probes Blend Probes
Reflection Probes Blend Probes
Anchor Override None (Transform)
RedBeard_WoodWall
Shader Standard
Rendering Mode Opaque
Main Maps
Albedo
Metallic
Smoothness 1
Source Metallic Alpha
Normal Map 1
Height Map 0.0476
Occlusion
Emission 0
Global Illumination Realtime
Detail Mask
Tiling X 10 Y 10
Offset X 0 Y 0
Secondary Maps
Detail Albedo x2
Normal Map 1
Tiling X 1 Y 1
Offset X 0 Y 0
UV Set UV0
Forward Rendering Options
Specular Highlights
Reflections
Procedural Properties
Generate all outputs
Project Console
Favorites
All Materials
All Models
All Prefabs
All Scripts
Assets
Editor
Assets
Editor
RedBeard Su...
RedBeard_Bl...
RedBeard_B...
RedBeard_C...
RedBeard_Ol...
RedBeard_Ro...
RedBeard_Til...
RedBeard_T...
Looks nice, let's run it.
@MarioBodemann

x Personal (64bit) - Untitled - Cardboard Sample - PC, Mac & Li
1x



Looks nice, but there is nothing happening, let's change that!

Overview of adding a gravity animation



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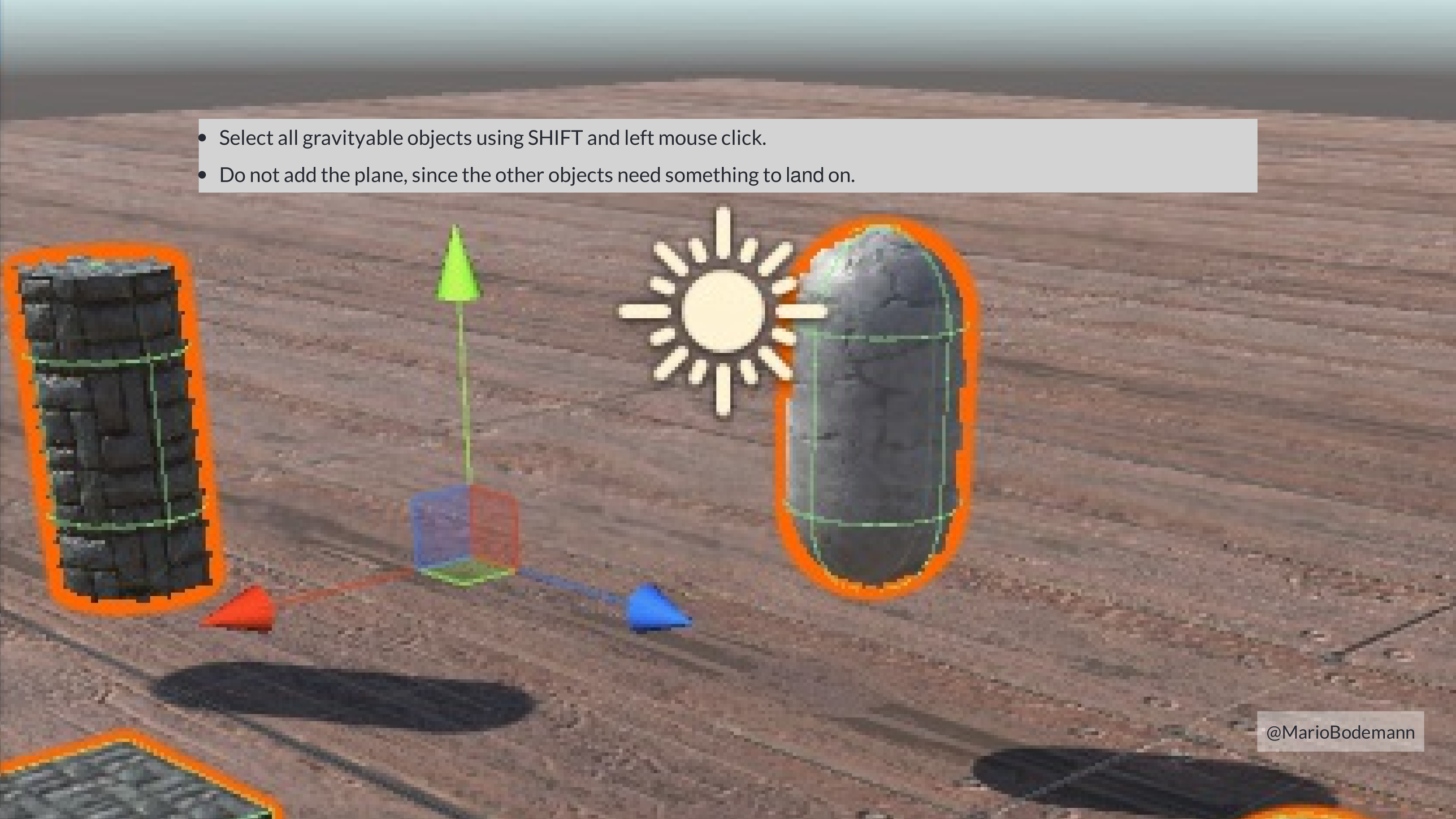
- Select all gravityable objects using SHIFT and left mouse click.
- Do not add the plane, since the other objects need something to land on.



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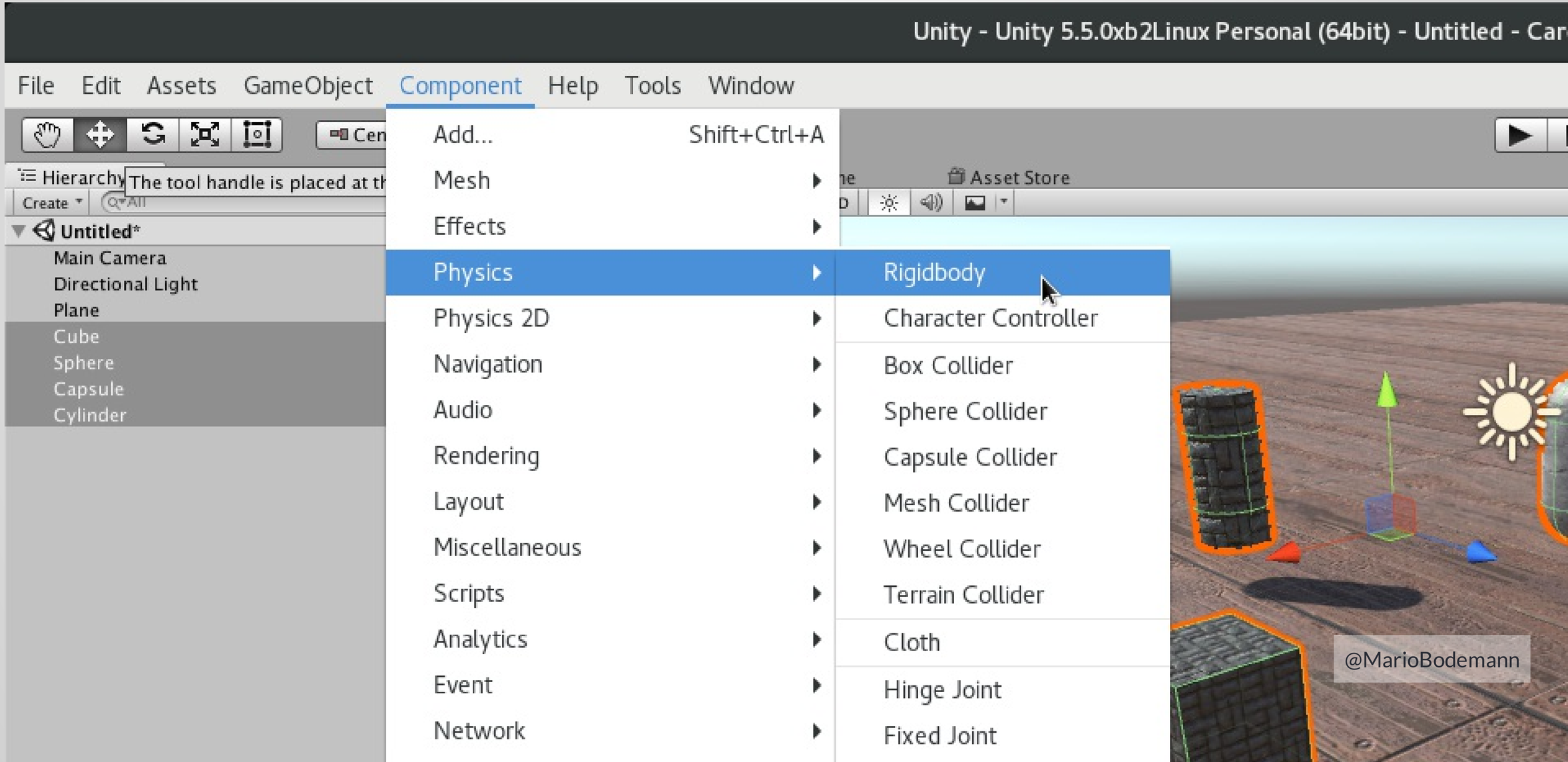
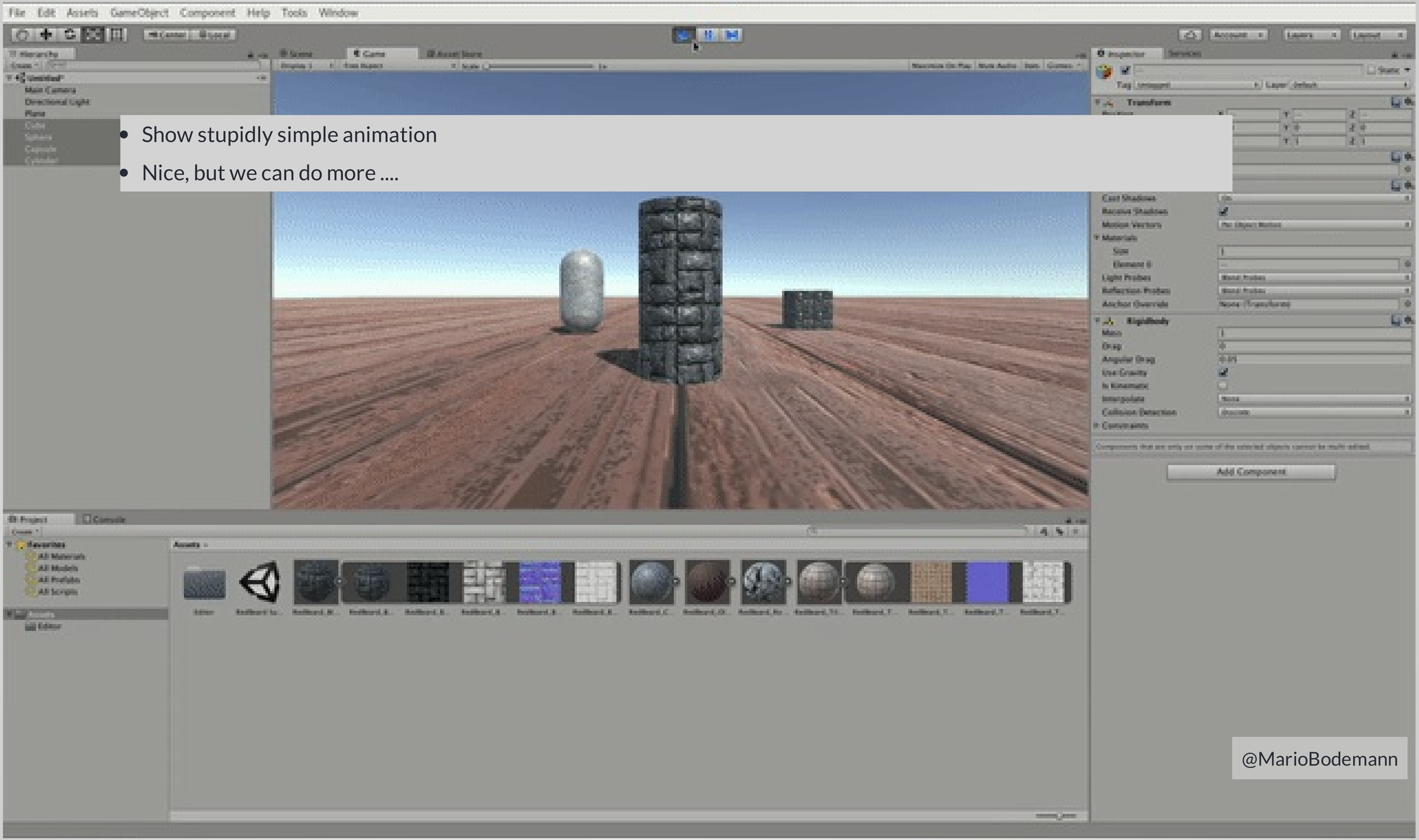
Add gravity to all selected objects by hitting menu option Component > Physics > Rigidbody.



Hit play.



- Show stupidly simple animation
- Nice, but we can do more ....

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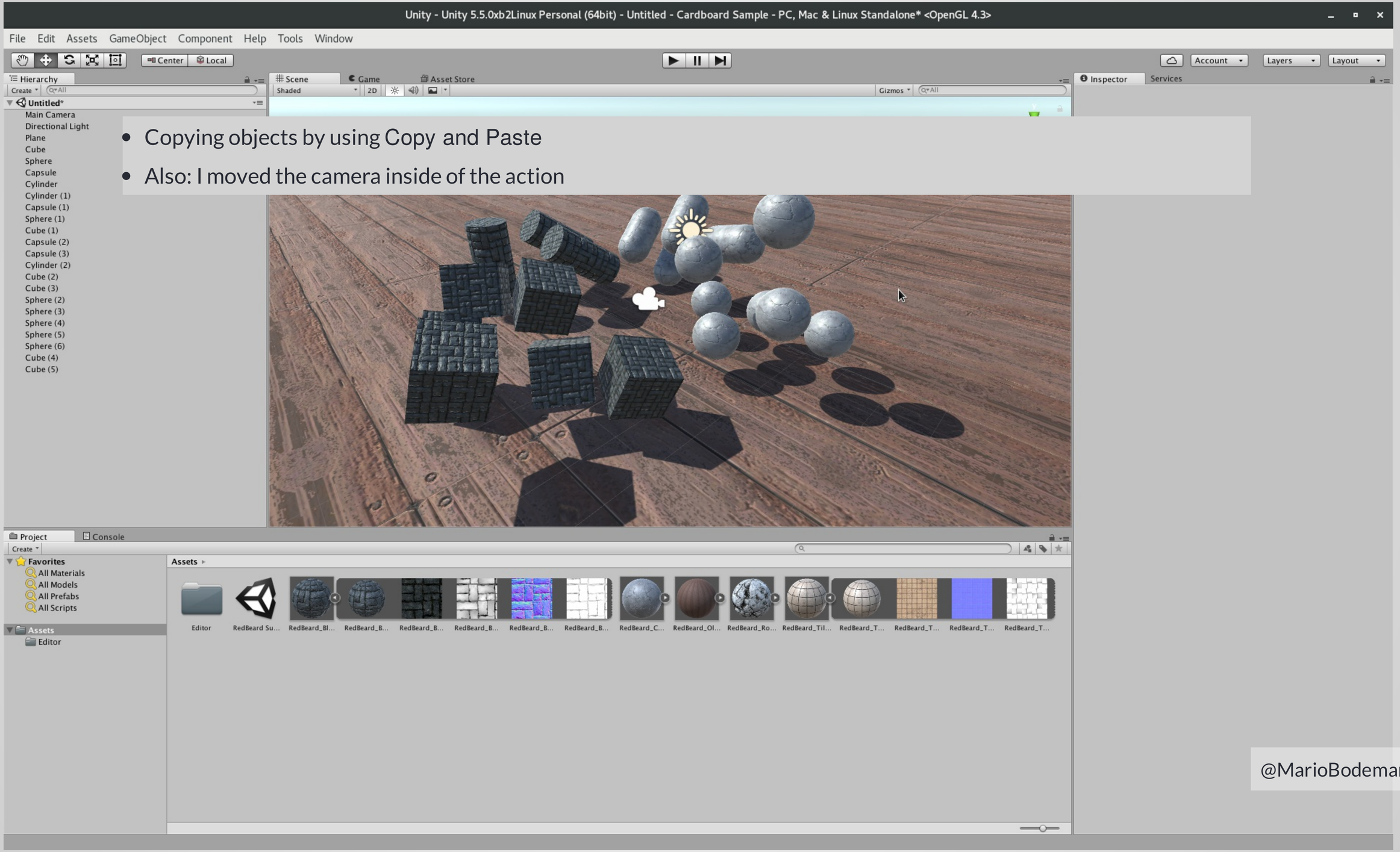

- Copying objects by using Copy and Paste
- Also: I moved the camera inside of the action

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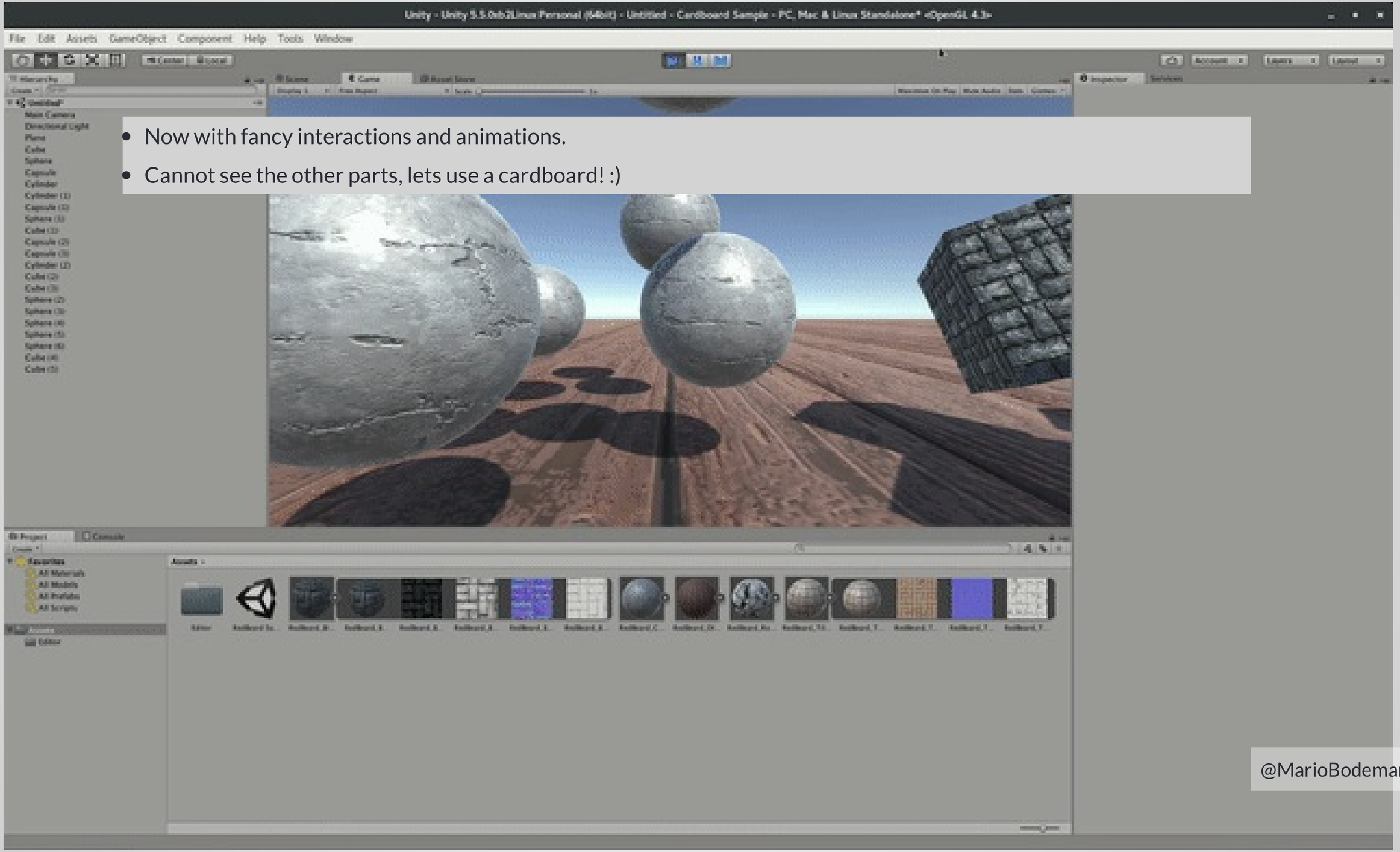

- Now with fancy interactions and animations.
- Cannot see the other parts, lets use a cardboard! :)

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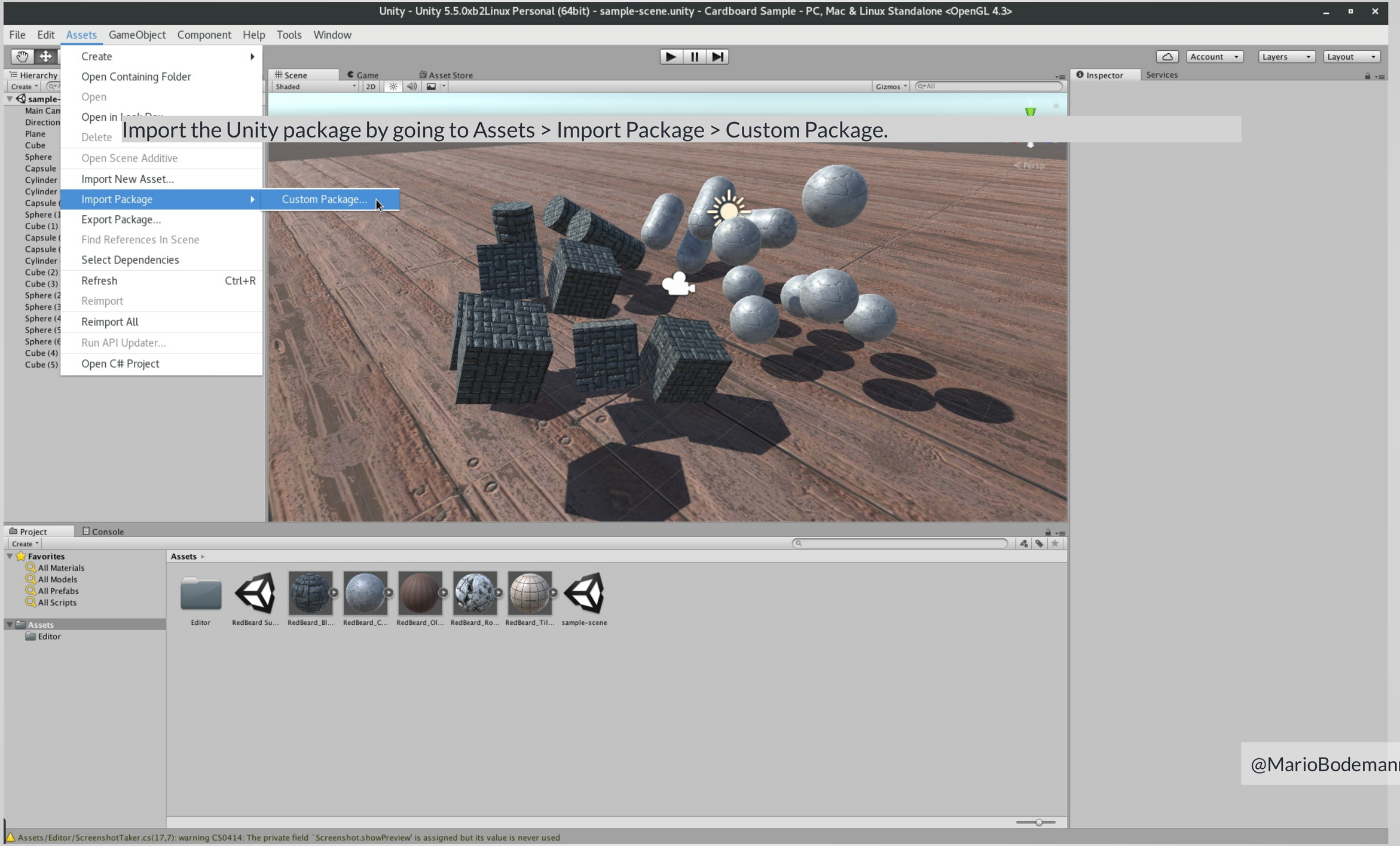

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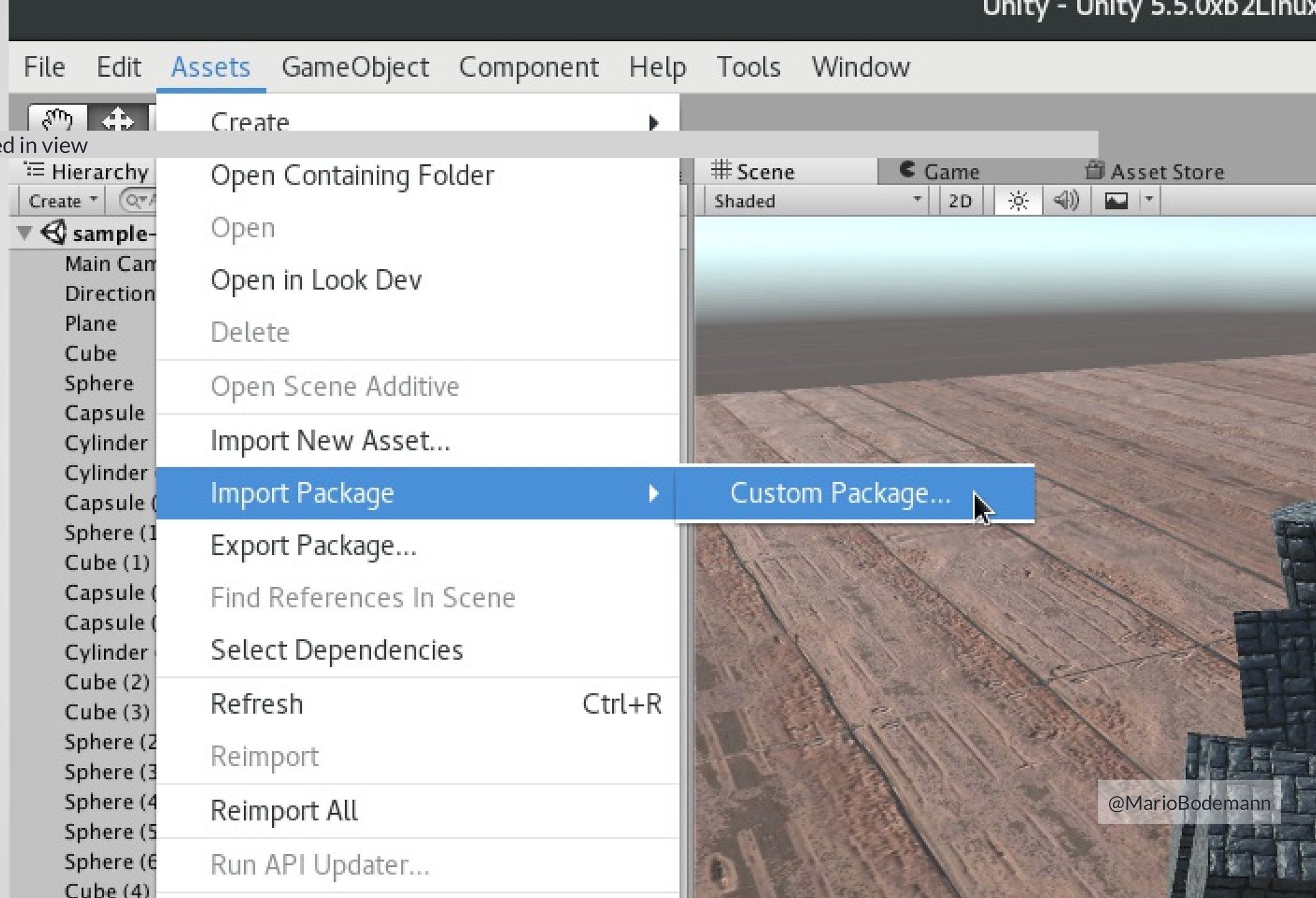
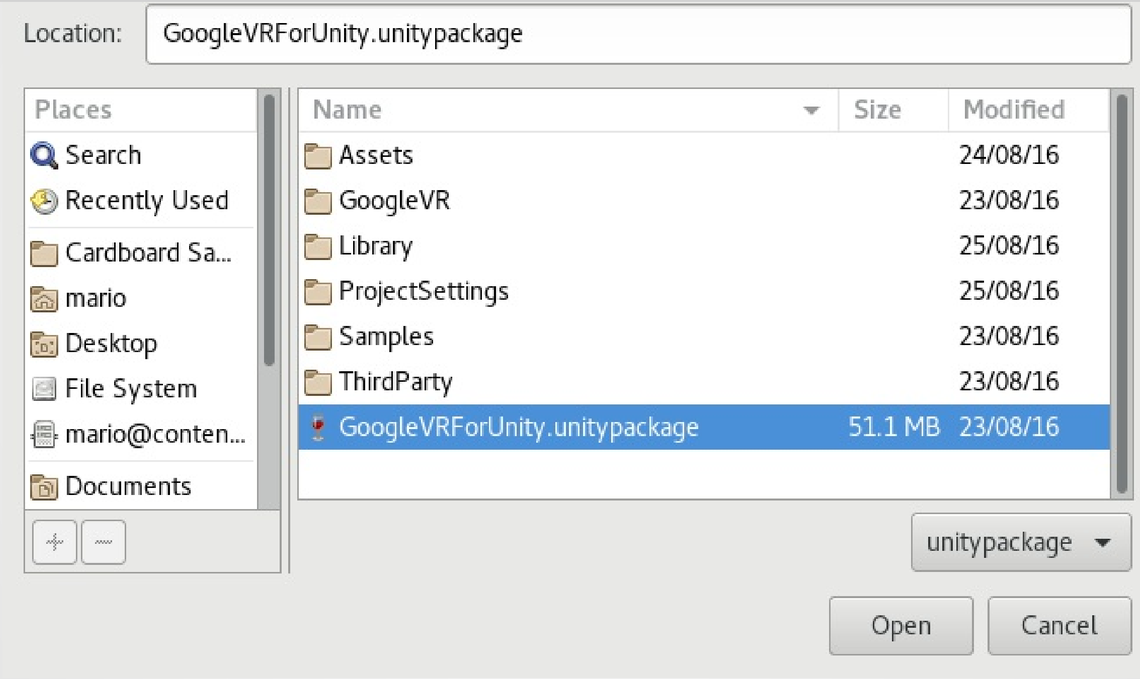
zoomed in view



- Find the checked out folder from step 1
- Select the GoogleVRForUnity.unitypackage
- Hit Open.
- Wait



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Select all and hit ok again. You have now the complete sdk imported.

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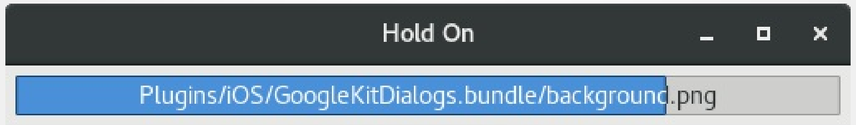
Please wait ... ;)



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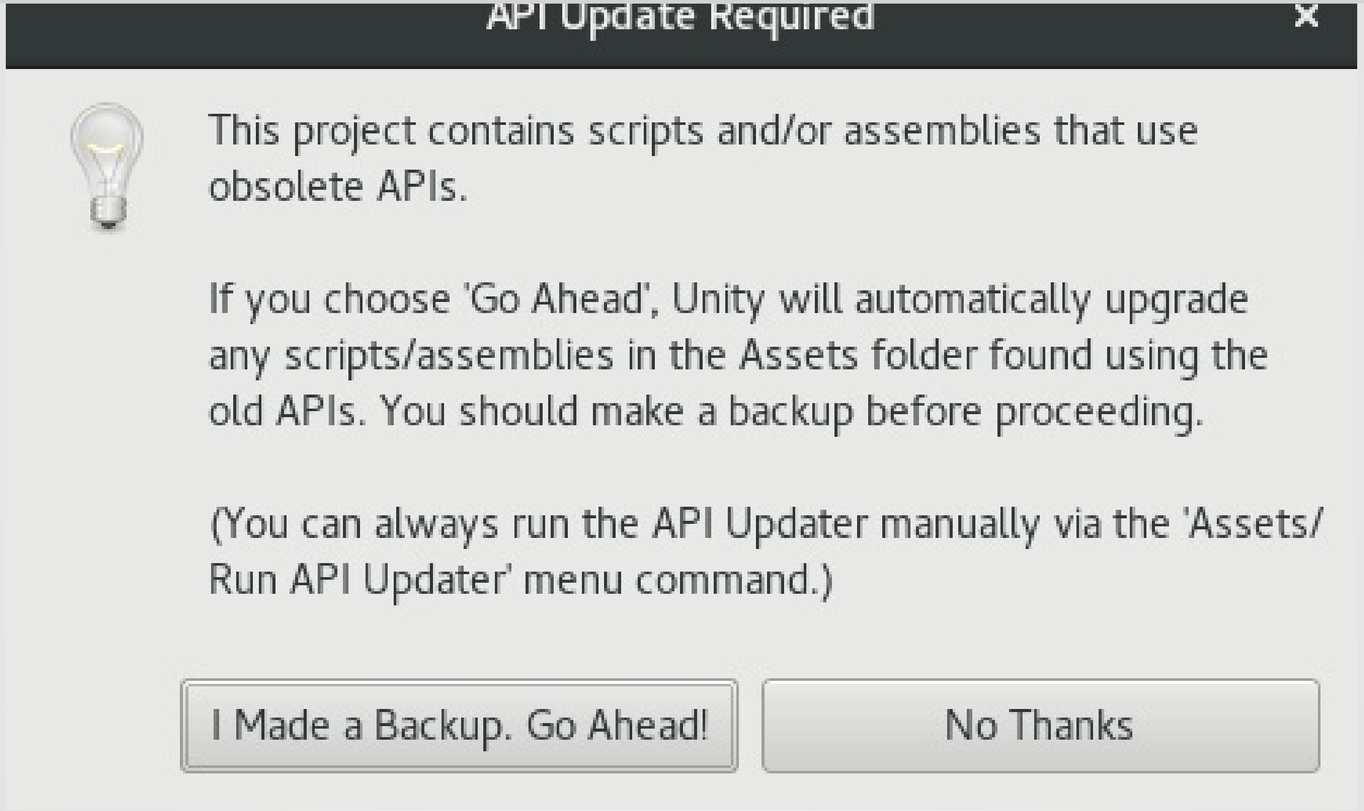
- Updating is fine for simple projects, more complex might be an issue.
- I Made a Backup. Go Ahead!



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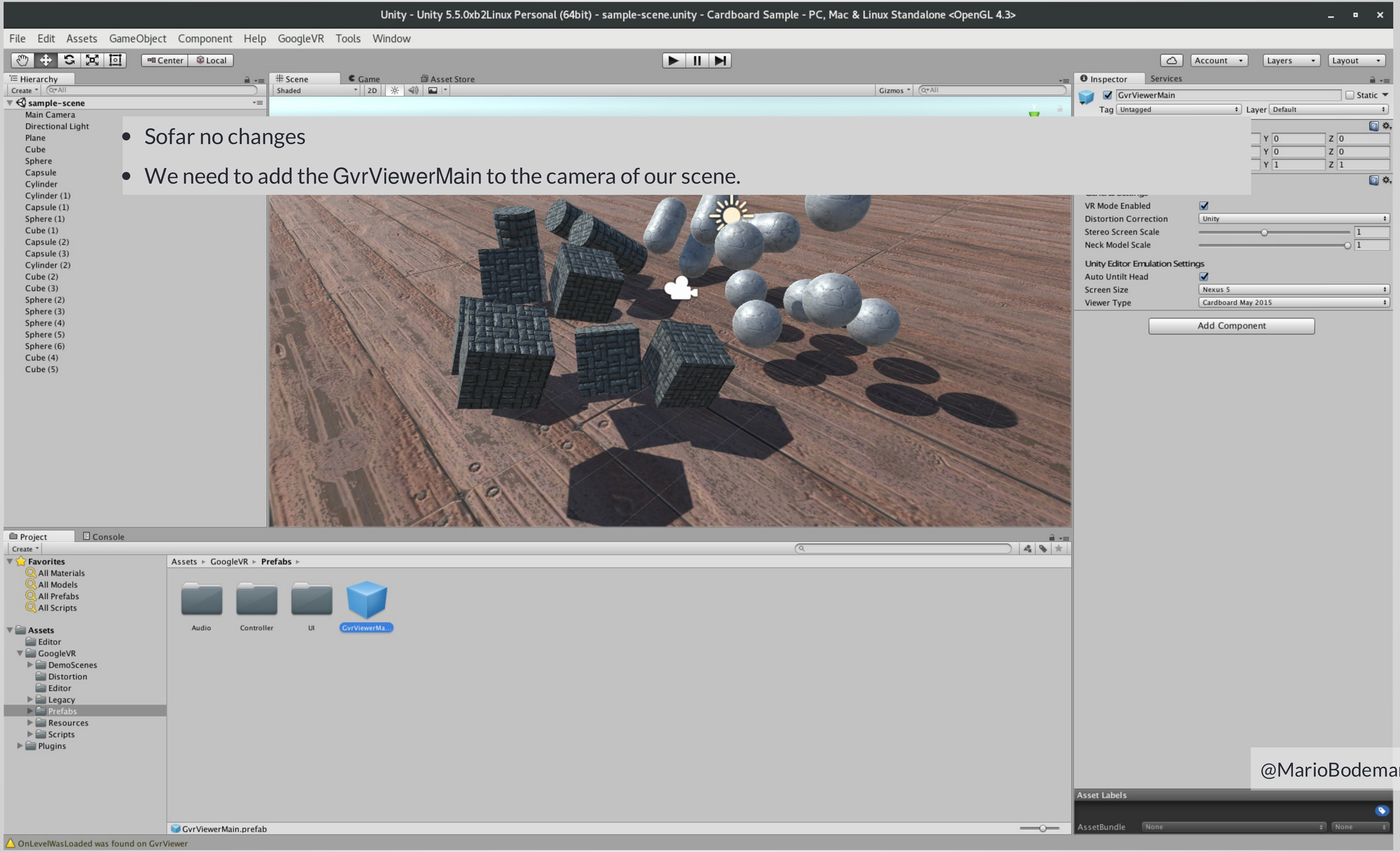

- Sofar no changes
- We need to add the GvrViewerMain to the camera of our scene.

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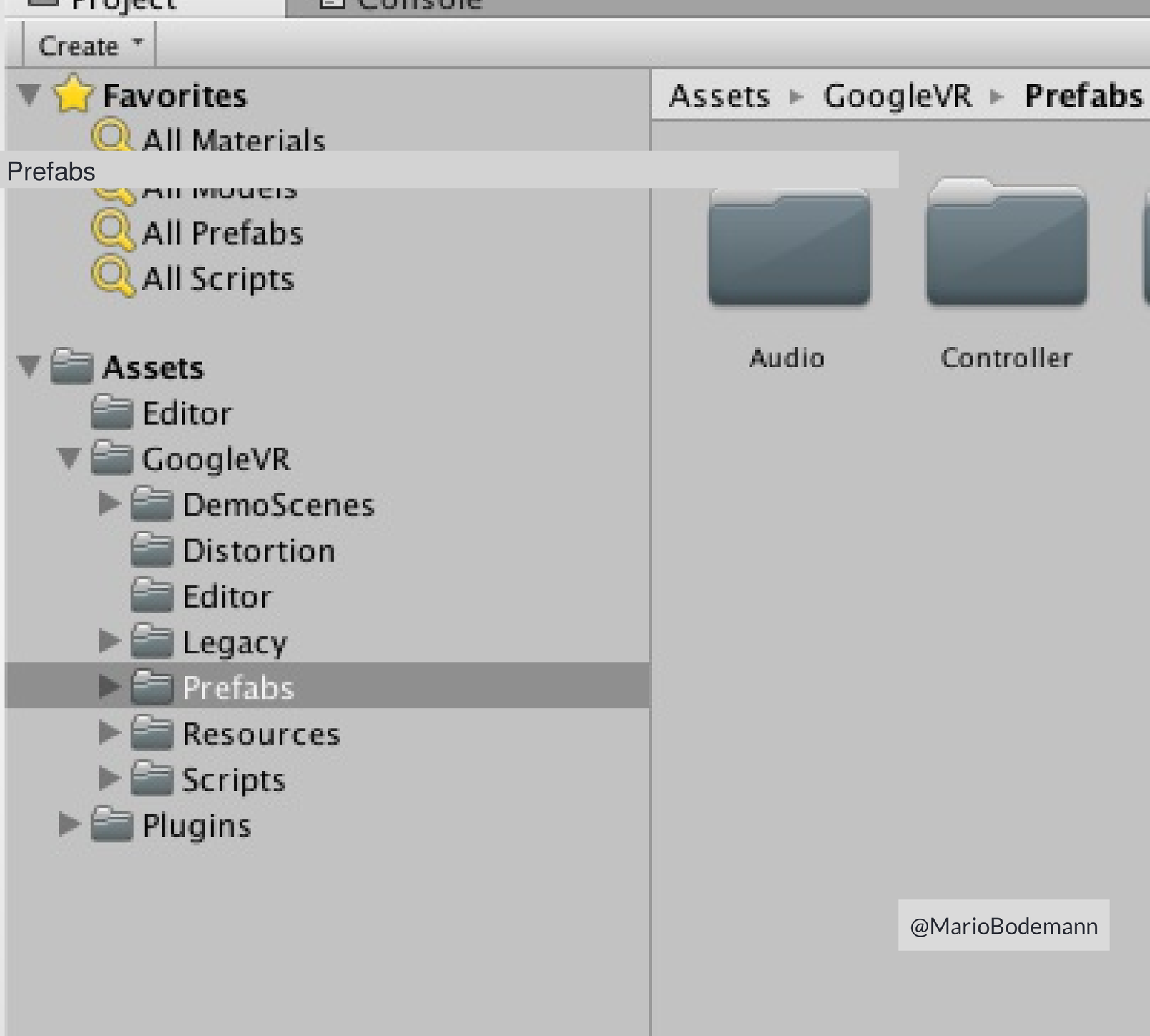
Select Project > Assets > GoogleVR > Prefabs



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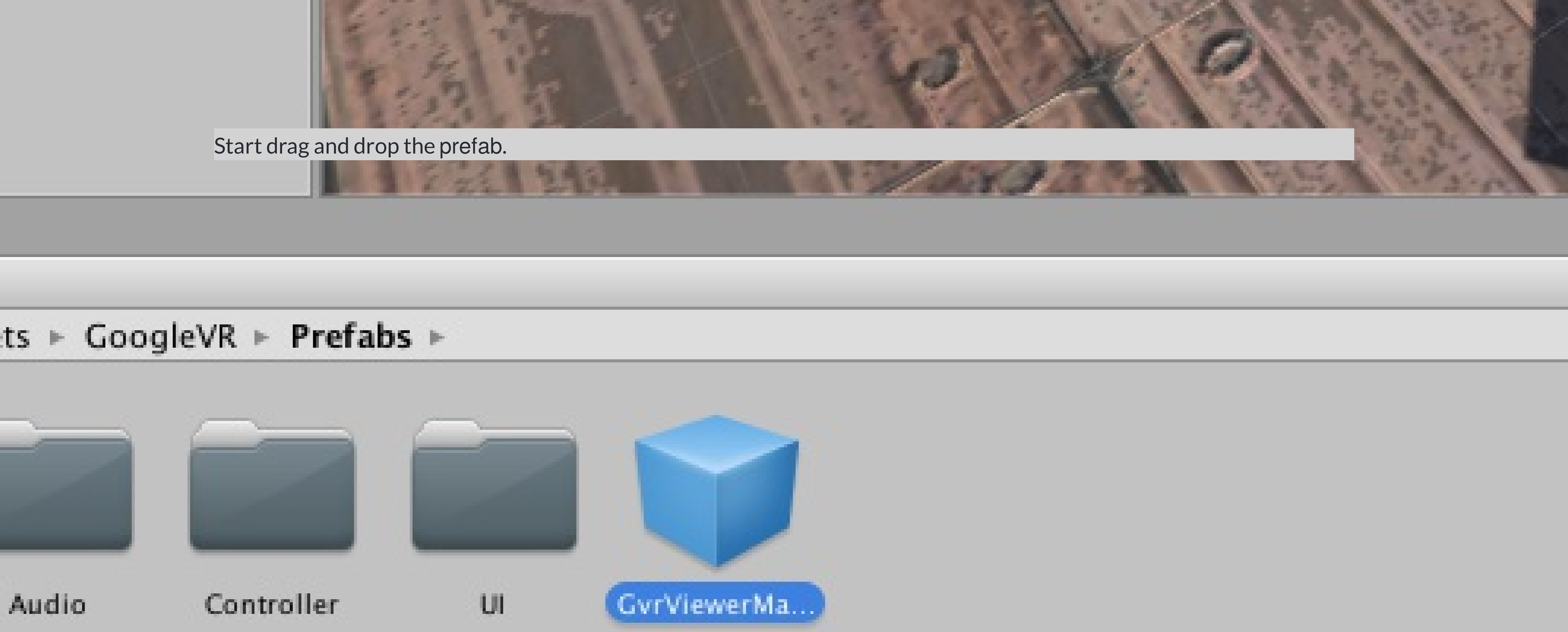
Start drag and drop the prefab.



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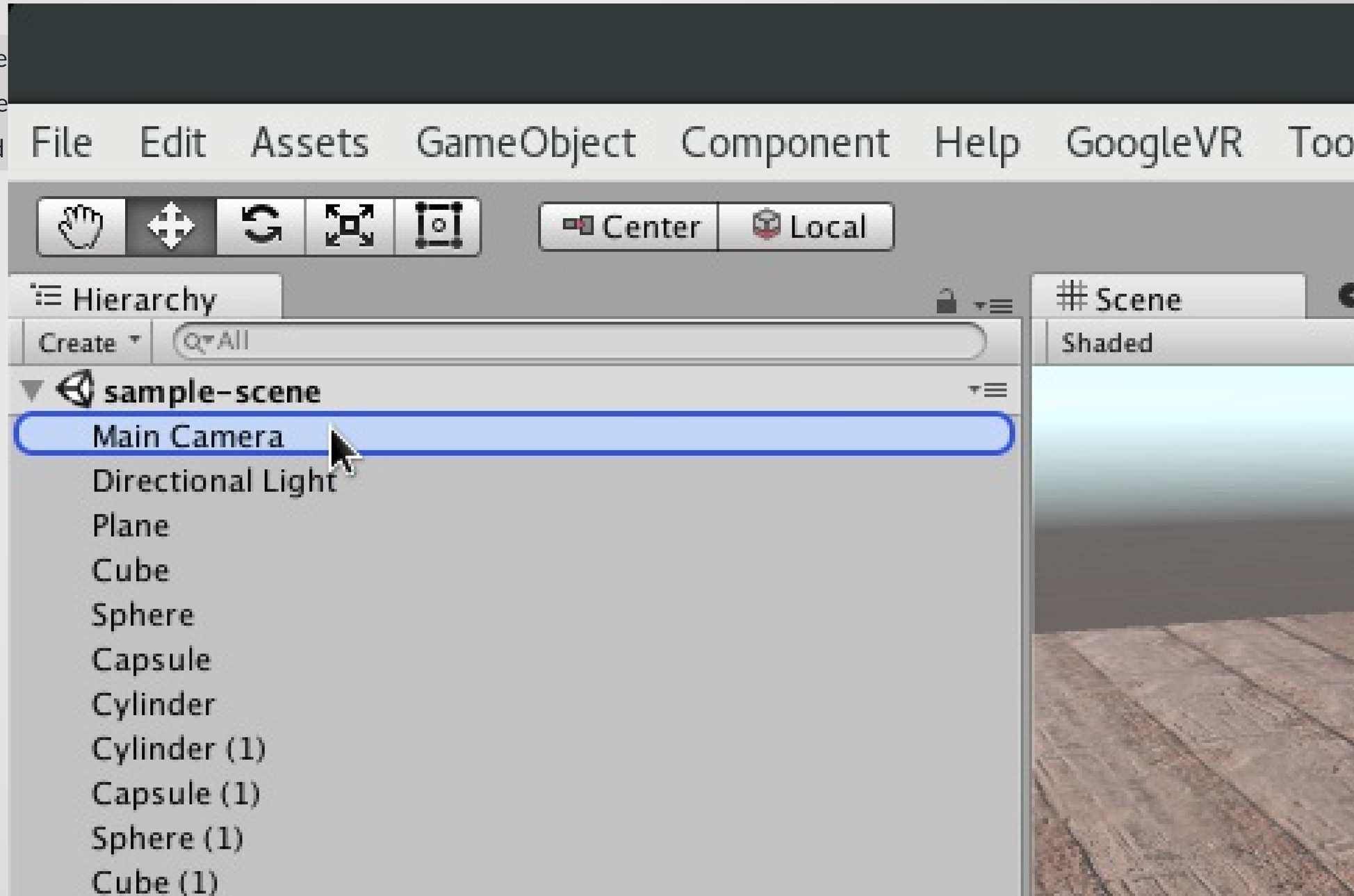
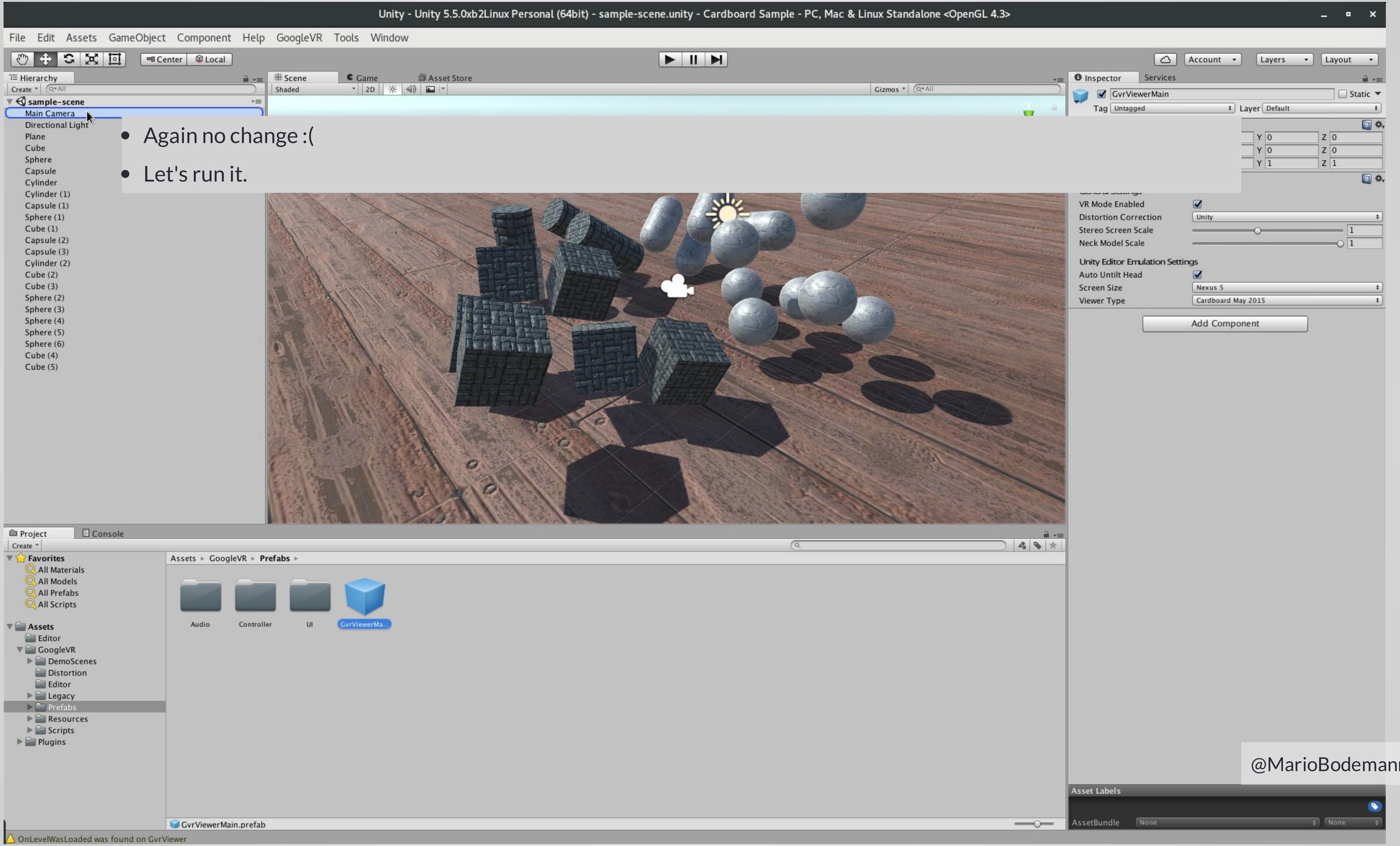
- Drop it onto the
- Sofar no change
- We need to add





- Again no change :(
- Let's run it.

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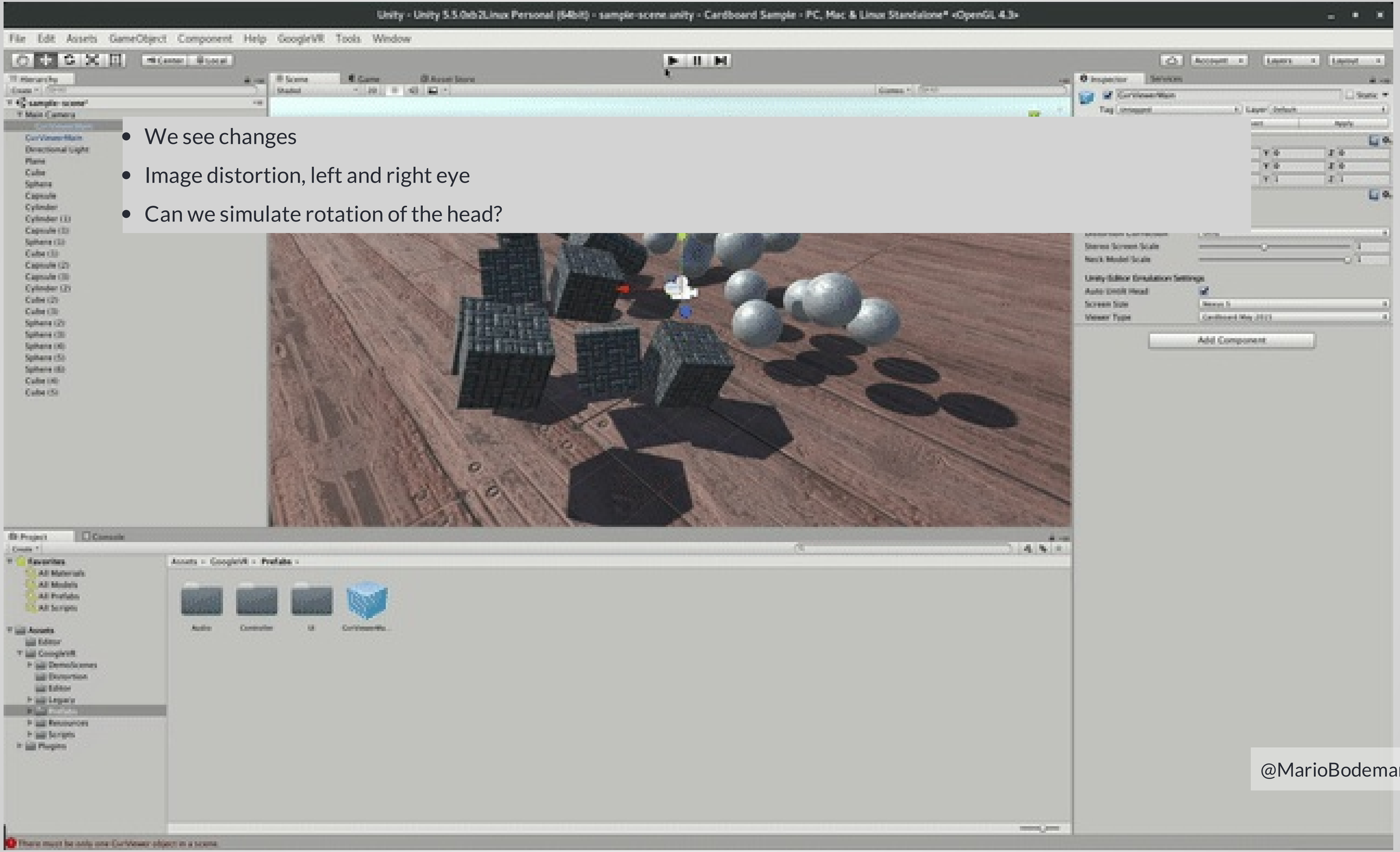

- We see changes
- Image distortion, left and right eye
- Can we simulate rotation of the head?

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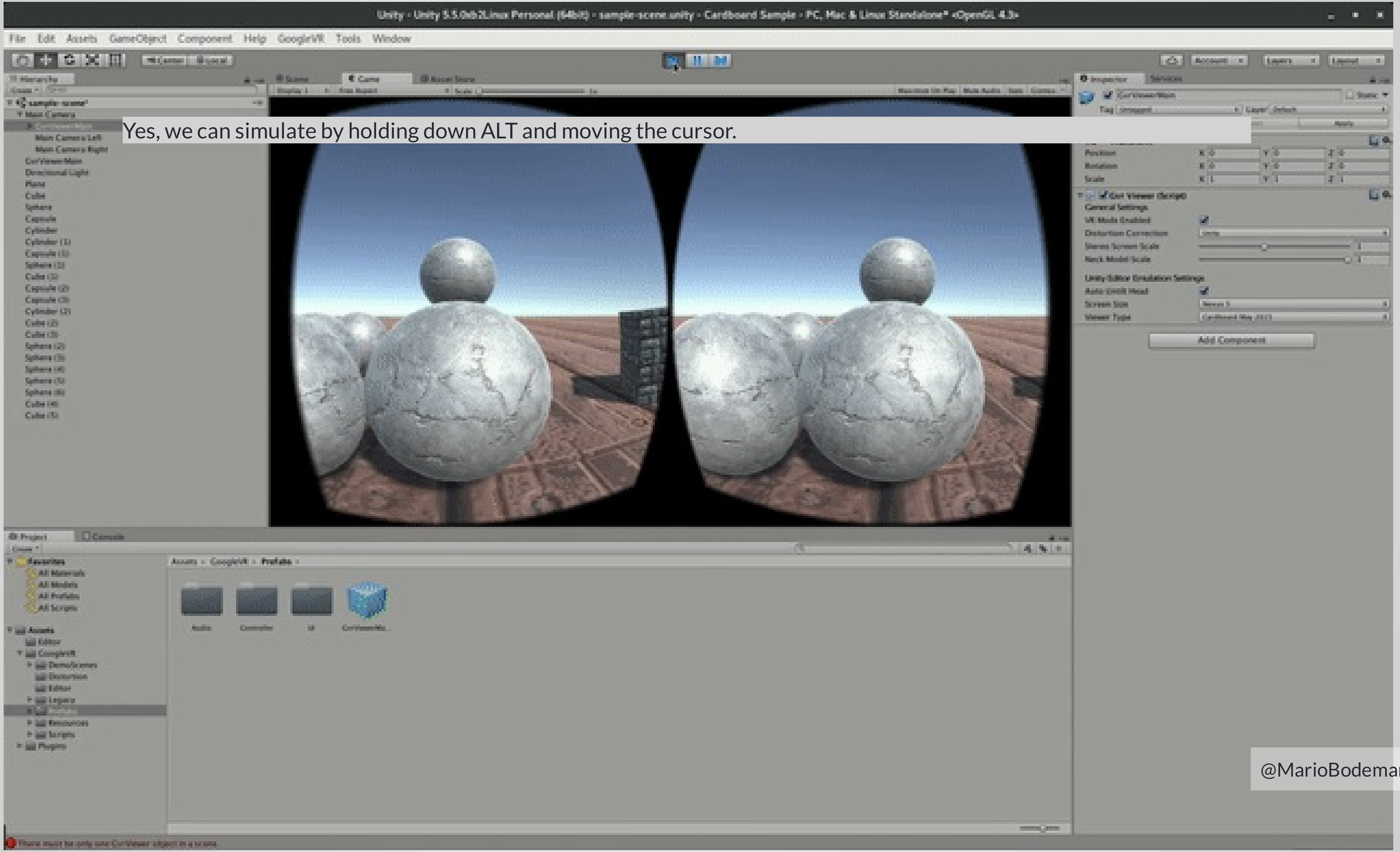

Yes, we can simulate by holding down ALT and moving the cursor.

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Summary of Unity Demo

- Using Unity is fast
- Using Cardboard SDK is easy
- Using internal renderer for simulating
- `GvrIntent` start of interoperation Android - Unity

📄 Project 📱 APK

Difficulties in using Unity

- Cost for non free version exists.
- Integration with other (Java) libraries difficult at best.

- Introduced at Google I/O this year.
- Soon™ first hardware available.

Daydream

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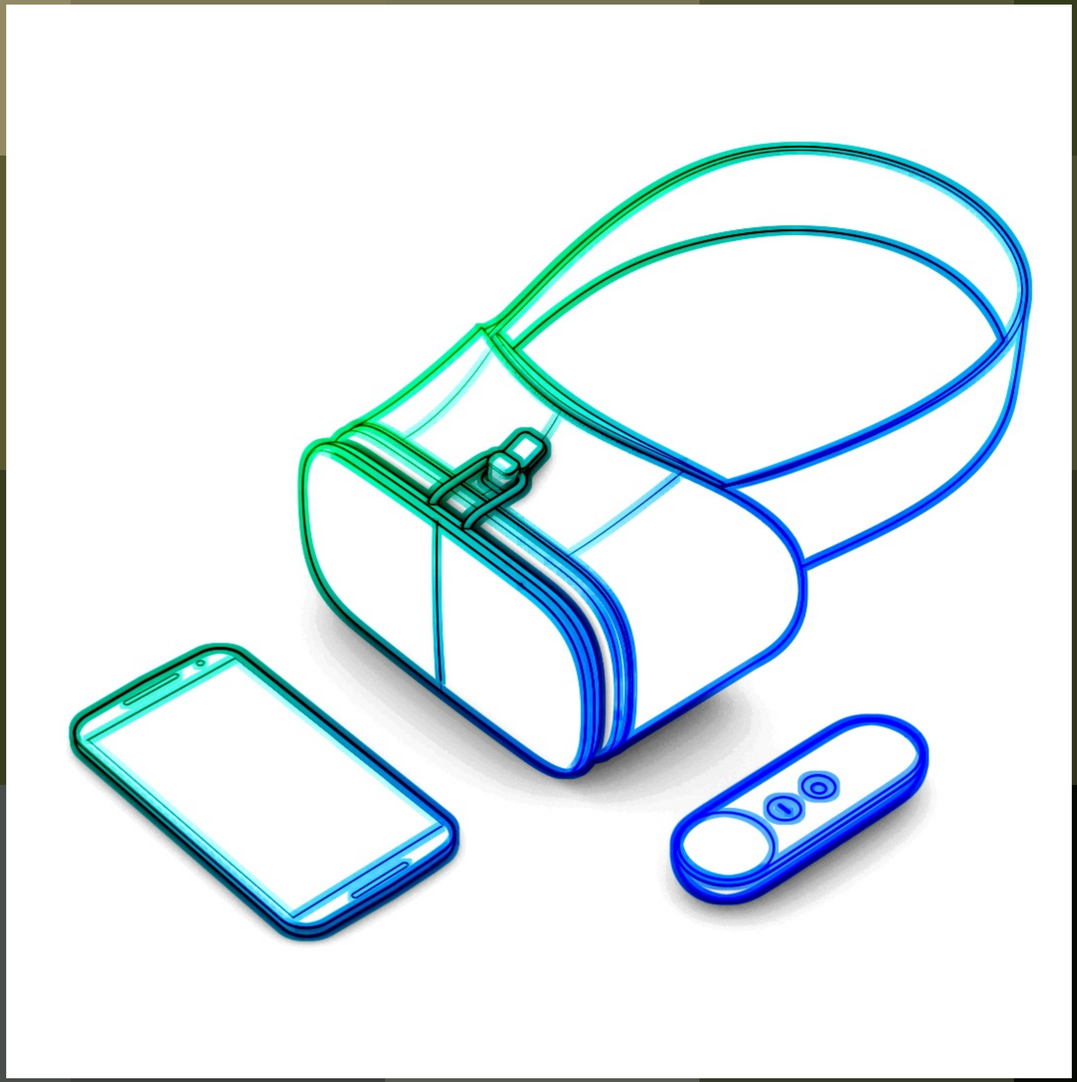

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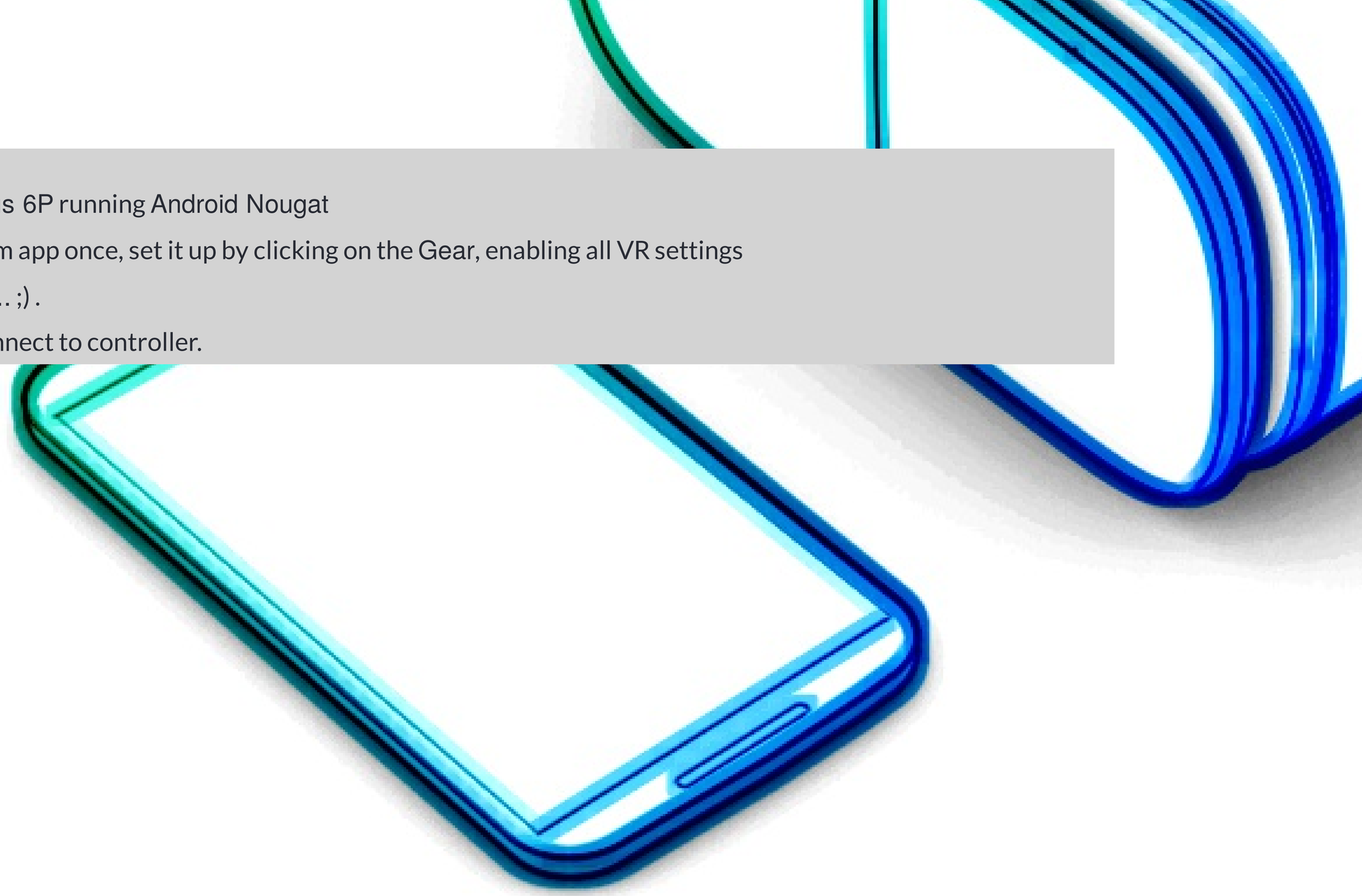
Controller

- uses special hardware as controller
  - can get emulated by any Android phone (>= 4.4)
  - has four Buttons: Volume +/-, App(Programmable), Home
  - clickable Touchpad. (x/y position, clicked state)(emulated by two touches)
- Print out sheet to not get to disctracted by Phone
- Connects via bluetooth to Headset Phone

Headset Phone

- has to be a Nexus 6P running Android Nougat
- start a Daydream app once, set it up by clicking on the Gear, enabling all VR settings
- Reboot phone … ;) .
- Bluetooth to connect to controller.



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Complete Package

- Daydream Ready
  - high performance sensors for high accuracy head tracking
  - displays with fast response time to minimize blur
  - powerfull mobile processor
  - VR System notifications
- will be available in fall
- will be created by hardware partners
- certified by Google
- Google Play for VR and Daydream Home

Daydream SDK features

- Same as Cardboard SDK
- Controlling the controller
  - orientation/acceleration
  - input (Clickpad: x,y, clicked, App Button, Vol+/-)
- support for all Android architectures

- ApiStatus changed: If controller gets invalid
- recenter: Long press on home button on controller, should assume current rotation is straight forward ...

How to use the controller

```
ControllerManager manager =
  new ControllerManager(this,
    new ControllerManager.EventListener() {

  public void onApiStatusChanged(int state) {
  }

  public void onRecentered() {
  }
});
```

- orientation: Quaternion (xyzw)
- polling every frame

```
Controller controller = manager.getController();
if (controller != null) {
  controller.timestamp
  controller.orientation
  controller.isTouching
  controller.touch
  controller.clickButtonState
  controller.appButtonState
  controller.homeButtonState
  controller.volumeUpButtonState
  controller.volumeDownButtonState
}
```

VRView, available for

- Android
- IOS
- Web

Not for Unity!

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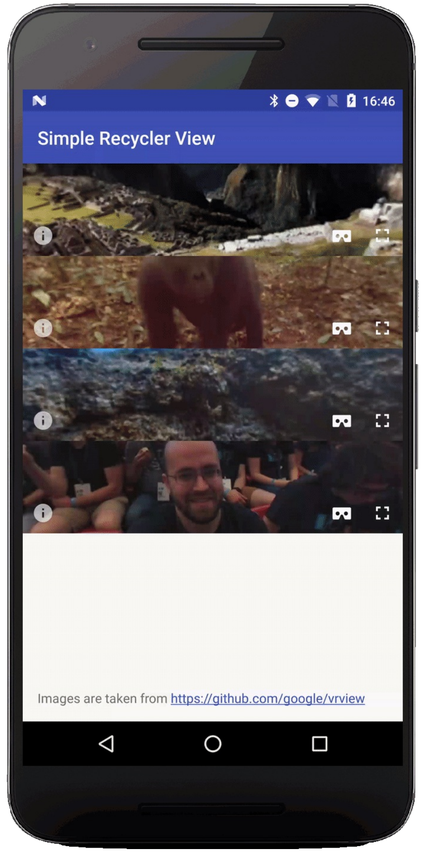
Simple RecyclerView with 4 VrViews © images



Run through the code

How to write an photosphere app like this

Sample equirectangular image

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Dependencies

- common.aar, commonwidget.aar and panowidget.aar as new module or directly in `gradle`.
- `compile 'com.google.protobuf.nano:protobuf-javanano:3.0.0-alpha-7'`

see Google VR Getting Started

item_layout.xml

```xml
<?xml version="1.0" encoding="utf-8"?>
<com.google.vr.sdk.widgets.pano.VrPanoramaView
  android:layout_width="match_parent"
  android:layout_height="100dp"
  />
```

```
@Override public void onBindViewHolder(…) //{

final ResourceItemViewHolder viewHolder =
  (ResourceItemViewHolder) baseHolder;
final Resources resources =
  viewHolder.vrPanoramaView.getResources();
final Bitmap bitmap =
  BitmapFactory.decodeResource(resources,
    elements.get(position));
viewHolder.vrPanoramaView
  .loadImageFromBitmap(bitmap, null);

}
```

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}
```

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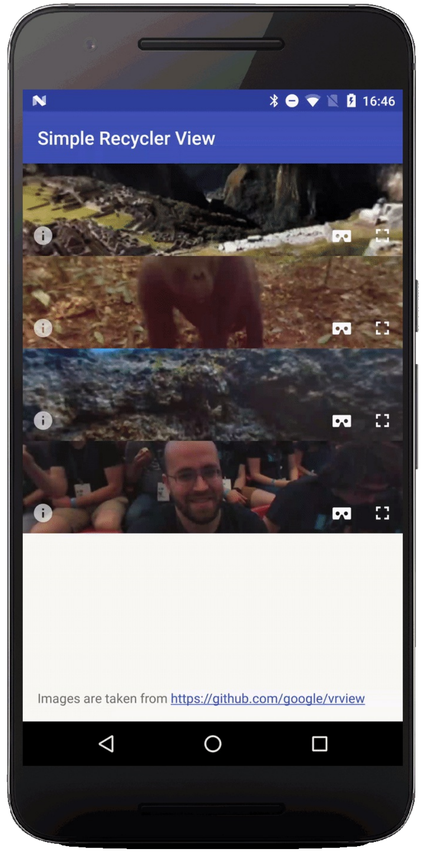
Final result of our current demo

Result

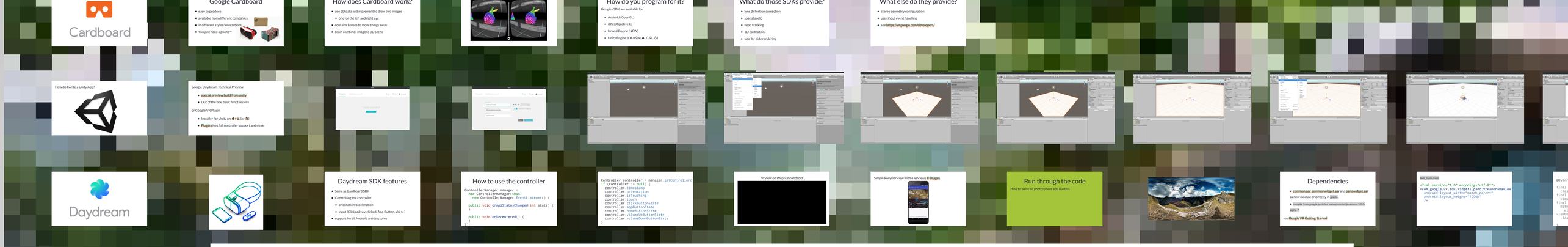


What did we do?

- Loaded a equirectangular image into a bitmap
- Let it be displayed by a VrPanoramaView
- Use Daydream SDK to display it

Limitations of Daydream for Android SDK

- using 3D models has to be done by
  - either low level OpenGL or
  - 3rd party 3d engine



What will you build?

🎥 General 🎥 Controller 🎥 Designing

📄 Google VR Github

🐦@MarioBodemann