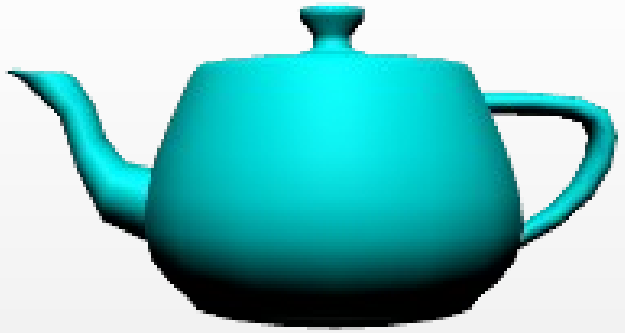

Teapots Can Fly

3D Graphics for Web Programmers

Presented by

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Salticid Software, Codechix

So,

how does

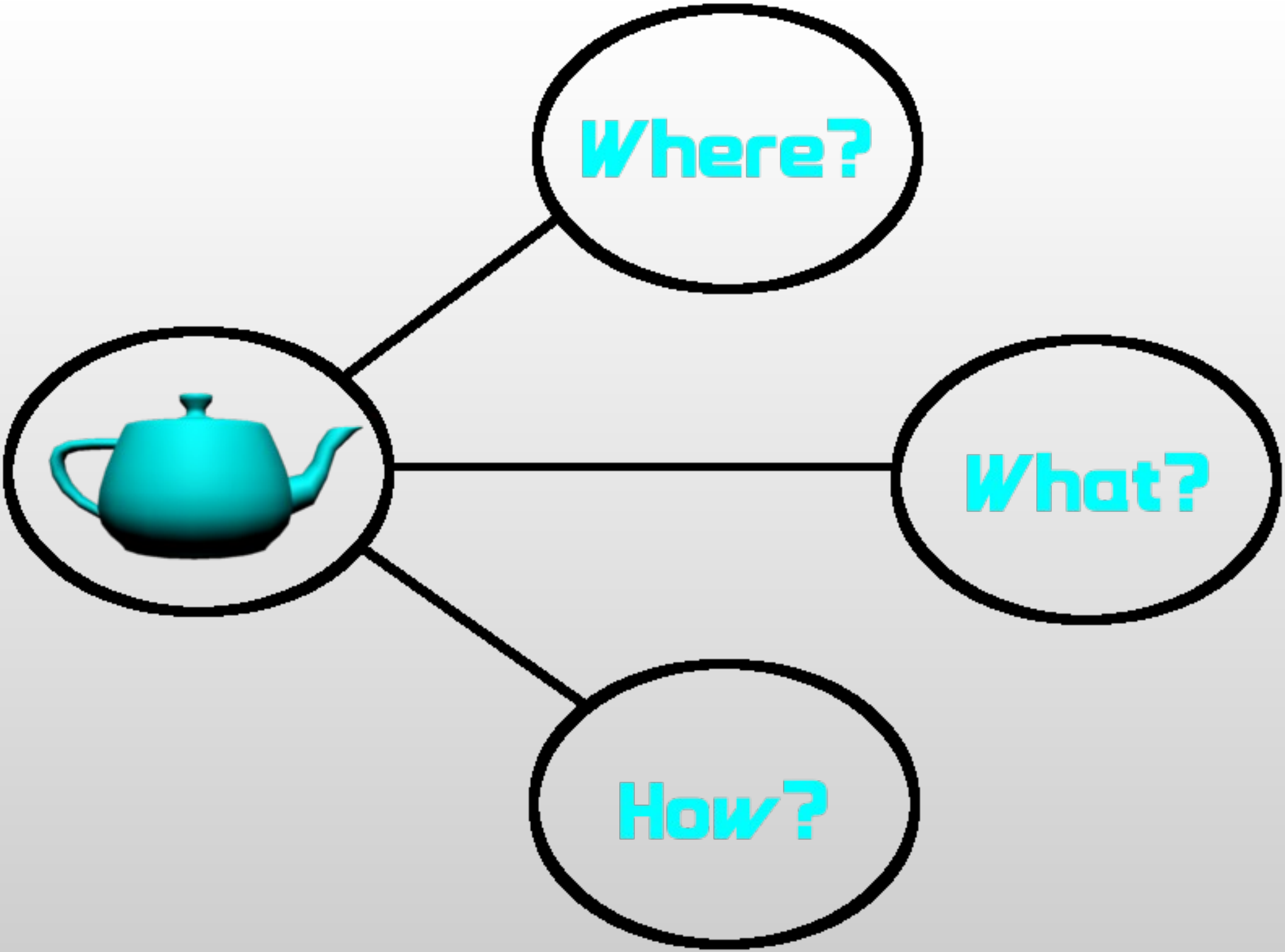
3D animation

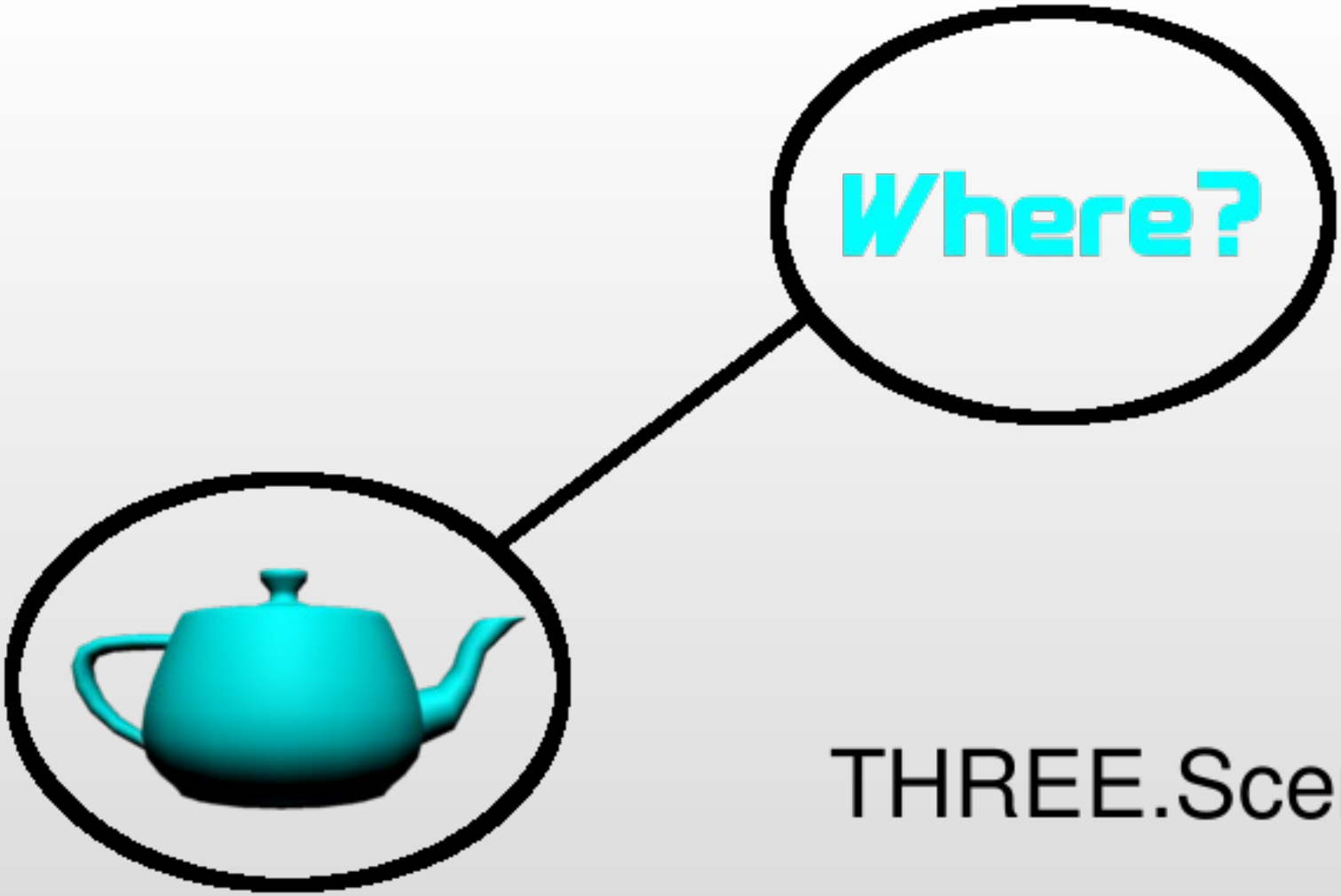
work?

3D Animation is like Claymation

We’re building

Our own little world


Where?
What?
How?



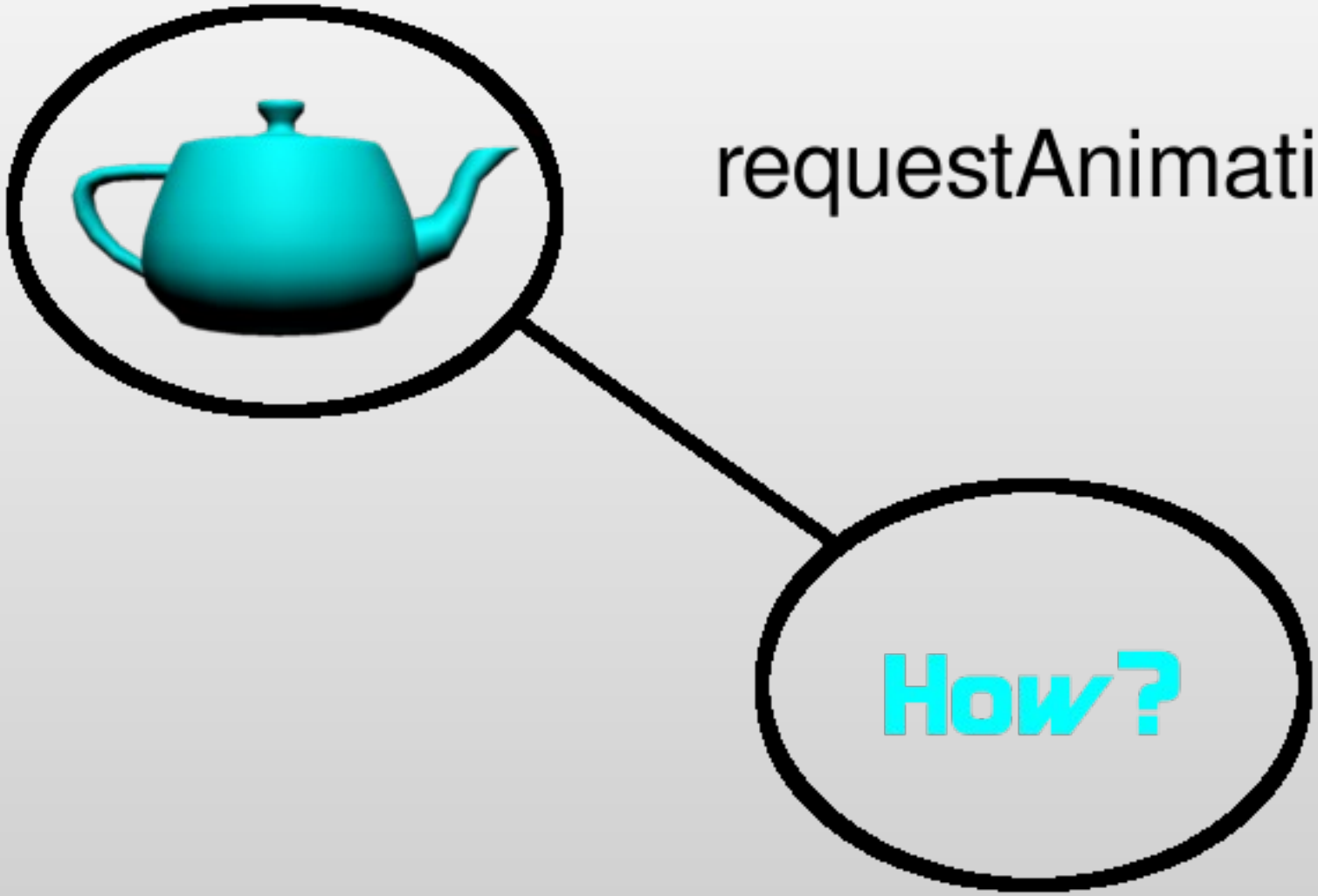
THREE.Scene

THREE.PerspectiveCamera

THREE.Mesh

THREE.PointLight

Affine transformations:
translate, rotate, scale



requestAnimationFrame()

What do we need?

- three.js
- teapot.js
- An html5 page

To get it all:

https://github.com/
teapots_can_fly

clone or download zip

The basic setup:

```
<head>
   <title>Teapots can fly!<title>
   <style>canvas { width: 100%;
      Height: 100% }
   </style>
</head>
```

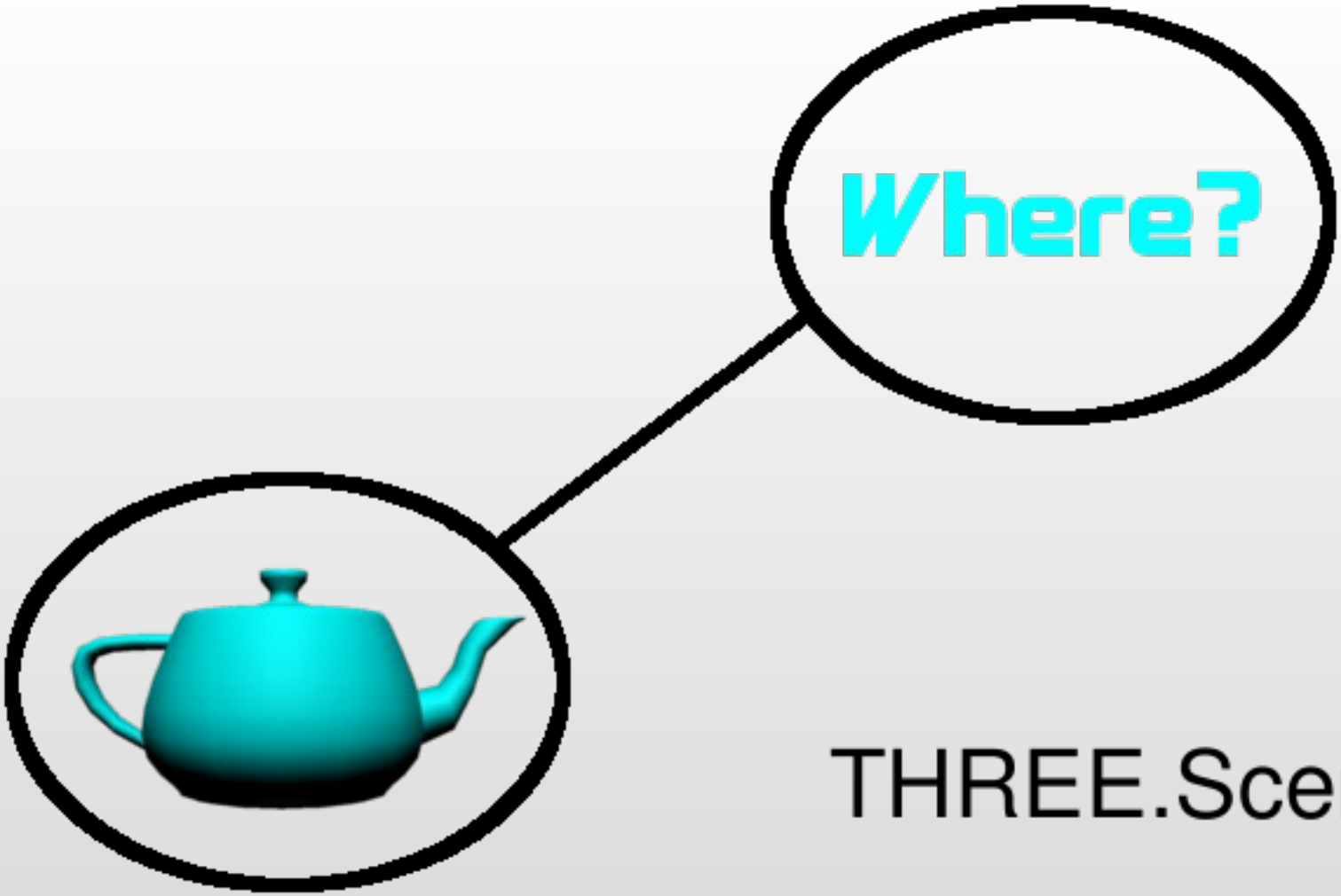
The basic setup:

```
<body>
  <script src="three.min.js">
  </script>
  <script>
     ** Our Stuff Goes Here! **
  </script>
</body>
```

The last setup step:

```
<script>

 var renderer = new THREE.WebGLRenderer();

 renderer.setSize(window.innerWidth,
                  window.innerHeight);

 document.body.appendChild
                    (renderer.domElement);

</script>
```

And now, the 3D code!



THREE.Scene

THREE.PerspectiveCamera

The Diorama

```
var scene = new THREE.Scene();
```

The Camera

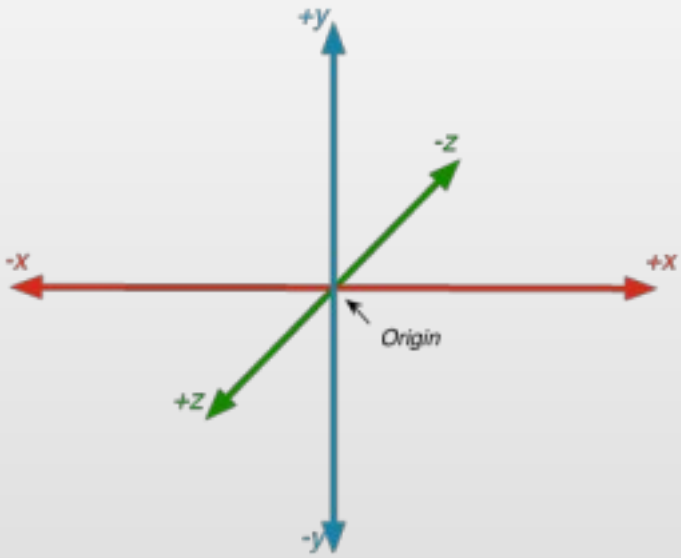
```
var camera = new THREE.PerspectiveCamera(
35,
window.innerWidth/window.innerHeight,
0.1, 1000);

camera.position.z = 50;
```

Right-handed coordinates

Positive X to the right

Positive Z coming out

of the screen



THREE.Mesh

THREE.PointLight

The Teapot

```
var teapot;
var jsonLoader = new THREE.JSONLoader();
jsonLoader.load( "teapot.js", createTeapot);
```

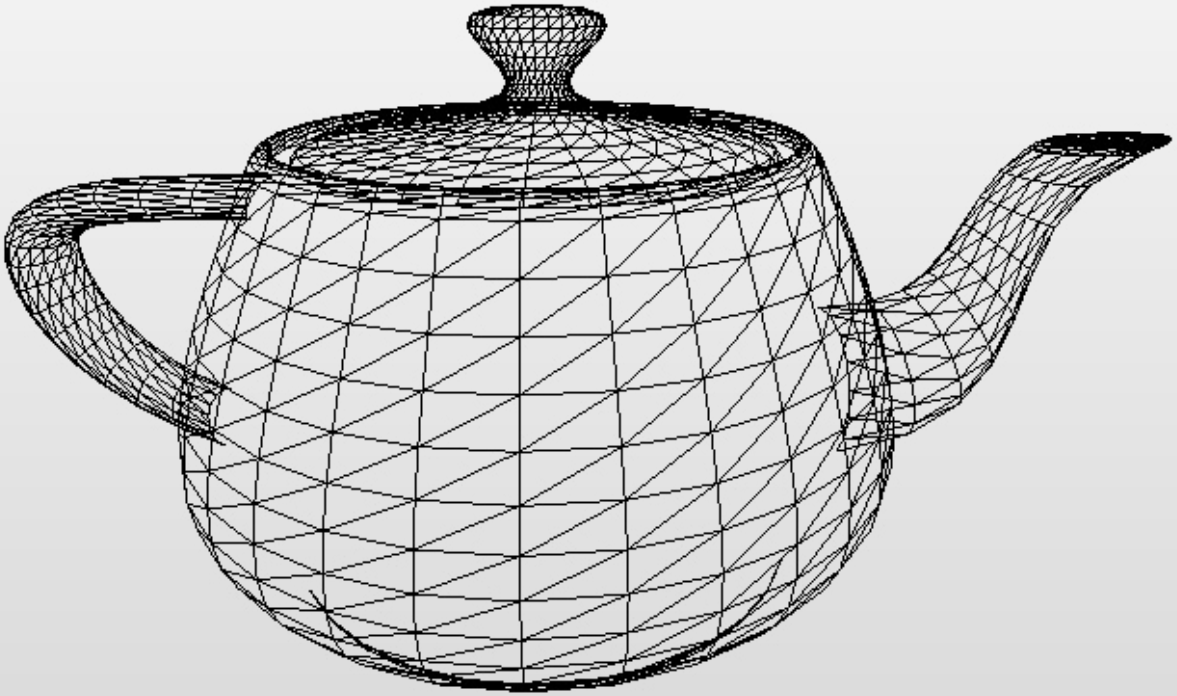
The Teapot's Callback

```
function createTeapot(tGeometry){
  var tMaterial = new
        THREE.MeshPhongMaterial({color: 0x00ffff});
  var tMesh = new THREE.Mesh( tGeometry, tMaterial );
  scene.add(tMesh);
  teapot = tMesh;
}
```

A closer look...

```
new THREE.Mesh( tGeometry, tMaterial );
```

A mesh has two parts



A Geometry

Is like

Bones...

...A Material

Is like

Skin.

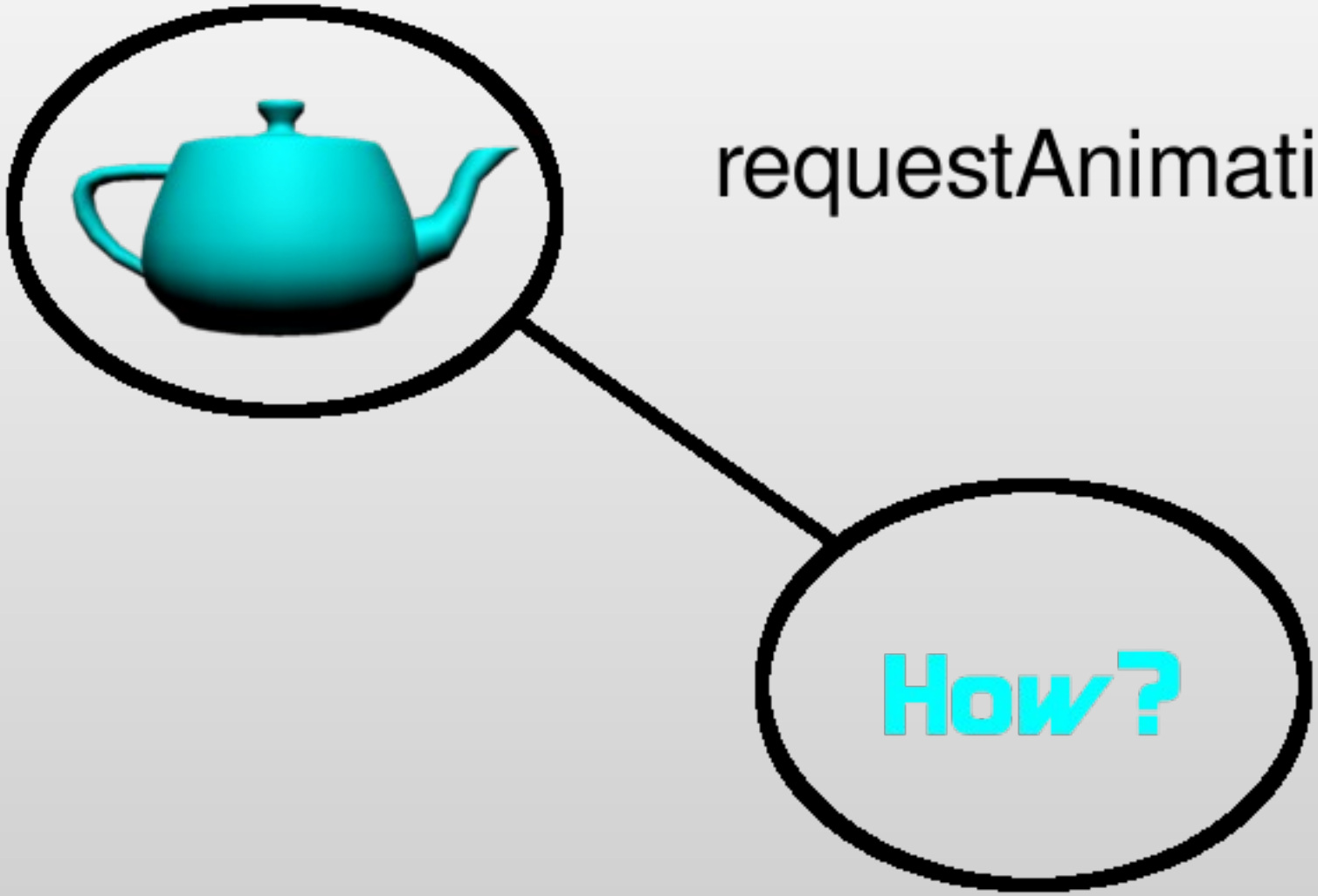
The Teapot's Callback

```
function createTeapot(tGeometry){
  var tMaterial = new
        THREE.MeshPhongMaterial({color: 0x00ffff});
  var tMesh = new THREE.Mesh( tGeometry, tMaterial );
  scene.add(tMesh);
  teapot = tMesh;
}
```

Let there be light!

```
var light = new THREE.PointLight(0xffffff);
light.position.set(0,150,150);
scene.add(light);
```

Affine transformations:
translate, rotate, scale



requestAnimationFrame()

Making the Teapot Move

```
teapot.position.x += 0.1;
if (teapot.position.x > halfScreenWidth)
    teapot.position.x = -halfScreenWidth;
```

Rendering the Frame

```
renderer.render(scene, camera);
```

Setting Up the Next Frame

```
requestAnimationFrame(render);
```

The Complete Render Loop

```
var halfScreenWidth = 80;
var render = function () {
  if (teapot) {
      teapot.position.x += 0.1;
      if (teapot.position.x > halfScreenWidth)
          teapot.position.x = -halfScreenWidth;
      renderer.render(scene, camera);
  }
requestAnimationFrame(render);
};
render();
```

So...what else can we do?

Texture the Teapot

```
var tTexture =  THREE.ImageUtils.loadTexture
                ('appleredq.jpg');
tTexture.wrapS = THREE.RepeatWrapping;
tTexture.wrapT = THREE.RepeatWrapping;

var tMaterial = new THREE.MeshPhongMaterial
                ({map: tTexture});
```

Change the Teapot's Shape

tMesh.scale.y = 1.5;

Change the Teapot's Path

```
teapot.position.x += xIncrement;

if (Math.abs(teapot.position.x) > halfScreenWidth){
        xIncrement = -xIncrement;
        teapot.rotation.y += 3.14;
```

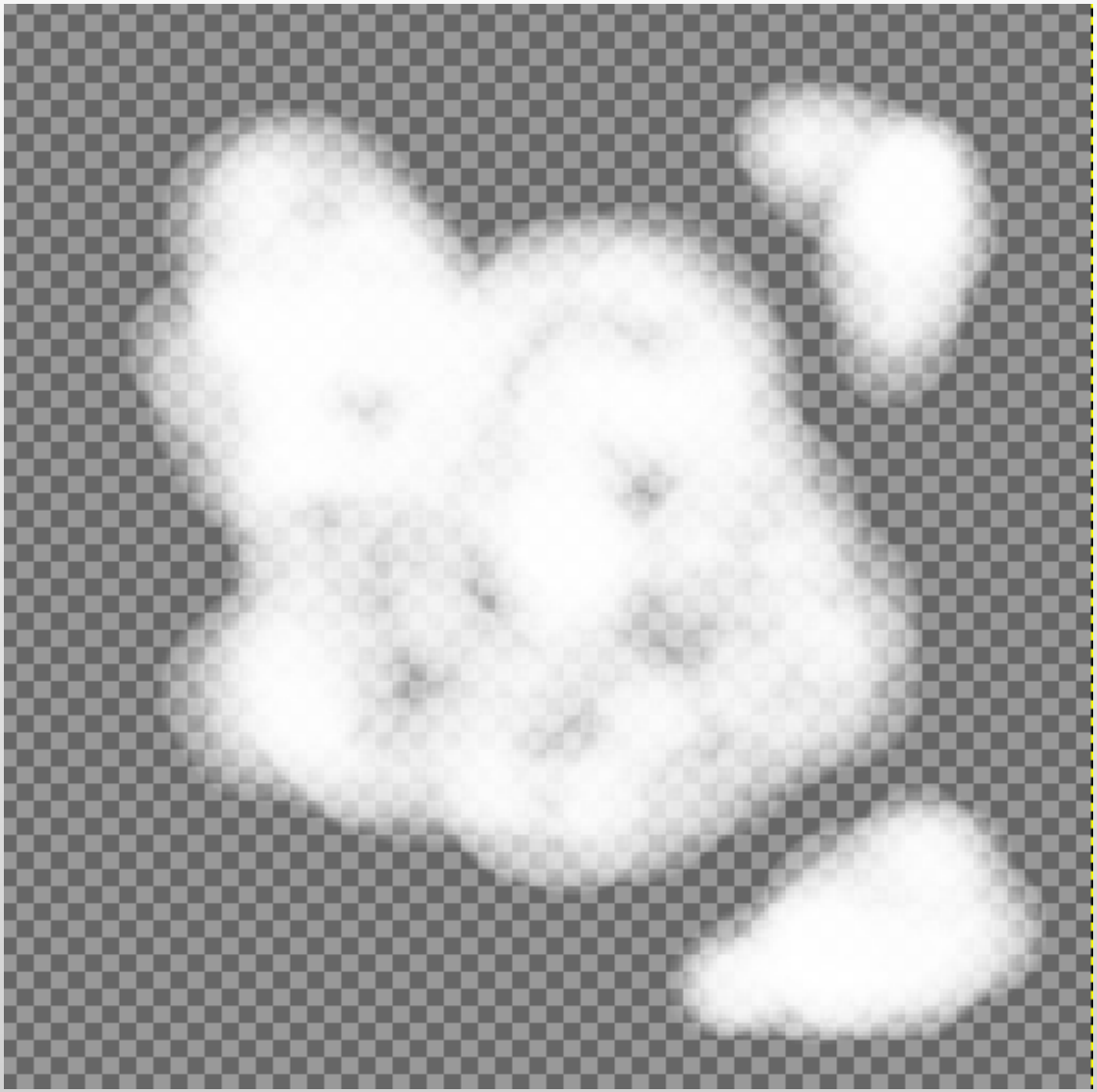
Color the Background

```
renderer.setClearColor(0xC2DFFF, 1.0);
```

...What's Billboarding?

Just what it sounds like

The Cloud Image



A flat mesh
is like glass

A texture is
like a sticker

Add Some Clouds

```
var cTexture = THREE.ImageUtils.loadTexture
                    ('cloud.png');
var cMaterial = new THREE.MeshBasicMaterial
                    ({map: cTexture, transparent: true});
```

Add Some Clouds

```
var cGeometry2 = new THREE.PlaneGeometry
                        (50, 100);
var cloud2 = new THREE.Mesh
                        (cGeometry2, cMaterial);
scene.add(cloud2);
```

Position the Clouds in the Sky

```
cloud2.position.z = -80;
cloud2.position.x = -50;
cloud2.rotation.z = 1.57;
```

Add Mouse Controls

```
<script src="OrbitControls.js"></script>
…
var controls = new THREE.OrbitControls
                        ( camera );
…
controls.update();
```

...And one again, the repo:

http://github.com/shegeek/teapots_can_fly

Enjoy! Make cool stuff!

kelleynnn@gmail.com

Resources and links

three.js repo: https://github.com/mrdoob/three.js
three.js home page: http://threejs.org/

Stemkoski's examples:
http://stemkoski.github.io/Three.js/index.html

WebGL Up and Running (by Tony Parisi):
http://shop.oreilly.com/product/0636920024729.do

Learning Three.js blog: http://learningthreejs.com/

Resources and links

three.js boilerplate builder:
http://jeromeetienne.github.io/threejsboilerplatebuilder/

An Introduction to Web GL:
http://dev.opera.com/articles/view/an-introduction-to-webgl/

Tutorials on the LearningWebGL blog:
http://learningwebgl.com/blog/?page_id=1217

WebGL 1.0 spec: http://www.khronos.org/webgl/

Felix image courtesy of Wikihow
wikihow.com/Draw-Felix-the-Cat

Gumby image courtesy of
Art Clokey's Gumbyworld
gumbyworld.com

Earth image courtesy of NASA
visibleearth.nasa.gov

Coordinate axes image courtesy of
http://www.cocos2d-x.org/

Teapot wireframe image courtesy of
caig.cs.nctu.edu.tw/

Saran Wrap man image courtesy of
funnyordie.com

Obama Celebrity image from photobucket user DeSwiss
http://s88.photobucket.com/user/DeSwiss/media/obamacelebrity.jpg.html

Cling decal image from Design Diva
http://designiva.net/window-stickers-design/