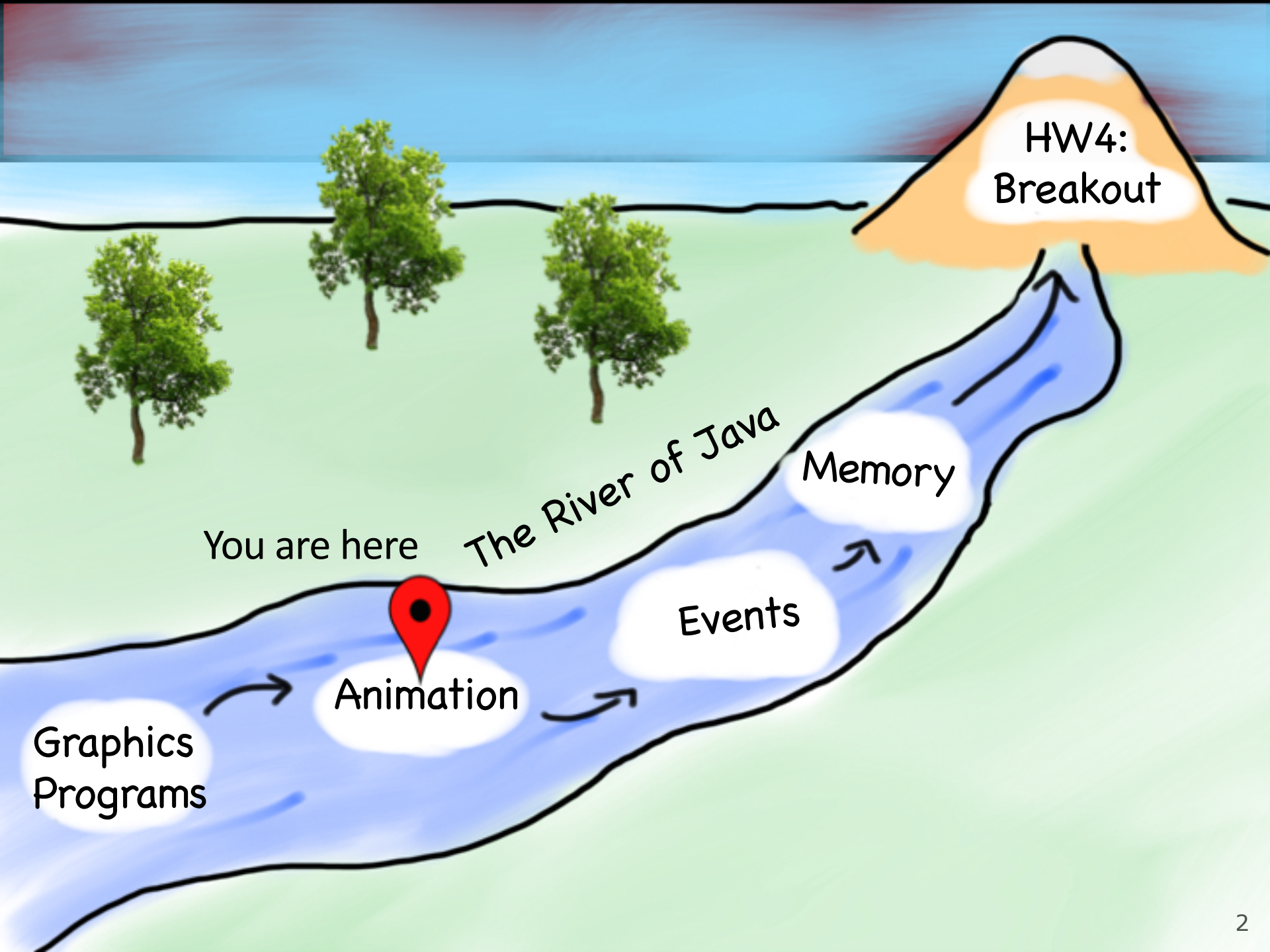
CS 106A, Lecture 13
Animation

reading:
Art & Science of Java, Ch. 9


HW4:
Breakout
The River of Java
You are here
Memory
Events
Animation
Graphics
Programs

Plan For Today

- Null
- Animation
- Practice: Animated Square
- Practice: Kelp Forest

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Null

Null is a special variable value that objects can have that means "nothing". Primitives cannot be null.

If a method returns an object, it can return **null** to signify "nothing". (just say `return null;`)

```
// may be a GObject, or null if nothing at (x, y)
GObject maybeAnObject = getElementAt(x, y);
```

Objects have the value **null** before being initialized.

```
Scanner myScanner; // initially null
```

Null

You can check if something is null using == and !=

even though you usually compare Objects using .equals()

```
// may be a GObject, or null if nothing at (x, y)
GObject maybeAnObject = getElementAt(x, y);
if (maybeAnObject != null) {
      // do something with maybeAnObject
} else {
      // null – nothing at that location
}
```

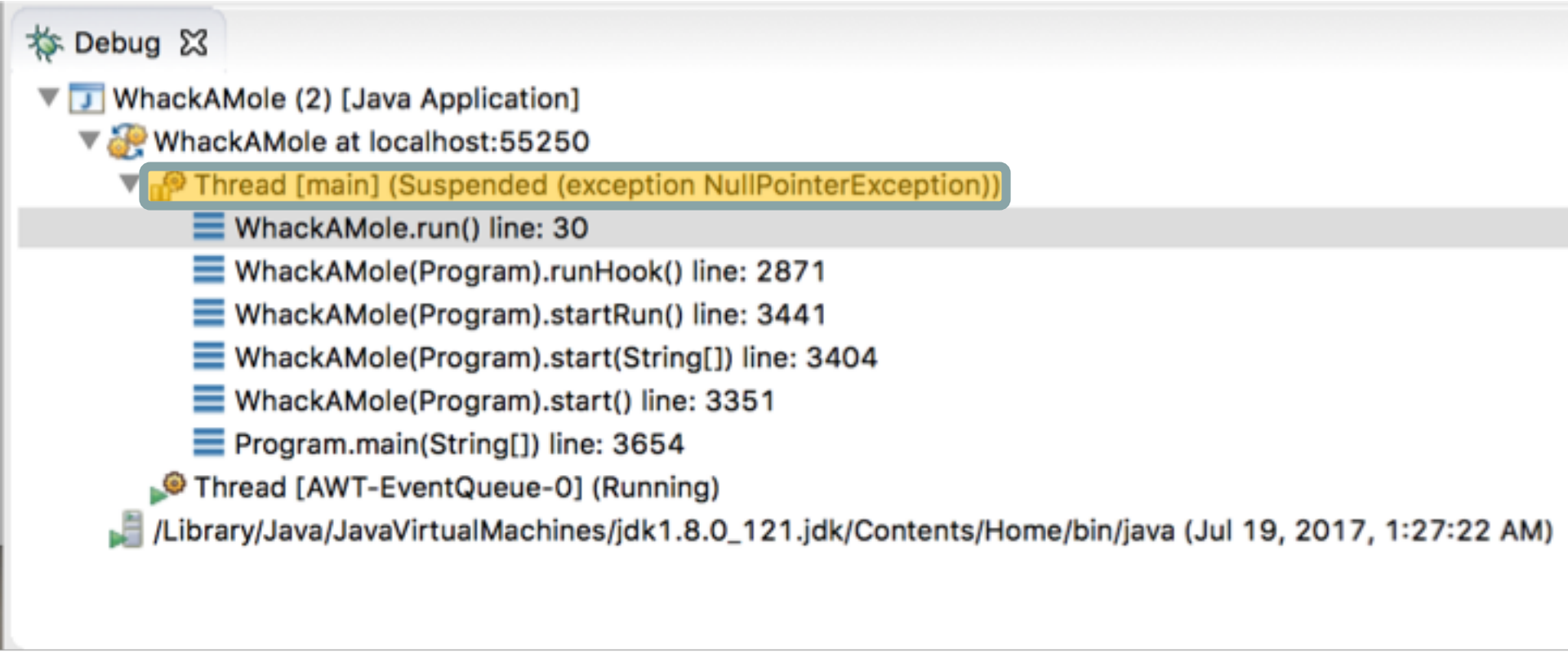
Null

Calling methods on an object that is **null** will crash your program!

```
// may be a GObject, or null if nothing at (x, y)
GObject maybeAnObject = getElementAt(x, y);
if (maybeAnObject != null) {
      int x = maybeAnObject.getX(); // OK
} else {
      int x = maybeAnObject.getX(); // CRASH!
}
```

Null

Calling methods on an object that is **null** will crash your program! (throws a NullPointerException)



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Simple animation

- A Graphics program can be made to animate with a loop such as:

```
public void run() {
    // create shapes here
    while (condition) {
        update the position of shapes;
        pause(milliseconds);
    }
}
```

- The best number of ms to pause depends on the program.
  - most video games ~= 50 frames/sec = 25ms pause

Simple animation

- Example:

```
public void run() {
    GOval ball = new GOval(50, 50);
    while (true) {
        ball.move(1,1);
        pause(10);
    }
}
```

- Can use `setLocation` or `move` for animation
  - `setLocation` takes an absolute position (x, y) as paremeters
  - `move` takes the change in position (dx, dy) as parameters

Graphical methods

- These methods in graphical objects can be useful for animation:

Method	Description
`obj.getX()`	the left *x*-coordinate of the shape
`obj.getY()`	the top *y*-coordinate of the shape
`obj.getWidth()`	number of pixels wide the shape is
`obj.getHeight()`	number of pixels tall the shape is
`obj.move(dx, dy);`	adjusts location by the given amount
`obj.setLocation(x, y);`	change the object's x/y position
`obj.setSize(w, h);`	change the object's width*height size

- The `GraphicsProgram` itself has these methods, too:

`getWidth()`	number of pixels wide the window is
`getHeight()`	number of pixels tall the window is
`setCanvasSize(w, h)`	change the canvas's width*height size

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Recap

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Next Time: Interactive Graphics Programs