Opening Discussion

- Minute essay comments:
  - Can't type as fast as me in vi.
  - Deciding between panels.
  - Retails of publisher/reactor model.
  - Coding of graphics intensive games.
  - Sorting the in-class code by date.
  - What is my take on Anonymous.
I want to make the GUIs we wrote last time put data into the tables before we move forward today.
Motivation

- You can do lots of things with the standard GUI elements in Swing.
- We could set up quite a bit of a GUI using that. However, no GUI library can predict everything that you will want to do and we want to be able to add custom drawing to our applications.

- Uses:
  - Drawing a shot-chart in basketball.
  - Drawing Dinosaurs.
  - Drawing anything there isn't a GUI component for.
For this we will rely on the Java2D library. Java2D was added about the same time Swing was and it is fundamentally based on the java.awt.Graphics2D class.

Let's go find the Java API and find this class in it.
We are going to follow a simple approach to doing this making a new Panel that draws what we want.

```scala
new Panel {
  override def paint(g:Graphics2D) {
    ...
  }
}
```

Whatever you draw to `g` appears in the panel.
Let's look a bit at the Graphics2D class to see what some of the possibilities might be for what we can draw.

The java.awt.geom package and the java.awt.image package also have some useful things in them.
There are several things that we can set on the Graphics2D object that are used when we draw things. Here are some:

- **Paint** – could be a color, but there are also gradients and textures
- **Stroke** – determines how lines are drawn
- **Font** – how you want text to appear
- **Transform** – AffineTransform allows translate, rotate, scale, or shear
Less Used Settings

- Composite – how colors combine when you draw over old stuff
- Clip – where your drawings will appear
- Render hints – other things like antialiasing
Graphics2D objects aren't limited to just drawing on components.

The Image class (and its subtype BufferedImage) will let you get Graphics objects that you can draw to and what you draw will be on the image.

We'll typically do this even if we are drawing to a component to implement buffering which reduces flicker.
The easiest way to load images from disk is using `javax.imageio.ImageIO`.

This class has read methods that take File or URL objects.
How do you think we would go about creating animation?