Macromedia Flash MX

A Brief Tutorial for
"Programming Usable Interfaces"

Andrew Ko

Versions

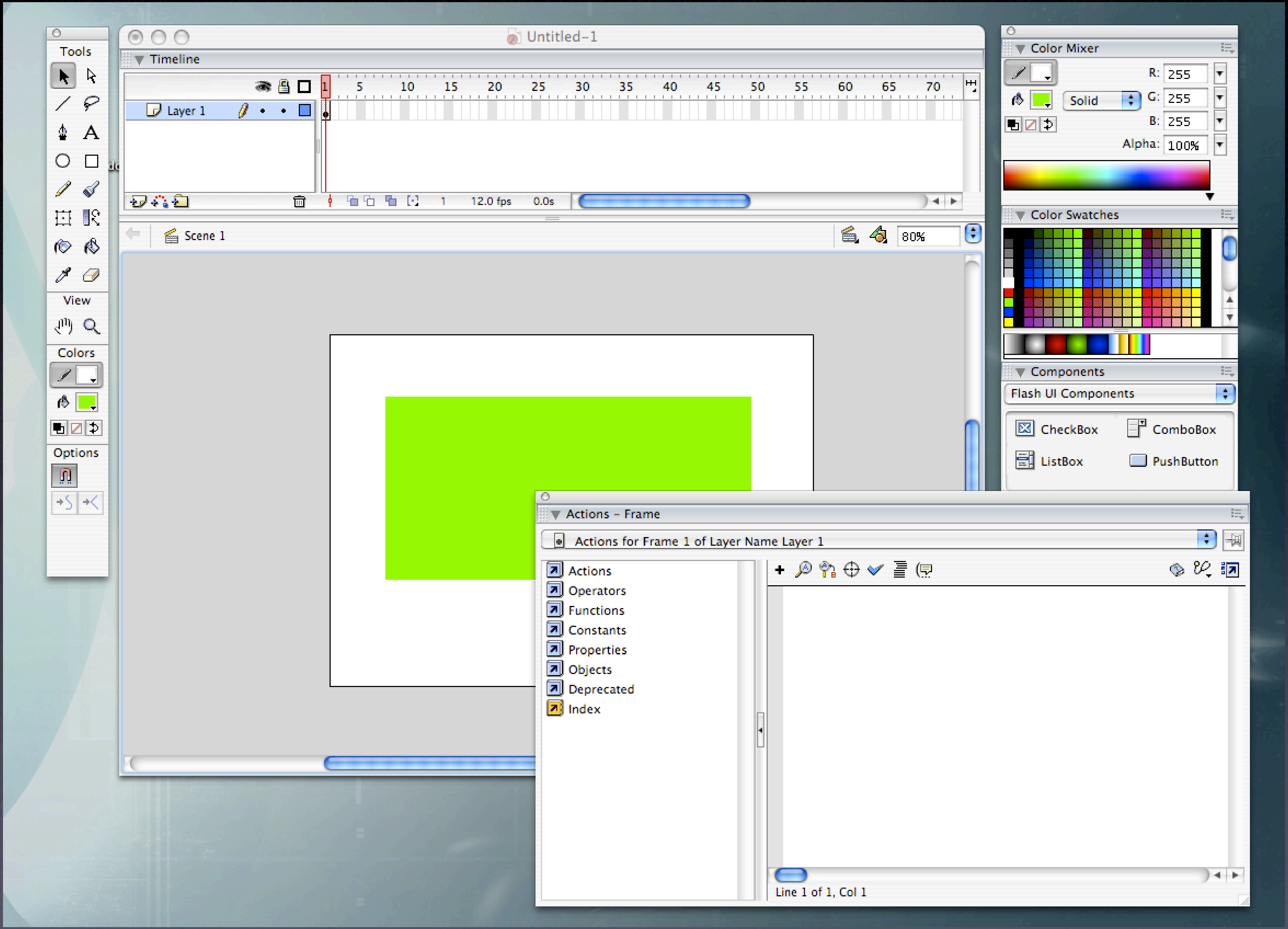
- Macromedia **Flash MX**
  - **Not** Flash MX 2004 (the newer version)
  - Not any older version
- No site license
  - PC version: Wean clusters, Cyert Hall
  - Mac version: Hunt Library, Cyert Hall

A Beginner's Book

- *Foundation Macromedia Flash MX*
  - Kris Besley
- Comes highly recommended on Amazon
- ~$10 paperback on Amazon and Half.com
- Not a reference, but a very detailed introduction for people unfamiliar with Flash

VB.NET vs. Flash MX

- VB is great for **form-based** applications
    - Flash is great for **time-based** applications
- Both VB and Flash are event-based.

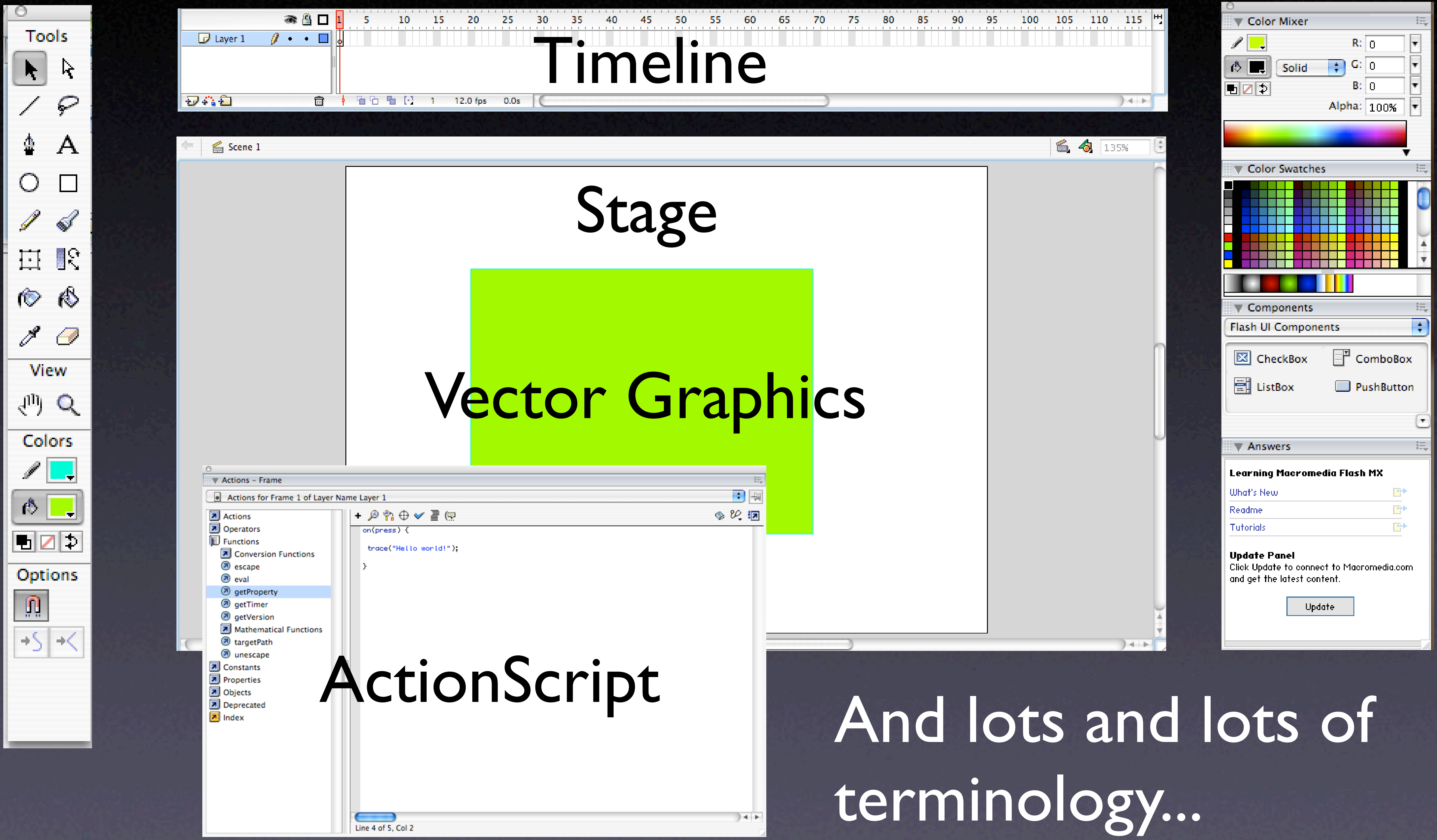


Intro • The Stage • Vector Graphics • Timelines • Layers • Symbols • ActionScript • Buttons

What is Flash?

Drawing

Palettes



```
on(press) {
  trace("Hello world!");
}
```

Learning Macromedia Flash MX

What's New

Readme

Tutorials

Update Panel

Click Update to connect to Macromedia.com and get the latest content.

Update

Timeline

Stage

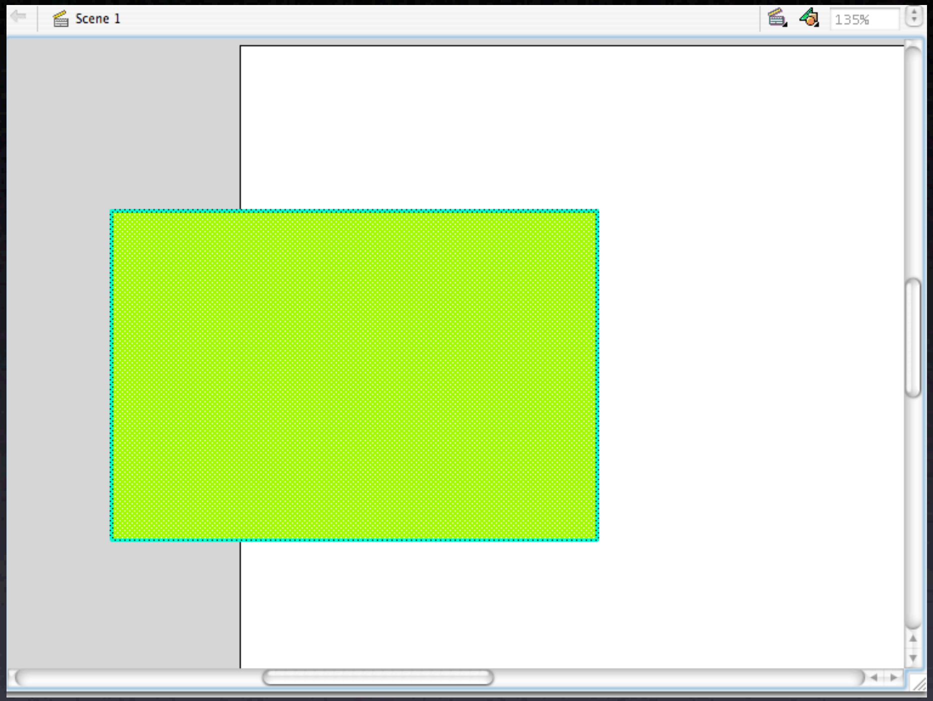
Vector Graphics

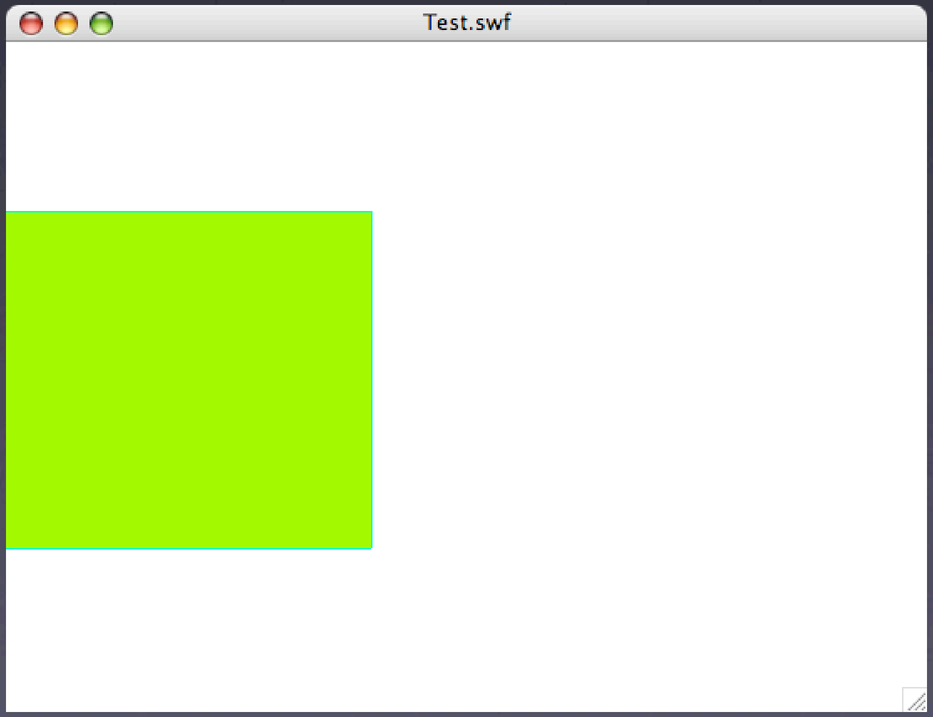
ActionScript

And lots and lots of terminology...

The Stage

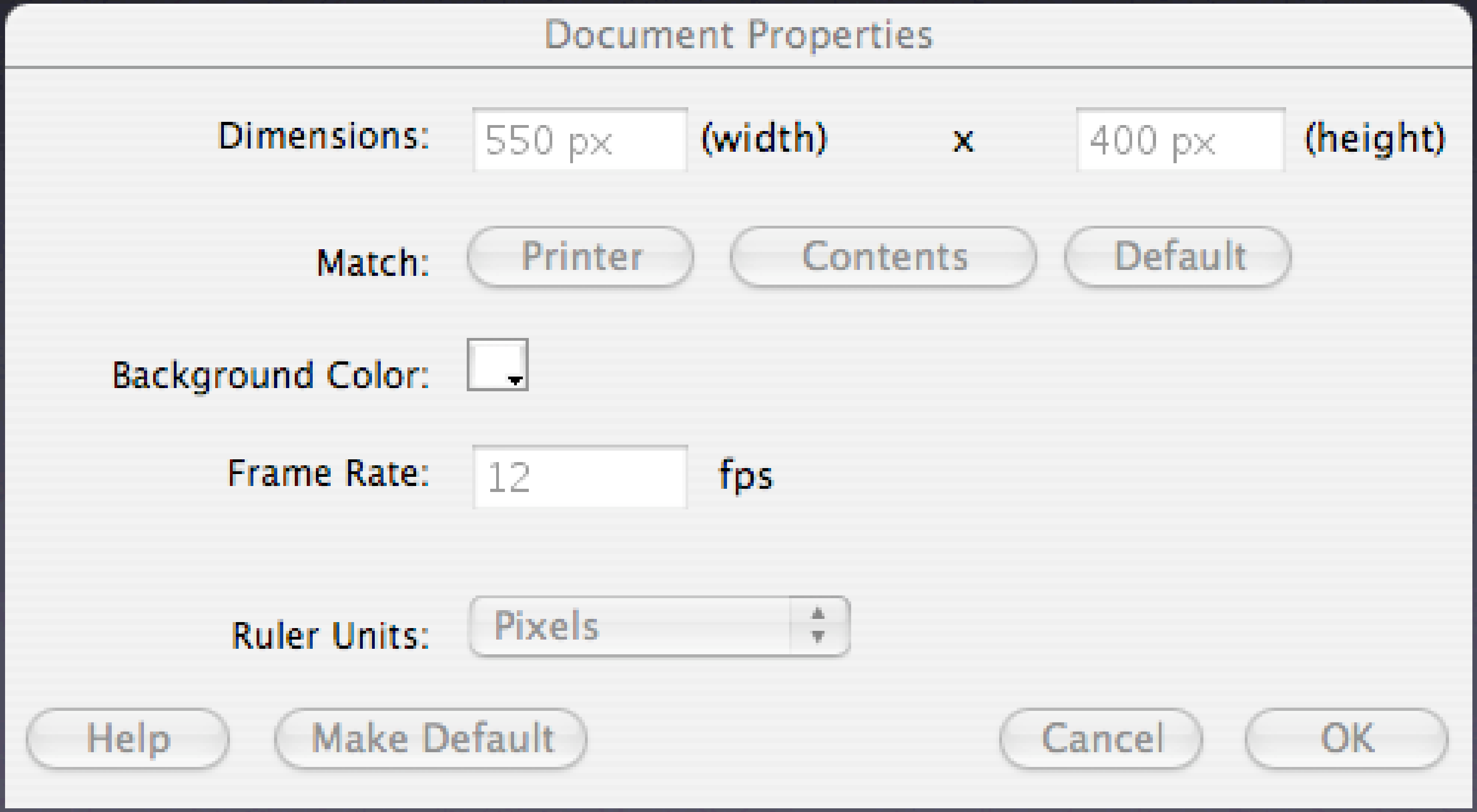
- Contains the objects, images, drawings, buttons, etc.
- Where drawings are created, modified, deleted, etc.
- Things can go outside the stage, but they are clipped when the movie is played.





The Stage

- Modify the stage size, background color, frames per second, ruler units, etc. by going to:
  - **Modify → Document...**


Document Properties

Dimensions: 550 px (width) x 400 px (height)

Match: Printer Contents Default

Background Color:

Frame Rate: 12 fps

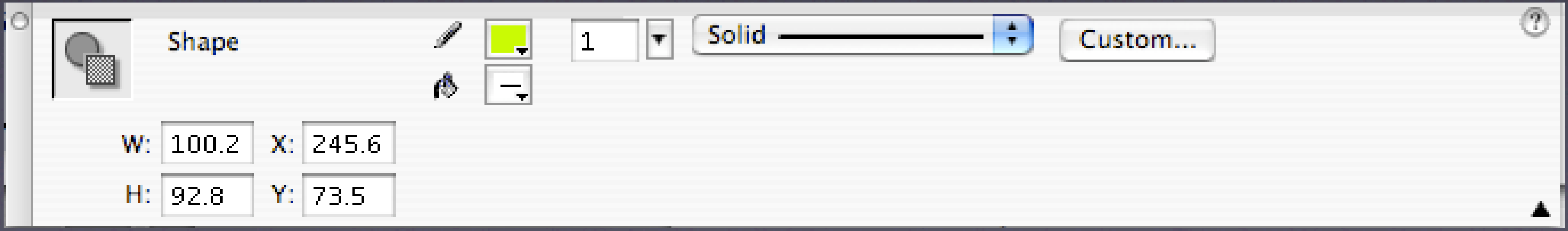
Ruler Units: Pixels

Vector Graphics

All shapes in Flash are made out of points, lines, and curves. Even this one:

Vector Graphics

- Because shapes are made out of points, Flash
  - Snaps objects' edges together
  - Snaps objects' points to each other
- All shapes have an outline and fill color, a line pattern, and a stroke thickness
  - These can be changed in the property window

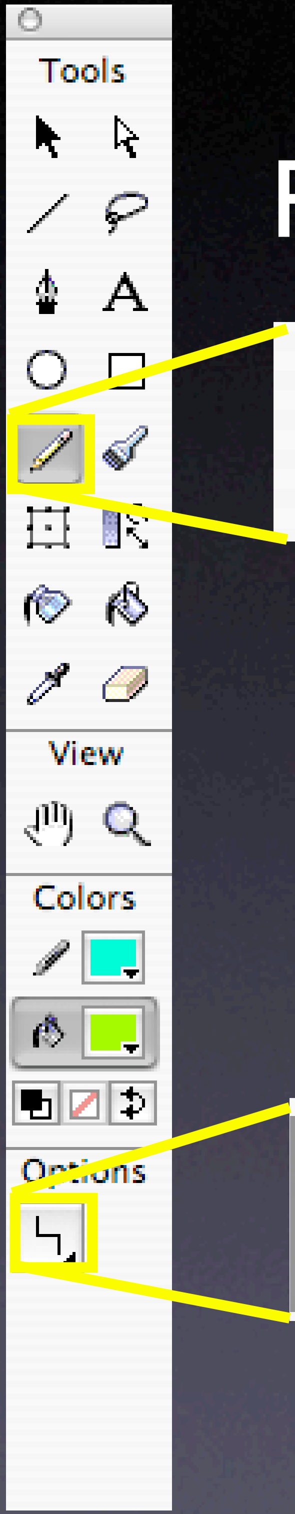

Shape

1 Solid Custom...

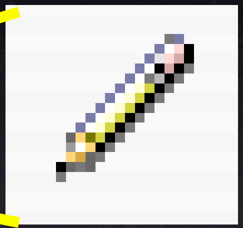
W: 100.2 X: 245.6

H: 92.8 Y: 73.5

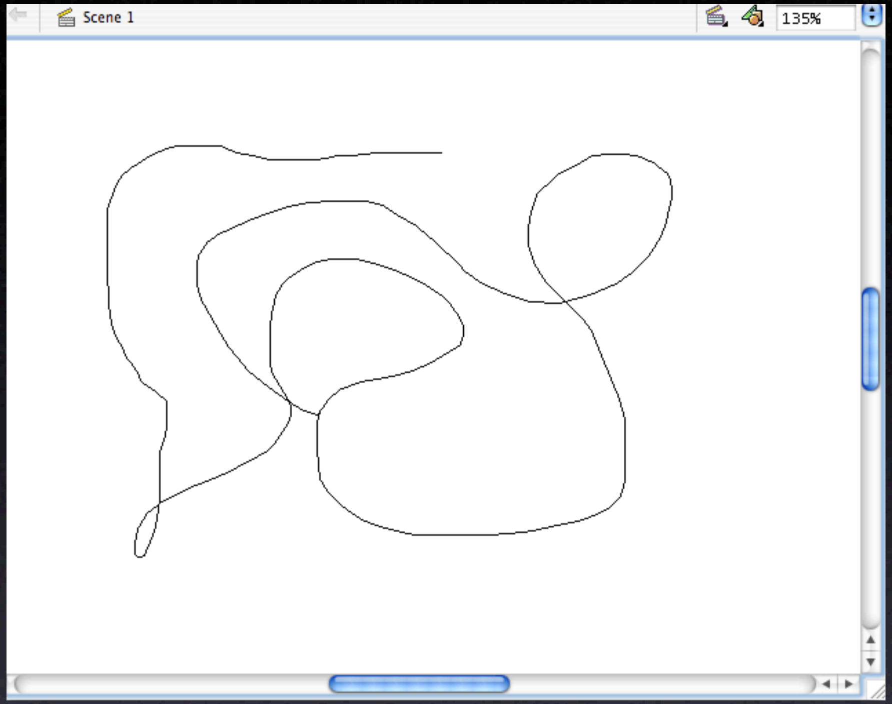
Freeform Lines and Shapes

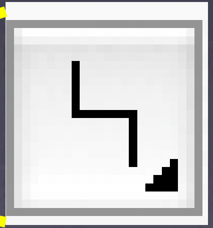


Pencil

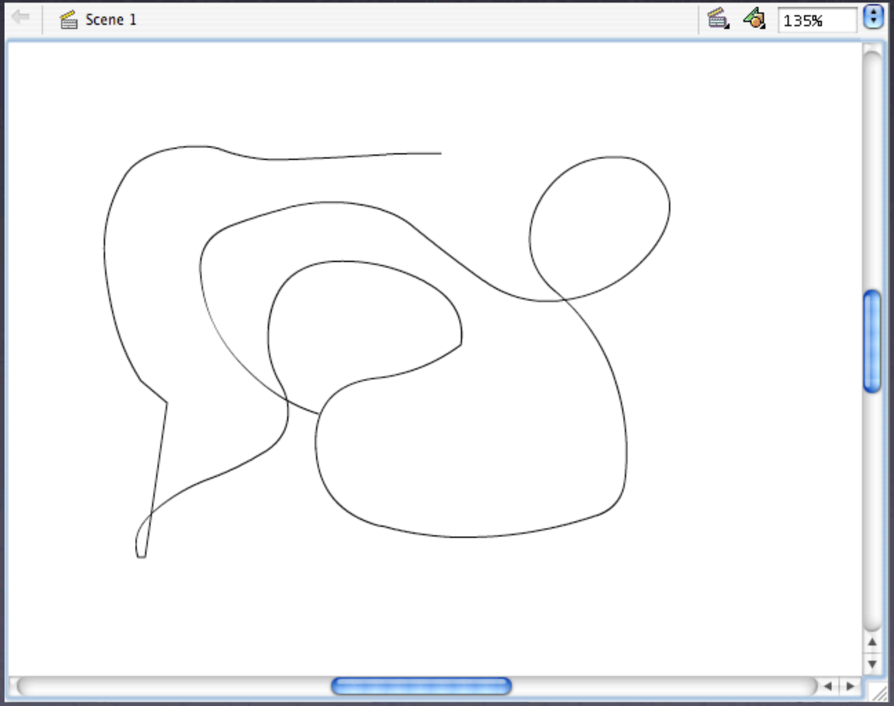


Your freeform stroke is turned into a modifiable shape.

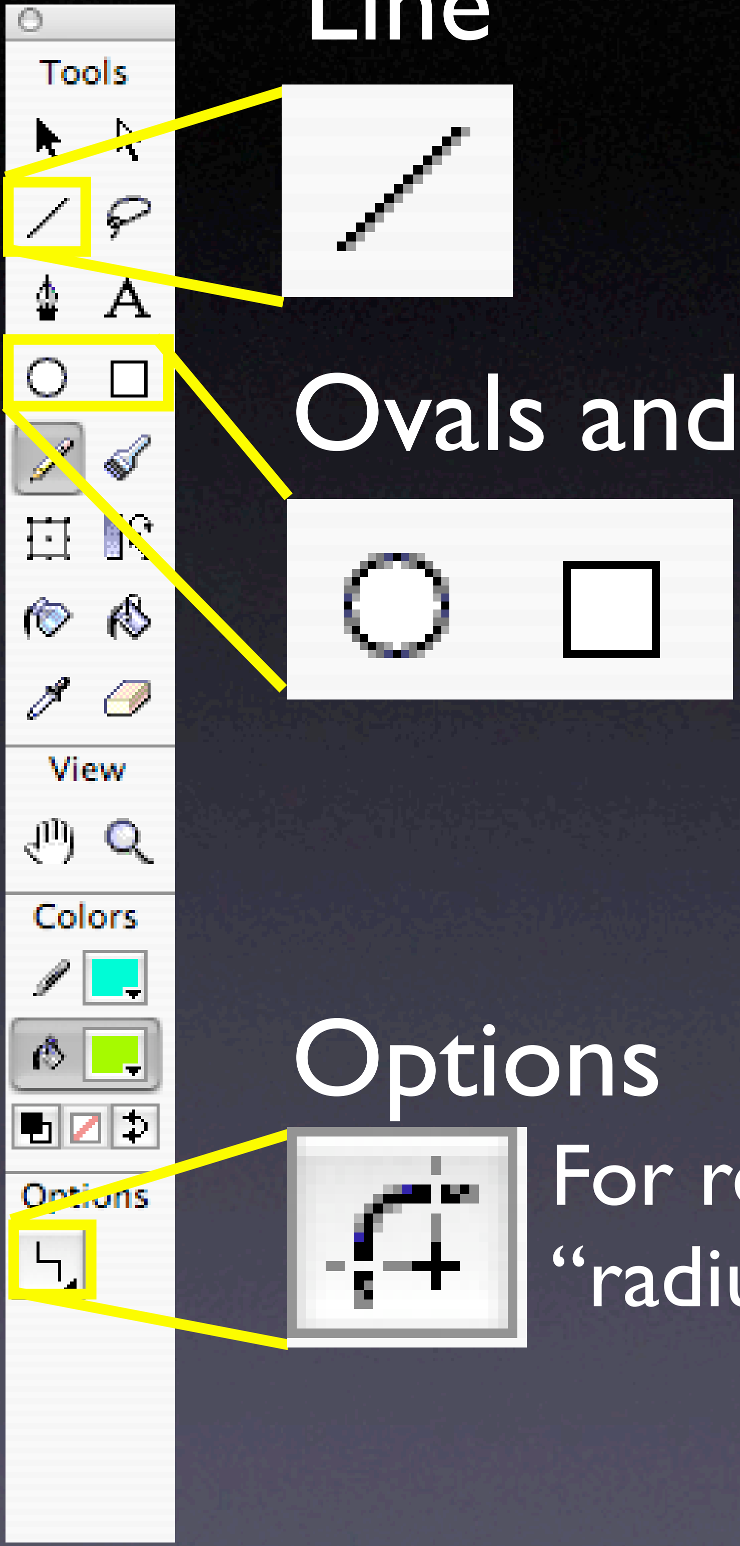




Options that allow you to straighten, smooth, or "ink" (no modification)



Lines, Ovals, and Rectangles

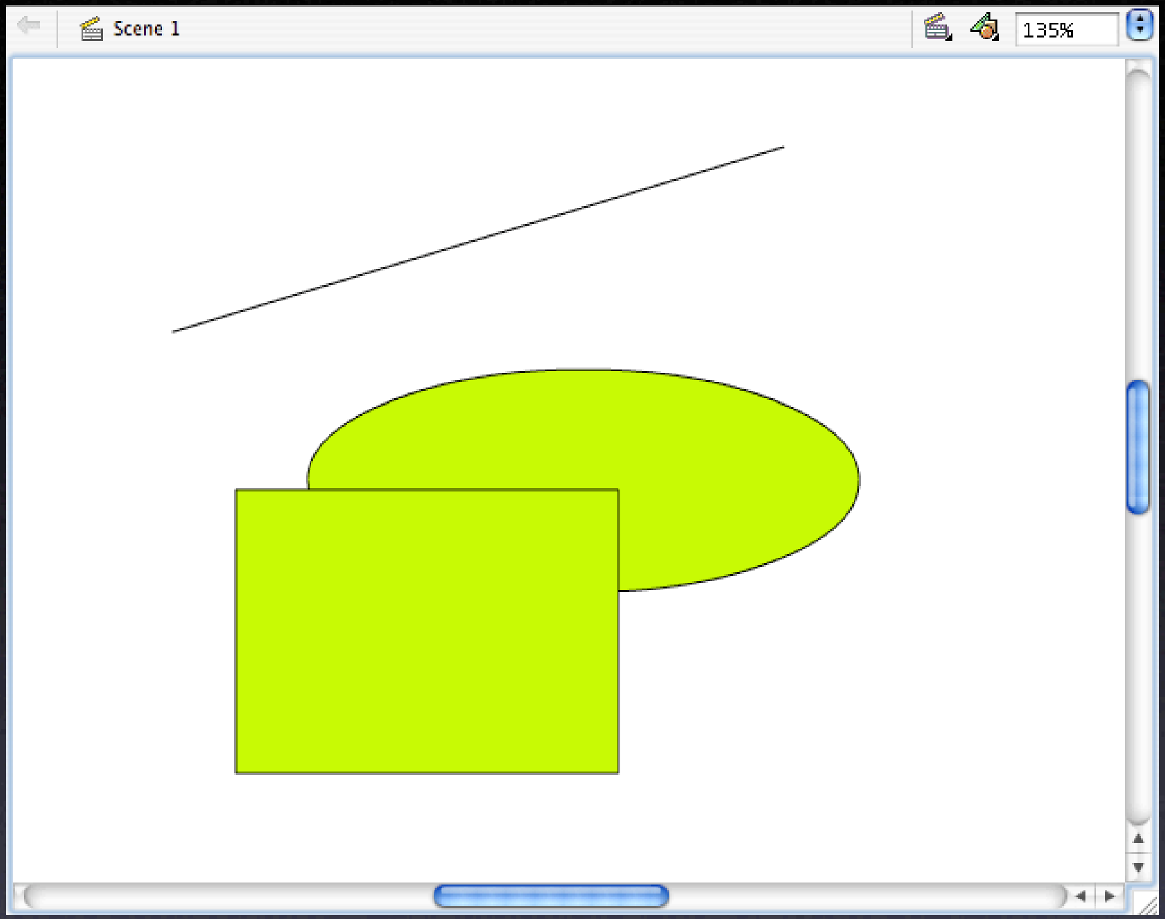


Line

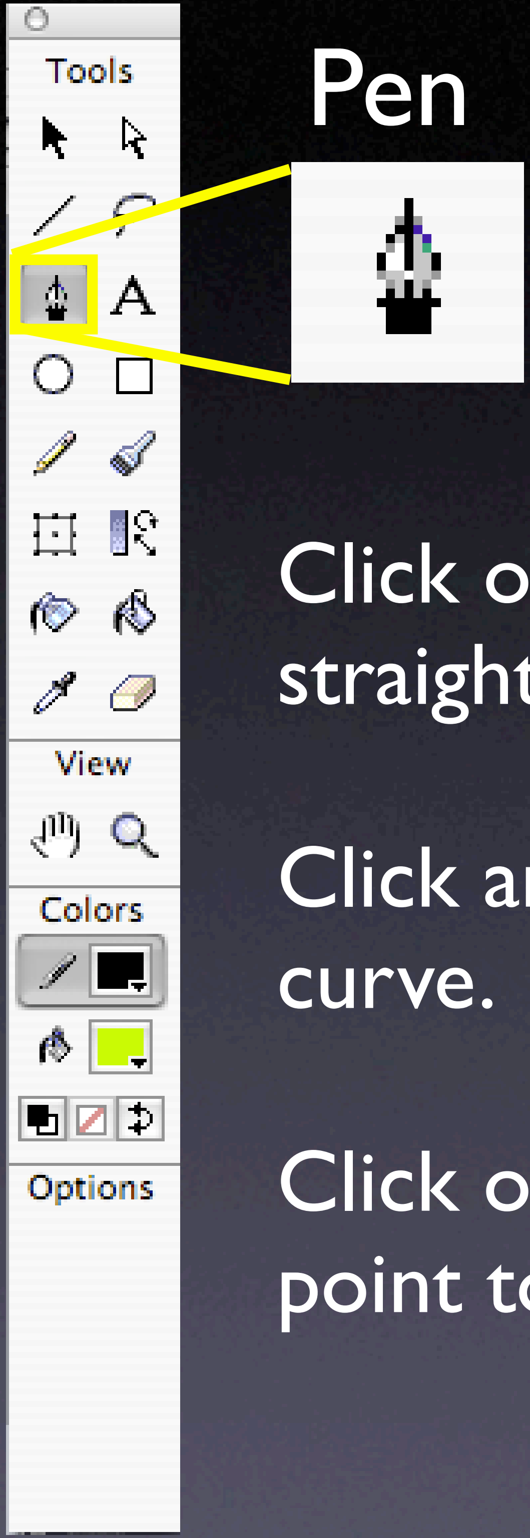
Ovals and rectangles

Options

For rectangles, the "radius" of the corner



Paths of Lines and Curves

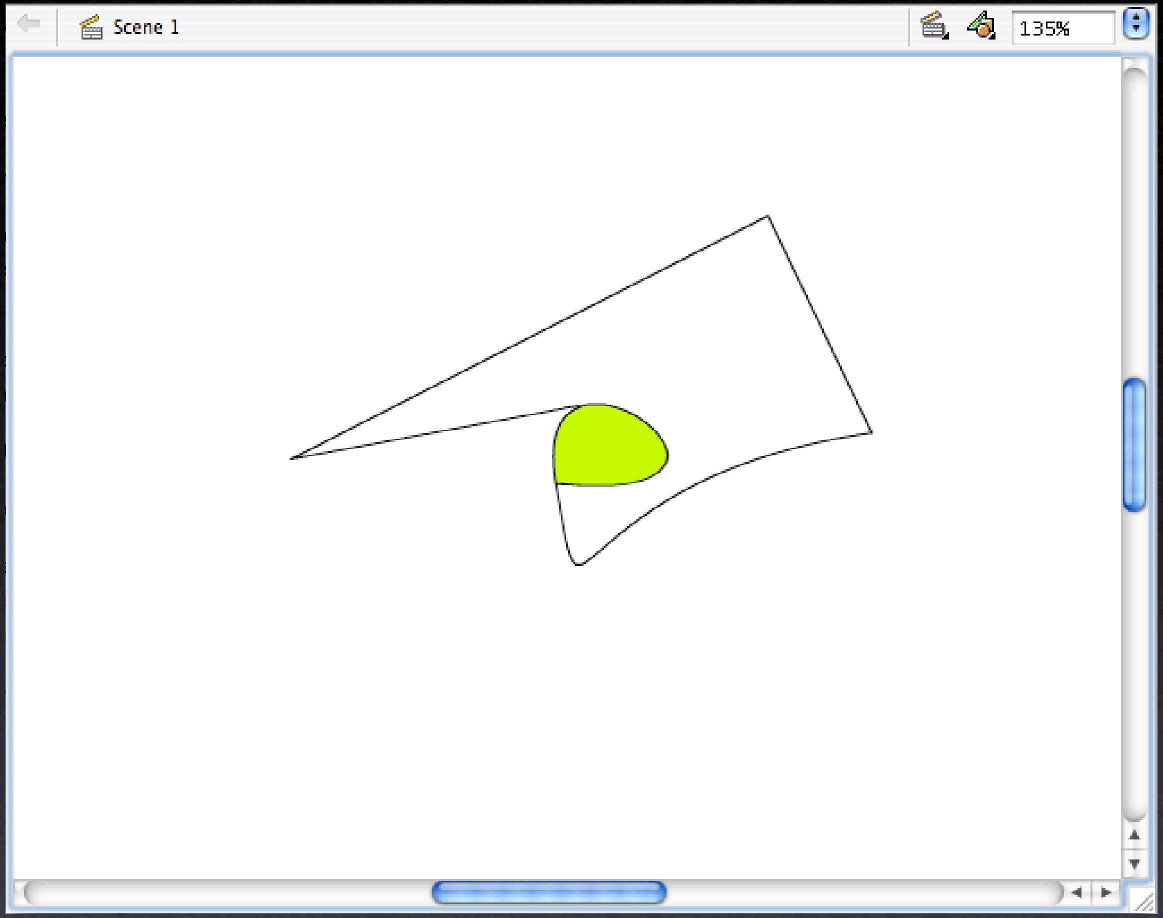


Pen

Click once to make a straight line in the path.

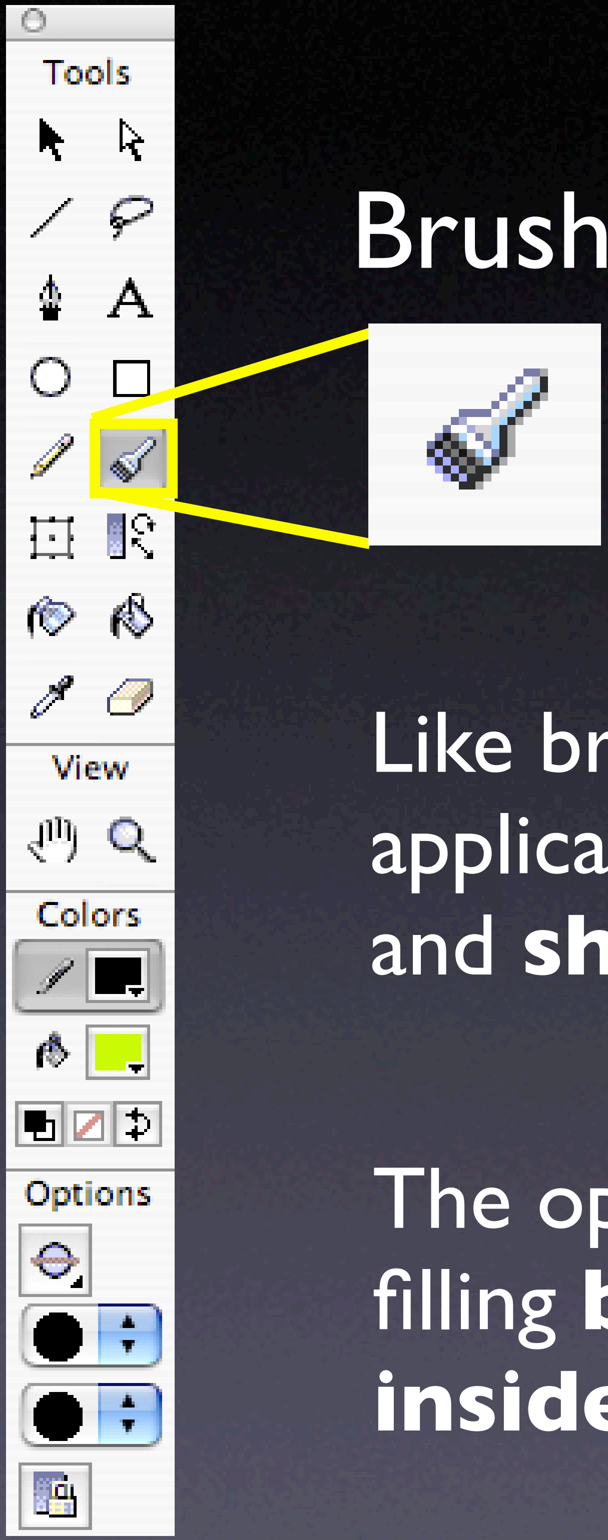
Click and drag to make a curve.

Click on a previously made point to close the shape.



Pay close attention to the changes in the cursor with this tool.

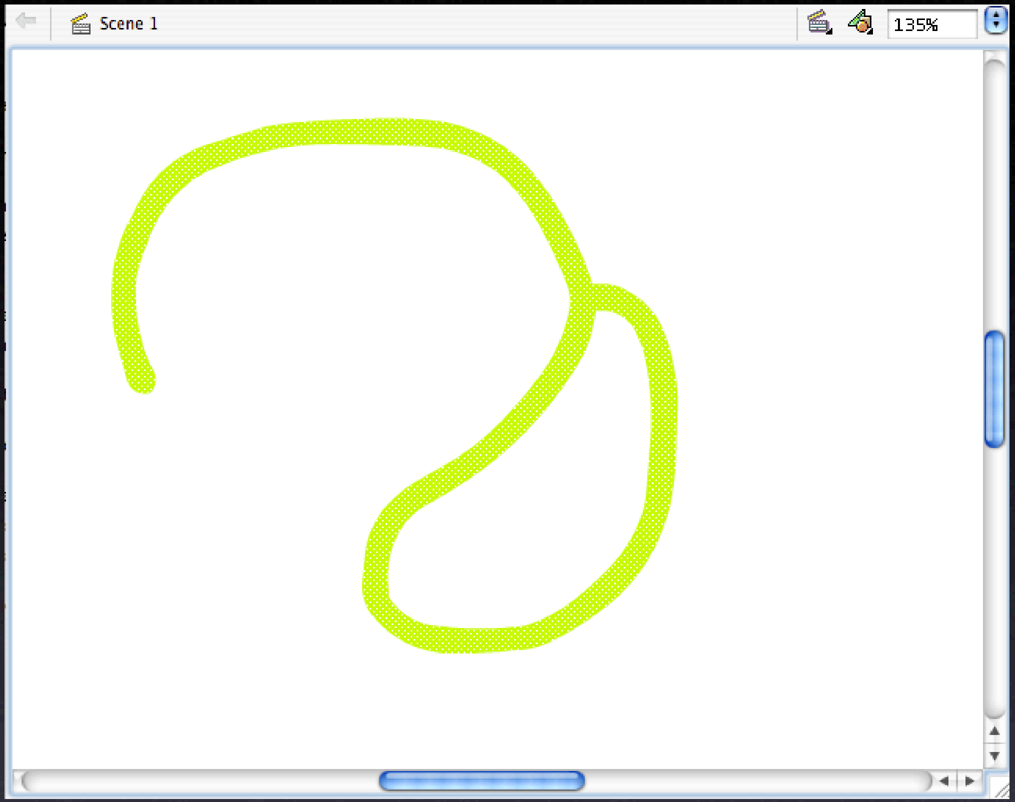
Brush Strokes



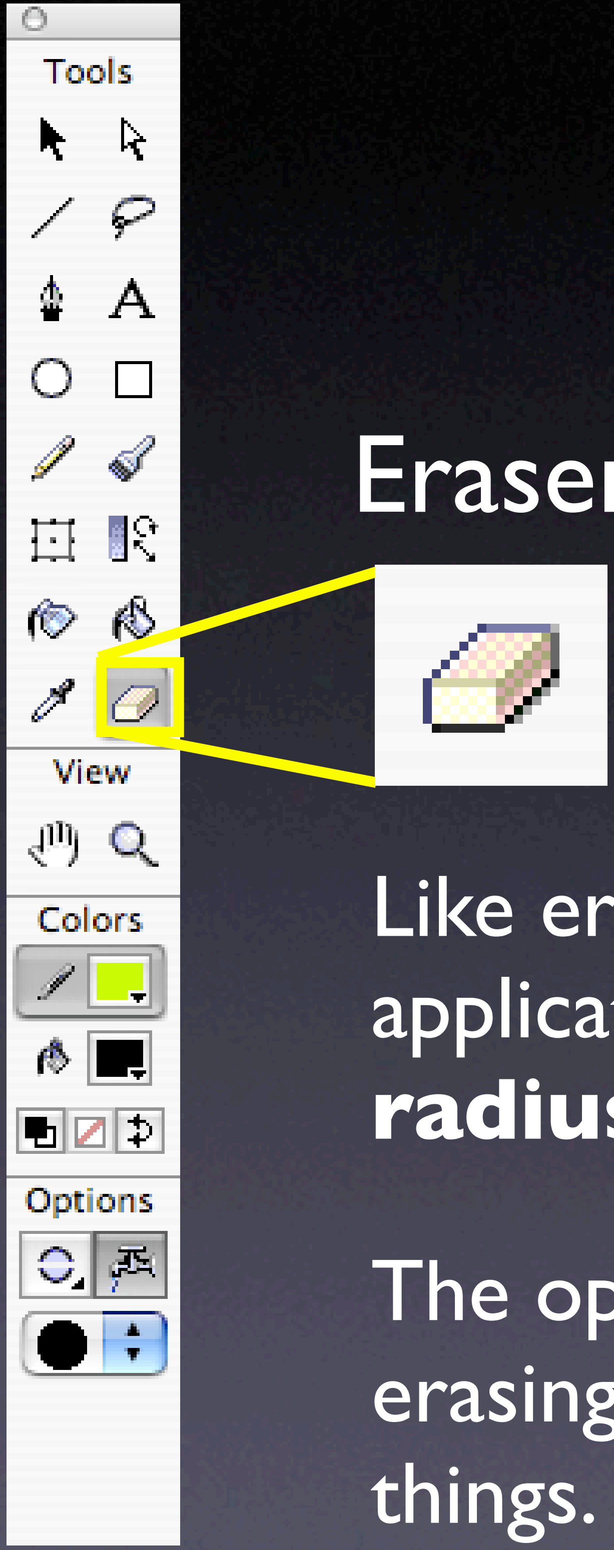
Brush

Like brushes in other applications, has a **radius** and **shape**.

The options also allow for filling **behind**, **selection**, **inside**...



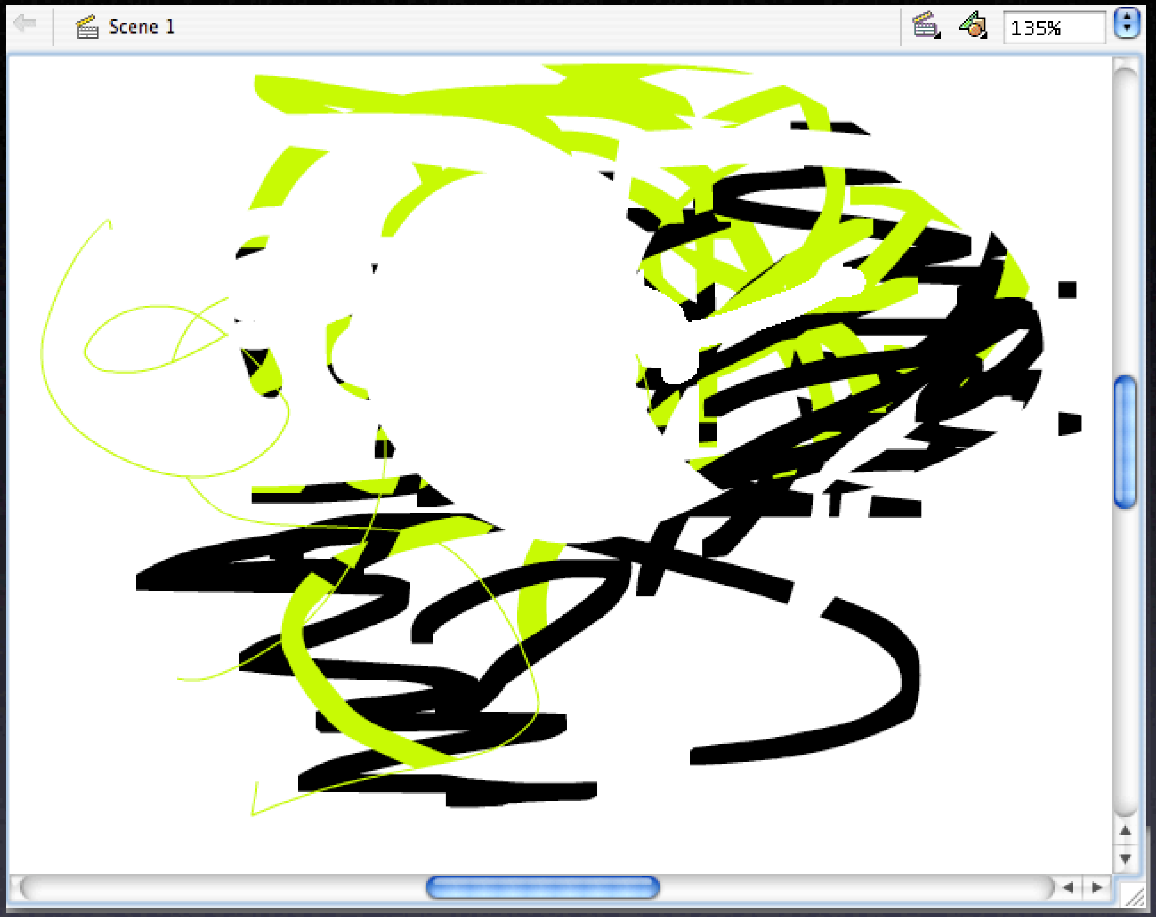
Erasing Parts of Shapes



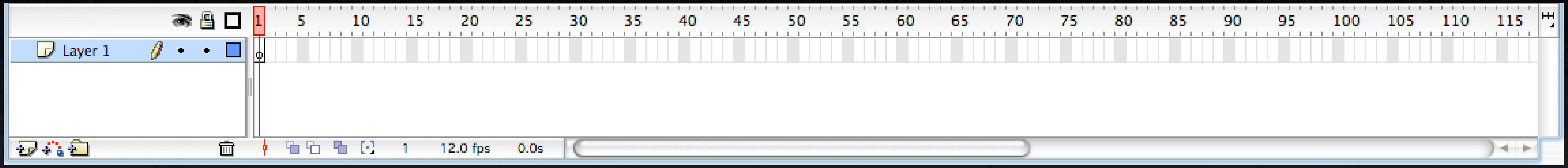
Eraser

Like erasers in other applications, has a **radius** and **shape**.

The options also allow for erasing fills, lines, and other things.

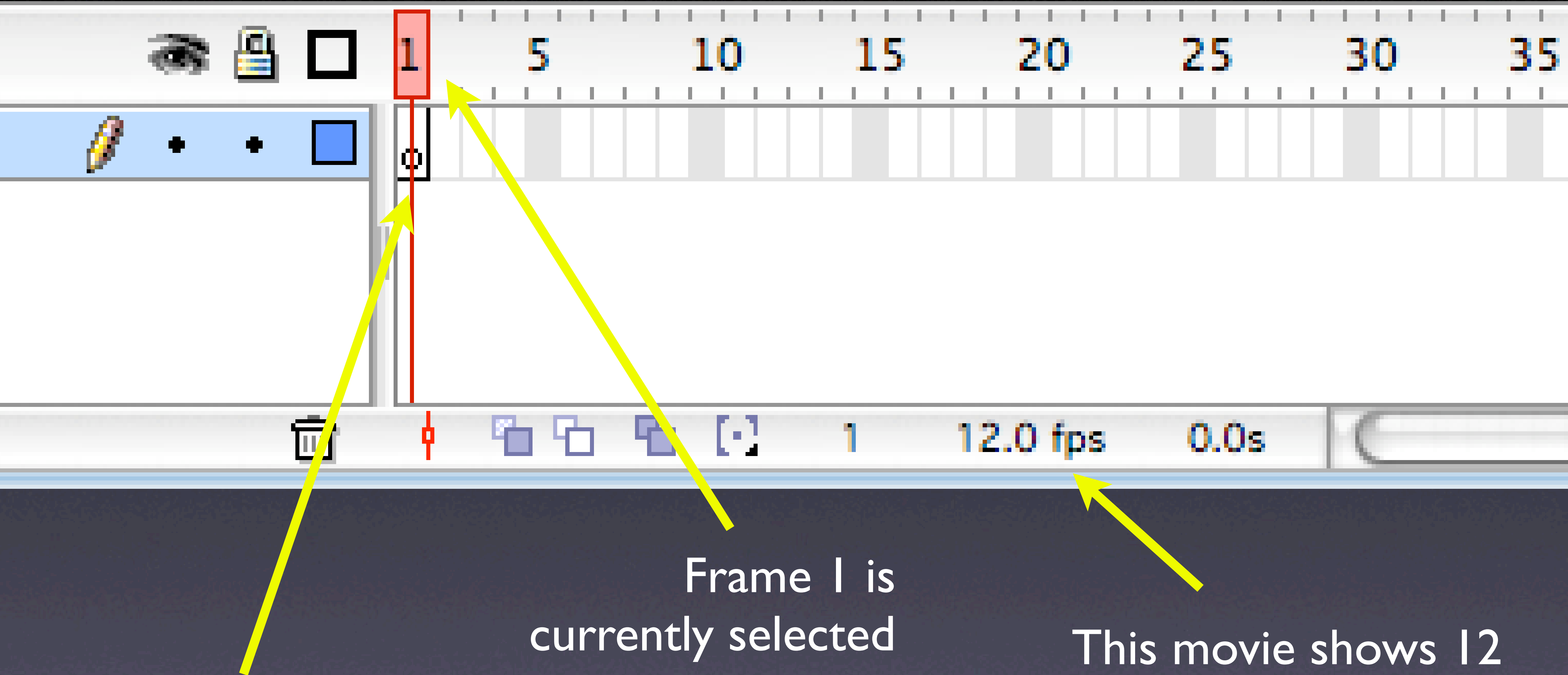


The Timeline



- A view of all of the **frames** and **layers** in your **movie**
- Of course, most Flash-based media is interactive, so its not *exactly* a movie.

Frames

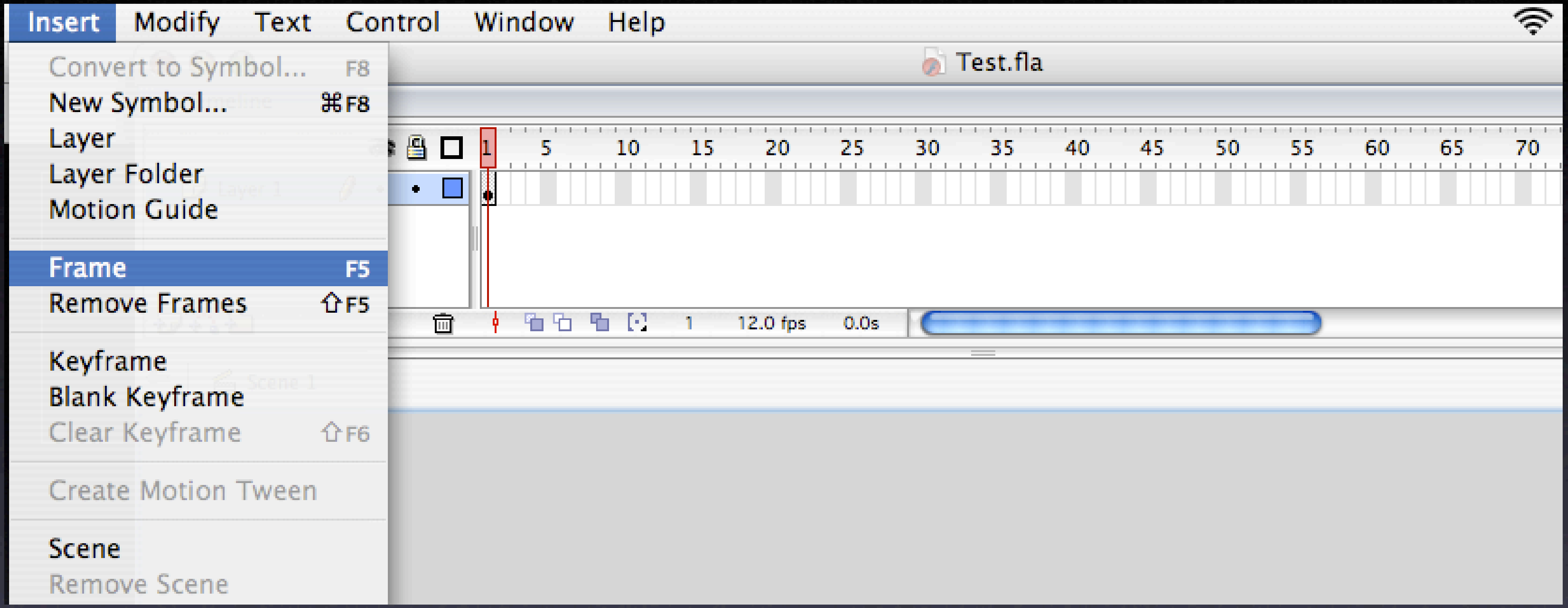


This is a **frame**

Frame 1 is currently selected

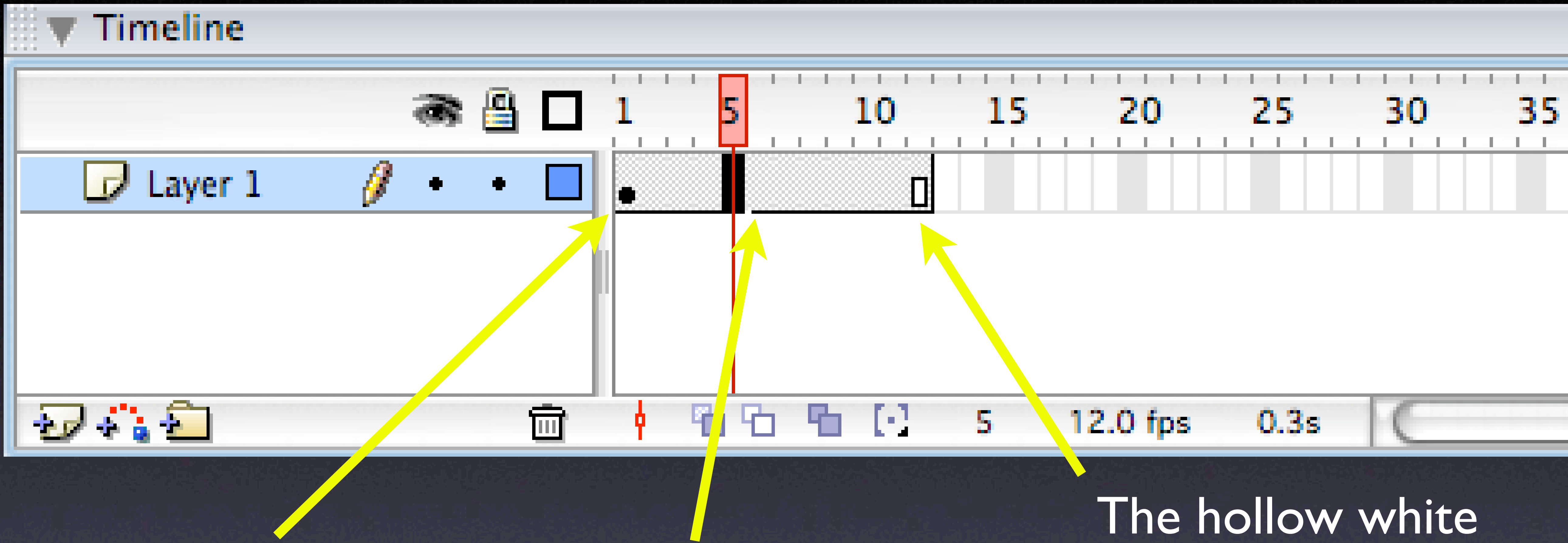
This movie shows 12 **frames per second**

Frames



- Use the **insert** menu to insert and remove frames.
- We'll insert 11 frames

Frames



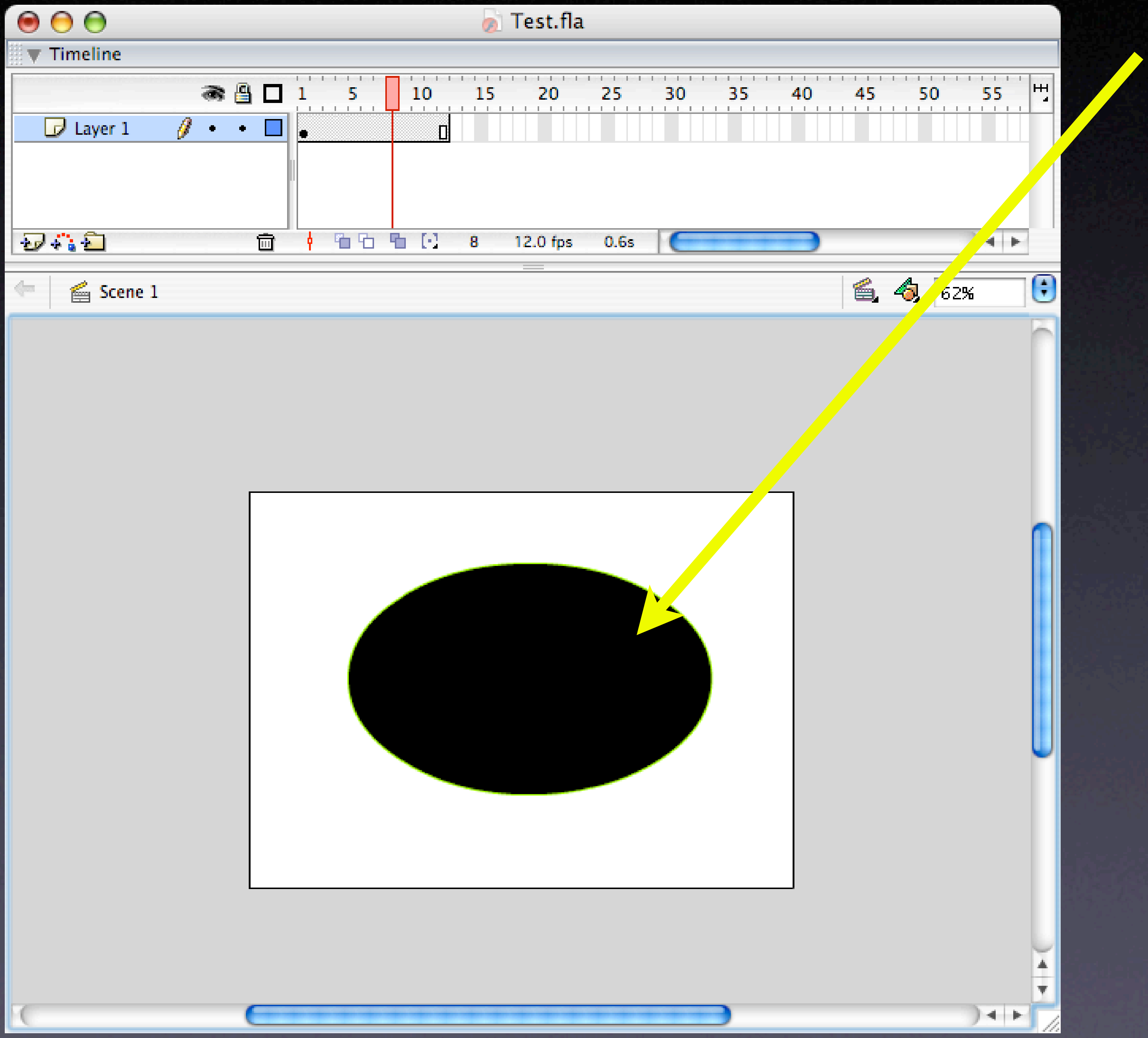
The black dot means that frame 1 is a **keyframe**

The grey frames 2-12 have the same content as the frame 1, the keyframe

The hollow white rectangle means that it is the end of the span of frames.

*A keyframes defines the content of **all frames following it**, up until the **next** keyframe.*

Frames

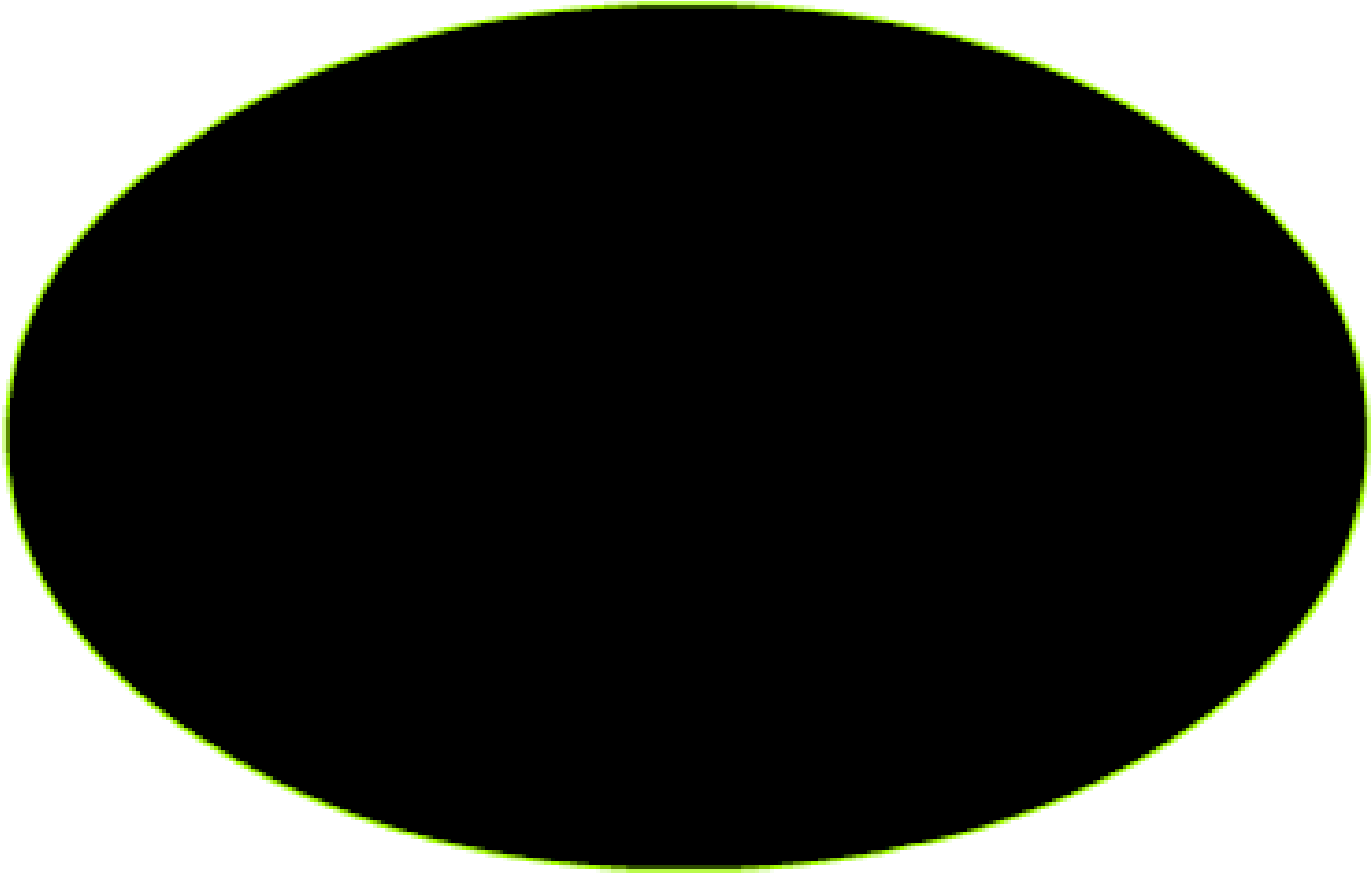


Frame 1, a keyframe, has a black oval on the stage.

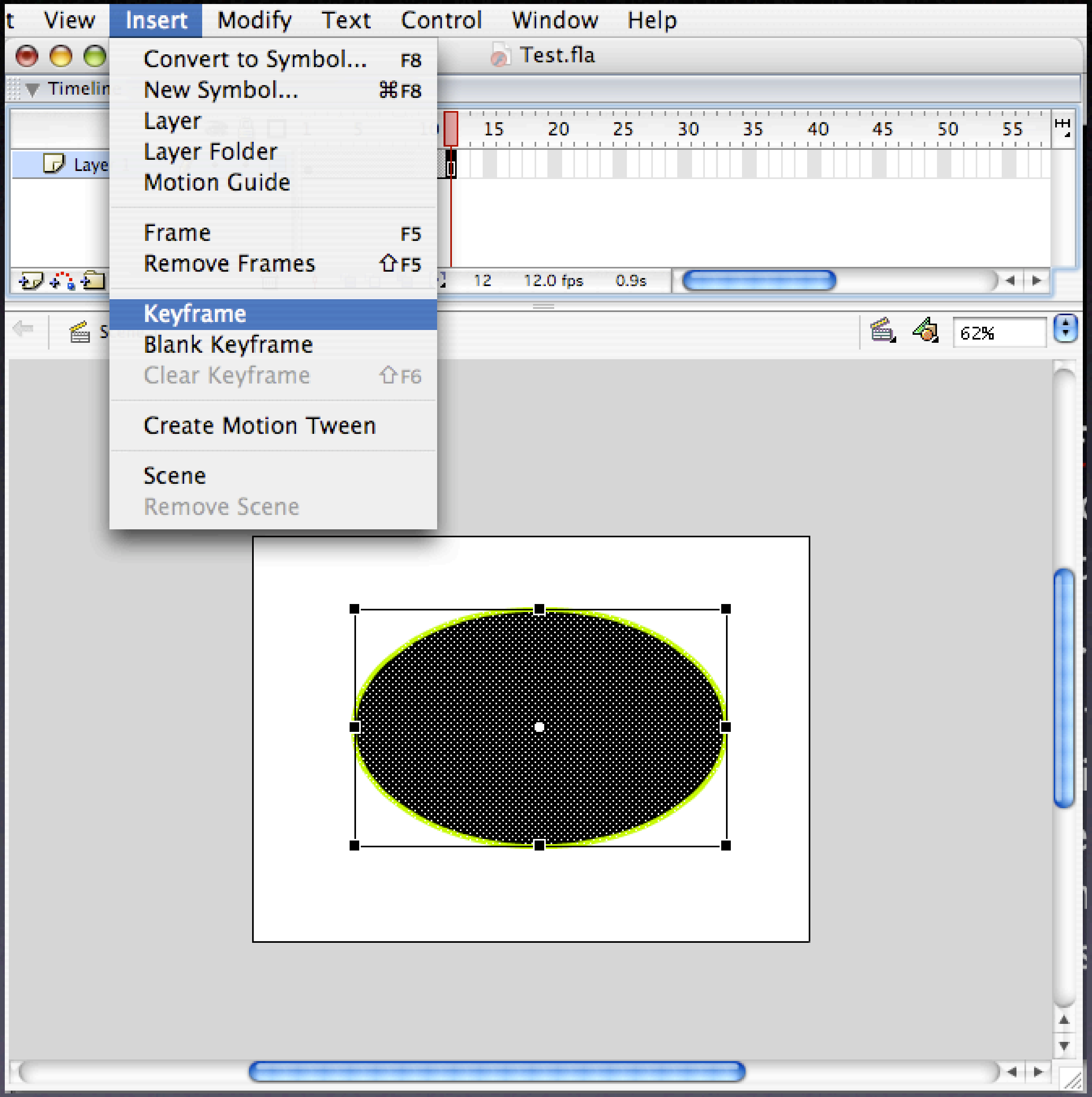
All of the *grey* frames following it have the same black oval as frame 1.

The last frame that with the black oval is frame 12, represented by the white rectangle.

This movie will show this black oval for 12 frames (1 second) and then loop.



Frames



If we want to change what the *13th* frame displays, we "insert a keyframe"

Inserting actually just changes the selected frame to a keyframe.

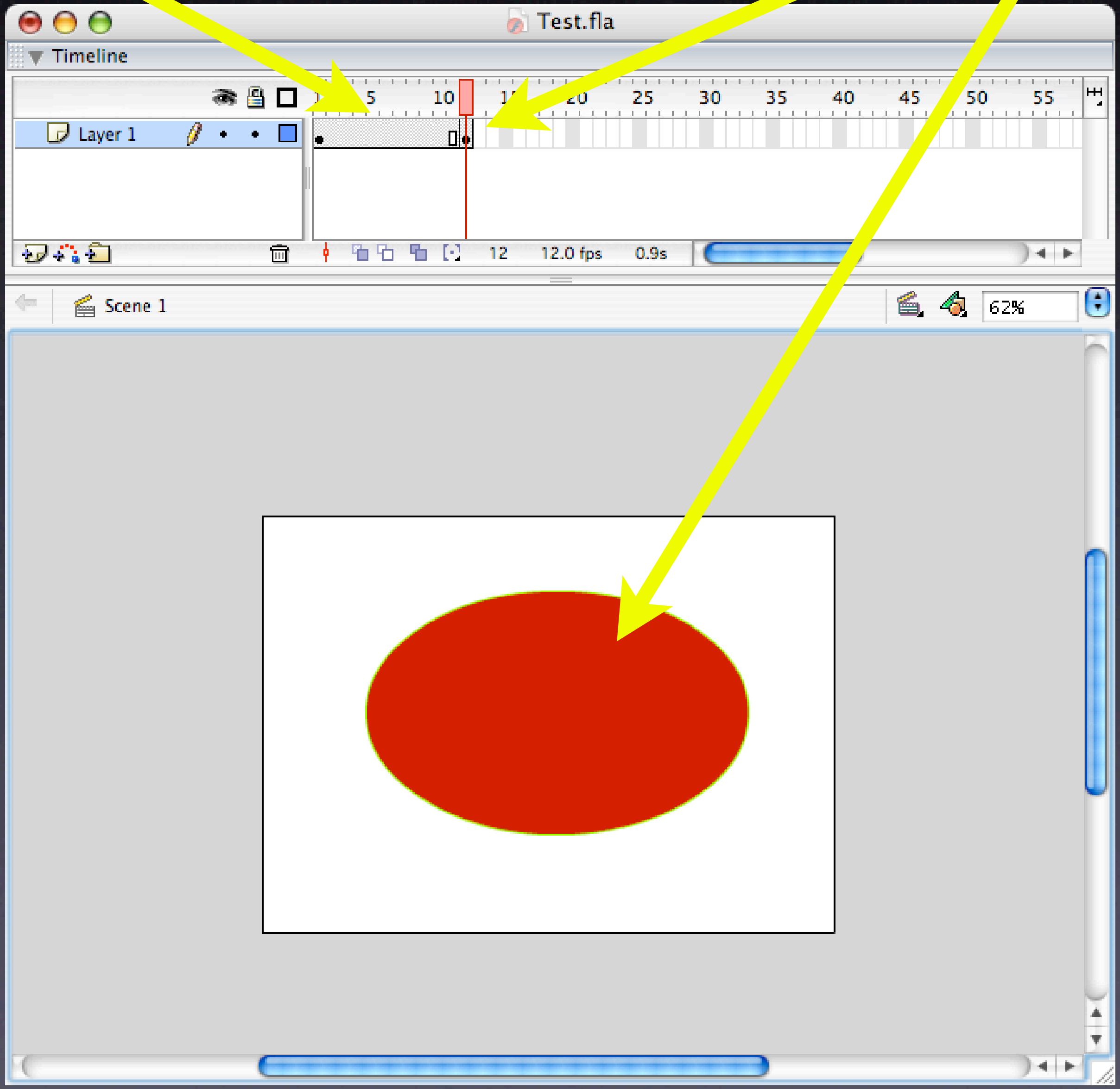
This **copies** the previous keyframe's contents.

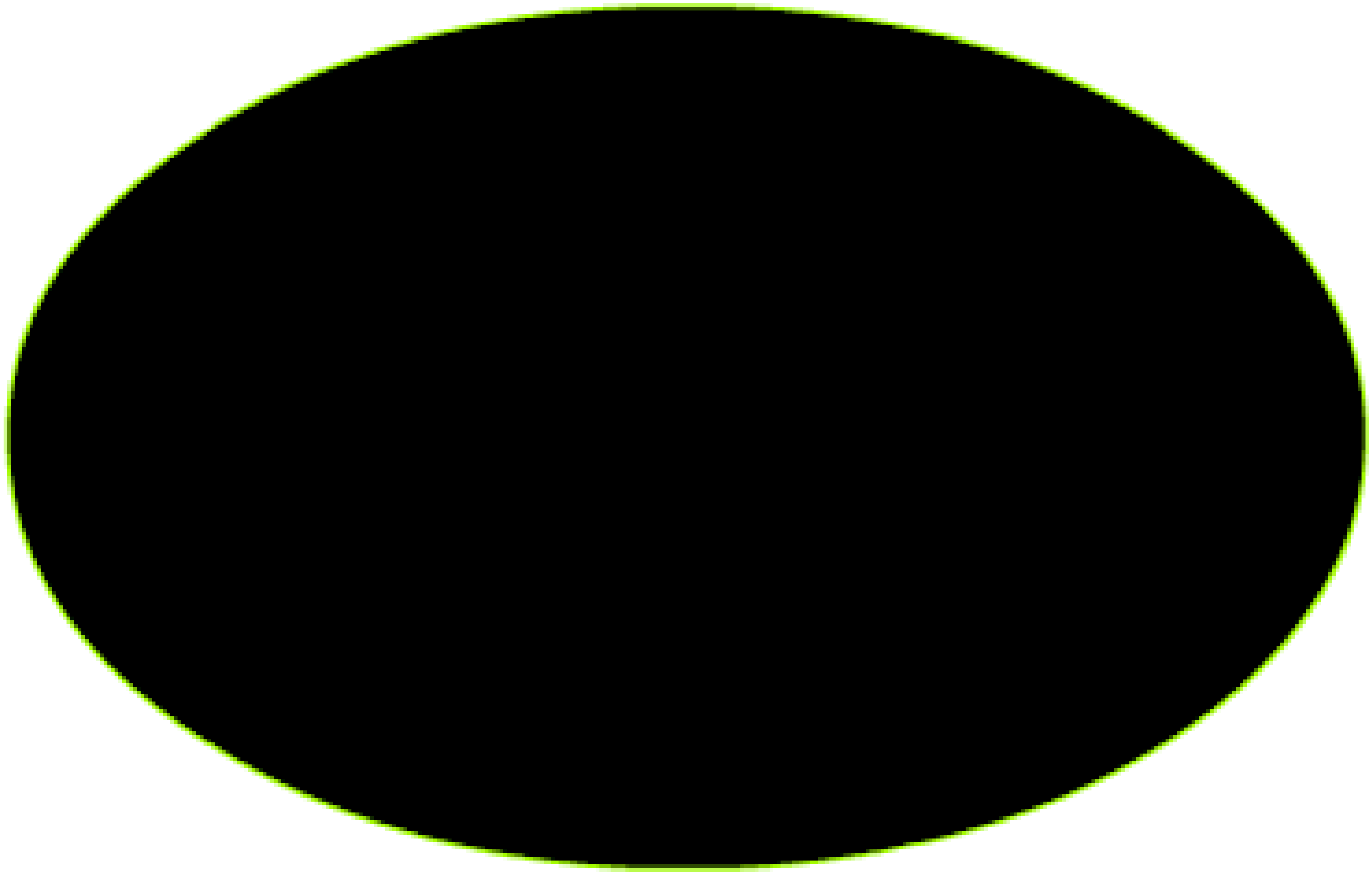
We can then change the contents of the *new* keyframe.

Frames

Now, the first 12 frames have a black oval.

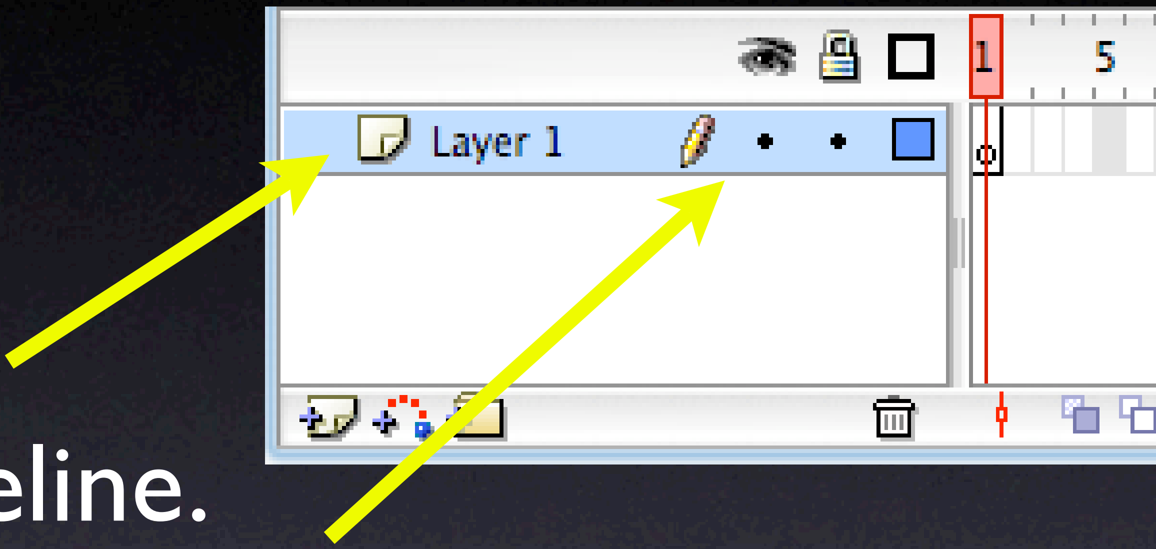
The 13th frame has a red oval of the same size.



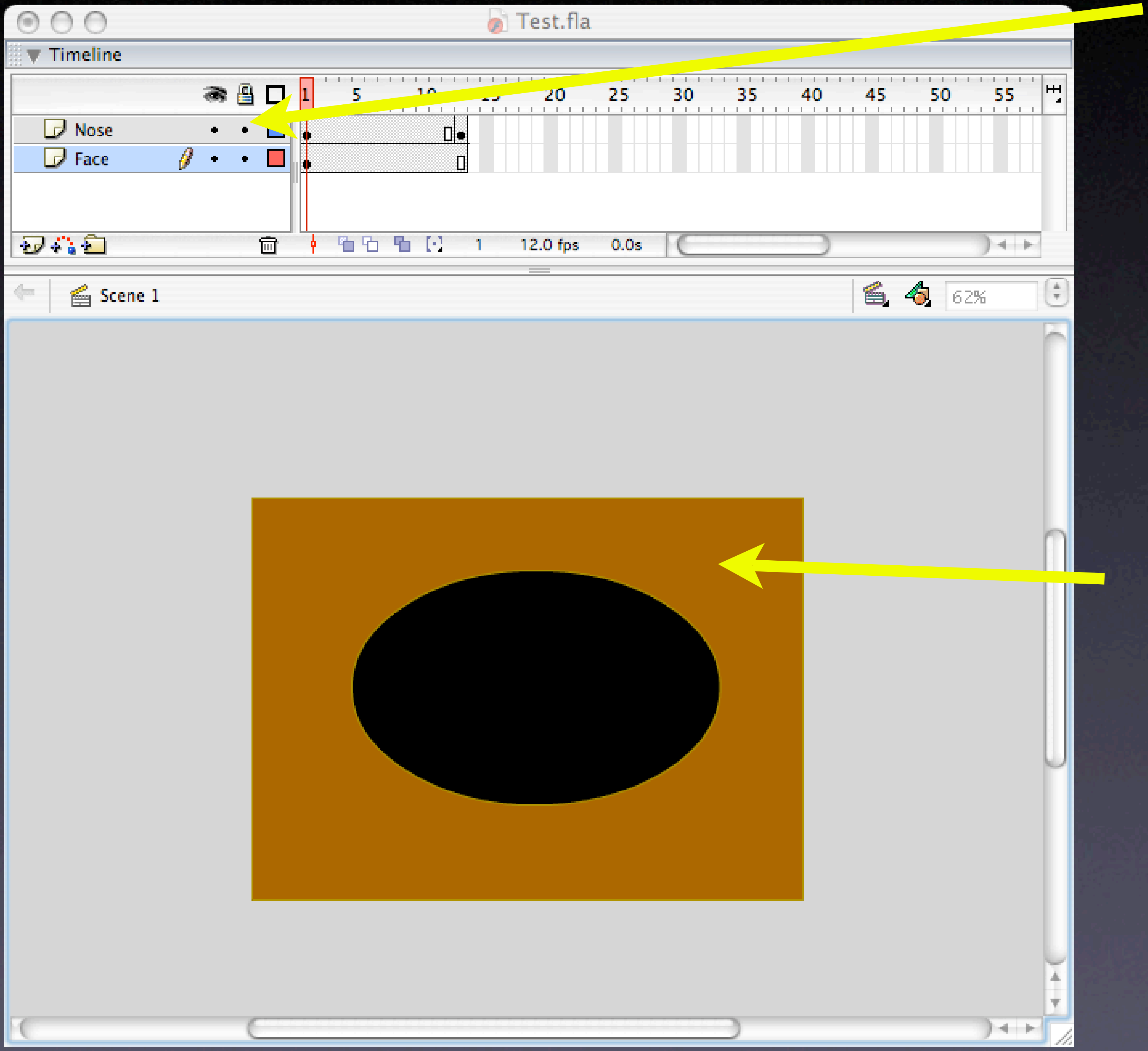


Layers

- Just like Illustrator and other applications, Flash supports **layers** of content.
- The layers are part of the timeline.
- Layers can be locked, hidden, and organized in folders.
- *Layers determine the order in which content is displayed for each frame.*



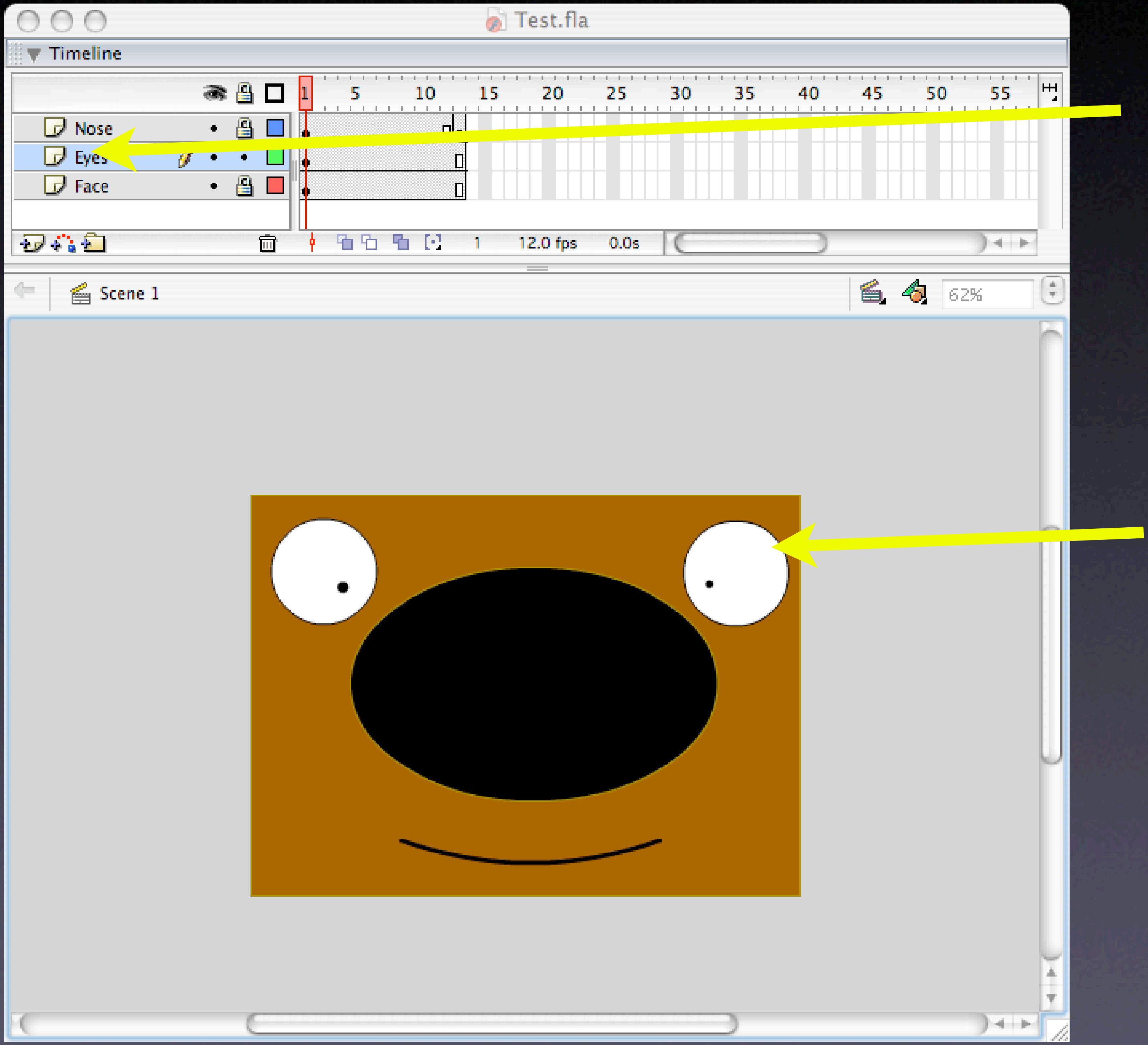
Layers



Here I've renamed **Layer 1** to **Nose** and added a layer called **Face**

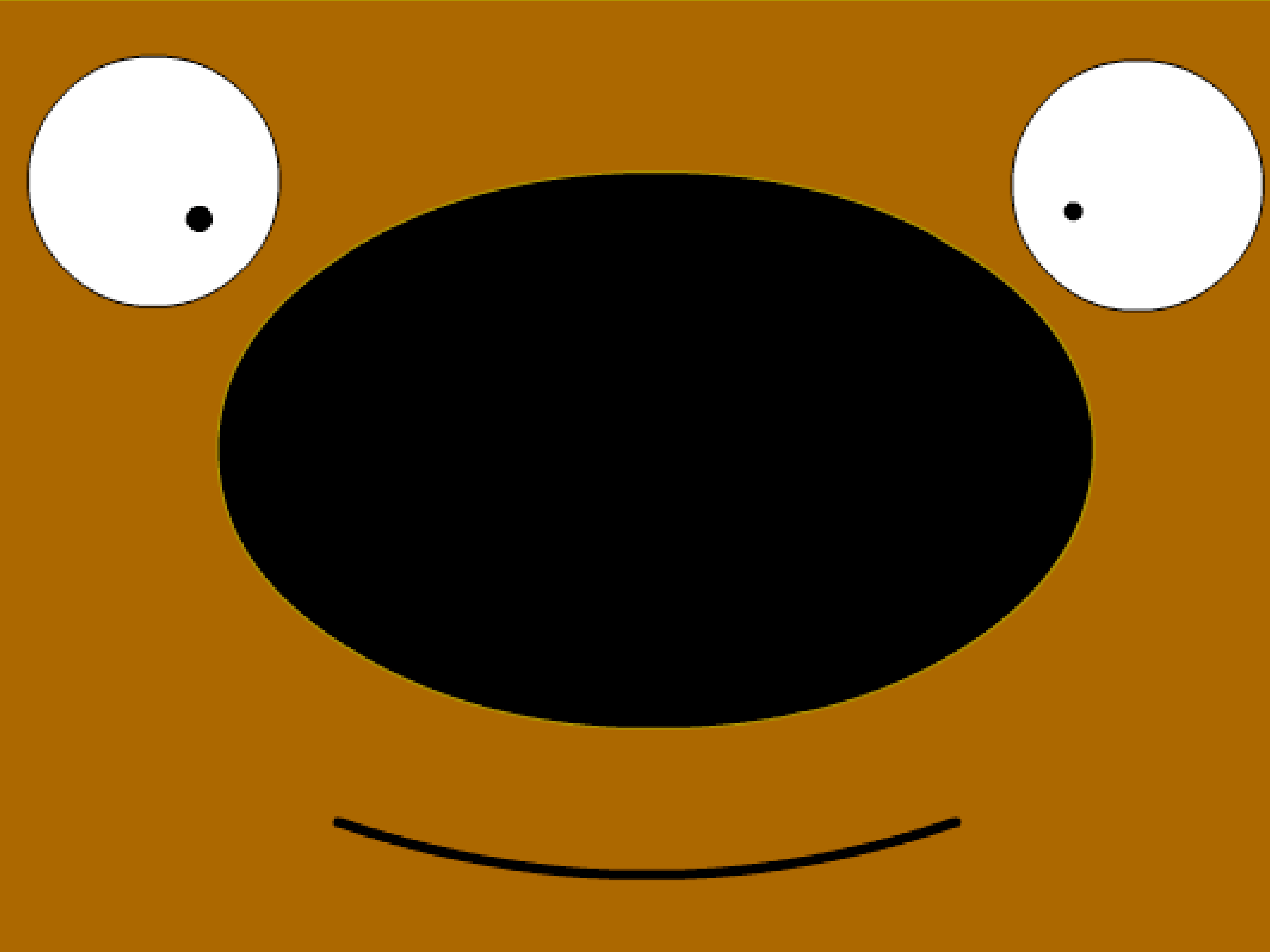
Then I drew a brown rectangle on the **Face** layer.

Layers

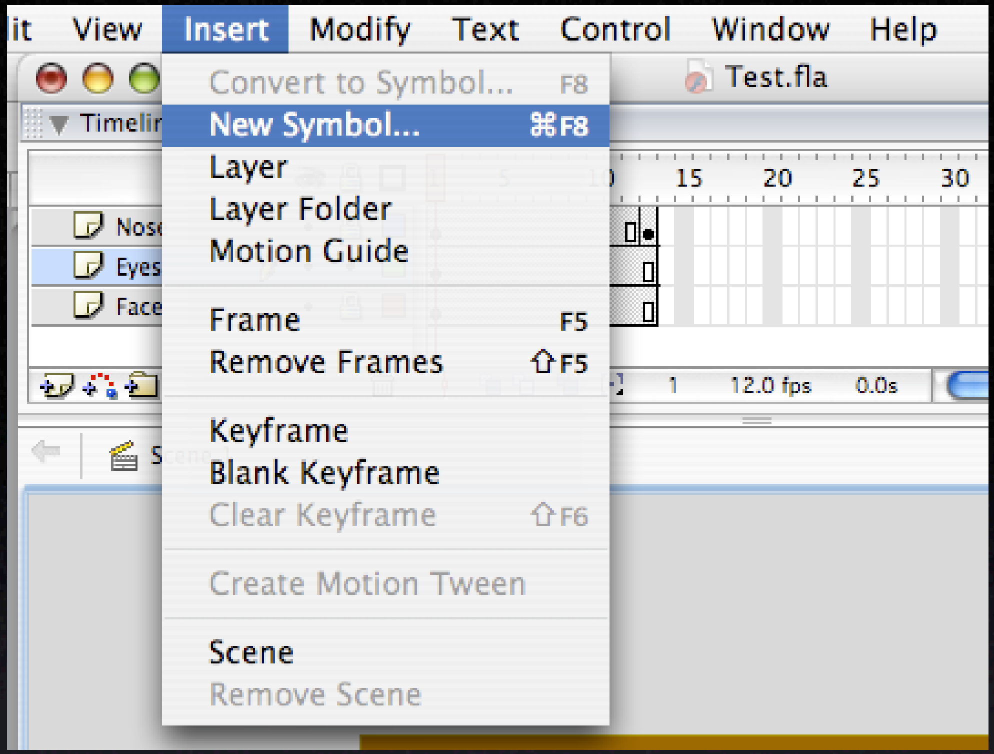


Then I added an **Eyes** layer, and drew the eyes and mouth.

Then I drew a the eyes and the mouth

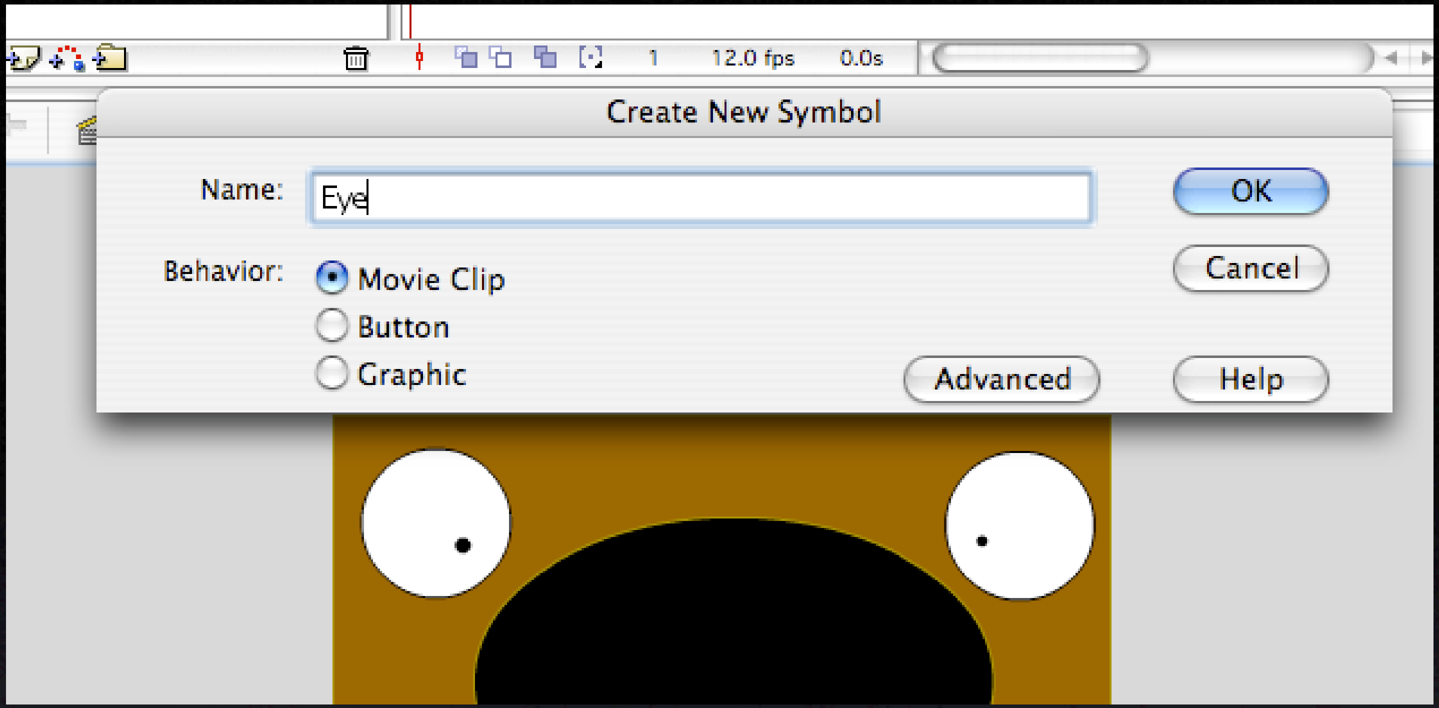


Symbols



- Symbols are tricky.
- Symbols can also be thought of as a class.
  - A single Button *class* → many Button instances
- Symbols = Separate Timeline + Stage + Layers
  - So they can also be thought of as movies inside of movies.

Types of Symbols

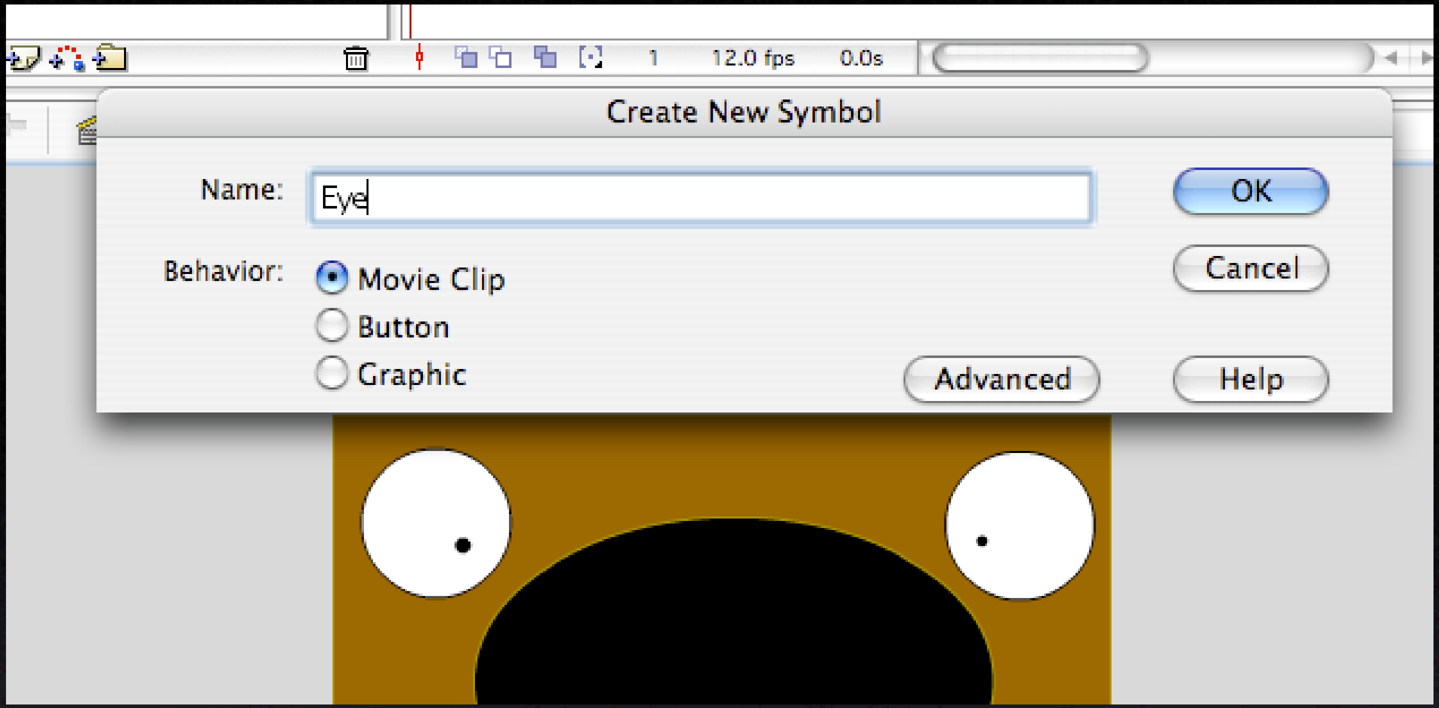

Create New Symbol

Name: Eye

Behavior: [✓ Movie Clip] Button Graphic

- ***Graphic***
  - Operate in sync with the main movie's timeline. Used for images or reusable animations.
- ***Movie Clip***
  - Movie inside a movie. On their own time, not necessarily in sync with the main timeline.
  - Good for interactive things and sounds.

Types of Symbols

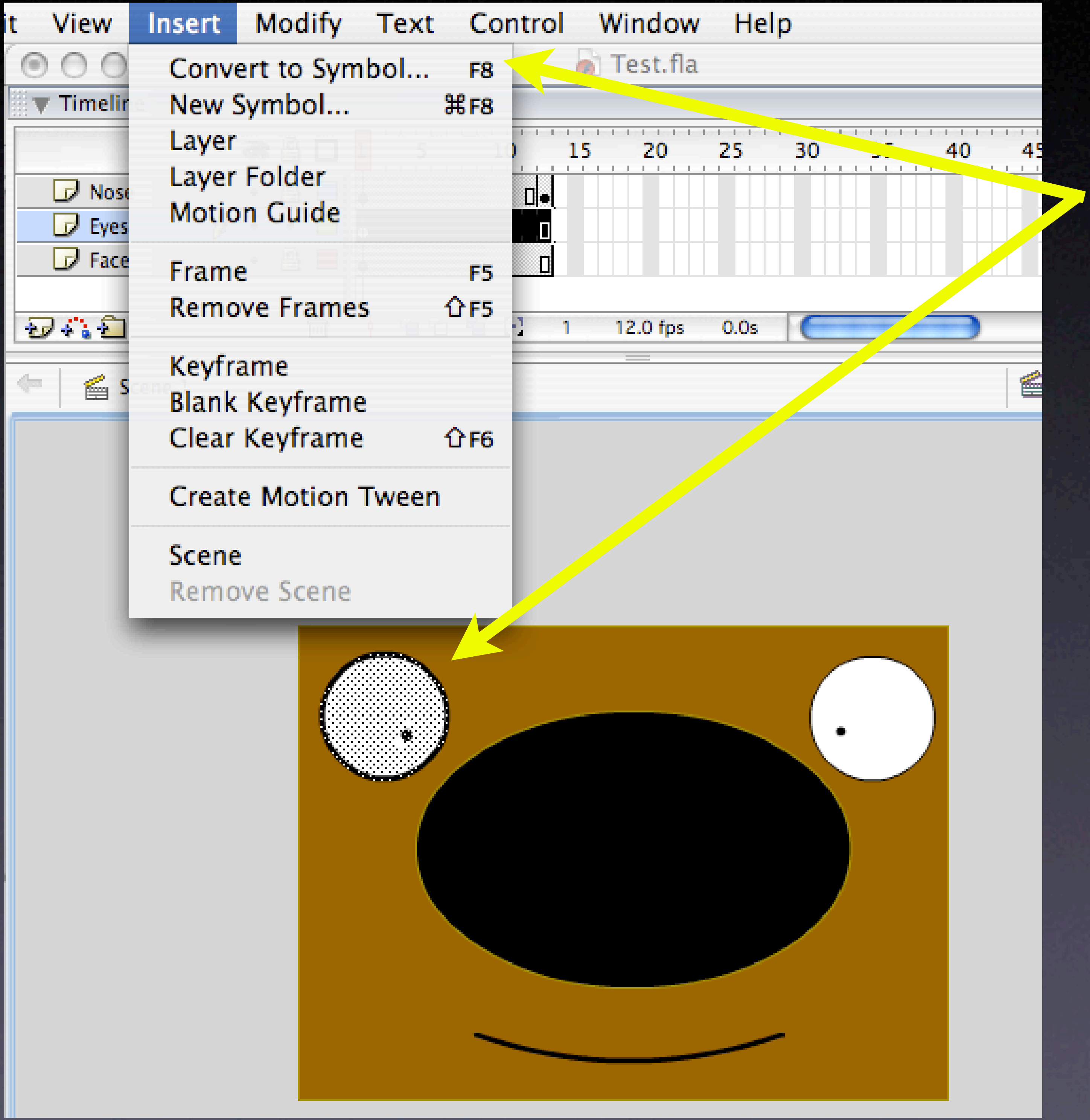


Name: Eye

Behavior: [✓ Movie Clip] Button Graphic

- ***Buttons***
  - Special kind of Movie Clip symbol that responds to clicks, rollovers and other actions.
  - You define the graphics for each of the various button states, and then assign particular actions to an **instance** of a button.

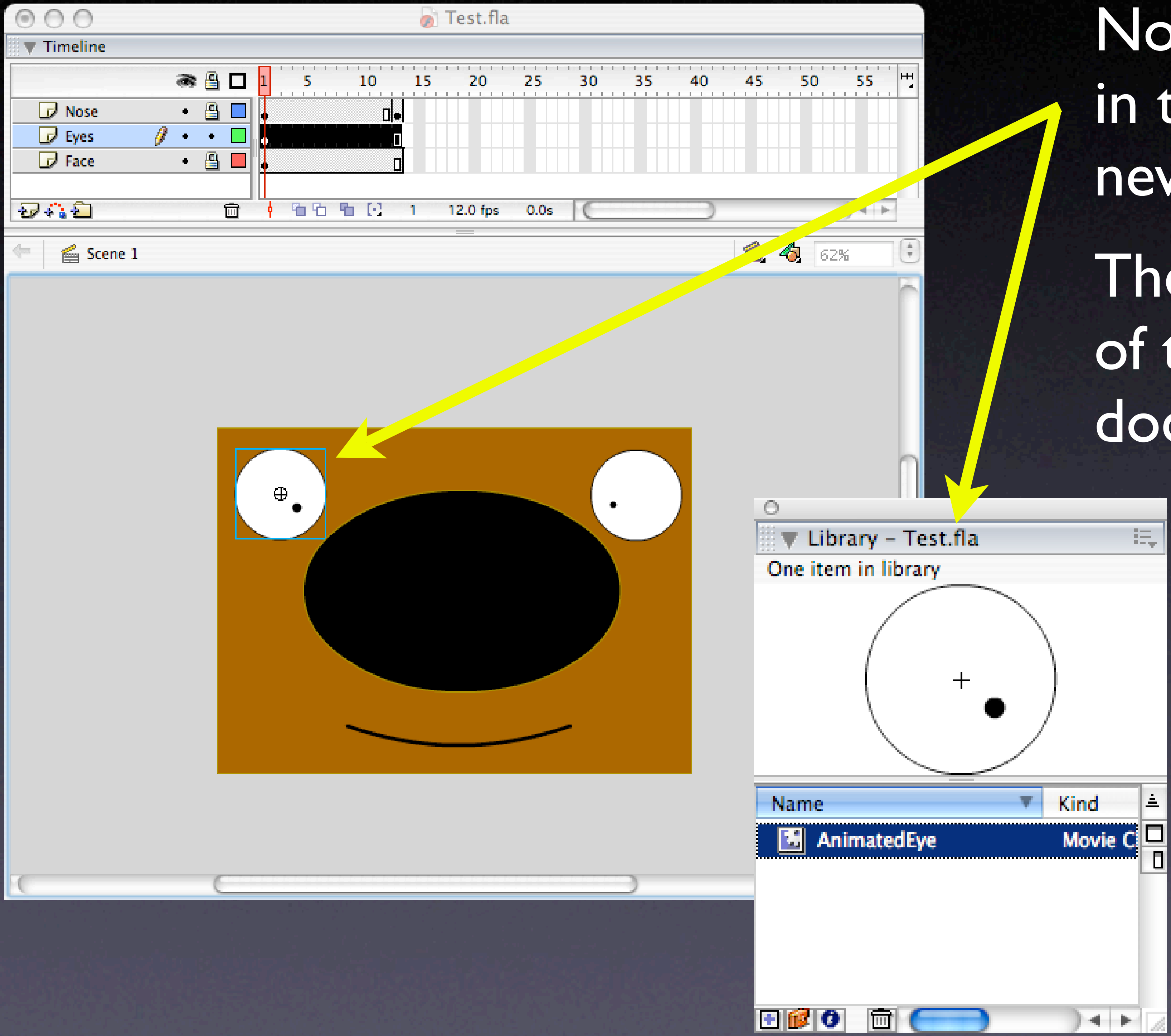
Making a Symbol



You can make a new, blank symbol by going to ***Insert→Insert Symbol...***

Here, we have selected the eye (by locking the nose and face layers and dragging a box around the eye), so the menu says **Convert to Symbol** instead.

The Library



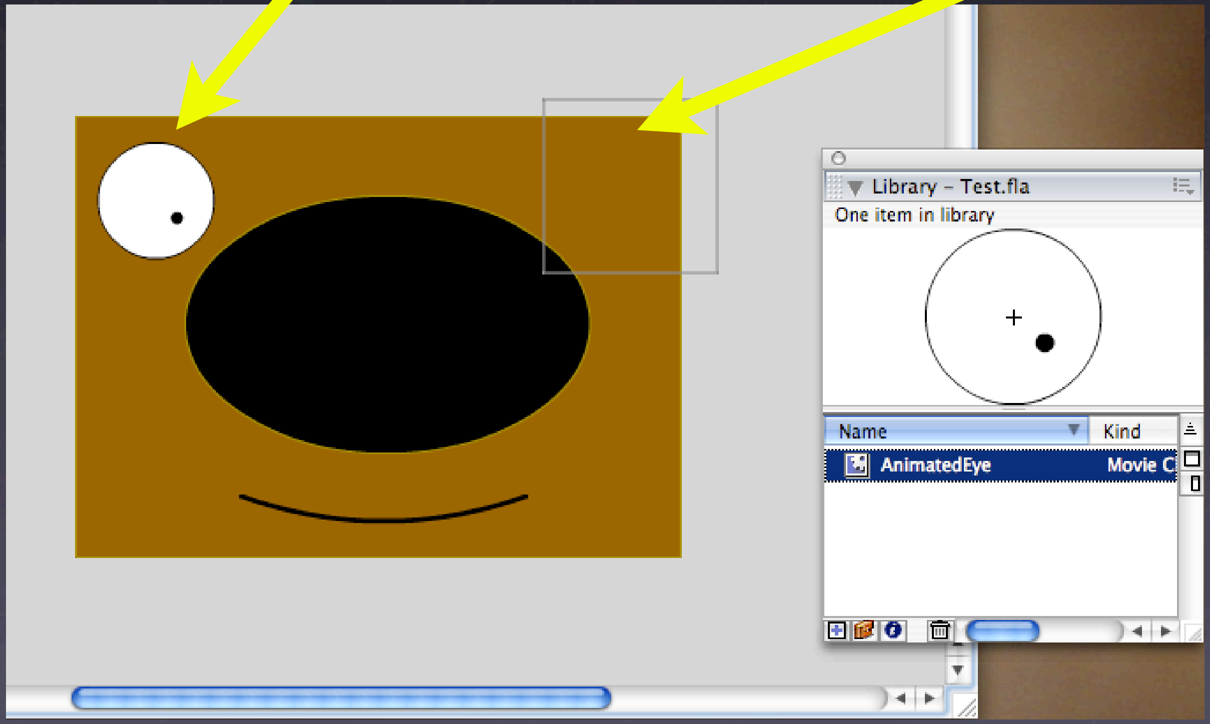
Now, the eye appears in the ***Library*** as a new symbol.

The library contains all of this Flash document's symbols.

An Instance of a Symbol

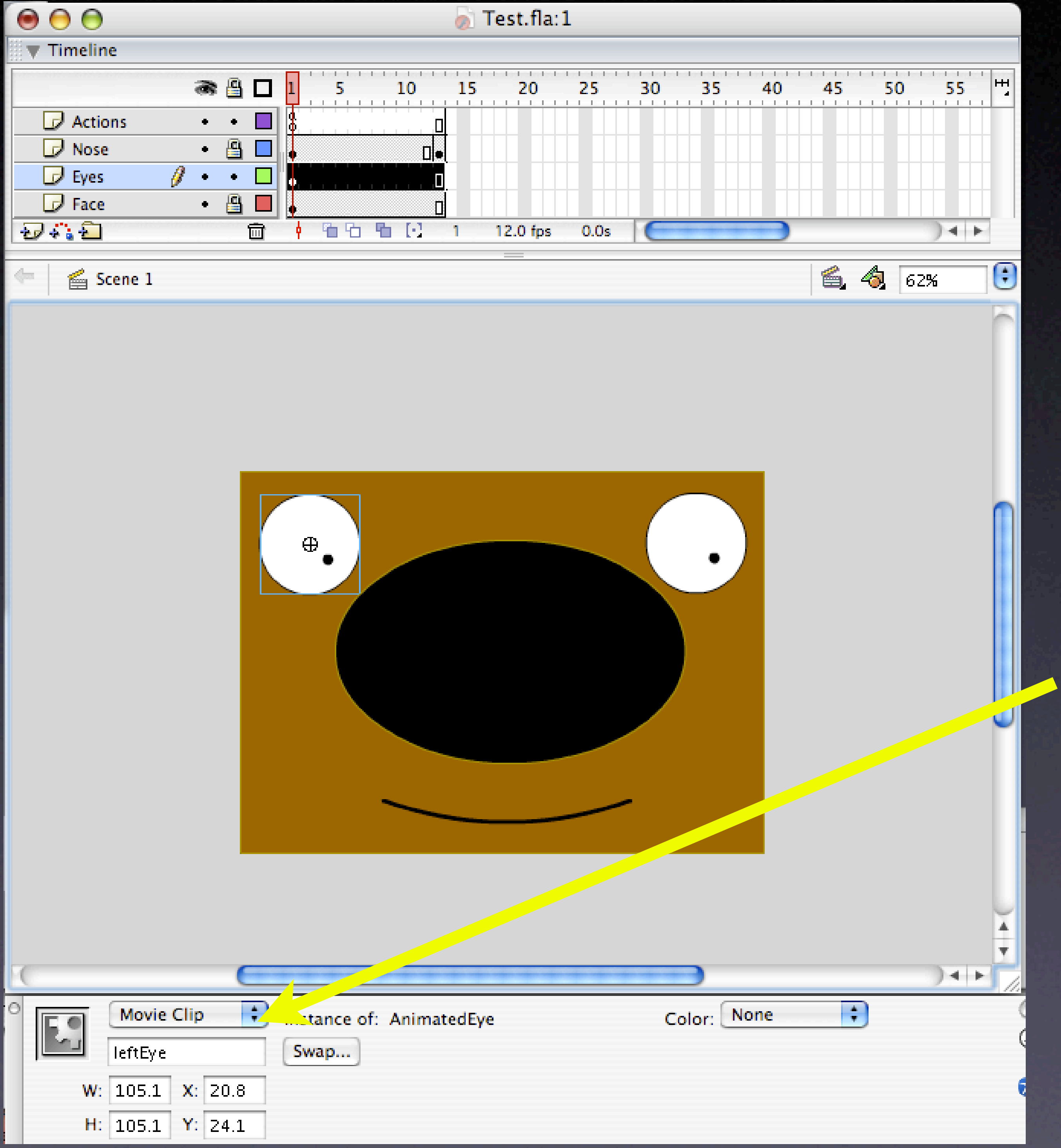
Now, the left eye is an instance of the **AnimatedEye** symbol

After erasing the right eye, we can drag a new instance of the **AnimatedEye** symbol from the library for the right eye.



Now we have two instances of the animated eye symbol, each with their own positions, but sharing the symbol's timeline, layers, etc.

Naming Instances



Instance of: AnimatedEye

leftEye

W: 105.1 X: 20.8

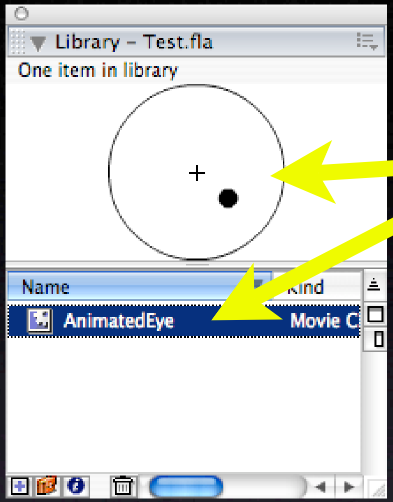
H: 105.1 Y: 24.1

Its important to name an instance if you want to refer to it in code.

We name the left eye **leftEye** by selecting the left eye and changing the instance name in the property window.

We do the same for the right eye.

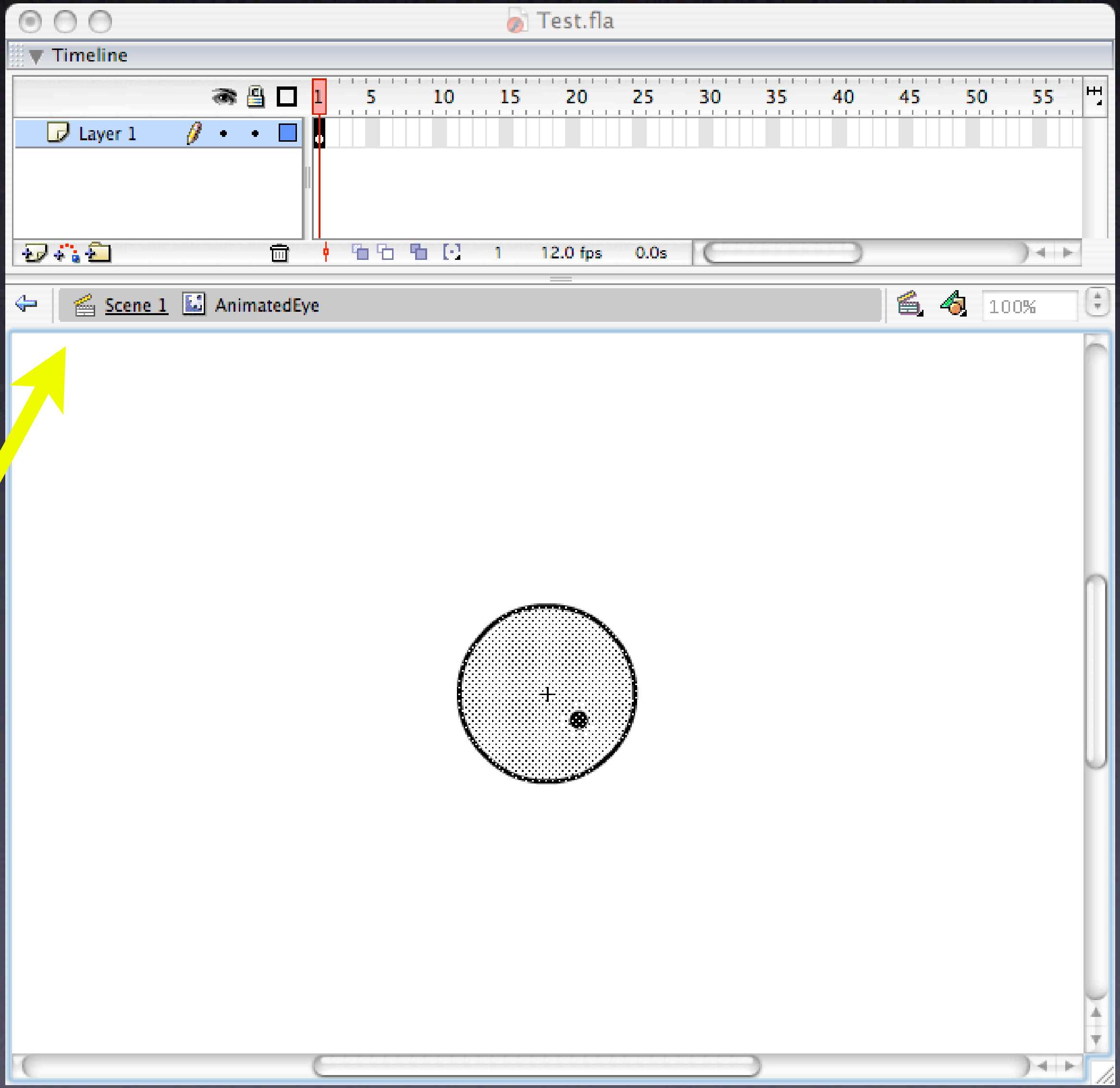
Editing a Symbol



To edit a symbol, double-click on the symbol in the library (either the name or image).

Notice that the timeline, layers, and stage are now specific to the **AnimatedEye** symbol.

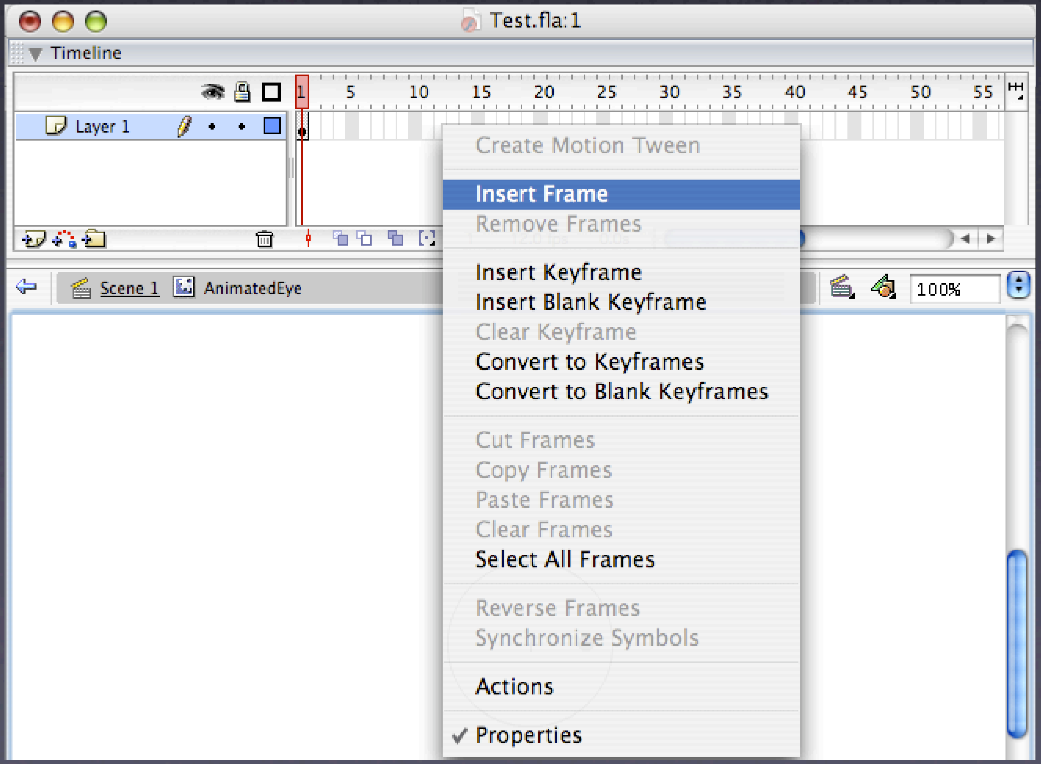
Our view is now *inside* the main scene. You can return to it by clicking here.



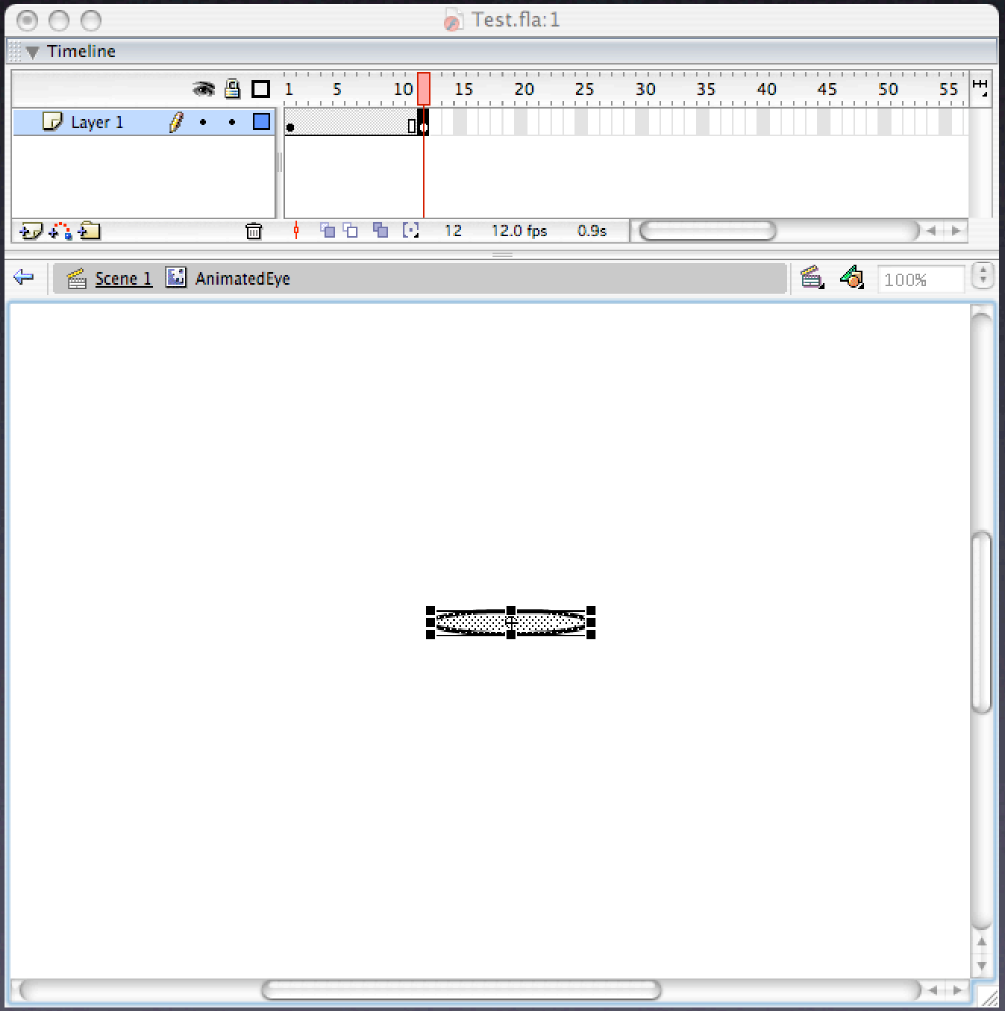
Editing a Symbol

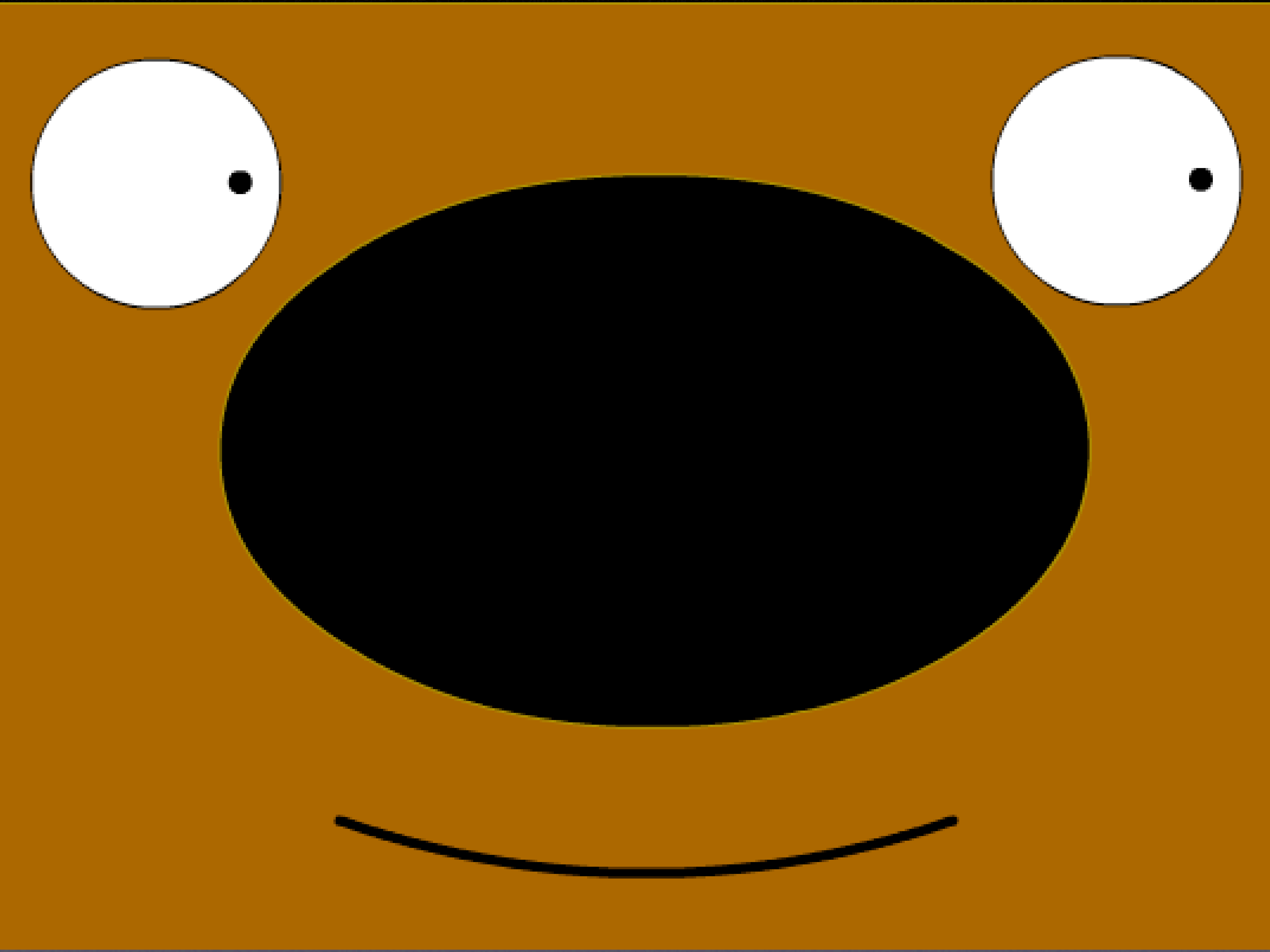
Let's make the eyes blink every 1/12th of a second.

If we right-click on the 12th frame in the eye's timeline and select insert frame, it inserts frames in between.



Then we make a keyframe, and change the eye so that it is blinking.





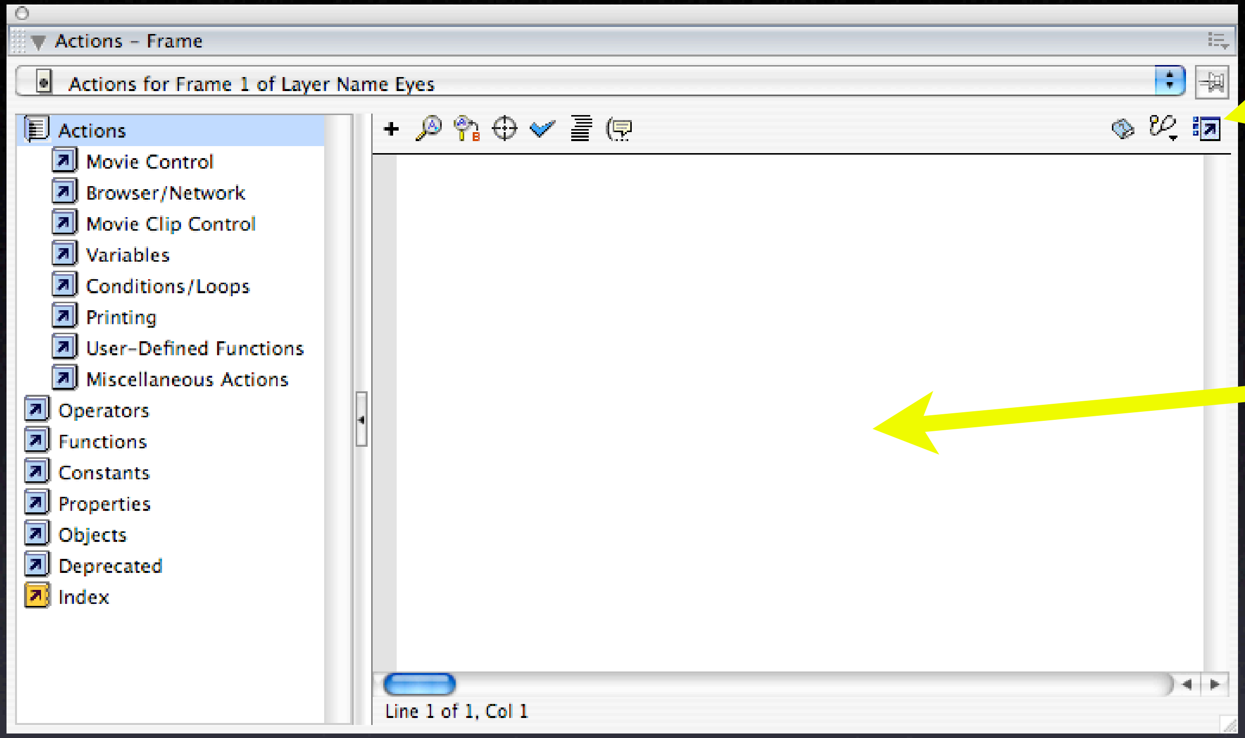
ActionScript

- Let's make the eyes look at the mouse using ***ActionScript***, the Flash scripting language.
- ActionScript is event-based, like VB.NET, and has two main types of events:
  - Button events (pressed, released, rollOver...)
  - MovieClip events (load, enterFrame, mouseMove...)
- Each has its own syntax.

ActionScript

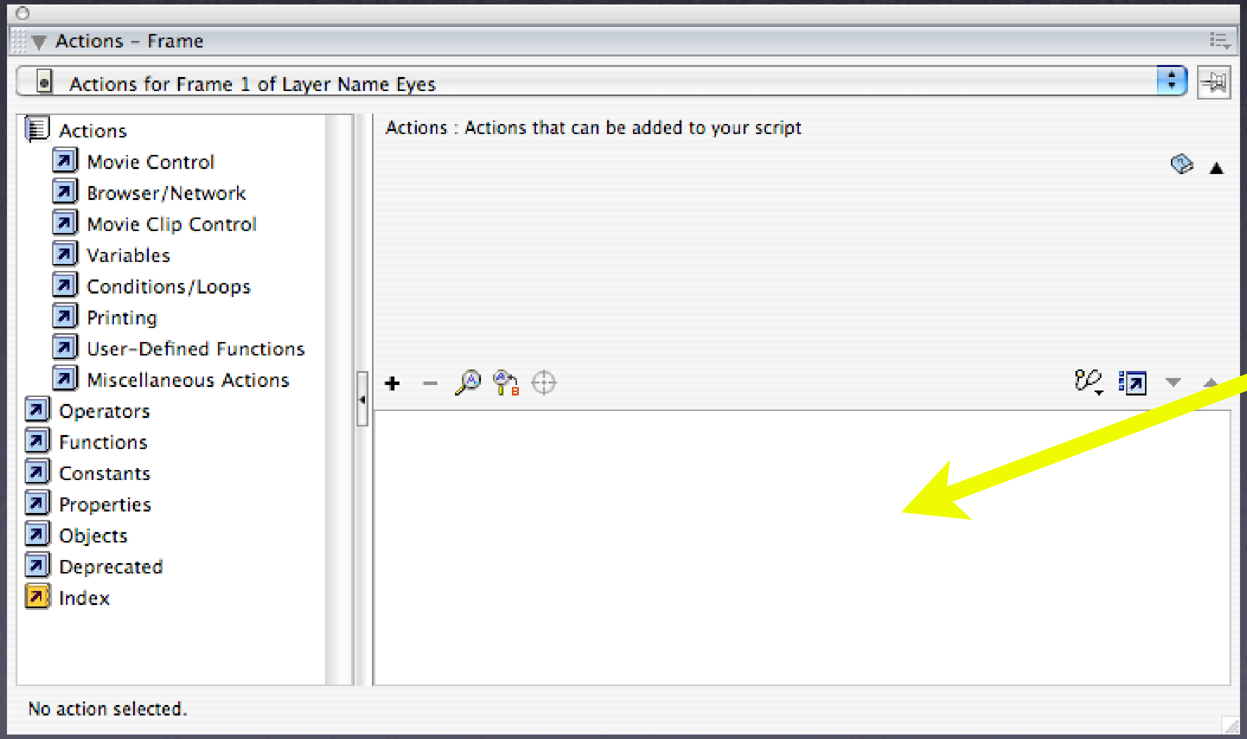
- ActionScript code is associated with frames, Movie Clips, and Buttons.
- **Just before a frame is displayed, its code is executed.**
- The frames following a keyframe share the same code as the keyframe. The keyframe's code is executed just before it is displayed.

The Action Window



There are two editing modes

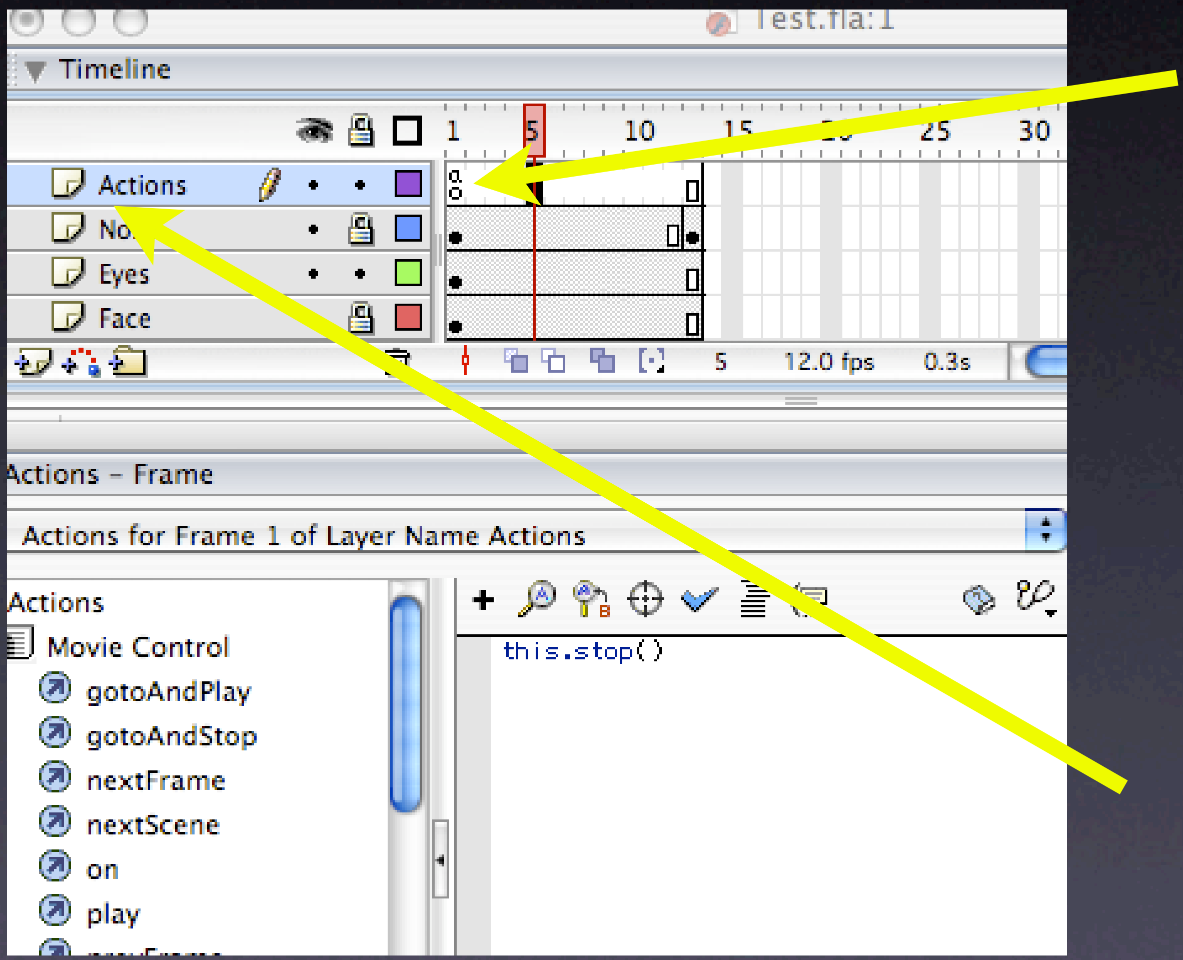
In ***expert*** mode, you type, and can use the *Intellisense* like pop-up to see the available methods.



In ***normal*** mode, you drag and drop "Actions" from the area in the left.

The Action Window

The code shown in the Actions window depends on the current selection in the Flash environment.



```
this.stop()
```

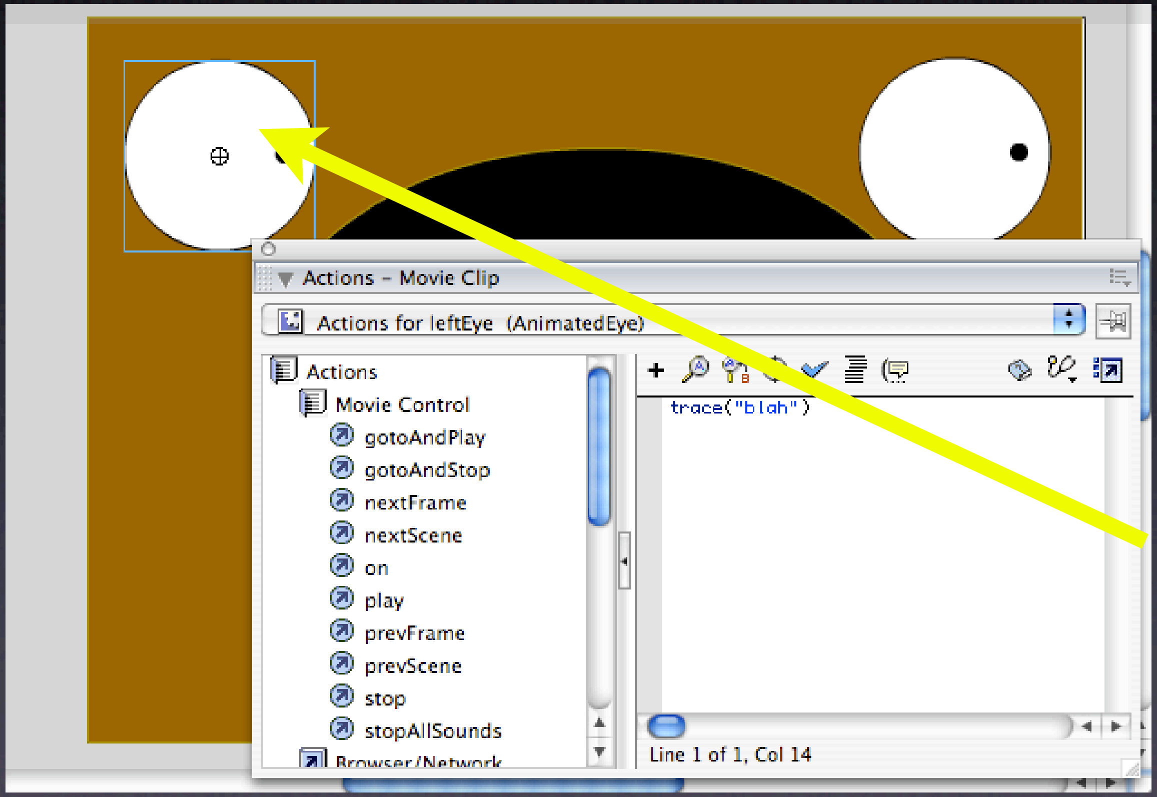
Individual frames can have ActionScript. This is represented by the ‘a’ in the frame.

All frames that follow a keyframe share the same ActionScript code.

To help you find your code, make a layer in the timeline that is reserved for *code only*. Then you only have to search in that one layer.

The Action Window

The code shown in the Actions window depends on the current selection in the Flash environment.



```
trace("blah")
```

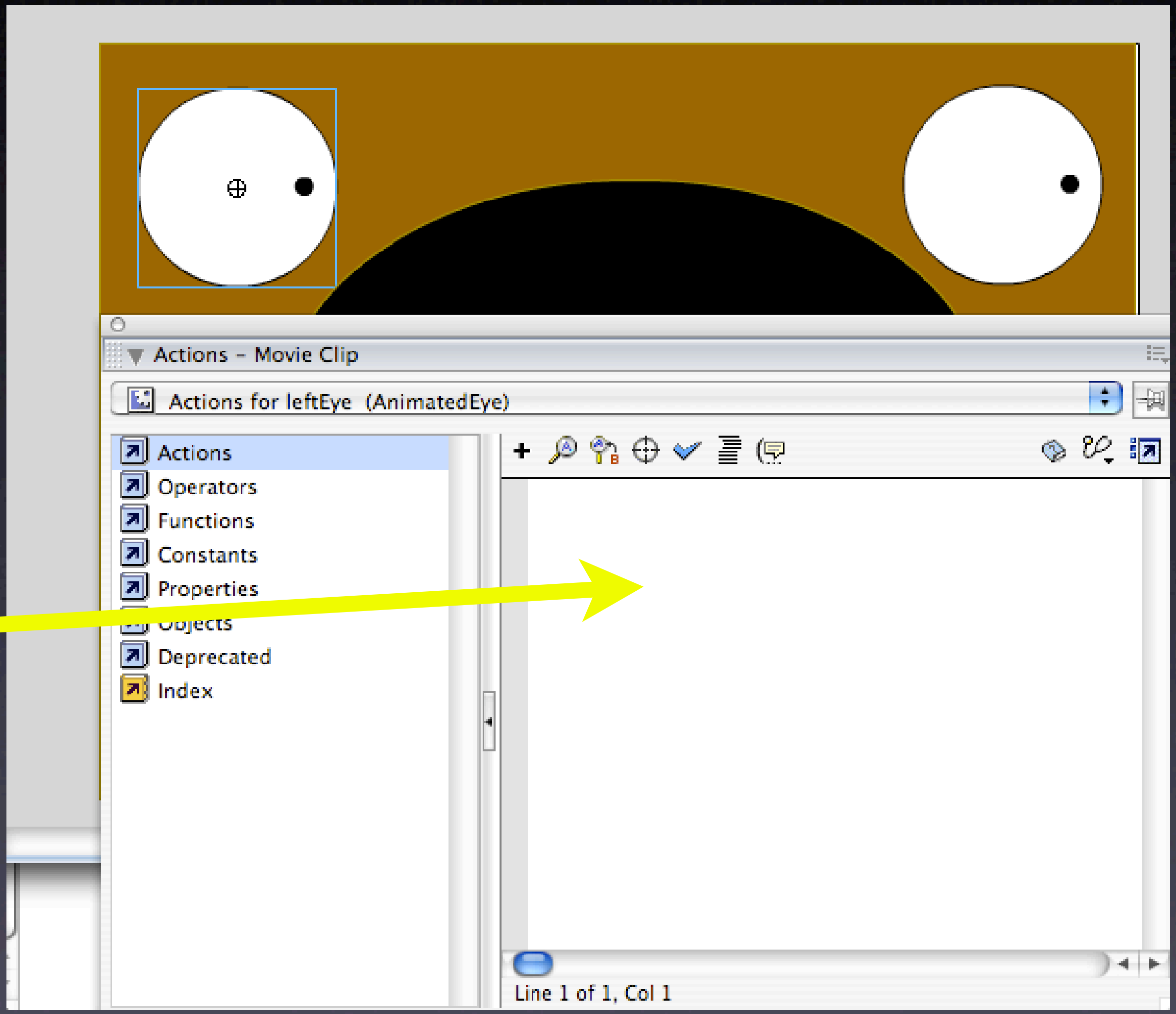
Movie clips can also have code, but it can only be movie clip event handlers.

Notice that the movie clip's code appears when the movie clip is selected.

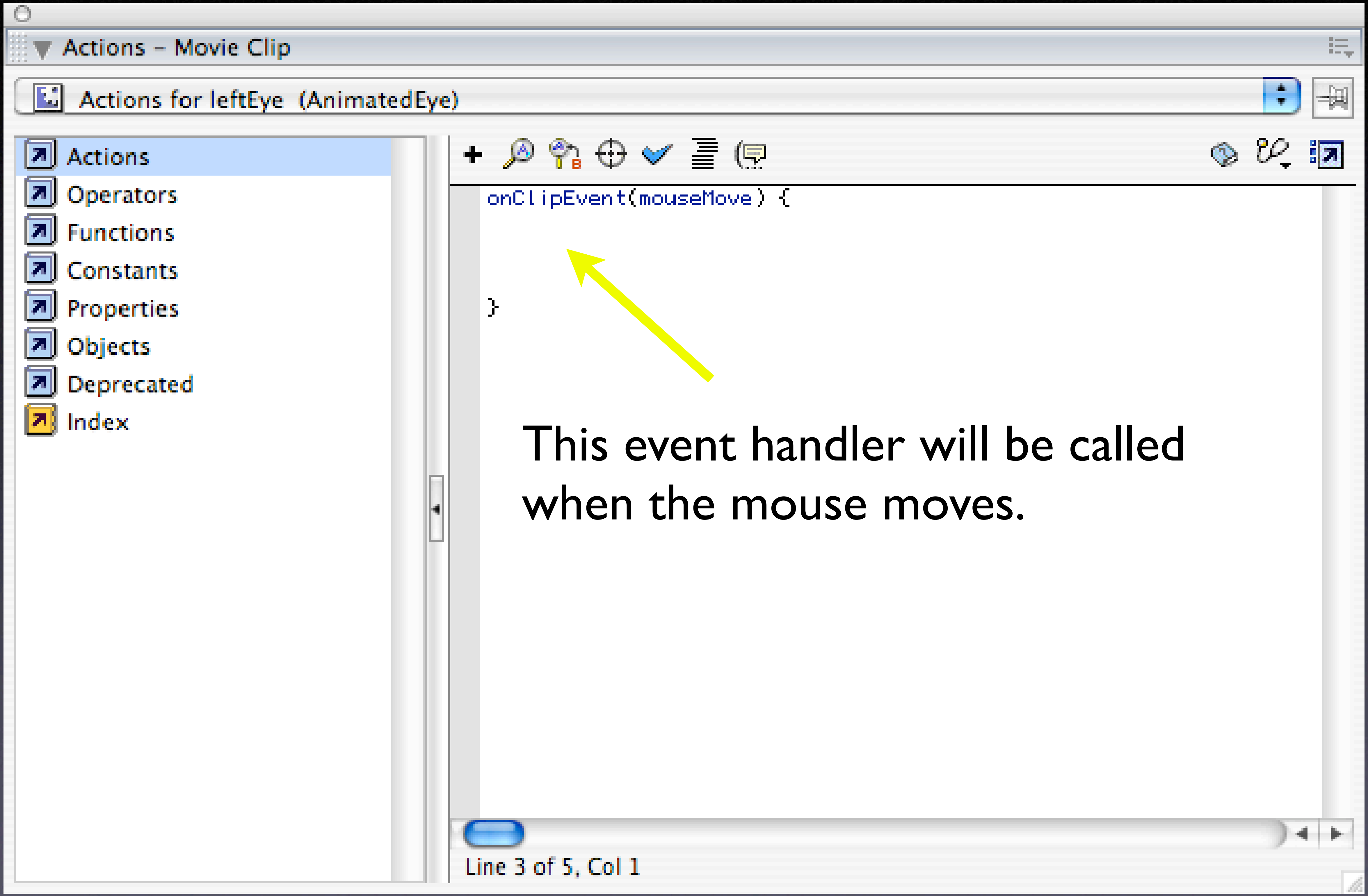
Following the Mouse

To make the eyes follow the mouse cursor, we will put event handling code "in" each eye.

The Actions window for the left eye instance doesn't have any code yet.



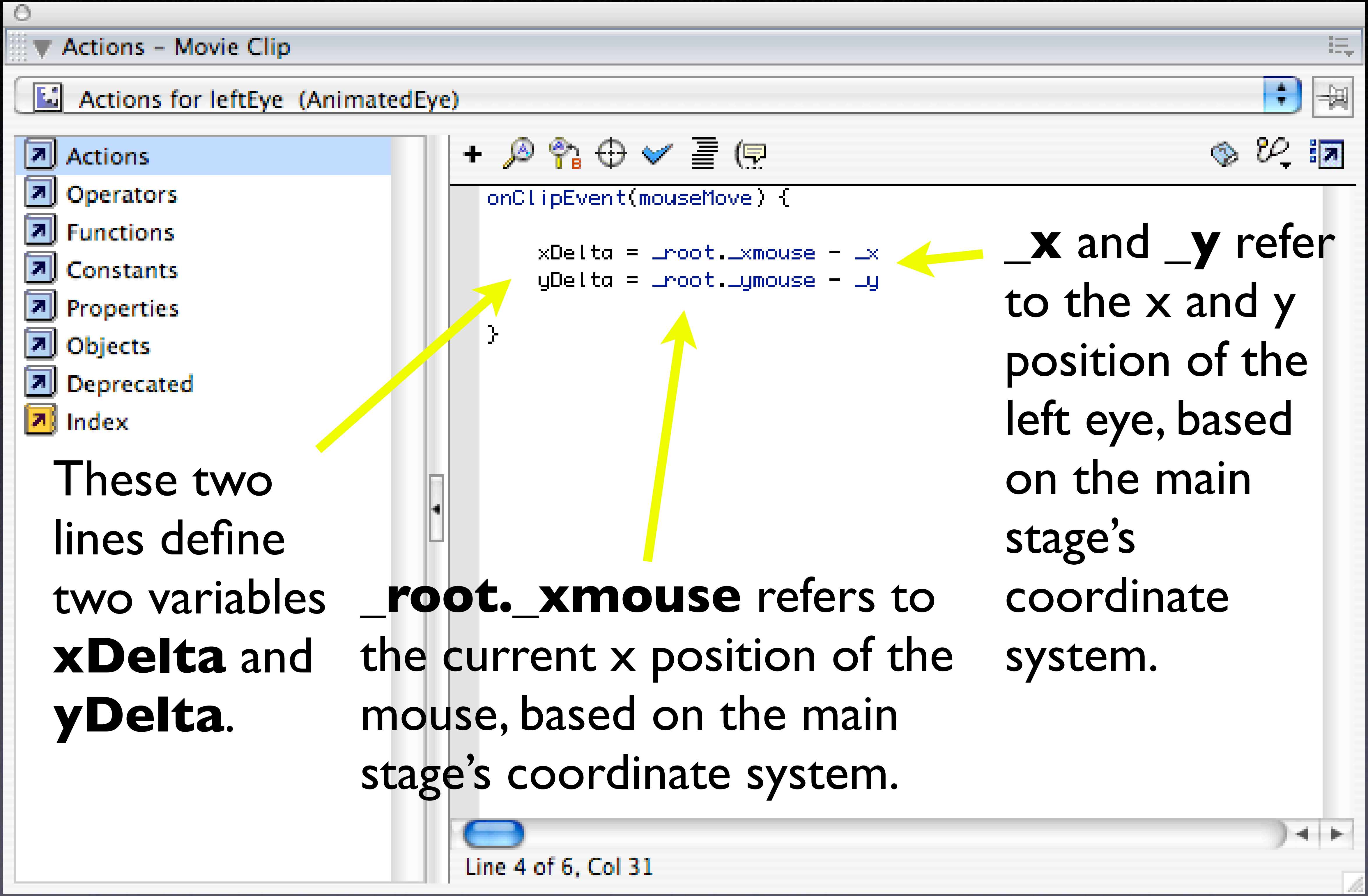
Following the Mouse



```
onClipEvent(mouseMove) {


}
```

This event handler will be called when the mouse moves.

Following the Mouse



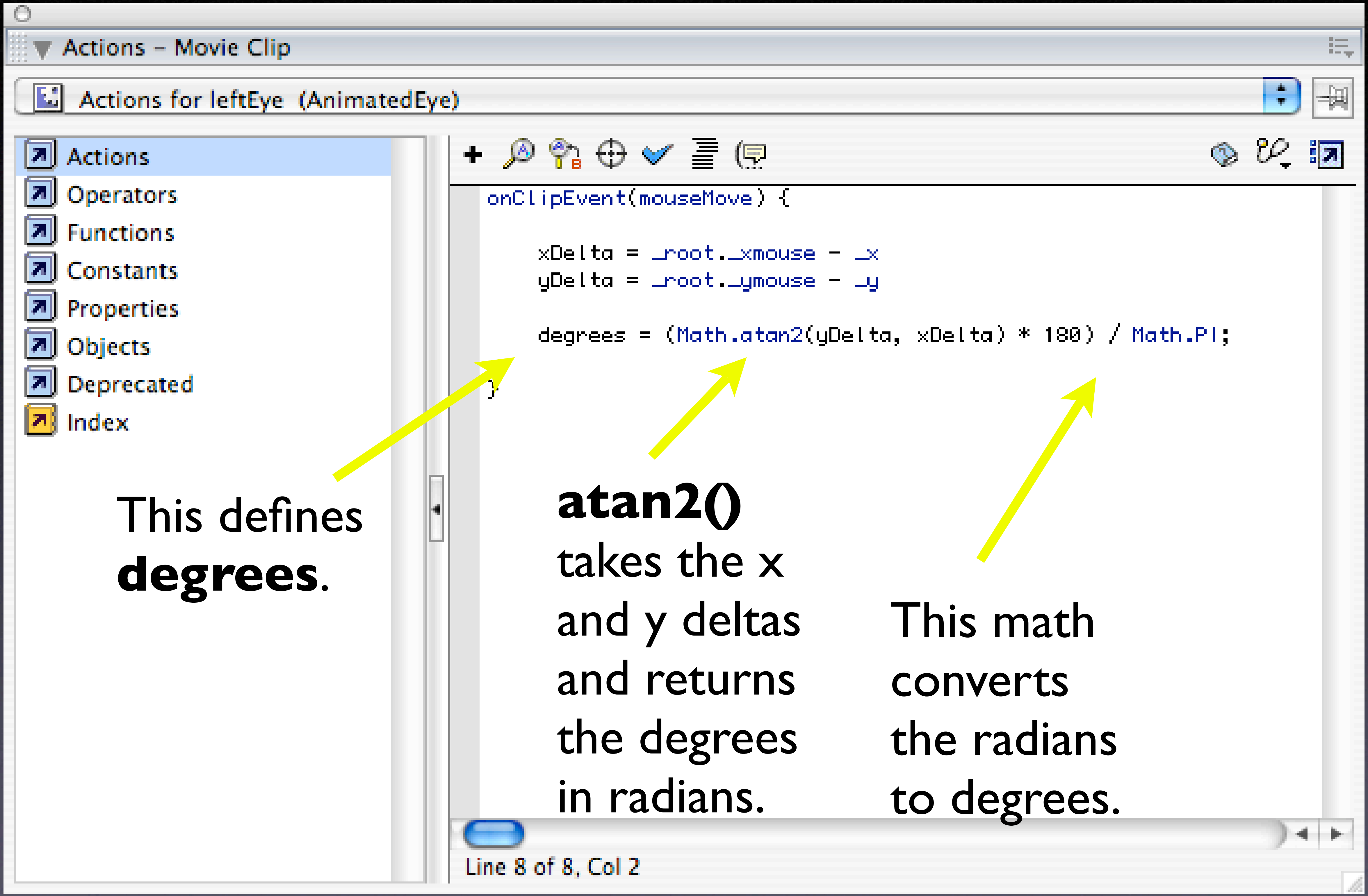
```
onClipEvent(mouseMove) {

    xDelta = _root._xmouse - _x
    yDelta = _root._ymouse - _y

}
```

These two lines define two variables **xDelta** and **yDelta**.

_root._xmouse refers to the current x position of the mouse, based on the main stage's coordinate system.

_x and **_y** refer to the x and y position of the left eye, based on the main stage's coordinate system.

Following the Mouse



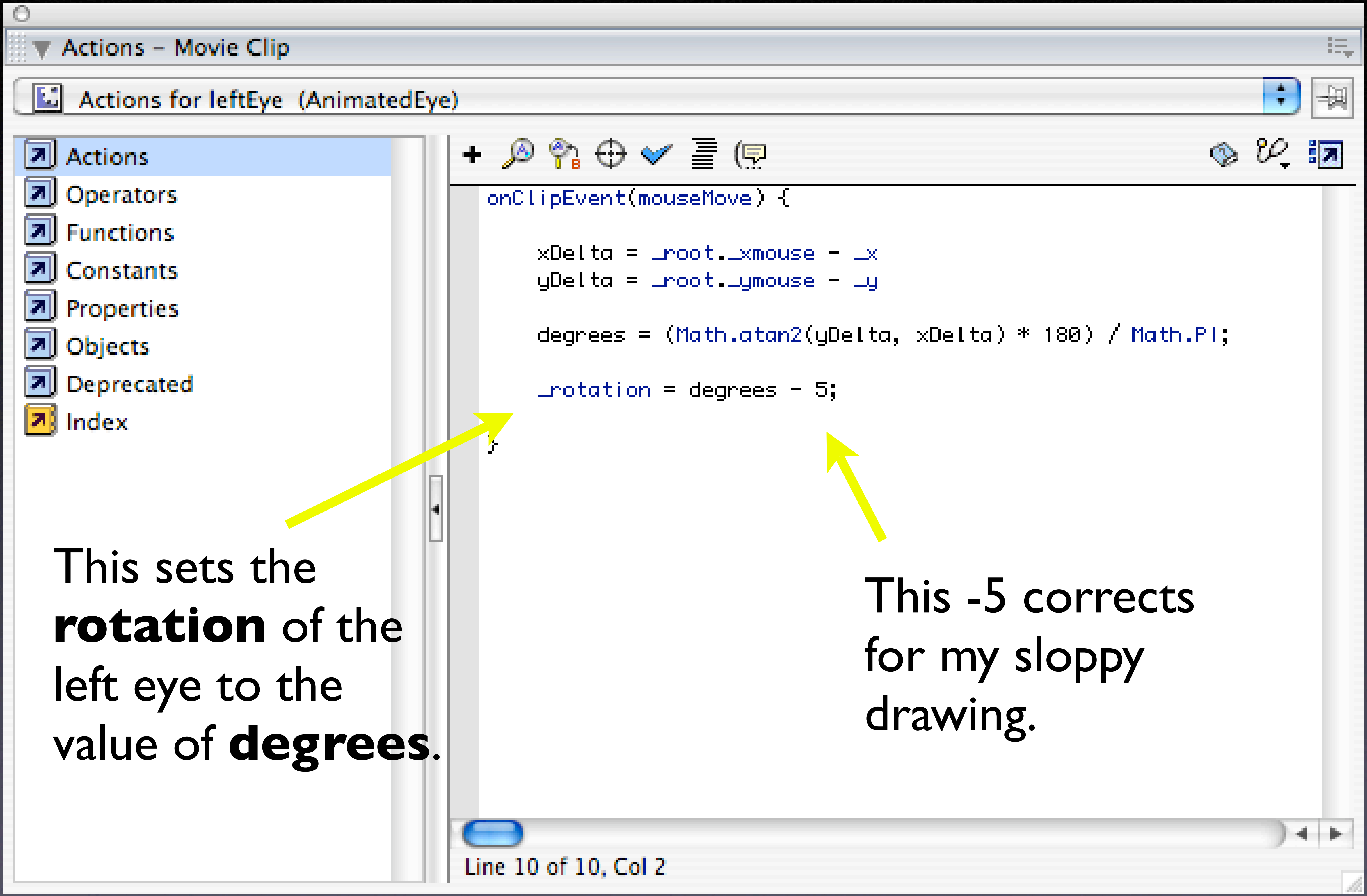
```
onClipEvent(mouseMove) {

    xDelta = _root._xmouse - _x
    yDelta = _root._ymouse - _y

    degrees = (Math.atan2(yDelta, xDelta) * 180) / Math.PI;

}
```

This defines **degrees**.

atan2() takes the x and y deltas and returns the degrees in radians.

This math converts the radians to degrees.

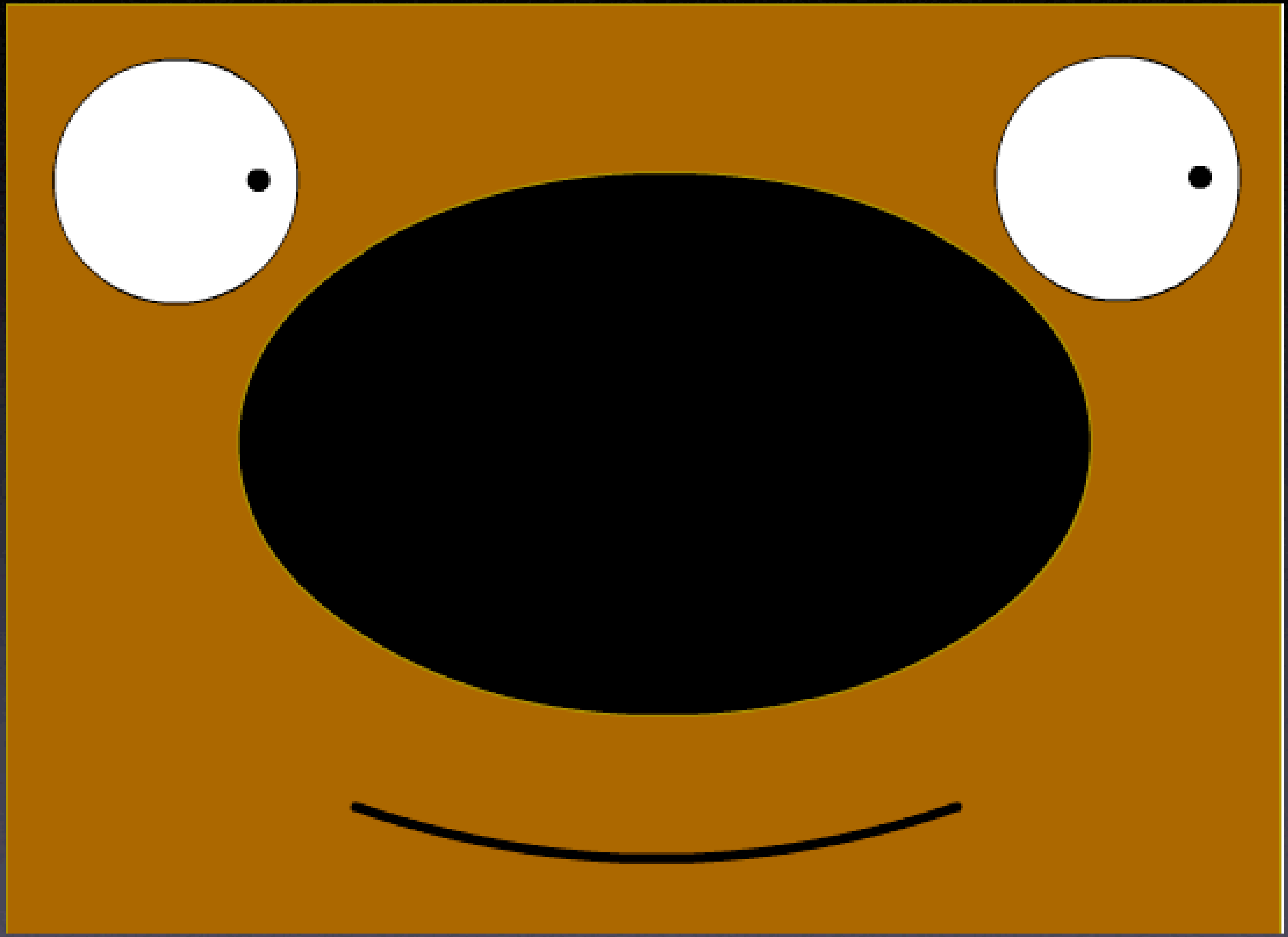
Following the Mouse



```
onClipEvent(mouseMove) {

    xDelta = _root._xmouse - _x
    yDelta = _root._ymouse - _y

    degrees = (Math.atan2(yDelta, xDelta) * 180) / Math.PI;

    _rotation = degrees - 5;

}
```

This sets the **rotation** of the left eye to the value of **degrees**.

This -5 corrects for my sloppy drawing.

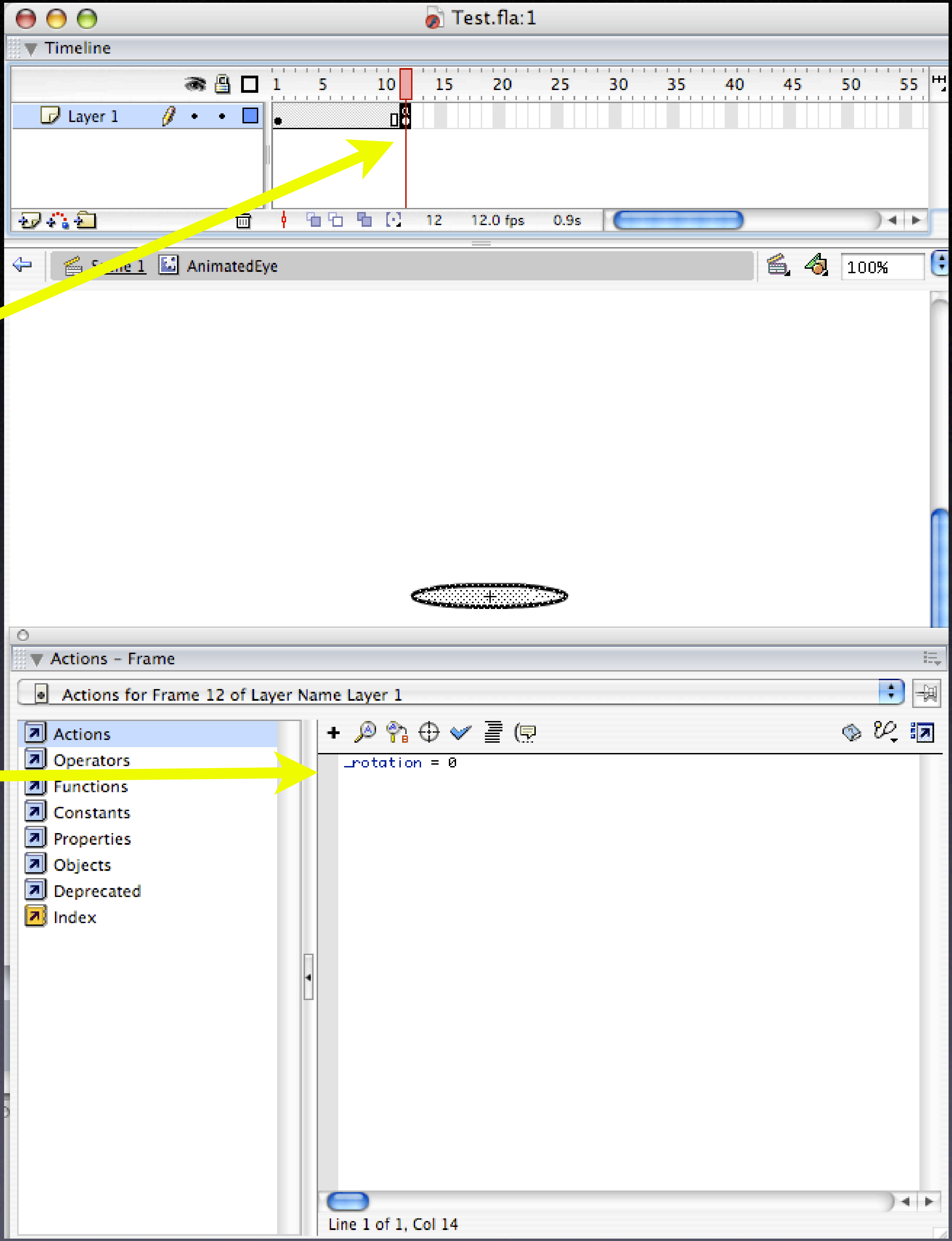


We'll edit the symbol by double-clicking on it in the library...

Go to the blink frame of the eye animation...

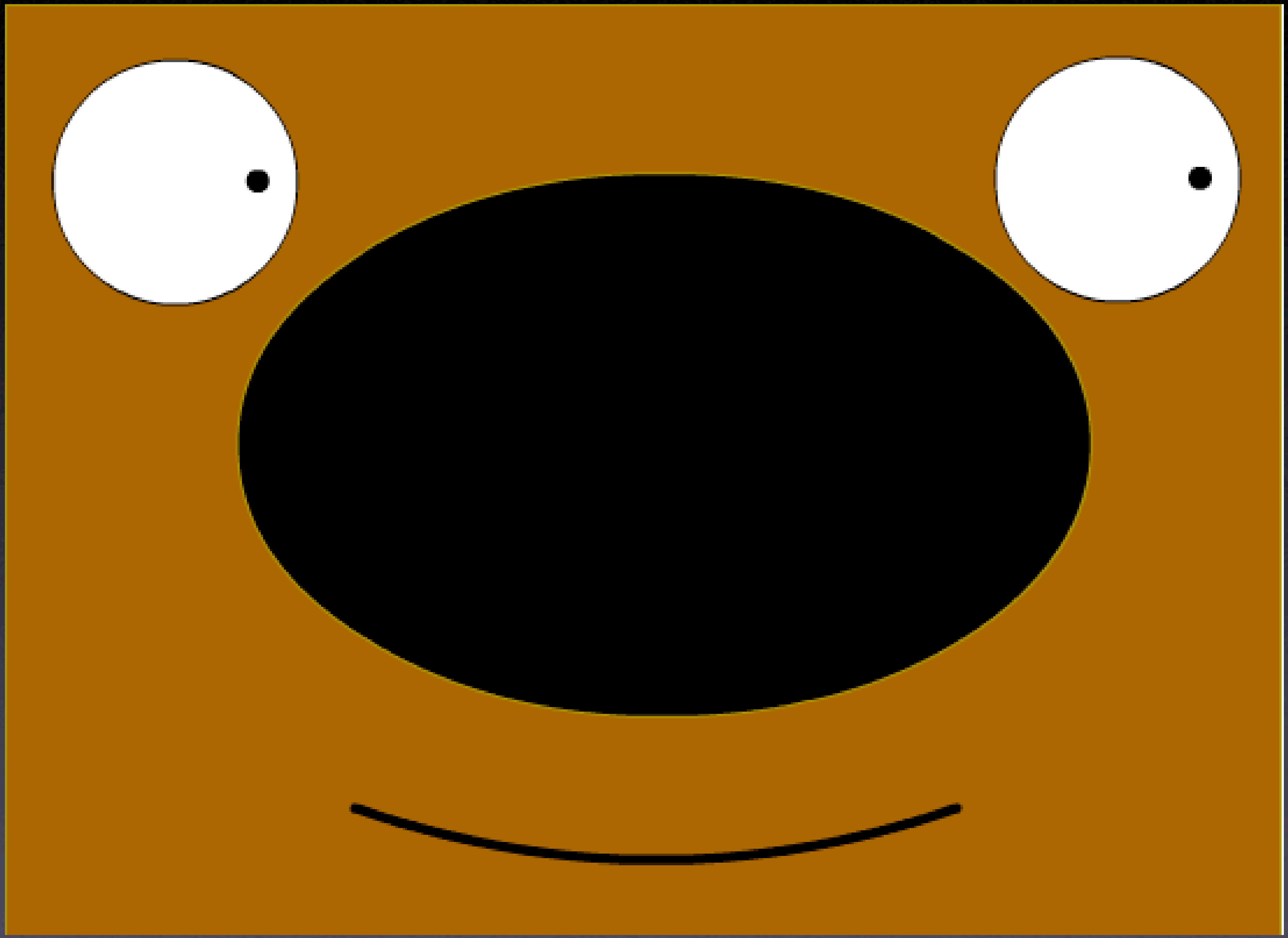
Open the Action window for the frame...

...and set the rotation of the eye to 0 for that frame.



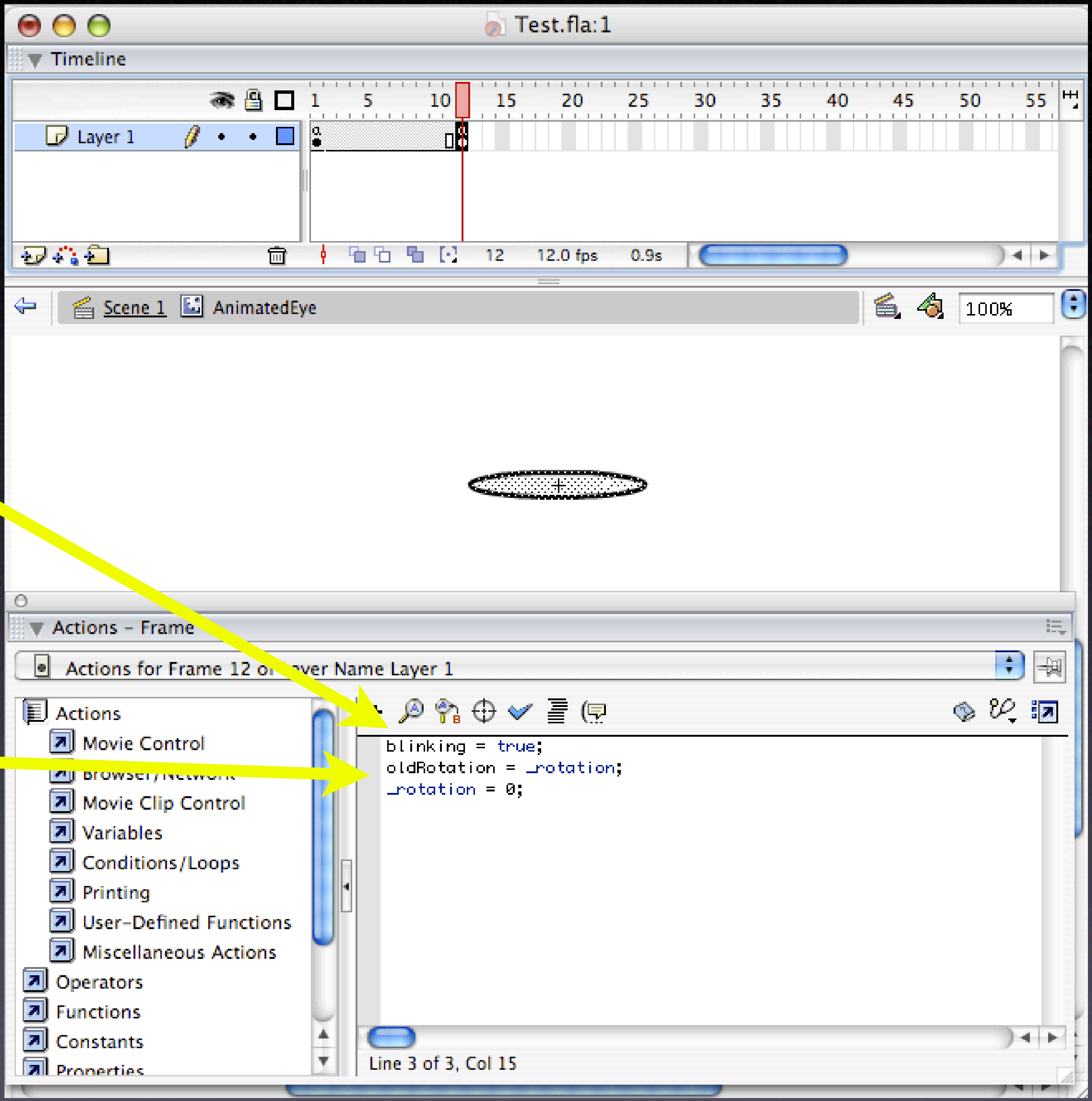
```
_rotation = 0
```

Line 1 of 1, Col 14

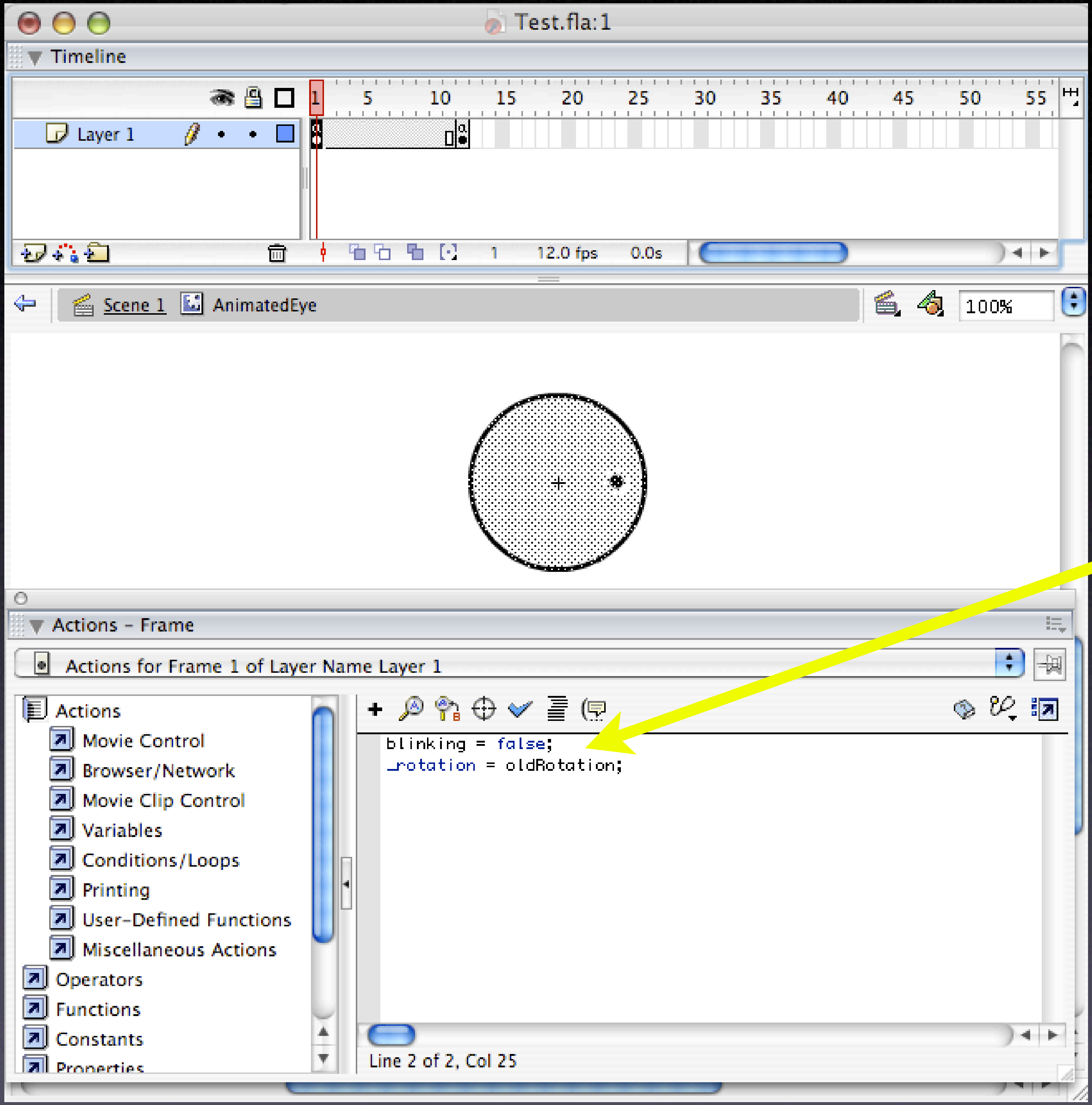


Create a “blinking” variable that’s **true** when Rudolph is blinking....

Then remember the old rotation so we can restore it after blinking.



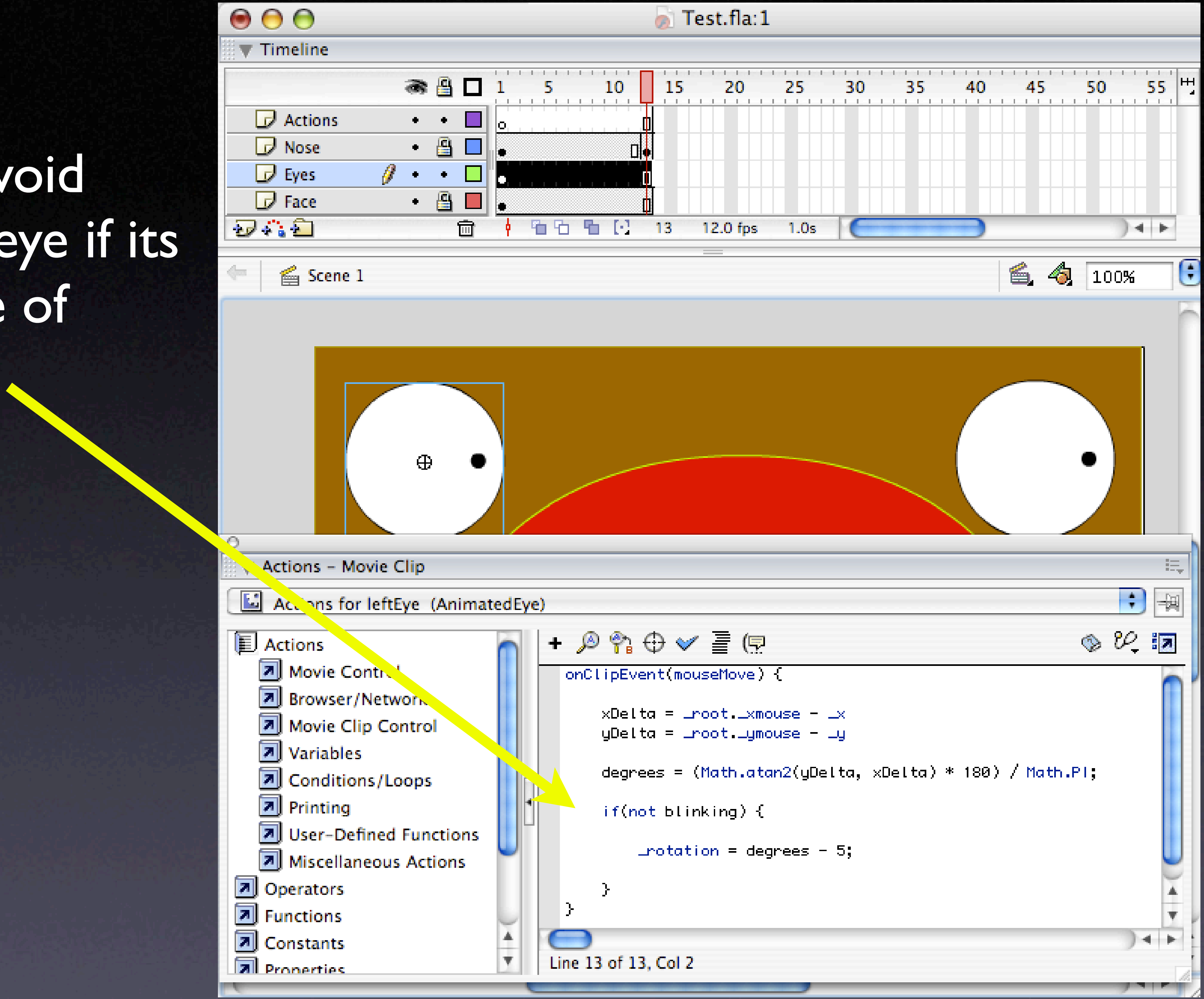
```
blinking = true;
oldRotation = _rotation;
_rotation = 0;
```



```
blinking = false;
_rotation = oldRotation;
```

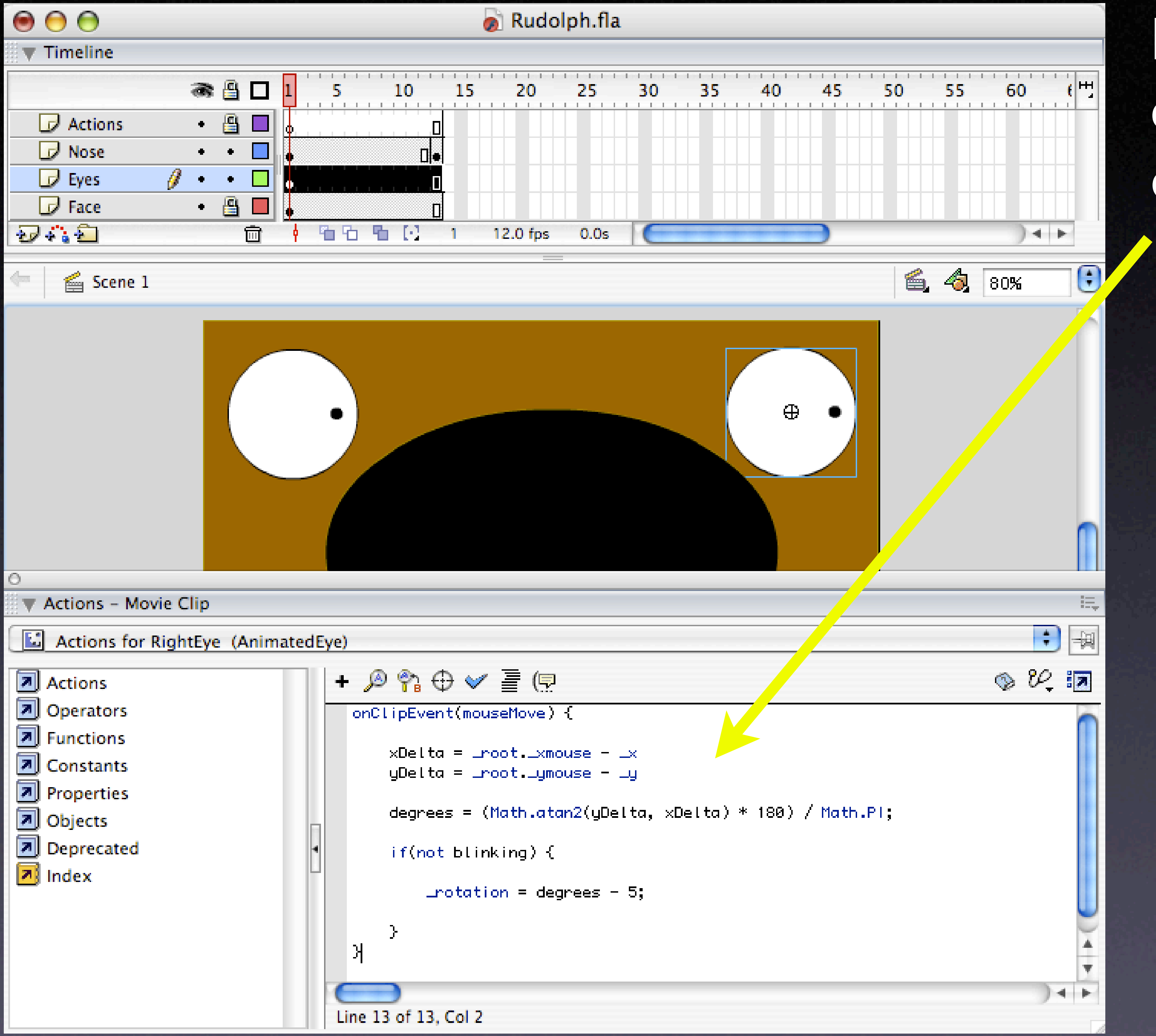
In the first frame, we'll restore the old rotation value.

Then, we'll avoid rotating the eye if its in the middle of blinking.



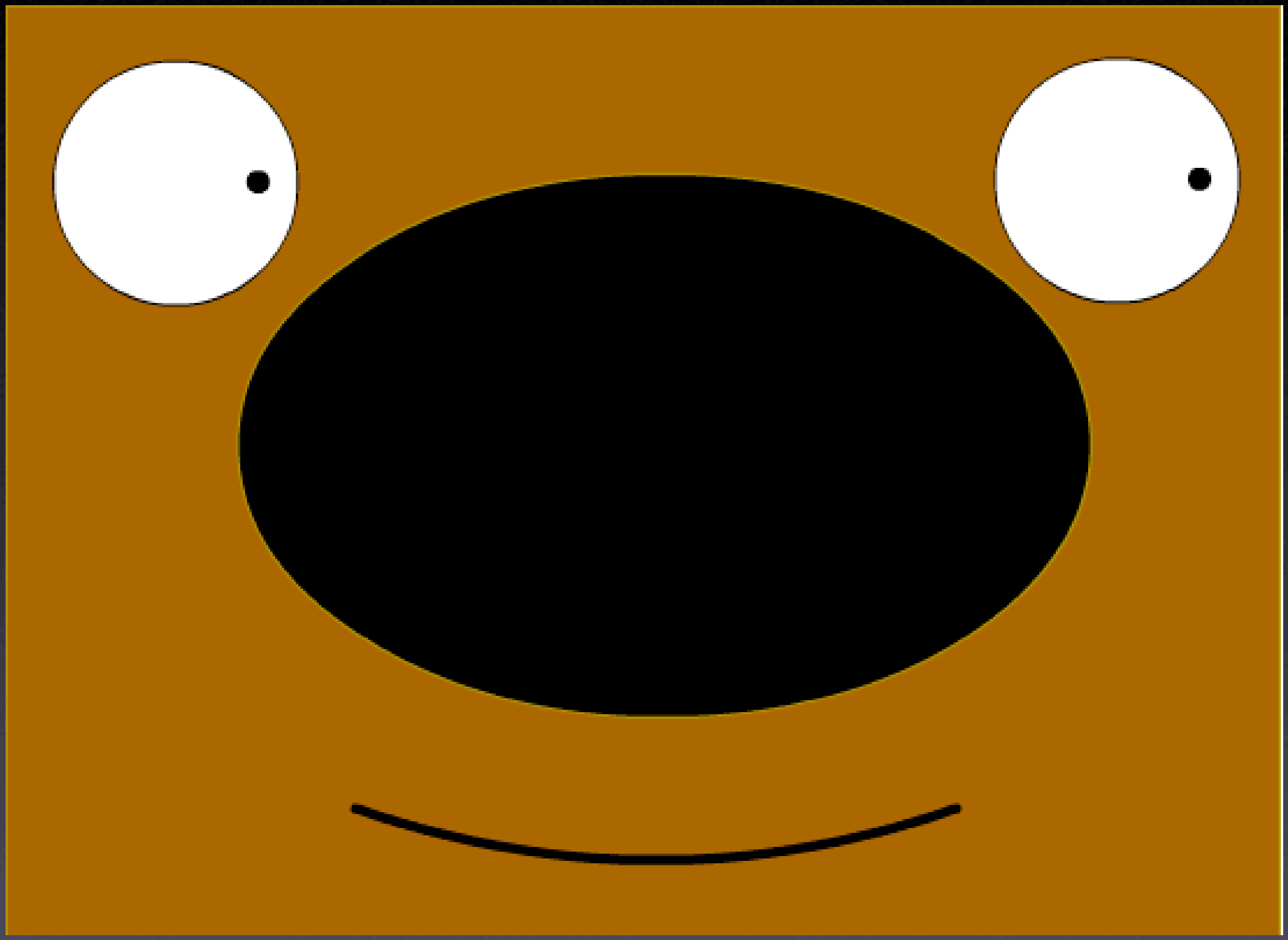
```
onClipEvent(mouseMove) {

    xDelta = _root._xmouse - _x
    yDelta = _root._ymouse - _y

    degrees = (Math.atan2(yDelta, xDelta) * 180) / Math.PI;

    if(not blinking) {

        _rotation = degrees - 5;

    }
}
```

Line 13 of 13, Col 2



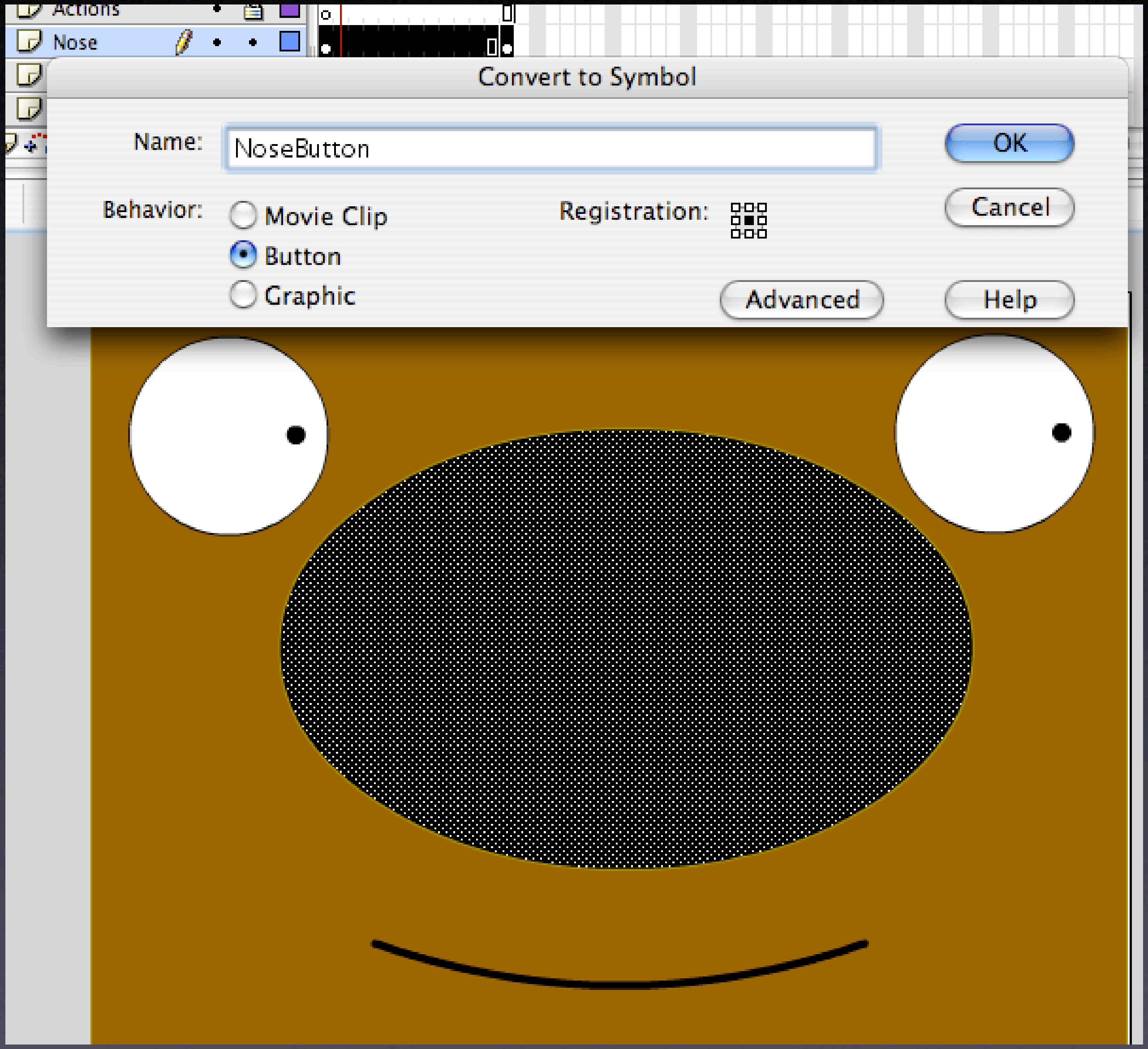
```
onClipEvent(mouseMove) {

    xDelta = _root._xmouse - _x
    yDelta = _root._ymouse - _y

    degrees = (Math.atan2(yDelta, xDelta) * 180) / Math.PI;

    if(not blinking) {

        _rotation = degrees - 5;

    }
}
```

Finally, we'll copy the code from the left eye to the right eye.



Buttons

- Buttons are a special type of Symbol, which have frames for each of their states.
- Let's make Rudolph's nose a button by converting it to a symbol.



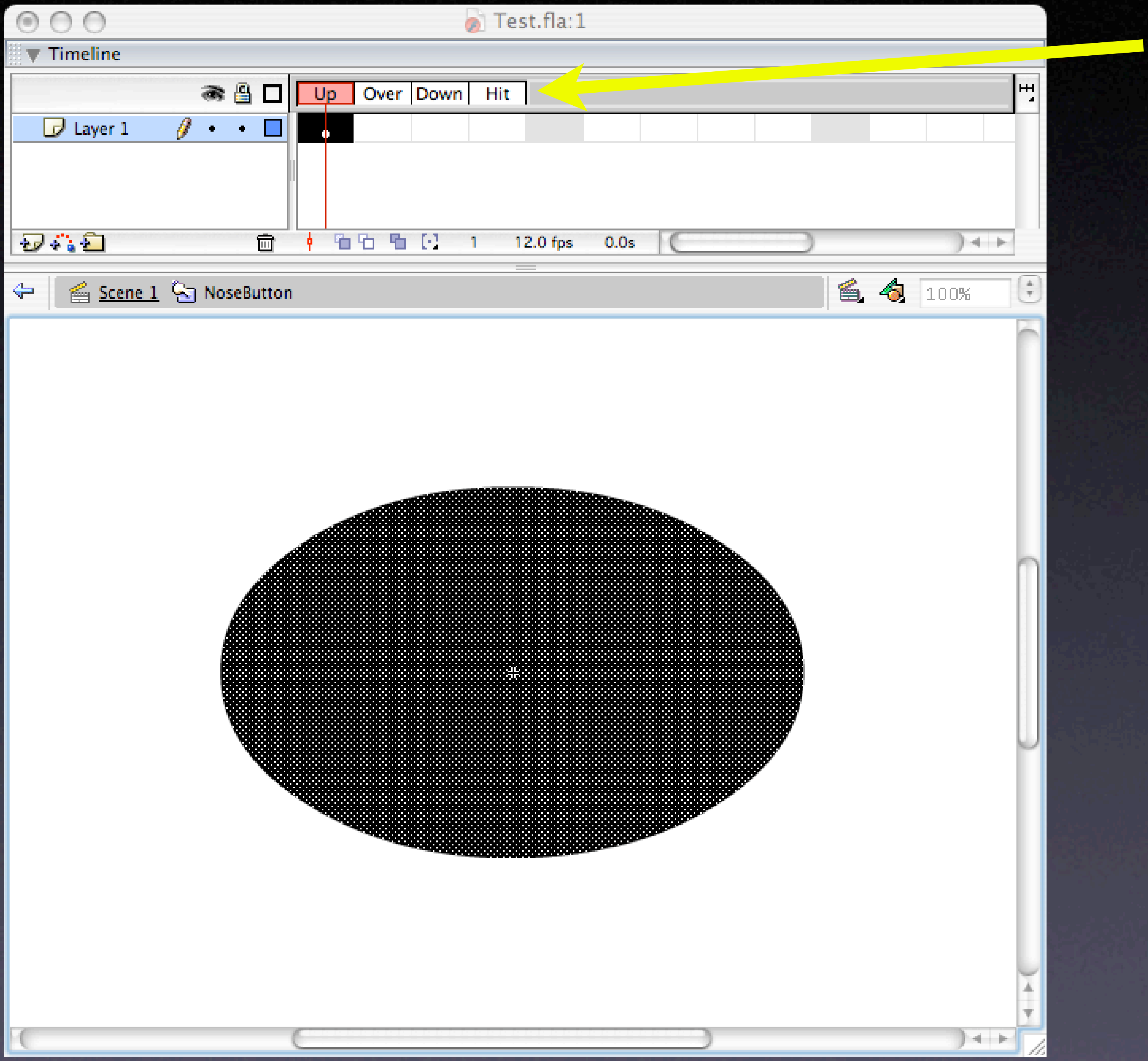
Convert to Symbol

Name: NoseButton

Behavior: Movie Clip [✓ Button] Graphic

Registration:

Buttons



A Button has four frames, each defining its appearance and behavior in different states.

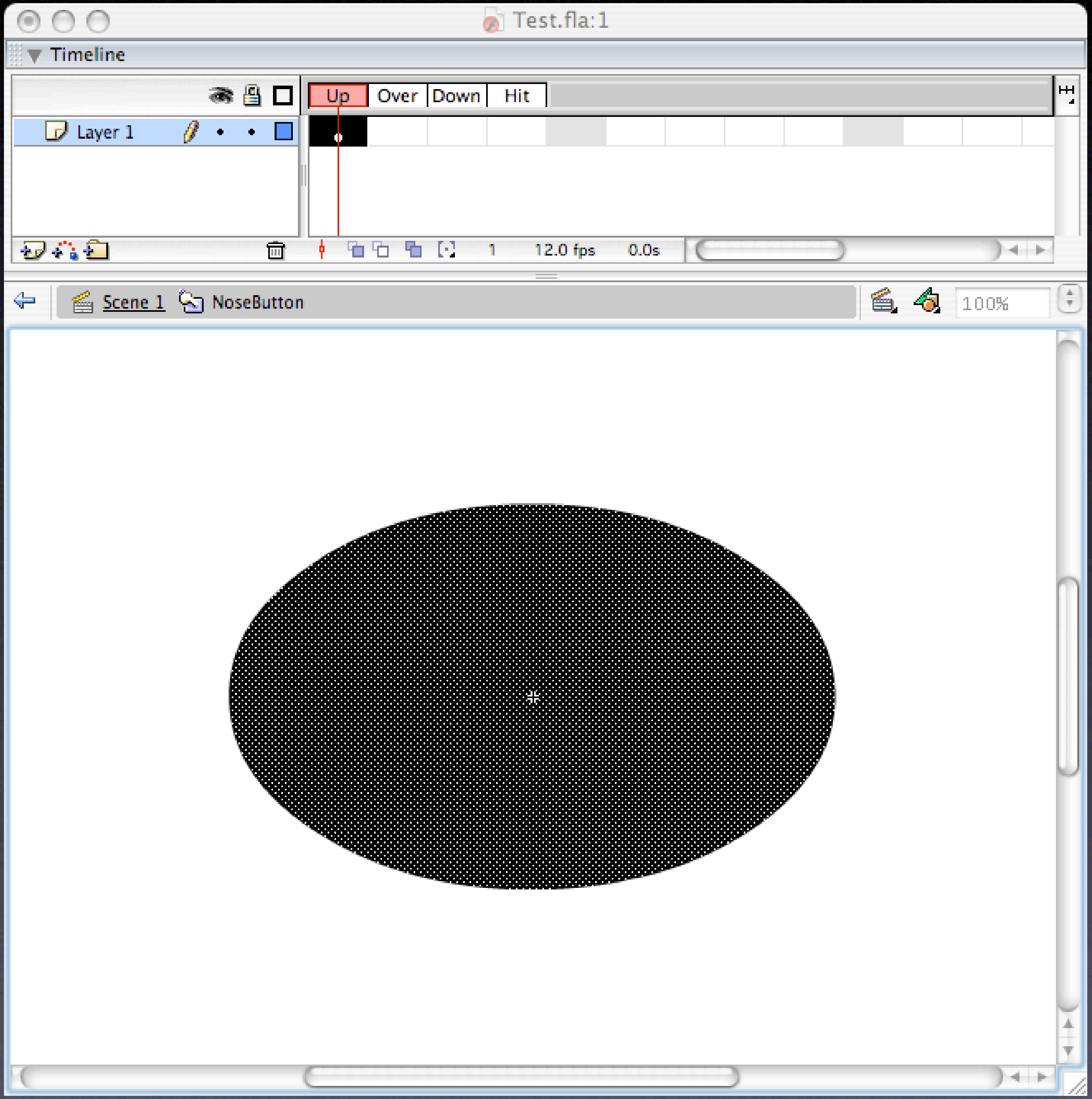
Up is when the button is not pressed, or released.

Over is when the button is hovered over.

Down is when the button is pressed.

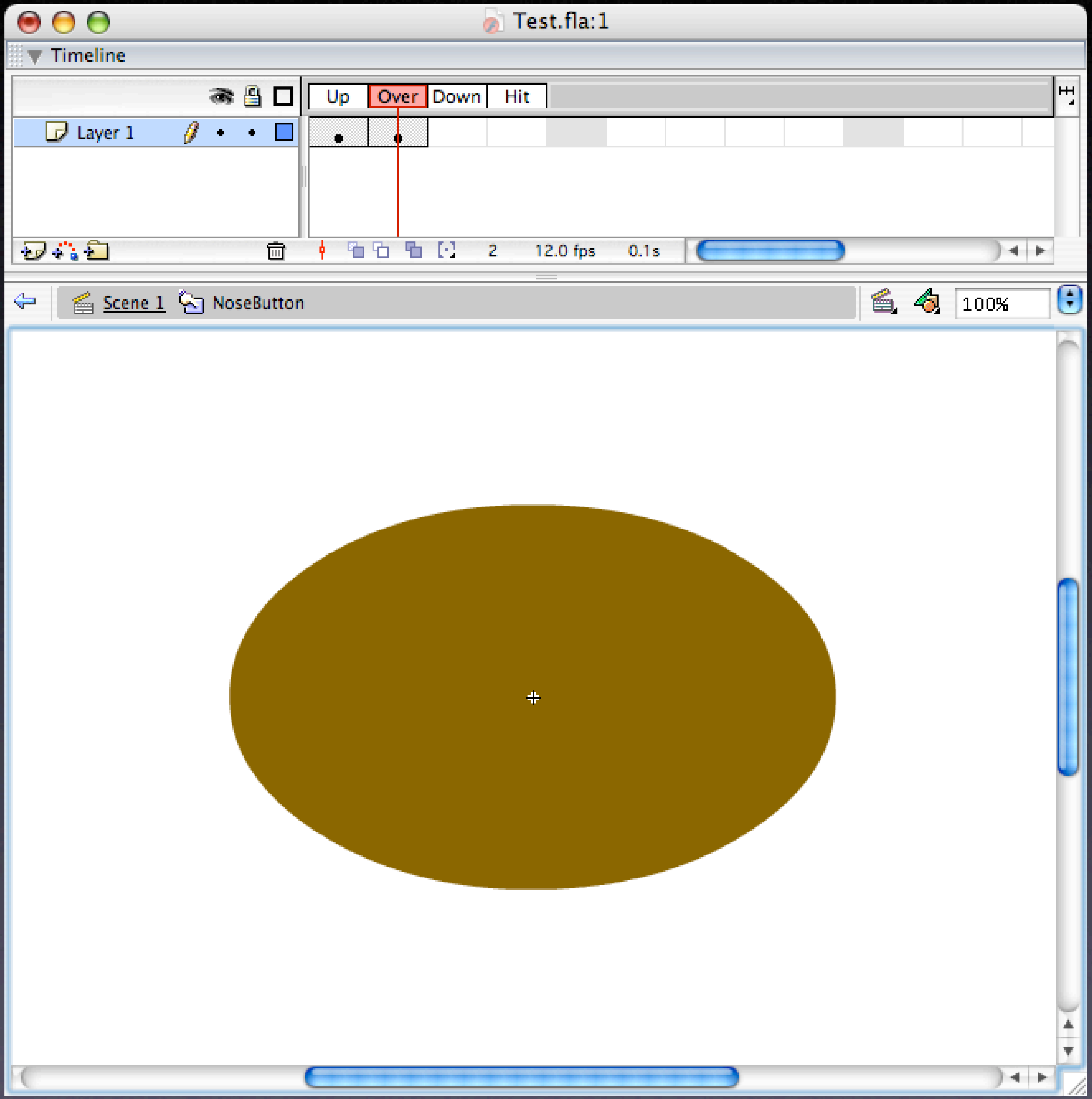
Hit defines the clickable area of the button.

Up



The nose's **up** frame will be just as it is.

Over

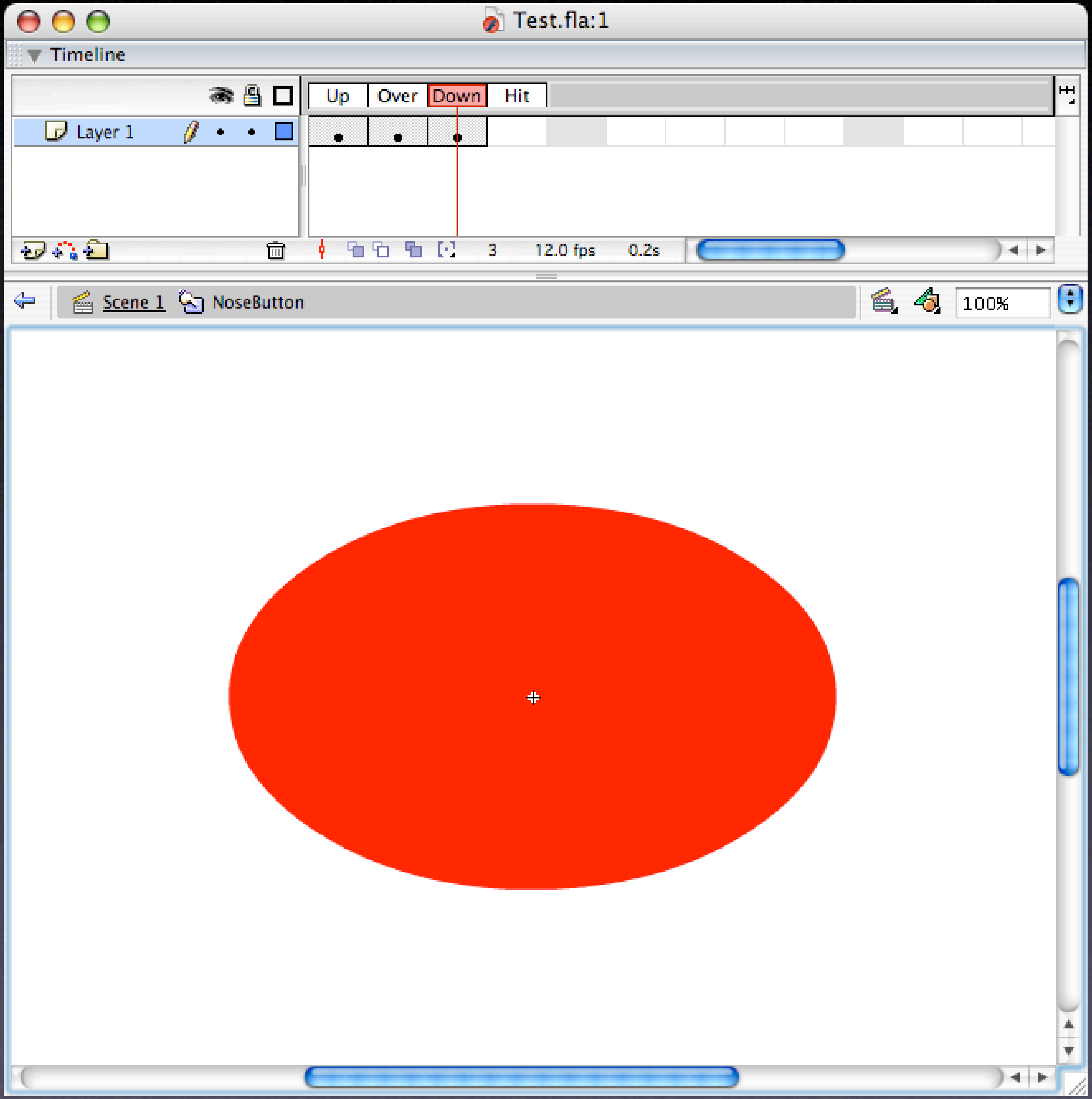


To make the nose's **over** frame, insert a keyframe.

I've filled the nose with brown.

If we don't make a keyframe, ***this changes the up frame to brown as well.***

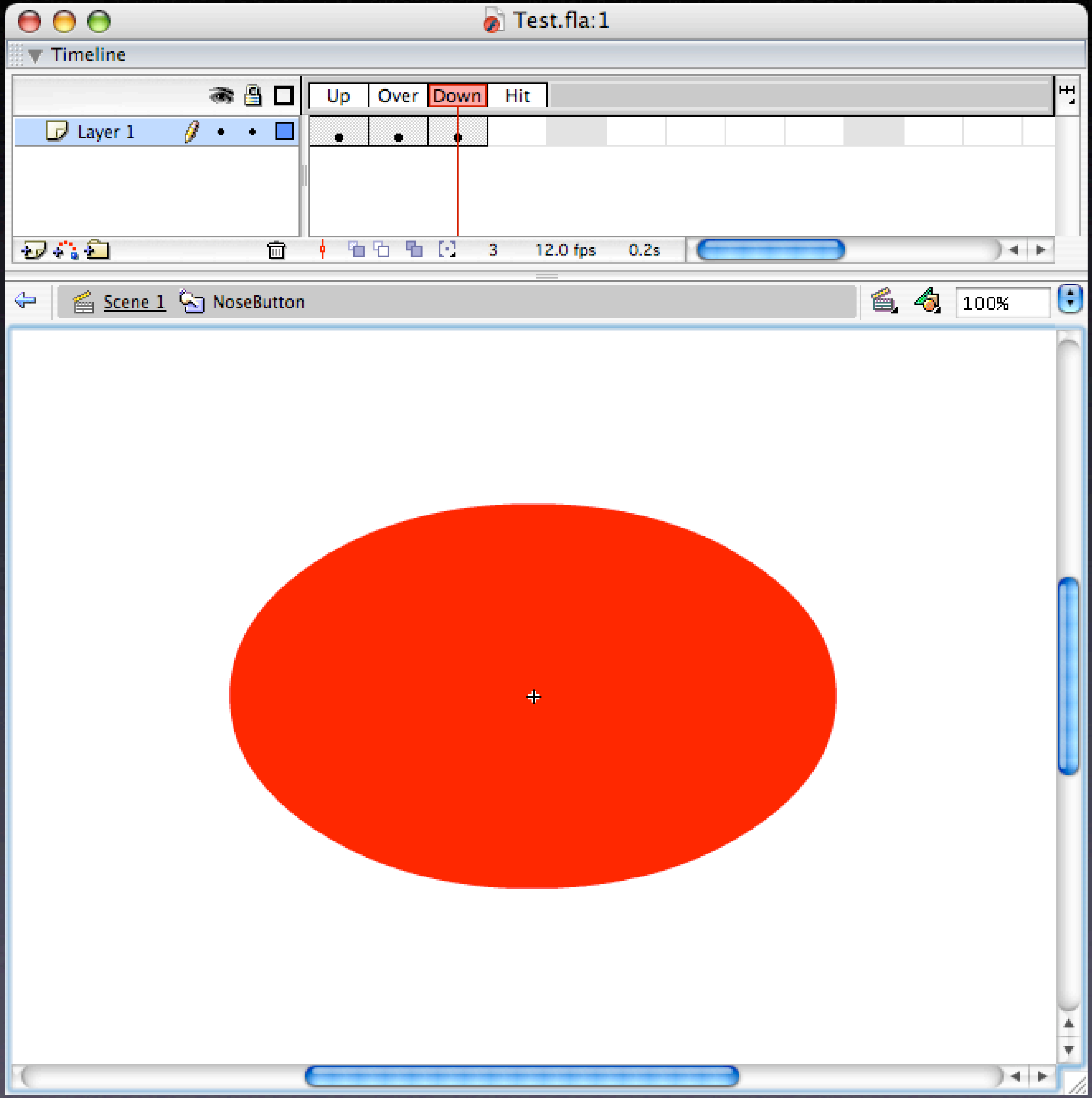
Down



To make the nose's **down** frame, insert a keyframe.

I've filled the nose with red.

Hit

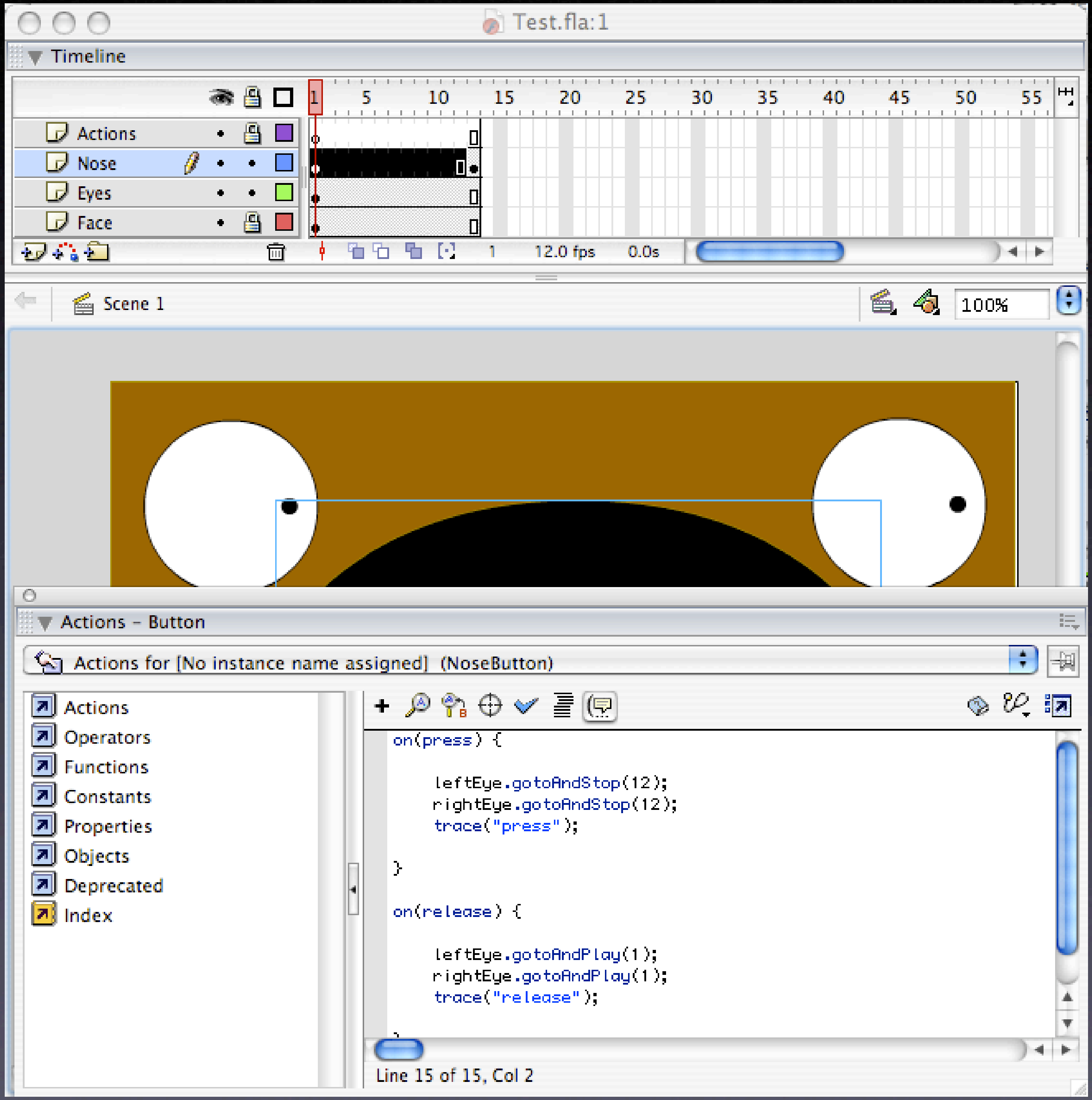


By default, the clickable area is defined by the oval on the screen.

Button Events

To make an event for the button, select the NoseButton instance on the stage, and open the Actions window.

Use on(*event*) to respond to press, release, rollOver, etc.

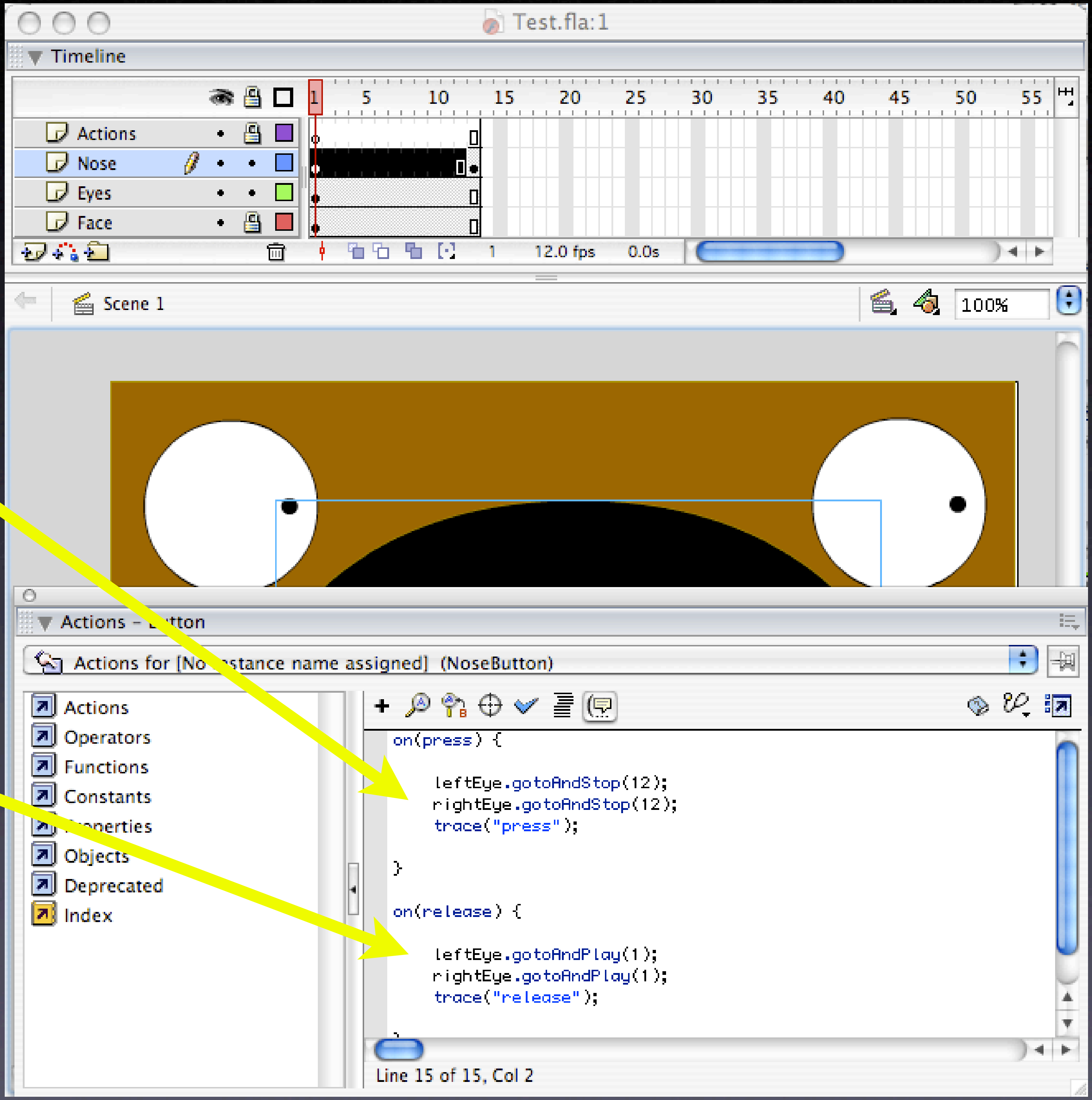


```
on(press) {

    leftEye.gotoAndStop(12);
    rightEye.gotoAndStop(12);
    trace("press");

}

on(release) {

    leftEye.gotoAndPlay(1);
    rightEye.gotoAndPlay(1);
    trace("release");
```

Button Events

When pressed, the eyes will goto frame 12 (the blinking frame) and stop playing.

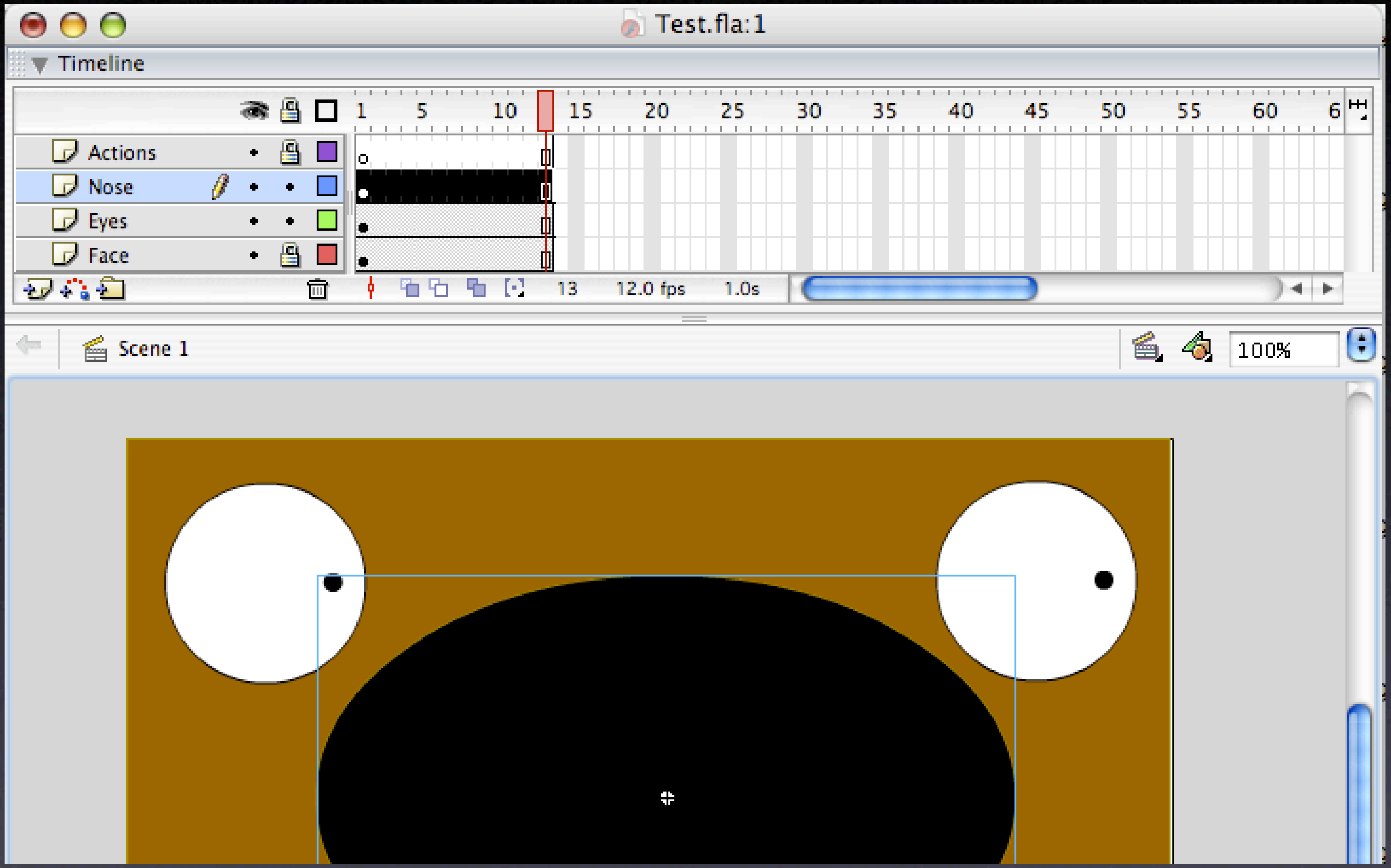
When the nose button is released, the eyes will go to frame 1 and start playing.



```
on(press) {

    leftEye.gotoAndStop(12);
    rightEye.gotoAndStop(12);
    trace("press");

}

on(release) {

    leftEye.gotoAndPlay(1);
    rightEye.gotoAndPlay(1);
    trace("release");
```

Button Events

Button Events



We'll remove the keyframe with the red nose, so the nose button is clickable for the whole movie.

Button Events