Quick Exercise

What does this code do?
What Went Wrong?

We changed every pixel to grayscale whenever one pixel was light enough.
What Went Wrong?

We changed every pixel to grayscale whenever one pixel was light enough.

This gives us the wrong answer.
What Went Wrong?

We changed every pixel to grayscale whenever one pixel was light enough.

This gives us the wrong answer.

It also takes a really long time to run.
<table>
<thead>
<tr>
<th>$n$</th>
<th>$n$ squared</th>
<th>sample time</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
<td>1:40</td>
</tr>
<tr>
<td>100</td>
<td>10000</td>
<td>2:46:40</td>
</tr>
<tr>
<td>1000</td>
<td>1000000</td>
<td>277:46:40</td>
</tr>
<tr>
<td>1000000</td>
<td>10000000000000</td>
<td>long wait</td>
</tr>
</tbody>
</table>
Thinking Through the \texttt{lakeEffect}() \\

\textbf{Idea} \\

make a new image twice as tall  

copy the image into the top of the new image  

mirror top half into bottom half,  

with a “dampening”
Mirroring and Dampening

If we ignore the end pixels...

```java
public void mirrorAndDampen()
{
    int height = this.getHeight();
    int width  = this.getWidth();

    for (int y = 0; y < height/2; y++)
        for (int x = 1; x < width - 1; x++)
            mirrorAndDampenPixel( x, y );
}
```
Mirroring and Dampening a Pixel

And then...

```java
public void mirrorAndDampenPixel( x, y )
{
    Pixel pixelLeft  = this.getPixel( x-1, y );
    Pixel pixelRight = this.getPixel( x+1, y );
    int    height    = this.getHeight();

    int red   = (pixelLeft.getRed()   + pixelRight.getRed()  )/2;
    int green = (pixelLeft.getGreen() + pixelRight.getGreen() )/2;
    int blue  = (pixelLeft.getBlue()  + pixelRight.getBlue() )/2;

    Pixel p = this.getPixel( x, height-1-y );
    p.setColor( new Color(red, green, blue) );
}
```
So, How Long?

<table>
<thead>
<tr>
<th>$n$</th>
<th>$n$ squared</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
<td>&quot;1 minutes 40 seconds&quot;</td>
</tr>
<tr>
<td>100</td>
<td>10000</td>
<td>&quot;2 hours 46 minutes 40 seconds&quot;</td>
</tr>
<tr>
<td>1000</td>
<td>1000000</td>
<td>&quot;11 days 13 hours 46 minutes 40 seconds&quot;</td>
</tr>
<tr>
<td>1000000</td>
<td>10000000000000</td>
<td>NumberFormatException: For input string: &quot;10000000000000&quot;</td>
</tr>
</tbody>
</table>

"31688 years 1 months 1 days 15 hours 46 minutes 41.0 seconds"