*All images taken from* [*ImageJ*](ImageJ)

Pictures suggestions.

- Take the highest resolution picture of your specimen.
- Make sure you have something in the picture for scale. This object should have known dimensions in order to make future measurements. (If possible use a ruler)
- Try to get the object used for scale in the same plane as the specimen you want to measure.

How to set up and use ImageJ

If your computer doesn't have ImageJ; Download ImageJ from the website http://imagej.nih.gov/ij/

1. Open Image J. You should see something like this:
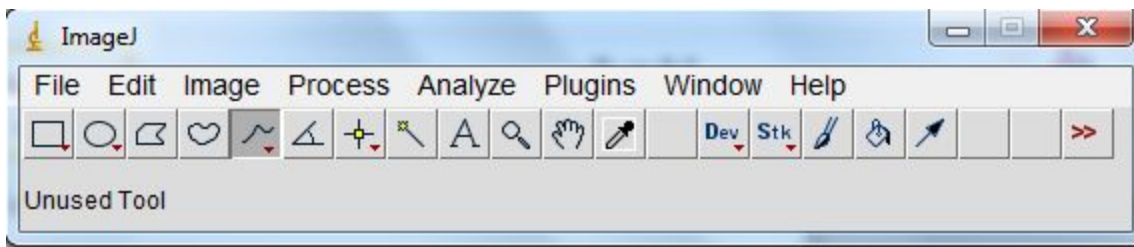
2. Now using the File option open your picture that you are going to analyze.
   a. If you open the picture first and then Image J it will not work!
3. Now you need to set the scale for all your future measurements
4. Pick the draw a "line" option on your toolbar

Resource by Jeff Grant
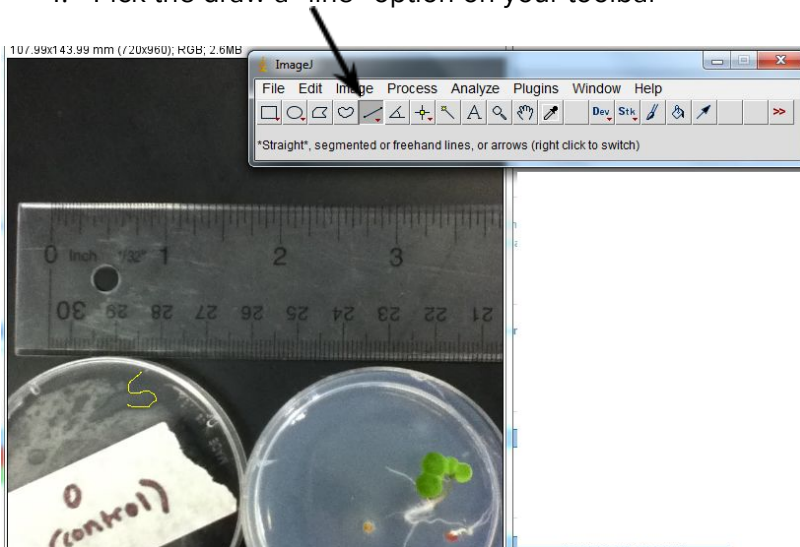
5. Zoom in on your object in your picture that you are using as a scale.
   a. To do this click the "analyze" drop down tab and hit "zoom"
   b. For this example I am going to use a ruler as an example.

6. Use the line measuring tool to measure a distance on the ruler.
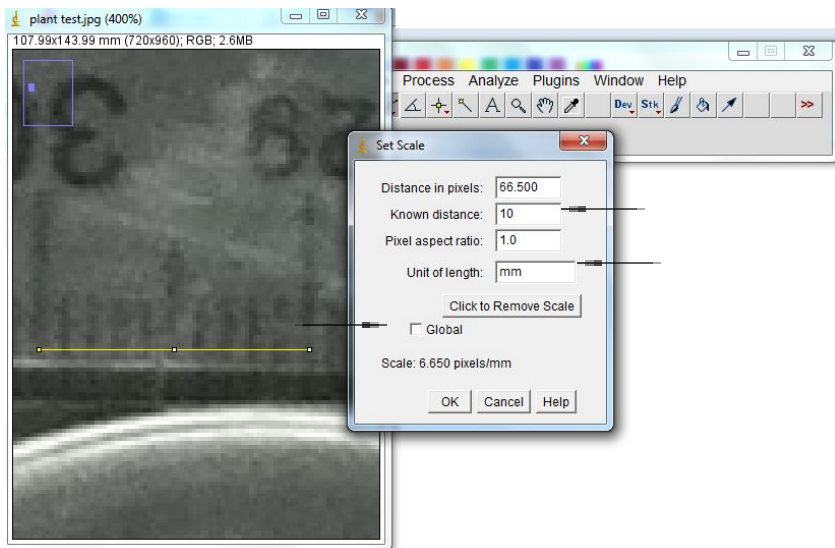
7. Click on the tab Analyze. Then the option for Set Scale.

8. Enter your known distance of that object.
   a. Type into the option "Known Distance" the actual distance of that line from the ruler.
   b. Type into the option "Unit of Length" the units your measurement is in.
   c. You can click the box "Global" if all of the other pictures you are going to load in have the same scale as this picture.

NOTE*** Every time you open ImageJ you will have to set the scale of your image. Don't EVER assume that the scale is set. If you make this mistake all of your measurements will be incredibly off. ********

Ok now you are ready to measure items in the picture.

1. Pick a way you want to measure (Square, circle, polygon, line, angle). To understand what they do see near the end of this document
2. Measure the item in the picture using the tool best suited for the job.
3. Hit the "analyze" tab and then click "Measure"
4. A window will pop up with the information about that measurement you made.

   For example it may look like this:

	Area	Mode	X	Y	Perim.	Angle	Circ.	AR	Round	Solidity	Length
1	28.424	79	93.815	91.392	29.758	0	0.403	1.515	0.660	0.671	0
2	3.889	248.465	23.759	103.008	25.712	24.167	0.074	0	0	NaN	25.712

Description of tools and what results you can obtain.

- **Line**- length of that line. Click where you want to start your line and where you want to end your line

If you right click on the line option you can also do a **segmented line** or a **free hand line**. These are incredibly useful if you are doing a slightly curved object like the root of a plant or a curved stem. (Just do a quick double click when you are done with the line to close the line segment)

- **Square**- all measurements associated with a square.
- **Polygon**- You can click your way around to make a polygon of your choice. You can get the area, perimeter, and solidity.
- **Oval**- Get the basic area and perimeter of the object you want to measure
- **Angle**- be able to measure the angle of an object in degrees
- **Paint marking tool** (looks like a paintbrush)- you can mark things that you are counting on your image so that you don't accidentally double count.
- There are other tools and capabilities but these are the basics that will allow you to generate some great quantitative data.