

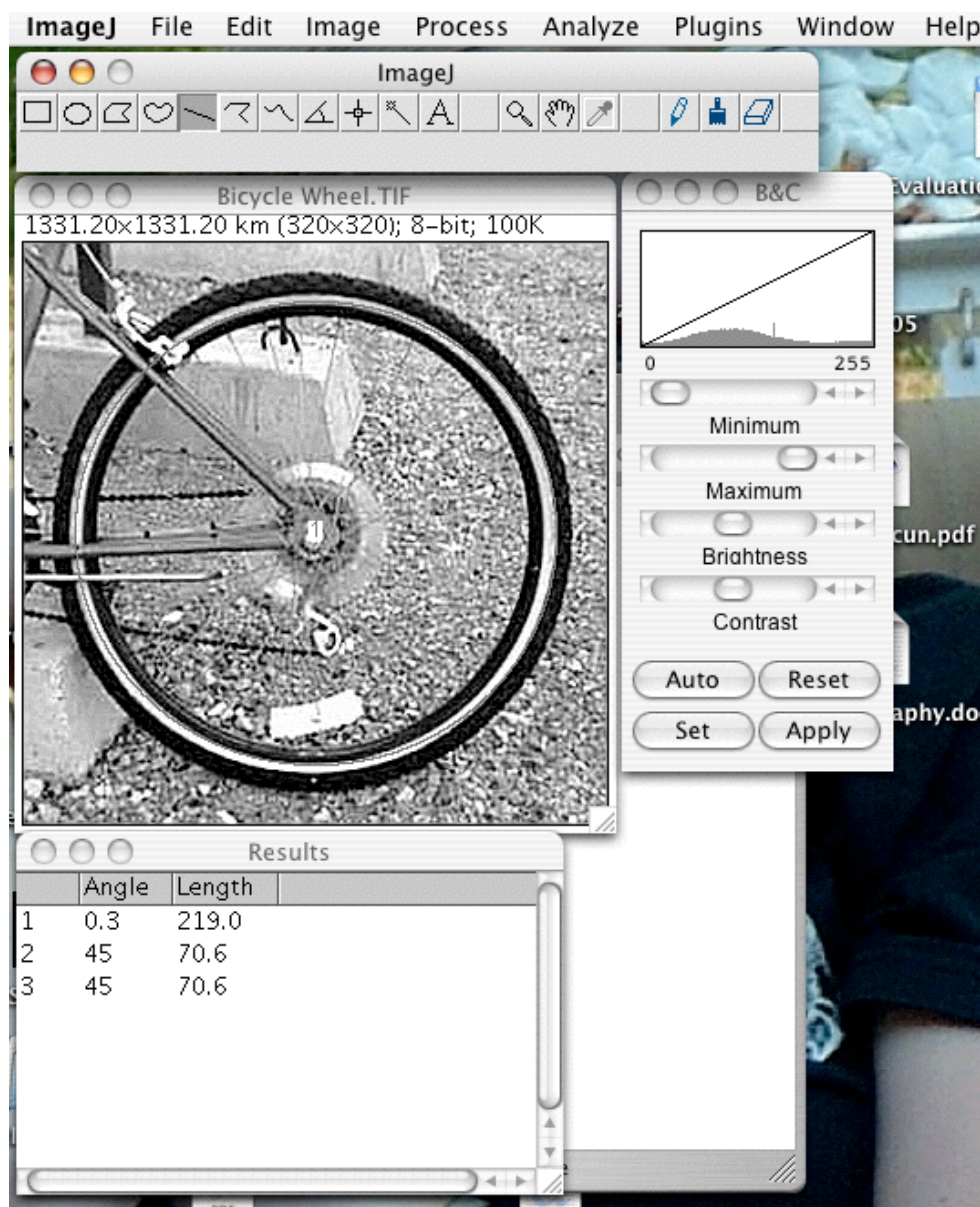
ImageJ technical tip sheet

Available at

http://fg.ed.pacificu.edu/charlesm/presentations/ip_math_sci/index.html

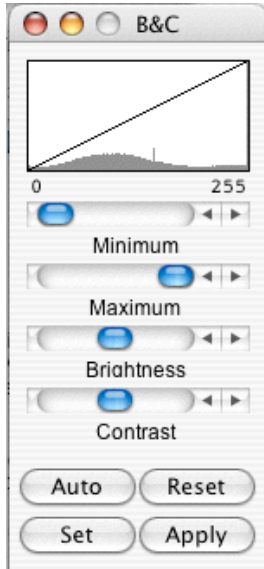
Below are some technical tips for working with *ImageJ*, a public domain image-processing program available on the web for your classroom. With just a few simple steps you can learn to process and measure digital images with your students.

Below is an image of a bicycle wheel open in *ImageJ* with the brightness and contrast and results windows also visible.



1. Adjusting the brightness and contrast of an image

Image/Adjust/Brightness\Contrast to display the brightness and contrast window (shown below)

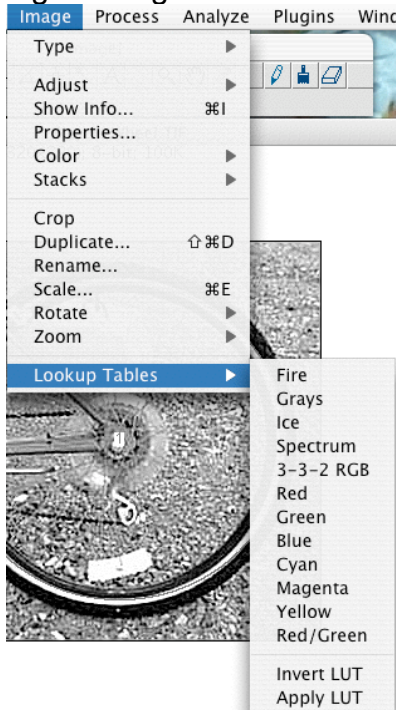


Adjust the minimum and maximum pixel values displayed and the brightness and contrast by sliding the sliders.

Reset restores the original brightness and contrast settings that the image opened with originally.

2. Changing the look up table

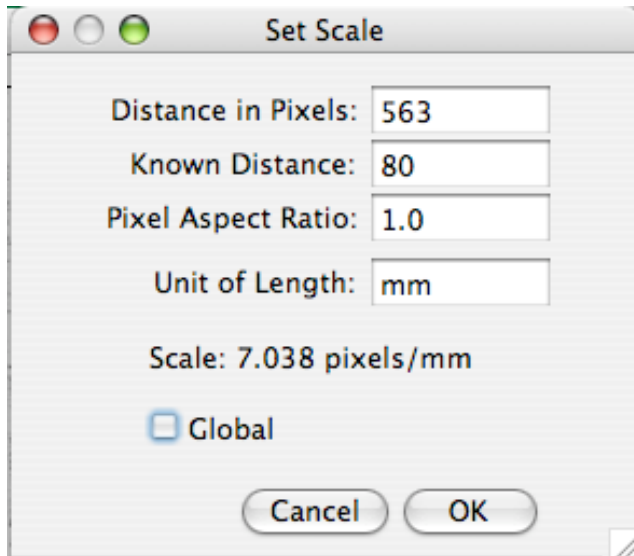
Image/Lookup Tables/*select one* to change the colors that are assigned to the digital image.



Color lookup tables often allow the human eye to see subtle differences in pixel values that would not otherwise be apparent when viewing different shades of gray. Weather maps on TV use these frequently.

3. Setting a scale

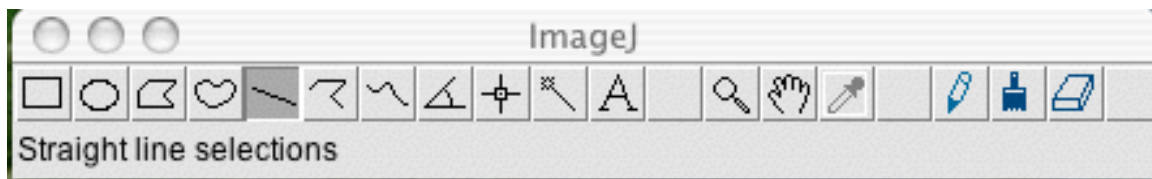
Analyze/Set Scale brings up the dialog box below. Note that to set a scale you must have a known distance in the field of view that is at the same depth of field as the part of the image you are trying to measure.



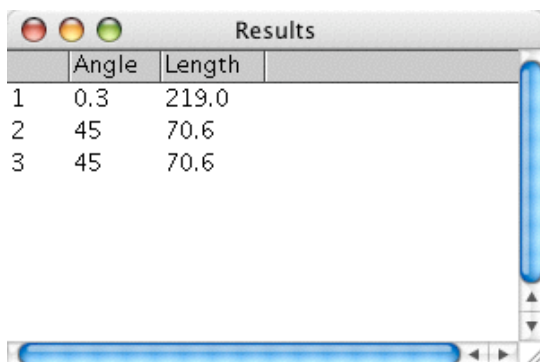
In this example, a distance of 563 pixels is equal to 80 mm. The software calculates a scale of 7.038 pixels per mm.

After a scale has been set...measuring selected pixels in the image

Select the right selection tool from the tool bar. For example, below I selected the straightline tool. There are seven different tools to choose from...oval, segmented line, square...etc.



Select some pixels on the image to measure with the tool. Analyze/Measure report the length of the measurement in the "Results" box.



	Angle	Length
1	0.3	219.0
2	45	70.6
3	45	70.6

Each measurement you make will be reported here. In this example I've made 3 measurements so far.

Windows/Results if you can't find the results window on your screen.

Analyze/Clear results to clear the table

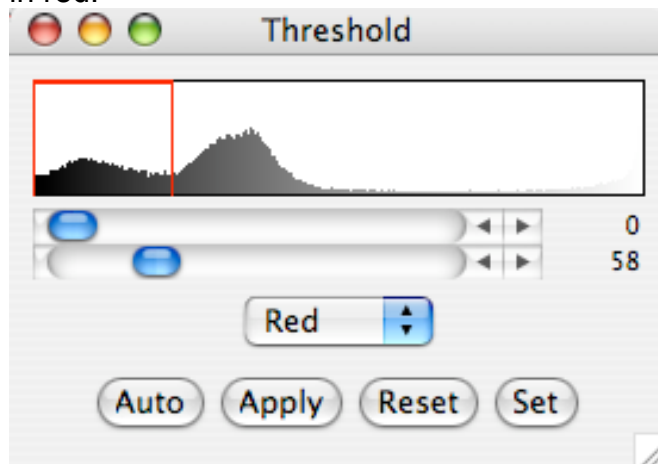
For more information about selecting lines and areas with *ImageJ*, see *ImageJ's Help/Online docs*. The [Tools](#) link explains more about the features of selecting lines and area with *ImageJ*, and the menu commands section explains the various menu commands and occasionally provides examples of how practicing scientists use this tool.


Measuring the area of a complex object

Notes adapted from Larry Reinking, Department of Biology, Millersville University
Area measurements document available at
<http://rsb.info.nih.gov/ij/docs/menus/analyze.html#scale>

Problem: Determine the photosynthetic (i.e. green) portion of a variegated leaf

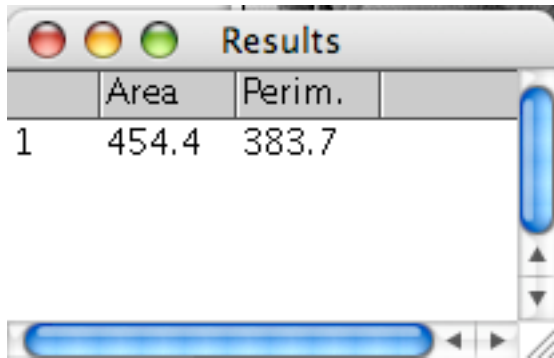
1. Convert scanned image of leaf to grayscale
Image/Type/8 bit or do this when you scan in the leaf with your scanner program. I found that I had to greatly contrast the image so that the difference between “green” and “non-green” was obvious in gray scale
2. Measure the area of the entire leaf
Image/Adjust/Threshold so that the entire area of the leaf is highlighted in red.



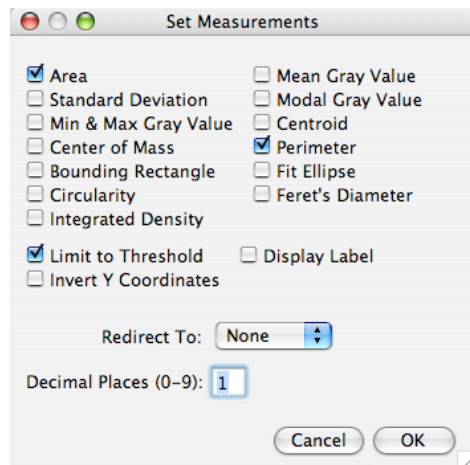
Select the magic wand tool  to select the area of the leaf. Click outside and just to the left of leaf. You will know you have been successful when the leaf is outlined in a fine yellow line. If you need to select more than one area, use shift-click; alt-click will deselect an area.

- Hint: If you can't see the line, try changing the threshold color from “red” to “over/under” which changes the selection color to blue or green which some find is easier to see the yellow line.


To measure the area traced in yellow use **Analyze/Measure** and look in the **Results** window. The results should report the area and perimeter of the leaf.



- You can manually select which measurements show in the Results window by going to **Analyze/Set measurements** and selecting what measurements appear.



- Measure the area of the non-green portion of the leaf. Repeat the process described above, but this time highlight the area of the leaf that is not green. **Image/Adjust/Threshold** and adjust the threshold sliders so that the area of the leaf that is not green is highlighted in red.

Select the magic wand tool  and use it as described above to select the part of the leaf that is not green. Shift-click to select multiple areas; alt-click to deselect areas.

To measure the area traced in yellow use **Analyze/Measure** and look in the **Results** window. The results should report the area and perimeter of the leaf.

- You can manually select which measurements show in the Results window by going to **Analyze/Set measurements** and selecting what measurements appear.