

ImageJ

Quick Reference

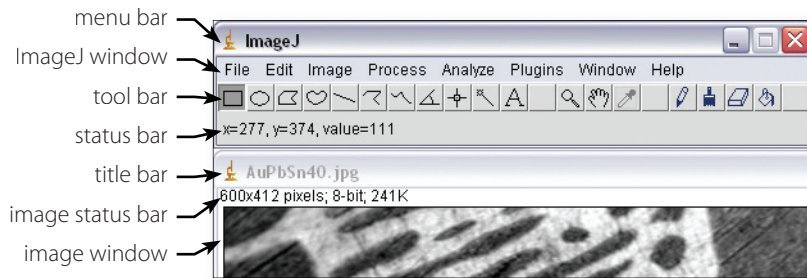


The ImageJ user interface

The ImageJ user interface is nearly identical for Windows and Macintosh operating systems, except for the location of the menu bar.

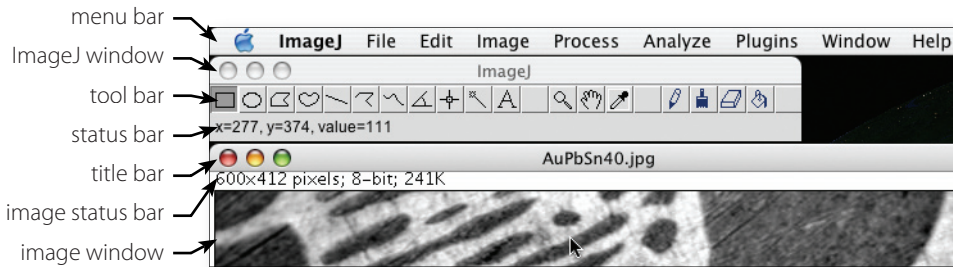
Windows

Under Windows, the menu bar is at the top of the ImageJ window.

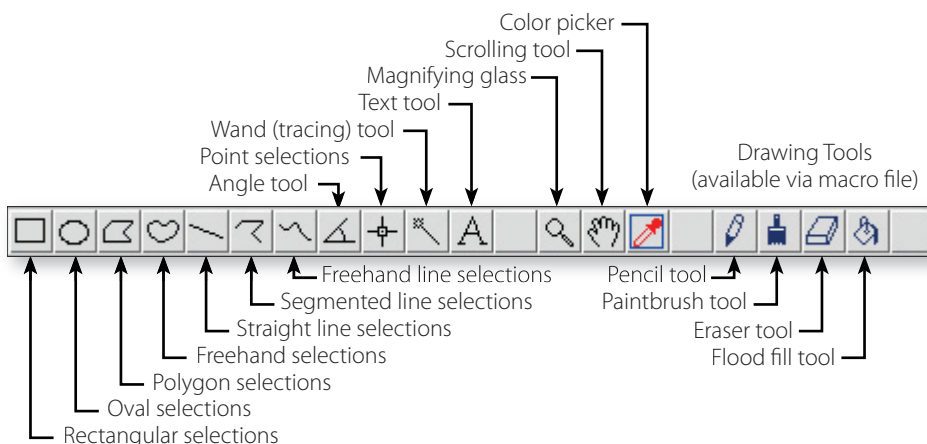


Macintosh

On the Macintosh, the menu bar is at the top of the screen, separate from the ImageJ window.



The ImageJ toolbar



ImageJ updates

ImageJ is constantly being updated and improved. Updating your copy of ImageJ from the version included with this package may result in changes to the user interface. The capabilities of the program may also change significantly, and lesson instructions and results may need to be modified.

You can have access to the latest tools and functions while retaining compatibility with these materials by installing multiple copies (versions) of ImageJ on your computer. Each copy can be launched and run independently.

Need to know more?

For additional information about ImageJ's tools and menus, refer to the online user's guide at:

<http://rsb.info.nih.gov/ij/docs/>

This guide can be opened from within ImageJ by choosing **Help > Online Docs...**

Drawing tools

The blank buttons will be replaced by additional tools in future versions of ImageJ.



Tool descriptions

Area selection tools

The area selection tools allow you to select an area, or *region of interest* (ROI), of the image using a rectangle, oval, polygon, or freehand shape, or some combination of these shapes. To move a selection, click and drag within the selection outline, or use the arrow keys to nudge the selection one pixel at a time in any direction. The selected areas can be edited, enhanced, analyzed, outlined, filled, or copied using menu commands and keyboard shortcuts. As you make a selection, the location and dimensions of the selection are displayed in the ImageJ status bar.

To measure the selected area, press **M** (measure); to outline the selected area using the foreground color, press **D** (draw); to fill the selected region with the foreground color, type **F** (fill); and to fill the area with the background color, press the **Backspace** key (**Delete** key on Macs).

To subtract from an existing selection using any of these tools, hold down the **Alt** (Win) or **Option** (Mac) key as you make the selection. To add to an existing selection, hold down the **Shift** key as you make additional selections. Note: When adding selections with the rectangle and oval tools, you can avoid constraining your selection to a square or circle by releasing the **Shift** key before you release the mouse button.

Rectangle

When creating rectangular selections, click on one corner of the area and drag to the opposite corner. Hold the **Shift** key down to constrain the selection to a square. You can modify the selection by dragging any of the eight square handles around the edges of the selection. In addition, you can use the **Alt** (Win) or **Option** (Mac) key combined with the **Arrow** keys to change the height and width of the selection by one pixel at a time.

Oval

Creates elliptical selections that can be moved and resized using the same methods as rectangular selections.

Polygon

Creates irregularly shaped selections composed of a series of line segments. Click at the end of each segment, then click in the small box at the starting point to complete the selection. Alternatively, you can double-click **at the end** of the next-to-last segment, and ImageJ will automatically complete the last segment. To modify the polygon, drag the square handles at each vertex. To delete a vertex, hold down the **Alt** (Win) or **Option** (Mac) key and click on the vertex. To add a vertex, hold down **Shift** and click on a segment.

Freehand area

The freehand area tool lets you drag the cursor to create irregularly shaped selections. The area will automatically close when you release the mouse button. To edit a freehand area, choose **Edit > Selection > Fit Spline**. The resulting selection can then be edited using the same methods as the polygon selection tool.

Changing the selection outline color

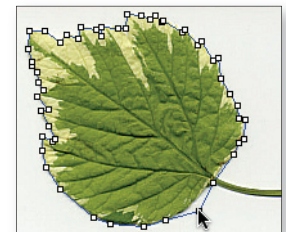
By default, ImageJ uses a yellow line to outline selection. This may not always be appropriate, such as when selecting against a light (or even yellow) background. To change the selection outline color, choose **Edit > Options > Colors...** and choose a different color.

Setting line width

To set the drawing line width for all of the selection tools, double-click any of the line selection tools and set the desired width in pixels.



Editing selections with handles



To modify a selection with editing handles (the small squares along the selection line), drag a handle to the desired location.

With polygon selections, you can **Alt**-(Win) or **Option**-(Mac) **click** on a handle to delete it, and **Shift-click** on a handle to add a new handle.



Line selection tools

The line selection tools create straight, segmented, or freehand line selections. Drag or use the arrow keys to move line selections, and drag handles to edit the selection. To measure the selected line, press **M** (measure); to draw the selected line using the foreground color, press **D** (draw) or **F** (fill); and to draw the line with the background color, press the **Backspace** key.

Caution: Regardless of the shape selected, measurements made with the line selection tools include only the pixels under or behind the line. Using the segmented or freehand line selection tools to select and measure areas will produce incorrect results.

Straight line

Click, drag, and release the mouse button to define the endpoints of a line selection. Hold down the **Shift** key while dragging to constrain the line to vertical or horizontal. While dragging, the length and angle of the line is displayed in the status bar.

Segmented line

Use the segmented line tool to select lines made of straight line segments. Click once at the end of each segment, and double-click at the final endpoint. If double-clicking is difficult, you can also click in the box at the beginning of the line. (Unlike the polygon area tool, the segmented line tool cannot “close in” an area.)

Freehand line

Use the freehand line tool to create irregular line selections by dragging on the image. To convert the freehand line to an editable curved line, choose **Edit > Selection > Fit Spline**.

Angle tool

The angle tool selects angles on images using three clicks—the first defines one leg, the second the vertex, and the third the other leg. After the first click, the status bar displays the angle of the cursor, measured $\pm 180^\circ$ relative to the 3 o’clock position. After the second click, the status bar displays the interior angle ($\leq 180^\circ$) of the angle defined by the first leg and the current cursor position.

To edit an angle, drag any of the three handles. As you drag a handle, the changing angle measurement is displayed in the status bar.

Point selection tool

Click on the image with the point selection tool to select, mark, and record locations on the image. To select multiple points, hold down the **Shift** key while clicking on each location. Drag a point to move it, and **Alt-click** (Win) or **Option-click** (Mac) a point to delete it.

In **Auto Measure** mode, each click on the image records the coordinates and brightness value of the pixel in the **Results** window. Double-click the point selection tool button to turn on the auto-measure mode option or set the mark width. If a mark width greater than zero pixels is selected, a point will automatically be drawn each time you click on the image. To draw points without measuring, turn off **Auto Measure**, select a point, and press the **D** (draw) key.

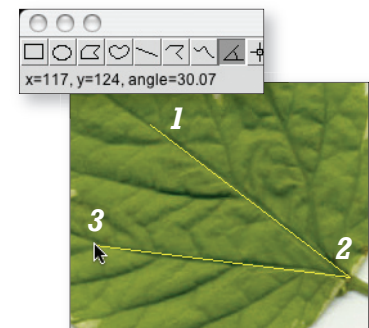
Line tool areas

Although it appears possible to select an area using the freehand line tool, the area reported when you measure the selection is *not* the area enclosed by the selection. Rather, it is the area of the pixels crossed by the selection line, shown here in black. Always use the area selection tools to select and measure areas.

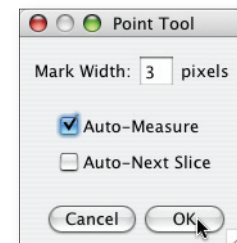


Using the Angle tool

Selecting with the angle tool requires three clicks: (1) the first leg, (2) the vertex, and (3) the second leg.



Point tool options



Note: with RGB color images, pixel values are reported on the status bar as separate red, green, and blue channel values. The value recorded in the **Results** window is the average of the R, G, and B values (not very useful!).

Wand (tracing) tool

The wand tool automatically finds the edge of an object and traces its shape. It works best with high contrast images. Place the wand to the left of an edge, and click to have ImageJ trace along the edge of the object until it returns to the starting point.

An object is defined as a cluster of pixels having the same color or value. ImageJ does not currently have the ability to define an object based on a *range* of pixel values.

Text tool


The text tool is used to add text labels to images. Adding text is a simple four-part process:

- Click at the text's desired location.
- Type the text. This creates a selection shaped like the desired text, which expands as you type. Type **Return (Enter)** on some keyboards) to create multi-line text. Use the backspace key to edit the text.
- Drag the text selection, or use the arrow keys to move the selection to the proper location.
- Draw the text using **Ctrl+D** or by choosing **Edit > Draw**.

Double-click the text tool button to select the text font, size, and style. Text draws in the foreground color defined in the color picker tool button.

Note: Drawing text on an image destroys data by replacing the original pixel values with the foreground color. Text cannot be edited after it is drawn, but it can be deleted by immediately choosing **Edit > Undo**. After this, the only way to delete text is to choose **File > Revert**, which will undo all changes made to the image since it was last saved.

Magnifying glass (zoom) tool

To zoom in or magnify the image up to 32 \times , click on the image or press the **+** key repeatedly. To zoom out or reduce an image down to 1/32 \times , you may right-click, **Option-click** (Mac), **Alt-click** (Win), or press the **-** key repeatedly. Double-clicking  returns the image to full size.

Scrolling tool

This tool allows you to move the image within its window if it is larger than the window. While using any other tool except the text tool, you can quickly toggle on the scrolling tool by holding down the space bar.

Color picker tool

This tool sets the foreground drawing color or text color by "picking up" colors from images with the cursor. Colors may also be picked up from the **CP** (color picker) window by double-clicking the color picker button. **Alt-click** (or **Option-click**) in the **CP** window to change the background color. The eyedropper in the color picker tool button shows the current foreground color while the frame around it shows the background color.

Selecting areas using the wand tool

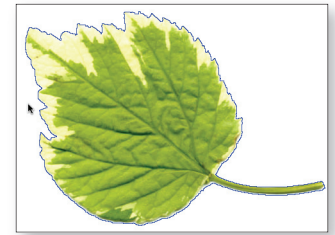


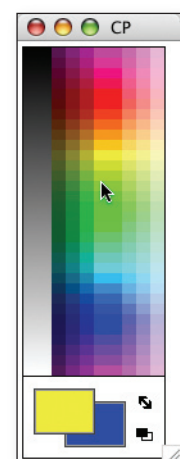
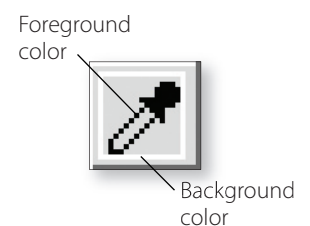
Image of leaf selected using the wand (tracing) tool. To isolate the background, the contrast had to be increased using the **Brightness and Contrast** control panel, and the contrast change permanently applied to the image.

Text tip

To add color labels to grayscale or 8-bit color images, convert the image to RGB color first, using **Image > Type > RGB**.

Foreground & background colors

The current foreground and background colors are shown on the color picker tool button. Double-click this button to set these colors.



Caution: Even though colors appear in the color picker tool, accurate colors are only available when working with RGB color images. On 8-bit color images, drawing colors will not match the foreground and background colors; on grayscale images, actual drawing colors will be shades of gray.

Drawing tools

In addition to drawing and filling shapes using the selection tools, ImageJ provides familiar drawing tools like those found in most graphic applications. The actual tools are provided through a macro file that ImageJ loads automatically at startup. If these tool buttons do not appear on the toolbar, you may need to install or replace this file.

Remember that the drawing tools permanently modify pixel values, and that scientific analysis may not be valid if the image has been modified in any way.

Pencil tool

The pencil tool draws points and lines in the foreground color. Double-click the tool button to set the diameter of the pencil tool.

Paint brush tool

The paint brush tool draws with a circular brush, using the foreground color. Double-click the tool button to set the diameter of the paintbrush tool.

Eraser tool

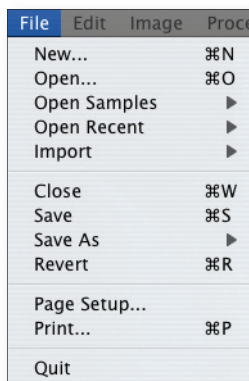
The eraser tool draws with a circular shape, using the background color. Double-click the tool button to set the diameter of the eraser tool.

Flood fill tool

The flood fill tool fills the pixel you click on and any adjacent pixels having the same value with the foreground color. Double-click the tool button to set the foreground color.



ImageJ menus

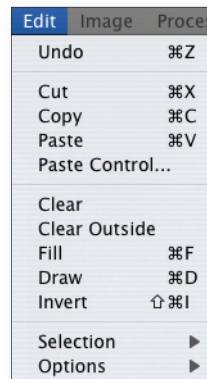


File menu

The **File** menu allows you to create new image windows, open existing image files, as well as print and save image files.

Edit menu

The **Edit** menu provides standard editing functions such as undo, cut, copy, and paste. In addition, it offers the powerful Paste Control feature, drawing commands, and selection and program options.



Need to know more?

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<http://rsb.info.nih.gov/ij/docs>

This guide can be opened from within ImageJ by choosing **Help > Online Docs...**

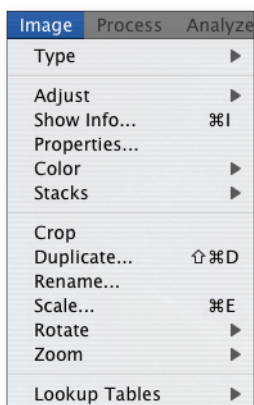
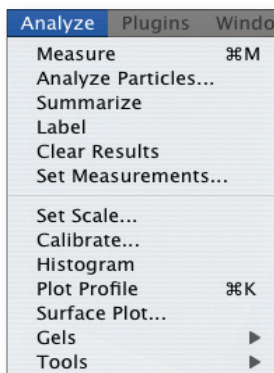
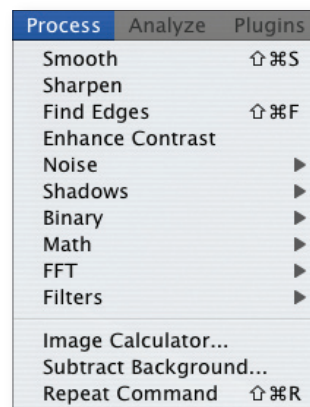


Image menu

The **Image** menu provides functions for manipulating the display of images.

Process menu

The **Process** menu includes powerful data filtering and manipulation tools.

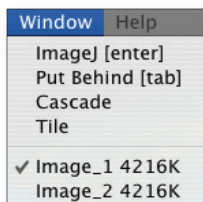
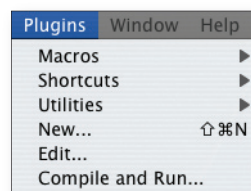


Analyze menu

The **Analyze** menu offers a variety of tools and functions for measuring and representing image data.

Plugins menu

The **Plugins** menu provides access to ImageJ plugins and macros that expand the power and convenience of the application.



Window menu

The **Window** menu allows the user to control the placement of image and program windows in ImageJ.

Help menu

The **Help** menu links to the ImageJ Web site and online documentation.

