Image J
An introduction to image processing
And more...
What is **NOT** Image J?

- Photoshop (not an artistic tool)
- Powerpoint (not a presentation tool)
- Instagram (not easy to understand)
- Maya, Blender (not a 3D modeler)
- Premiere, iMovie (not a movie tool)
- MatLab (no images from formulas)
- An i device (not user friendly)
So What is Image J?

- Image processing toolbox
- Scientific image reader
- Powerful analysis toolbox
- Batch tool
- Programmable toolbox
- Customizable toolbox
History and principle of Image J

1. 1994, NIH Image, Mac OS
   Astrophycisists

2. 1995, Scion Image, Windows
   Doctors

   Biologists
History and principle of Image J

Features and philosophy behind

**Runs Everywhere**

ImageJ is written in **Java**, which allows it to run on Linux, Mac OS X and Windows, in both 32-bit and 64-bit modes.

**Open Source**

ImageJ and its Java source code are freely available and in the **public domain**. No license is required.
History and principle of Image J

Features and philosophy behind

Data Types
8-bit grayscale or indexed color, 16-bit unsigned integer, 32-bit floating-point and RGB color.

File Formats
Open and save all supported data types as TIFF (uncompressed) or as raw data. Open and save GIF, JPEG, BMP, PNG, PGM, FITS and ASCII. Open DICOM. Open TIFFs, GIFs, JPEGs, DICOMs and raw data using a URL. Open and save many other formats using plugins.

Stacks
Display a "stack" of related images in a single window. Process an entire stack using a single command. Open a folder of images as a stack. Save stacks as multi-image TIFF files.
History and principle of Image J

Features and philosophy behind

**Image Enhancement**

Supports smoothing, sharpening, edge detection, median filtering and thresholding on both 8-bit grayscale and RGB color images. Interactively adjust brightness and contrast of 8, 16 and 32-bit images.

**Geometric Operations**

Crop, scale, resize and rotate. Flip vertically or horizontally.

**Color Processing**

Split a 32-bit color image into RGB or HSV components. Merge 8-bit components into a color image. Convert an RGB image to 8-bit indexed color. Apply pseudo-color palettes to grayscale images.
History and principle of Image J
Features and philosophy behind

**Macros**
Automate tasks and create custom tools using macros. Generate macro code using the command recorder and debug it using the macro debugger. More than 300 macros are available on the ImageJ Web site.

**Plugins**
Extend ImageJ by developing plugins using ImageJ's built in text editor and Java compiler. More than 500 plugins are available.

**Toolkit**
Use ImageJ as a image processing toolkit (class library) to develop applets, servlets or applications.
# History and principle of Image J

## Usage scenario

### Problem to Handle

**Basic tasks**
(basic adjustments, simple measurements)

**Repetitive work**
(multiple measurements, series of transformations)

**Complex projects**
Necessity of creating new functions, work with new image formats, communication with other applications (third party), etc.

### Solution

**Existing functions in Image J**

**Integrated macros Image J or recording and modifications of existing macros**

**Writing plugins from scratch or modifying existing plugins in Java language**
# How does Image J stands up against its competitors?

<table>
<thead>
<tr>
<th>Feature</th>
<th>Metamorph</th>
<th>Image J</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic image processing</td>
<td>Yes</td>
<td>Yes</td>
</tr>
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<td>Advanced image processing</td>
<td>Yes</td>
<td>Yes</td>
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<td>Macro language</td>
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<td>Yes</td>
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<td>Plugins</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>Communication with instruments</td>
<td>Yes</td>
<td>Yes !</td>
</tr>
<tr>
<td>Multi-user</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Support</td>
<td>Integrated help, Tutorials</td>
<td>Web ressources (±)</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows only</td>
<td>Windows, Mac OS, Mac OS X, Linux, ...</td>
</tr>
<tr>
<td>Cost</td>
<td>Expensive</td>
<td>Free – Open source</td>
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## How does Image J stands up against its competitors?

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<td>Basic image processing</td>
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<td>Advanced image processing</td>
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<td>3D, 3D ROI</td>
<td>Yes</td>
<td>Under development (FIJI)</td>
</tr>
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History and principle of Image J

WJCIF, MBF Image J, FIJI, µManager, ...

1. 1994, NIH Image, Mac OS
   Astrophysicists

2. 1995, Scion Image, Windows
   Doctors

   Biologists

4. Present day, Image J «packages»
   Everyone
The Image J current ecosystem

- Fiji
- Image Surfer
- Image J
- μManager
- ICY
- Bio 7
- Cell Profiler
- MIPAV
<table>
<thead>
<tr>
<th>Name</th>
<th>Author/Maintainer(s)</th>
<th>Description</th>
<th>Initiated</th>
<th>Status</th>
</tr>
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<tr>
<td>ImageJ</td>
<td>Wayne Rasband</td>
<td>The current, stable version is known simply as &quot;ImageJ&quot;—or sometimes &quot;ImageJ1&quot; or &quot;IJ1&quot; to differentiate it from ImageJ 2.0 (still in development).</td>
<td>1997</td>
<td>Active</td>
</tr>
<tr>
<td>ImageJ1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ImageJ2</td>
<td>ImageJ developers</td>
<td>The ImageJDev project (this web site and associated community) is developing version 2.0 of ImageJ, referred to as &quot;ImageJ2&quot; or &quot;IJ2&quot; for short. It is a complete rewrite of ImageJ, but includes ImageJ1 with a compatibility layer, so that old-style plugins and macros can run the same as in IJ1.</td>
<td>Dec. 2009</td>
<td>Active</td>
</tr>
<tr>
<td>ImageJDev</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ImageJA</td>
<td>Johannes Schindelin</td>
<td>ImageJA is a project that provides a clean Git History of ImageJ1, with a proper 'pom.xml' file so that it can be used with Maven without hassles. It is what Fiji uses (see below) at its core.</td>
<td>Jul. 2005</td>
<td>Active</td>
</tr>
<tr>
<td>Fiji</td>
<td>Fiji contributors</td>
<td>Fiji is Just ImageJ, with extras. It is a distribution of ImageJ with many plugins useful for image analysis in the life sciences, an automatic updater, and improved scripting capabilities. It is actively maintained, with updates released often. <strong>We recommend Fiji as the preferred version of ImageJ.</strong></td>
<td>Dec. 2007</td>
<td>Active</td>
</tr>
<tr>
<td>MBF ImageJ</td>
<td>Tony Collins</td>
<td>The MBF &quot;ImageJ for Microscopy&quot; bundle (formerly WCIF ImageJ) is a collection of plugins and macros, collated and organized by the MacBiophotonics facility. It went hand in hand with a comprehensive manual describing how to use the bundle with light microscopy image data. It was a great resource by microscopists, for microscopists. Unfortunately, the manual went offline in late 2012. Nonetheless, it is often possible to add specific plugins from MBF ImageJ to a Fiji installation, combining the best of both programs.</td>
<td>2005</td>
<td>Defunct (Last update: Dec. 2009)</td>
</tr>
<tr>
<td>ImageJ2x</td>
<td>Rawak Software</td>
<td>ImageJ2x is a fork of ImageJ1, modified to use a Swing interface.</td>
<td>Unknown</td>
<td>Last update: Sep. 2012</td>
</tr>
<tr>
<td>SalsaJ</td>
<td>EU-HOU</td>
<td>SalsaJ is a closed-source fork of ImageJ1 intended for use with professional astronomy images. It was designed to be used in classrooms, and has been localized into over 30 different languages.</td>
<td>Unknown</td>
<td>Last update: Aug. 2012</td>
</tr>
<tr>
<td>ImageJX</td>
<td>Grant Harris</td>
<td>ImageJX was created as a means to discuss and explore improvements to ImageJ. There was an ImageJX mailing list as well as an ImageJX software prototype. The ImageJX software prototype was a proof of concept—an attempt to reorganize ImageJ's internals to make it more flexible. The prototype demonstrated this flexibility by recasting the program in Swing. The ImageJX project formed the basis of an application to NIH for funding, which is what launched the ImageJDev project (see above).</td>
<td>Mar. 2009</td>
<td>Superceded by ImageJ2</td>
</tr>
<tr>
<td>NIH Image</td>
<td>Wayne Rasband</td>
<td>NIH Image is a public domain image processing and analysis program for the Macintosh. It is the direct predecessor of ImageJ, and is no longer under active development (though see ImageSXM below).</td>
<td>1993 or earlier</td>
<td>Superceded by ImageJ</td>
</tr>
<tr>
<td>ImageSXM</td>
<td>Steve Barrett</td>
<td>Image SXM is a version of NIH Image that has been extended to handle the loading, display and analysis of scanning microscope images.</td>
<td>May 1993</td>
<td>Active</td>
</tr>
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</table>
The Image J current ecosystem

Classic Image J

Mac Bio Photonics Image J

Fiji
Image J – Basic Functions
Fiji
Staying up to date
Demo time
What’s next?
What’s next?

Several issues to address:

- Maintain ALL content updated
- Development standardization
- Modularity, plugins as blocks
- Increase interoperability with other softwares
- ...
What’s next?

http://developer.imagej.net/

ImageJ2 or IJ2
What’s next – IJ2

- Works with existing plugins and macros
- Works with new, exciting plugins and scripts
- Handles larger, more complex datasets
- Multidimensional visualization tools
- Easier to link with other software
- Easier plugin management
What’s next – IJ2
What’s next – IJ2

- First Image J 2.0 Beta versions are currently being released. 
  (Beta 7 can be downloaded and tested.)

- For more info about the progress: 
  http://developer.imagej.net/

- First planned stable release: when it’s done...
What else
An alternative to Image J

Icy's statistics, refreshed everyday.

Active Icy within the last 31 days

1602

Distribution of installed versions

* Number of active icy: icy which have at least run once during the specified time-window.
What else
An alternative to Image J

Current number of plugins: 237
What else
An alternative to Image J

icy

RATE AND COMMENT PLUGINS

INTERACTIVE WIDGETS
What else
An alternative to Image J

WRITE SCRIPTS IN JAVASCRIPT OR PYTHON

GRAPHICAL PROGRAMING WITH PROTOCOLS
What else
An alternative to Image J

icy

NATIVE IMAGEJ INTEGRATION

NATIVE MICRO-MANAGER INTEGRATION
Demo time
References

Icy
http://icy.bioimageanalysis.org/

Fiji:
http://fiji.sc/wiki/index.php/Fiji

Differences between versions:
http://imagejdev.org/what-difference-between-imagej-imagej2-imagejdev-imagejx-imageja/etc

Development:
http://imagejdev.org/development