Fiji

Fiji Is Just ImageJ
(batteries included)

Fiji for users

- one free software package
- many bundled plugins
- advanced scripting languages
- tutorials/documentation
- coherent menu structure

Fiji for developers

- version control
- build system
- open source

Some ImageJ History

NIH Image

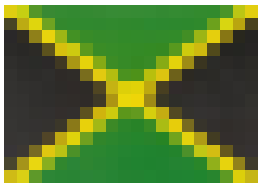
NIH IMAGE

Apple Mac only

ImageJ

Java – all platforms

ImageJA



Applet, Advanced

Fiji

“installer for TrakEM2”

... and then much more

Batteries Included !

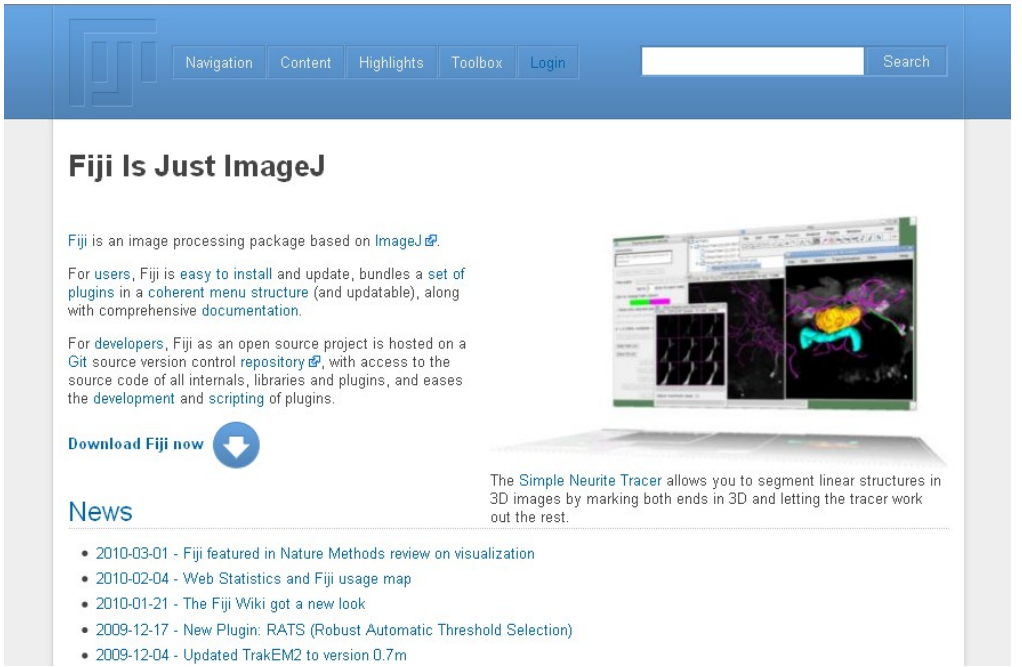
One software package

Java Runtime + Java3D,
for Windows, Mac, Linux

32/64-bit

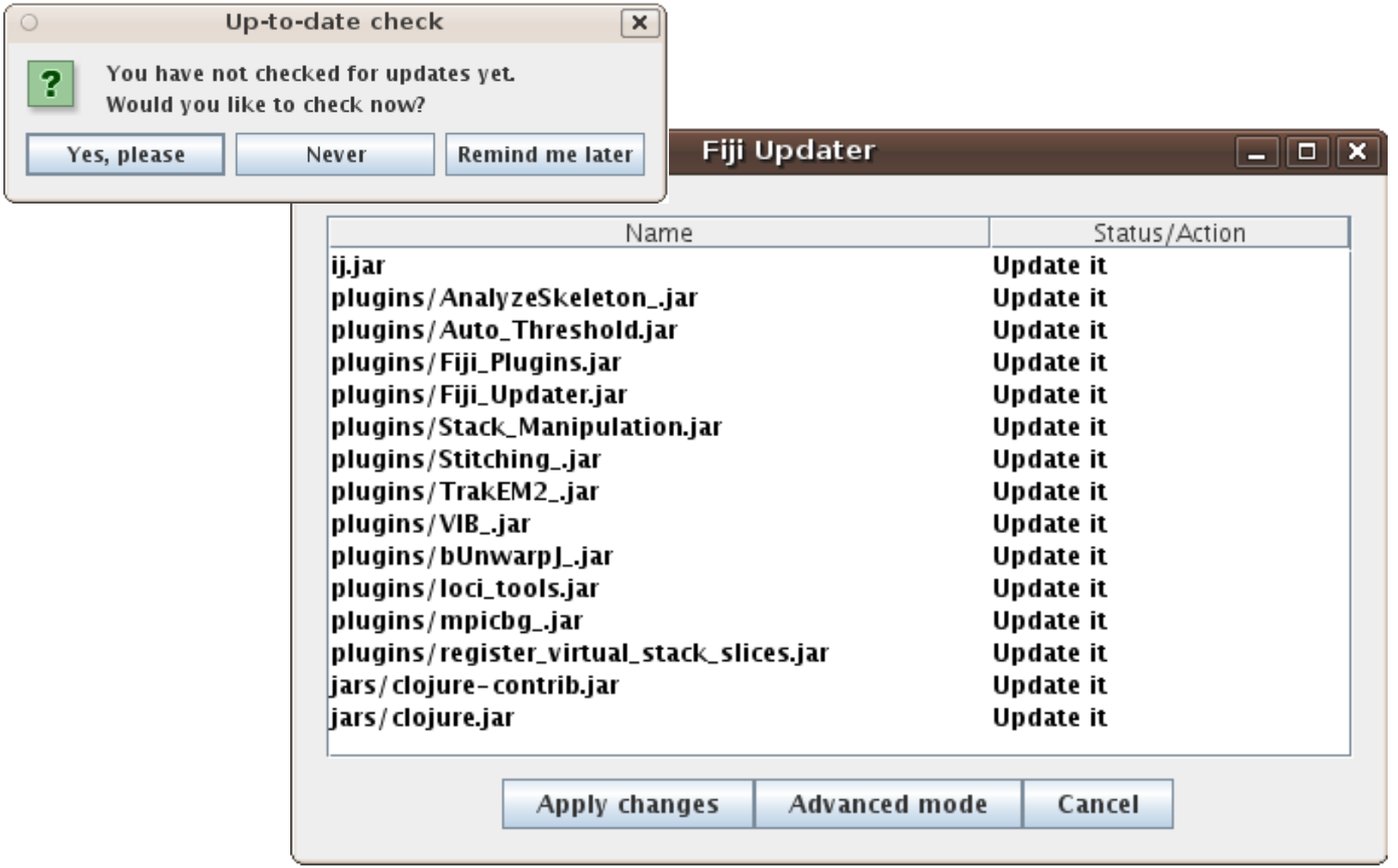
ImageJA

Plugins!

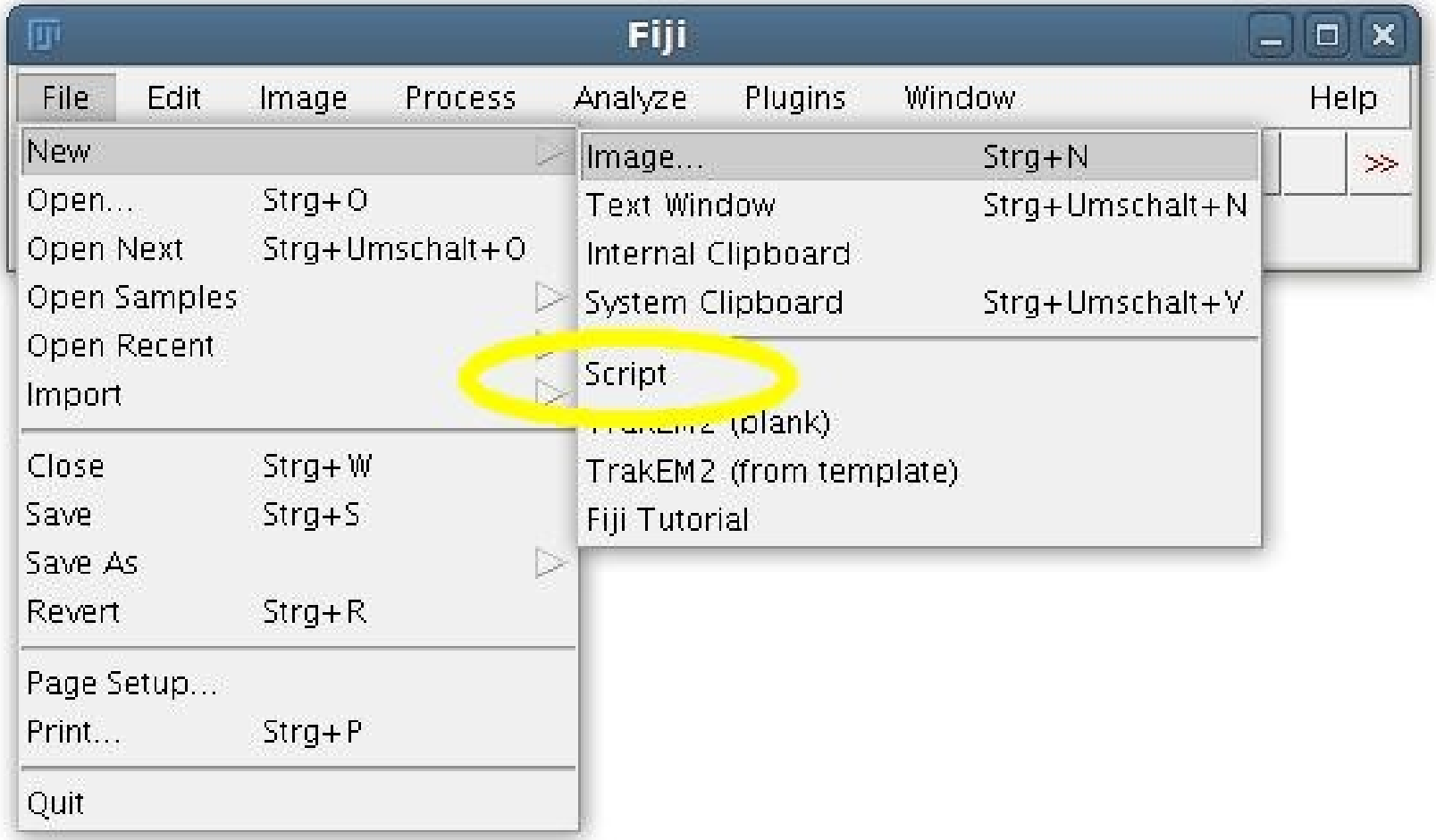


http://fiji.sc/

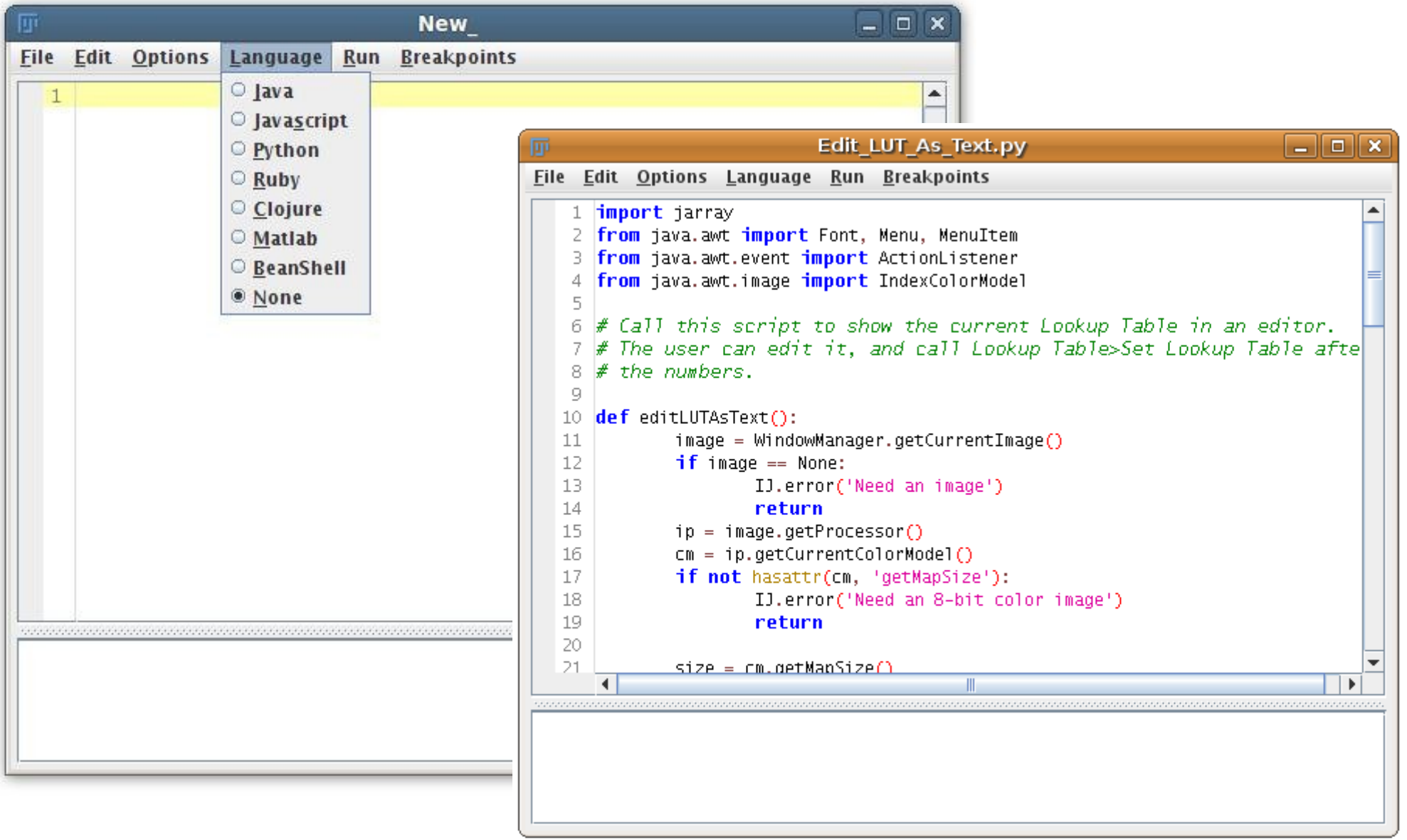
Fiji Updater



Script Editor



Script Editor



Advanced Users: Scripting

- 

- 

- 

- Javascript 

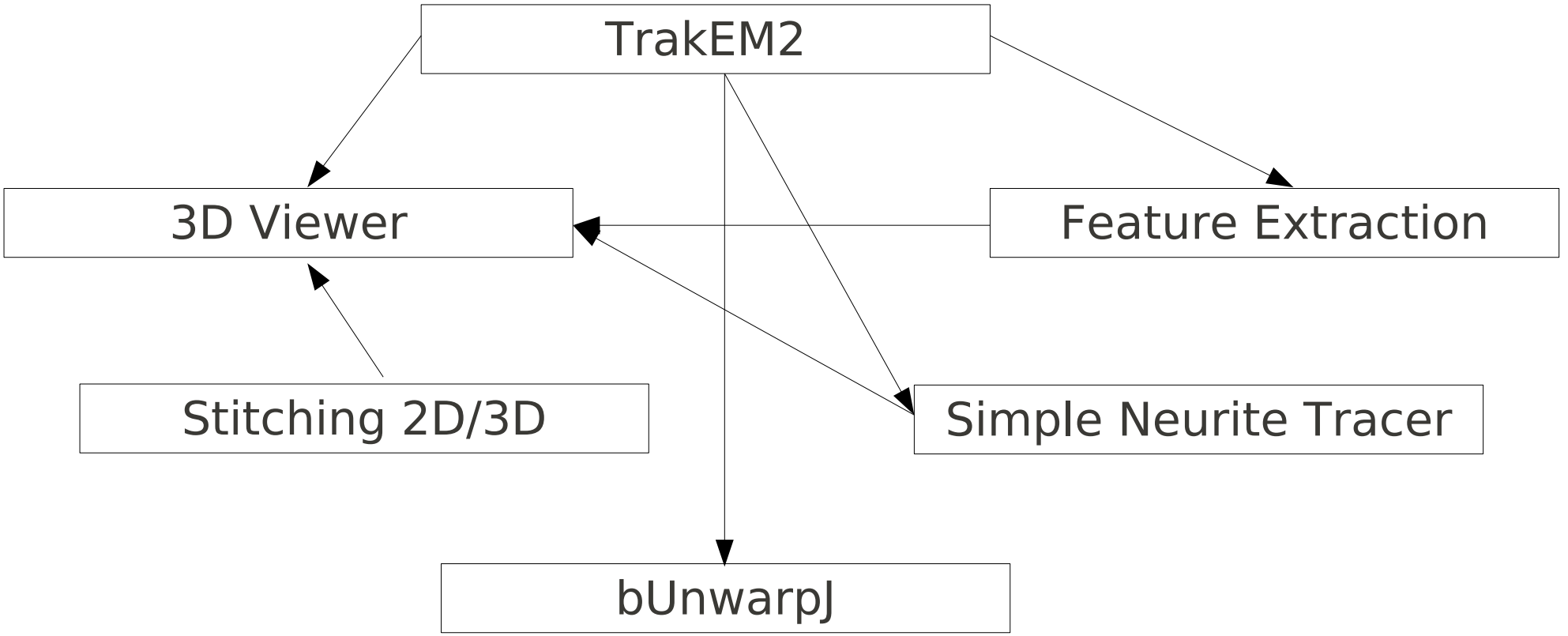
- BeanShell 

Why not use ImageJ's macro language?

- More Power
- Faster
- Quicker to test ideas
- Full access to Java classes
- Many users know Python, Ruby, Javascript

Example: Fiji Logo 3D – you cannot do that with macro language

Fiji fosters collaboration and reuse



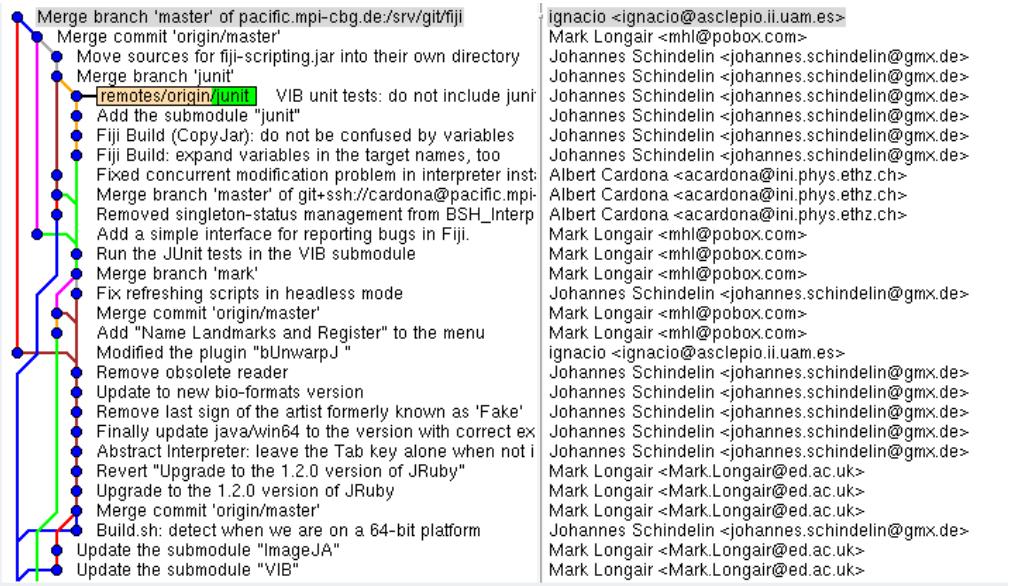
See also http://fiji.sc/#Projects

Working together:

Version Control

“before”

“after”



See also http://fiji.sc/Git

Fiji Usage

Fiji usage map

This page was produced using GeoLite data created by MaxMind, available from MaxMind, downloaded from ipinfodb.com

Purpose: Quantitative Image Processing

• We want answers, not pretty pictures

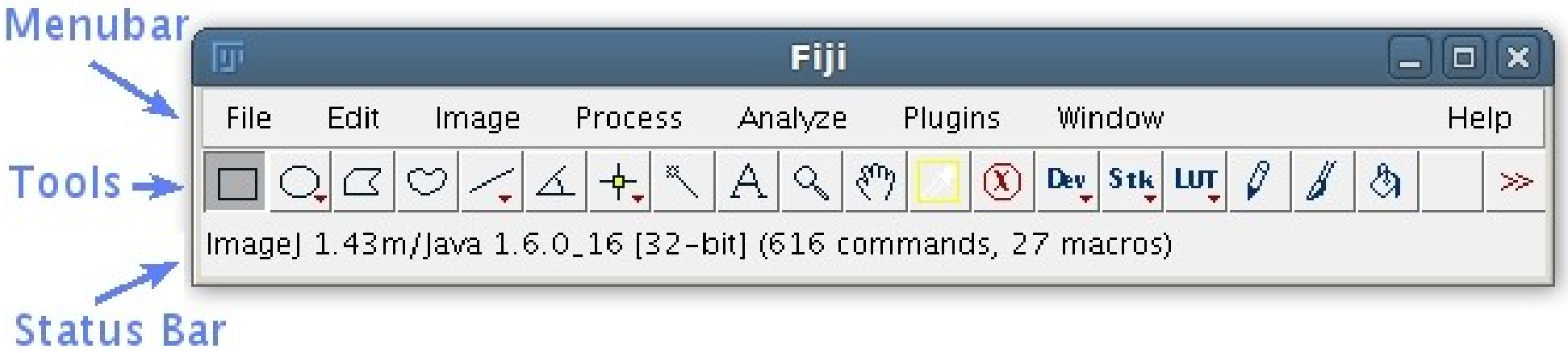
• Processing images means *stripping away information*, never *adding information*. We need to be careful to strip away information we do not want.

• At the end of the day, we want to convincing evidence. That means statistics.

• If we know how we want to analyze the images, we have a better idea how to prepare the samples and how to obtain the images.

Getting started:

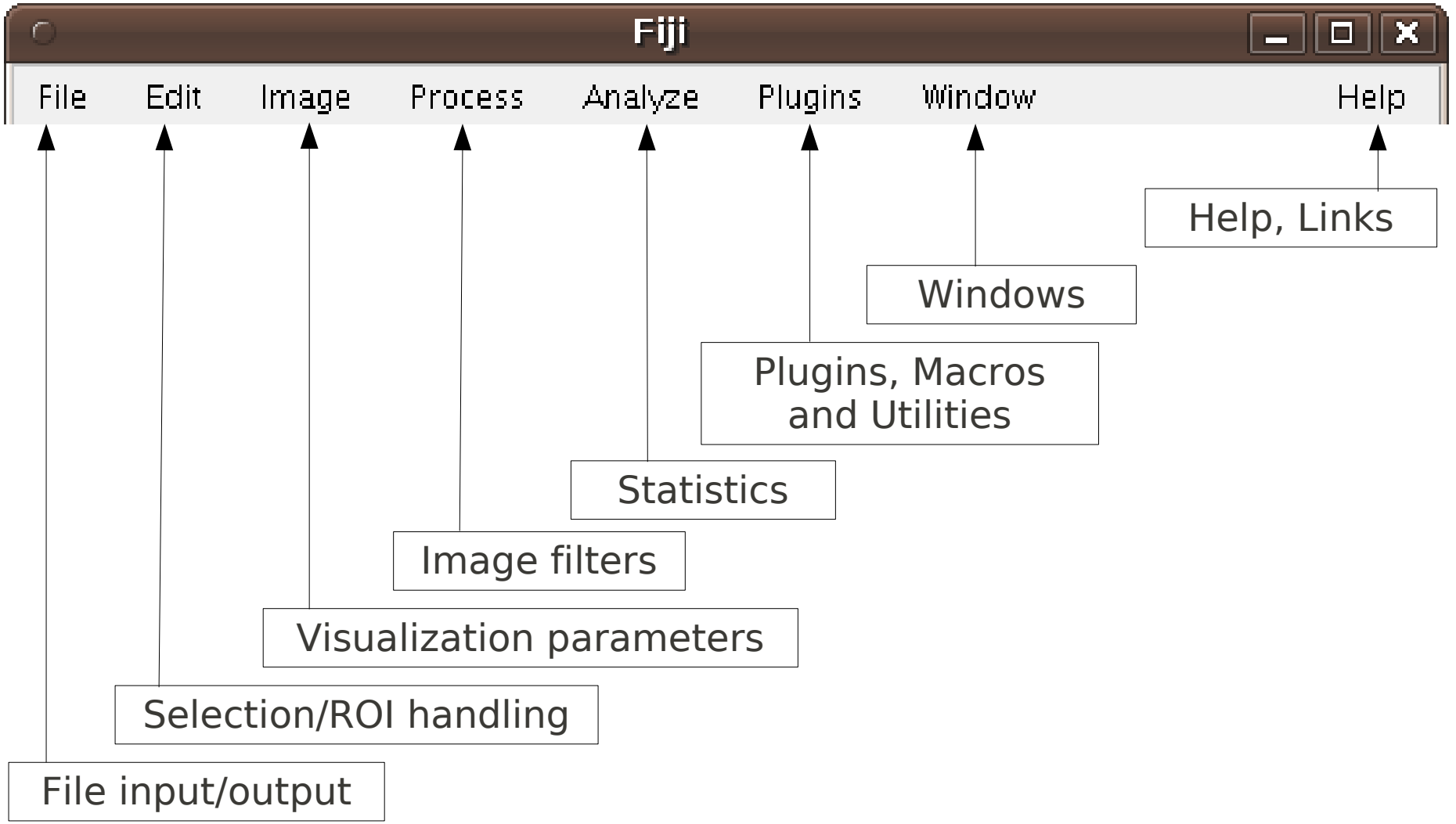
The main window



See also http://fiji.sc/Getting_started

Getting started:

Overview of the menus

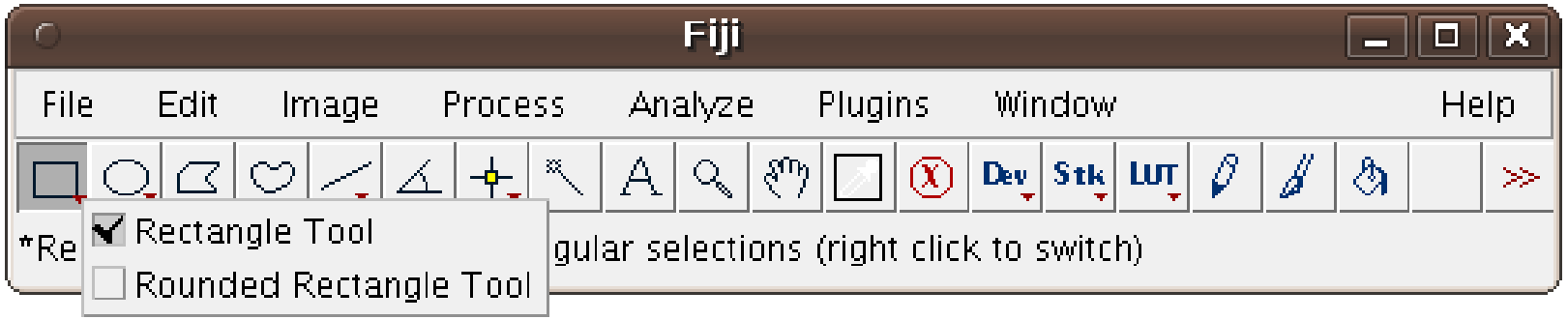


See also http://fiji.sc/Getting_started

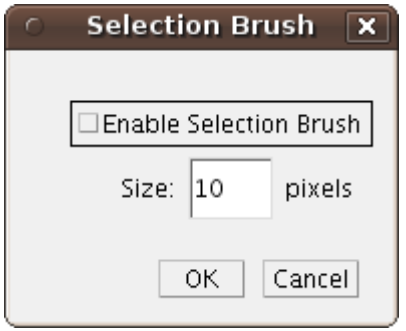
Getting started:

Tools, alternate tools & options

- Click on tool icons to switch to another tool
- Right-click on the little red arrows to select alternate tools:



- Double-click on tool icons to open option dialogs:

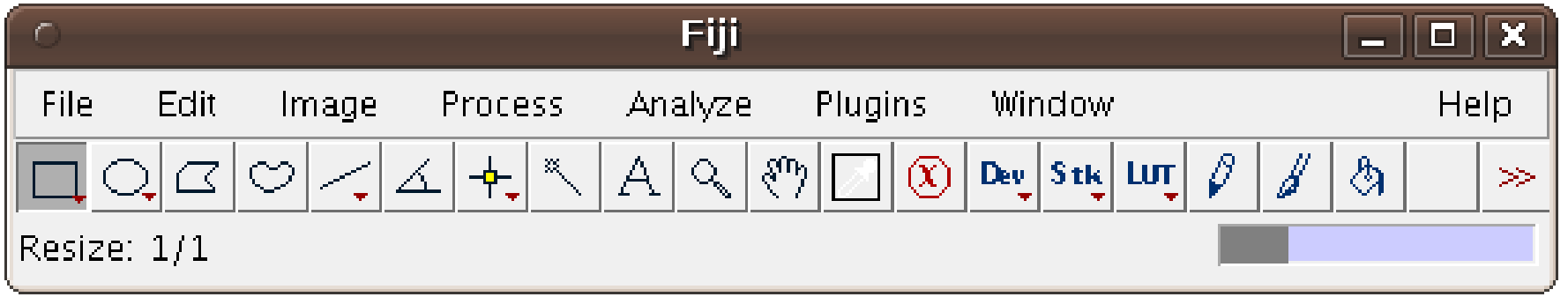


See also http://fiji.sc/Getting_started

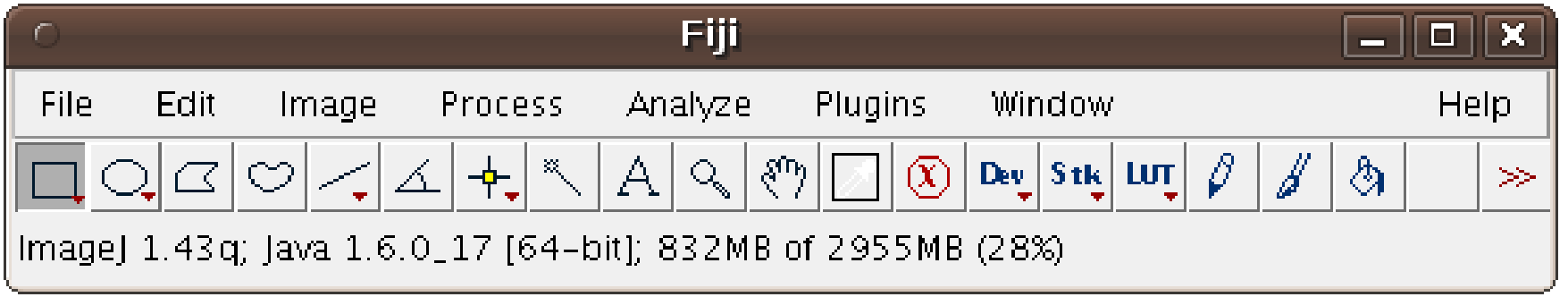
Getting started:

The status bar (messages & progress)

- The status bar shows information about long-running processes:



- Clicking in the status bar shows information about memory consumption:



See also http://fiji.sc/Getting_started

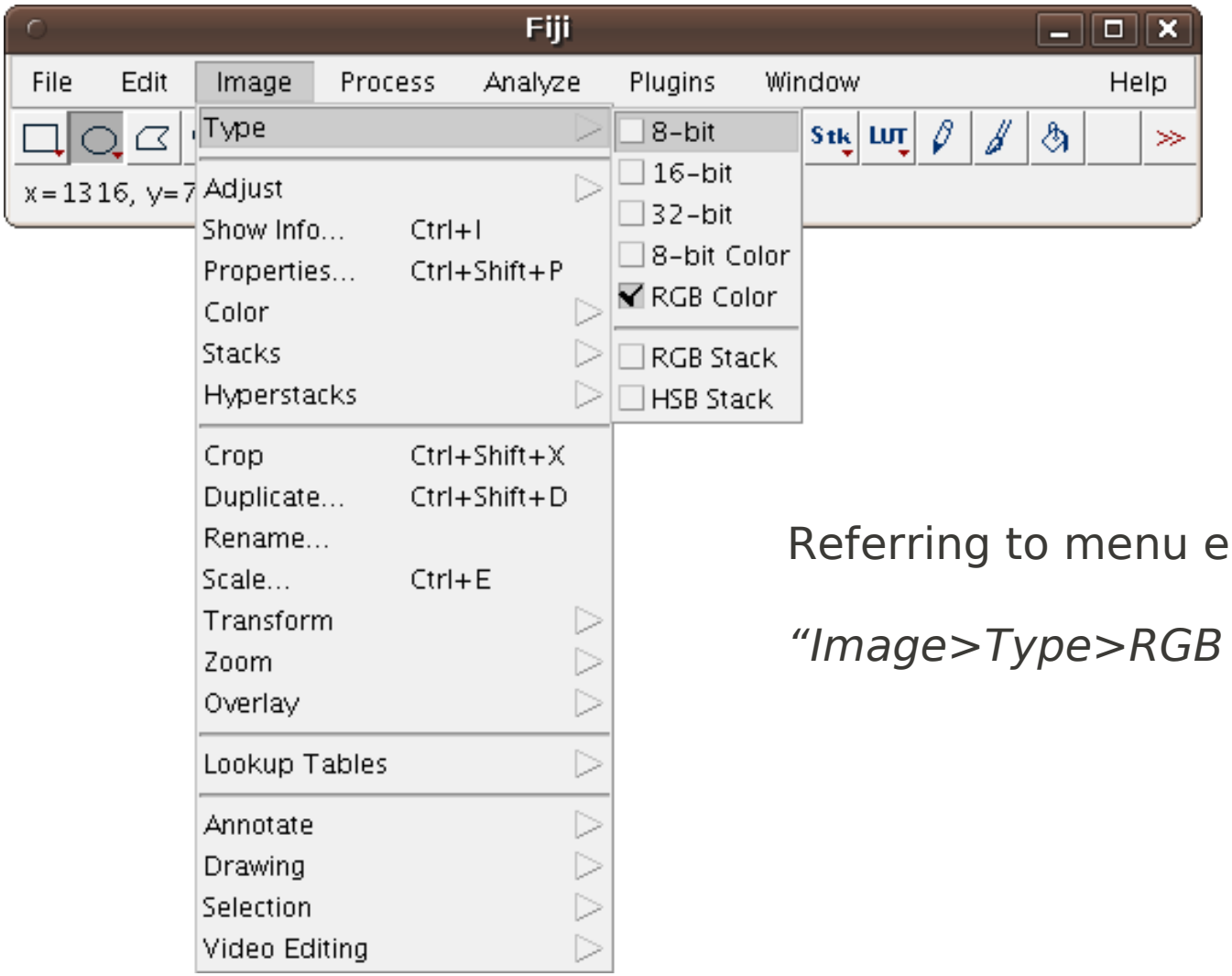
Getting started:

Image windows

See also http://fiji.sc/Getting_started

Getting started:

Image types



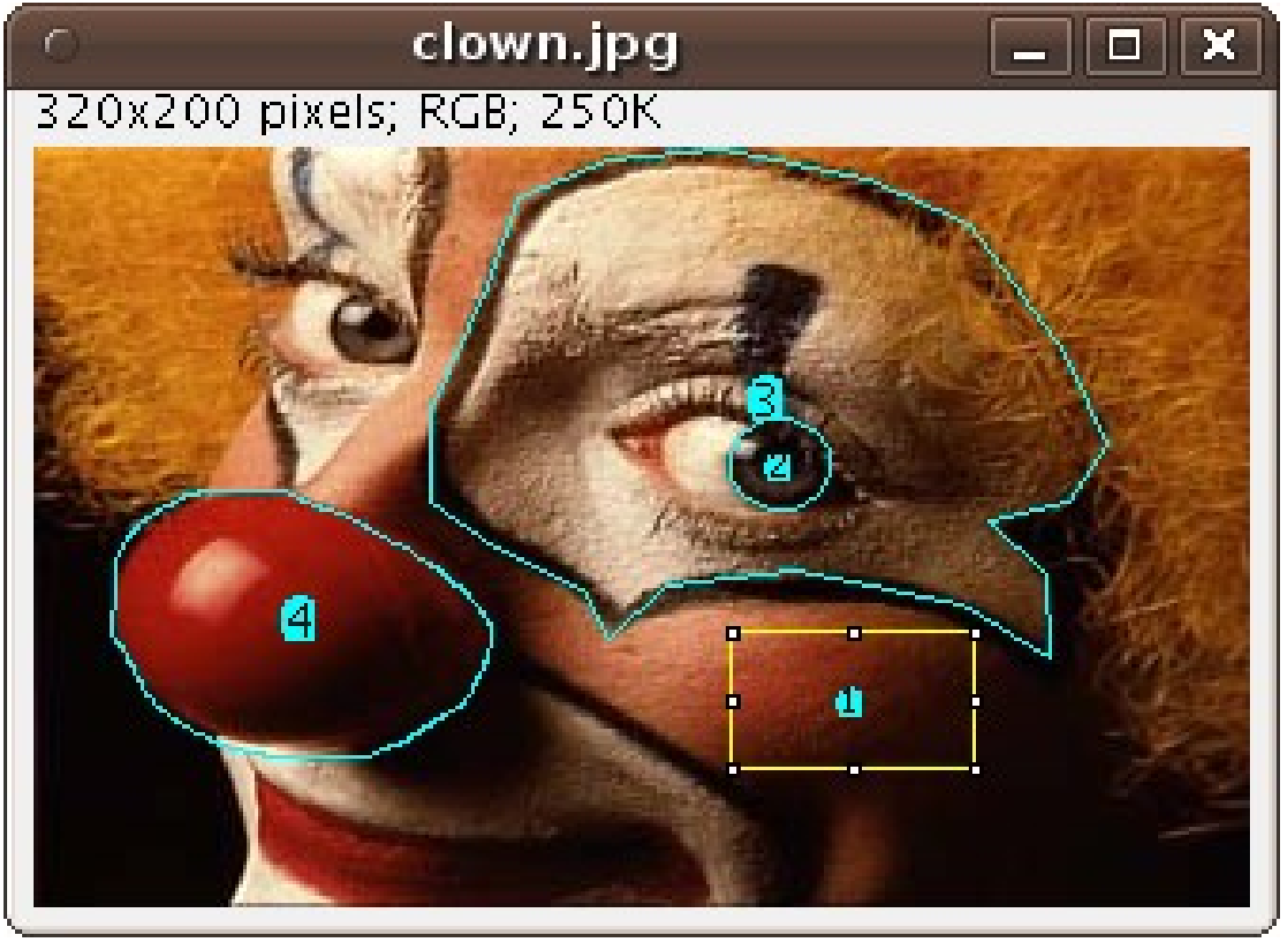
Referring to menu entries:

“Image>Type>RGB Color”

See also http://fiji.sc/Getting_started

Getting started:

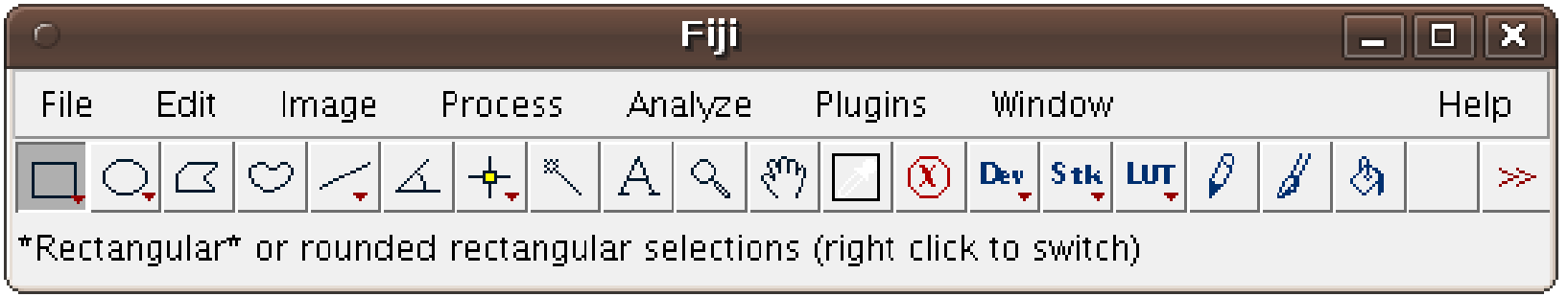
ROIs (*Region of Interest*, or *Selection*)

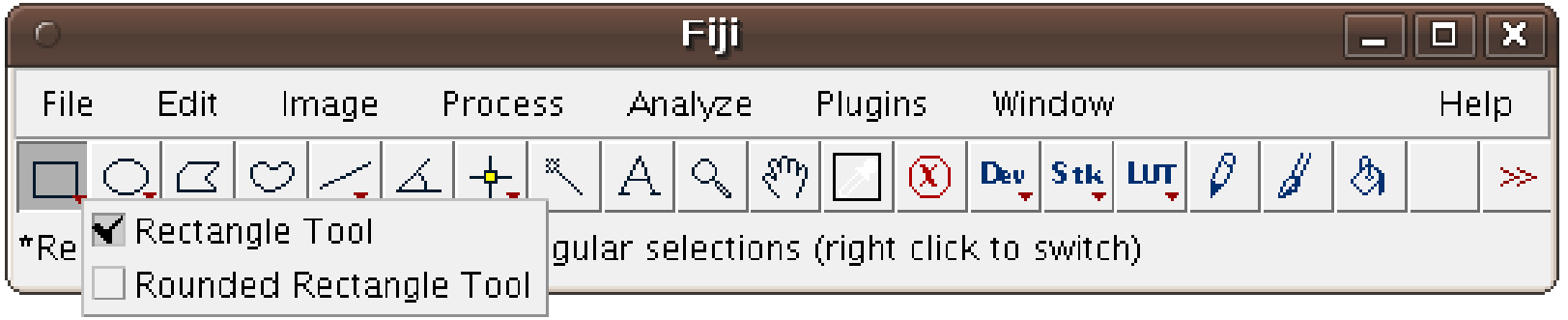


See also http://fiji.sc/Getting_started

Getting started:

Selecting an area





See also http://fiji.sc/Getting_started

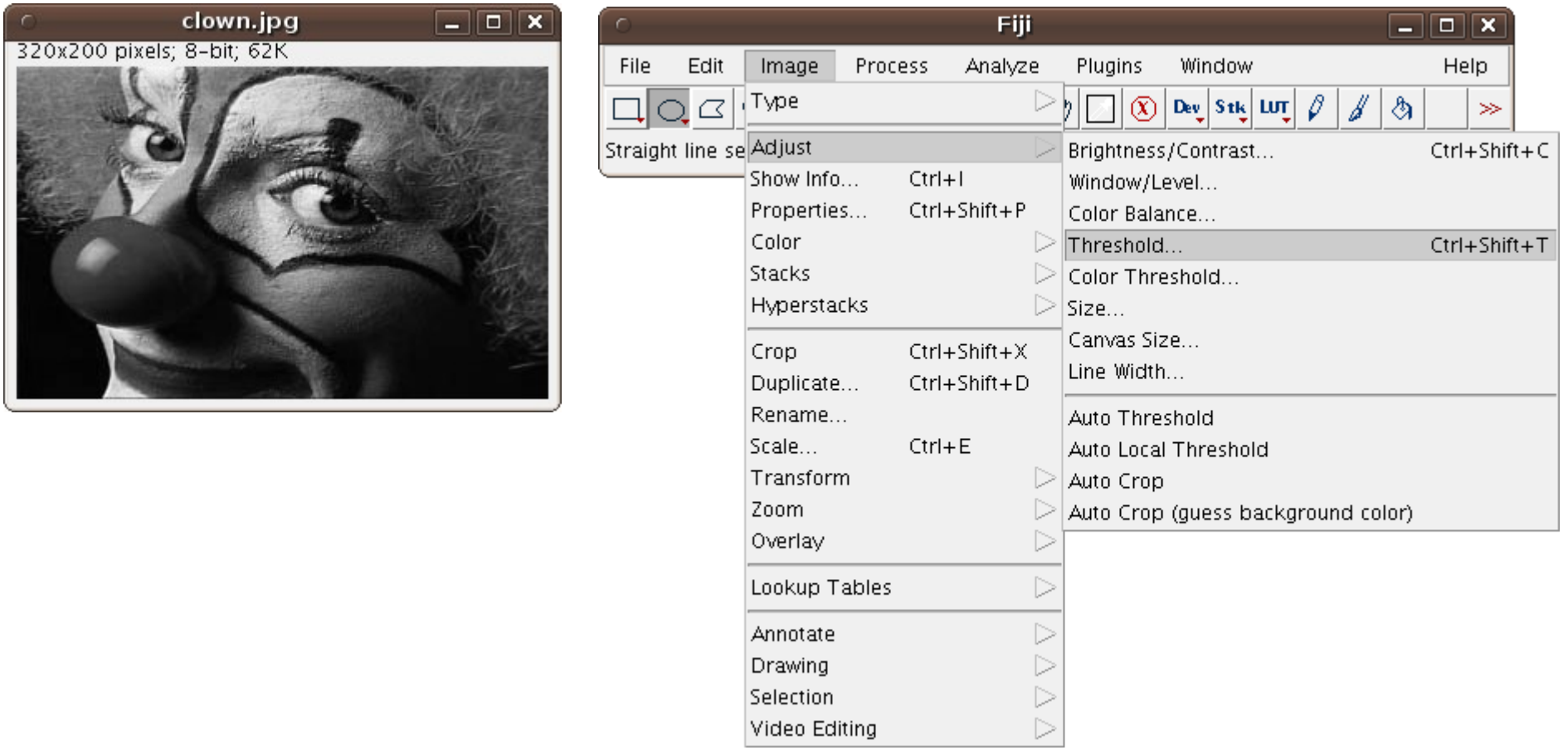
Getting started:

Selecting an area by threshold

See also http://fiji.sc/Getting_started

Getting started:

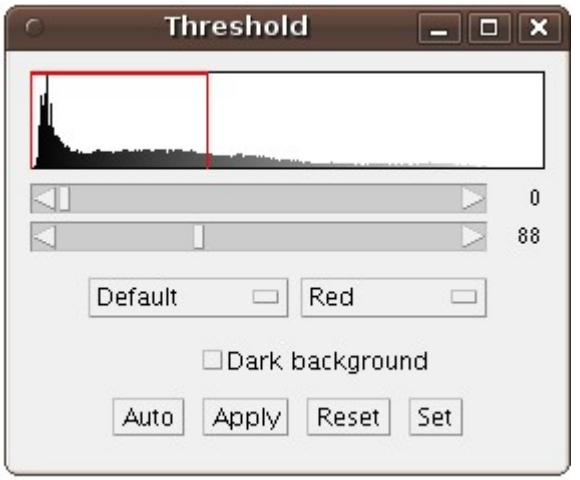
Selecting an area by threshold



See also http://fiji.sc/Getting_started

Getting started:

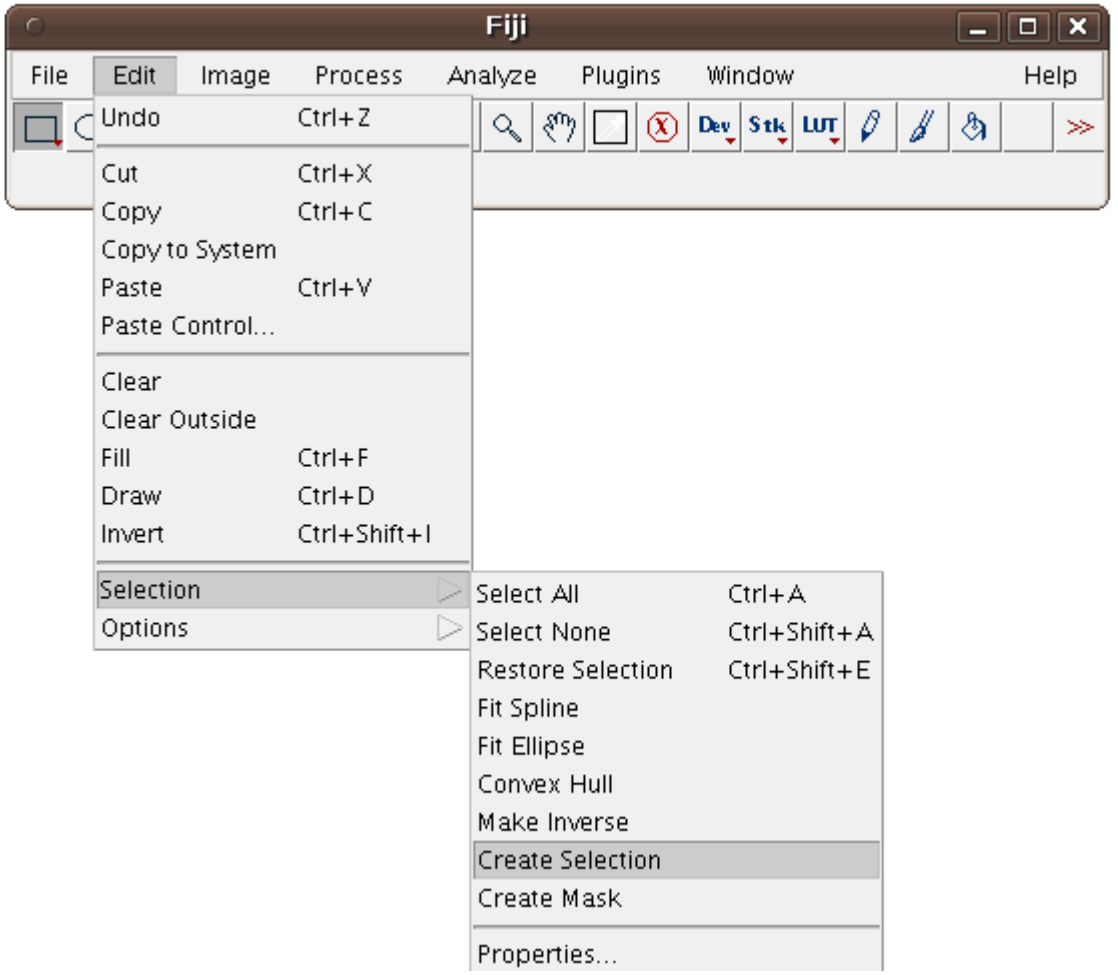
Selecting an area by threshold



See also http://fiji.sc/Getting_started

Getting started:

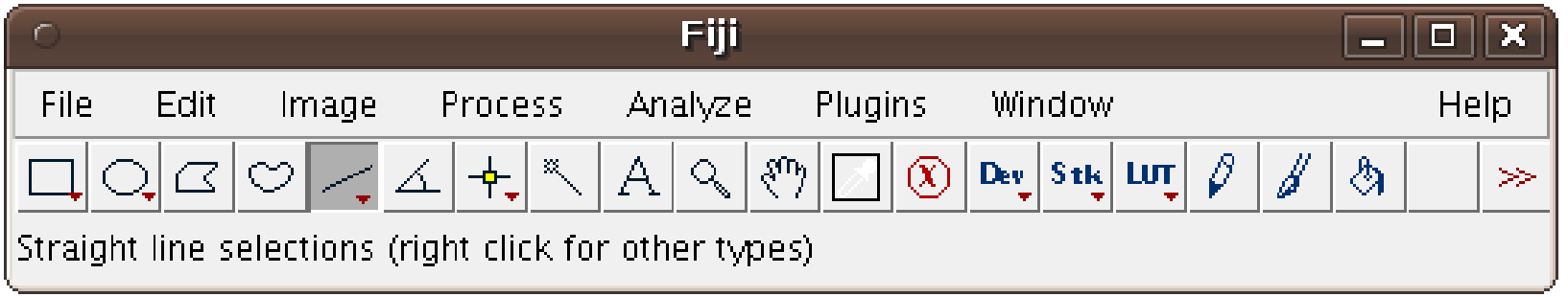
Selecting an area by threshold

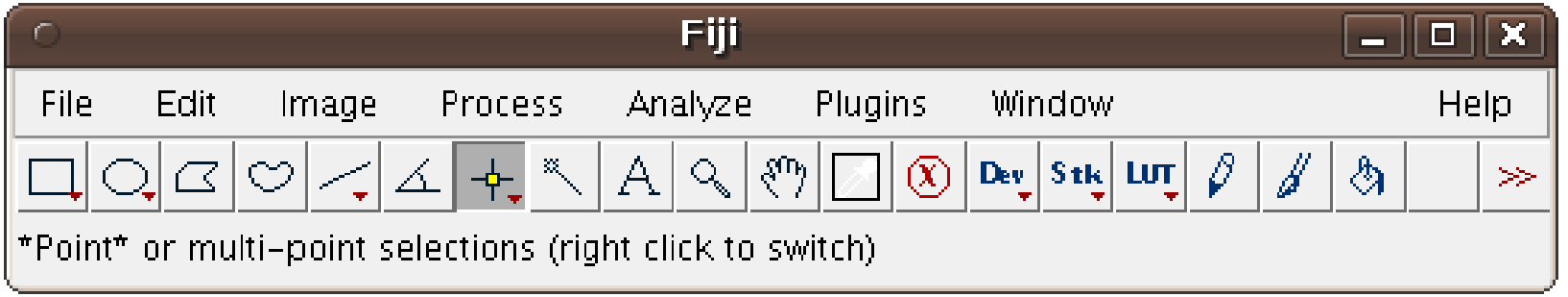


See also http://fiji.sc/Getting_started

Getting started:

Selecting lines, points

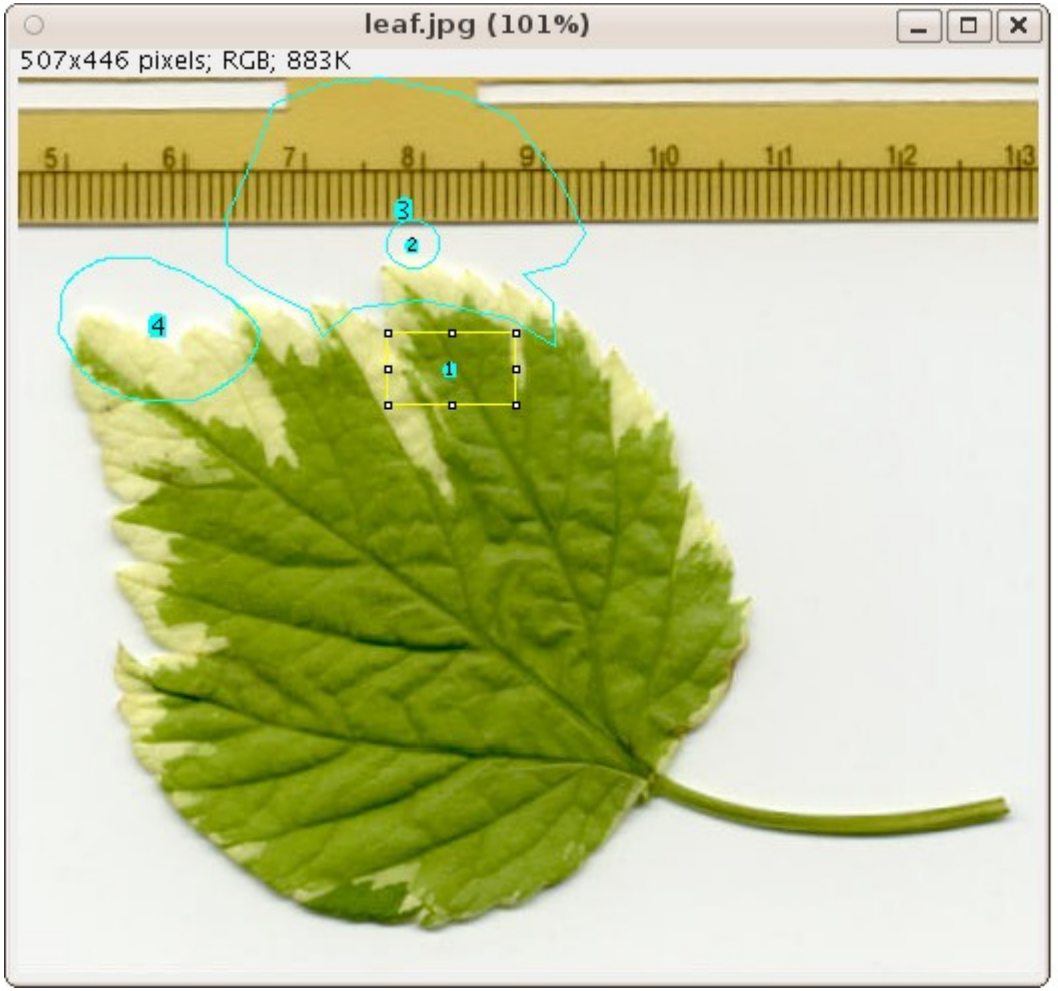


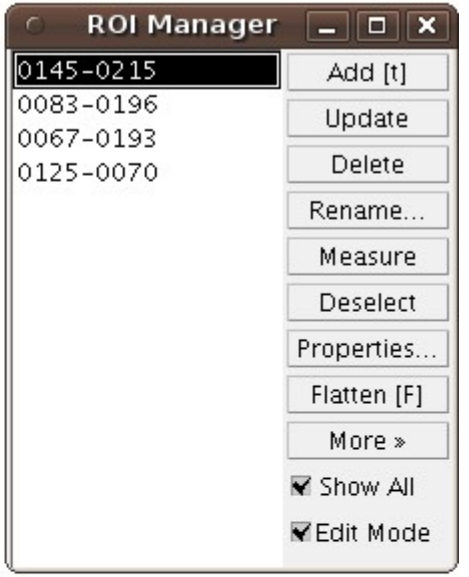


See also http://fiji.sc/Getting_started

Getting started:

ROI Manager





See also http://fiji.sc/Getting_started

Getting started:

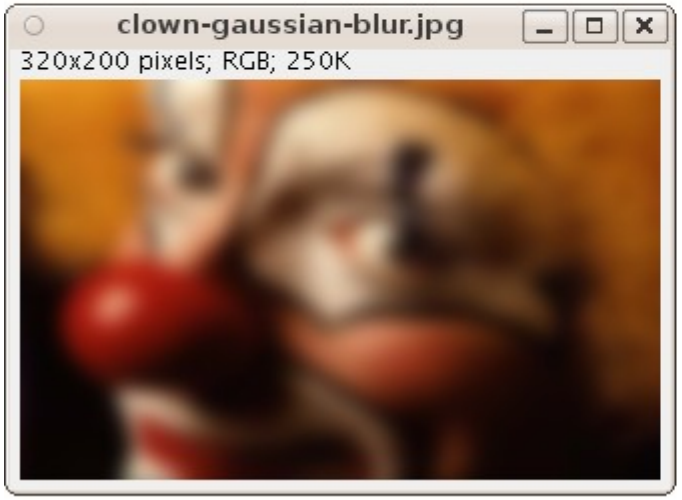
Common filters

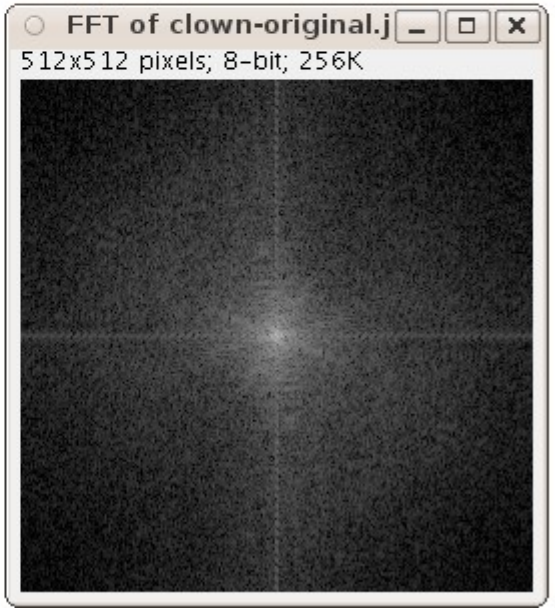
- Median filter: *Process>Filters>Median...*
- Gaussian Blur: *Process>Filters>Gaussian Blur...*
- Fourier Transform: *Process>FFT>FFT*
- Morphological Operators: *Process>Binary>Erode*
- Arithmetic Operators: *Process>Math>Add...*
- Arithmetics on two images: *Process>Image Calculator...*
- etc

See also http://fiji.sc/Getting_started

Getting started:

Common filters: examples





Getting started:

Command Launcher

See also http://fiji.sc/Getting_started

Macros:

Purpose

- Automation
- Reusable scripts
- Adding tools to the toolbar
- Adding keyboard shortcuts

See also http://fiji.sc/Macros_Intro

Macros:

Basic concept: Variables

- A variable is a placeholder for a changing entity
- Each variable has a name
- Each variable has a value
- Values can be numeric
- Values can be text, so-called *strings*
- Variables can be assigned new values

See also http://fiji.sc/Macros_Intro

Macro variables:

Setting variables

```
value = 2;

intensity = 255;

title = “Hello, World!”;

text = “title”;

text = title;
```

See also http://fiji.sc/Macros_Intro

Macro variables:

Using variables

```
x = y;

text = “The title reads “ + title;

x = y * y – 2 * y + 3;

intensity = intensity * 2;
```

See also http://fiji.sc/Macros_Intro

Macro variables:

String concatenation: what is it?
And why do I need it?

```
number = 1;

text = “The number is “ + number;

run(“My plugin”, “does_not_work=number”);

run(“My plugin”, “this_works=” + number);
```

See also http://fiji.sc/Macros_Intro

Macros:

Comments

```
// This is a comment trying to help you to remember
// what you meant to do here:
a = exp(x * sin(y)) + atan(x * y – a);

// Code can be disabled by commenting it out
// x = y * 2;
```

See also http://fiji.sc/Macros_Intro

Macros:

Built-in macro functions

```
print(“The title reads “ + title);

rename(title); // change the image title

// This creates a new 640x480 color image
newImage(“My new image”, “RGB”, 640, 480, 1);
```

The documentation of available built-in macro functions can be accessed via *Help>Macro Functions...*

See also http://fiji.sc/Macros_Intro

Macros:

Example: Hello, World!

```
// This creates a new 640x480 color image
newImage("World image", "RGB black", 640, 480, 1);

// make a selection in the image
makeText("Hello, World!", 50, 300);

// draw it
run("Draw");

// write text into the Log window
print("Hello, World!");
```

See also http://fiji.sc/Macros_Intro

Macros:

Basic concept: User-defined functions

```
// Define a function for a recurring task
function newBlackImage(title, width, height) {
    // The function body is usually indented for clarity
    newImage(title, “RGB black”, width, height, 1);
}

newBlackImage(“Tiny”, 10, 10);
newBlackImage(“Huge”, 8000, 8000);
```

See also http://fiji.sc/Macros_Intro

Macros:

Basic concept: Conditional code blocks

```
// If the image is not binary, abort
if (!is(“binary”)) {
    exit(“You need a binary image for this macro!”);
}
```

```
// If the code block consists of only one statement, the
// curly braces can be dropped:
if (!is(“binary”))
    exit(“This image is not binary!”);
```

See also http://fiji.sc/Macros_Intro

Macros:

Basic concept: Loops

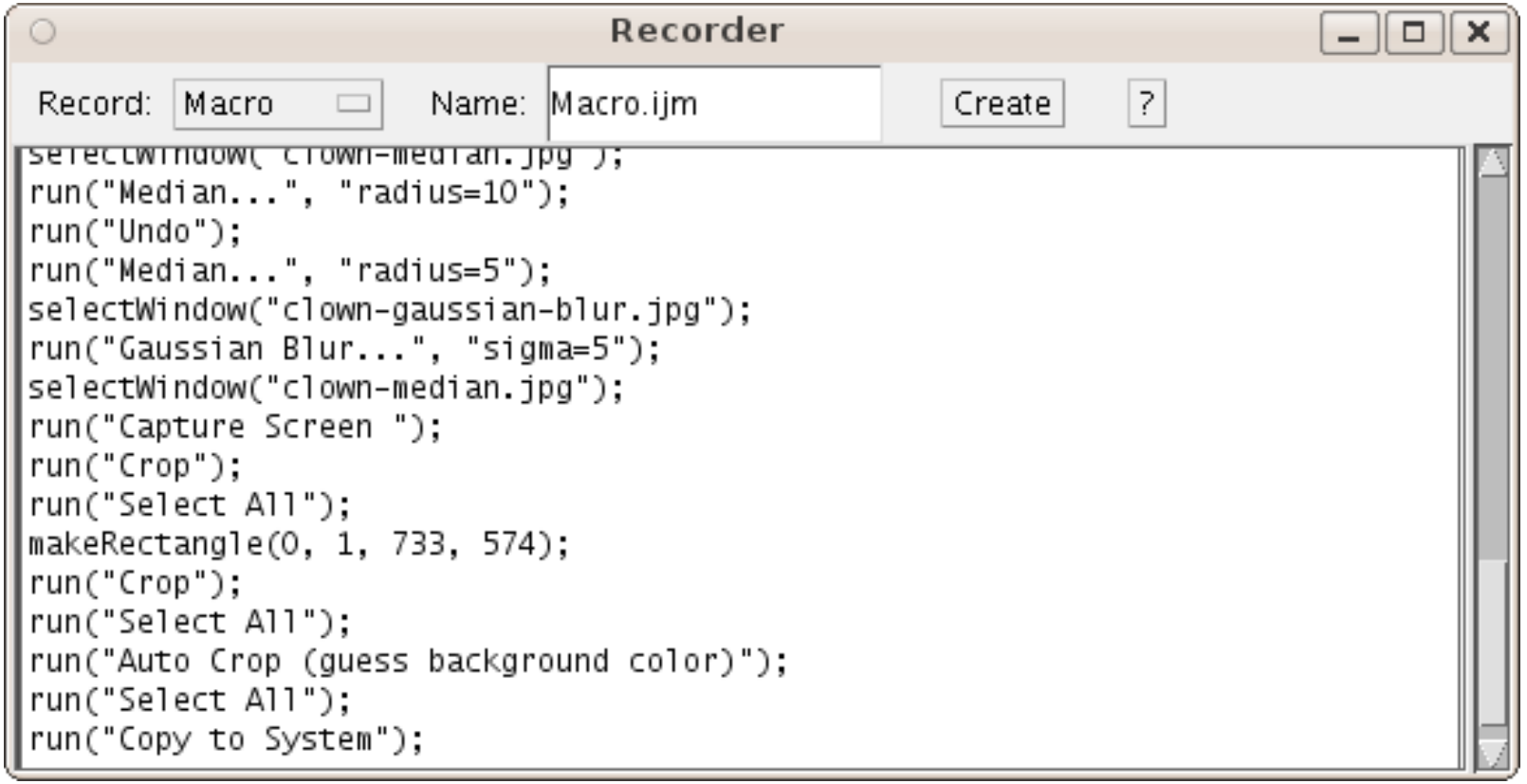
```
// Write “Hello, World!” ten times
for (i = 0; i < 10; i++)
    print(“Hello, World!”);

// As before, if the code block (or “loop body”) consists
// of more than one statement, curly braces need to
// be added
for (i = 0; i < 10; i++) {
    showProgress(i, 10); // show the progress bar
    run(“Gaussian Blur...”, “radius=” + i);
}
```

See also http://fiji.sc/Macros_Intro

Macros:

The Macro Recorder

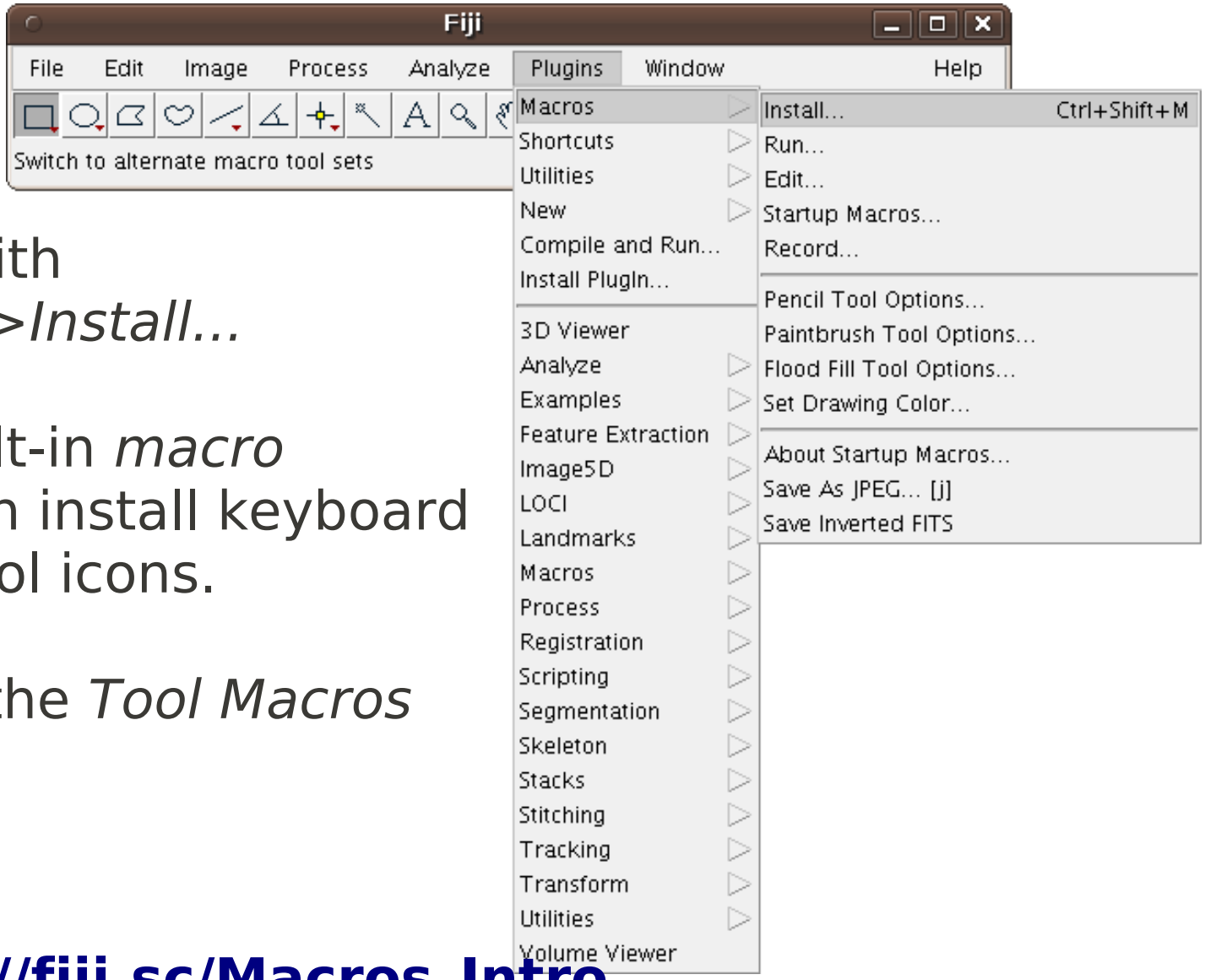
Start it with *Plugins>Macros>Record...*



See also http://fiji.sc/Macros_Intro

Macros:

Installing Macros



Install macros with *Plugins>Macros>Install...*

By using the built-in *macro* function, you can install keyboard shortcuts and tool icons.

For details, see the *Tool Macros* section in

Help>Macros...

See also http://fiji.sc/Macros_Intro

Macros:

Real-world example: keyboard shortcut

```
// install a keyboard shortcut: when pressing Ctrl+J,
// the user is asked for JPEG quality and for a location
// to save the current image as .jpg file

macro "Save As JPEG... [j]" {
    quality = call("ij.plugin.JpegWriter.getQuality");
    quality = getNumber("JPEG quality (0-100):", quality);
    run("Input/Output...", "jpeg="+quality);
    saveAs("Jpeg");
}
```

See also http://fiji.sc/Macros_Intro

Macros:

Real-world example: action tool

```
// A click on the empty rectangle will have the same
// effect as File>Save As>Jpeg...

macro "Save As JPEG Action Tool - C000R11ee" {
    saveAs("Jpeg");
}

// A right-click on the tool icon lets the user change
// the JPEG Quality

macro "Save As JPEG Action Tool Options" {
    quality = call("ij.plugin.JpegWriter.getQuality");
    quality = getNumber("JPEG quality (0-100):", quality);
    run("Input/Output...", "jpeg="+quality);
}
```

Macros:

Examples on the Fiji Wiki

http://fiji.sc/Macros_Intro#Example_macros

Note: double-clicking the code snippets automatically selects them for easy copying into the Clipboard.

Macros:

Further examples & documentation

http://rsb.info.nih.gov/ij/developer/index.html

Plugins:

When macros are not enough...

Macros are quick and easy to record or write, but

- Slow
- Waste memory for more complicated tasks
- Cannot use the full functionality of ImageJ, only what the built-in functions offer
- Run always in foreground, blocking the computer

Plugins:

What does a plugin consist of?

Plugins are *.jar* files (really *.zip* files with a certain structure), containing:

• One or more Java class(es) implementing the functionality, and

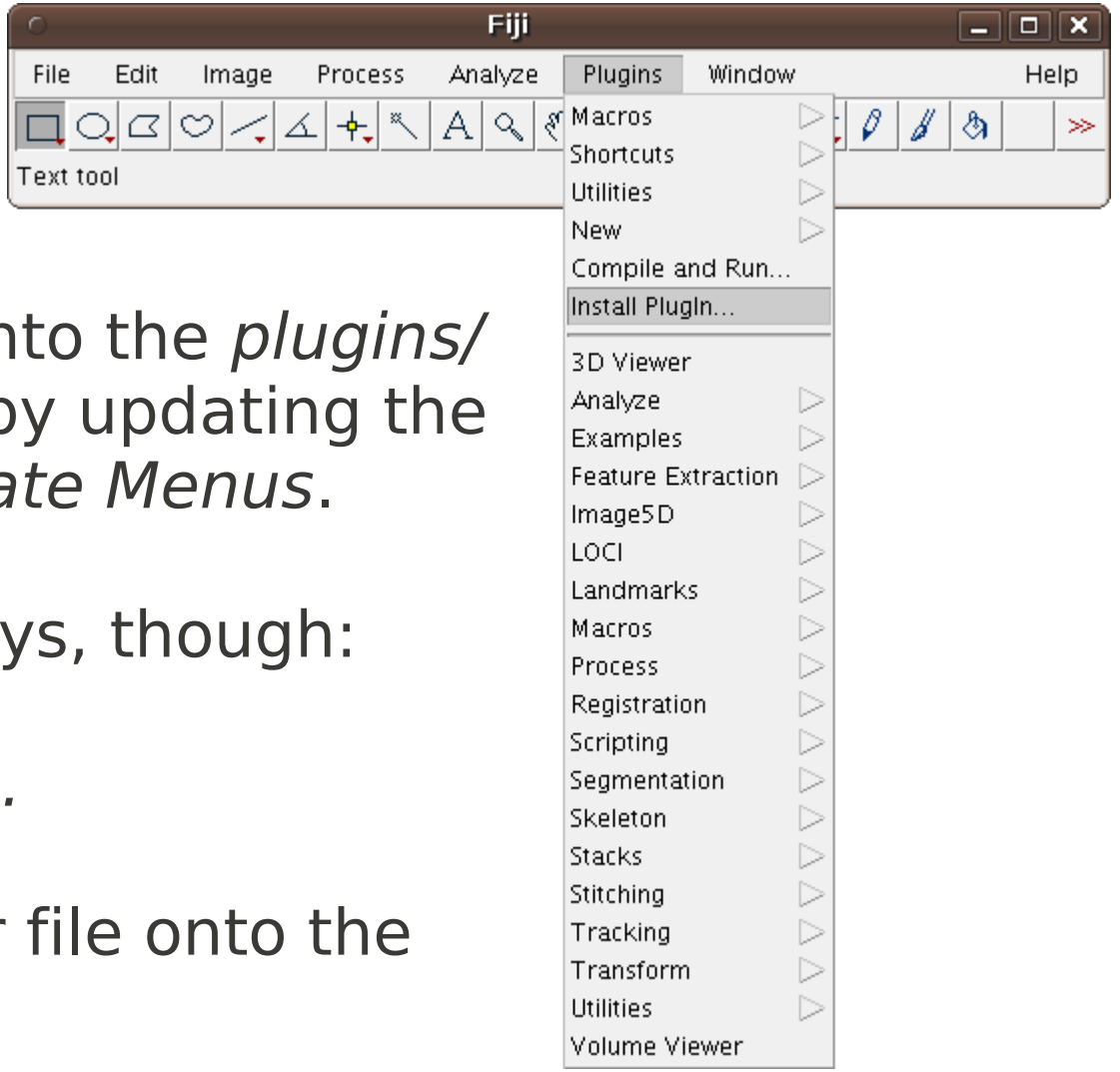
• a *plugins.config* file defining which menu entries offer the functionality.

• Optionally additional resources required by the plugin, such as images or icons.

If the plugin is implemented in one Java class, and it offers only one menu entry in the *Plugins* menu, it can be offered as bare *.java* or *.class* file, too.

Plugins:

Installing plugins



Plugins can be installed manually by copying the *.jar* file into the *plugins/* subdirectory of Fiji and by updating the menus using *Help>Update Menus*.

There are two easier ways, though:

- *Plugins>Install PlugIn...*

- Or drag 'n drop the .jar file onto the Fiji main window.

Plugins:

Where do I find new plugins?

http://rsb.info.nih.gov/ij/plugins/index.html

Plugins

Contents

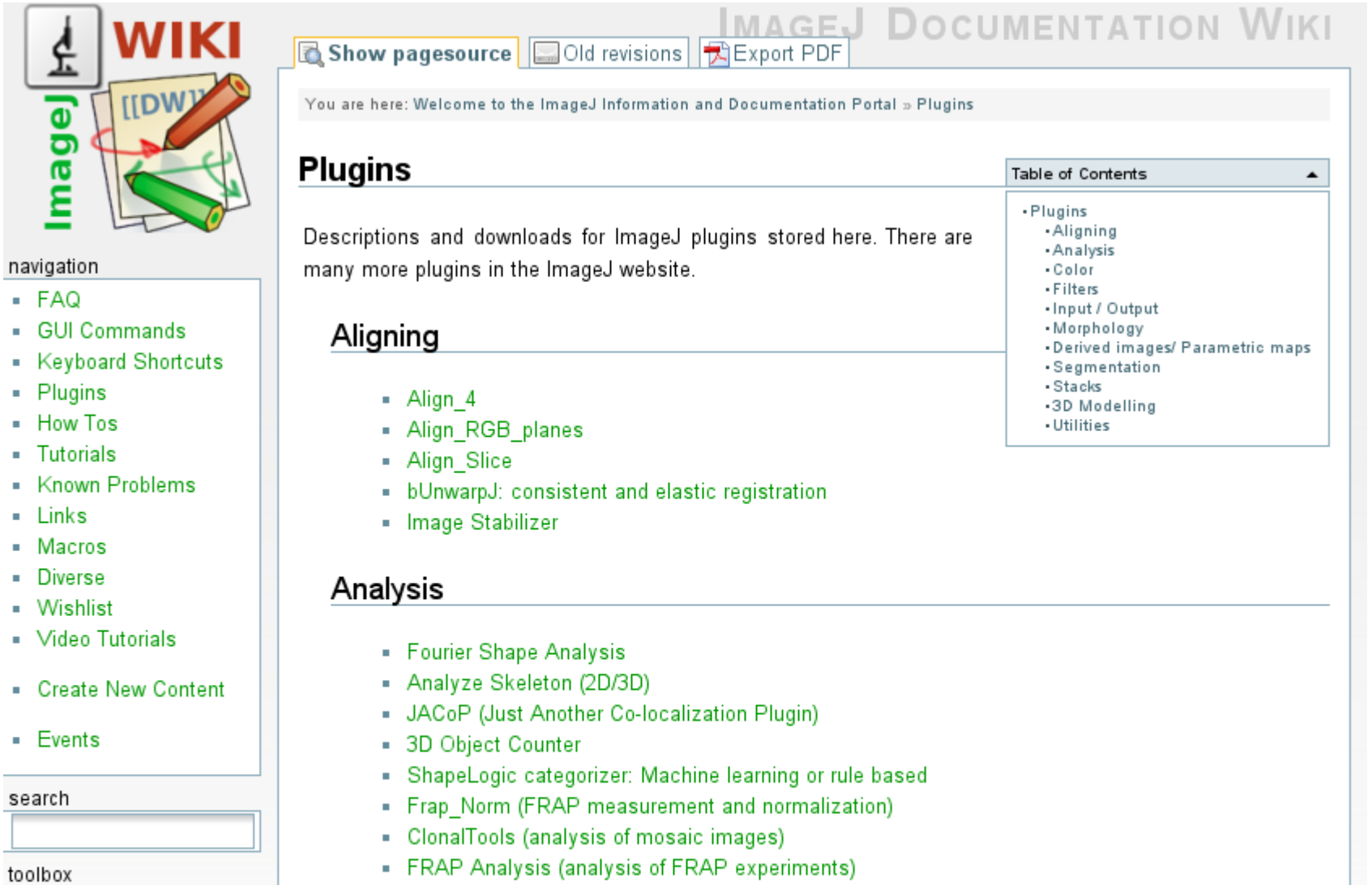
Acquisition [top]

Hamamatsu Orca 12-bit Camera
Shading Corrector
QuickTime Capture (Capture images using QuickTime) Updated
TWAIN
JTwain
Twain Scan New
SensiCam Long Exposure Camera

Plugins:

Where do I find new plugins?

http://imagejdocu.tudor.lu/doku.php?id=plugin:start



Fiji community:

Mailing lists:

Fiji User list <fiji-user@googlegroups.com>

ImageJ mailing list <imagej@list.nih.gov>

Fiji developer list <fiji-devel@googlegroups.com>

IRC (internet chat):

#fiji-devel on irc.freenode.net

See also http://fiji.sc/IRC

Documentation, information, tutorials:

http://fiji.sc/

Thanks!

Max Planck Institute CBG, Dresden
http://www.mpi-cbg.de/

Janelia Farm, Ashburn VA http://janelia.hhmi.org

INI, Zürich http://www.ini.uzh.ch/

Wayne Rasband (ImageJ)

The Fiji Team:

http://fiji.sc/Contributors