

# **Introduction to ImageJ**

**Image Processing & Analysis for Life Scientist**

Romain Guiet, Olivier Burri & Arne Seitz



# Introduction to ImageJ

---



- Why choosing ImageJ ?
- How to install/run ImageJ/Fiji
- ImageJ as a tool to display images.
- What is "metadata"?
- Record macro
- Where to get help



# Many Software Exist



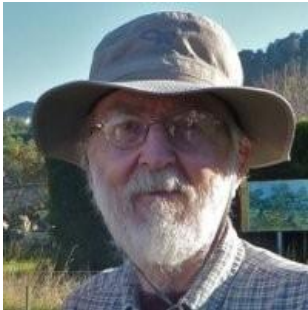
...



# ImageJ - History



1997



Wayne  
Rasband

**NIH Image to ImageJ: 25 years of image analysis.**  
Schneider CA, Rasband WS, Eliceiri KW.  
[Nat Methods](#). 2012 Jul;9(7):671-5.  
PMID : 22930834



2005



Johannes  
Schindelin



[github.com/fiji](https://github.com/fiji) **contributors**



# Fiji - Home Page



The screenshot shows a web browser window with the title "Fiji is just ImageJ". The address bar shows "https://fiji.sc". The page has a dark navigation bar with links for "Fiji", "Home", "Wiki", "Source", and "Forum". A search bar is also present. The main content area features the Fiji logo (a blue stylized 'F') and a description: "Fiji is an image processing package—a 'batteries-included' distribution of [ImageJ](#), bundling a lot of plugins which facilitate scientific image analysis." Below this are three buttons: "Download »", "Cite »", and "Contribute »". A diagonal banner in the top right corner says "Find me on GitHub!".

**Tweets** by @FijiSc

Fiji Retweeted

**Curtis Rueden**  
@ctrueden

imagej 0.2.0 released on PyPI: [pypi.org/project/imagej/](https://pypi.org/project/imagej/)  
imagej 1.0.0 released on npm: [npmjs.com/package/imagej](https://npmjs.com/package/imagej)  
Have fun calling [#ImageJ](#) in-process from Python and/or

[Embed](#) [View on Twitter](#)

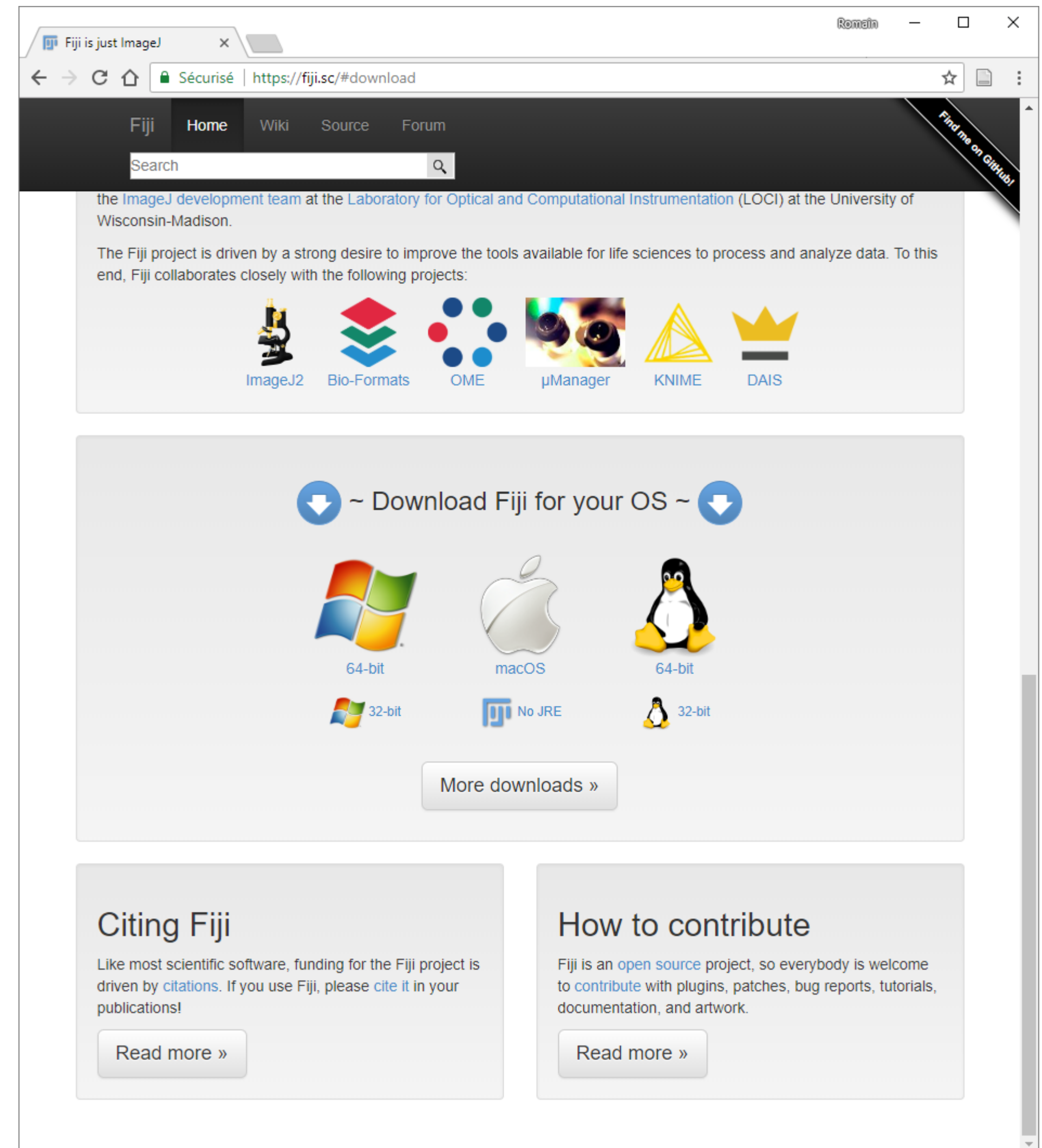
**SPIM Registration**  
Quickly and accurately register and fuse Selective Plane Illumination Microscopy data as well as other 3D multi-angle image acquisitions.



Iteration 283  
(σ = 1.1 px)



# Fiji - Home Page



The screenshot shows the Fiji Home Page in a web browser. The browser's address bar displays "https://fiji.sc/#download". The page features a dark navigation bar with links for "Fiji", "Home", "Wiki", "Source", and "Forum", along with a search bar. A diagonal banner on the right says "Find me on GitHub!". The main content area includes a paragraph about the ImageJ development team at the University of Wisconsin-Madison, followed by a list of partner projects with their logos: ImageJ2, Bio-Formats, OME, µManager, KNIME, and DAIS. Below this is a large section titled "Download Fiji for your OS" with icons for Windows (64-bit, 32-bit), macOS, and Linux (64-bit, 32-bit), plus a "No JRE" option. A "More downloads »" button is at the bottom of this section. The footer contains two columns: "Citing Fiji" with a "Read more »" button, and "How to contribute" with a "Read more »" button.

Fiji is just ImageJ

← → ↻ ⌂ Sécurisé | <https://fiji.sc/#download> ☆







Fiji Home Wiki Source Forum

Search 🔍




Find me on GitHub!

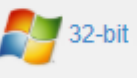


the [ImageJ development team](#) at the [Laboratory for Optical and Computational Instrumentation \(LOCI\)](#) at the University of Wisconsin-Madison.

The Fiji project is driven by a strong desire to improve the tools available for life sciences to process and analyze data. To this end, Fiji collaborates closely with the following projects:

 [ImageJ2](#)  [Bio-Formats](#)  [OME](#)  [µManager](#)  [KNIME](#)  [DAIS](#)

~ Download Fiji for your OS ~

 64-bit  macOS  64-bit

 32-bit  No JRE  32-bit

[More downloads »](#)

### Citing Fiji

Like most scientific software, funding for the Fiji project is driven by [citations](#). If you use Fiji, please [cite it](#) in your publications!

[Read more »](#)

### How to contribute

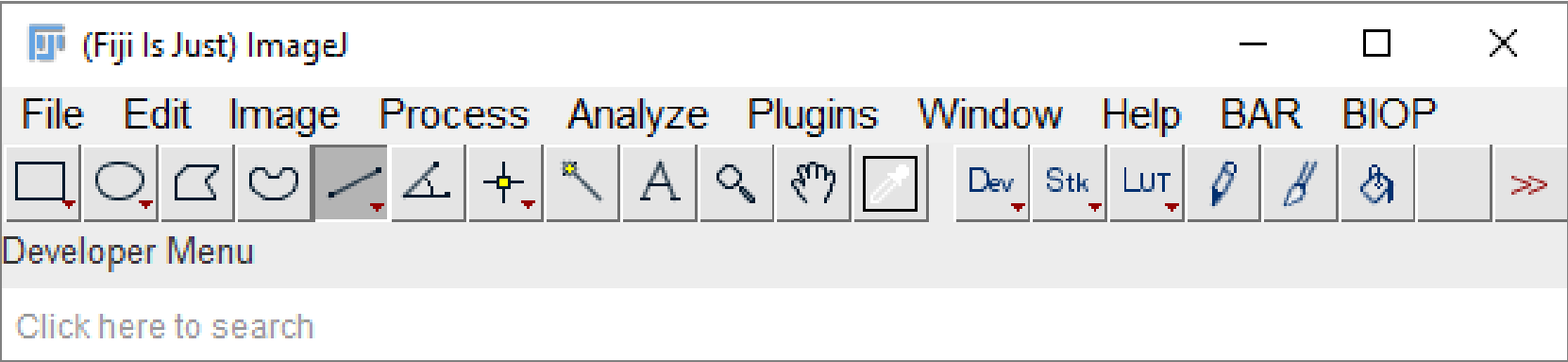
Fiji is an [open source](#) project, so everybody is welcome to [contribute](#) with plugins, patches, bug reports, tutorials, documentation, and artwork.

[Read more »](#)



# Fiji - Benefits

- Java





# Fiji - Benefits

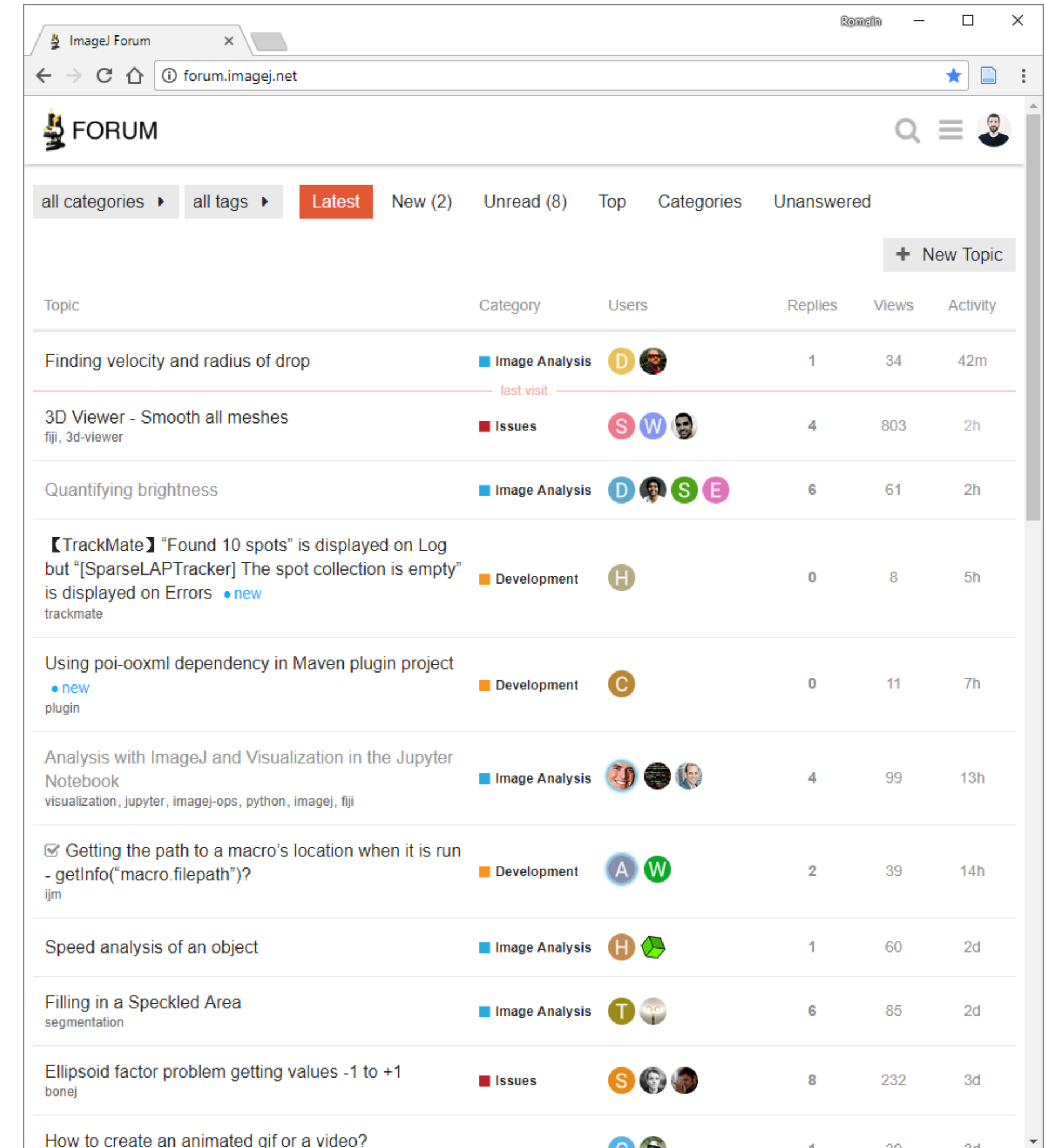
- Java
- Large community
  - 1000 plugins
  - Documentation, tutorials





# Fiji - Benefits

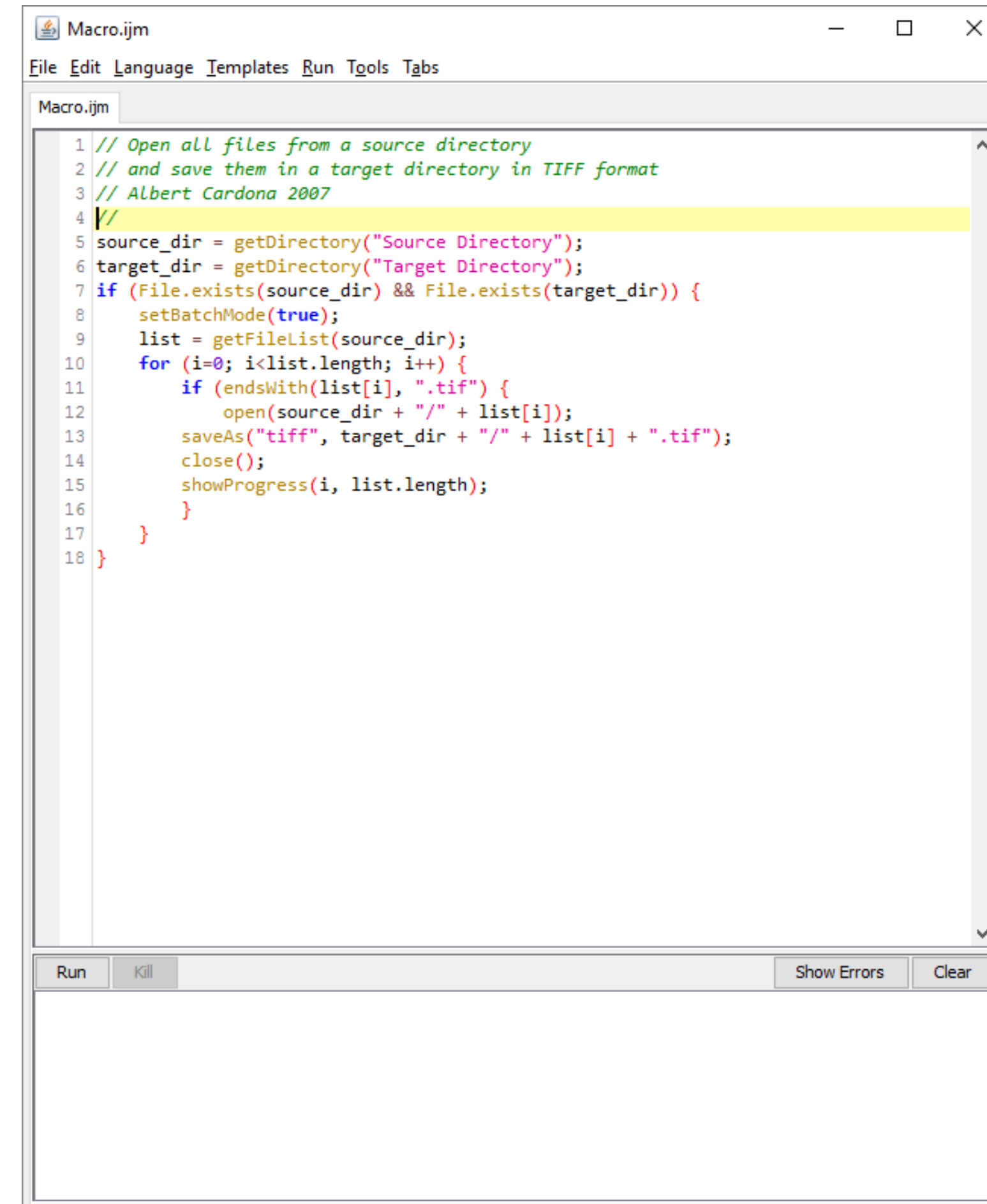
- Java
- Large community
  - 1000 plugins
  - Documentation, tutorials
  - Forum





# Fiji - Benefits

- Java
- Large community
  - 1000 plugins
  - Documentation, tutorials
  - Forum
  - Easy Scripting using “macro language”



The screenshot shows the 'Macro.ijm' window in Fiji. The menu bar includes File, Edit, Language, Templates, Run, Tools, and Tabs. The script content is as follows:

```
1 // Open all files from a source directory
2 // and save them in a target directory in TIFF format
3 // Albert Cardona 2007
4 //
5 source_dir = getDirectory("Source Directory");
6 target_dir = getDirectory("Target Directory");
7 if (File.exists(source_dir) && File.exists(target_dir)) {
8     setBatchMode(true);
9     list = getFileList(source_dir);
10    for (i=0; i<list.length; i++) {
11        if (endsWith(list[i], ".tif") {
12            open(source_dir + "/" + list[i]);
13            saveAs("tiff", target_dir + "/" + list[i] + ".tif");
14            close();
15            showProgress(i, list.length);
16        }
17    }
18 }
```

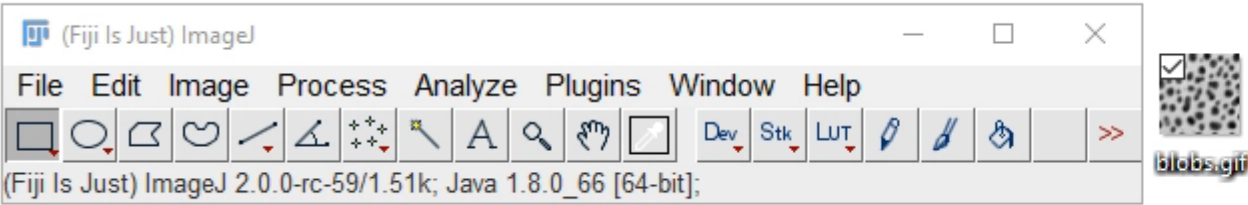
At the bottom of the window, there are buttons for 'Run', 'Kill', 'Show Errors', and 'Clear'.





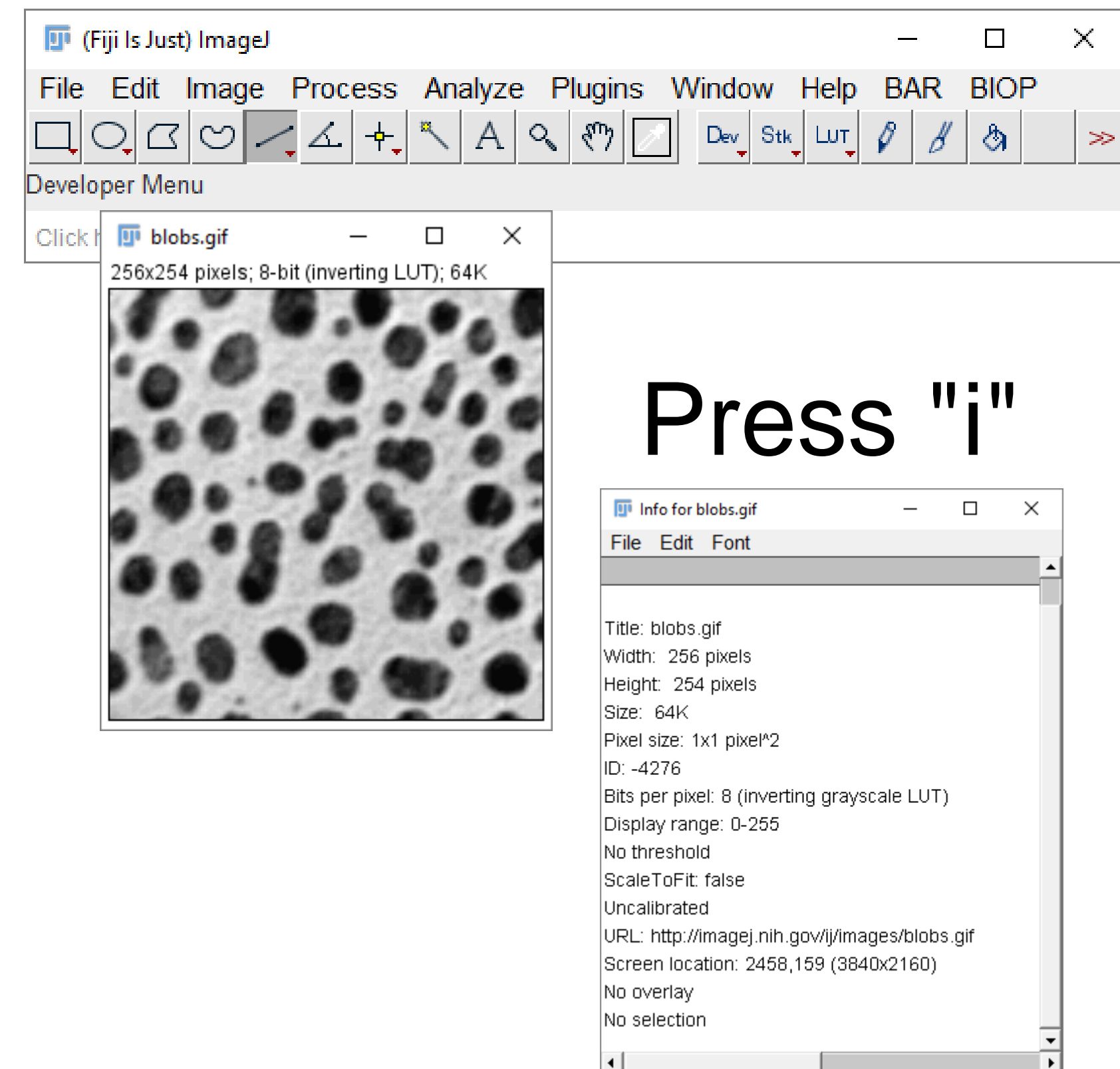


# Fiji - First use



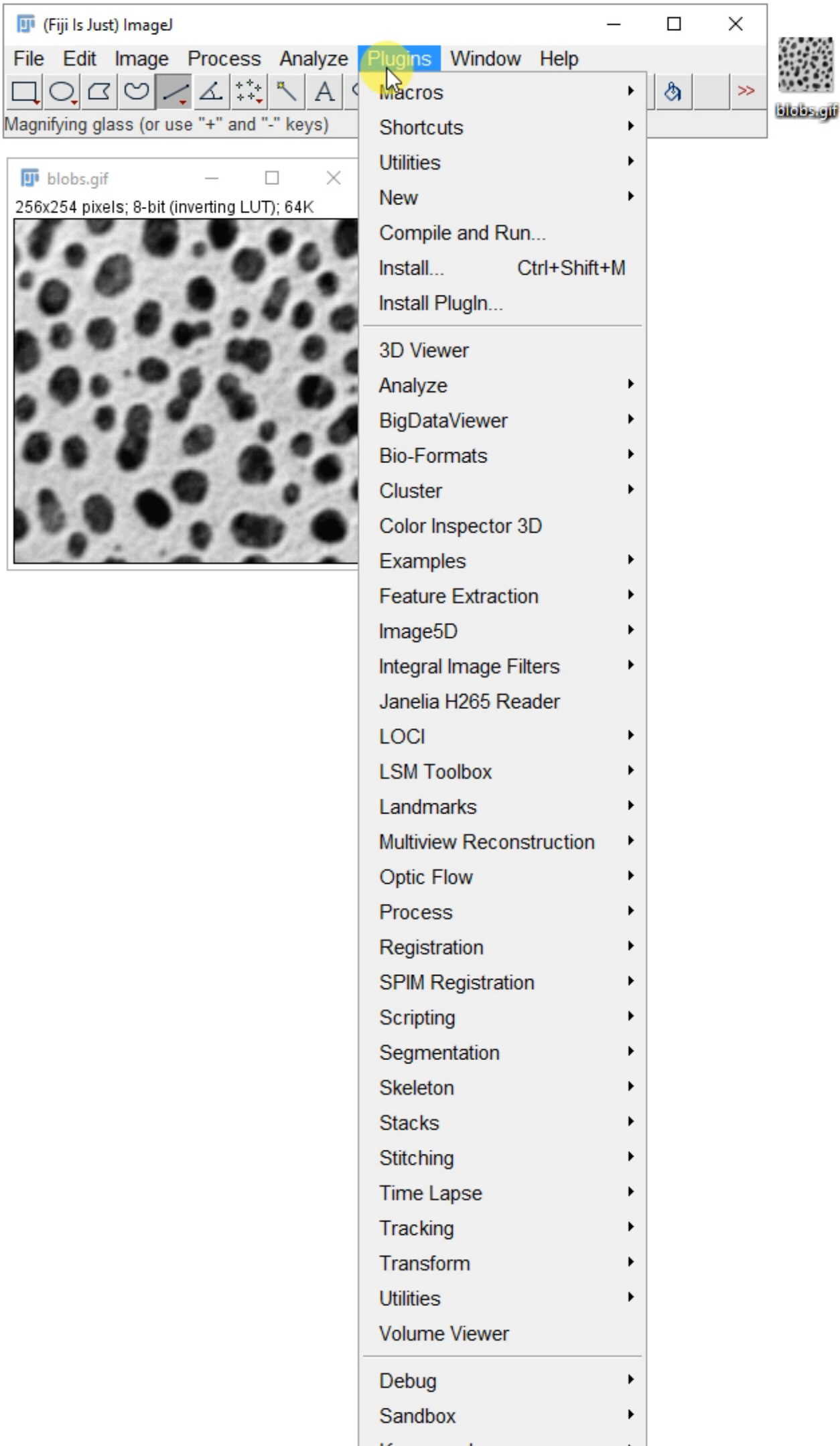


- Pixel Size, bit depth, ...



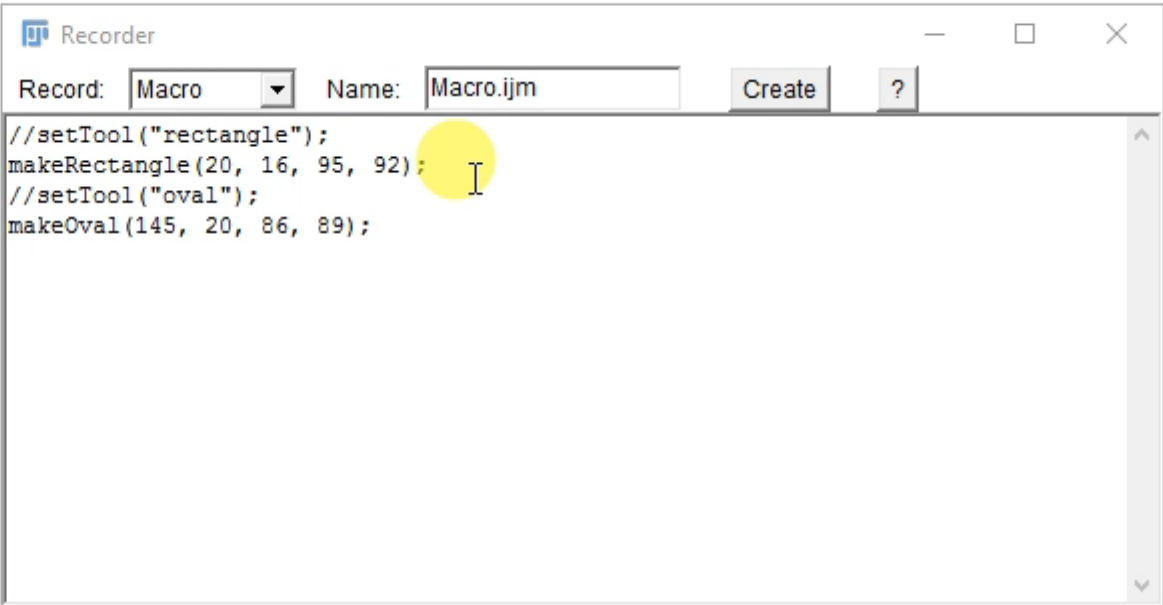
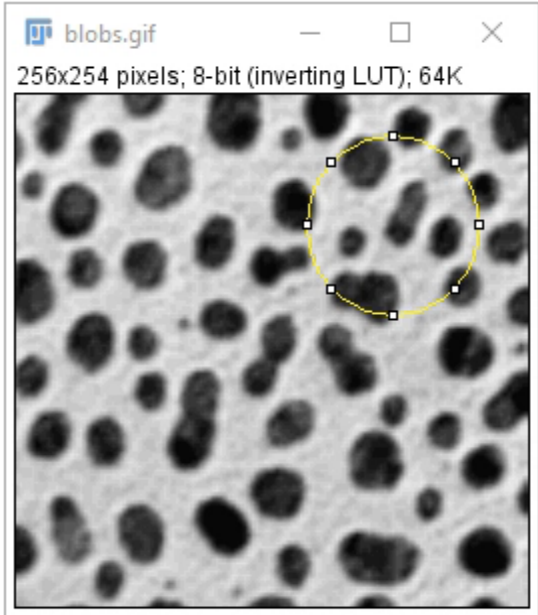
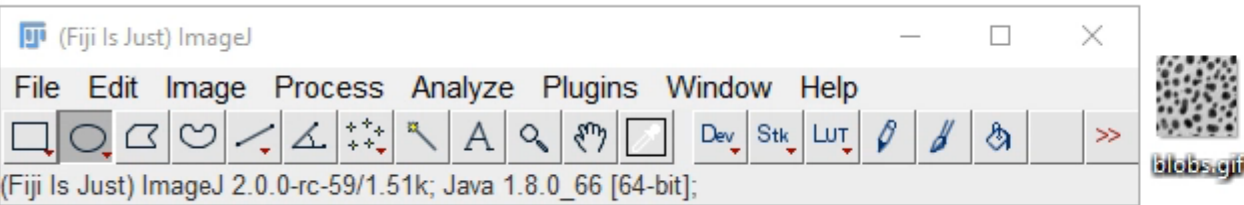


# Fiji - Recorder



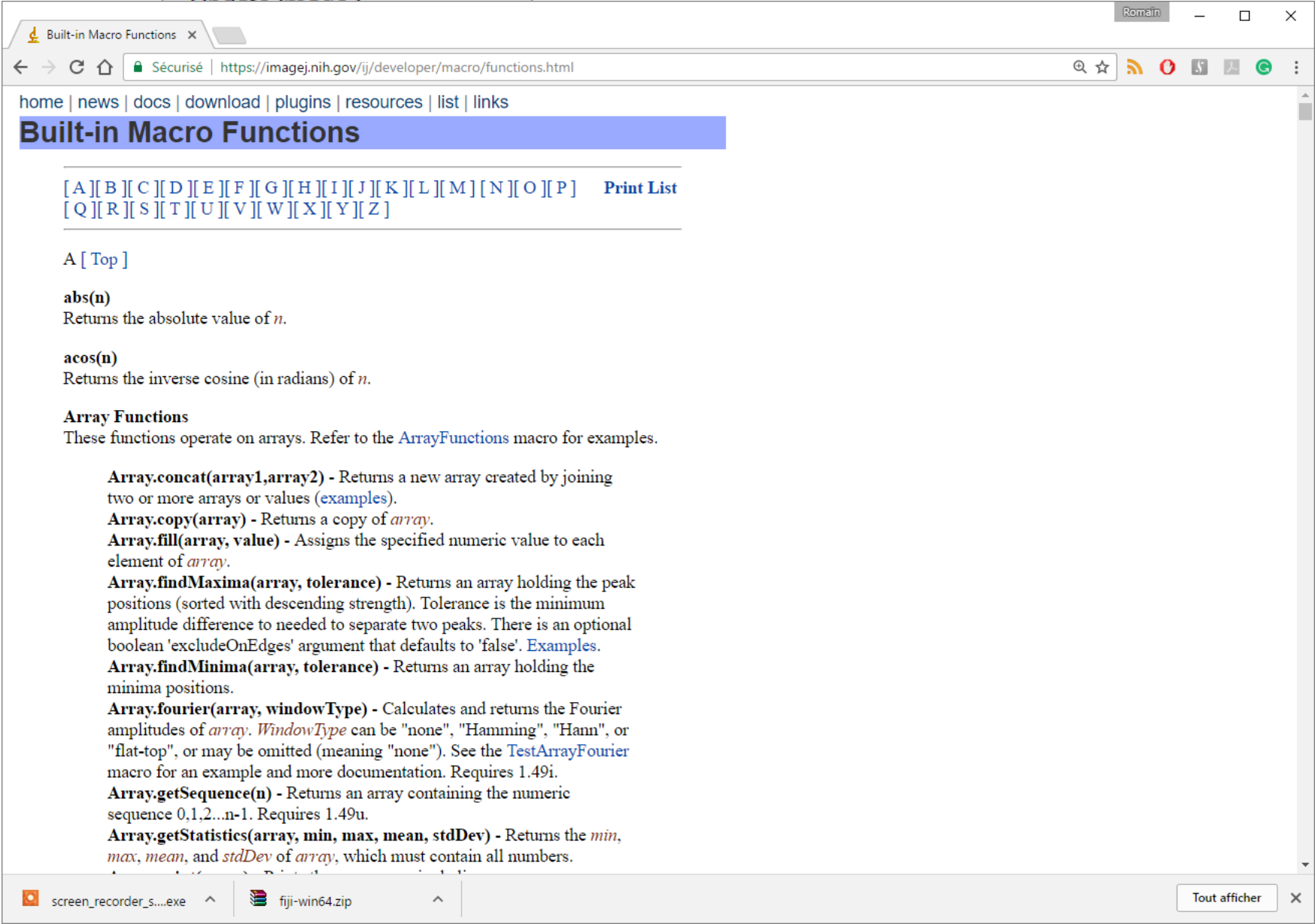
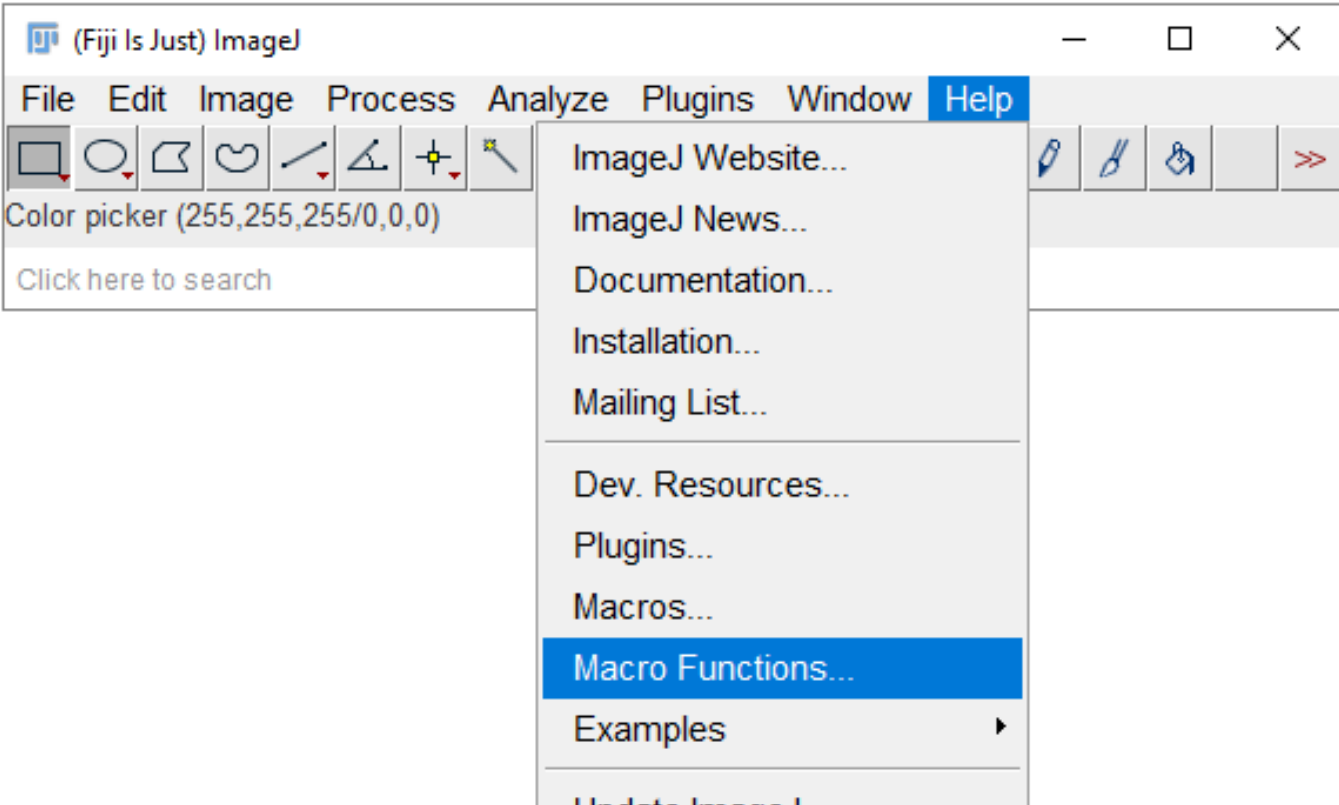


# Fiji - Create a Macro



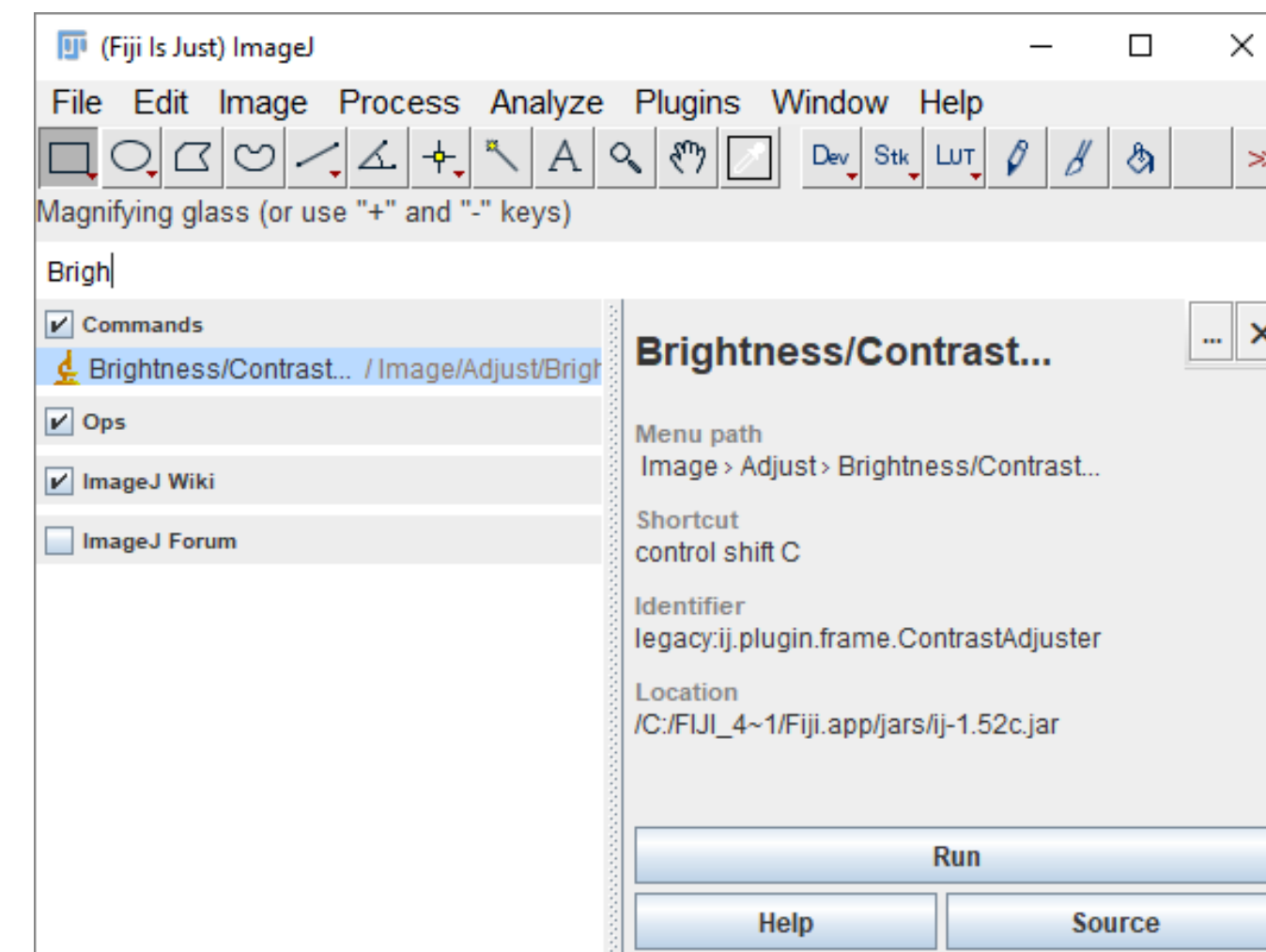
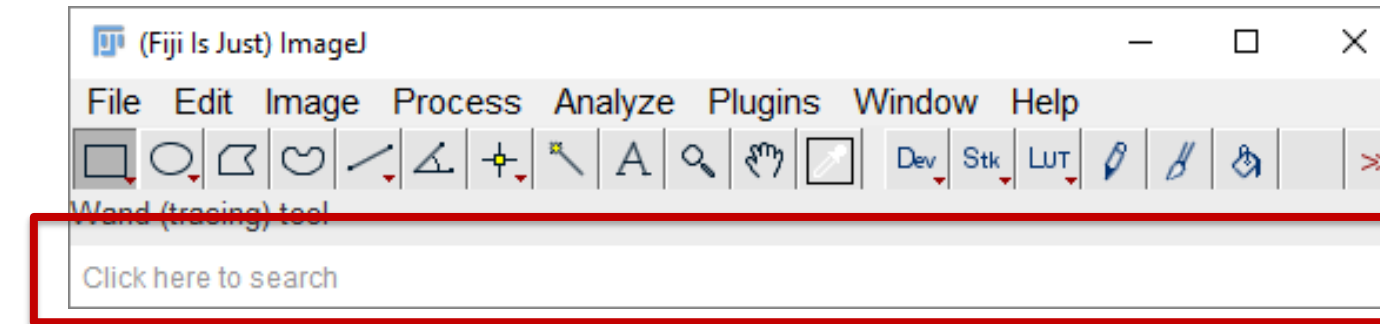


# Fiji - Finding Function





# FIJI - Finding Function

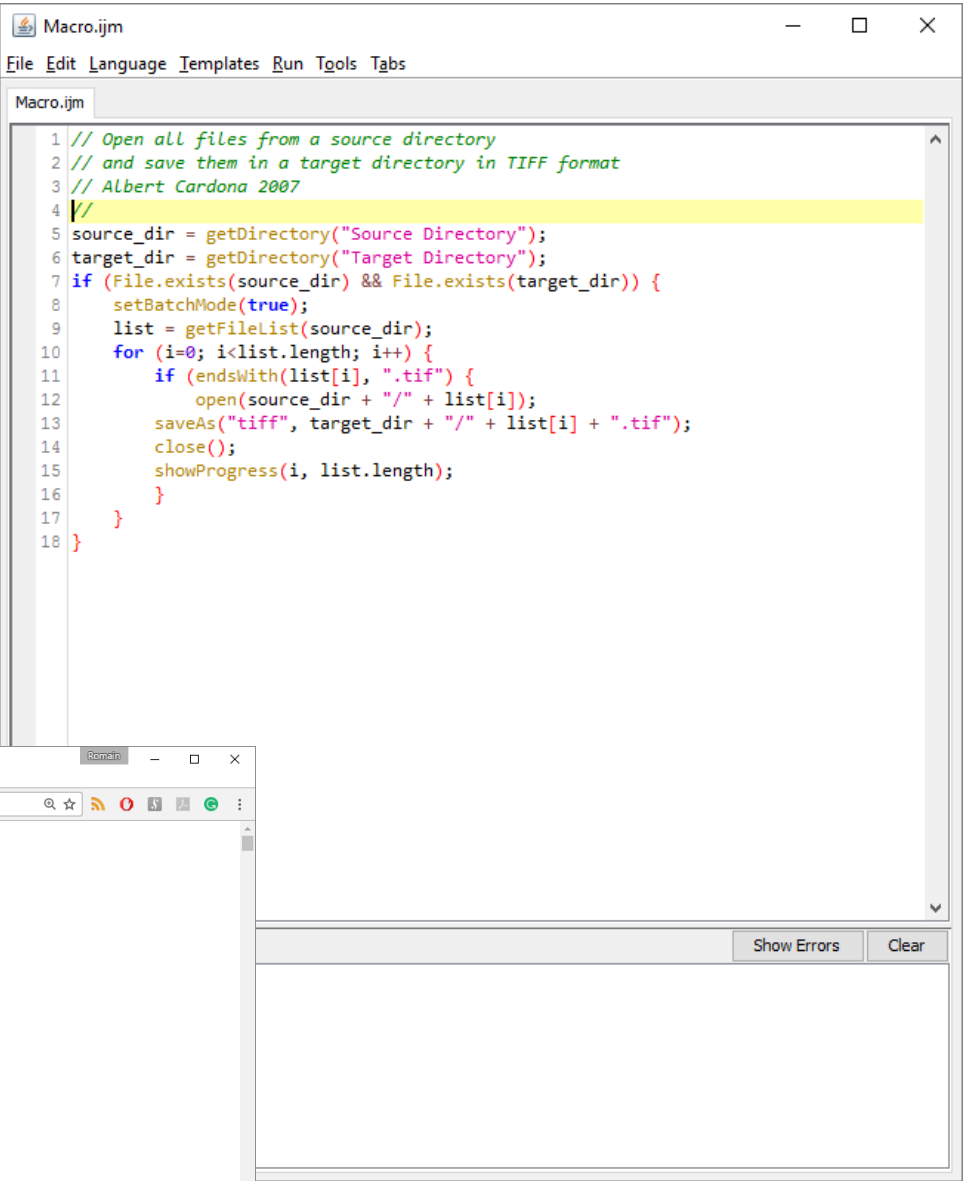
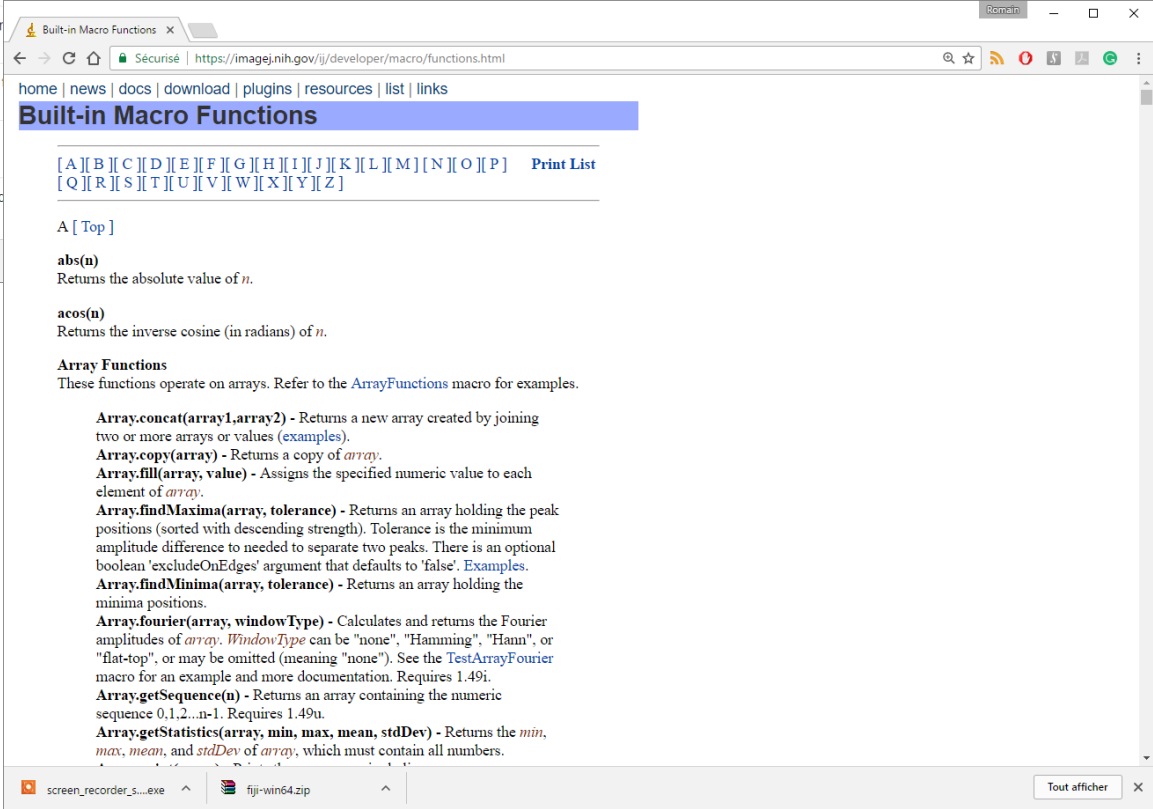
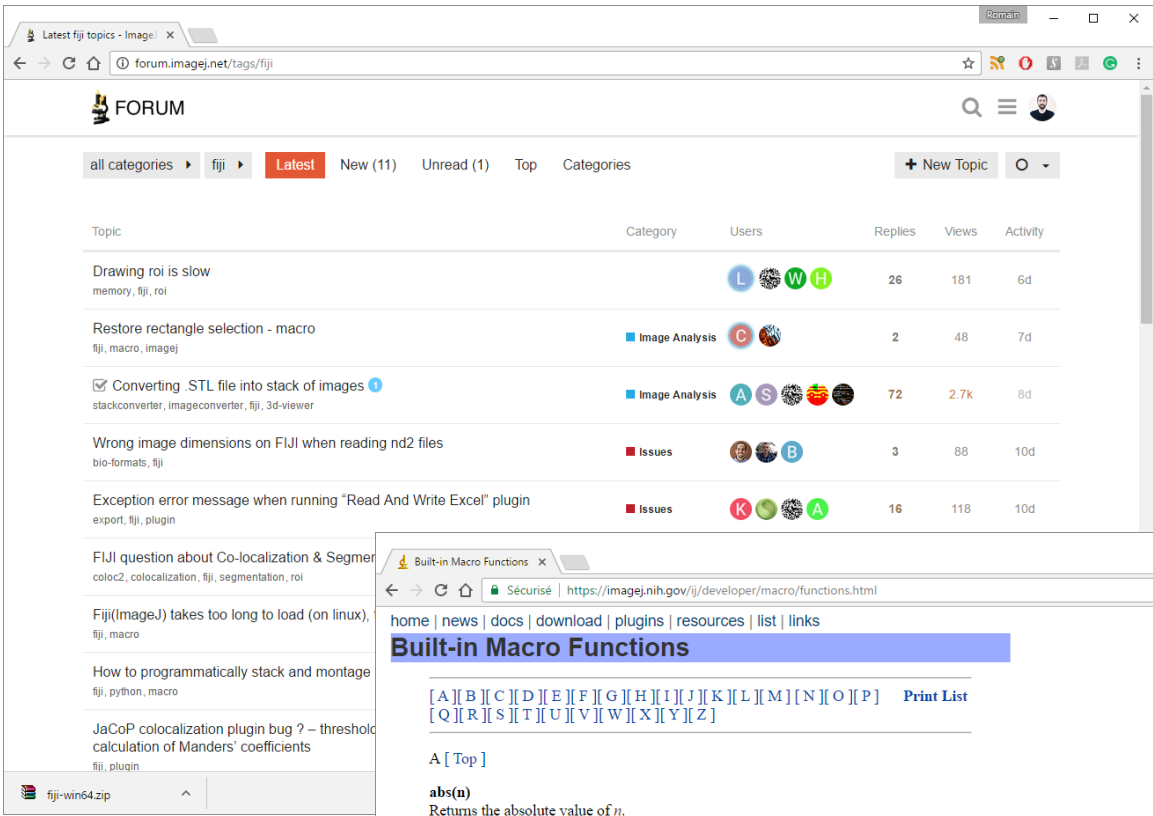
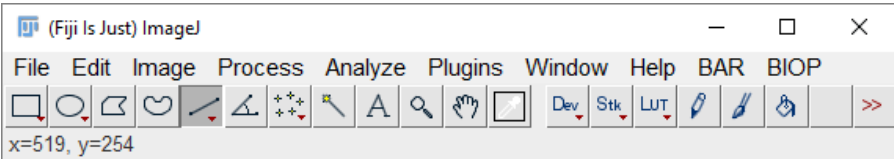




- Fiji = ImageJ
- Fiji benefits & First use
- Images contain Metadata
  - usefull information required for processing
- Use of the Recorder
  - Keep track of actions
  - Reproducibility
- Where to find additional help
  - Function web page
  - forum



# Conclusion













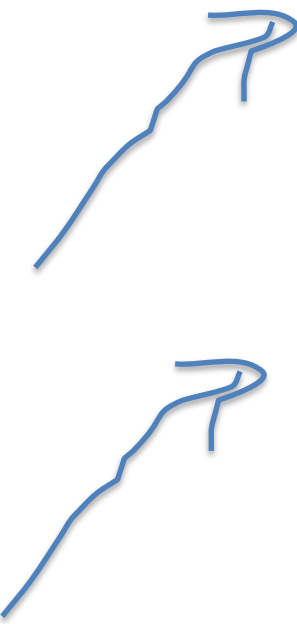
# Sample => Explanations (Split shot)



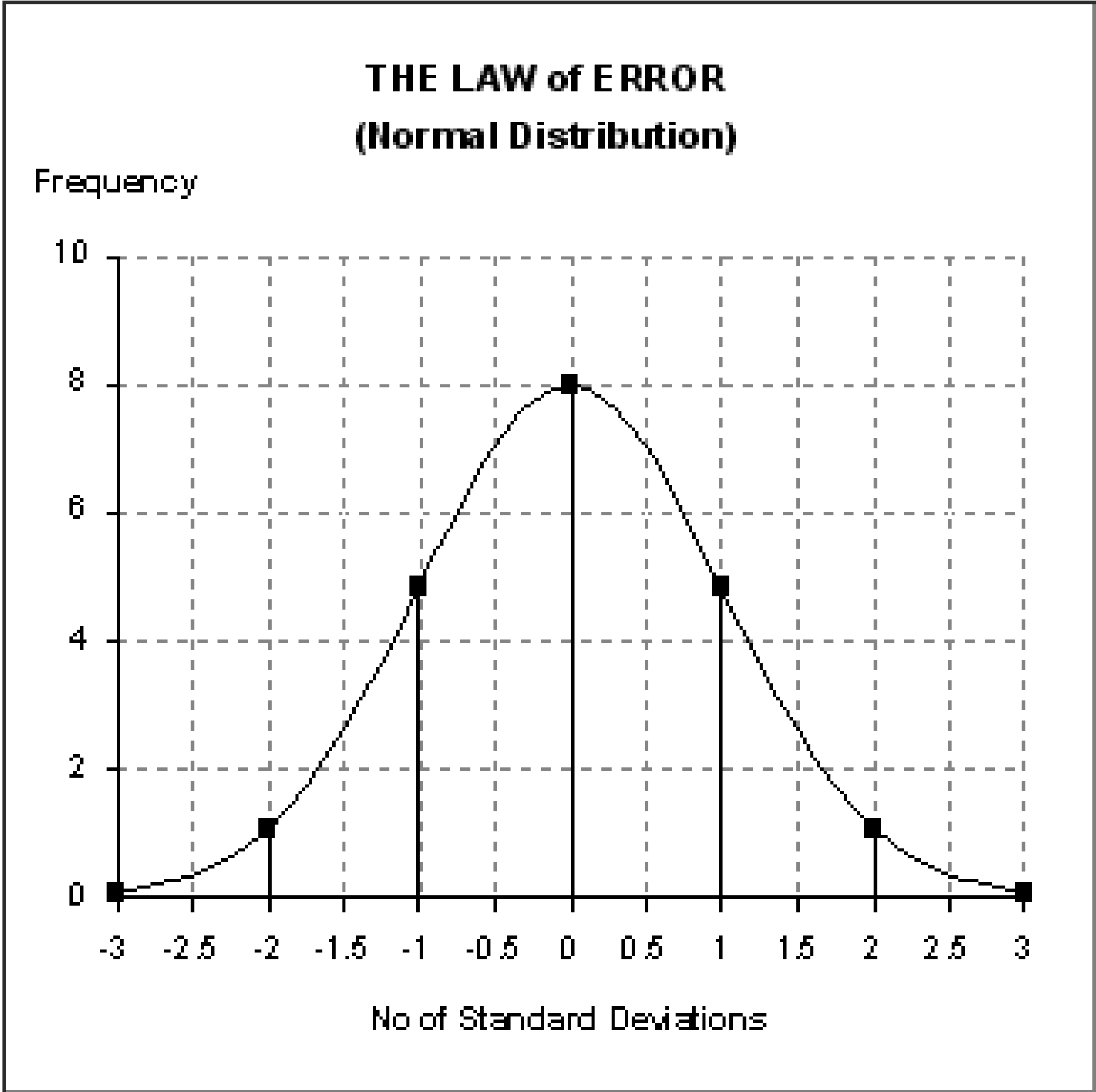
- Referring and explaining
- Split Shot with professor profile
  - Look at the iMac (screen placed on the side of the camera)
  - This will result in a 2/3 shot that gives the impression that the teacher is looking at the content.
- For Bullets and Video
  - Use this shot when commenting static content (an image, graphics, a schema) or a video



# Sample => Complementary representations



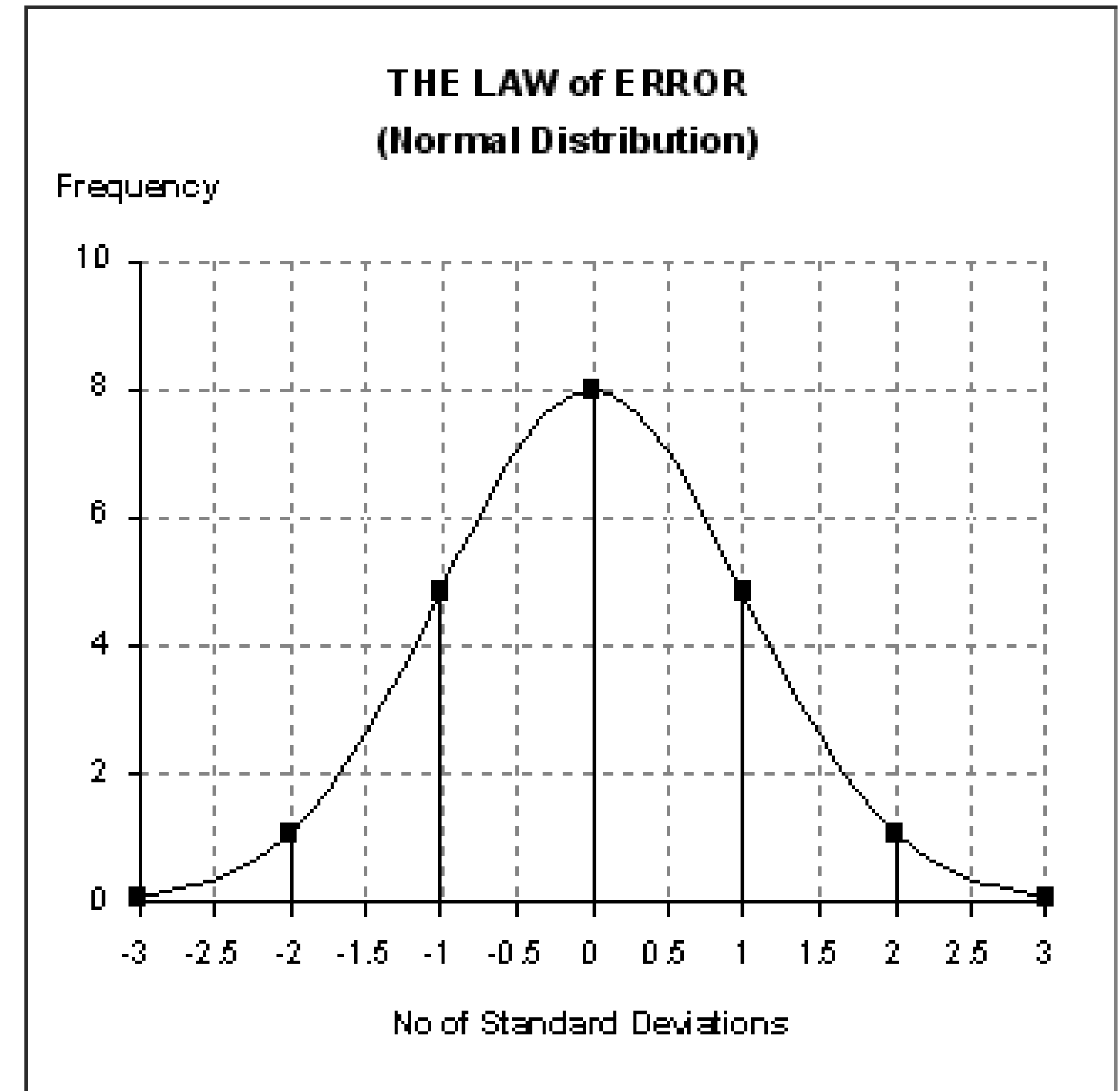
Notation	$\mathcal{N}(\mu, \Sigma)$
Parameters	$\mu \in \mathbb{R}^k$ — location $\Sigma \in \mathbb{R}^{k \times k}$ — covariance (nonnegative-definite matrix)
Support	$x \in \mu + \text{span}(\Sigma) \subseteq \mathbb{R}^k$
PDF	$ 2\pi \Sigma ^{-\frac{1}{2}} e^{-\frac{1}{2}(x-\mu)' \Sigma^{-1}(x-\mu)}$ , exists only when $\Sigma$ is positive-definite
CDF	(no analytic expression)
Mean	$\mu$
Mode	$\mu$
Variance	$\Sigma$
Entropy	$\frac{1}{2} \ln  2\pi e \Sigma $
MGF	$\exp\left(\mu' t + \frac{1}{2} t' \Sigma t\right)$
CF	$\exp\left(i \mu' t - \frac{1}{2} t' \Sigma t\right)$





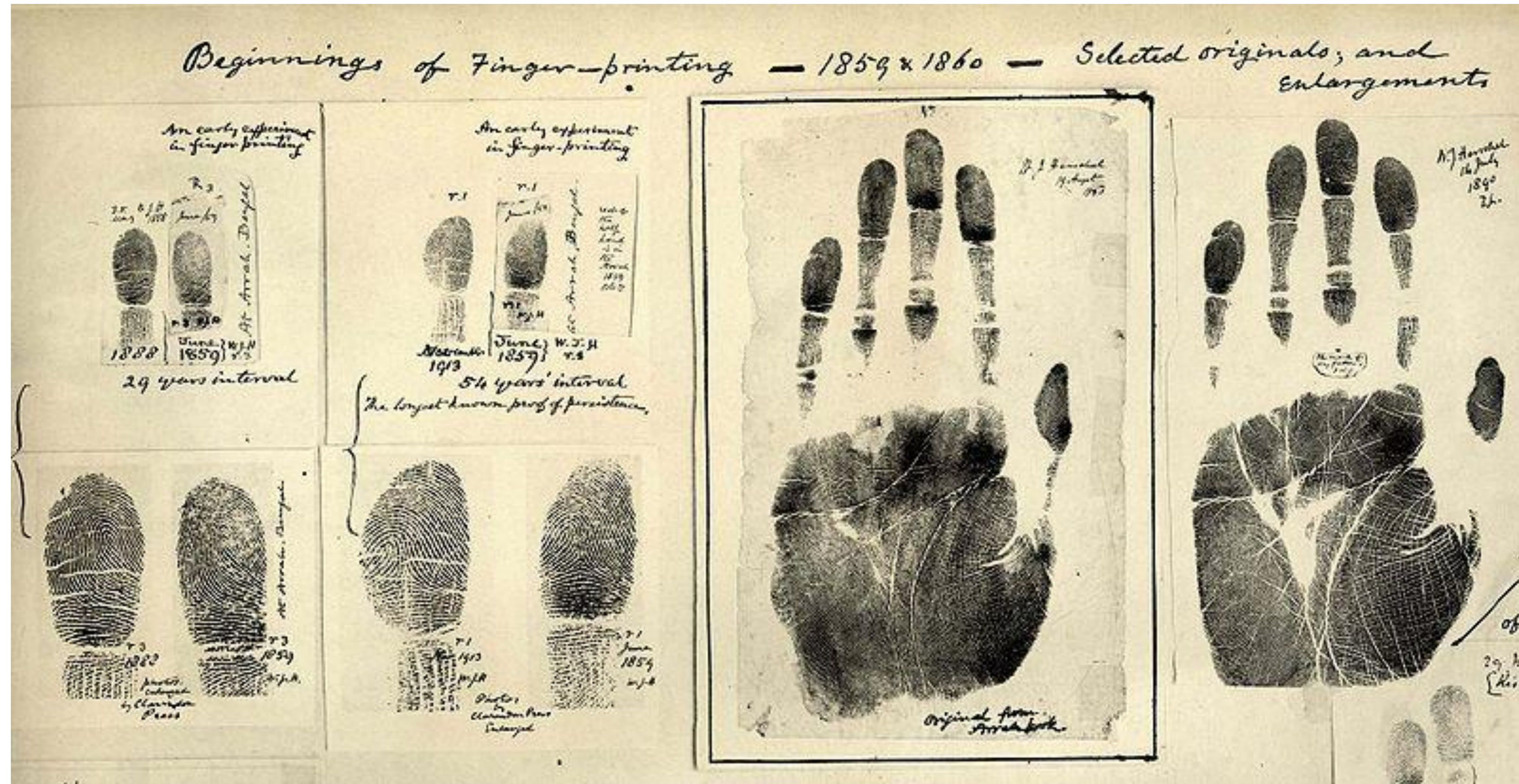
# Sample => Handwriting and reference (Split shot)

$$\exp\left(\mu't + \frac{1}{2} t' \Sigma t\right)$$



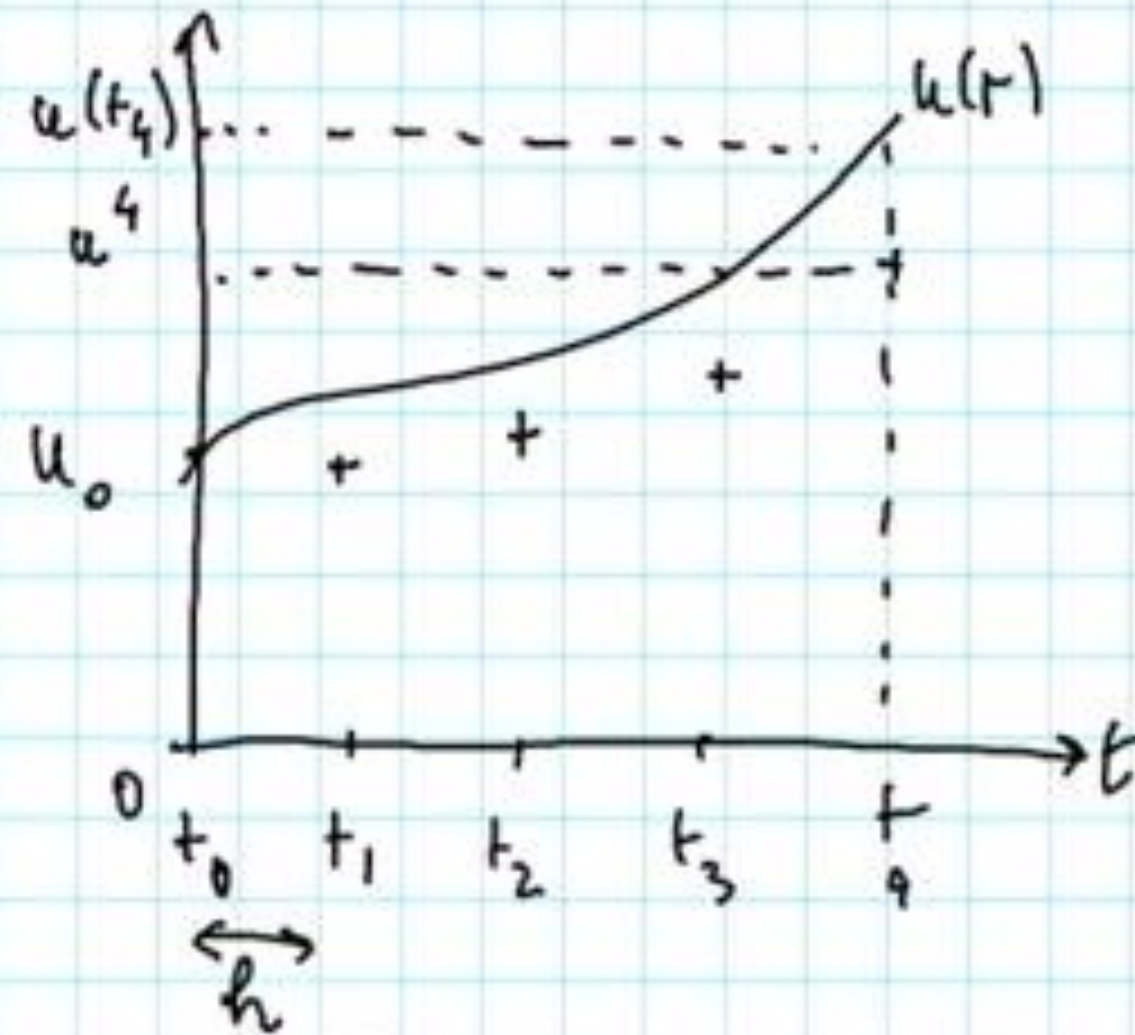


# Sample => Wide Content, picture or video





# Sample => Handwritten Content (Full shot)



$t_n = nh$   $n=0,1,2,\dots$  Calculer  $u^n$  de  $u(t_n)$

A partir de  $u^0 = u_0$  on va calculer  $u^1, u^2, \dots, u^{n+1}$  } méthode de marche en temps.

Schéma d'Euler progressif:  $\frac{u^{n+1} - u^n}{h} = f(u^n, t_n)$

origine? on écrit l'éq. diff. temps  $t_n$ :  $\dot{u}(t_n) = f(u(t_n), t_n)$  on utilise une formule de diff. finies progressive pour approcher  $\dot{u}(t_n)$  chap 2

$$\frac{u(t_{n+1}) - u(t_n)}{h} = f(u(t_n), t_n) + O(h) \text{ on remplace } u(t_n) \text{ par } u^n$$

avantage: schéma explicite:  $u^{n+1} = u^n + h f(u^n, t_n)$  facile à programmer

inconven



- Try to **avoid this**
- This is a layout that you would use if you have long text in bullets
  - But this might be **difficult to read**
  - And looses a lot of white space
- The best use of this template is to use it to present images or videos
  - The layout allows to have a title, logo, page number around the content.
  - Another advantage compared to the Blank Page Layout is that the content placed in a box:
    - Will be replaced and sized when you change the layout for the slide
    - Will survive the transition to another template in the future.

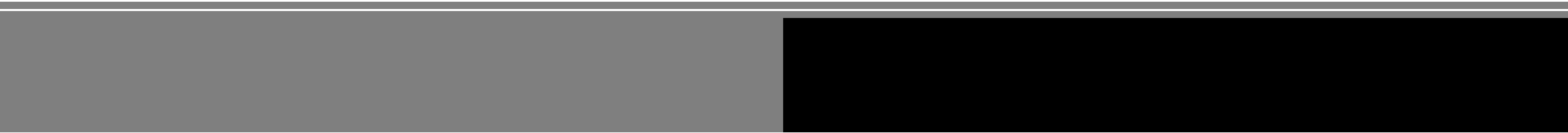


# Graphical elements

Texte Arial Narrow Bold

Texte Arial Narrow

Texte Arial Narrow Bold couleur



Texte Arial Narrow Bold

