

ImageJ

un outil polyvalent en
imagerie

Jean-Claude MENARD
Ahead Microscopy



ImageJ est un logiciel libre...

Conforme aux 4 libertés établies par Richard STALLMAN - FSF / GNU "*Gnu is Not Unix*"



- 🐼 liberté d'exécuter le programme, pour n'importe quel usage
- 🐼 liberté d'étudier le fonctionnement du programme et de l'adapter à ses besoins
- 🐼 liberté d'en redistribuer des copies pour aider les autres
- 🐼 liberté d'améliorer le programme et de rendre publiques ses améliorations

Sommaire



Historique

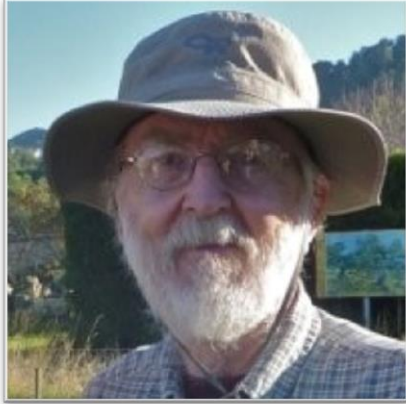


Interface



Exemples en MEB

Historique



Wayne S RASBAND

1965 Université du Nouveau-Mexique – Diplômé en Mathématiques

Pratique des machines à cartes perforées IBM

Découverte du langage COBOL

Pentagone – Service militaire

Université du Maryland – Diplômé en science informatique

1970 Employé au NIH

LINC (laboratory instrument computer)

depuis 2010 Employé bénévole au NIH – ImageJ

Historique

70's
"Image"



acquisition d'image 512x512 pixels /scanner à tambour

- autoradiographie
- résonance magnétique
- tomographie par émission de positons



Digital Equipment Corporation (DEC)
Programmable Data Processor PDP-11
mini computer

Historique

1987
"NIH Image"



image 8 bits (256 niveaux de gris)
éditeur langage Pascal
ports d'extension (Scion frame grabber)



Apple MAC II & NIH Image

Historique

1997
"Image J"



Langage Java – Sun Microsystems

"Write Once & Run Everywhere"



Historique

2007
"Fiji"

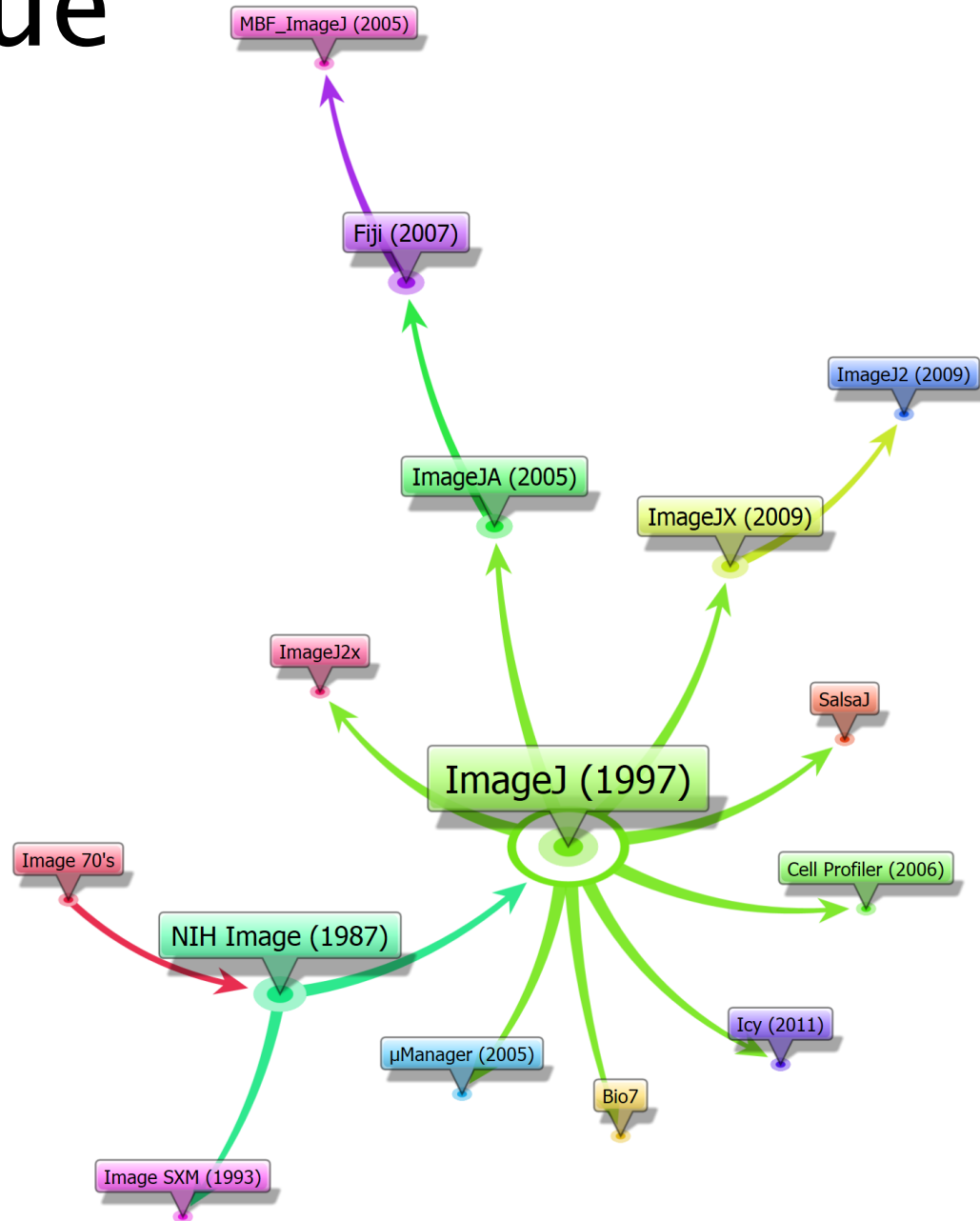


Distribution ImageJ + Plugins préinstallés



"Fiji is just imageJ"

Historique



Fiche d'identité



Langage Java

Plateformes Linux, MAC OS X, Windows

Modes 32 & 64 bit

Formats TIFF, BMP, JPEG, PNG, RAW,ASCII,...

Prise en charge de pile(s) d'images (stacks)

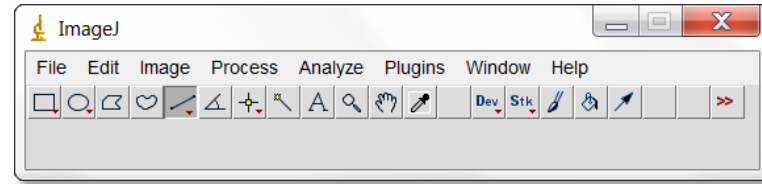
Type : 8 (gris/couleur) , 16, 32 bit, 24 bit RGB

300 macros, 500 plugins

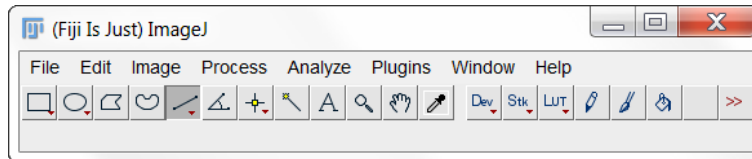
Interface



Barre d'outils NIH image (1987)



Barre d'outils ImageJ

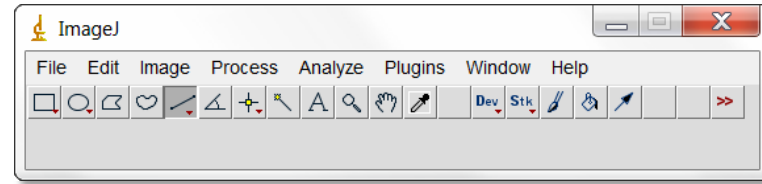


Barre d'outils Fiji

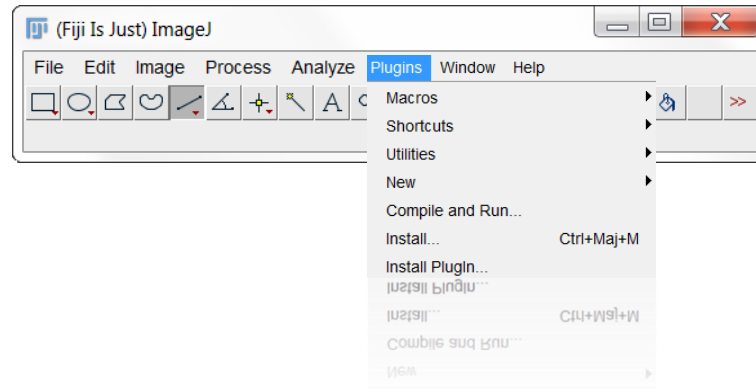
Interface



Barre d'outils NIH image (1987)



Barre d'outils ImageJ



Exemples en MEB



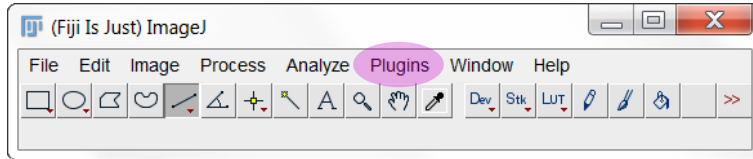
Haute Définition (XY) et Z



Imagerie EBSP

Haute Définition (XY)

Plugin Fiji : Grid/Collection stitching (Stephan Preibisch)

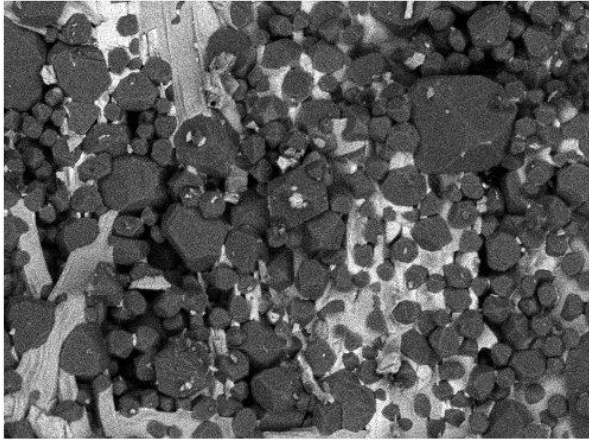


Plugin / Stitching / Grid/Collection stitching

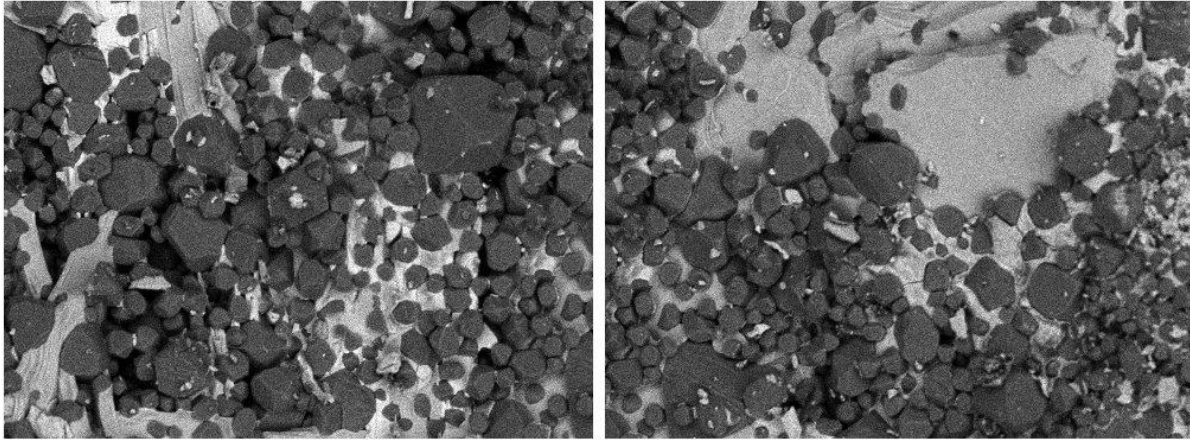


Haute Définition (XY)

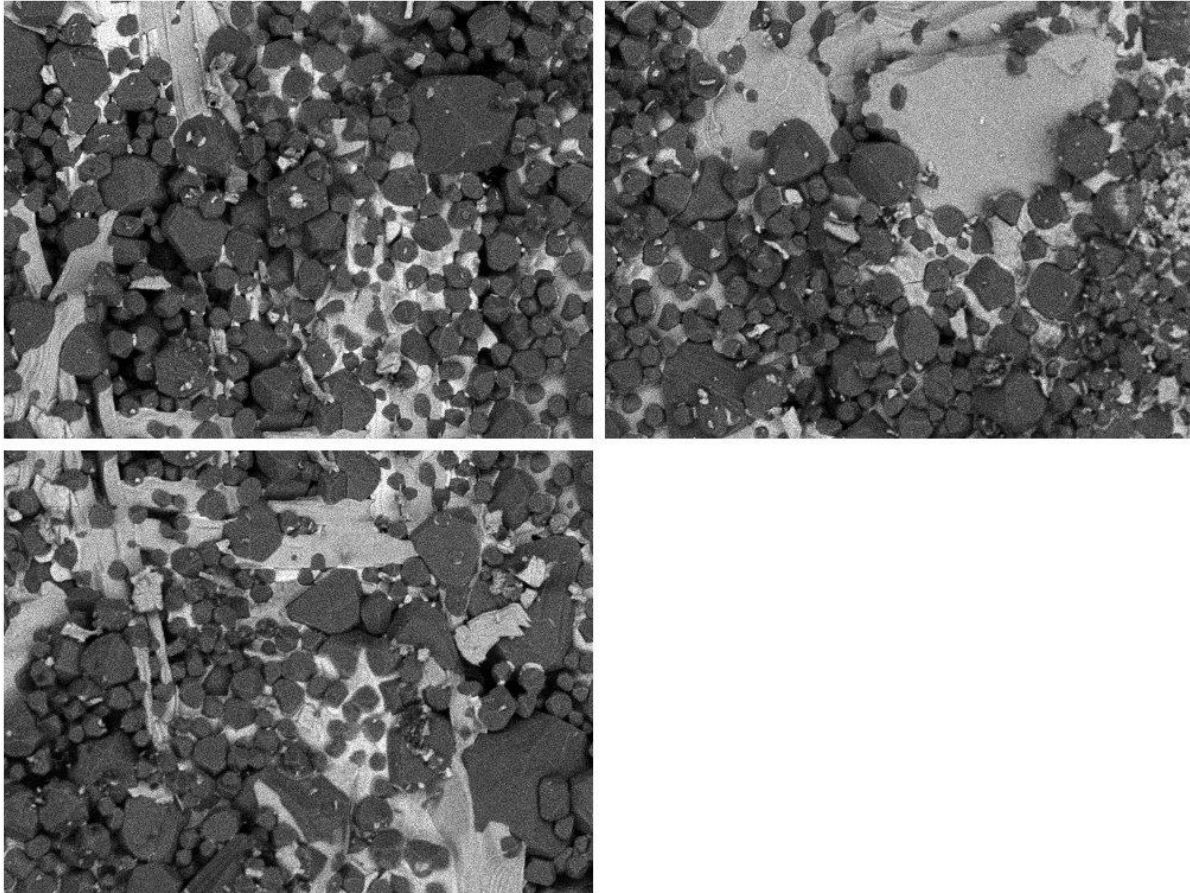
1024 x 768 pixels



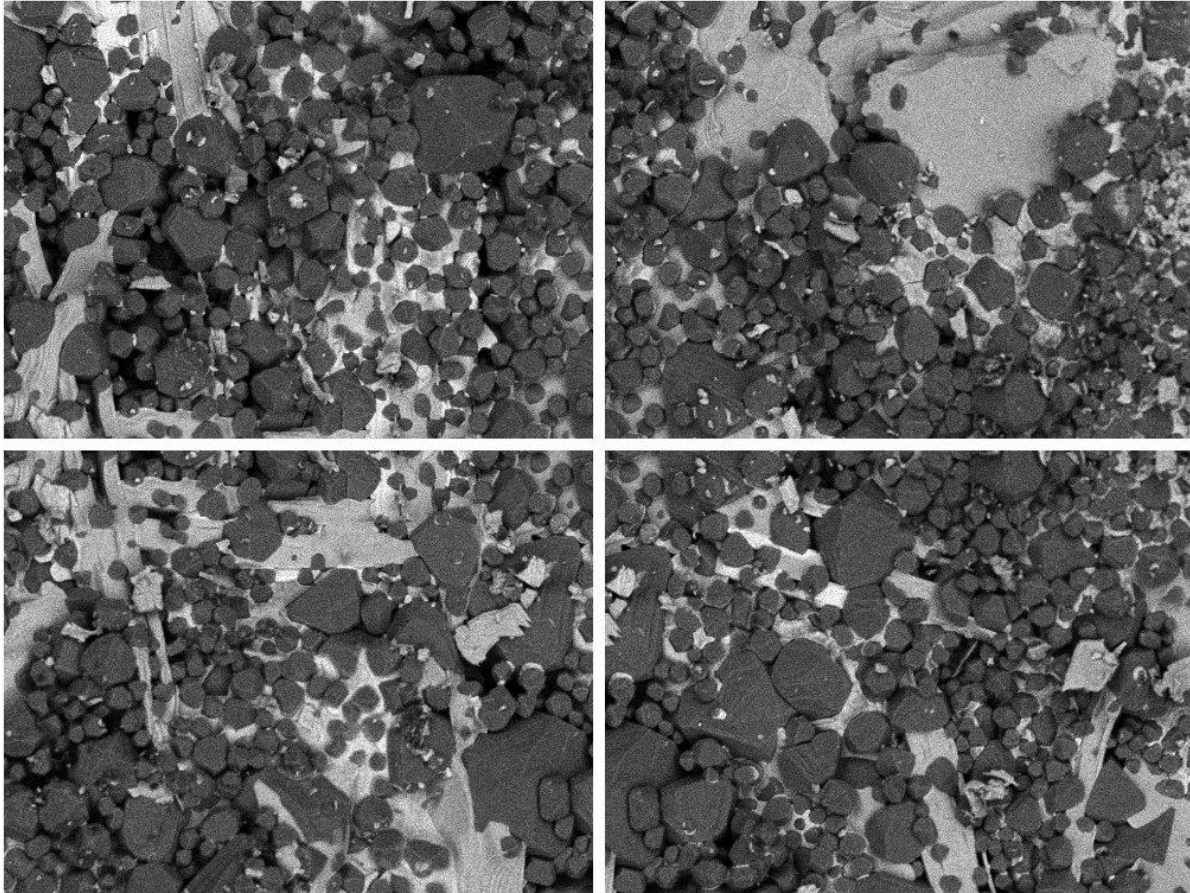
Haute Définition (XY)



Haute Définition (XY)

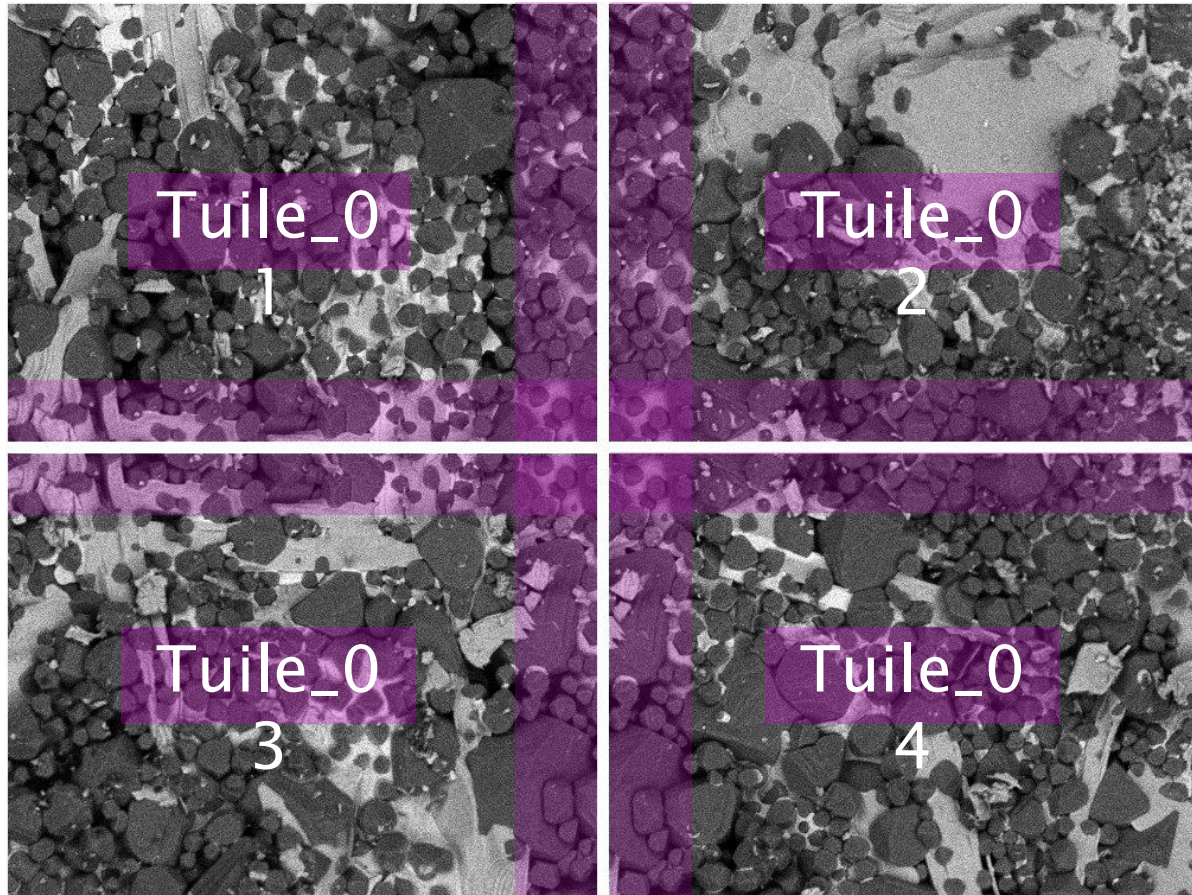


Haute Définition (XY)

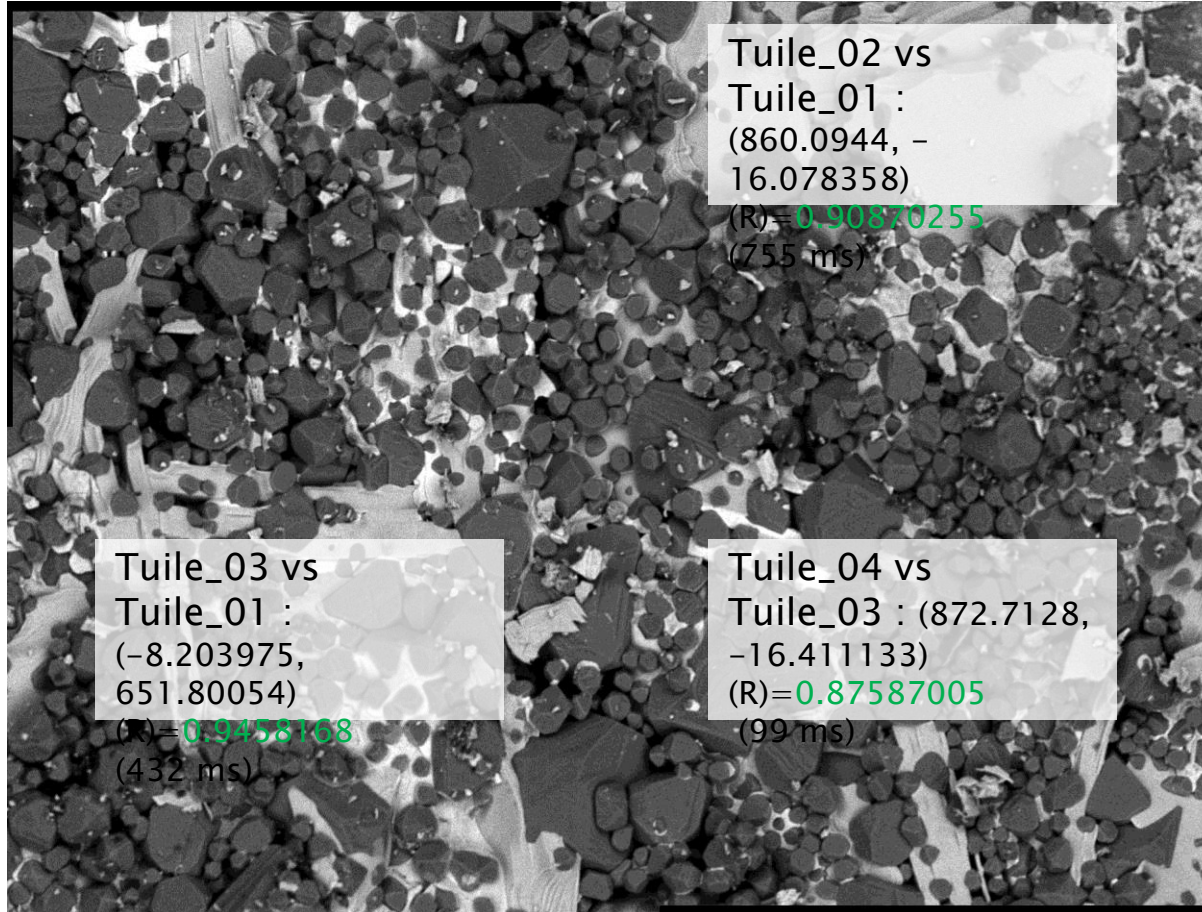


Haute Définition (XY)

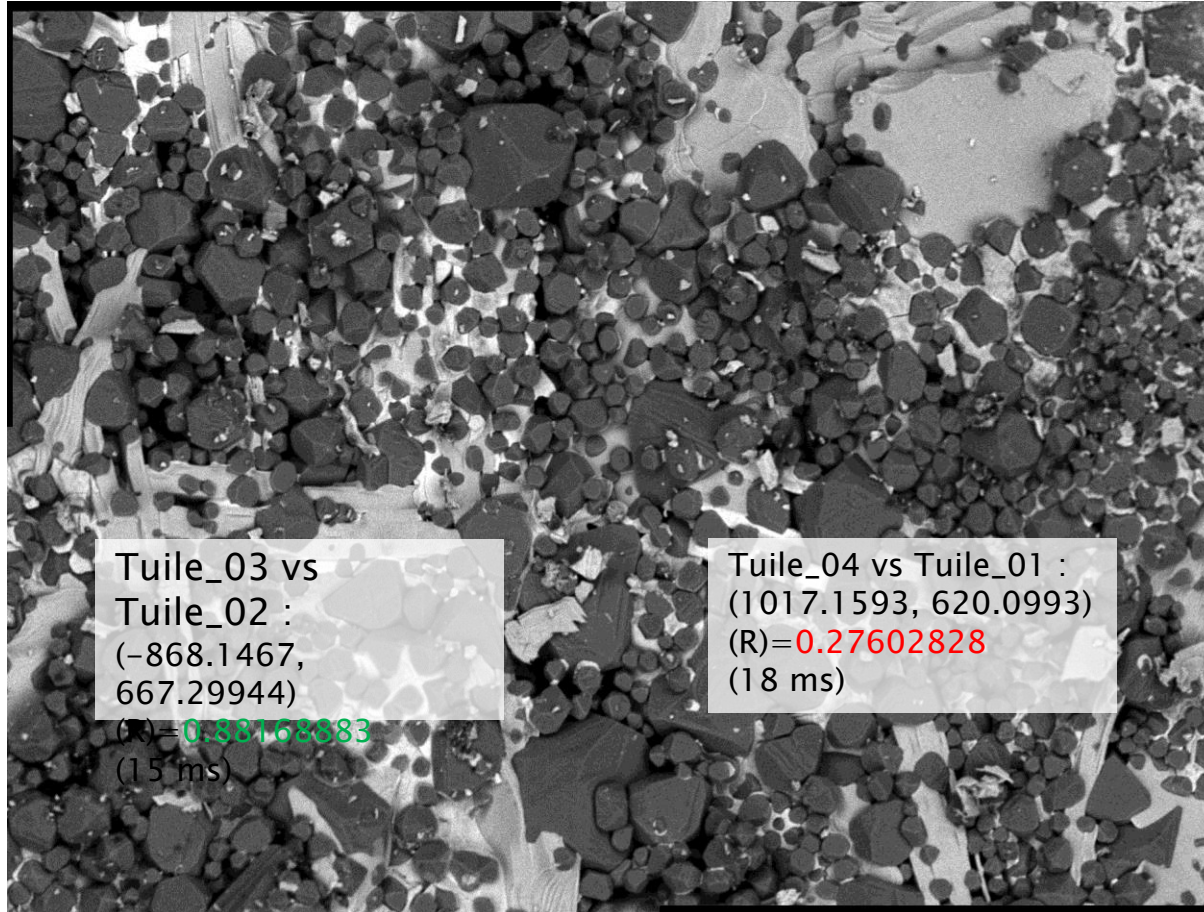
recouvrements



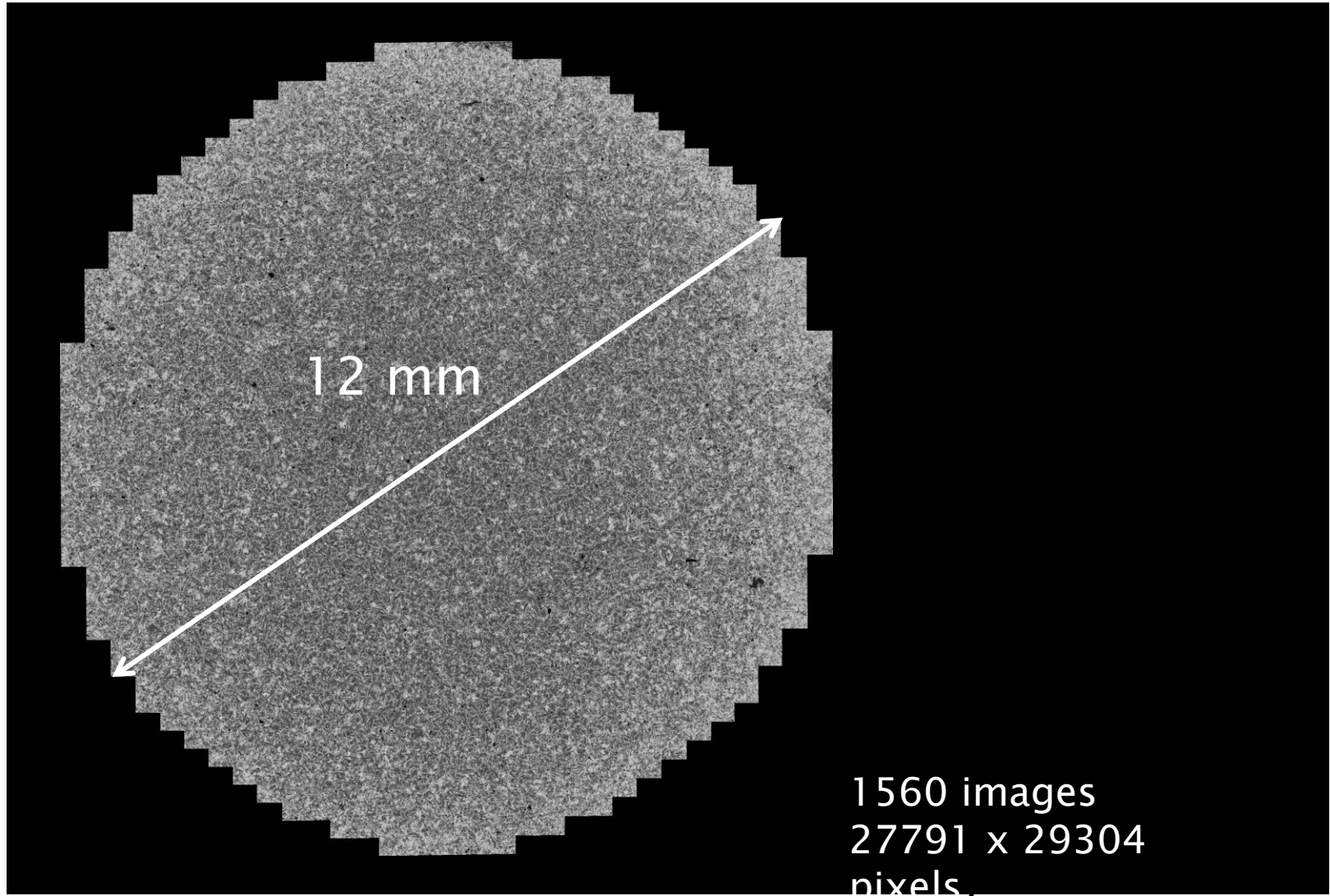
Haute Définition (XY)



Haute Définition (XY)



Haute Définition (XY)



Haute Définition (Z)

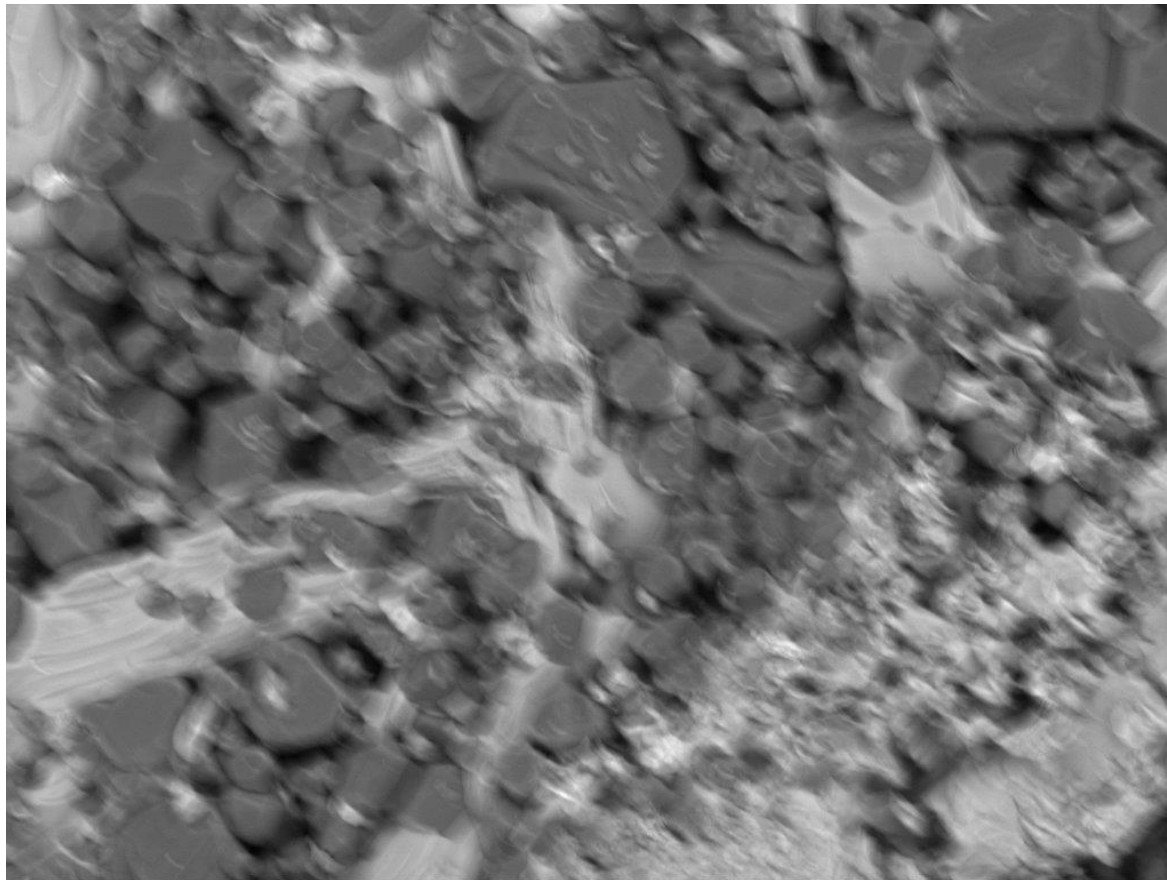
Fonction AccumulateWeighted

$$\text{dst}(x, y) \leftarrow (1 - \text{alpha}) \cdot \text{dst}(x, y) + \text{alpha} \cdot \text{src}(x, y)$$

Haute Définition (Z)

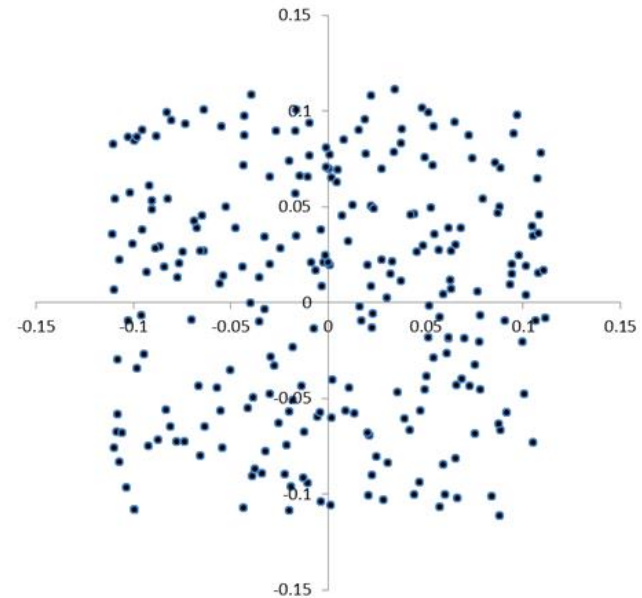
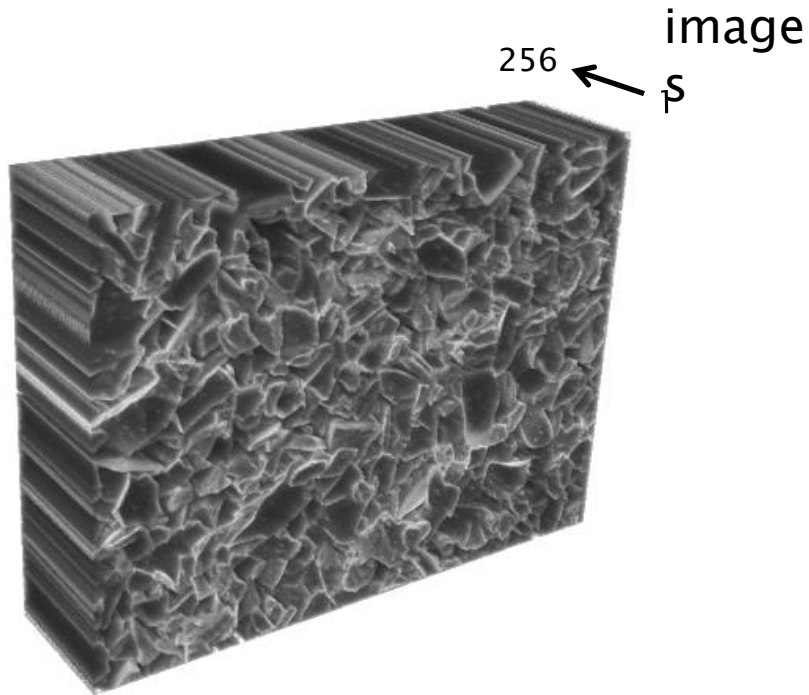
Fonction AccumulateWeighted

$$\text{dst}(x, y) \leftarrow (1 - \text{alpha}) \cdot \text{dst}(x, y) + \text{alpha} \cdot \text{src}(x, y)$$



Haute Définition (Z)

Plugin Fiji : Linear Stack Alignment with SIFT (Stephan SAALFELD – David LOWE)

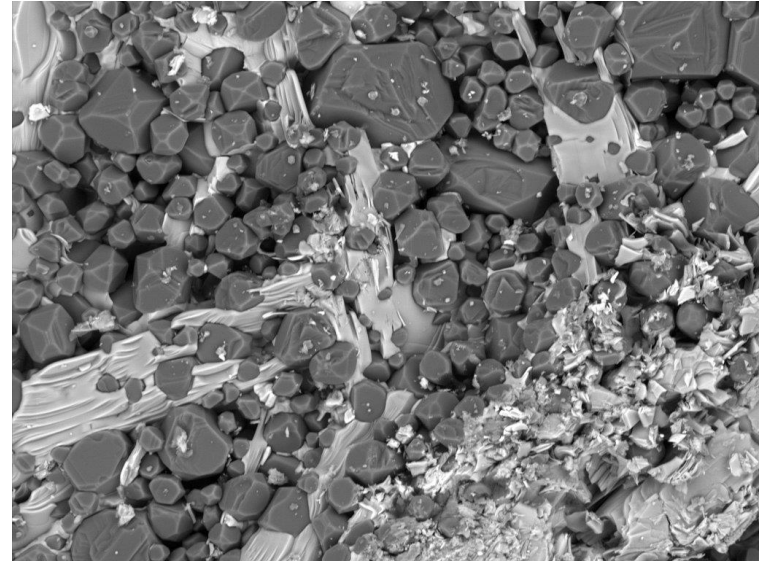
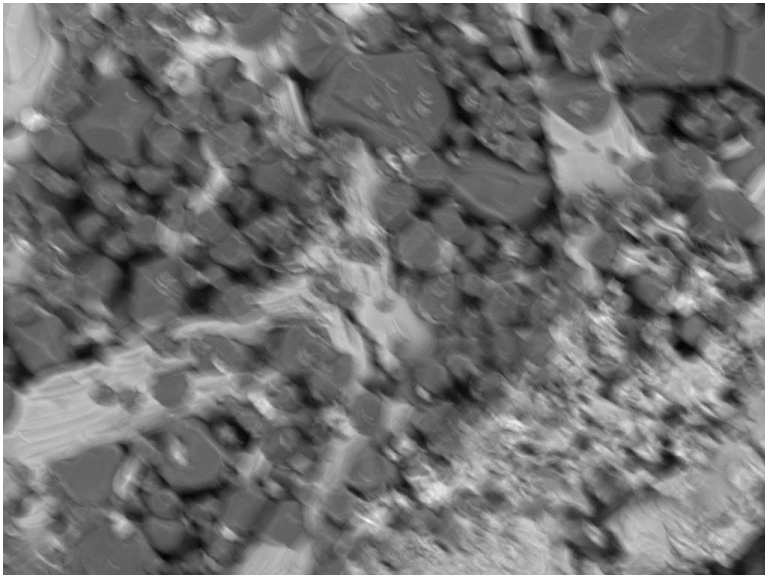


déplacement aléatoire du faisceau e-
(μm)

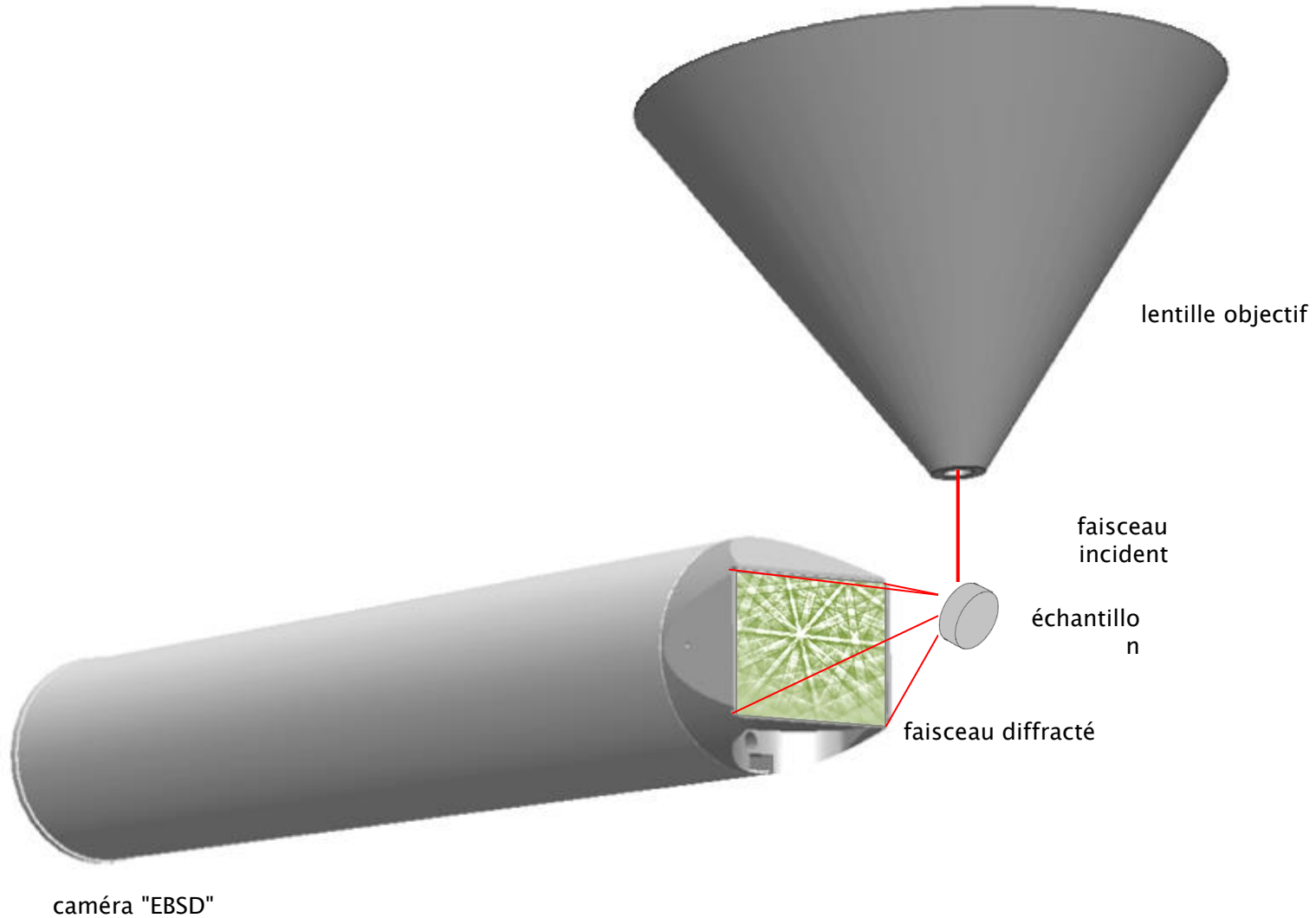
Haute Définition (Z)

```
1 open("E:\\GNMEBA\\Linear stack alignment with SIFT\\Stack\\1.tif");
2 run("8-bit");
3 run("Size...", "width=3072 height=2304 constrain average interpolation=Bicubic");
4 saveAs("Tiff", "E:\\GNMEBA\\Linear stack alignment with SIFT\\Stack\\aligned\\1.tif");
5 close();
6 for (i=1;i<256;i++){
7 run("Image Sequence...", "open=[E:\\GNMEBA\\Linear stack alignment with SIFT\\Stack\\1.tif] number=2 increment=i sort");
8 run("Size...", "width=3072 height=2304 depth=2 constrain interpolation=Bicubic");
9 run("Linear Stack Alignment with SIFT", "initial_gaussian_blur=1.60 steps_per_scale_octave=3 minimum_image_size=64 maximum
10 selectWindow("Stack");
11 close();
12 selectWindow("Aligned 2 of 2");
13 setSlice(1);
14 run("Delete Slice");
15 saveAs("Tiff", "E:\\GNMEBA\\Linear stack alignment with SIFT\\Stack\\aligned\\" + (i+1) + ".tif");
16 close();
17 }
```

Haute Définition (Z)

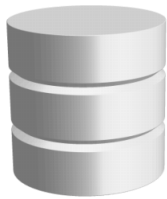


Imagerie EBSD

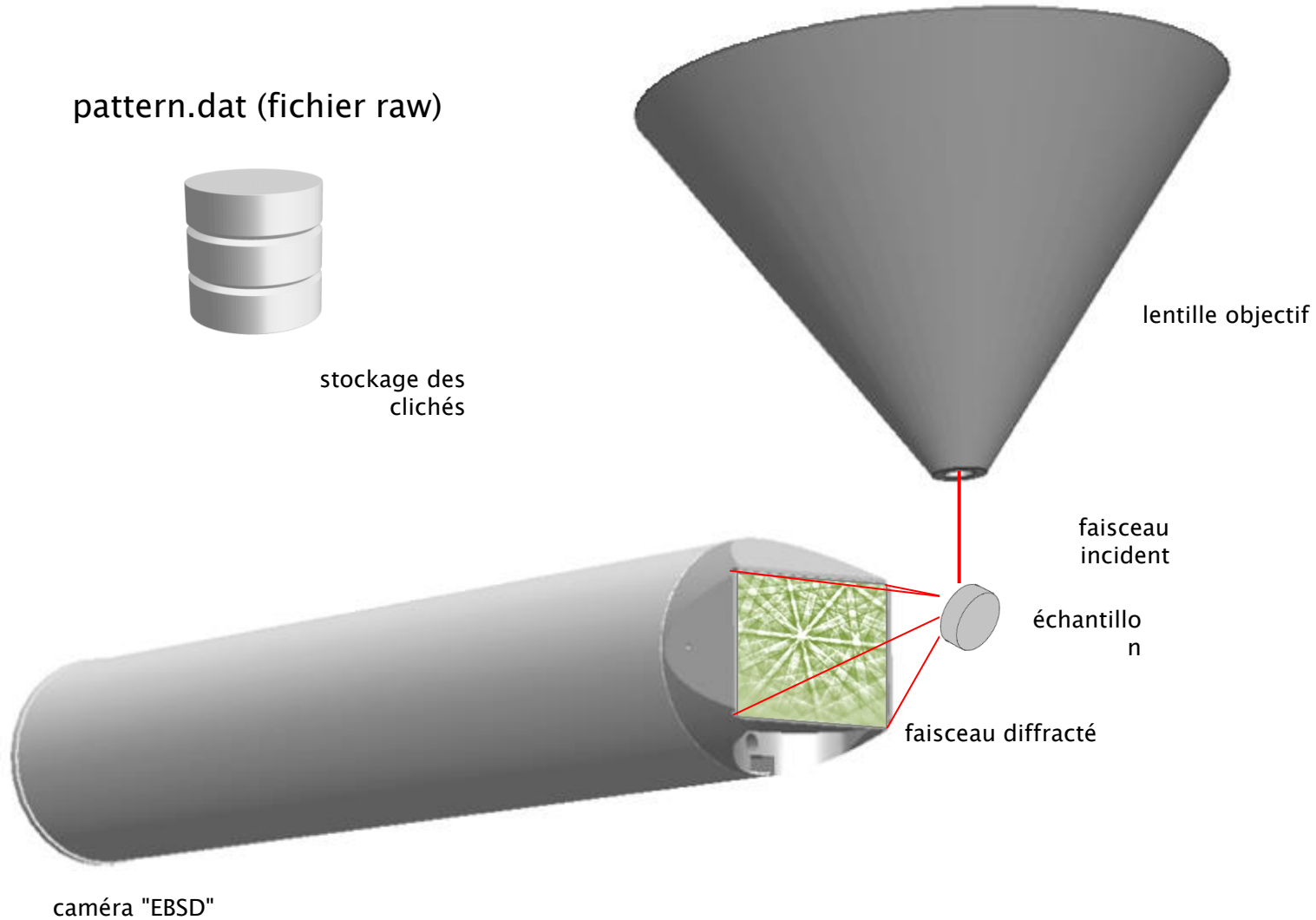


Imagerie EBSD

pattern.dat (fichier raw)

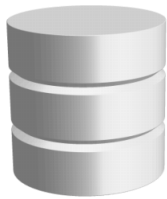


stockage des clichés



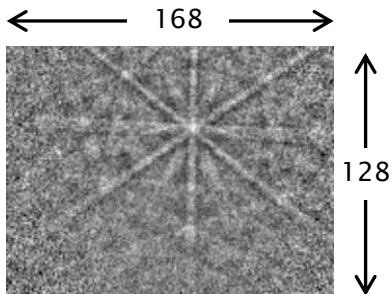
Imagerie EBSP

fichier raw : patterns.dat



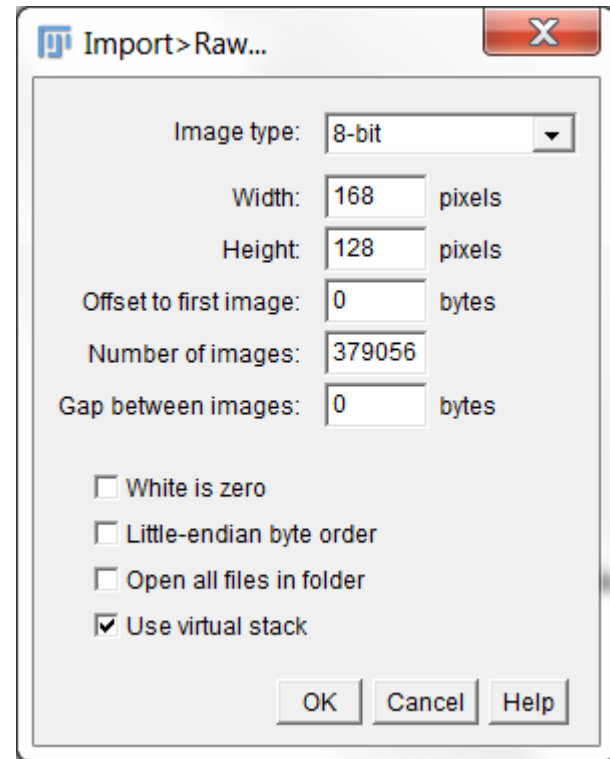
stockage des clichés

zone de balayage = $894 \times 424 = 379\,056$ points/clichés



8 151 220 224 octets

ImageJ
File/Import/Raw...



Imagerie EBSP

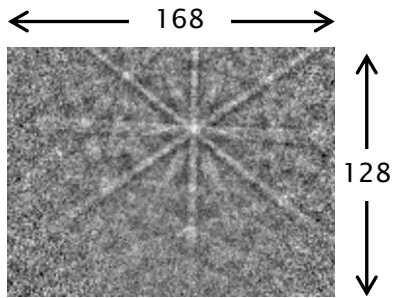


Image 8 bit

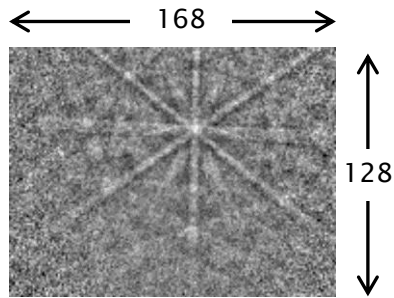
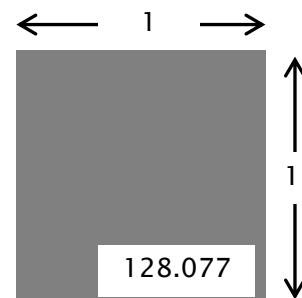


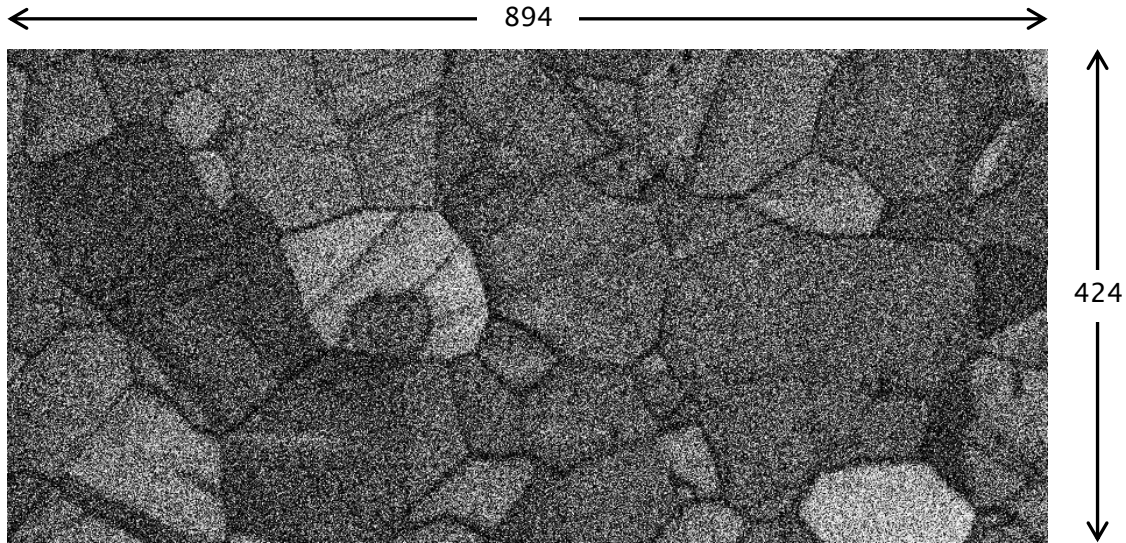
Image 32 bit

ImageJ
Image/Type/32-bit



ImageJ
Image/Adjust/Size (1x1)

Pour l'ensemble
des 379 056 clichés



Imagerie EPSP

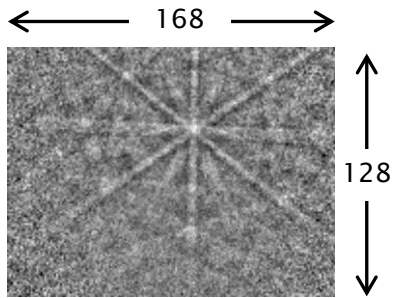
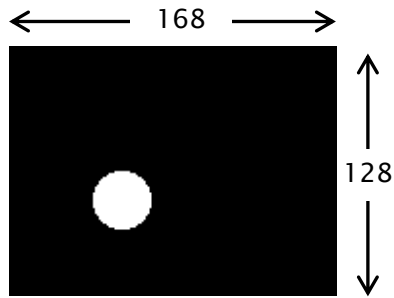


Image 8 bit



Masque

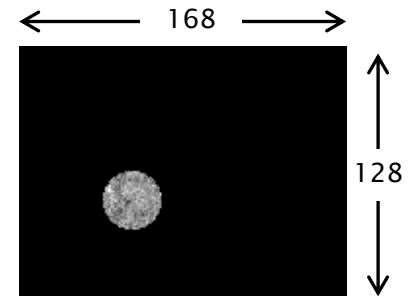
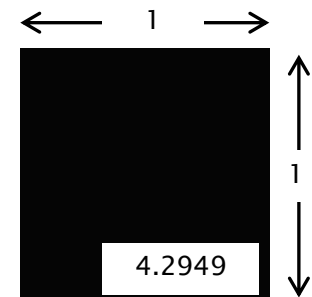
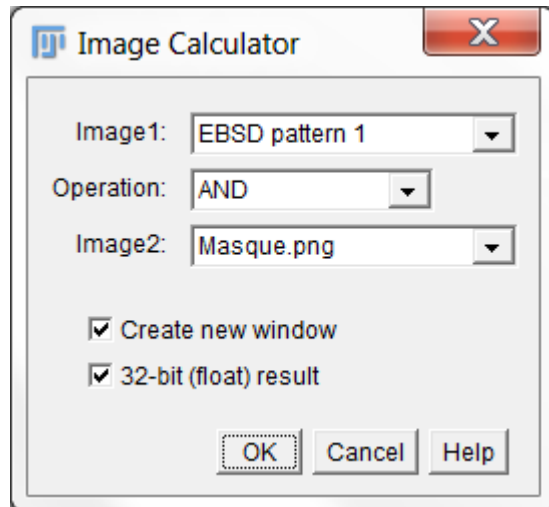


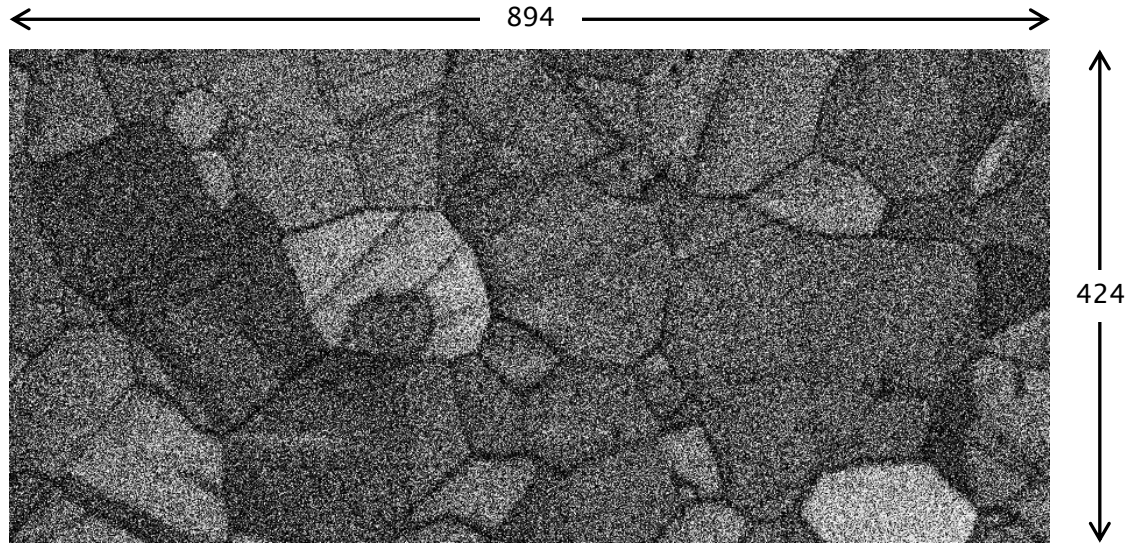
Image 32 bit



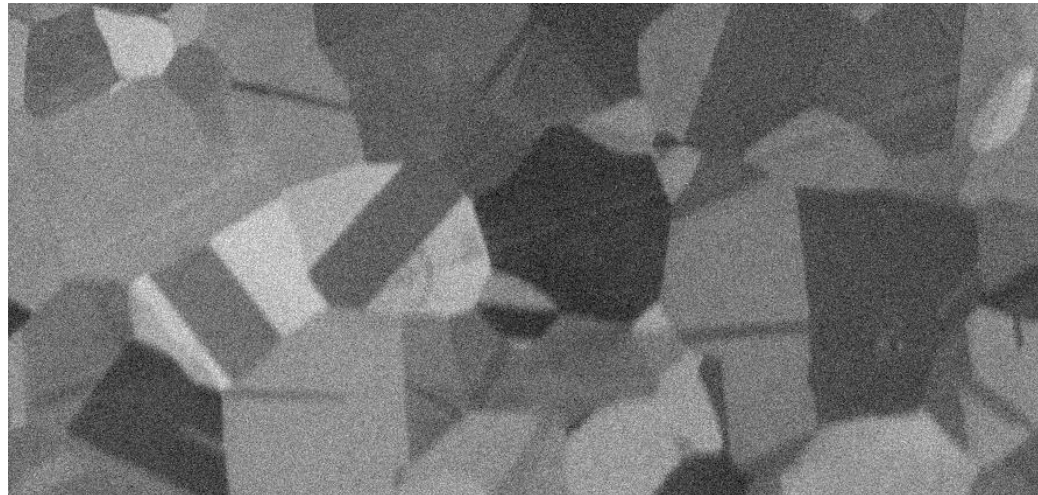
ImageJ
Image/Adjust/Size (1x1)

Imagerie EBSD

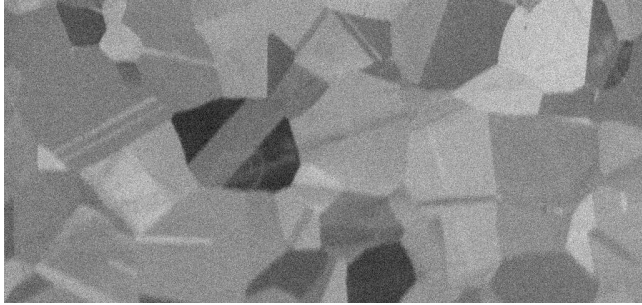
Pour l'ensemble
des 379 056 clichés



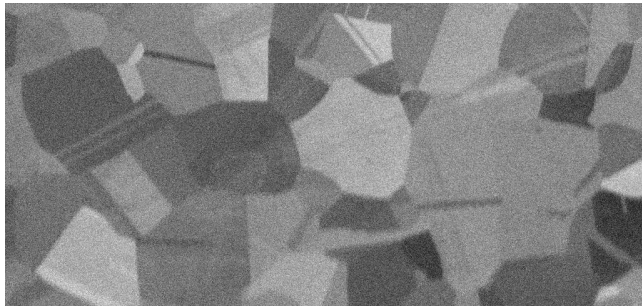
avec pré-traitement
via un masque



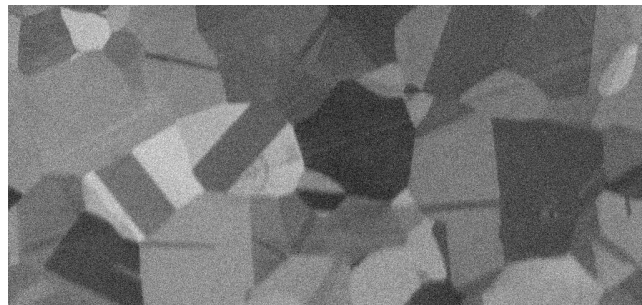
Imagerie EBSP



résultat traitement masque 1

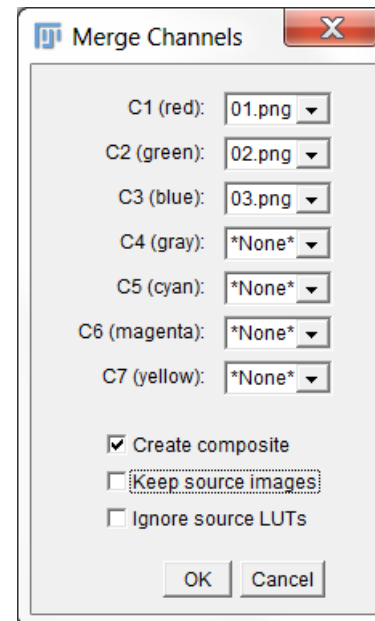
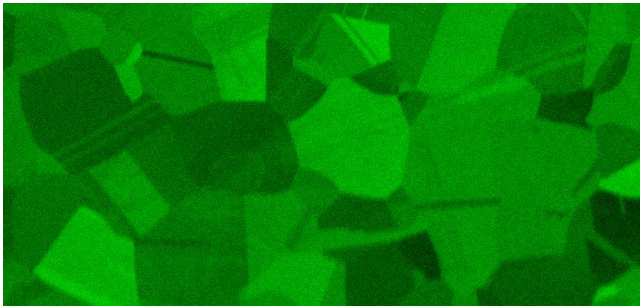
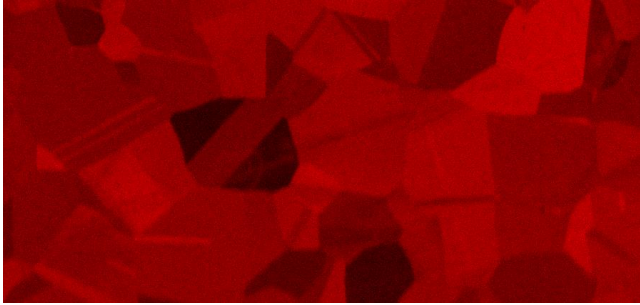


résultat traitement masque 2

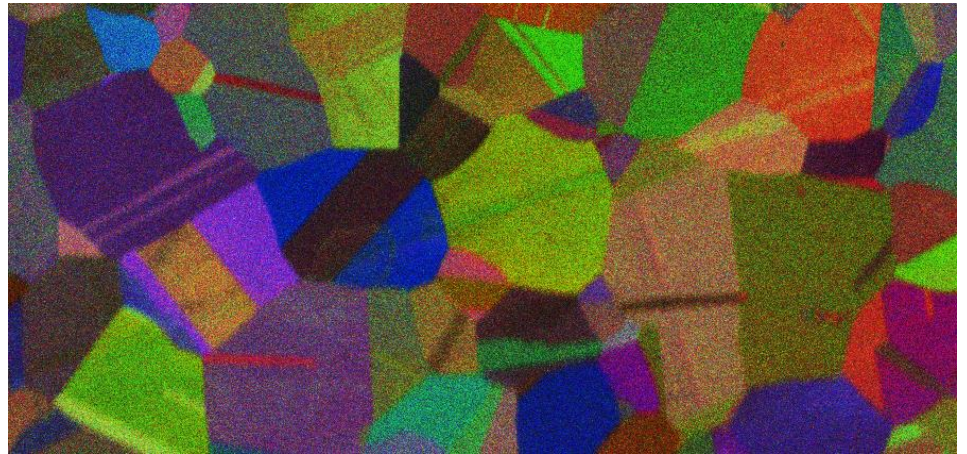
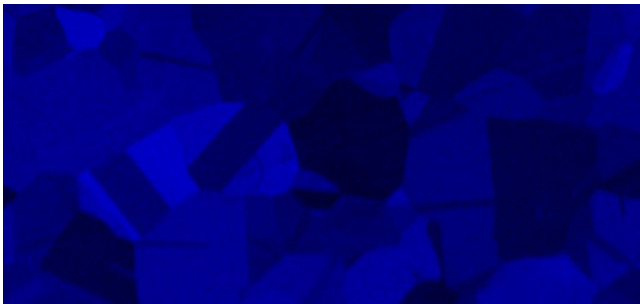
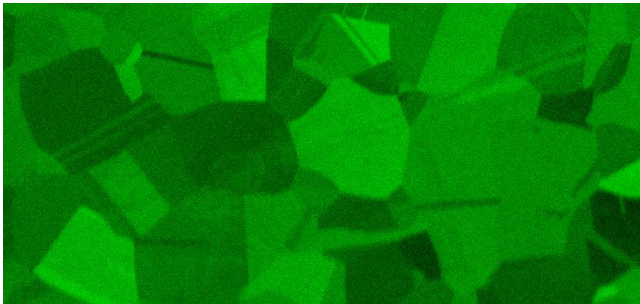
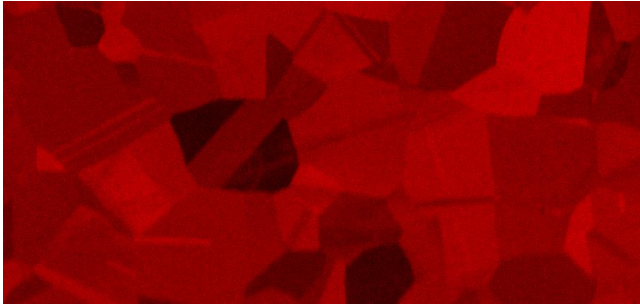


résultat traitement masque 3

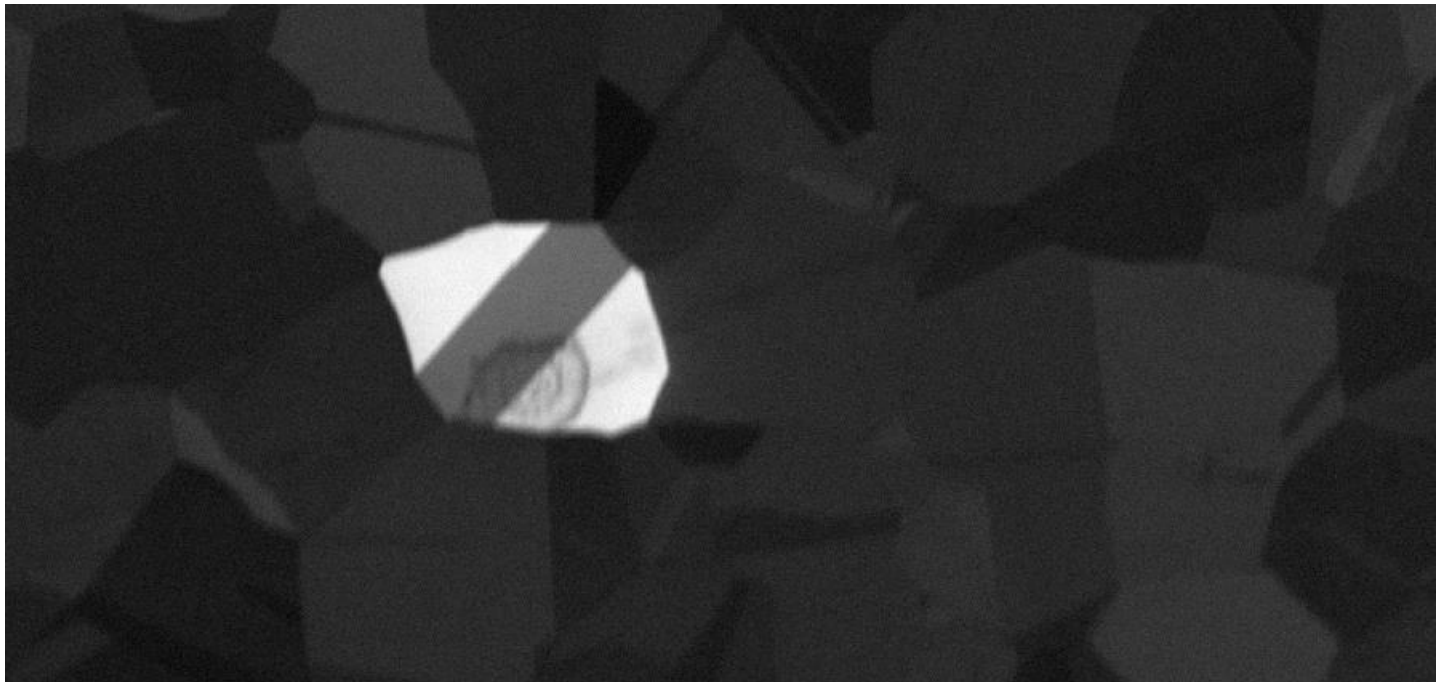
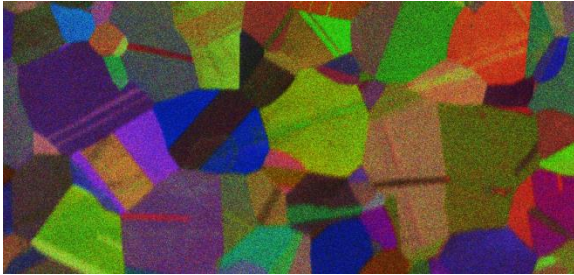
Imagerie EBSP



Imagerie EBSD



Imagerie EBSD



Références :

ImageJ

<http://imagej.nih.gov/ij/>

https://www.researchgate.net/publication/228085958_NIH_Image_to_ImageJ_25_years_of_image_analysis

http://imagej.net/Image_Stitching

GigaPan

<http://gigapan.com/gigapans/185182>

Digital Image Processing Wilhelm Burger/Mark J.Burge (Springer)
An algorithmic Introduction Using Java

