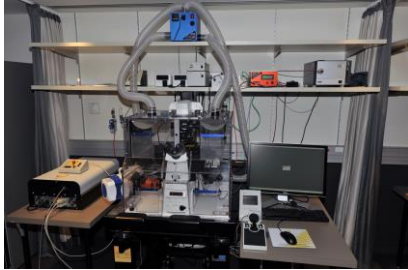
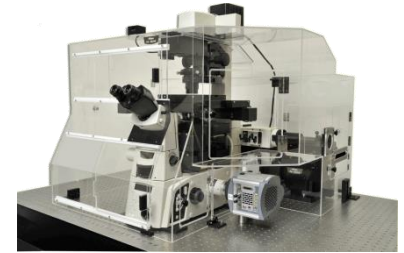
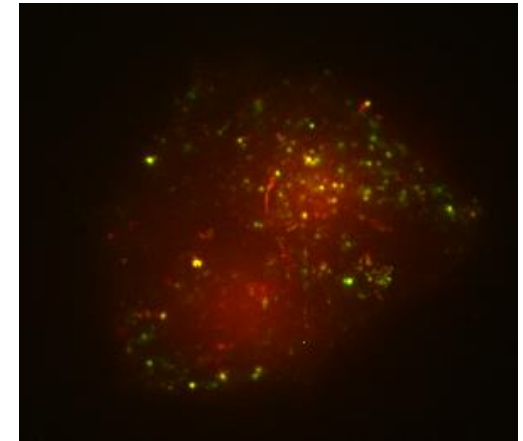
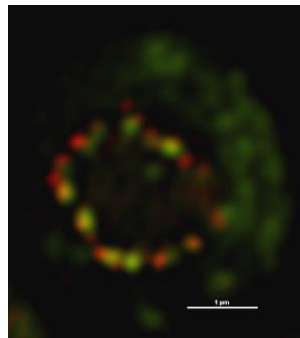
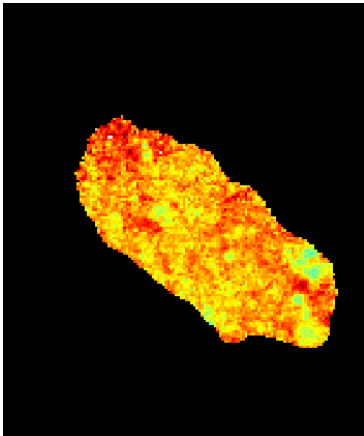


Imagiv, 13th of December 2012

# Image Data Base on a microscopy facility: Deployment and Examples of projects

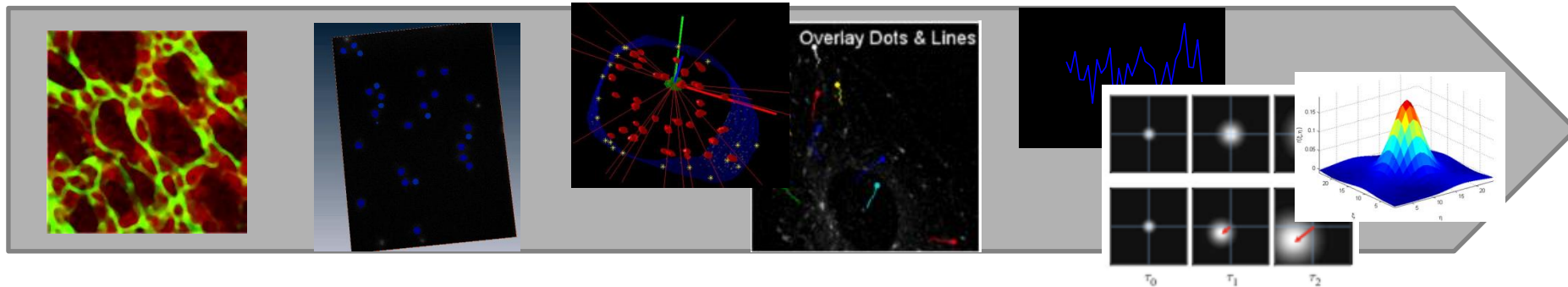


Perrine Paul-Gilloteaux, PICT-IBISA  
UMR144 Institut Curie CNRS  
Paris



## Needed at the local level

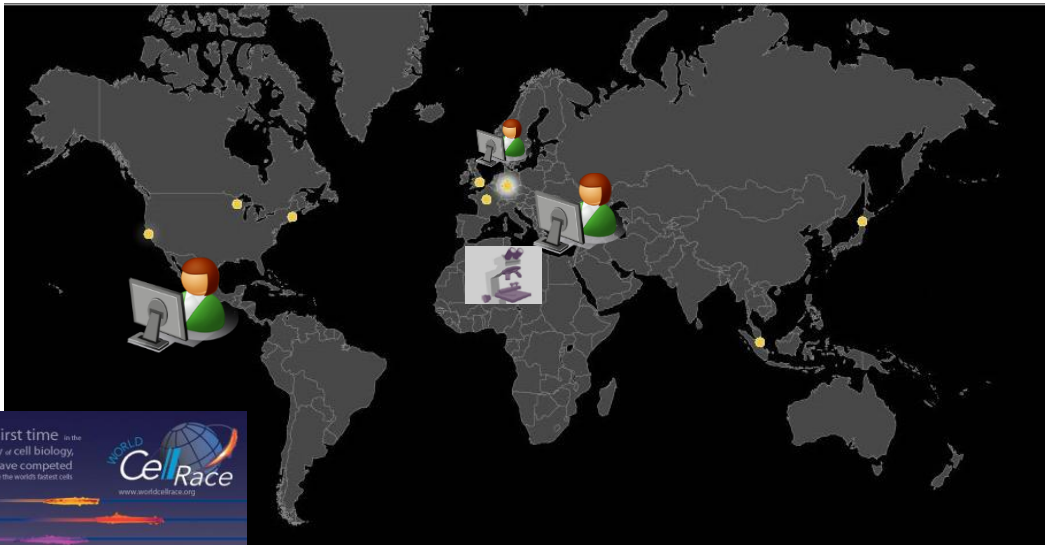
- a production of images over 4 years from 400 to 500 TB to archive, with an annual average of 100 TB to store redundantly,
- produced by ~30 microscopes (photonic and electronic) with different formats,
- around 250 users in Curie and external.
- Projects from tissue, developmental biology, single cells studies, cellular and subcellular dynamics, molecular dynamics



## But also at the international level

real need expressed at the national and international level (mostly externally financed by FBI, Canceropole, ...)

PICT-IBISA -> opened to external users.  
+ EUROBIOIMAGING



Users come to acquire image, could need help on processing or need microscopy expertise and comments.

Images of different sites in the same project

Need expertise on analysis on images not acquired on the facility

# Solution prospect (evaluated in 2010: new evaluation will be run in IPDM-BioimageInformatic node FBI)

**Objectives: (full specifications available on demand + summarized on the website)**

1. Data Management simplification, No loss of data,
2. No duplication of data
3. Quota management
4. Easiness of access to external facility users
5. To exploit previously acquired data, Helping to set up a quality process
6. Server of application

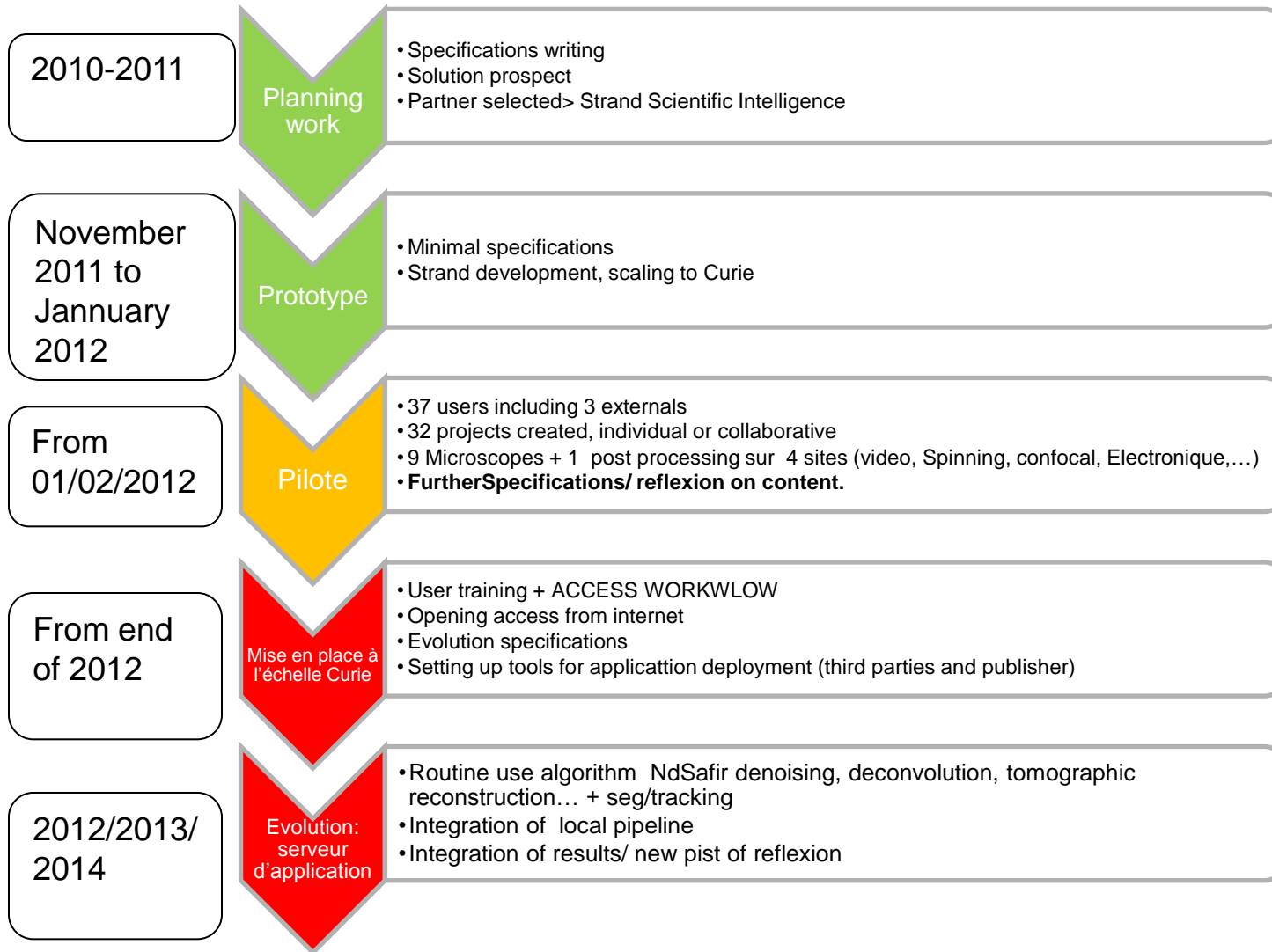
**Free and Open source:** OMERO (main actor in 2010); BISQUE (UCSB) (process oriented); (now also WIDE Montpellier)  
Need time and resources + maintainability (no backward compatibility)+ duplication of data.

Missing features-> rapid development needed + **EVOLUTIVE** and **SCALABLE**

**-> looking for an industrial partner:**

Audit of several companies (Visiohost, Sisncom, ImageAccess, Glencoe(omero), Strand ) and selection on specification based-criteria. HCS -> closed systems.

# Deployment plan



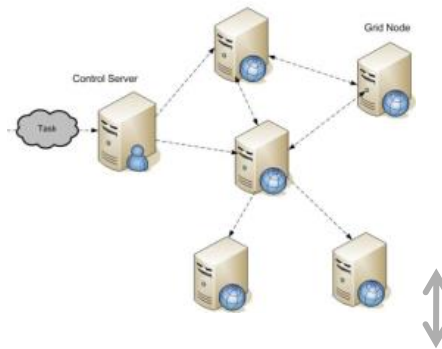
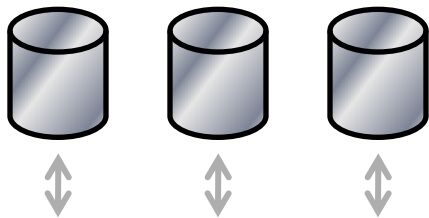
## Actors

- PICT-IBISA facility
- IT department Curie
- Strand Scientific Intelligence

+ users  
(Curie and externals)

# Image data base

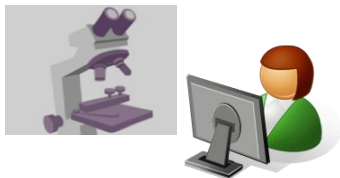
STORAGE



Processing batch of images on cluster (denoising, deconvolution, ...)

Images Server+ Metadata + annotations (manual or analysis results)/ attachments (publications,xls file..)

Acquisition Client



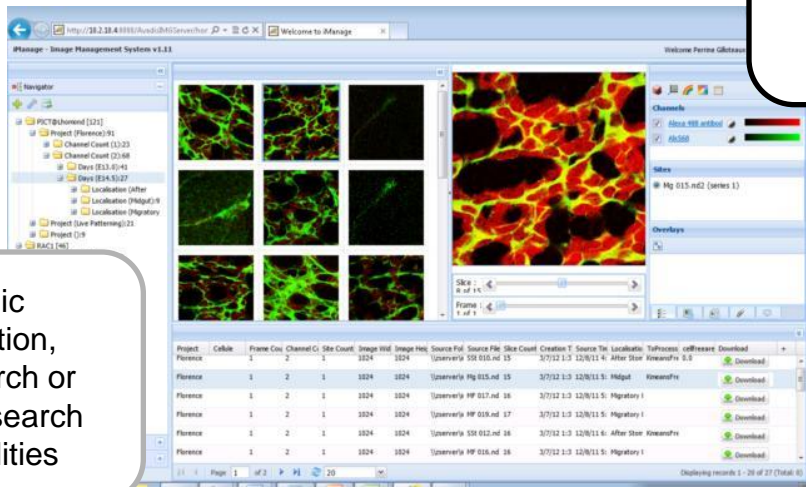
Web Client



Interface

Automatic analysis without full download, Data fusion, advanced visualisation

Web admin for project managing



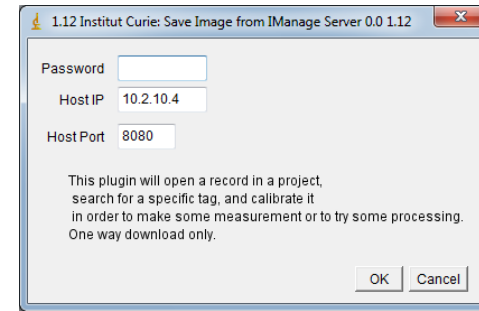
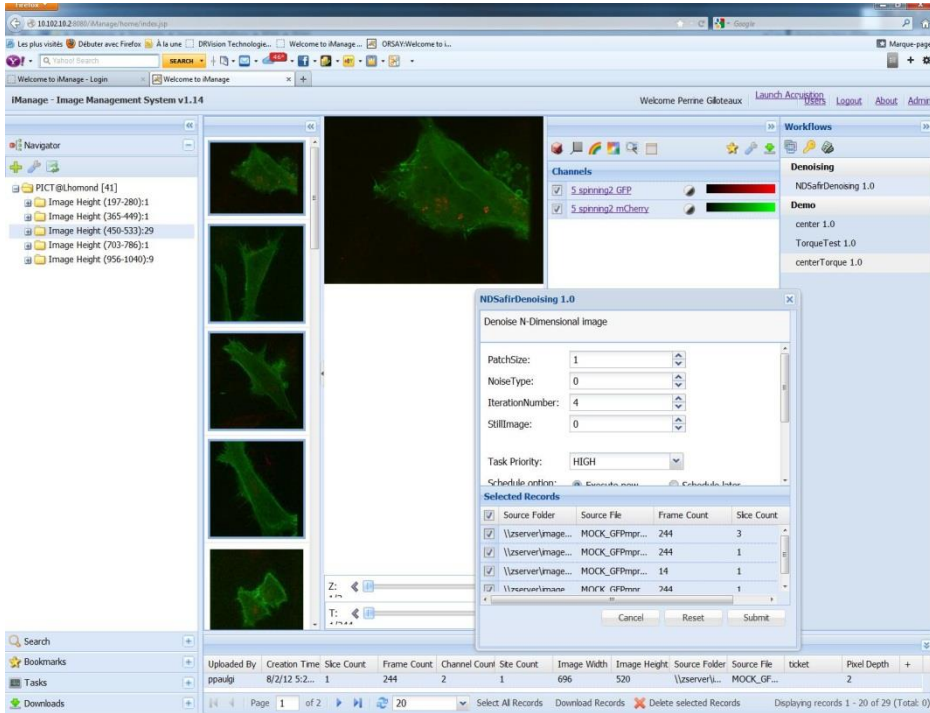
Metadata (pixel size, acquisition time,...) annotations, Parsing nD images Insuring reproducibility by storing all processing

Dynamic Organisation, Visual search or advanced search functionalities



institutCurie

# 2 level of processing integration



Example: integration of NdSafir denoising

From 3rd party software:  
ICY, fiji, matlab (via  
java), c++ via JNI

# Examples of On going Projects:

→ Eurobioimaging: (4 proof of concept studies)

The screenshot displays the iManage Image Management System v1.19 interface. The main window shows a large microscopy image with a smaller thumbnail on the left. The right-hand panel contains sections for Channels, Sites, and Overlays. The 'Channels' section shows 'Channel 0' and the 'Overlays' section shows 'tubule'. A table at the bottom displays metadata for the image, including upload time, slice count, frame count, and source folder.

Uploaded By	Upload Time	Slice Count	Frame Count	Channel Count	Site Count	Image Width	Image Height	Source Folder	Source File
ppaulgi	5/18/12 6:...	1	601	1	1	512	512	\\zserver\...	RealMPR1...



# Beads for dual tirf registration

The screenshot displays the iManage Image Management System v1.19 interface. The main window shows a large image of a dual TIRF registration, with two smaller images on the left showing the individual channels. The interface includes a Navigator panel on the left, a Channels panel on the right, and a Sites panel on the right. The Channels panel shows two channels: Channel 0 (red) and Channel 1 (green). The Sites panel shows a site named 'beadsafterregistration.tif'. The Overlays panel shows an overlay named 'aa'. The bottom of the interface features a table with columns for Uploaded By, Upload Time, Slice Count, Frame Count, Channel Count, Site Count, Image Width, Image Height, Source Folder, and Source File. The table contains one row of data.

Uploaded By	Upload Time	Slice Count	Frame Count	Channel Count	Site Count	Image Width	Image Height	Source Folder	Source File
ppaulgi	5/18/12 6...	1	1	2	1	256	512	\\zserver\...	beadsbef...

Page 1 of 1 | 20 | Select All Records | Download Records | Delete selected Records | Displaying

# Images were batch registered without download in ImageJ, and result was uploaded from ImageJ.

The screenshot displays the iManage web interface in a Firefox browser. The main window shows a microscopy image with a green background and orange/red spots. The interface includes a left sidebar with a tree view of folders, a top navigation bar with user information and links, and a right sidebar with panels for Channels, Sites, and Overlays. At the bottom, a table lists image upload details.

Uploaded By	Upload Time	Slice Count	Frame Count	Channel Count	Site Count	Image Width	Image Height	Source Folder	Source File
ppaulgi	5/29/12 5...	232	1	2	1	250	512	C:\Users\...	AP1GFP_...



# Examples of On going Projects: (collaboration with former post doc in NY on ongoing publication)

Firefox Welcome to iManage

https://vpn.curie.fr/+CSCO+30756767633A2F2F7076712E70686576722E7365+.../iManage/home/index.jsp

iManage - Image Management System v1.19 Welcome Facility Administrator [Launch Acquisition](#) [Users](#) [Logout](#) [About](#)

Navigator

- role of ESCRT proteins in melanosome bio.
  - Condition (Si Control):2
  - Condition (Sivps24):3
    - Creation Time (Jun 15, 2012 2:17:..
  - Condition (Sivps33a):2
  - Condition ():16
    - Creation Time (Aug 30, 2012 12:00.
    - Creation Time (Sep 1, 2012 12:00:..
    - Creation Time (Sep 17, 2012 12:00.
    - Creation Time (Sep 19, 2012 12:00.

Channels

- 2\_Trans BF
- 3\_spinning 2 GFP

Sites

- 2\_Trans BF/3\_spinning 2 GFP

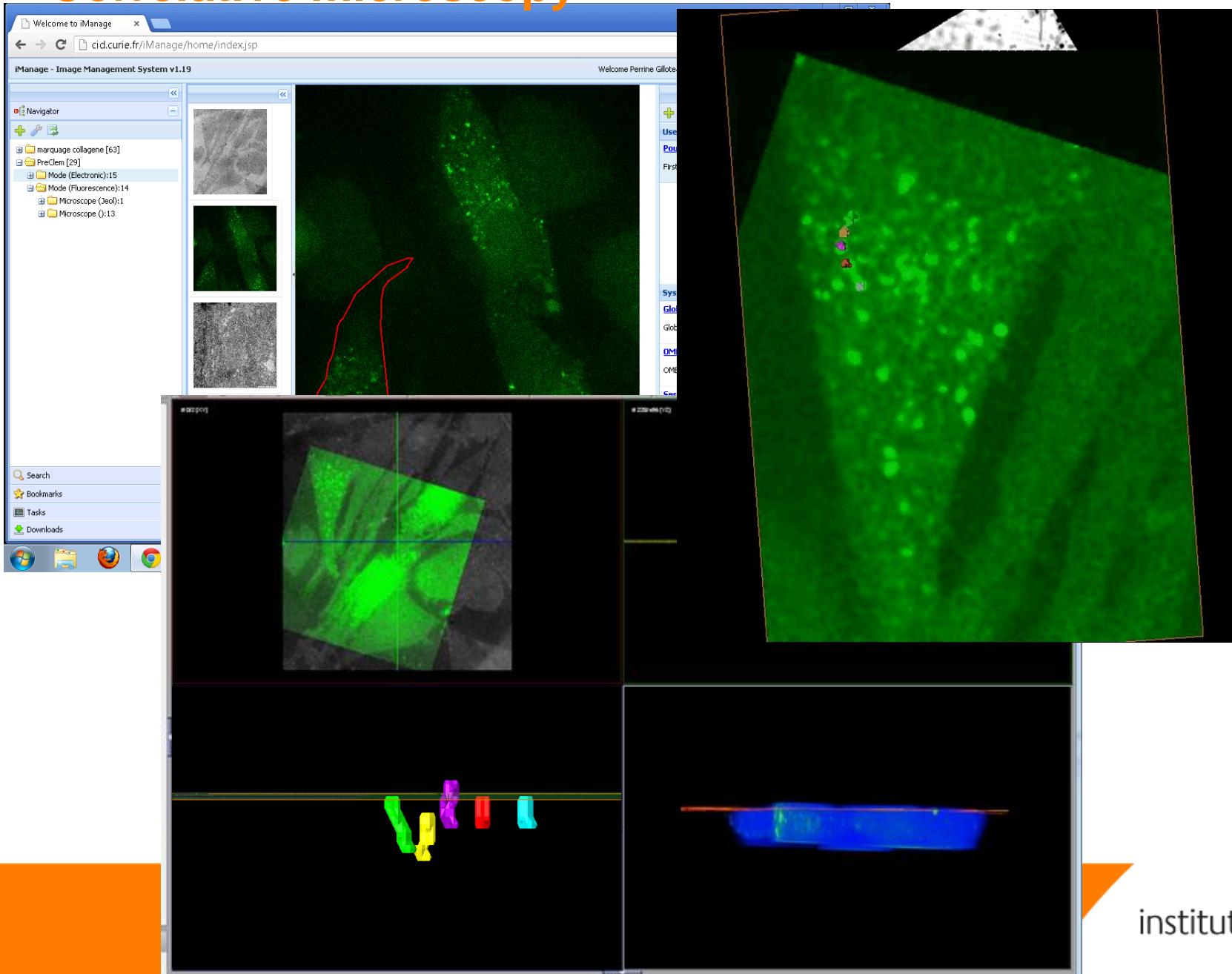
Overlays

- crop1
- crop2

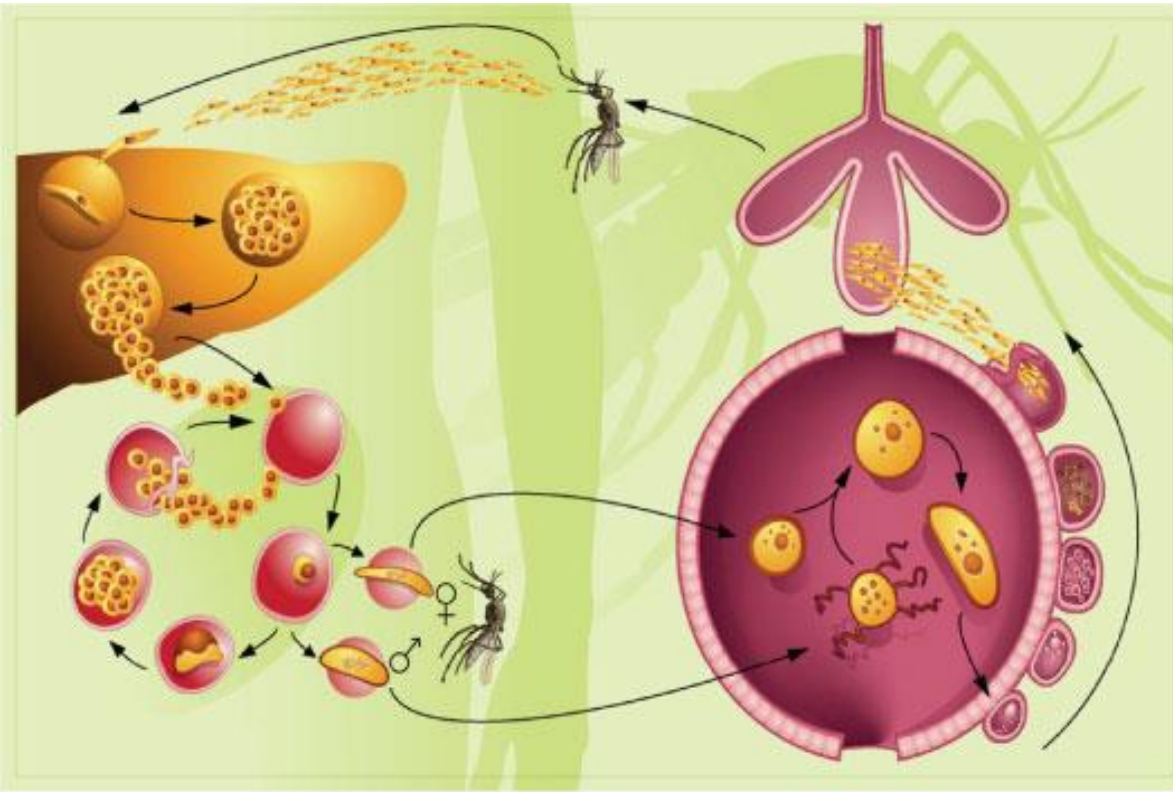
Pixel Depth	Uploaded By	Slice Count	Frame Count	Channel Cour	Site Count	Image Width	Image Height	Source Folde	Source File	
2	ssamoos	1	200	2	1	530	1024	C:\Users\...	Sivps33a_...	+

Page 1 of 2 20 Select All Records Download Records Delete selected Records Displaying

# Correlative microscopy



# Not a storage and image management tool: A R&D tool. Example of on-going project.



**malaria parasite  
invasion in the  
mosquito tissues**

Gloria Volohonsky  
IBMC Anopheles group  
Unistra

Elena Levashina  
Max Planck Institute for  
Infection Biology

# malaria parasite invasion in the mosquito tissues

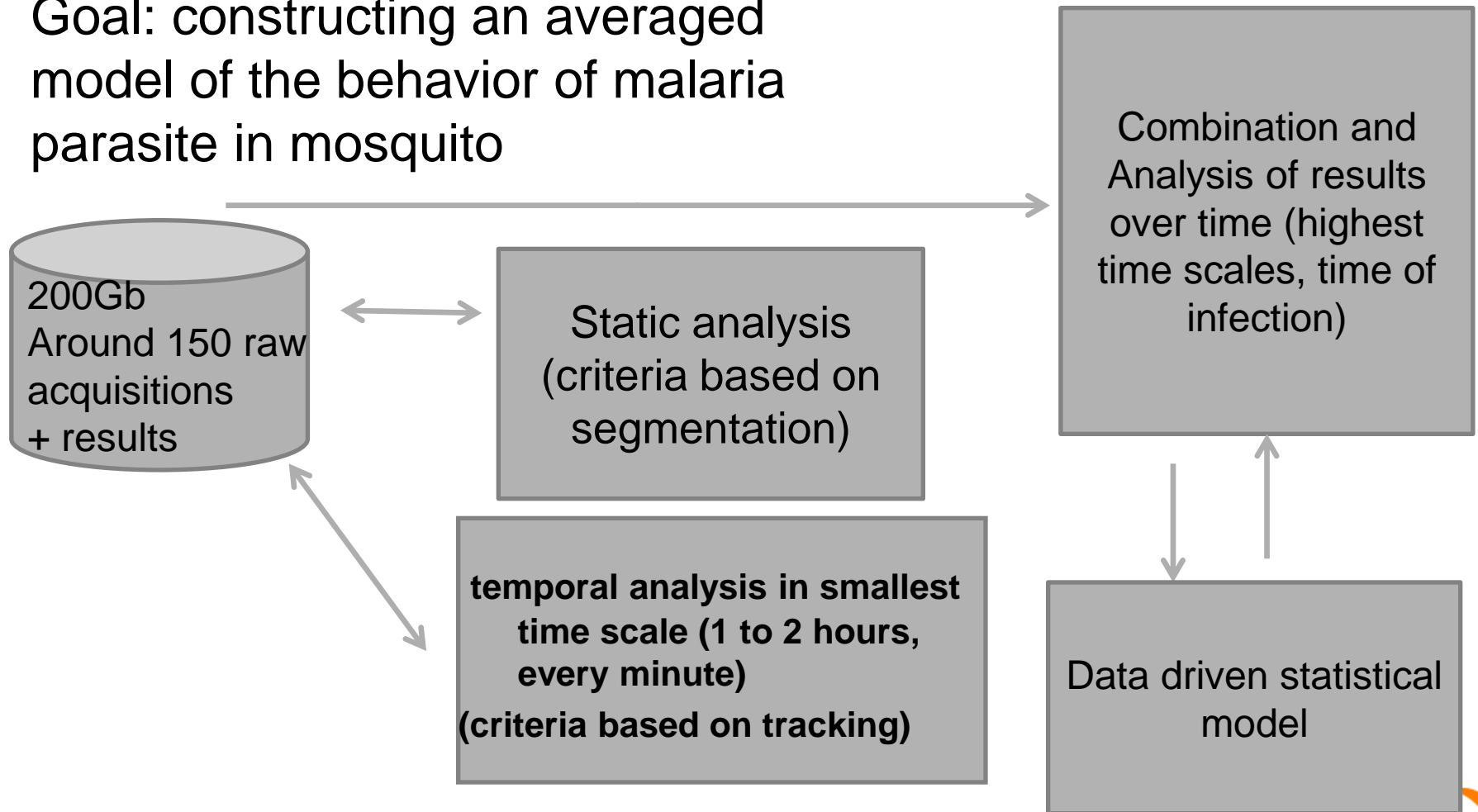
- Proteins attacking the parasite in mosquito LRIM, APL1, TEP 1 (hemocyte)
- Species of mosquito:
  - G12 (india)
  - DSX and HYPER ( African)
- Marker of damaged cells: Sugar Dextran, or hyper protein becoming fluorescent when binded to H2O2 or whith OPH changed.
- Different time of infection, different times post infection.

## Questions to answer:

- Parasite going out the gut wall: rate and proportion against different time?
- Is there any shape factor of the mosquito as an additional parameter?
- Inside the midgut: which are the mode of displacement of the parasite among cells? (assumption: the defense of cells attempting to eject the parasite would actually trigger the displacement)

# malaria parasite invasion in the mosquito tissues

Goal: constructing an averaged model of the behavior of malaria parasite in mosquito



# Data are annotated. Results of processing at the record level are uploaded by the processing algorithm

The screenshot displays the Image Management System v1.13 interface. On the left, a 'Navigator' pane shows a tree view of image folders, including 'Plasmodium parasite invasion in the mosquito 1' and sub-folders for 'TP1' and 'mosquito'. The main area features a grid of small image thumbnails and a large central image showing a detailed view of a mosquito cell with green and blue fluorescence. A 'Workflows' pane on the right contains a table of user annotations for the selected image.

User Annotation	Value
Nparasites	17.0
Proportion of damaged cells	3.0
Proportion of parasites in cells	66.0
REVERSE	0.0
Dextran	yes
mosquito	DSX
TP1	23.5

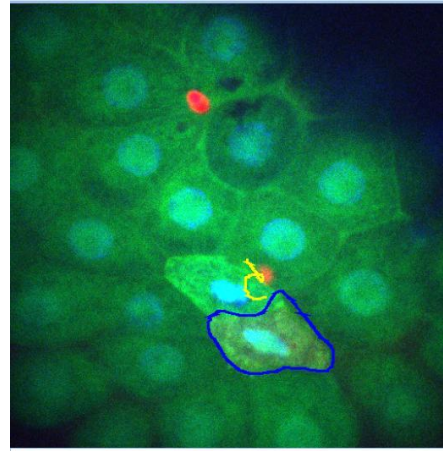
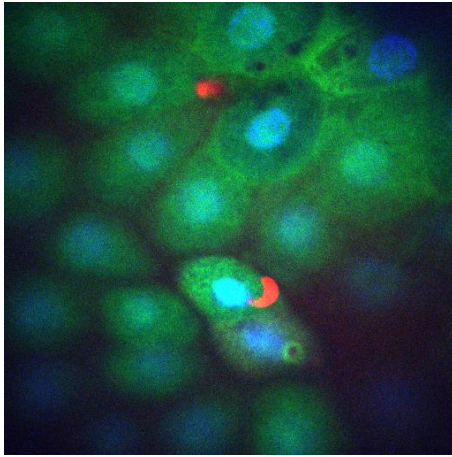
Below the image grid is a data table listing records with various attributes:

Uploaded By	Size Count	Time of Infection	Frame Count	Channel Count	Image Width	Image Height	mosquito	TP1	Dextran	REVERSE	Pixel Size X	Pixel Size Z
gvalchovsky	46	1	3	3	512	512	DSX	26.5	yes	0.0	0.08	1.8
gvalchovsky	46	1	3	3	512	512	DSX	30	yes	0.0	0.08	1.8
gvalchovsky	42	1	3	3	512	512	DSX	25.5	yes	0.0	0.08	1.8
gvalchovsky	22	1	3	3	512	512	DSX	21	no	0.0	0.08	1.8
gvalchovsky	47	1	3	3	512	512	DSX	21	no	0.0	0.08	1.8
gvalchovsky	62	1	3	3	512	512	DSX	24	yes	0.0	0.08	1.8
gvalchovsky	60	1	3	3	512	512	DSX	23.5	yes	0.0	0.08	1.8
gvalchovsky	44	1	3	3	512	512	DSX	25.5	yes	0.0	0.08	1.8
gvalchovsky	46	1	3	3	512	512	DSX	22	yes	0.0	0.08	1.8
gvalchovsky	37	1	3	3	512	512	DSX	24.5	yes	0.0	0.08	1.8
gvalchovsky	57	1	3	3	512	512	DSX	24.5	yes	0.0	0.08	1.8
gvalchovsky	57	1	3	3	512	512	DSX	24	yes	0.0	0.08	1.8
gvalchovsky	45	1	3	3	512	512	DSX	25	yes	0.0	0.08	1.8

At the bottom, a 'Tasks' pane shows a task for 'mosquito' with a progress bar and a 'Download' button. The status bar at the bottom indicates 'Page 1 of 2' and '58' records.



# Annotation automatically created can also be visual.



Z: 10/28  
T: 3/48

**Channels**

- w0000
- w0001
- w0002

**Sites**

- Site 0

**Overlays**

- Damaged cell
- test
- typical trajectory

**iManage - Image Management System v3.1.9**

Welcome Perrine Giloteaux | [Launch Acquisition](#) | [Users](#) | [Logout](#) | [About](#) | [Admin](#)

**Navigator**

- Malaria parasite invasion in the mosquito 1
- Parasites Typical trajectories [1]

**Channels**

- w0000
- w0001
- w0002

**Sites**

- Site 0

**Overlays**

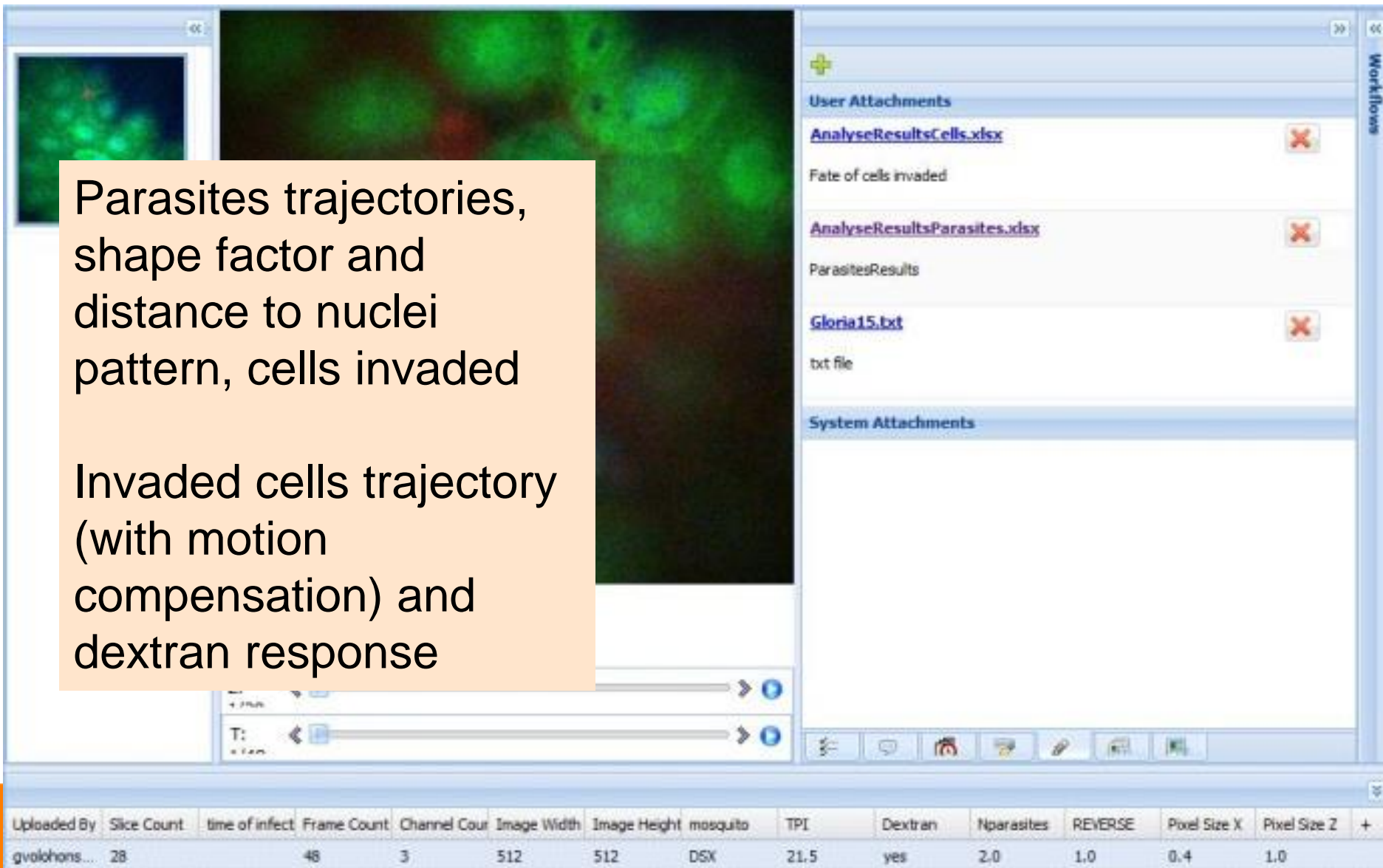
- Damaged cell
- test
- typical trajectory

Uploaded By	Slice Count	Time of Infect	Frame Count	Channel Count	Image Width	Image Height	mosquito	TP1	Dextran	REVERSE	Pixel Size X	Pixel Size Z	
grolshomsky	28		48	3	512	512	DX	21.5	yes	1.0	0.4	1.0	+

## Information at the object level (here parasites and cells)

Parasites trajectories,  
shape factor and  
distance to nuclei  
pattern, cells invaded

Invaded cells trajectory  
(with motion  
compensation) and  
dextran response



The screenshot displays a software interface with a central microscopy image showing green and red fluorescent signals. To the right, a 'User Attachments' panel lists three files: 'AnalyseResultsCells.xlsx', 'AnalyseResultsParasites.xlsx', and 'Gloria15.txt'. Below this is a 'System Attachments' section. At the bottom, a table provides metadata for the data.

Uploaded By	Slice Count	time of infect	Frame Count	Channel Count	Image Width	Image Height	mosquito	TPI	Dextran	Nparasites	REVERSE	Pixel Size X	Pixel Size Z	+
gvolohons...	28		48	3	512	512	DSX	21.5	yes	2.0	1.0	0.4	1.0	

# Perspectives

**Evolutionary tool in a collaboration framework with Strand Life Sciences**

**In particular:**

**Integration of image processing tools, creation of typical local workflows,... integration with electronic labbook...**

**Integration (association) with other databases**

**->toward real integrative exploitation of data**

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Jérôme Boulanger

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**FRANCE-BIOIMAGING**

Nœud Paris Centre + Nœud Bio Image  
Informatics (ex-IPDM)



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Jean-Gabriel Dick  
Camille Barette



Nimisha Gupta  
Anup Kulkarny  
Arunhaba Gosh  
Thiru Reddy  
Devendra

...

## Pilot users from Curie.

### Malaria parasites in mosquito gut project:

Gloria Volohonsky  
IBMC Anopheles group Unistra  
Elena Levashina  
Max Planck Institute for Infection Biology

