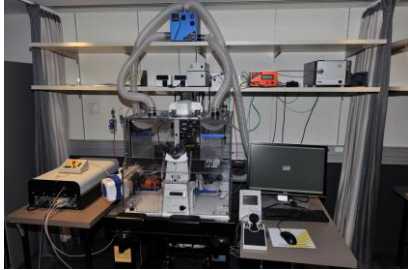
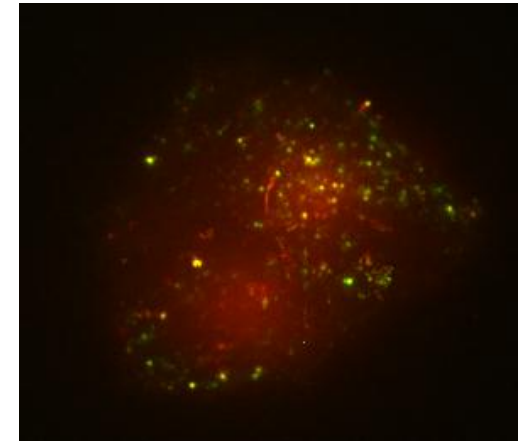
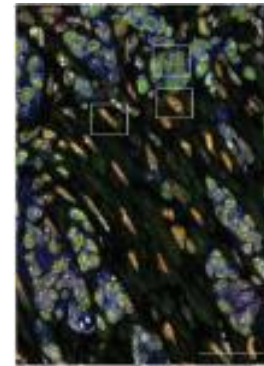
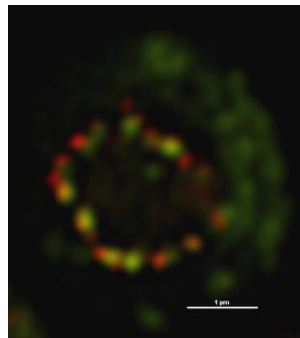
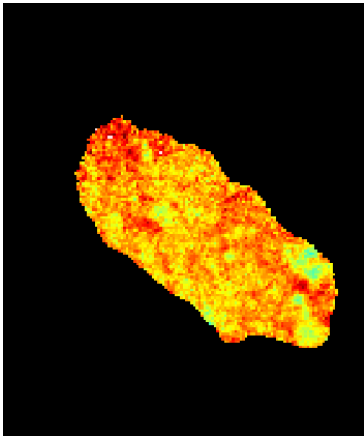


Imagiv, 13th of December 2012

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

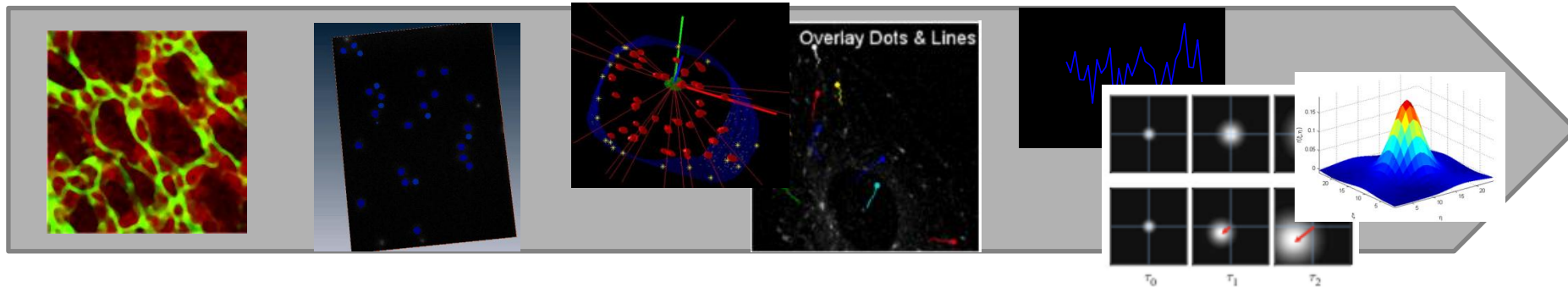


Perrine Paul-Gilloteaux, PICT-IBISA  
UMR144 Institut Curie CNRS  
Paris



## Needed at the local level

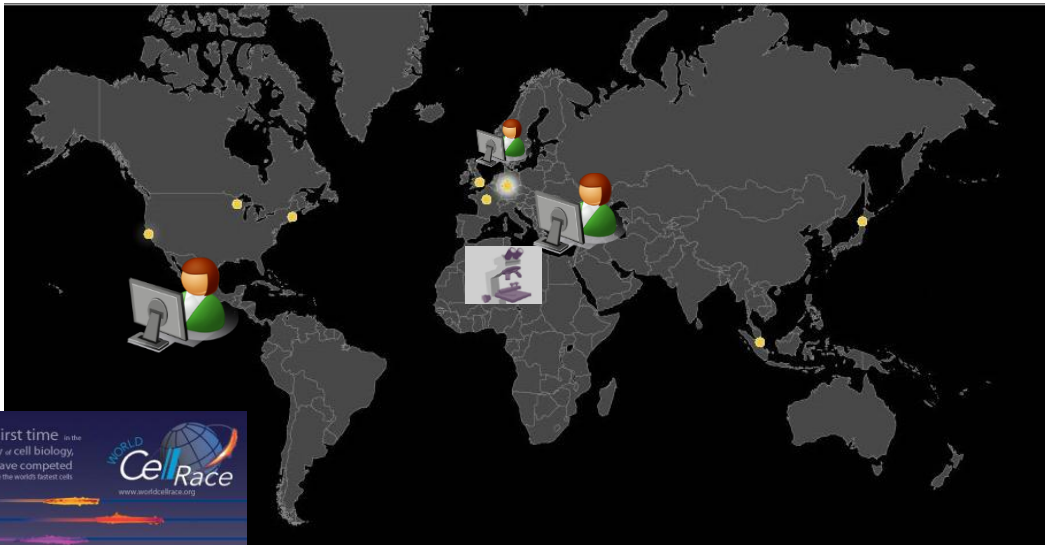
- a production of images over 4 years from 400 to 500 TB to archive, with an annual average of 100 TB to store redundantly,
- produced by ~30 microscopes (photonic and electronic) with different formats,
- around 250 users in Curie and external.
- Projects from tissue, developmental biology, single cells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

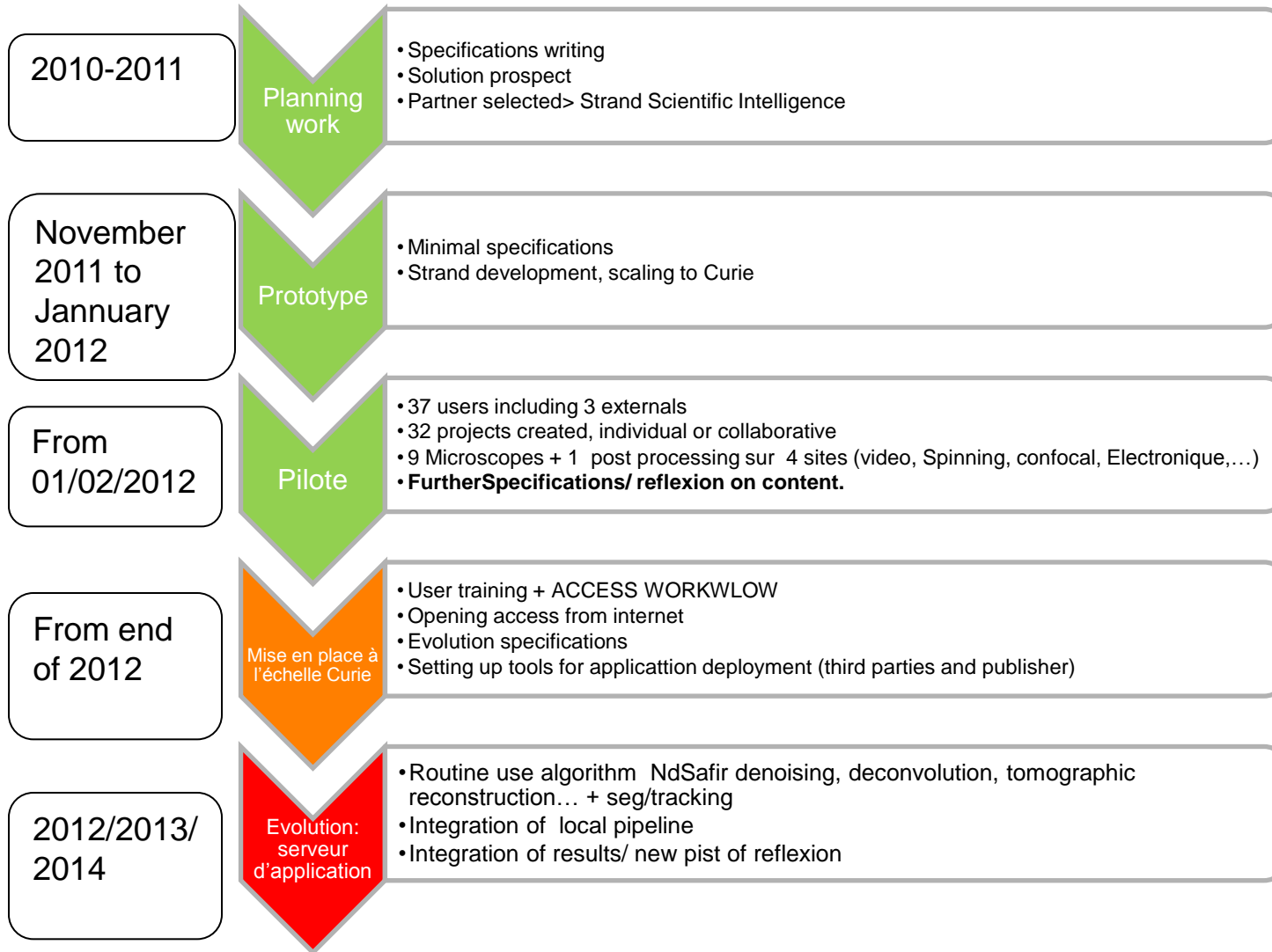
**Free and Open source:** OMERO (main actor in 2010); BISQUE (UCSB) (process oriented); (now also WIDE Montpellier)  
Need time and resources + maintainability (no backward compatibility)+ duplication of data.

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



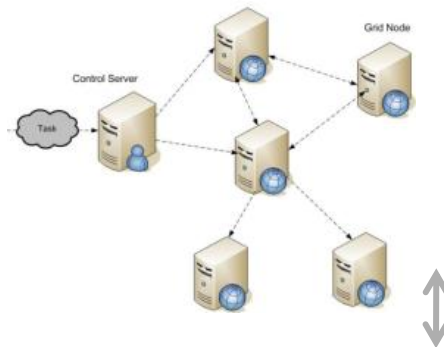
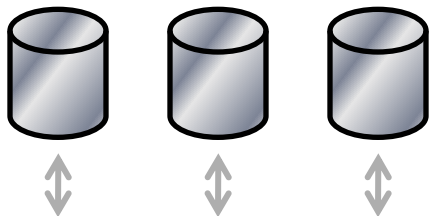
## Actors

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

+ users  
(Curie and externals)

# Image data base

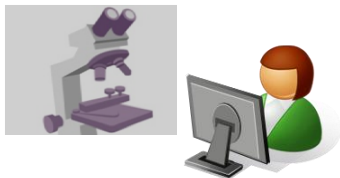
STORAGE



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

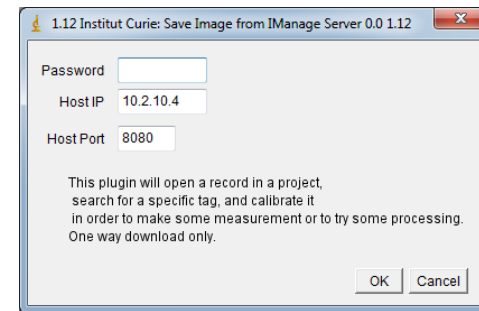
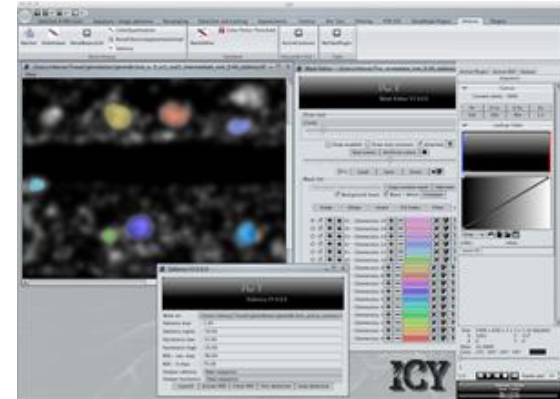
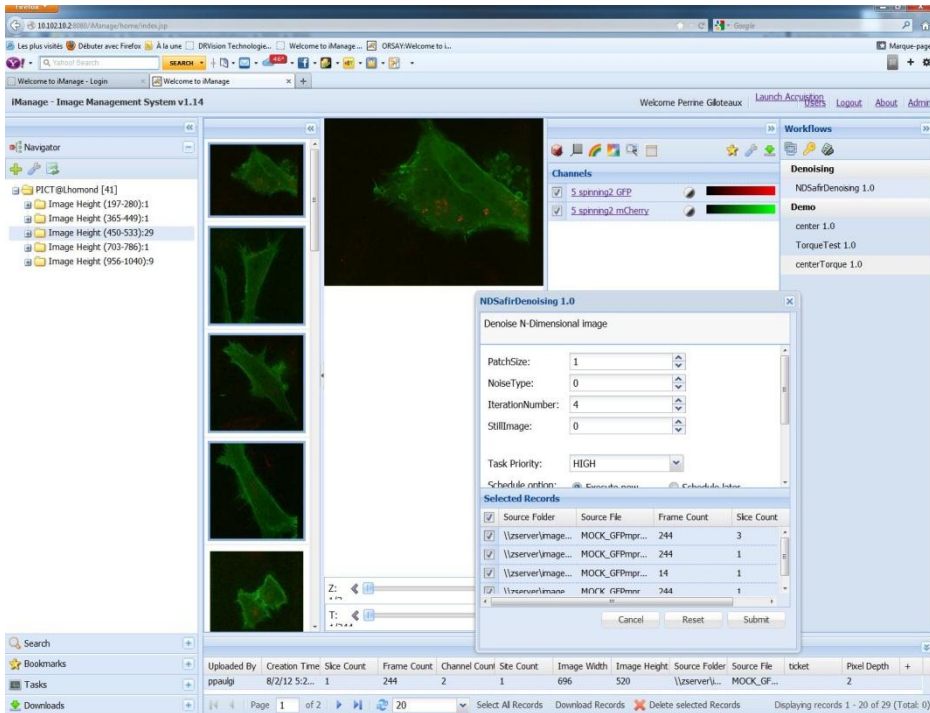


Metadata (pixel size, acquisition time,...) annotations, Parsing nD images Insuring reproducibility by storing all processing

Dynamic Organisation, Visual search or advanced search functionalities



# 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)

Firefox | Welcome to iManage | + | https://vpn.curie.fr/+CSCO+30756767633A2F2F7076712E70686576722E7365+//iManage/home/index.jsp | Google | iManage - Image Management System v1.19 | Welcome Facility Administrator | Launch Acquisition | Users | Logout | Time left: 3:42:54

Navigator

- Mihaela Anitei Eurobioimaging [354]
  - type of imaging (corrupted):9
  - type of imaging (SIM):37
  - type of imaging (Spinning ):119
  - type of imaging (TIRF):78
    - Cell Type (AP1):38
      - Cell Type (AP1 arf):1
      - Cell Type (beads):6
      - Cell Type (MPR):33
    - type of imaging (TIRF Alternate):6
    - type of imaging (TIRF dualview registe.
      - Cell Type (AP1):12
      - Cell Type (beads):10
      - Cell Type (MPR):11
      - Cell Type ():1
    - type of imaging (Wide-Field):6
    - type of imaging ():66

Channels

- Channel 0

Sites

Overlays

- tubule

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...

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



# Beads for dual view registration

The screenshot displays the iManage Image Management System v1.19 interface. The main window shows a dual-view registration of beads, with two smaller images on the left and a larger central image. The interface includes a Navigator panel on the left, a Channels panel on the right, and a Sites panel. 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 metadata and a footer with navigation controls.

Uploaded By	Upload Time	Slice Count	Frame Count	Channel Cour	Site Count	Image Width	Image Height	Source Folde	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 Image Management System v1.19 interface. The main window shows a list of folders under 'Mihaela Anitei Eurobioimaging [354]'. The folders are organized by imaging type and cell type. The central image viewer displays a large image with a green background and orange/red spots. The right sidebar shows 'Channels' with 'Channel 0' and 'Channel 1' selected. The bottom table lists image metadata.

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

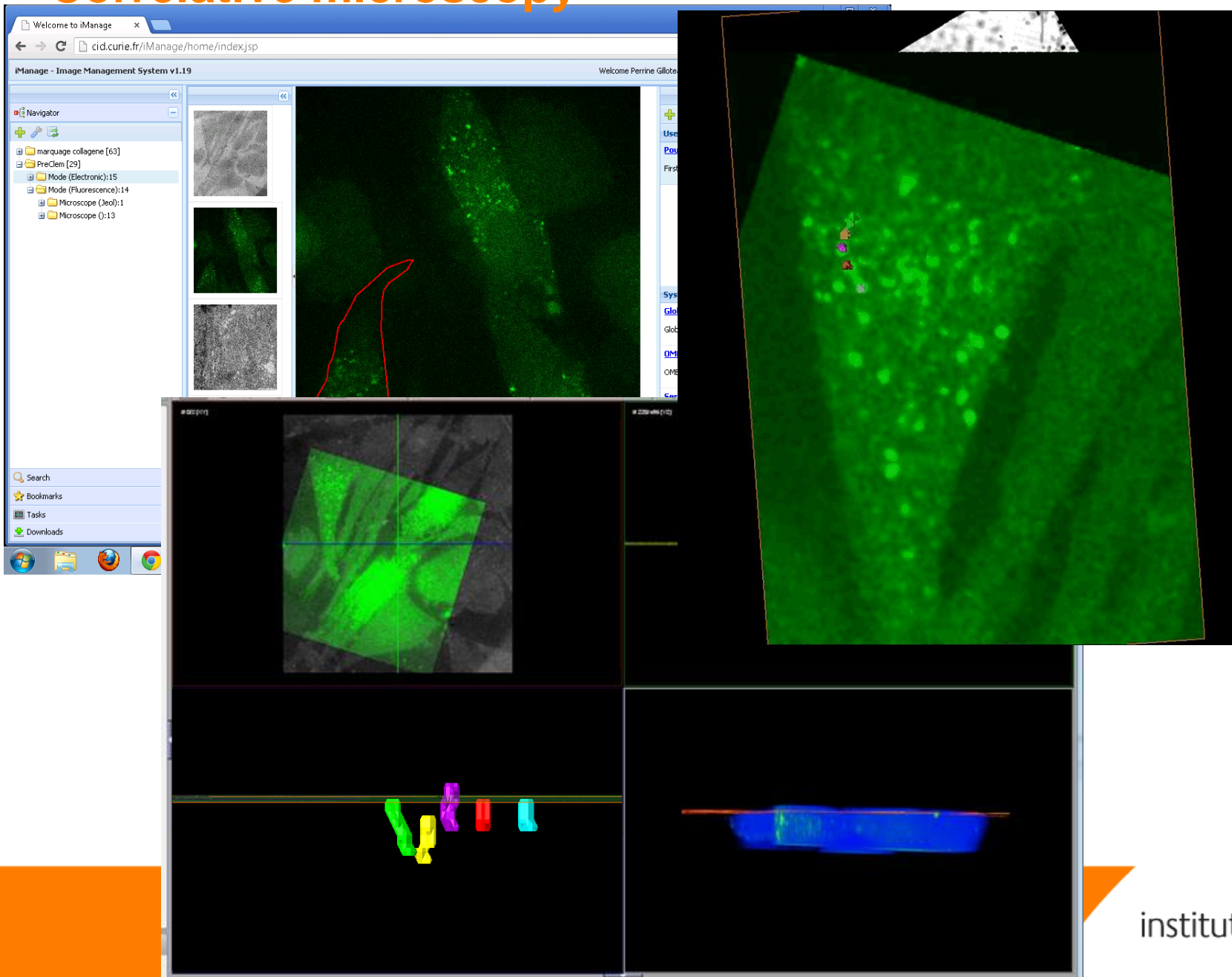
**Overlays**

- crop1
- crop2

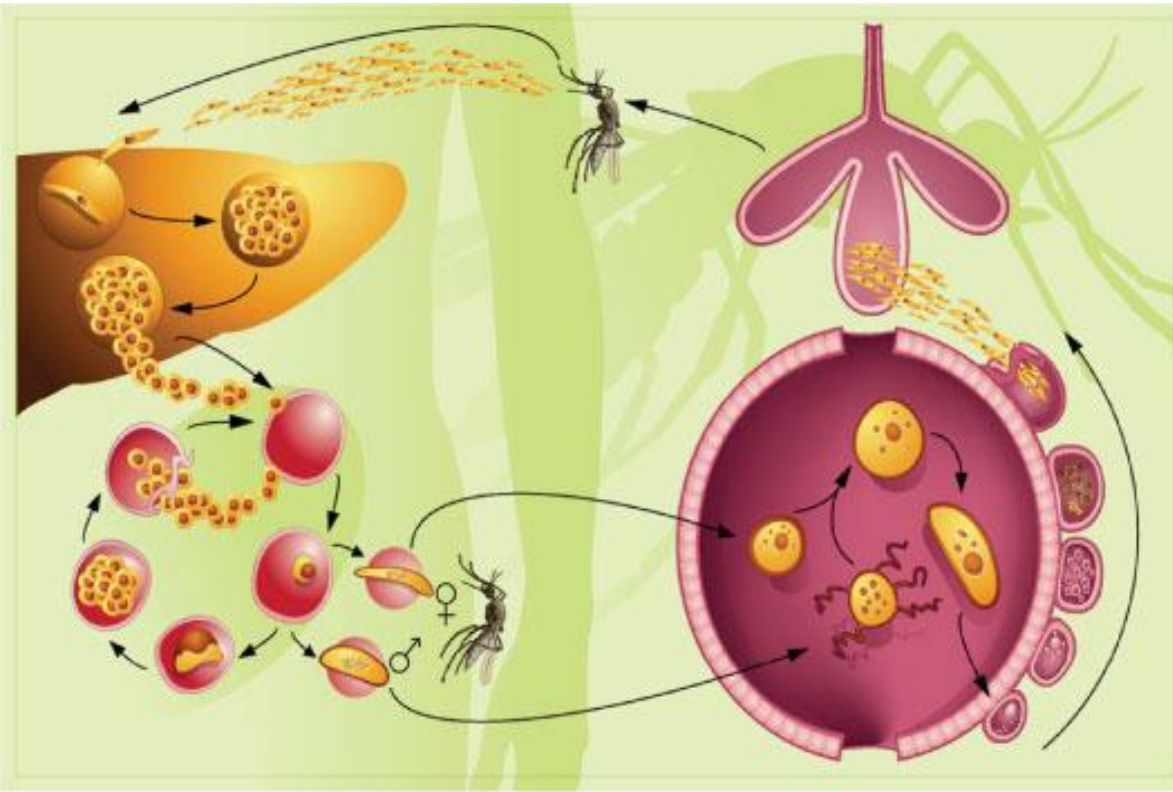
Pixel Depth	Uploaded By	Slice Count	Frame Count	Channel Cour	Site Count	Image Width	Image Height	Source Folde	Source File	
2	ssamoos	1	200	2	1	530	1024	C:\Users\...	Sivps33a_...	+

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

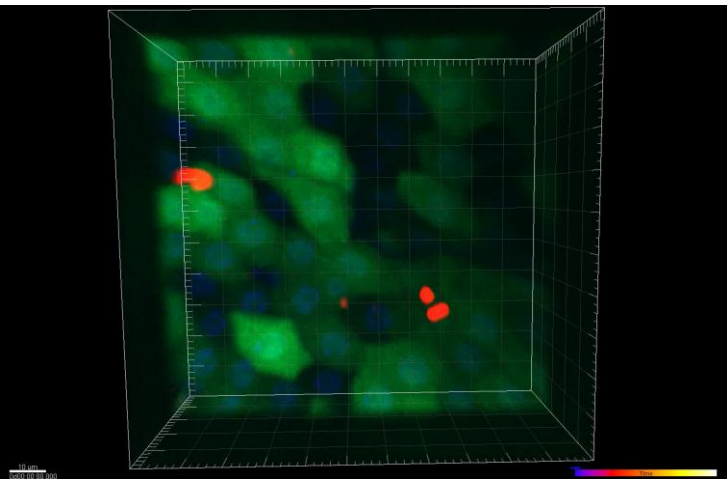
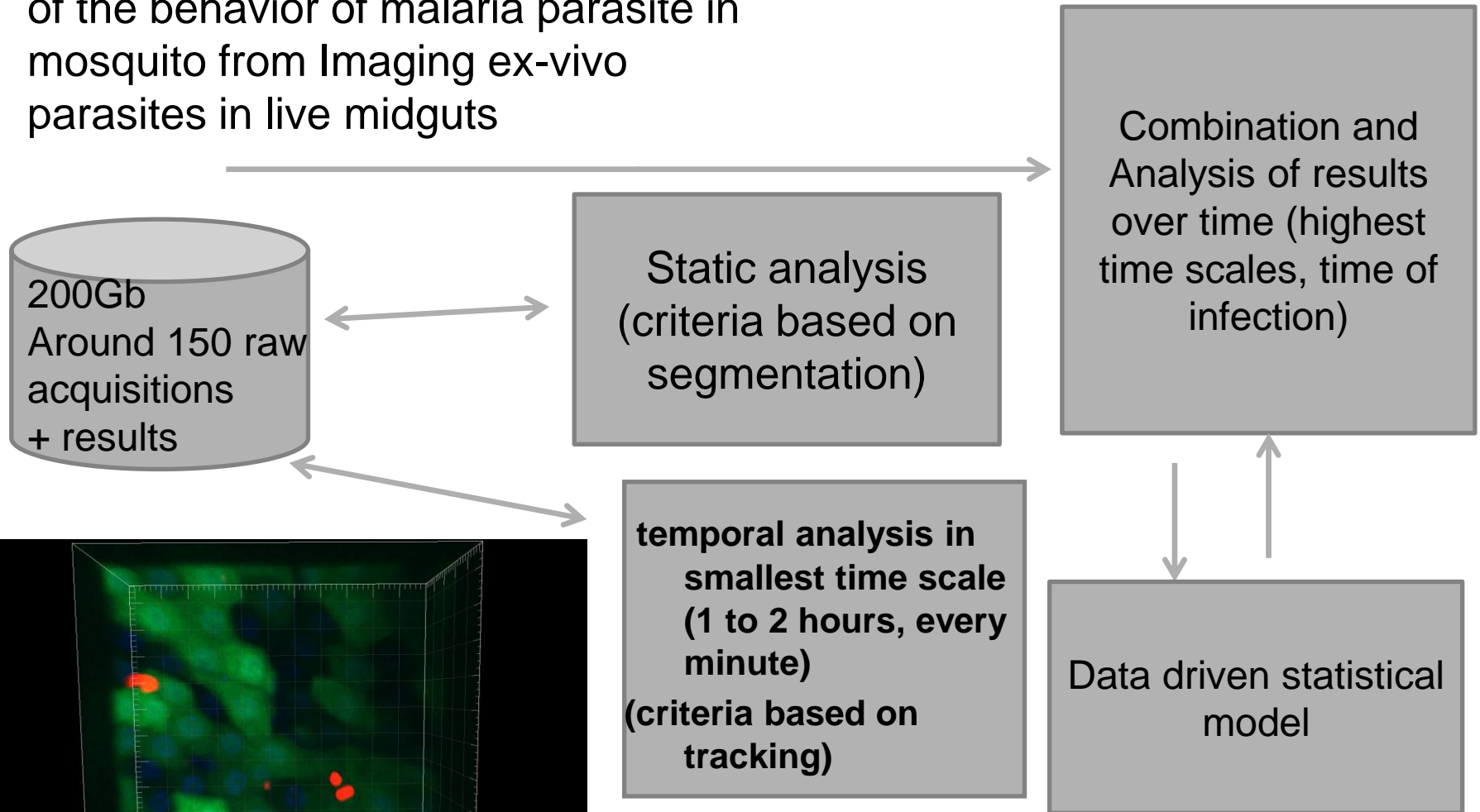
- Proteins attacking the parasite in mosquito LRIM, APL1, TEP 1 (hemocyte)
- Species of mosquito:
  - G12 (india)
  - DSX and HYPER ( African)
- Marker of damaged cells: Sugar Dextran, or hyper protein becoming fluorescent when binded to H2O2 or whith OPH changed.
- Different time of infection, different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



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

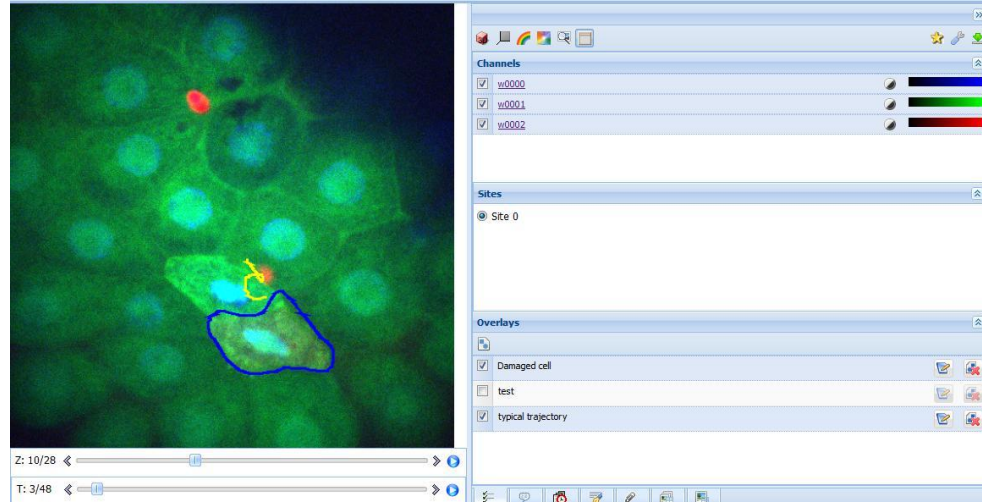
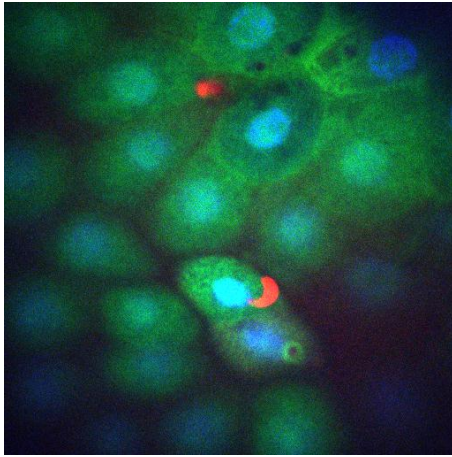
The screenshot displays the Image Management System v1.03 interface. On the left, a 'Navigator' pane shows a tree view of 'Plasmodium parasite invasion in the mosquito' with sub-items for 'mosquito (DSX) 131' and various 'TPI' (Time Point Image) folders. The main area features a grid of small image thumbnails and a large central image showing a detailed view of a mosquito cell with parasites. On the right, a 'User Annotation' table is visible, listing various parameters and their values. Below this, a larger table provides a comprehensive overview of the data records, including columns for 'Uploaded By', 'Slice Count', 'Time of Infection', 'Frame Count', 'Channel Count', 'Image Width', 'Image Height', 'mosquito', 'TPI', 'Dextran', 'REVERSE', 'Pixel Size X', and 'Pixel Size Z'. The bottom of the interface includes a 'Tasks' pane and a status bar showing 'Page 1 of 3' and '58' records.

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
TPI	23.5

Uploaded By	Slice Count	Time of Infection	Frame Count	Channel Count	Image Width	Image Height	mosquito	TPI	Dextran	REVERSE	Pixel Size X	Pixel Size Z
grolchomsky	46	1	3	3	512	512	DSX	26.5	yes	0.0	0.08	1.8
grolchomsky	40	1	3	3	512	512	DSX	20	yes	0.0	0.08	1.8
grolchomsky	42	1	3	3	512	512	DSX	25.5	yes	0.0	0.08	1.8
grolchomsky	22	1	3	3	512	512	DSX	21	no	0.0	0.08	1.8
grolchomsky	47	1	3	3	512	512	DSX	21	no	0.0	0.08	1.8
grolchomsky	63	1	3	3	512	512	DSX	24	yes	0.0	0.08	1.8
grolchomsky	60	1	3	3	512	512	DSX	23.5	yes	0.0	0.08	1.8
grolchomsky	44	1	3	3	512	512	DSX	25.5	yes	0.0	0.08	1.8
grolchomsky	45	1	3	3	512	512	DSX	22	yes	0.0	0.08	1.8
grolchomsky	37	1	3	3	512	512	DSX	24.5	yes	0.0	0.08	1.8
grolchomsky	57	1	3	3	512	512	DSX	24.5	yes	0.0	0.08	1.8
grolchomsky	57	1	3	3	512	512	DSX	24	yes	0.0	0.08	1.8
grolchomsky	48	7	7	7	512	512	DSX	25	yes	0.0	0.08	1.8



# Annotation automatically created can also be visual.



IFManage - Image Management System v1.19

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

Navigator  
Search  
Bookmarks  
Malaria parasite invasion in the mosquito I  
Parasites Typical trajectories [1]

Channels  
 w0000  
 w0001  
 w0002

Sites  
Site 0

Overlays  
 Damaged cell  
 test  
 typical trajectory

Z: 10/28  
T: 3/48

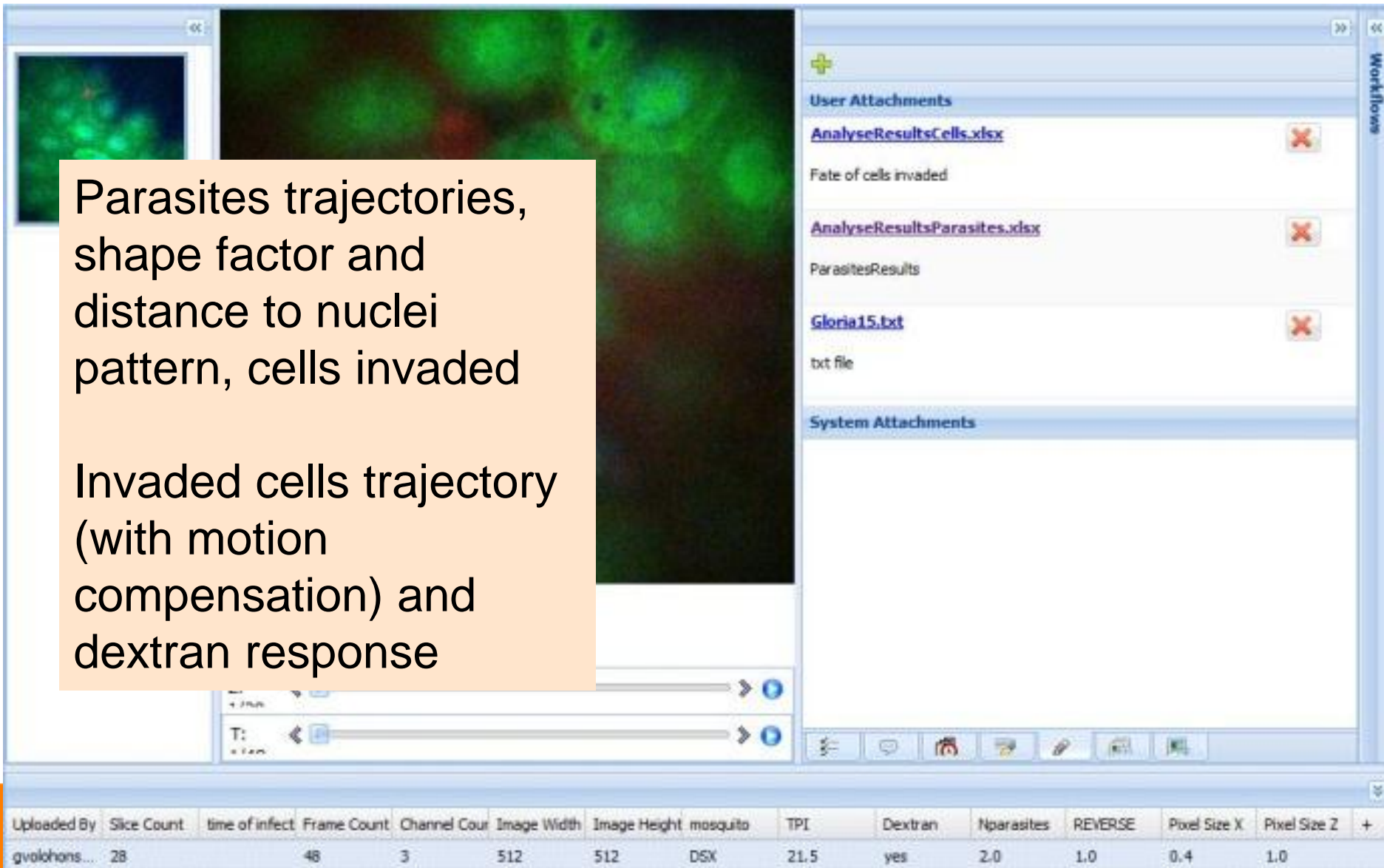
Z: 9/48  
T: 9/48

Uploaded By	Slide Count	Time of Infect	Frame Count	Channel Count	Image Width	Image Height	mosquito	TPI	Dextran	REVERSE	Pixel Size X	Pixel Size Z	
grolshovsky	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 fluorescent cells and red parasites. To the right is a 'Workflows' panel with 'User Attachments' including 'AnalyseResultsCells.xlsx', 'AnalyseResultsParasites.xlsx', and 'Gloria15.txt'. Below the image are navigation controls for time (T: 0:12:00). At the bottom is a data table with the following columns and values:

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**

# Acknowledgements

## PICT-IBISA

Jean Salamero



### Pict@Bdd:

Olivier Renaud  
Olivier Leroy  
Tristan Piolot

### Pict@Orsay

Fabrice Cordelières  
Pauline Chabosseau

### Pict@Lhomond+NIC

Vincent Fraisier  
Lucie Sengmanivong  
François Waharte  
Jérôme Boulanger

### Pict@Pasteur

Patricia Le Baccon

## Serpico team (Inria):

Charles Kervrann    Tristan Lecorgne



**FRANCE-BIOIMAGING**

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



## IT department

Sébastien Goud  
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



