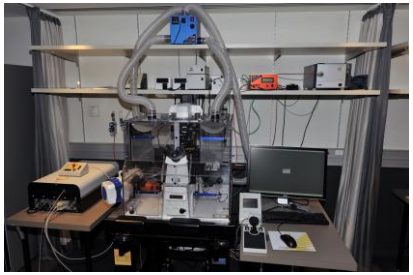
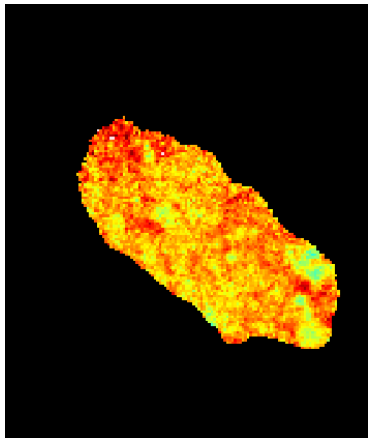
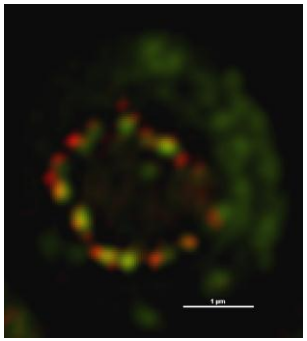
Imagiv, 13th of December 2012

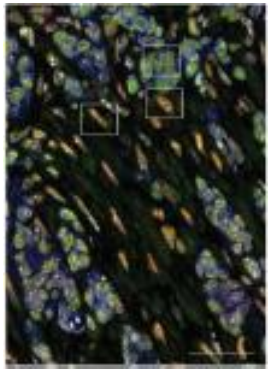
# Image Data Base on a microscopy facility: Deployment and Examples of projects

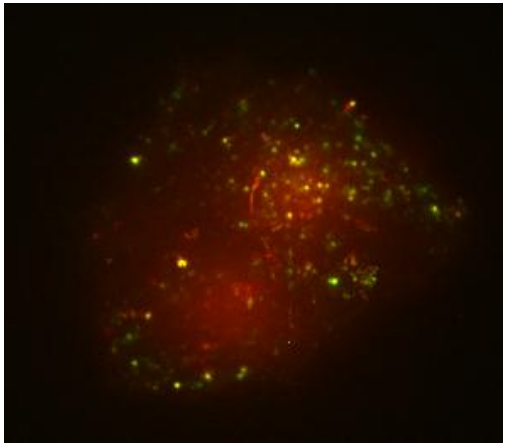


**Perrine Paul-Gilloteaux, PICT-IBISA**
**UMR144 Institut Curie CNRS**
**Paris**









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PICT

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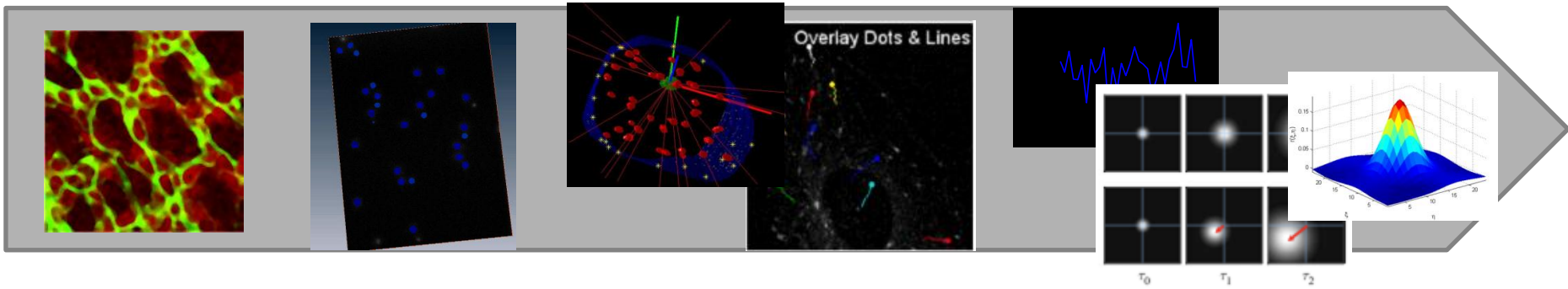
# Needed at the local level

→ 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 subcellar dynamics, molecular dynamics

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# 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

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# 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 Montpelier)
Need time and resources + maintanibility (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.

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# Deployment plan

| | | |
|---|---|---|
| 2010-2011 | Planning work | • Specifications writing<br>• Solution prospect<br>• Partner selected> Strand Scientific Intelligence |
| November 2011 to Jannuary 2012 | Prototype | • Minimal specifications<br>• Strand development, scaling to Curie |
| From 01/02/2012 | Pilote | • 37 users including 3 externals<br>• 32 projects created, individual or collaborative<br>• 9 Microscopes + 1 post processing sur 4 sites (video, Spinning, confocal, Electronique,…)<br>• **FurtherSpecifications/ reflexion on content.** |
| From end of 2012 | Mise en place à l'échelle Curie | • User training + ACCESS WORKWLOW<br>• Opening access from internet<br>• Evolution specifications<br>• Setting up tools for applicattion deployment (third parties and publisher) |
| 2012/2013/ 2014 | Evolution: serveur d'application | • Routine use algorithm NdSafir denoising, deconvolution, tomographic reconstruction… + seg/tracking<br>• Integration of local pipeline<br>• Integration of results/ new pist of reflexion |

Actors

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

+ users (Curie and externals)

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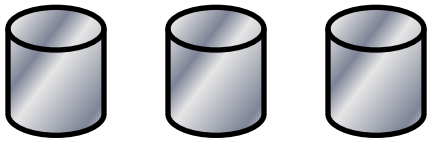
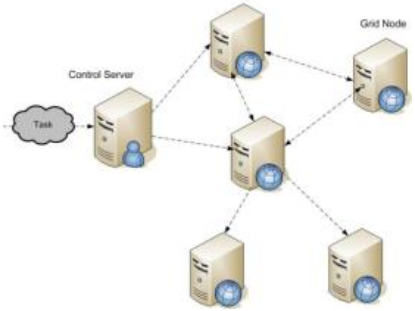
# Image data base

STORAGE






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

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

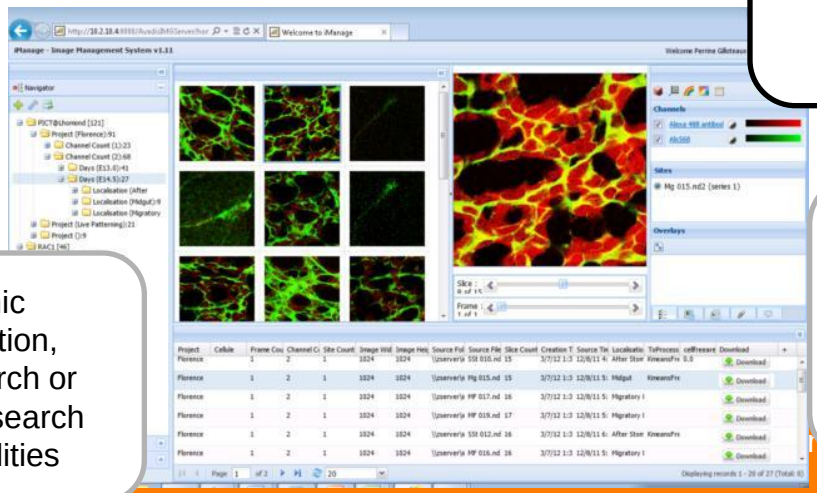
Acquisition Client

Web Client

Interface

Web admin for project managing

Automatic analysis without full download, Data fusion, advanced visualisation



Dynamic Organisation, Visual search or advanced search functionalities

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

Strand Life Sciences
Algorithms for Life

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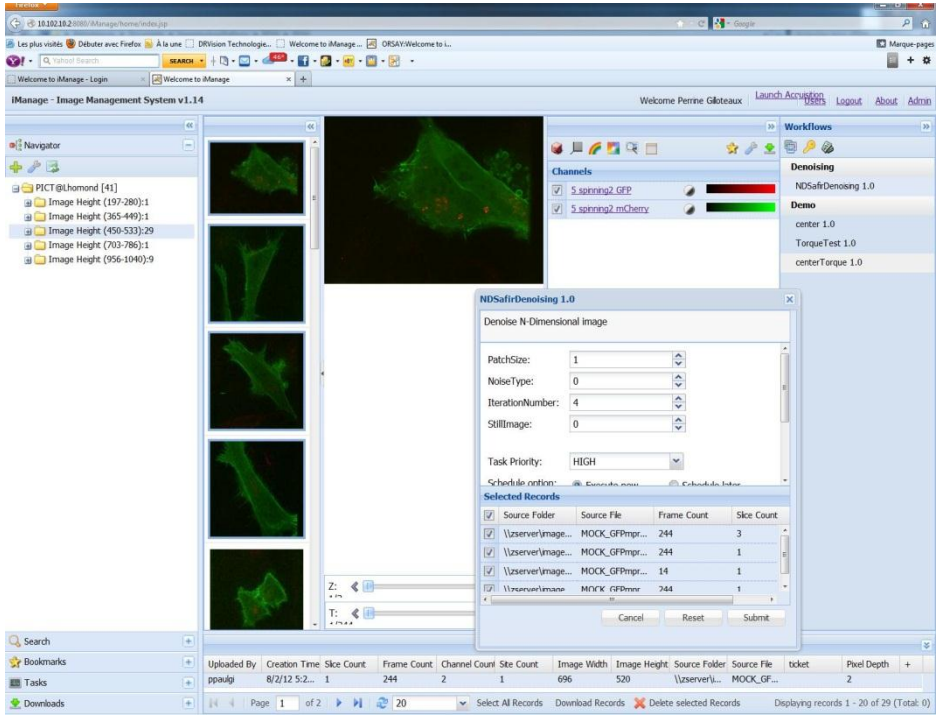
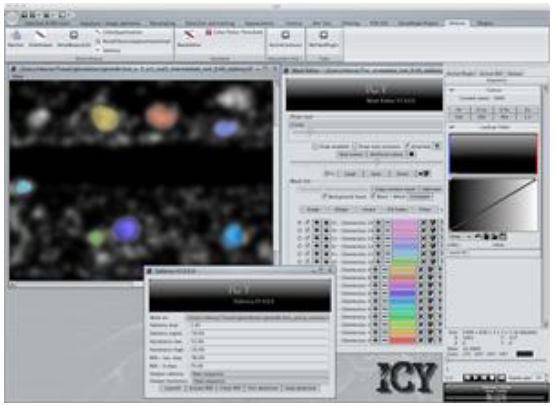
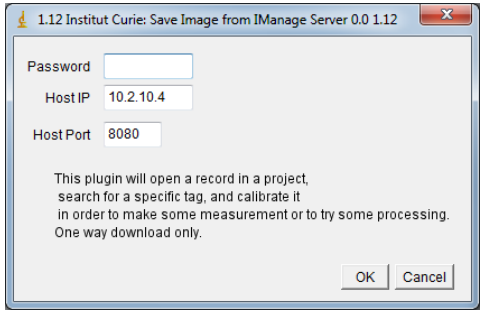
# 2 level of processing integration




Example: integration of NdSafir denoising

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

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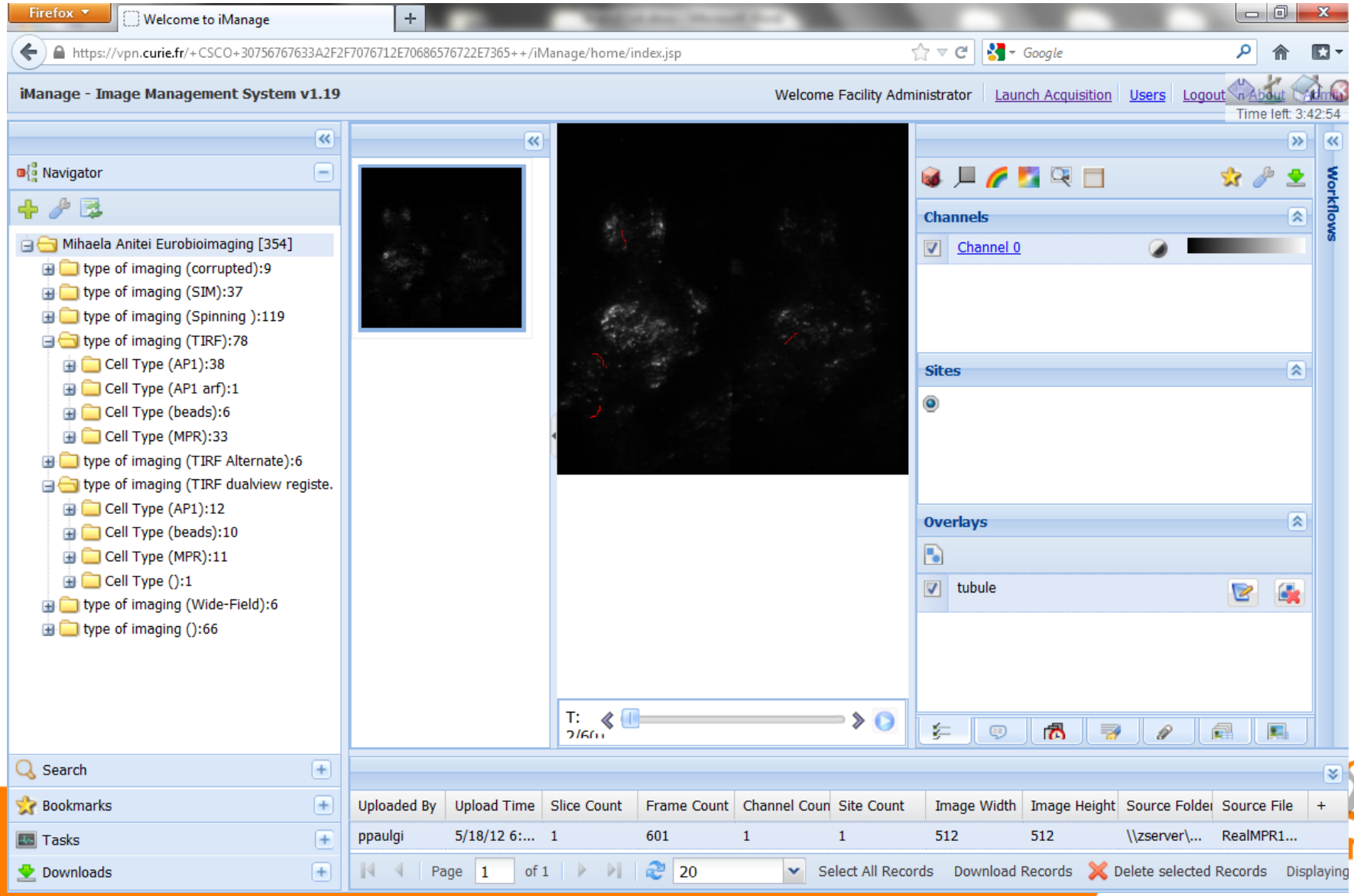
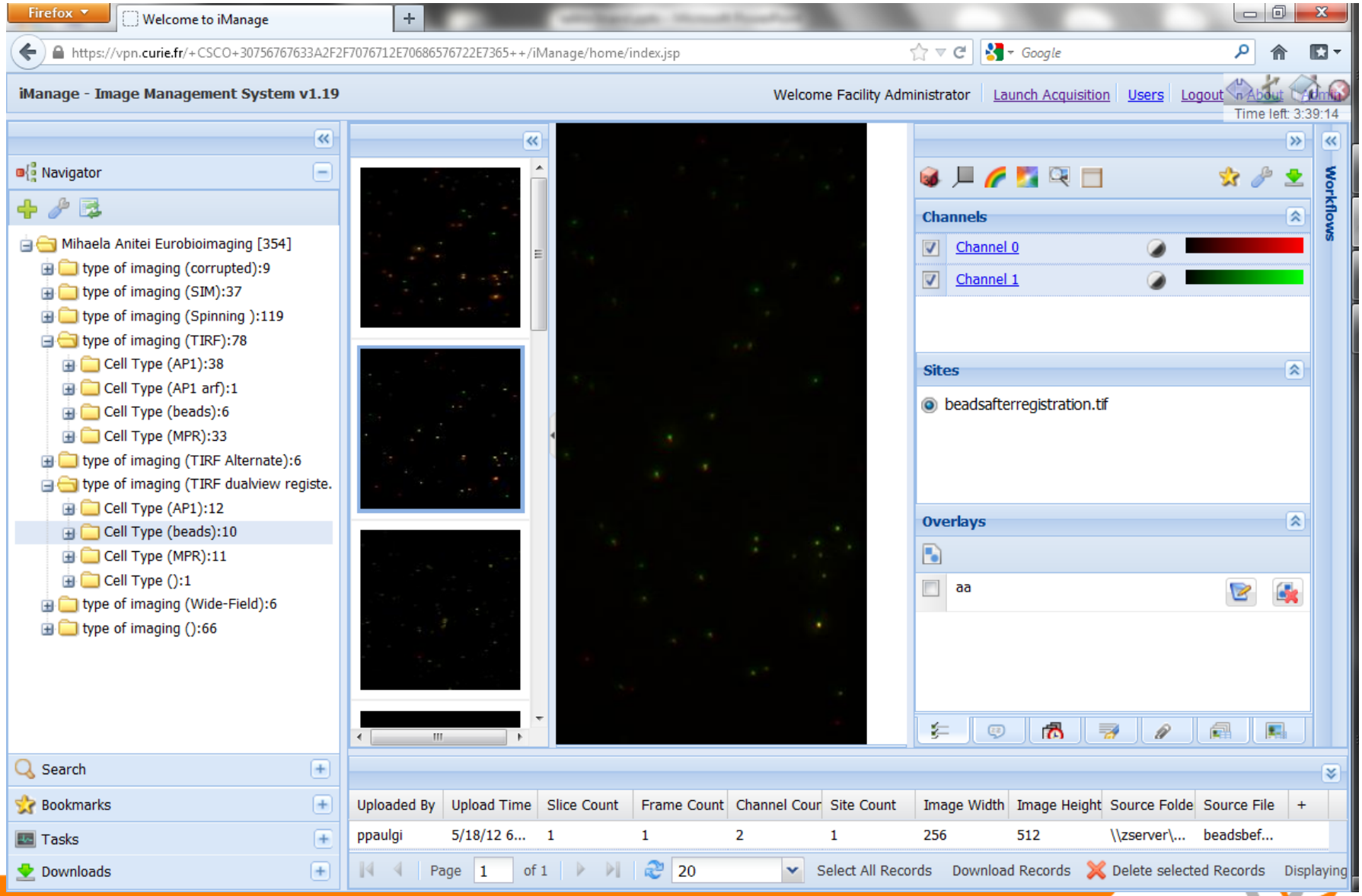
# Examples of On going Projects:

→ Eurobioimaging: (4 proof of concept studies)



# Beads for dual view  registration

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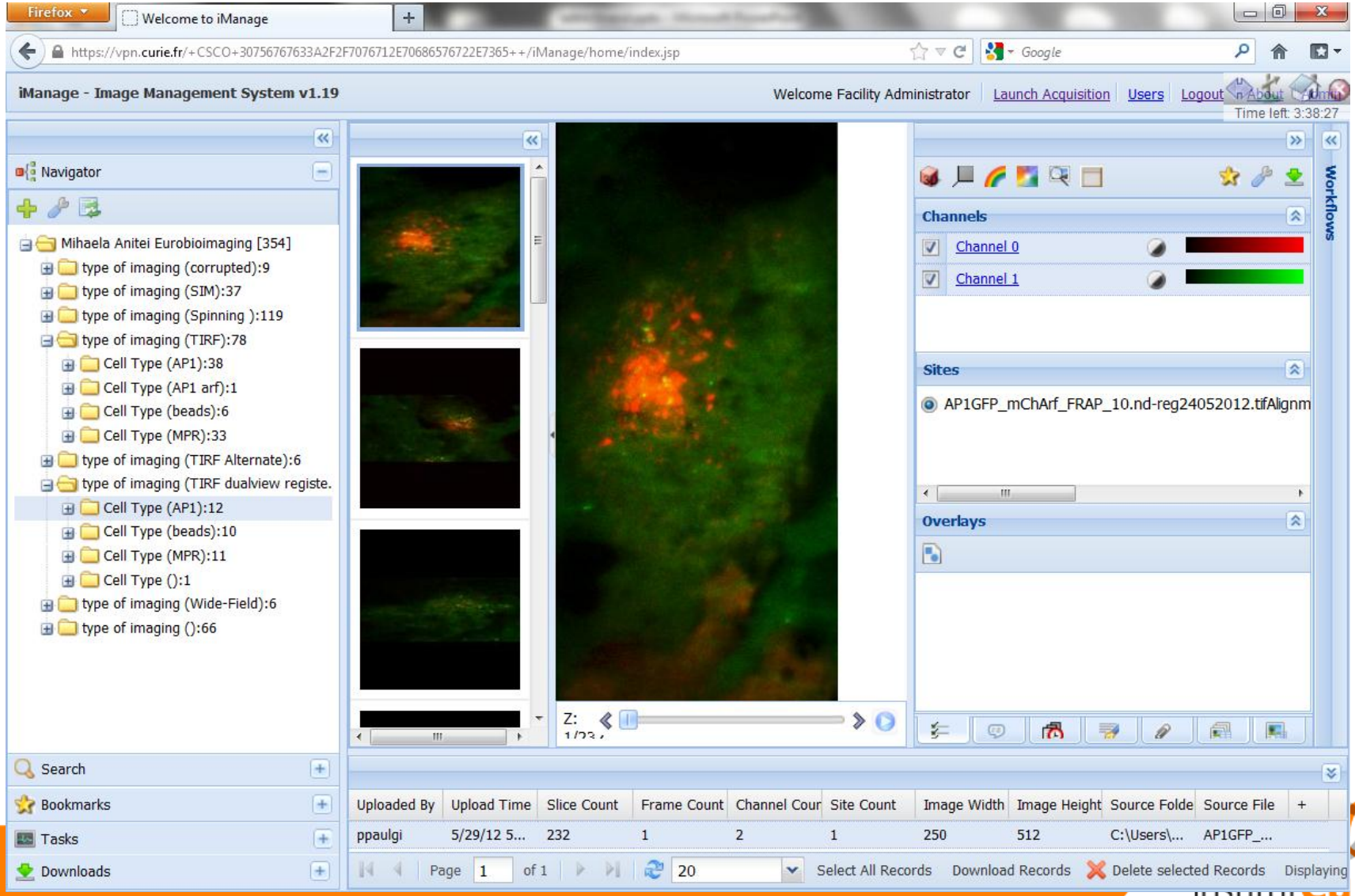
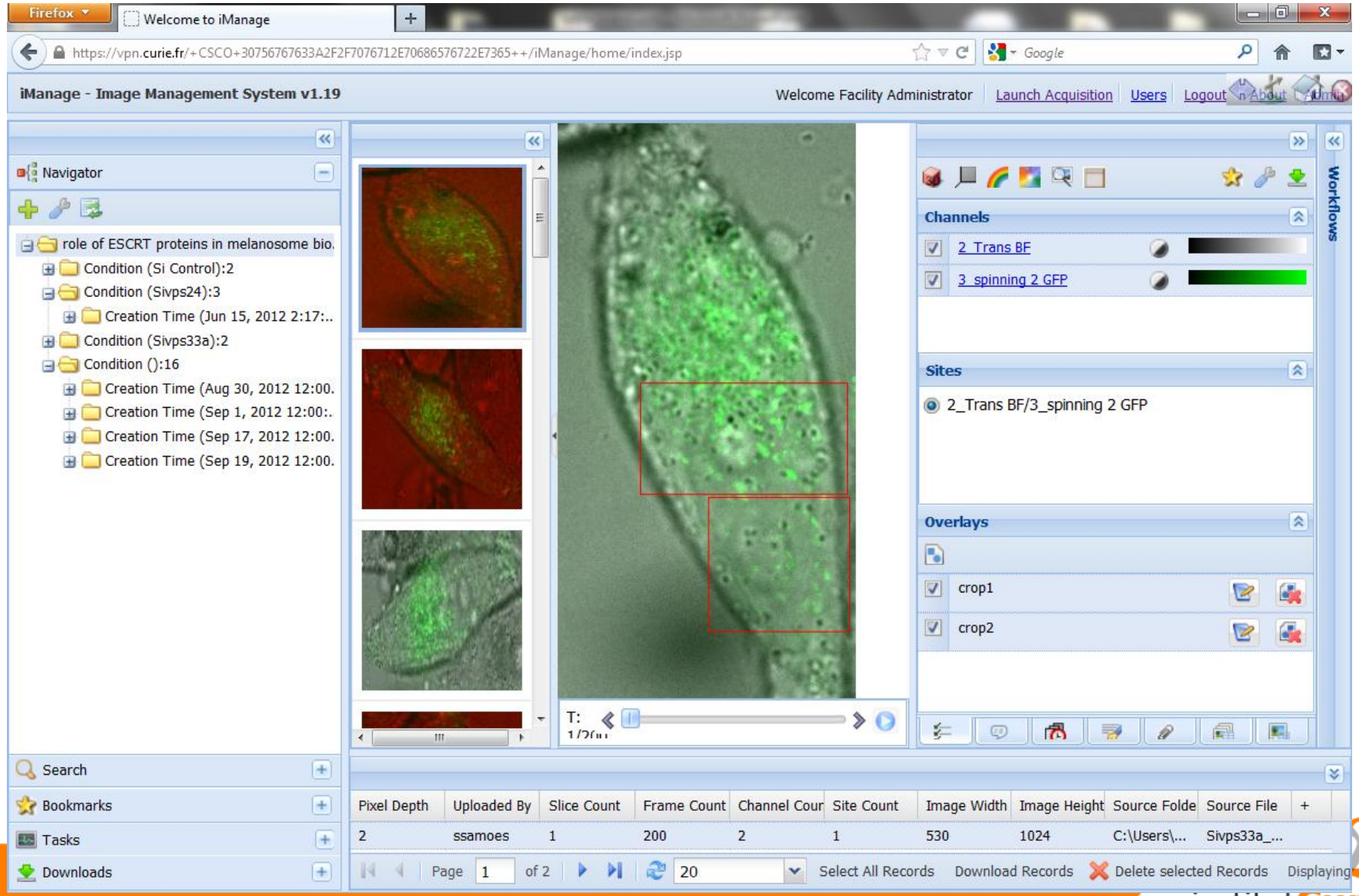
# Images were batch registered without download in ImageJ, and result was uploaded from ImageJ.



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

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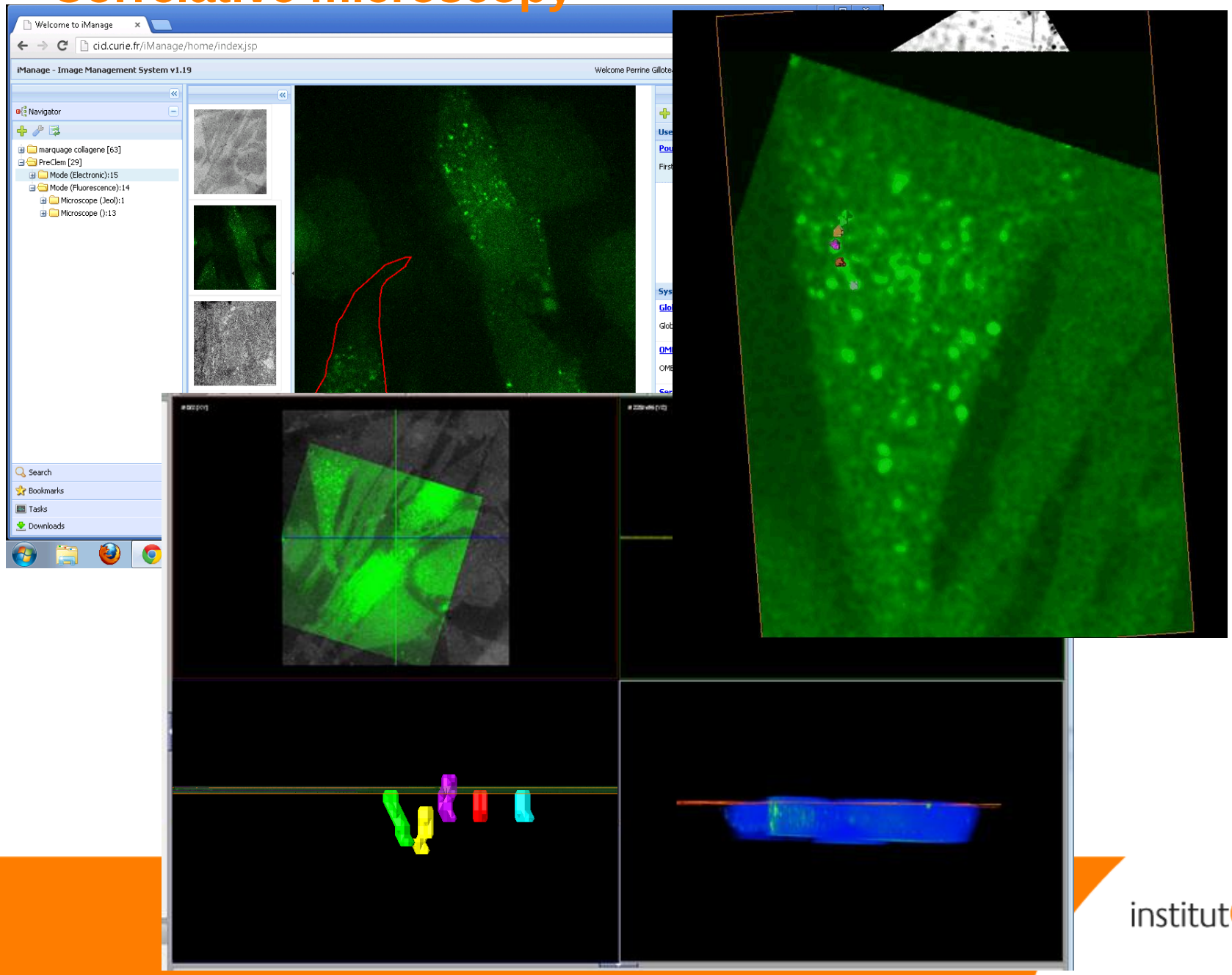
# Correlative microscopy

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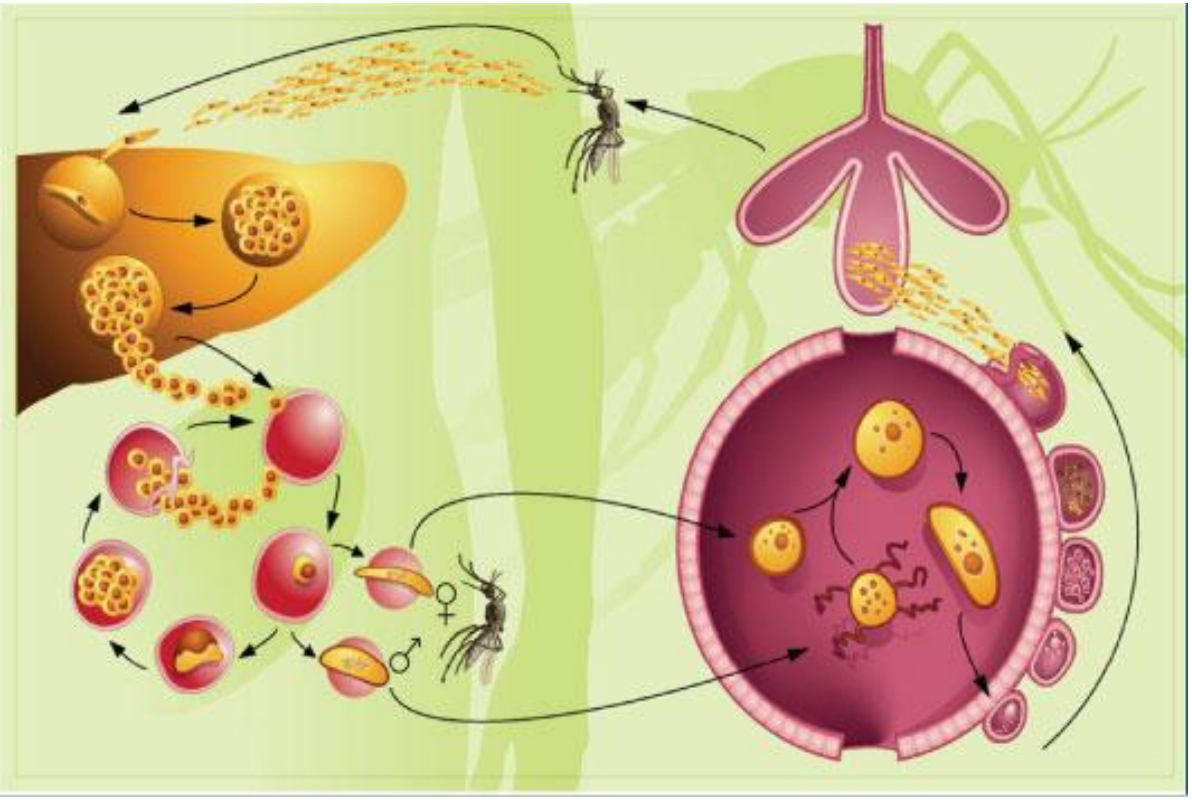
# Not a storage and image management tool: A R&D tool. Example of on-going project.



**malaria parasite invasion in the mosquito tissues**

Gloria Volohonsky
IBMC Anopheles group
Unistra

Elena Levashina
Max Planck Institute for Infection Biology

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# 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 H202 or whith OPH changed.

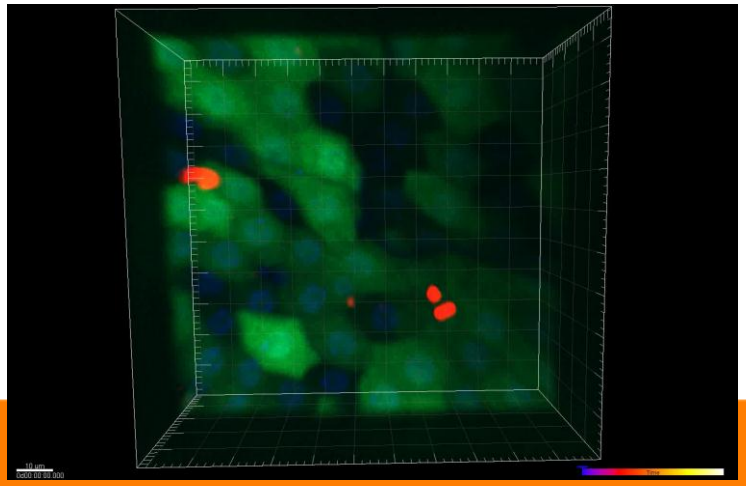
- Different time of infection, different times post infection.

**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



200Gb
Around 150 raw acquisitions
+ results

Static analysis (criteria based on segmentation)

**temporal analysis in smallest time scale (1 to 2 hours, every minute)**
**(criteria based on tracking)**

Combination and Analysis of results over time (highest time scales, time of infection)

Data driven statistical model

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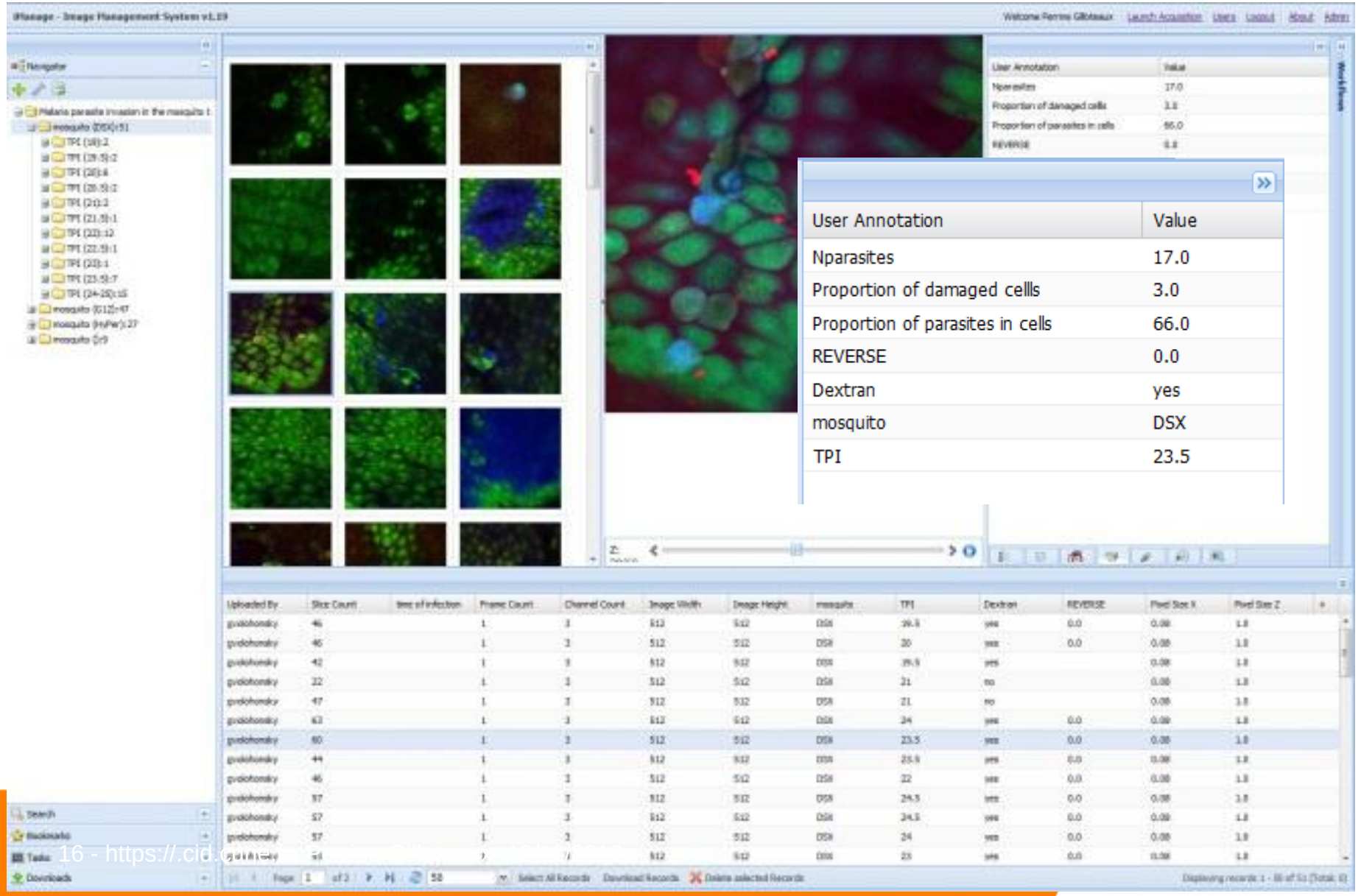
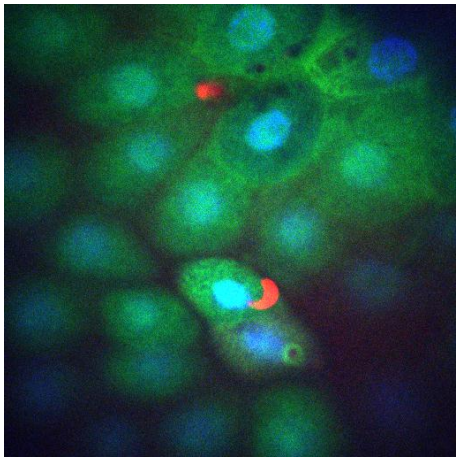
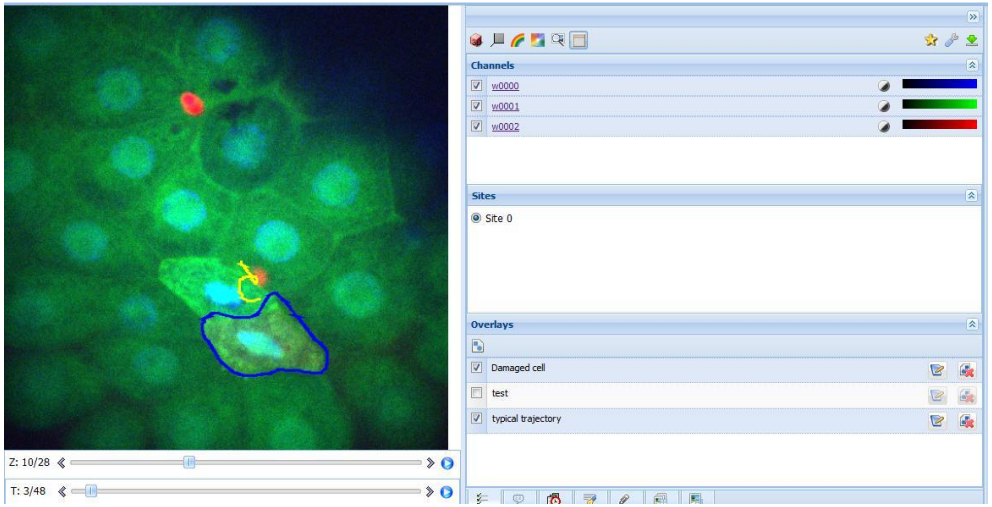
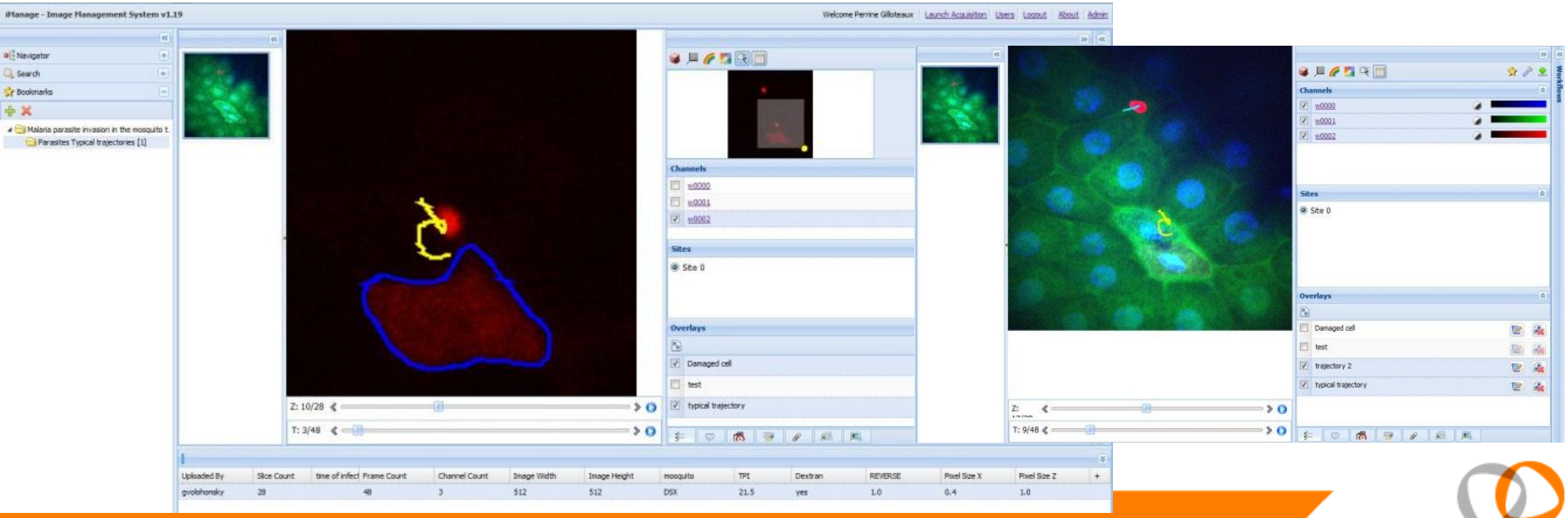
# Data are annotated. Results of processing at the record level are uploaded by the processing algorithm



# Annotation automatically created can also be visual.



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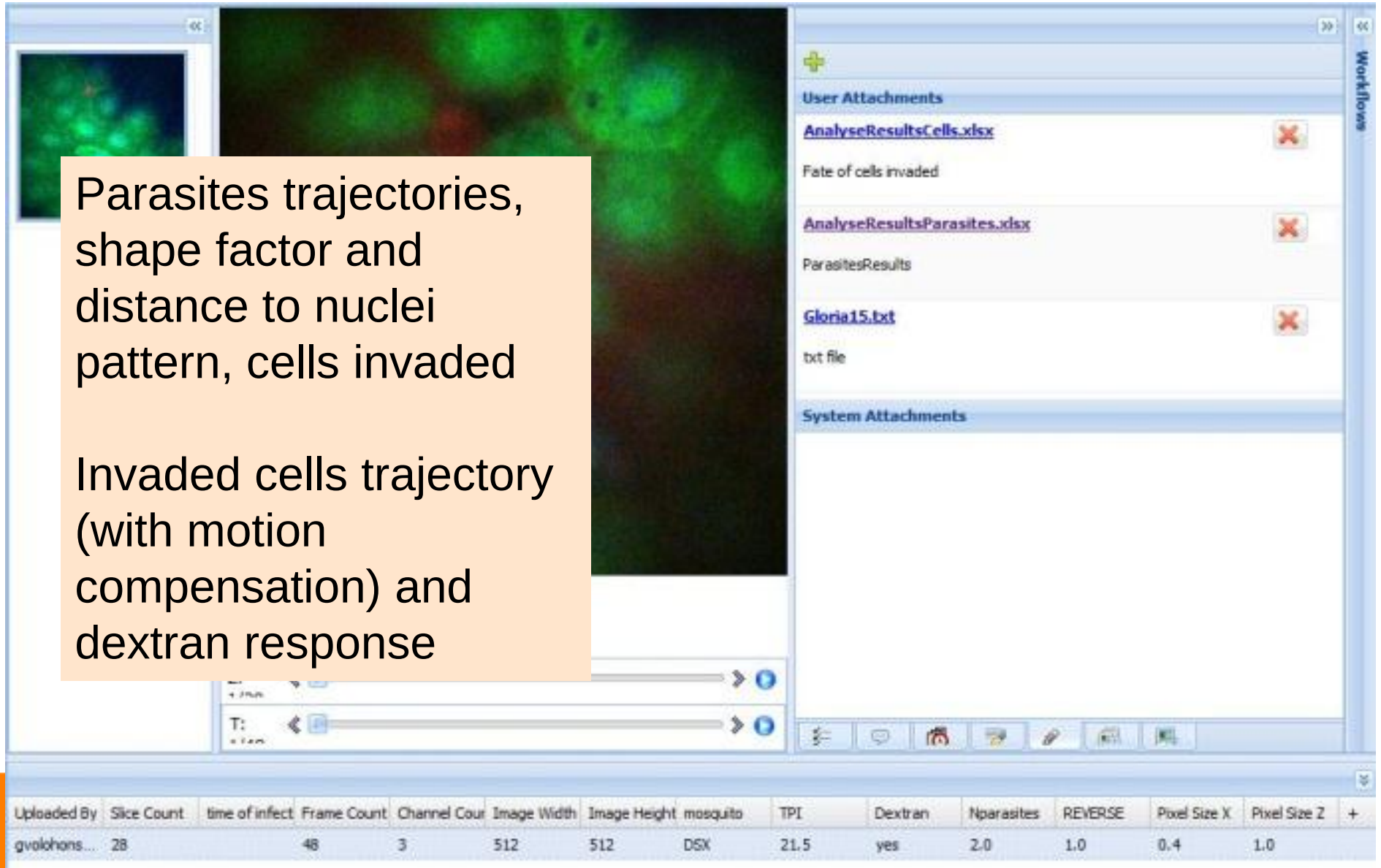
# Information at the object level (here parasites and cells)



# Perpectives

**Evolutive 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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# Acknowledgements


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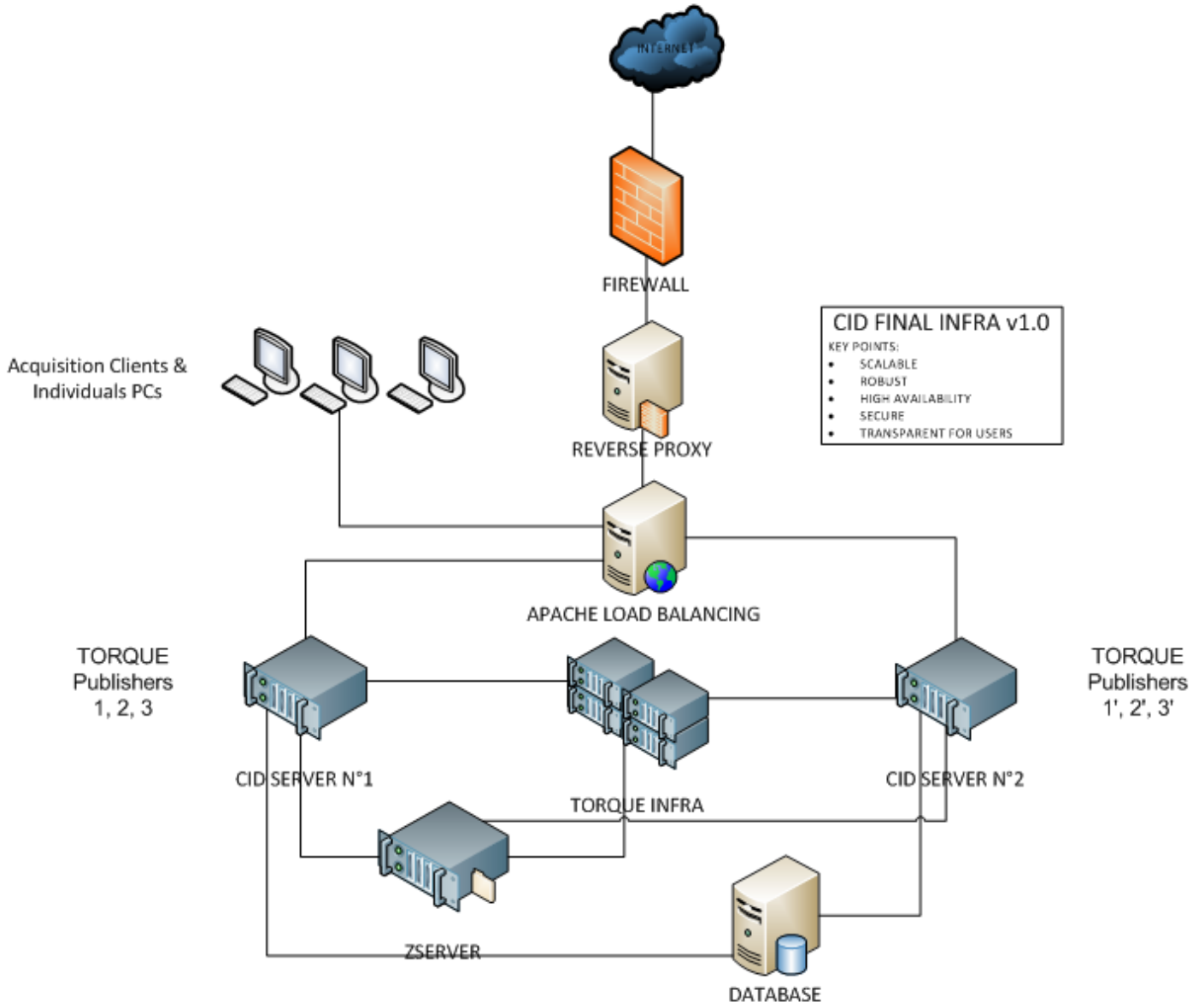
Arunhaba Gosh
Thiru Reddy
Devendra
…

## Pilot users from Curie.

**Malaria parasites in mosquito gut project:**
Gloria Volohonsky
IBMC Anopheles group Unistra
Elena Levashina
Max Planck Institute for Infection Biology

## Serpico team (Inria):
Charles Kervrann  Tristan Lecorgne

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

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