



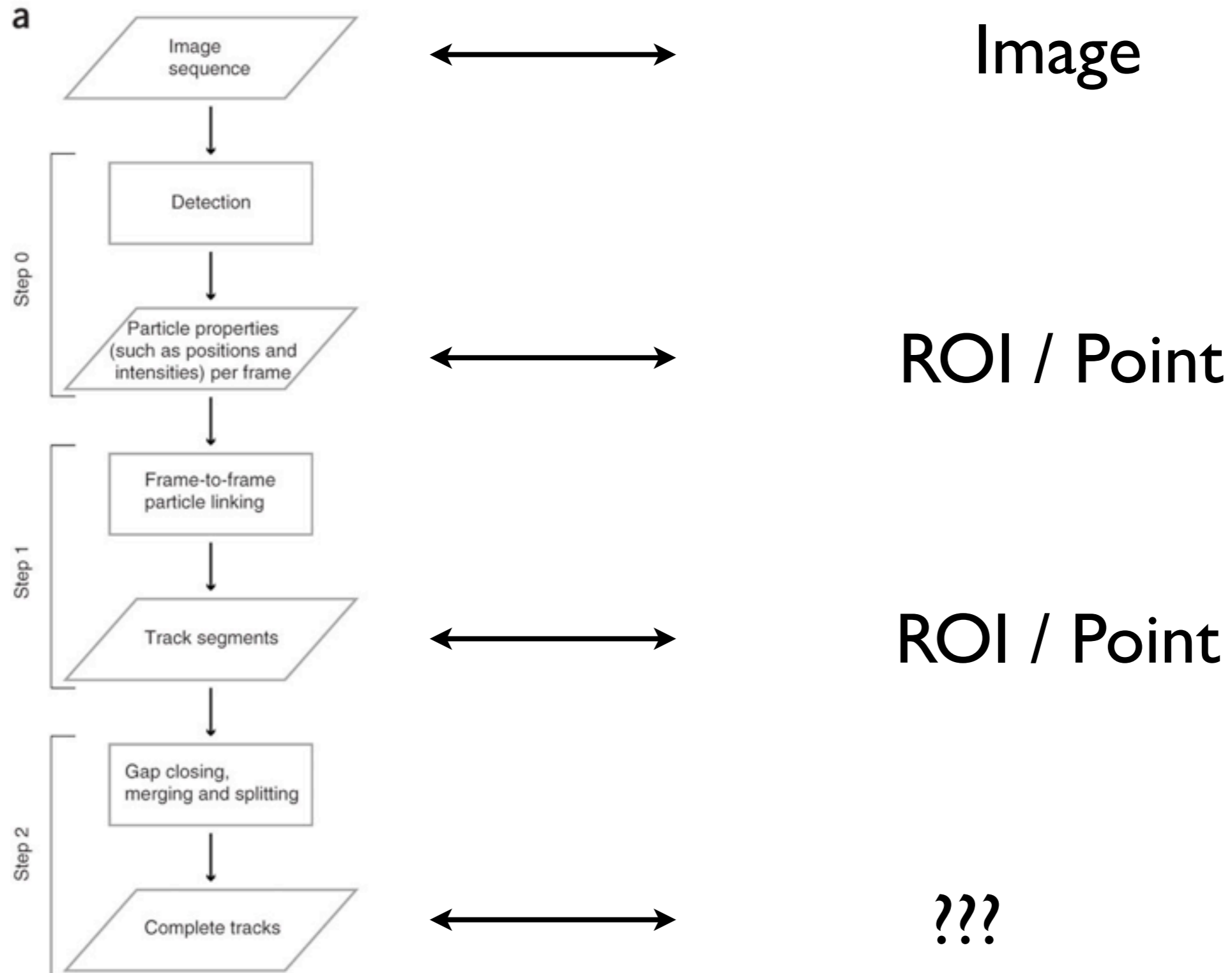
# Tracking with OMEERO

Sébastien Besson / Gaudenz Danuser  
LCCB - Harvard Medical School

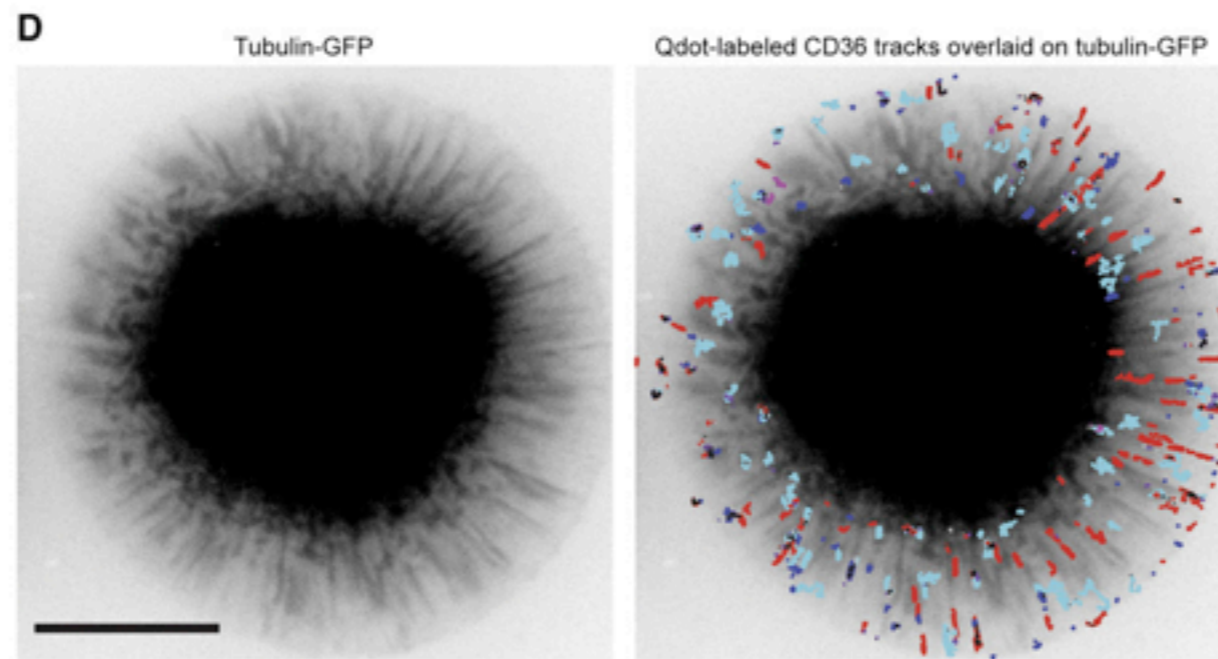
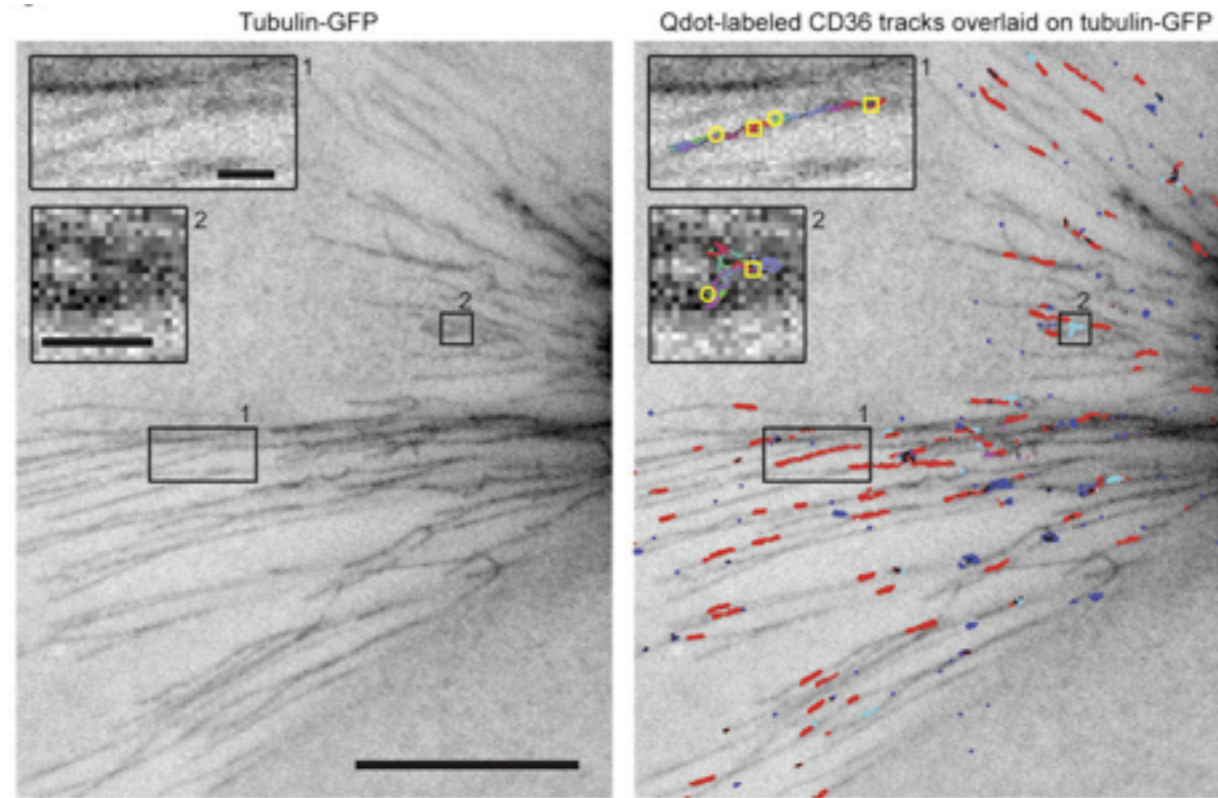
OME Developers & Satellite PIs Meeting  
February 28, 2013

# Tracking framework

Jaqaman et al. Nature Methods 2008

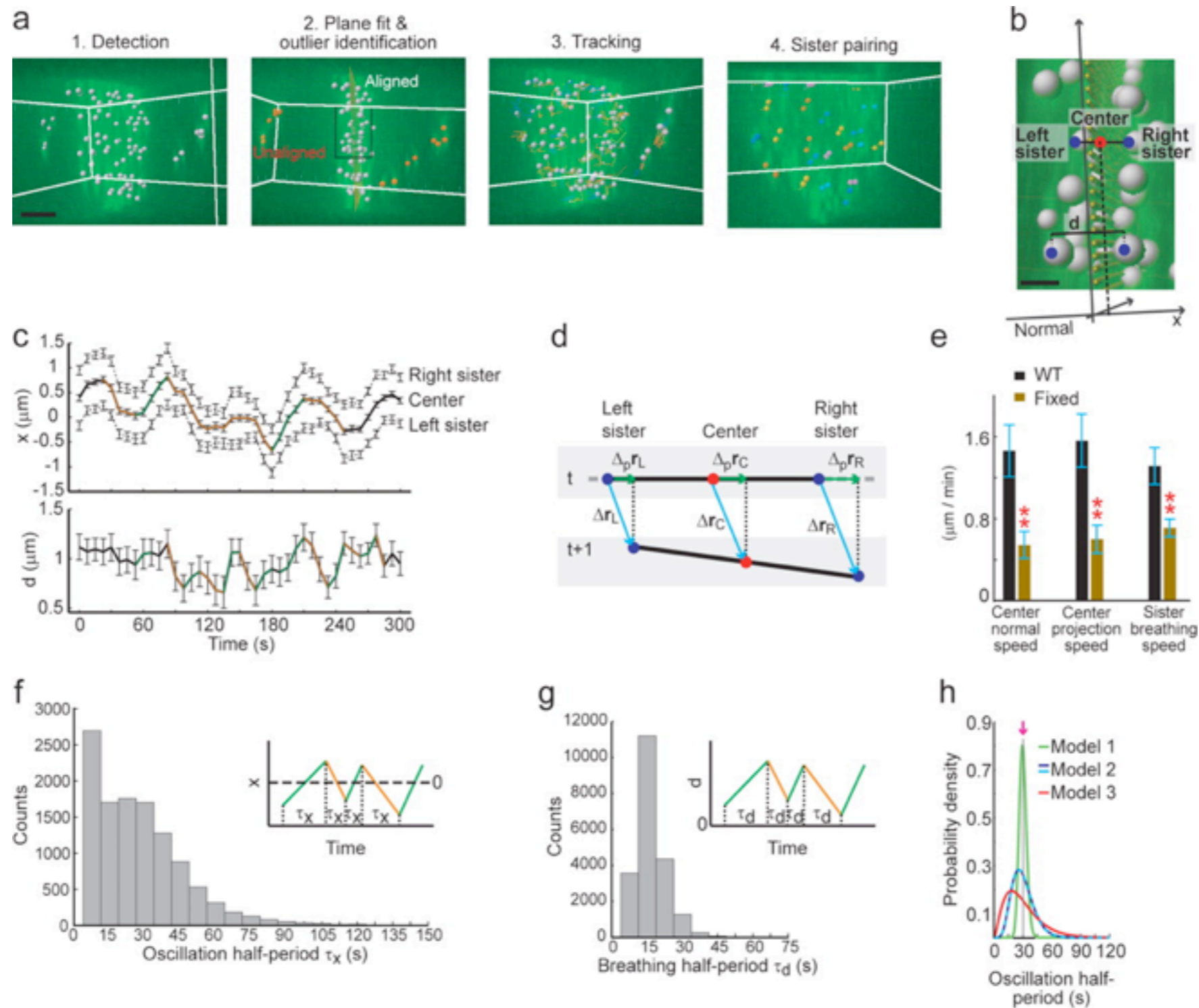


# Tracking applications (I)



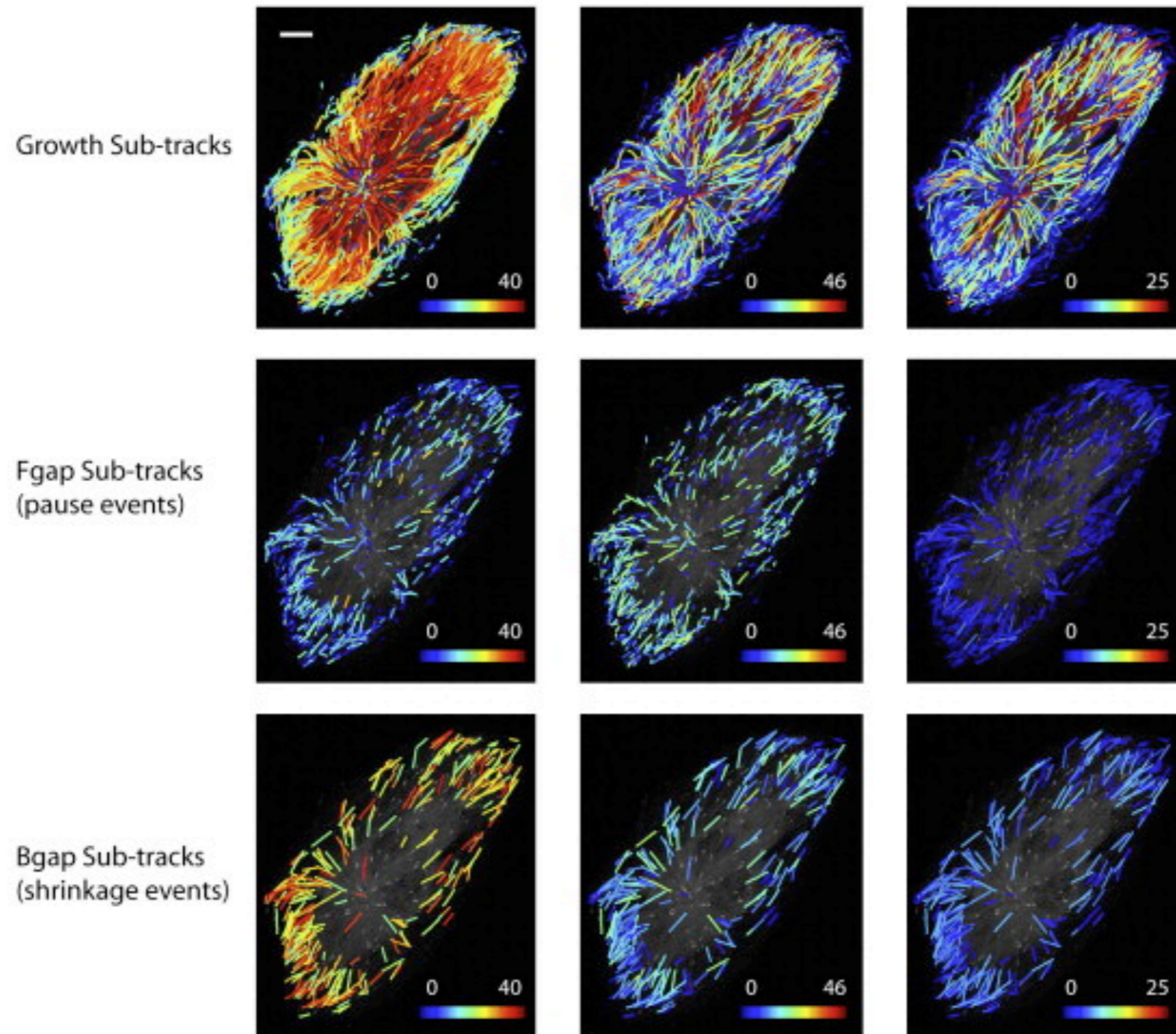
Jaqaman et al. Cell 2011

# Tracking examples (II)



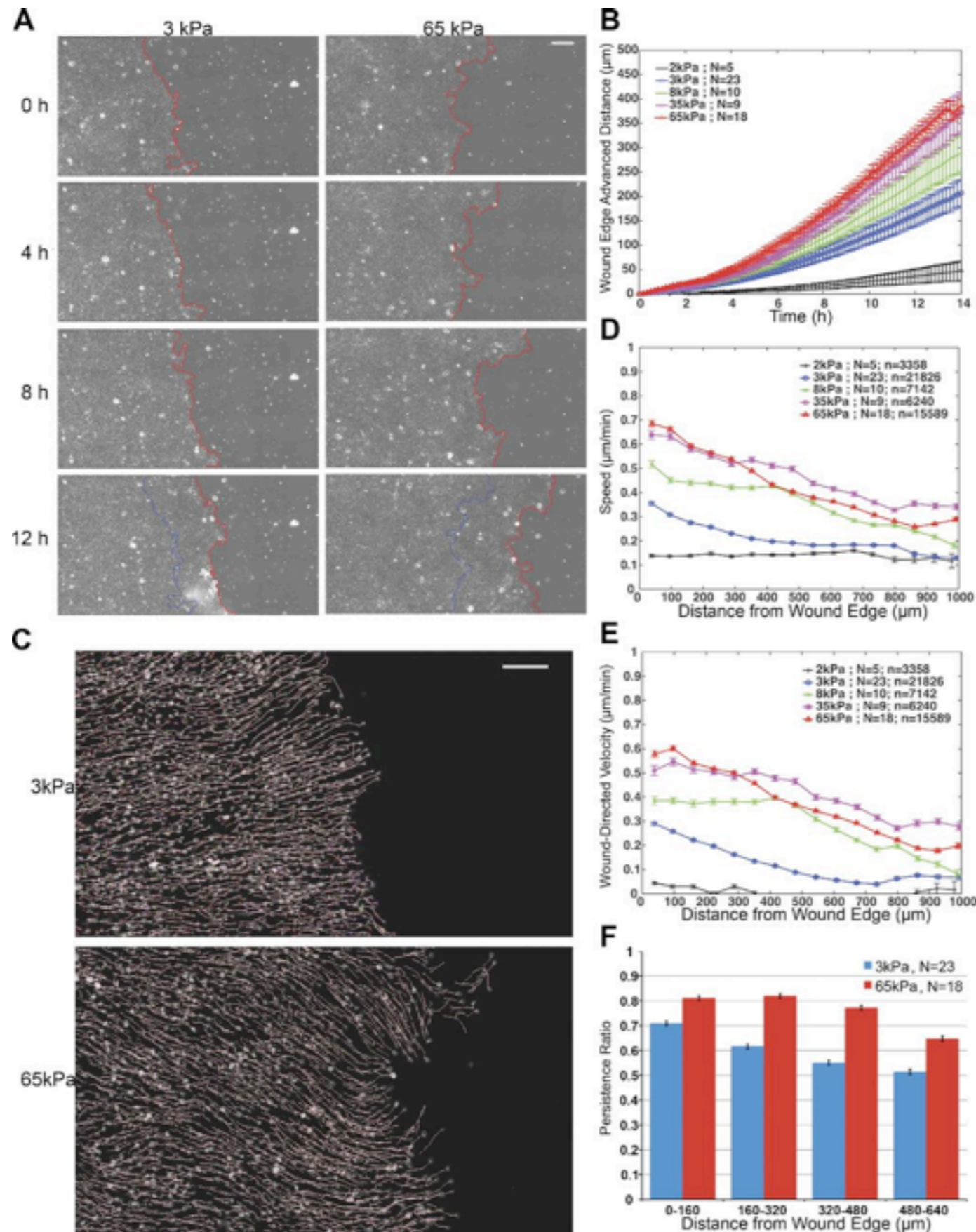
Jaqaman et al. JCB 2010

# Tracking applications (III)



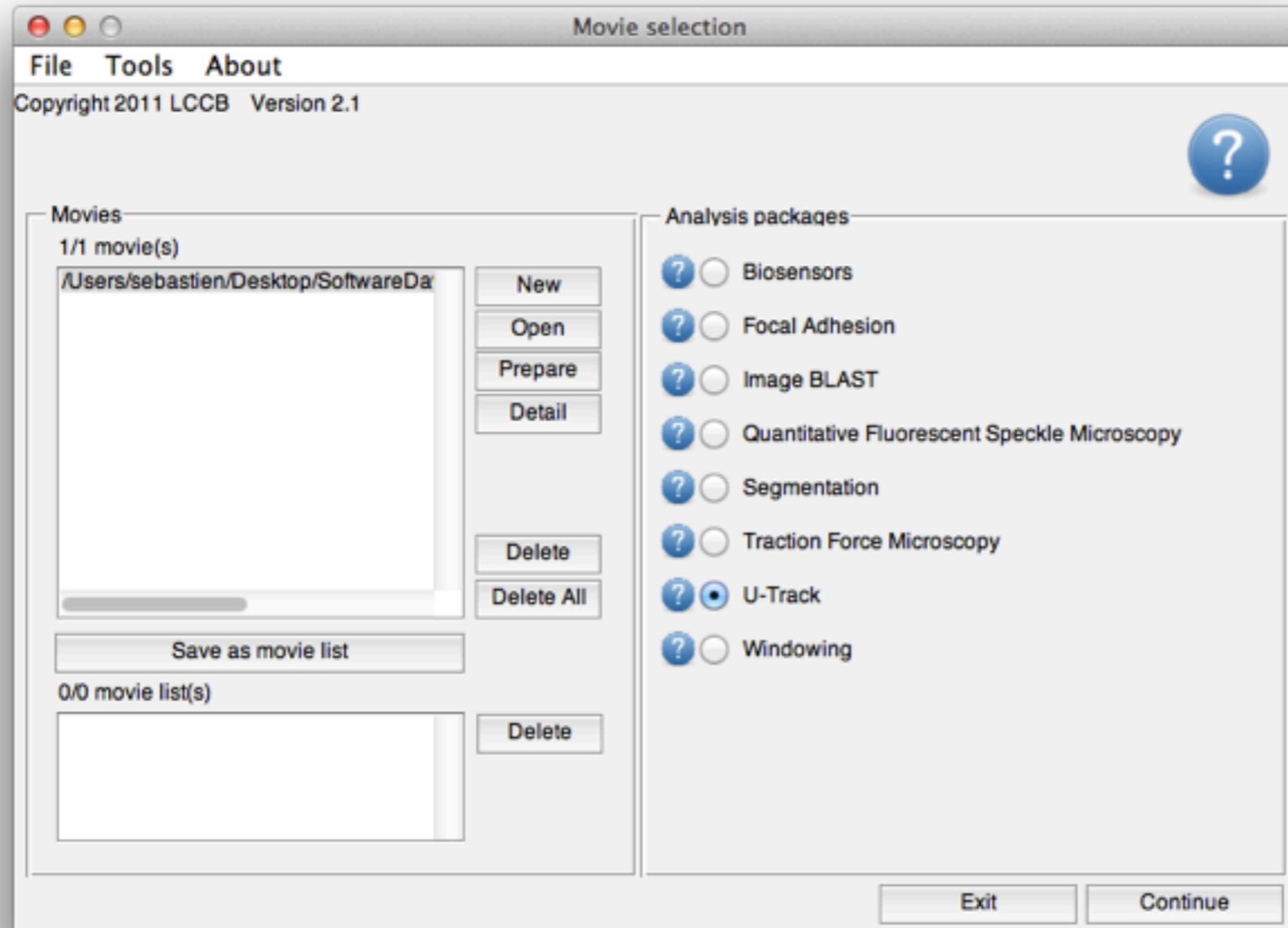
Applegate et al. JSB 2011

# Tracking applications (IV)

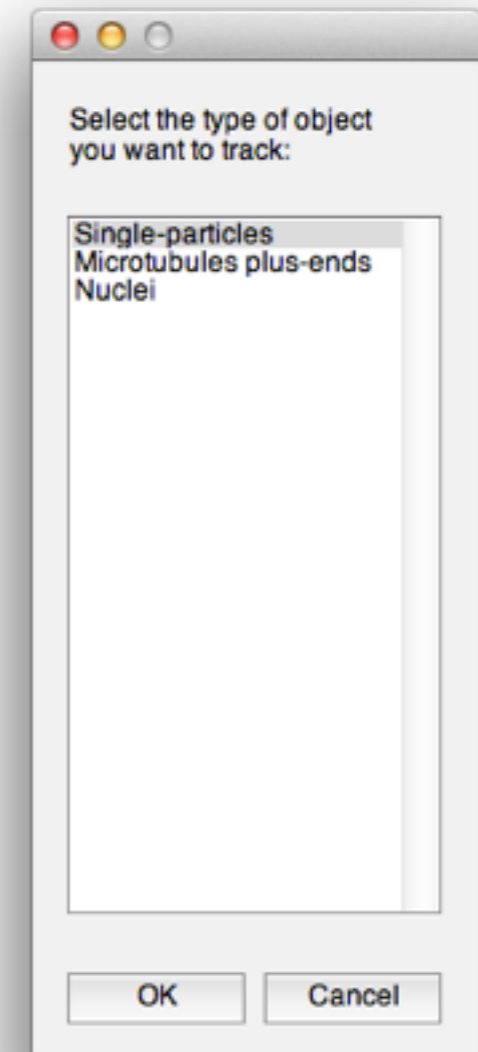
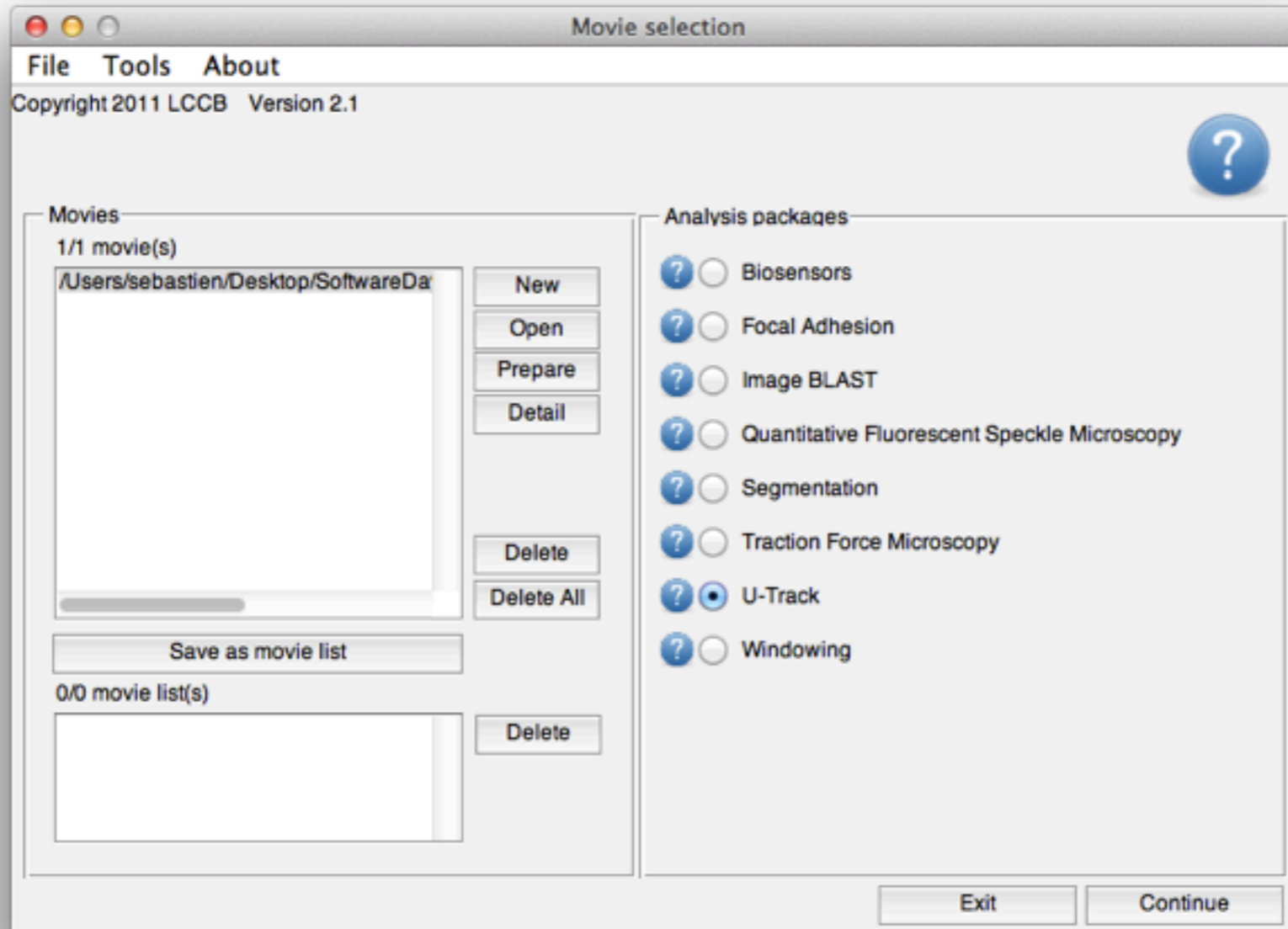


Ng et al. JCB 2012

# Tracking interface (I)

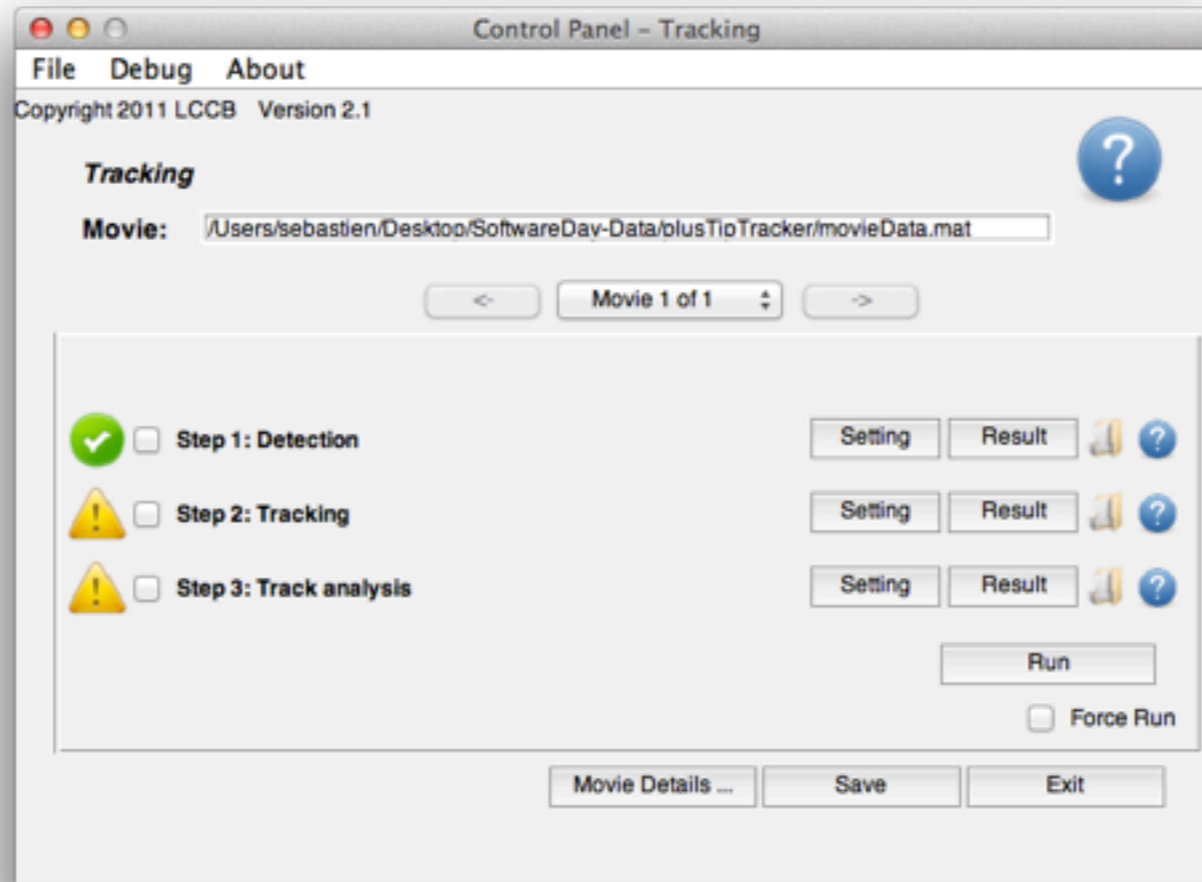


# Tracking interface (I)

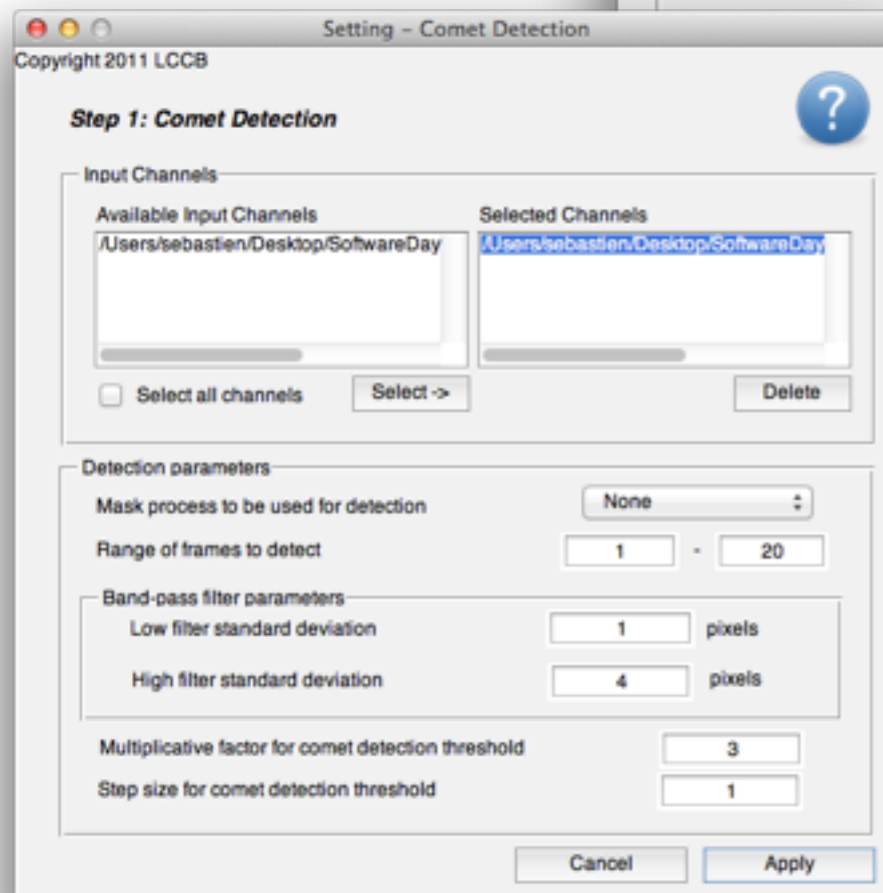
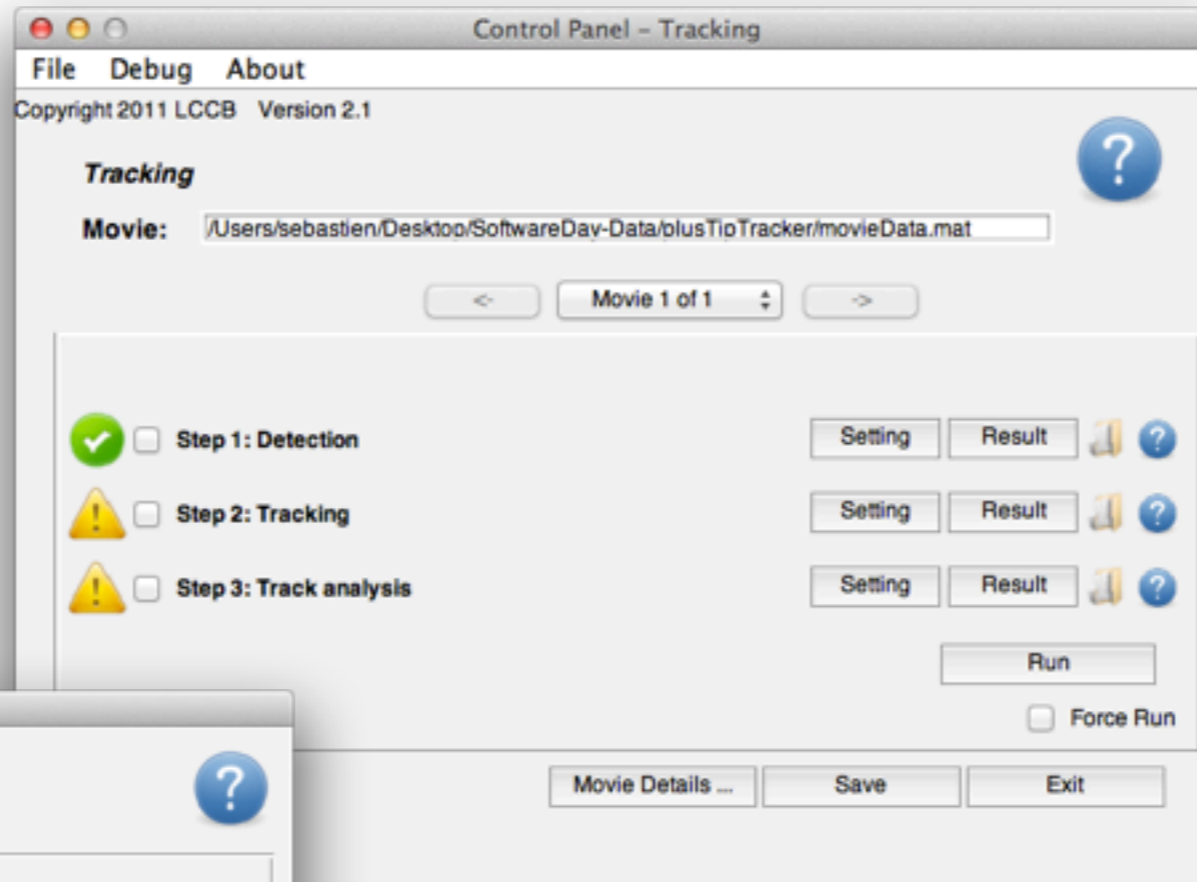




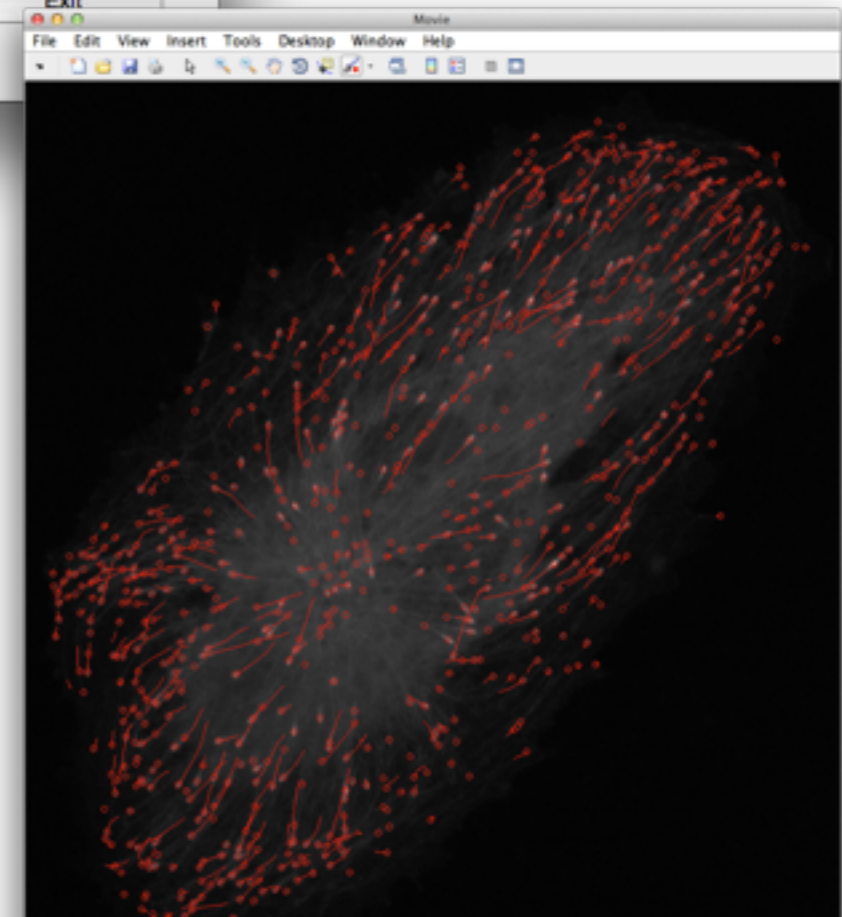
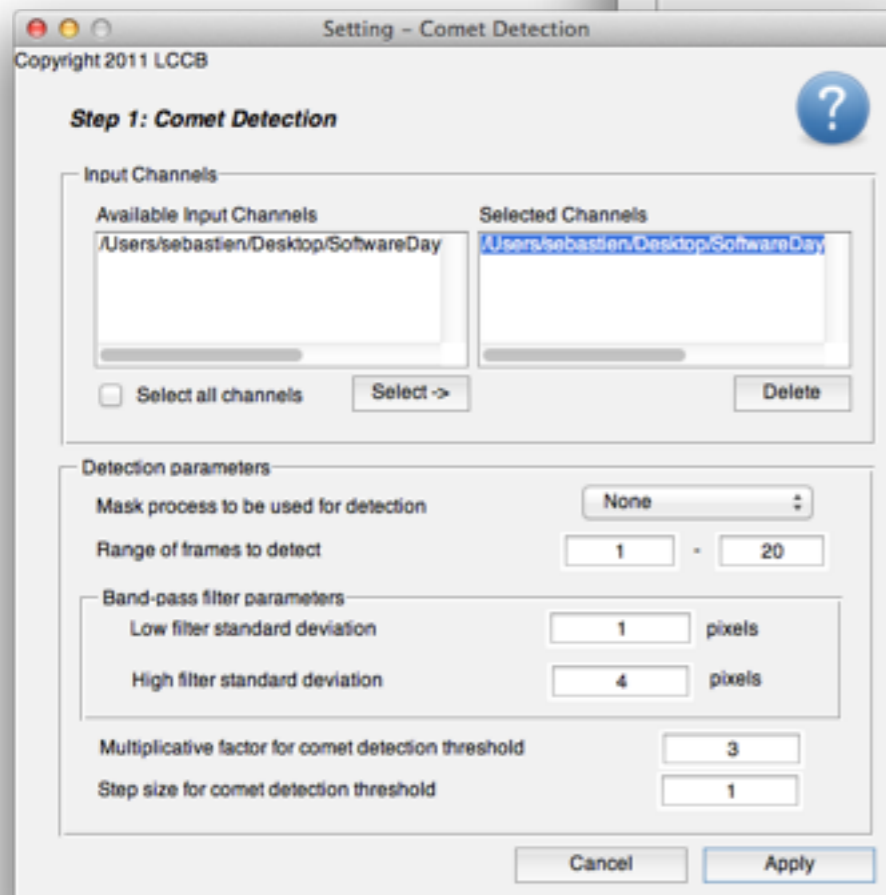
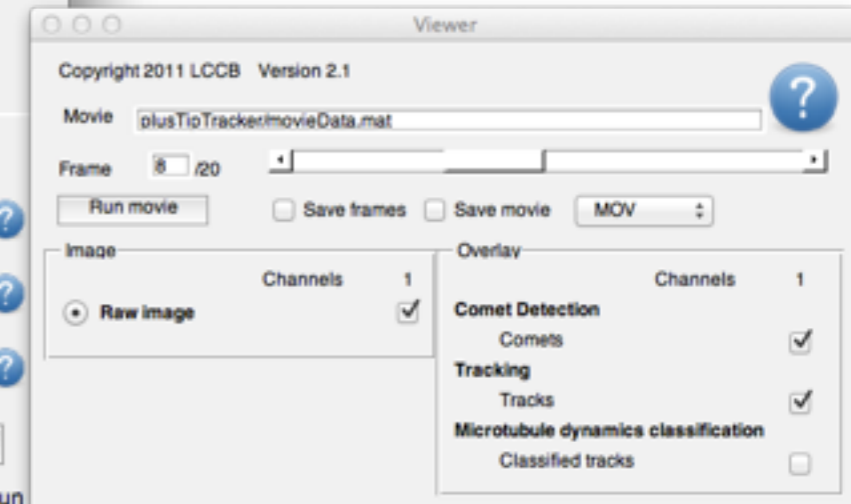
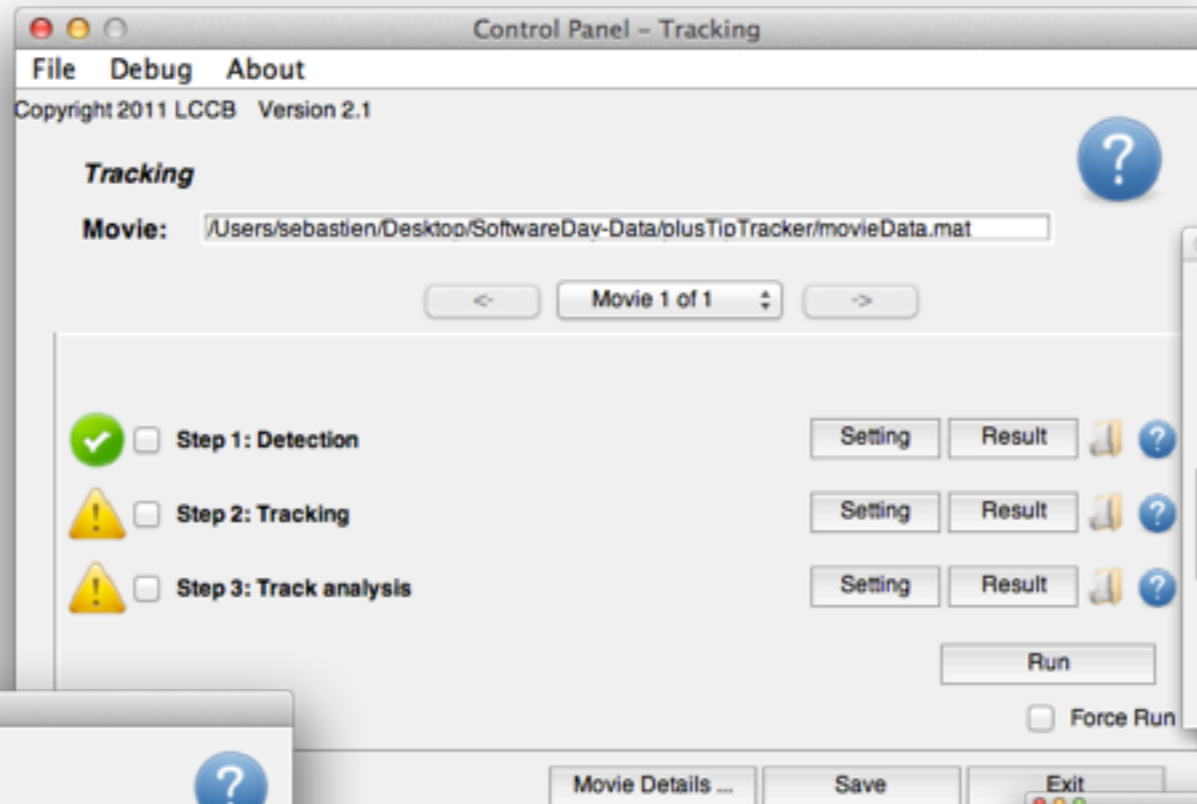
# Tracking interface (II)



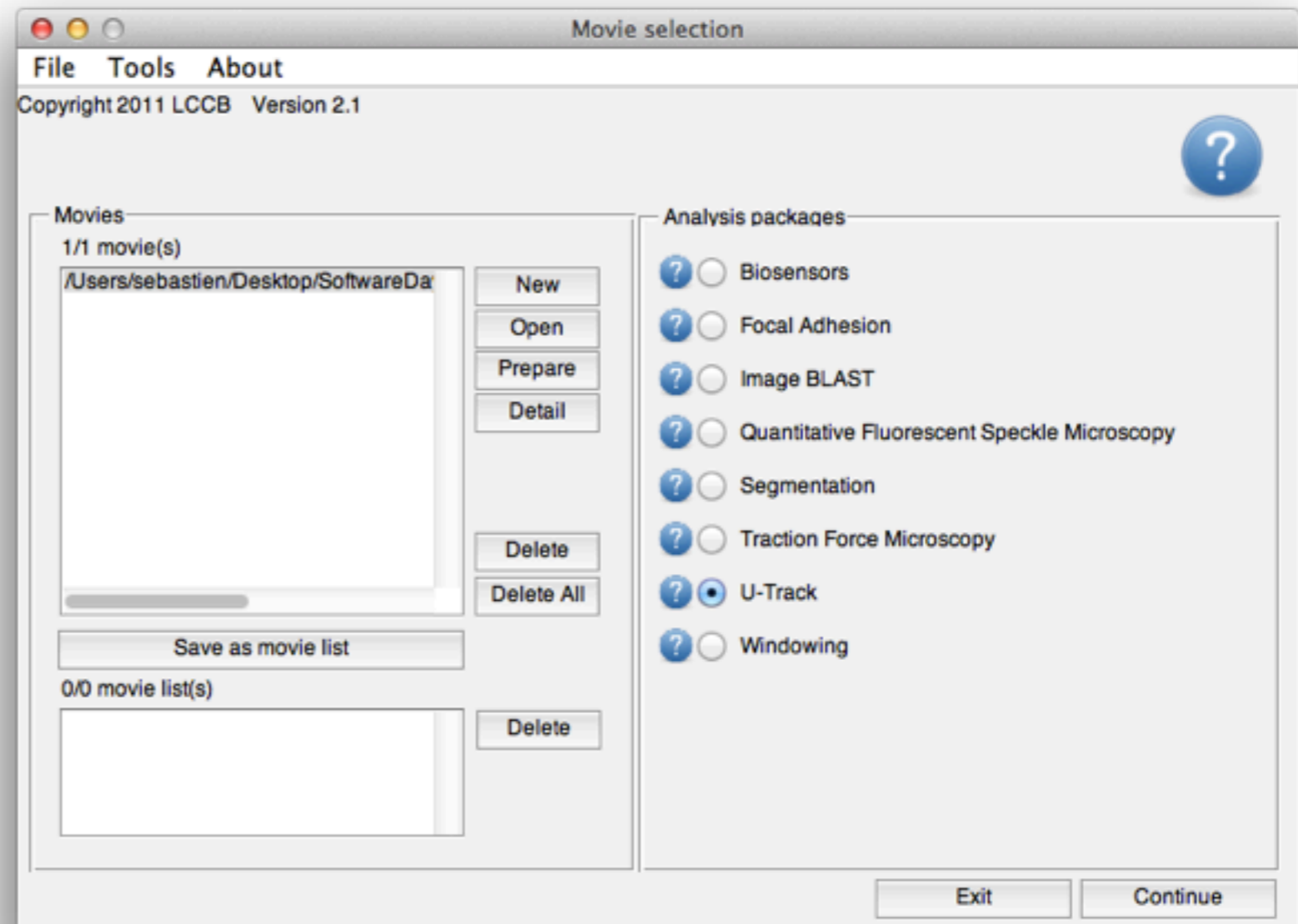
# Tracking interface (II)



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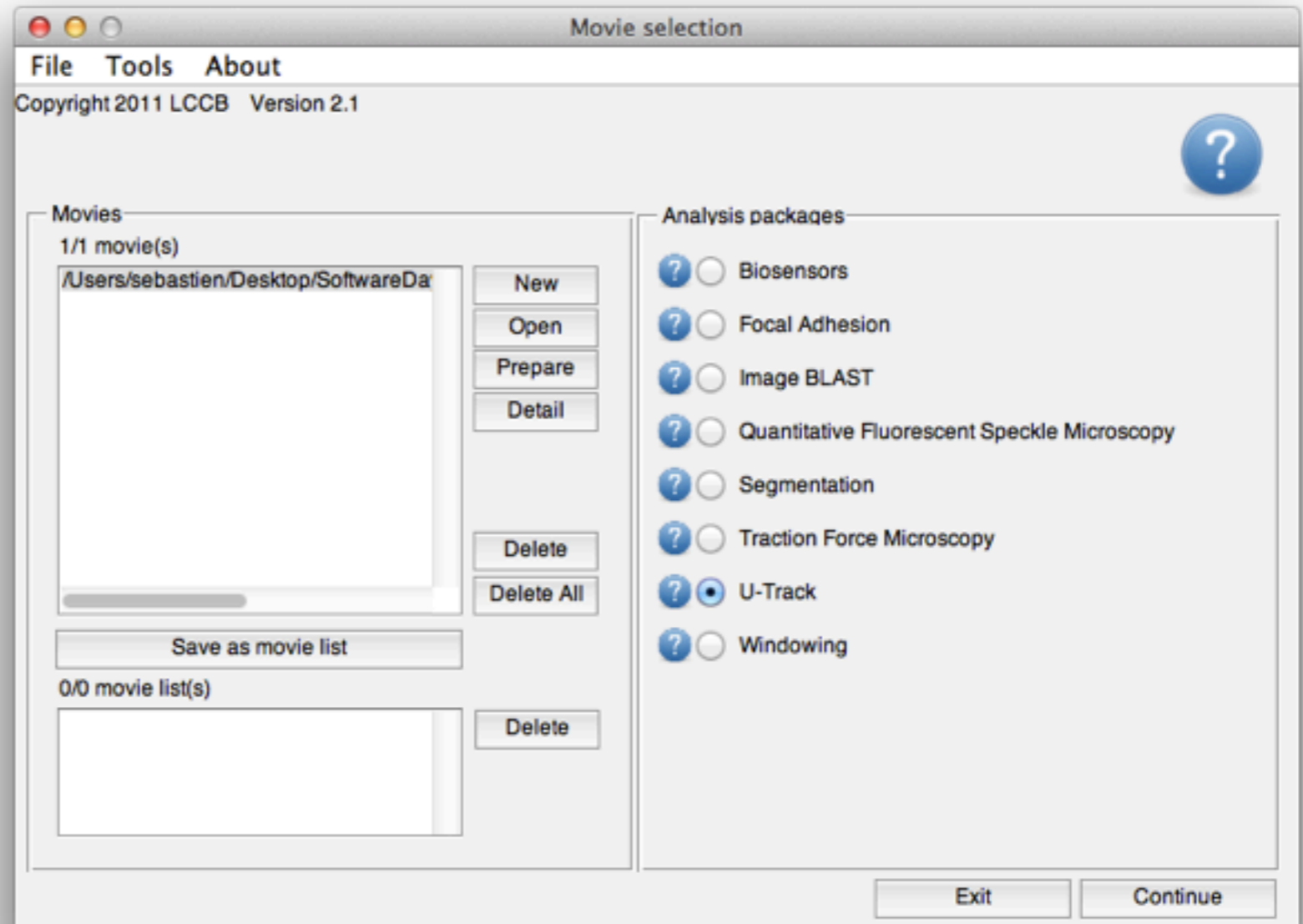
# Tracking interface (III)



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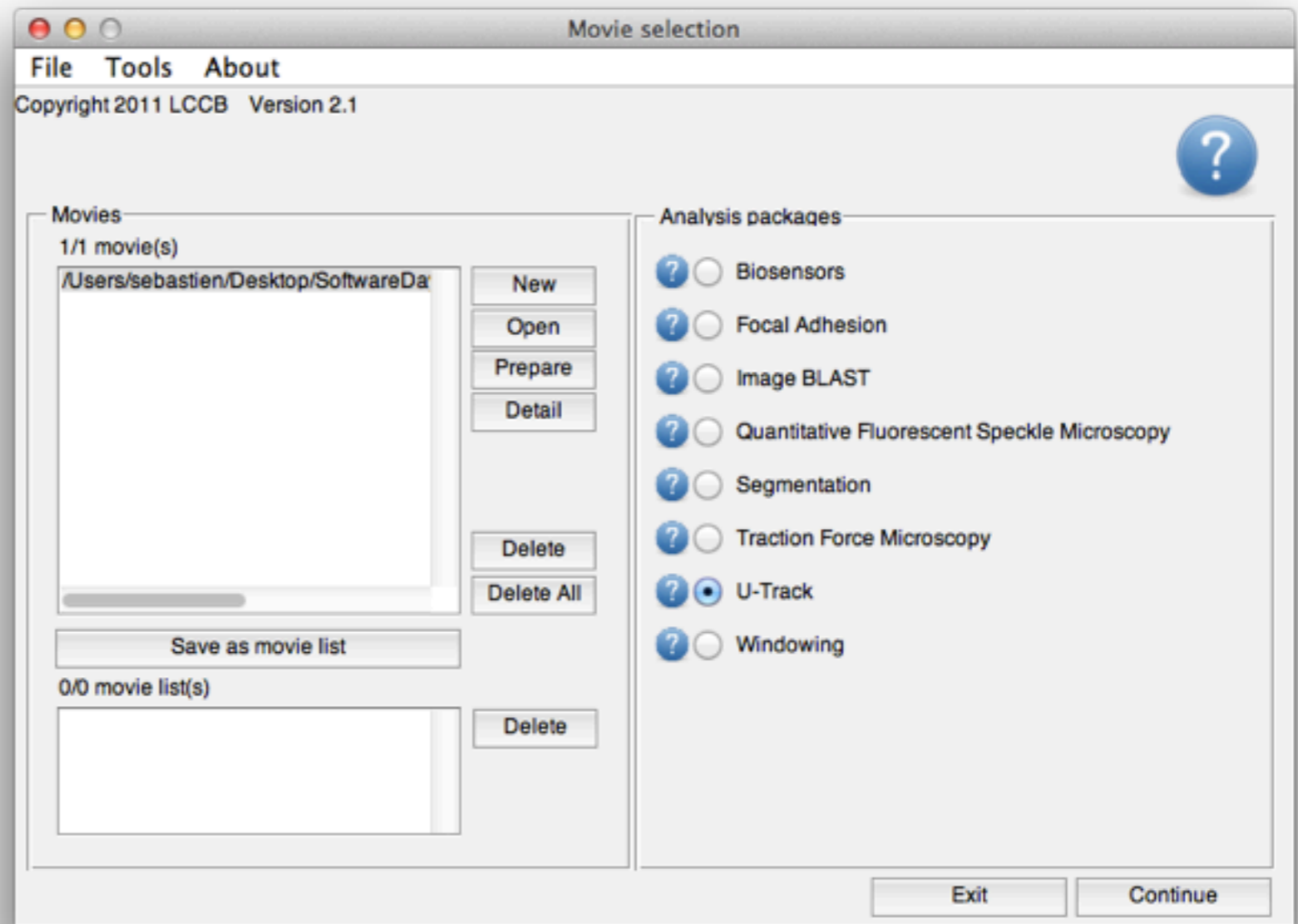
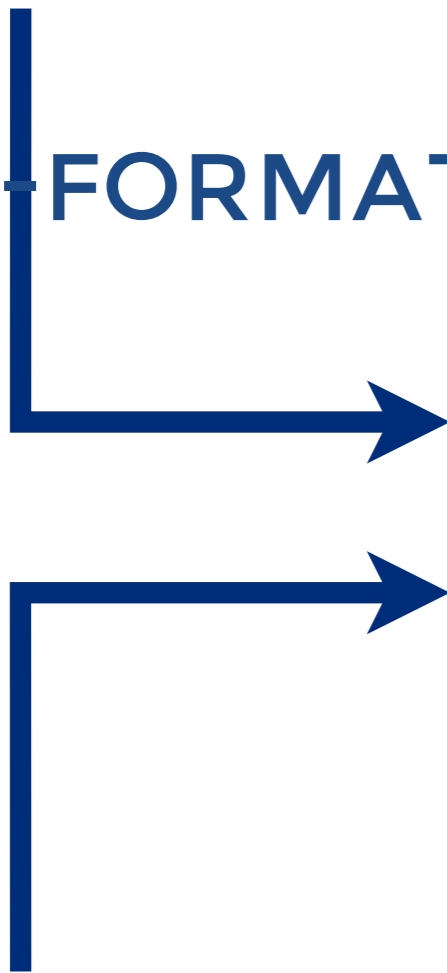
 **BIOFORMATS**



# Tracking interface (III)



 **BIOFORMATS**



 **OMERO**

# OMERO integration (I)

- Matlab client => OMEERO.matlab bindings
- Run the tracking analysis locally
- Interaction with the server:
  1. initialization (metadata, annotation)
  2. image plane loading
  3. results uploading as FileAnnotation: zipped analysis folder
  4. results uploading as ROIs

# OMERO integration (II)

The image displays the OMERO webclient interface. The main window shows a dataset titled "Case 1 Higher SNR" with an image ID of 3921661. The metadata includes acquisition and import dates of 2013-02-05 15:20:11, dimensions of 101 x 101 pixels, and 1 x 20 z-sections/timepoints. A red box highlights an attachment named "HMS-tracking.zip (51.8 KB)".

An inset window titled "Case 1 Higher SNR" shows a detailed view of an ROI. The ROI contains 101 x 101 pixels and 1 x 20 timepoints. The image shows a dark field with several bright spots, each surrounded by a white circle, representing tracked particles. The ROI count is 1.

Property	Value
Owner	Sebastien Besson
Acquisition Date	2013-02-05 15:20:11
Imported Date	2013-02-05 15:20:11
Dimensions (XY)	101 x 101
Pixels Type	uint8
Z-sections/Timepoints	1 x 20
Channels	0

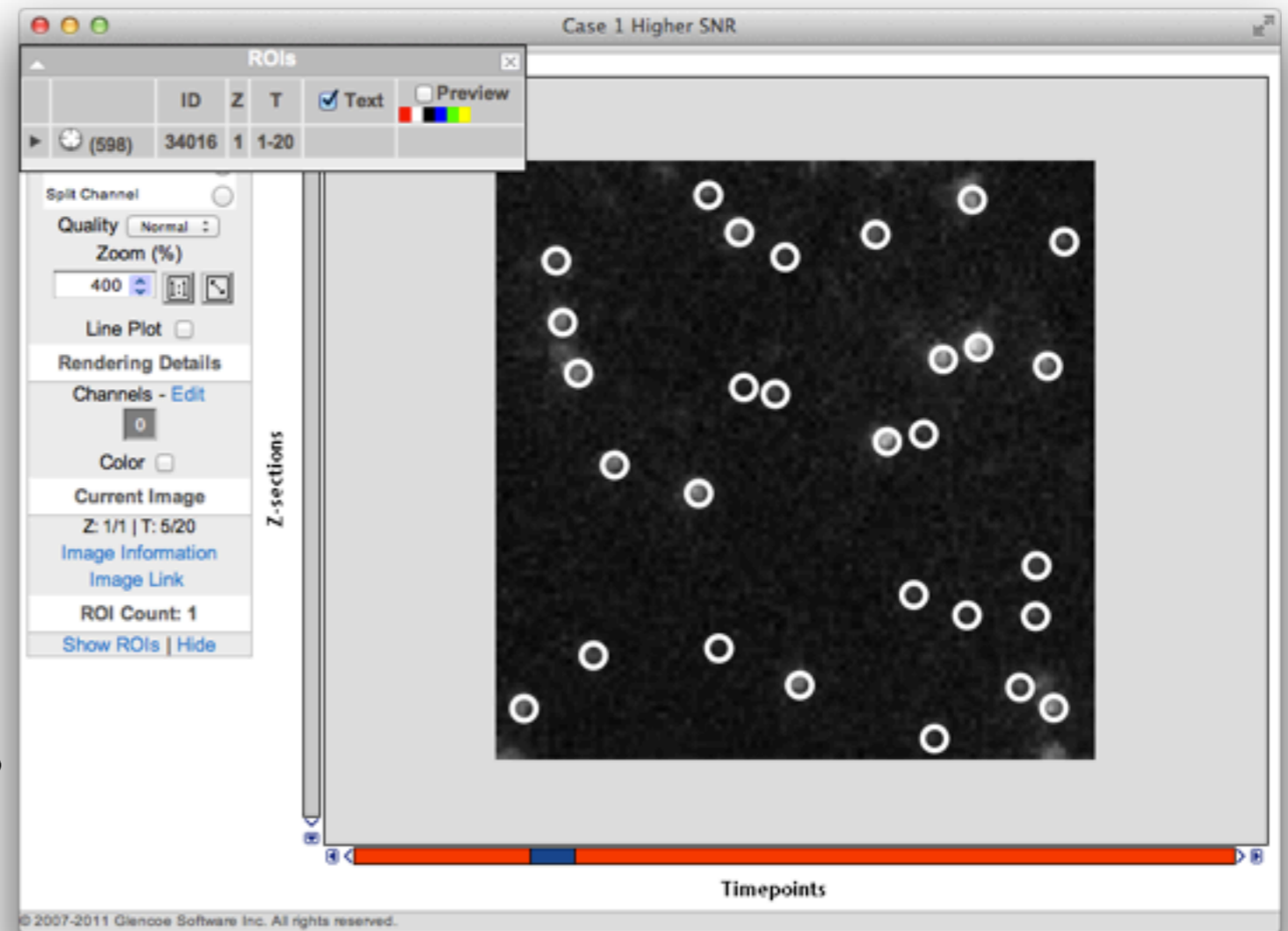
ID	Z	T
34016	1	1-20



# OMERO integration (III)

Detection process output:  
single ROI with Point shapes

- grouping of analysis run results
- ROI upload time
- support by OMERO clients (Insight)



# OMERO integration (IV)

- Done
  - load & analyze OMEMO Images using Matlab client
  - save analysis as annotation & reload analyzed movies
  - export detection output as ROI
- Next phase
  - code reintegration into core components
  - testing plan
  - additional support in the ROI Model

# OMERO.matlab

- SVN repository: ~10 OMERO-specific functions
  - at least 30% to be integrated into OMEMO.matlab
  - additional Matlab tests (unit & integration)
  - <https://trac.openmicroscopy.org.uk/ome/ticket/10390>
- Matlab projects (Imperial/FLIM project, Michael Porter,...)  
Test changes & upgrade codes with latest OMEMO.matlab (OMERO-merge-stable build)
- Graphical interfaces
- Long-term: cf BlitzGateway

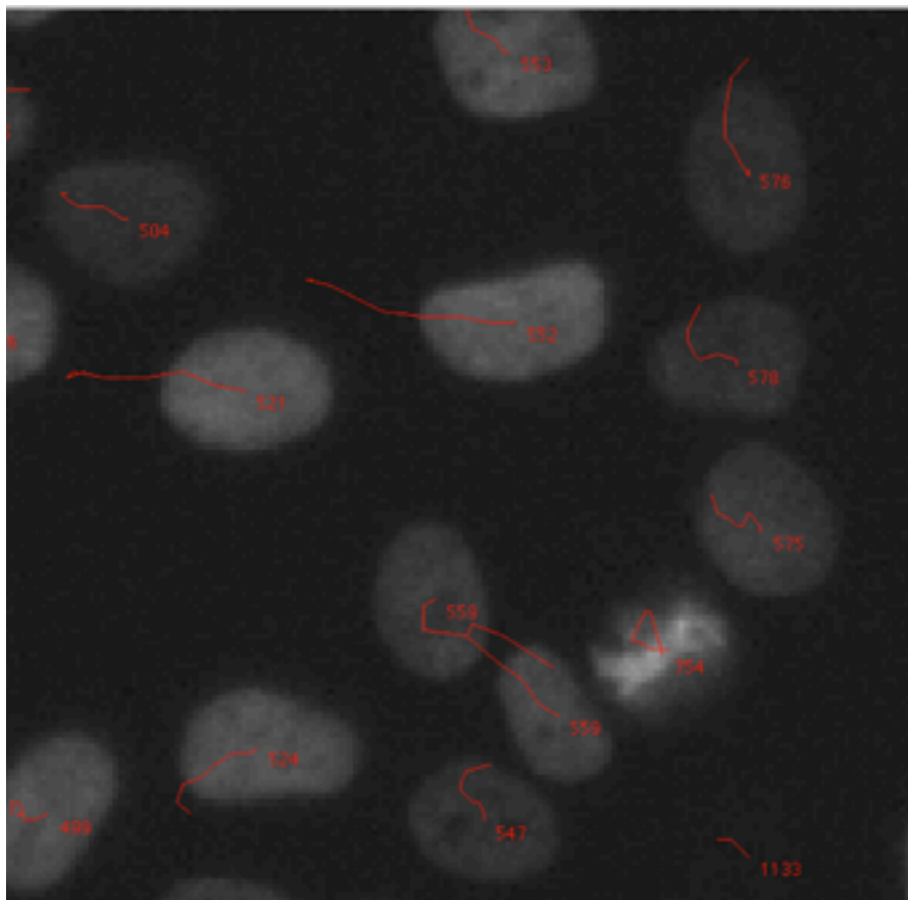
# ROI model: track support

Initial discussion: developers meeting of Feb 2012 discussion

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**Strategy I:** Define event ROIs  
to handle merge & split events

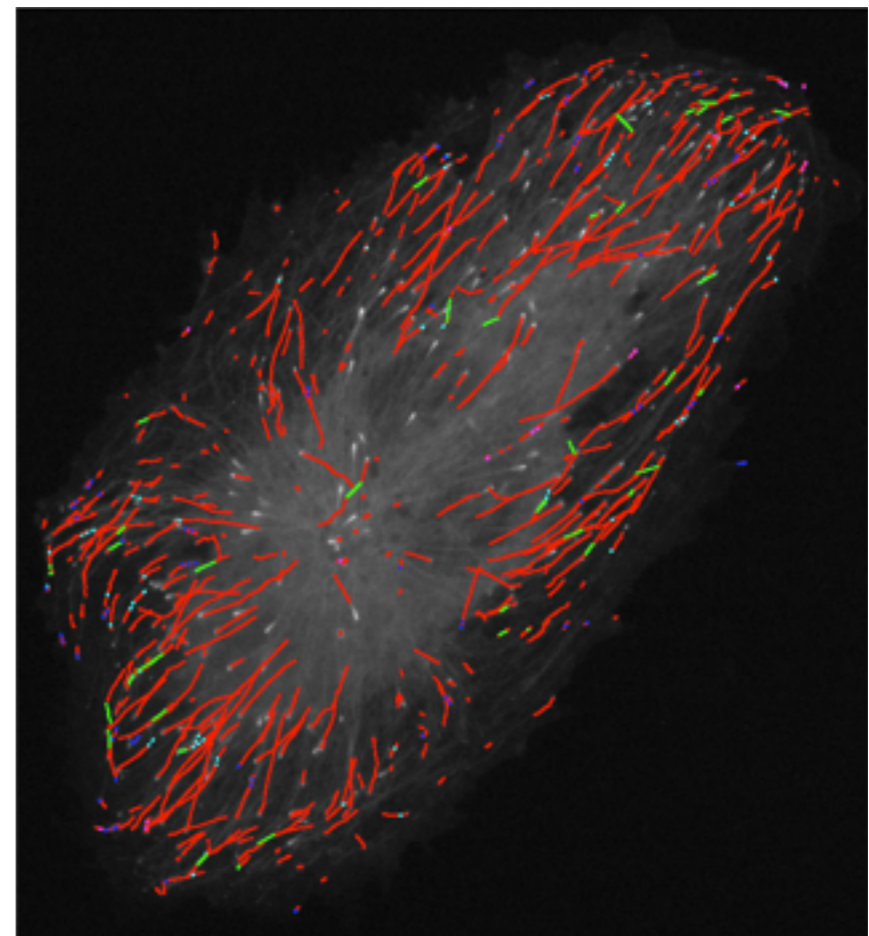
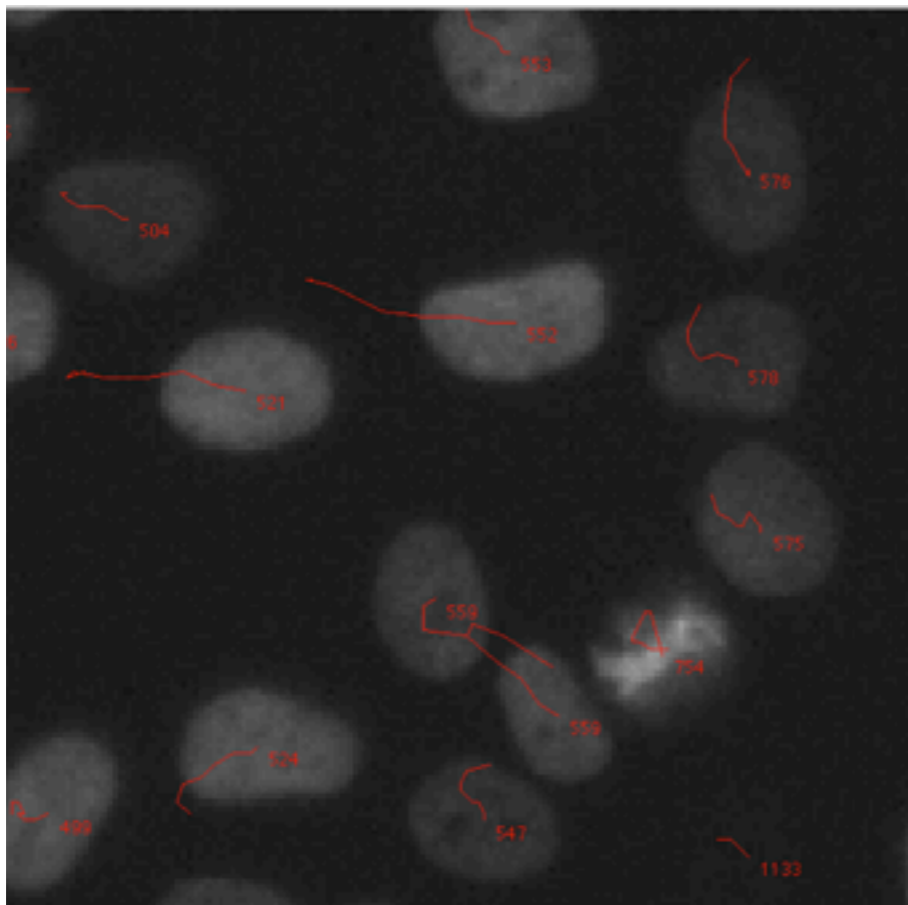


# ROI model: track support

Initial discussion: developers meeting of Feb 2012 discussion

**Strategy I:** Define event ROIs to handle merge & split events

**Strategy II:** Implement graph-based objects (ROI-ROI links)

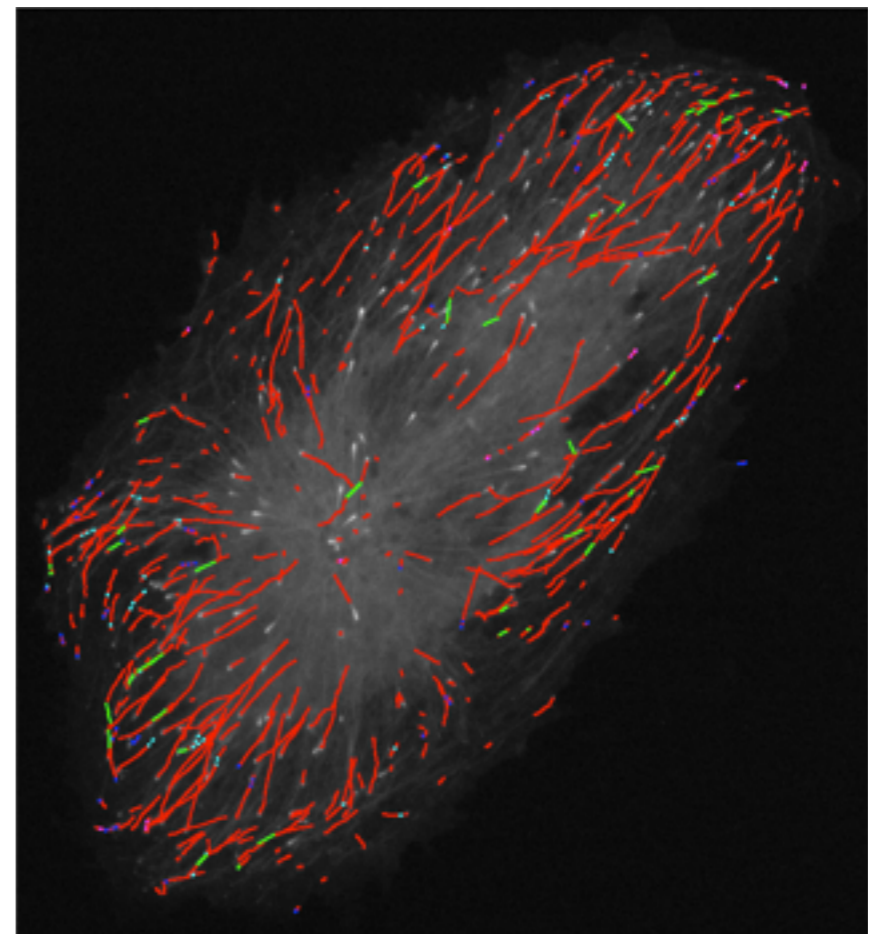
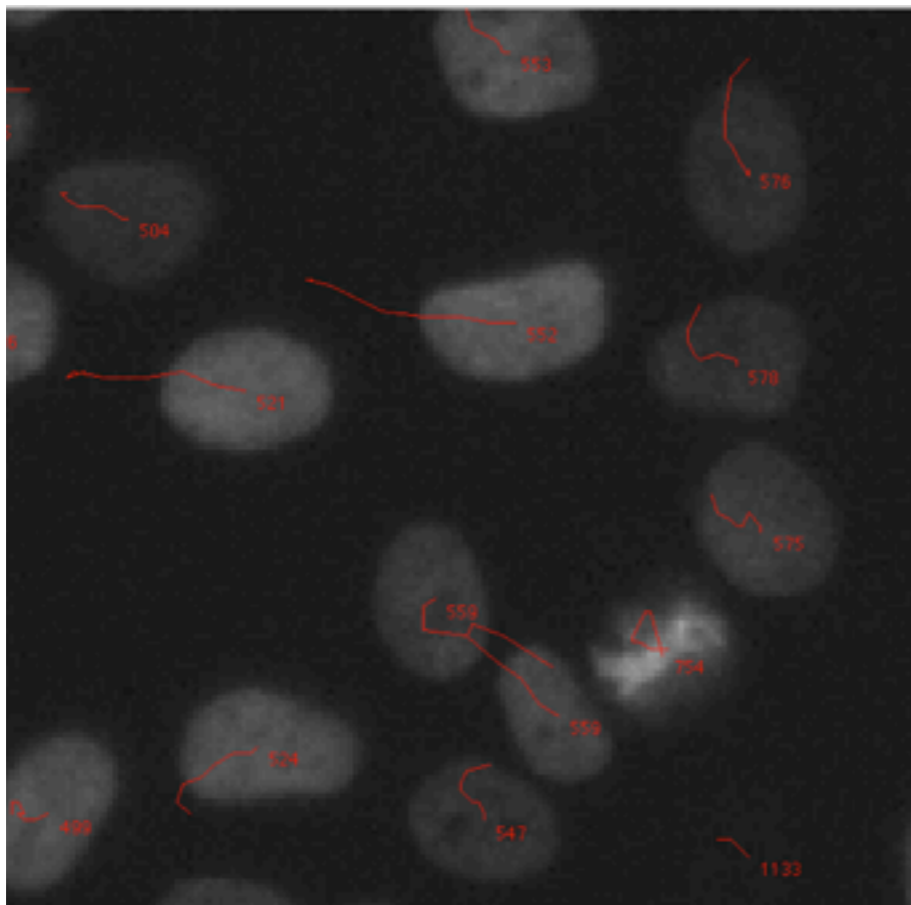


# ROI model: track support

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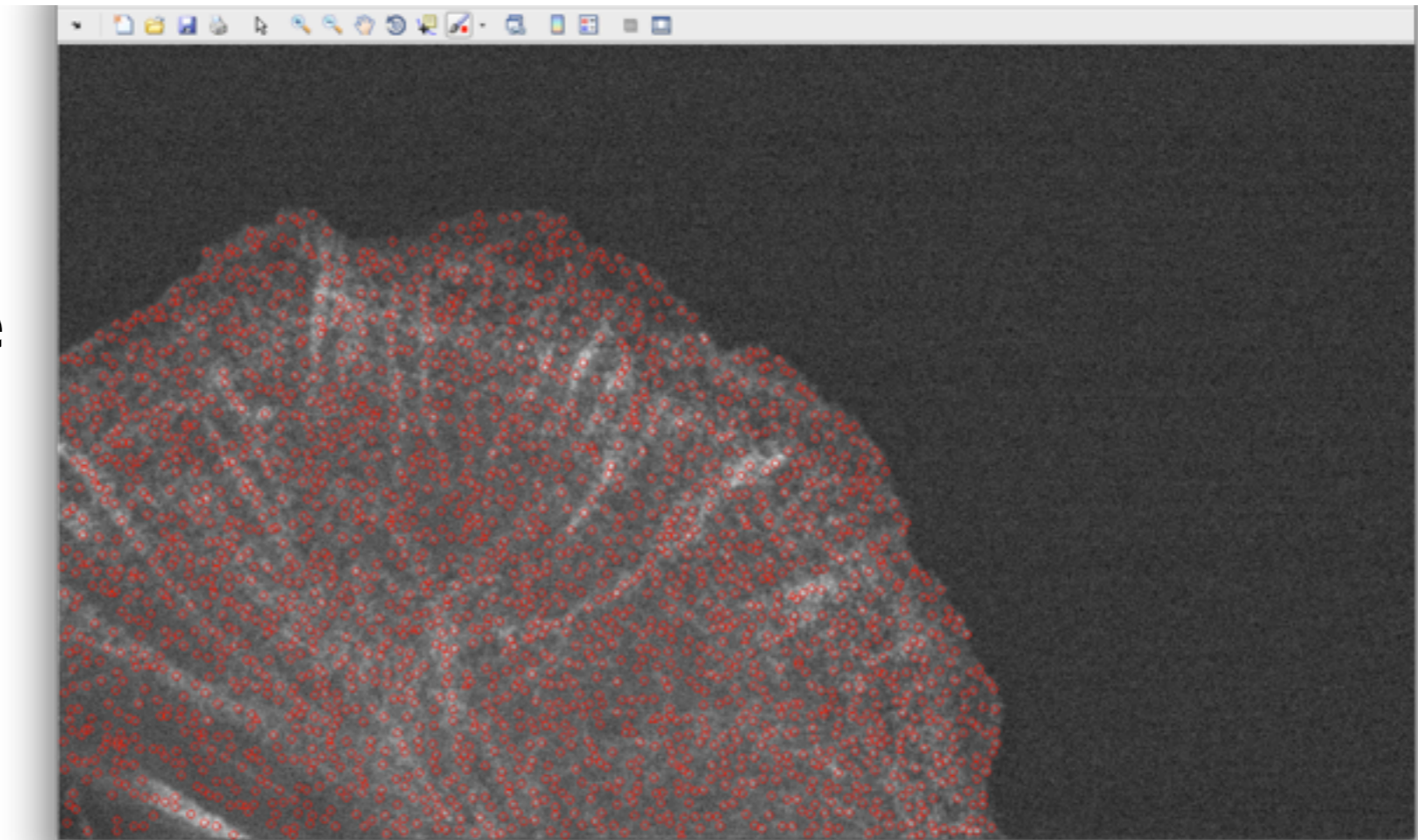
- Visualization tools need to be rewritten.
- Is there an agreement in the community to start working on a common ROI spec?

# Scaling with analysis size

## Fluorescent Speckle Microscopy

~1K-5K speckles  
detected per frame

~1K-10K tracks





# Testing phase

- AQLM'13  
demo using Dundee resources  
build and use local server for detection/tracking labs?
- CLS @ Dundee (Nathke, StanleyWall, Dickerson)  
Development server ome-ubuntu104  
may need development in terms of analysis
- IDAC @ HMS  
Deployment of tracking tools  
Local OMERO server? ([lincs.med.harvard.edu](http://lincs.med.harvard.edu))
- Jaqaman-Welburn joint project  
Technology from mammalian kinetochore project  
Data upload in Edinburgh vs analysis in Dallas