The Open Microscopy Environment: Image Informatics for Biological Sciences

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The Image Problem…

• A pretty picture?
• A measurement?
The Image Problem...is ubiquitous

- A pretty picture?
- A measurement?

- Organelles
- Cells
- Dynamics

- Lead Discovery
- Target Validation
- Physiology
- Pathology
- In Vivo
Talk Outline

• OME Team
• OME & Glencoe Software
• OME Strategic Award
• Future Aims
Glencoe Software

Josh Moore  Carlos Neves  Melissa Linkert
Community-Led Data Management for Life Sciences

- Open
- GPL License
- Freely available
- Supported by email lists

- Open
- GPL License
- SaaS, Commercial licenses for OMERo
- Customized, supported, warrantied
What is Glencoe Software?

• Software Start-up
  ✓ Wholly owned
  ✓ Self-funded

• OEM partnerships providing software infrastructure for imaging

• Commercial licenses and/or customization and support of OME software

• Major contributors to Bio-Formats & OMERO
  GPL code base
Glencoe Clients

- AppliedPrecision®
- JCB
- PerkinElmer®
- CANCER RESEARCH UK
- THE CELL
  an image library
- HARVARD Medical School
Welcome to the JCB DataViewer!

The JCB DataViewer is a browser-based application designed to facilitate viewing, analysis, and sharing of multi-dimensional image data associated with articles published in *The Journal of Cell Biology*.

For more information about the JCB DataViewer click [here](jcb-dataviewer.rupress.org).

**Featured Images**

1. The dynamic interaction of AMBRA1 with the dynein motor complex regulates mammalian autophagy
   - Sabrina Di Bartolomeo, Marco Corazza, Francesca Nazio, Serena Oliverio, Gaia Lis, Manuela Antonioli, Vittoria Pagliarini, Silvia Matteoni, Claudia Rucco, Luigi Giunta, Marcello D'Amelio, Roberta Nardacci, Alessandra Romagnoli, Mauro Picentini, Francesco Cocco, Gian Maria Filia
   - [Full Viewer](#) | [Article](#) | [Figure](#)

2. The differential interaction of snRNPs with pre-mRNA reveals splicing kinetics in living cells
   - Martina Huranová, Ivan Ivaní, Aleš Benda, Ina Poser, Yehuda Brody, Martin Hof, Yaron Shav-Tal, Kari M. Neugebauer, David Staněk
   - *jcb*. 2010, 191:75-86 DOI: 10.1083/jcb.201004030.
   - [Full Viewer](#) | [Article](#) | [Figure](#)

3. Kinesin-1 and dynein at the nuclear envelope mediate the bidirectional migrations of nuclei
   - Heidi N. Fridolfsson, Daniel A. Starr
   - *jcb*. 2010, 191:115-128 DOI: 10.1083/jcb.201004118.
   - [Full Viewer](#) | [Article](#) | [Figure](#)

4. Protein turnover of the Wallenda/DLK kinase regulates a retrograde response to axonal injury
   - Olga Vazquez-Miranda, Reza Farbod, Azadeh Ansari, Cristobal de la Iglesia
   - [Full Viewer](#) | [Article](#) | [Figure](#)

[jcb-dataviewer.rupress.org](http://jcb-dataviewer.rupress.org)
ASCB CELL Library: Access and Annotation

Watch the Neuroscience Information Framework hosted webinar on The Cell. Just click here.

Featured Image

Purple sea urchin embryos undergoing mitosis. Embryos are expressing GFP-rhodogen GTase binding domain, which is a probe for active Rho, with 3xmCherry-Escromin (a microtubule associated protein shown in blue). Embryos were imaged with a laser scanning confocal microscope (Radiance 2000; Bio-Rad...more

Image contributed by George Van Dessel

celllibrary.org
Interoperability

✓ Metadata
✓ Interfaces
OME: What We Will Do

OME Data Model

OME-TIFF
&
Bio-Formats:
Open File Formats

OMERO:
Open source,
Enterprise
Data Management
OME: What We Will Do

Dundee: 16 positions   Satellites: 9 positions
Development   Support   Integration
OME Bio-Formats: Proprietary File Conversion
OME Bio-Formats: Outputs

- Expanded coverage of file format types, with support for N-dimensional data (FLIM, SPIM, Big Lambda, etc.)
- Port to C++, for incorporation into software using C++, Qt, etc.
- Support for any alternative image data storage methods (e.g., HDF5, netCDF) that arise
- Support for defined ontologies for image data annotation
The OMERO Platform: Outputs

• Addition of new image processing and analysis algorithms, either released with OMERO, or available to download and integrate;

• Improved visualisation of analytic results in OMERO;

• Expanded data analysis facility, including a central repository for image analysis tools;

• Integration of several machine learning tools, to enable these tools to work with large, shared datasets; support for defined ontologies for image data annotation

• Export of data in OMERO installations to JCB DataViewer, ASCB CELL, or any other established repository that appears during the term of the project;

• Support for publishing of any data within an installation, available to the public using a standard URL, including search robot-readable metadata
Proposed Project Structure

- PI
  Jason Swedlow

- Project Manager
  TBD

- OME Support Team
  (2x TBD)

- OME Usability Team
  (Xinyi Jiang + 1 TBD)

- OME Development Team
  (6x Existing, 4x TBD)

- OME Satellite PIs
  Baldock, Danuser, Davis, Eliceiri, French, Goldberg, Murphy, Shorte, Zanetti

- OME Satellite Developers
OME Satellites

To bring these facilities into OMERO and thus into the hands of the wider community, we have defined nine world-leading groups and/or facilities that:

• have new data acquisition platforms and/or data types that must be supported by Bio-Formats & OMERO (*Davis*/Oxford; *French*/Imperial; *Shorte*/Pasteur);
• have large, diverse imaging platforms with significant requirements for data integration and management (*Davis*/Oxford; *French*/Imperial; *Shorte*/Pasteur)
• have well-established expertise developing new image analysis tools (*Danuser*/Harvard; *Baldock*/Edinburgh; *Murphy*/CMU; *Goldberg*/NIA-NIH);
• are running image repositories and/or software development projects for biological imaging and/or discovery (*Baldock*/Edinburgh; *Eliceiri*/Madison; *Murphy*/CMU; *Goldberg*/NIA-NIH);
• have strong experience developing and deploying large scale scientific computing resources, specifically to deliver solutions for large data problems (*Zanetti*/CRS4).
DMIB: “OMERO in Action”

- One year JISC-funded project @ UEA/John Innes to build cross-campus image data resource based on OMERO.
- Project lead: Jerome Avondo (http://dmbi.nbi.bbsrc.ac.uk)
- “OMERO in Action” 6-8 April, 2011; 77 Attendees

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Questions....

1. Priorities– what and when
2. Applications
3. Long-term sustainability
4. SAB-- ideas
The Value Proposition…

- Accessible
- Analysable
- Secure
- Shareable
- Publishable