The Open Microscopy Environment:
8th Annual User’s Meeting
Institut Pasteur, Paris

Jason Swedlow
Talk Outline

- Thank you!
- The Problem
- This Meeting...
- Our Progress
- Priorities
Thank you!!!

- **Institut Pasteur**
  - Christiane Pacaud
  - Nathalie Aulner
  - Anne Danckaert

- **University of Dundee**
  - Wilma Woudenberg
  - Joyce Walsh

- **The OME Consortium**
Thank you!!!
OME Consortium

- Dundee - Colin Blackburn, Jean-Marie Burel, Mark Carroll, Gus Ferguson, Helen Flynn, Kenny Gillen, Roger Leigh, Simon Li, Josh Moore, Will Moore, Andrew Patterson, Blazej Pindelski, Aleksandra Tarkowska, Petr Walczysko
- University of Wisconsin, Madison (LOCI) - Kevin Eliceiri, Curtis Rueden, Mark Hiner
- Harvard Medical School – Gaudenz Danuser, Sebastian Besson
- Oxford – Ilan Davis, Douglas Russell, Graeme Ball
- CRS4 - Gianuigi Zanetti, Gianmauro Cucurru
- Edinburgh – Richard Baldock, Bill Hill, Jianguo Rao
- Imperial – Paul French, Chris Dunsby, Ian Munro
- NIA, NIH – Ilya Goldberg, Chris Coletta
- Pasteur – Spencer Shorte, Sebastien Simard, Julien Jorde
- EBI – Gerard Kleywegt, Ardan Patwardhan, Ingvar Lagerstedt
- Glencoe Software – Chris Allan, Sam Hart, Niko Klaric, Andreas Knab, Laura Koneval, Melissa Linkert, Chris MacLeod, Josh Moore, Carlos Neves, Liza Unson, Wilma Woudenberg
THE PROBLEM
The Image Problem…

A pretty picture?
A measurement?
The Image Problem... is Ubiquitous

- Organelles
- Cells
- Dynamics
- Physiology
- Lead Discovery
- Target Validation
- Pathology
- In Vivo

A pretty picture?
A measurement?
A resource?
...Towards Image Informatics

Digital Image Acquisition System

Raw Data

Processed Data

Data Management, Tagging, Querying

Quantitative Analysis

Visualization
BIO-FORMATS:
Proprietary File Conversion

Raw Data

Processed Data

365,000+ FILES
40,000+ DATASETS
850 GIGABYTES
OMERO & BIO-FORMATS: OMERO.insight Java Client

Allan et al, 2012, Nature Methods
OMERO & BIO-FORMATS: OMERO.web Client

Allan et al., 2012, Nature Methods
THIS MEETING.....
Meeting Purpose

8th Annual User’s Mtg

- Attendees
  - OME Consortium
  - Broad cross-section of users

- *Day 1: Presentations*
  - Consortium developers
  - Users
  - Guests

- *Day 2: Workshops & demos*

- Progress Report
- Future development priorities & planning
OUR PROGRESS
OME : 2011- 2014

- OME Consortium (Wellcome Trust Strategic Award)
  - Development, Integration, Support, Outreach, Testing, Admin
  - Dundee: Jason Swedlow
  - Edinburgh: Richard Baldock
  - Oxford: Ilan Davis
  - Imperial: Paul French
  - Pasteur: Spencer Shorte
  - CRS4: Gianluigi Zanetti
  - Harvard Med: Gaudenz Danuser
  - CMU: Robert Murphy
  - NIH: Ilya Goldberg
  - Madison: Kevin Ellicieri

- Collaborations (BBSRC BBR Fund)
  - EBI: Kleywegt (EMDB/PDBe)
  - Edinburgh: Atkinson (Rapid)
OME: 2012/2013 Progress

- **Software:**
  - OME Consortium: Ten teams
  - Bio-Formats & OMERO 4.4.x & 5.0 releases
  - Good adoption
    - >60k Bio-Formats, ~2K server, ~4K client, ~1K web server
  - Consortium releases: FLIMfit, U-Track, PSLID OMERO.searcher, ImageJ2, ...

- **Papers:**
  - OMERO Nature Methods
  - OMERO.searcher Nature Methods
  - Eliceiri et al Nature Methods
  - Cucurro et al Galaxy Comm Conf

- Several external examples of our work
  - Harvard LINCS
  - JCB DataViewer
  - Stowers ODR
  - EMDdataBank– 134 3D tomograms
  - Dundee Histology Teaching
  - .....

THE PRIORITIES
OME 4: 2012 -2014

OMERO 4.4.x (currently, 4.4.8)

- New UI Features
  - Permissions
  - Data Sharing & Publication
  - Search
  - Tagging
- Analysis...
- All bugs
- Consortium requirements
- No API Breakage
  - API Additions Possible
    - OMERO.tables (for .searcher, WND-CHRM, .biobank, ...)
    - Modulo (for FLIM, LSFM, ...)
- Aim: 18-24 months of support
OMERO & BIO-FORMATS: OMEROL.insight Java Client

Allan et al, 2012, Nature Methods
OMERO & BIO-FORMATS: Data Publication

Jason Swedlow

Position: Professor of Quantitative Cell Biology
Address: College of Life Sciences, University of Dundee, Dundee
Telephone: 385819
Email: jason@lifesci.dundee.ac.uk
Website: Open Microscopy Environment
Related Links: Glencoe Software Incorporated

Research Overview

Mitotic chromosome dynamics

During cell division, the two copies of a cell's genetic material are completely separated and delivered to a pair of new daughter cells. Proper chromosome segregation requires the formation of correct attachments between the genetic material, assembled into chromosomes, and ends of microtubules. Our research is focused on establishing the molecular mechanisms that mediate and monitor the correct attachment of chromosomes to microtubules at a special structure known as the kinetochore. To achieve this, we make use of advanced tools for imaging the components of cell division, especially in living cells and specialized mass spectrometry methods to probe the molecular machinery of cell division. Recently, we used these tools to discover a new protein, Bcd1, that plays a critical role in the formation of correct attachments between microtubules and chromosomes by modulating the activity of Aurora B protein kinase. We recently installed a newly developed OMX microscope and are using this system to probe the inner workings of the centromere and kinetochore of the mitotic chromosome.

Like many cell biology labs, we generate large sets of image data. To manage, analyse and understand this data, we, along with our collaborators, formed the Open Microscopy Environment Consortium. OME develops data specifications, file format translators and data management software for imaging applications. OME tools are used in thousands of labs around the world. For more info on OME, see the Consortium's web site.

OMERO is used to store and visualise data for this project. An example of the image data can be viewed in OMERO by clicking on the thumbnail.
OME 5: OMERO.fs

- Critical technology for many sites
  - Import (almost) as fast as copy
  - No data duplication
  - Original file access
  - HCS, DigPath, LSFM

- Extremely challenging
  - Performance
  - File format diversity
  - Permissions
  - Clients...

- Progress & next steps
  - Bio-Formats & OMERO 5.0.0-Beta 1 released
  - Looking for Beta sites
  - Full release later in 2013
OMERO & BIO-FORMATS: Data Import & Access
Open Source Synergy

Open-source distribution, under the GPL license

- Freely available
- Community validated
- Online support
- No services

- Commercial licenses
- Supported, warrantied
- Customized versions
- SaaS
JCB Dataviewer: Access to Original Image Data

Welcome to the JCB Dataviewer! The JCB Dataviewer facilitates viewing, analysis, and sharing of multi-dimensional image data associated with articles published in The Journal of Cell Biology.
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