

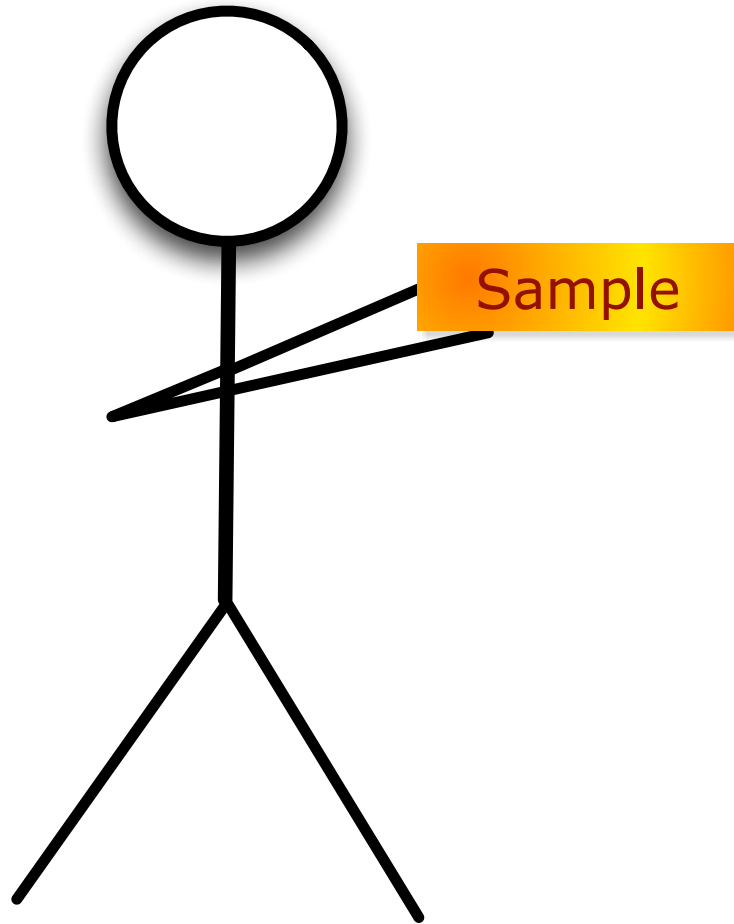
Image Management

Douglas Russell

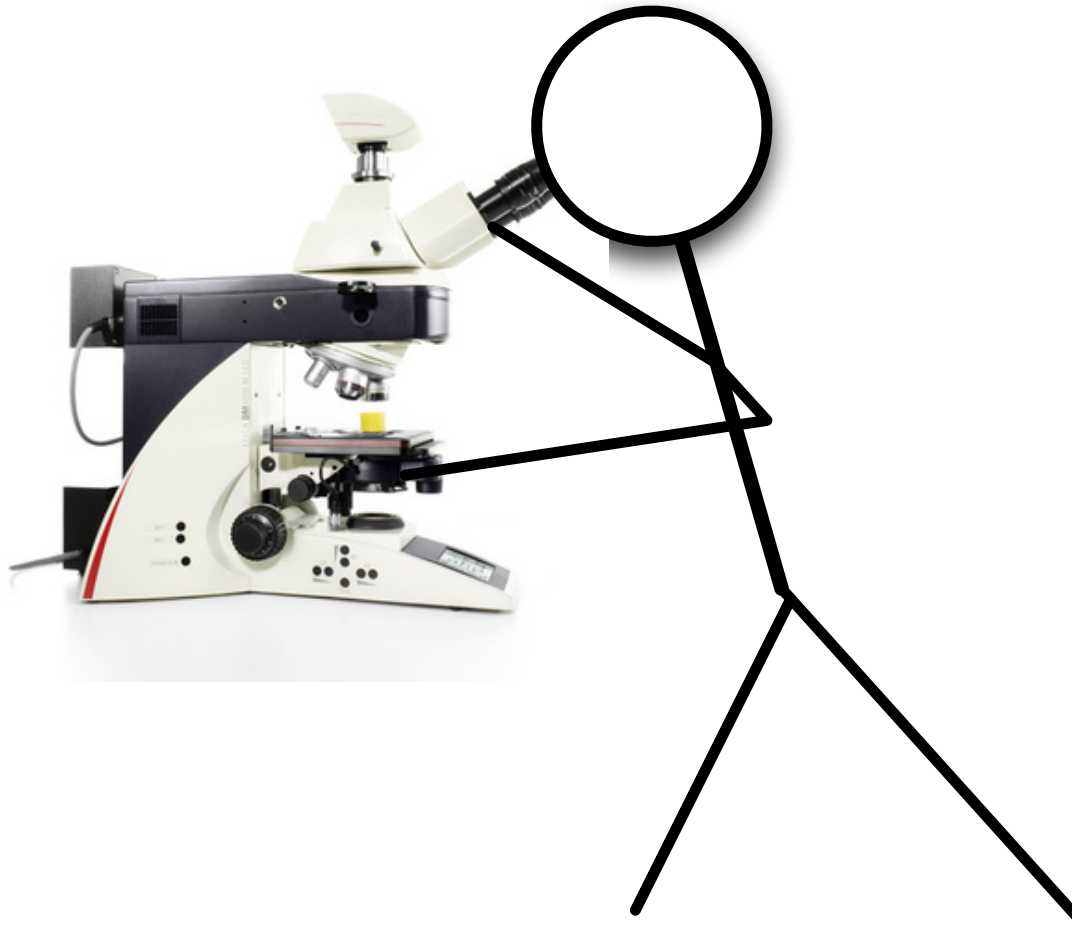
douglas.russell@bioch.ox.ac.uk

OME Satellite Developer

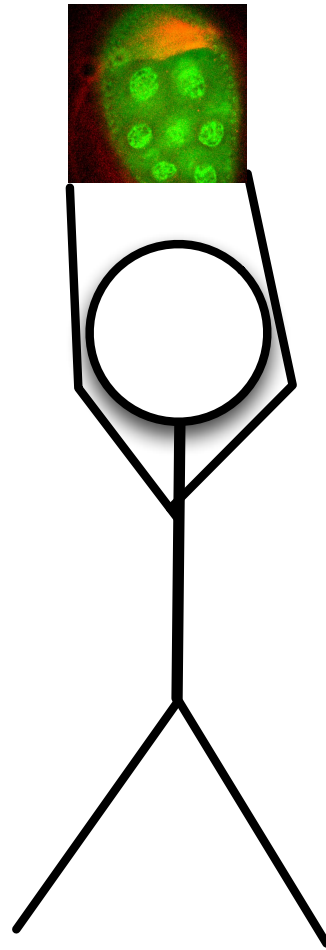
Biologist...



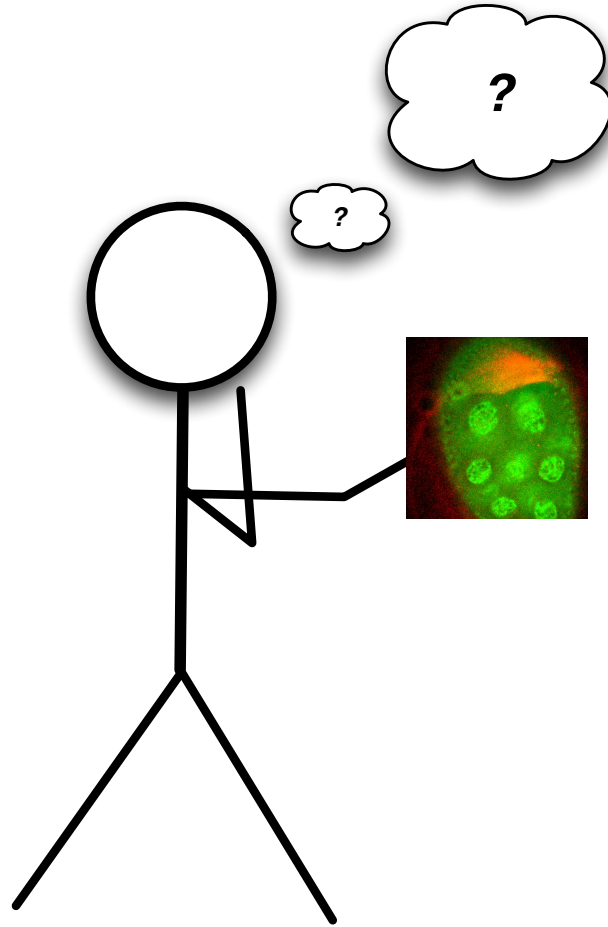
... and Microscope Operator



Results!



Now what?



Files



Computer User



External Hard Disks



- Portable?
- Convenient?
- Problem solved?



Uh oh!

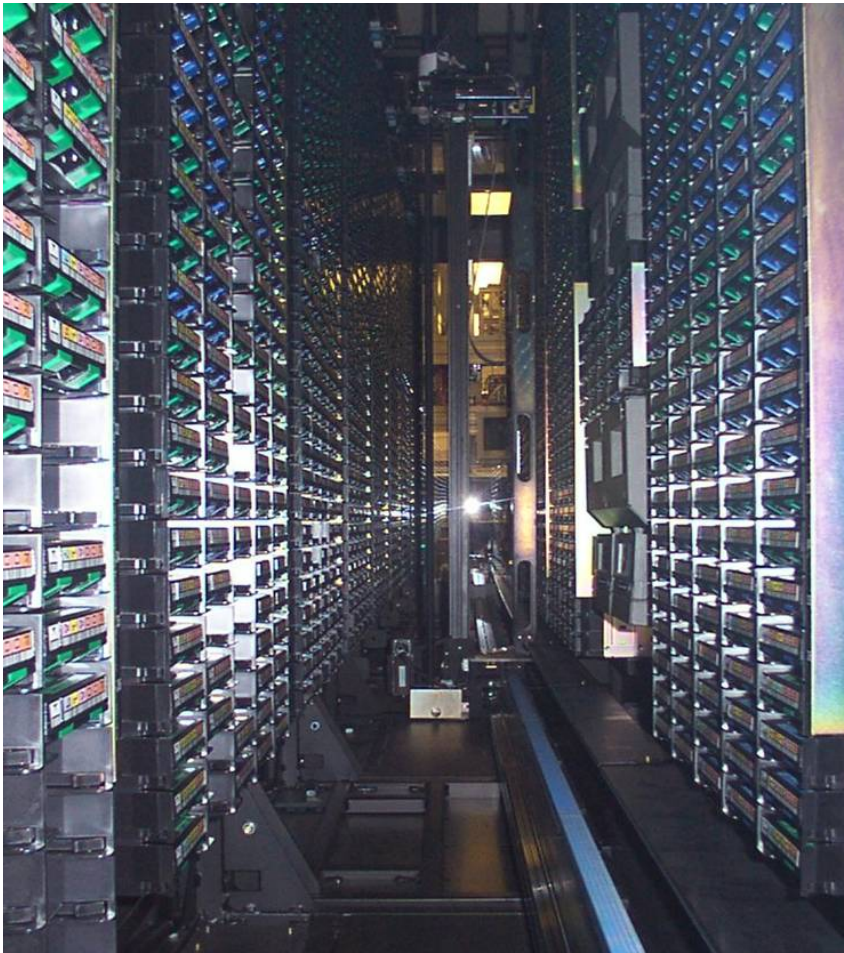


- Broken
- Lost
- Overwritten

Rage!



Backup



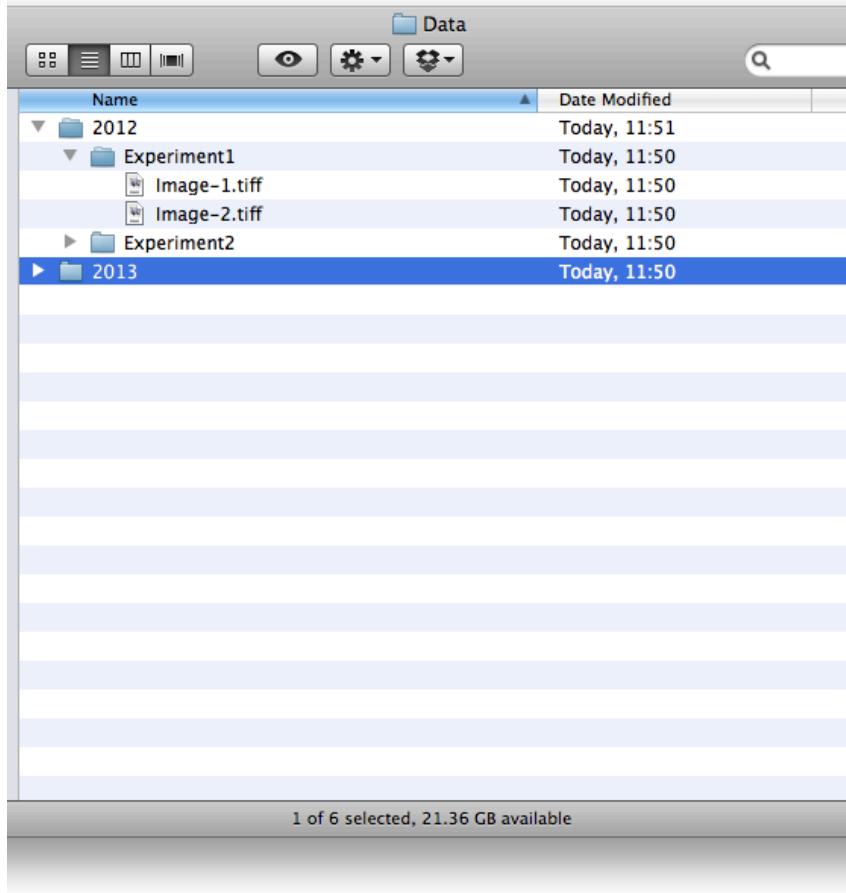
- Protect Against
 - Accidental Deletion
 - Malicious Viruses
 - Broken External Disk
 - Filesystem Failures
- Managed by Experts
- OUCS offer personal backups for all (limited by data volume)

Centralized File Systems



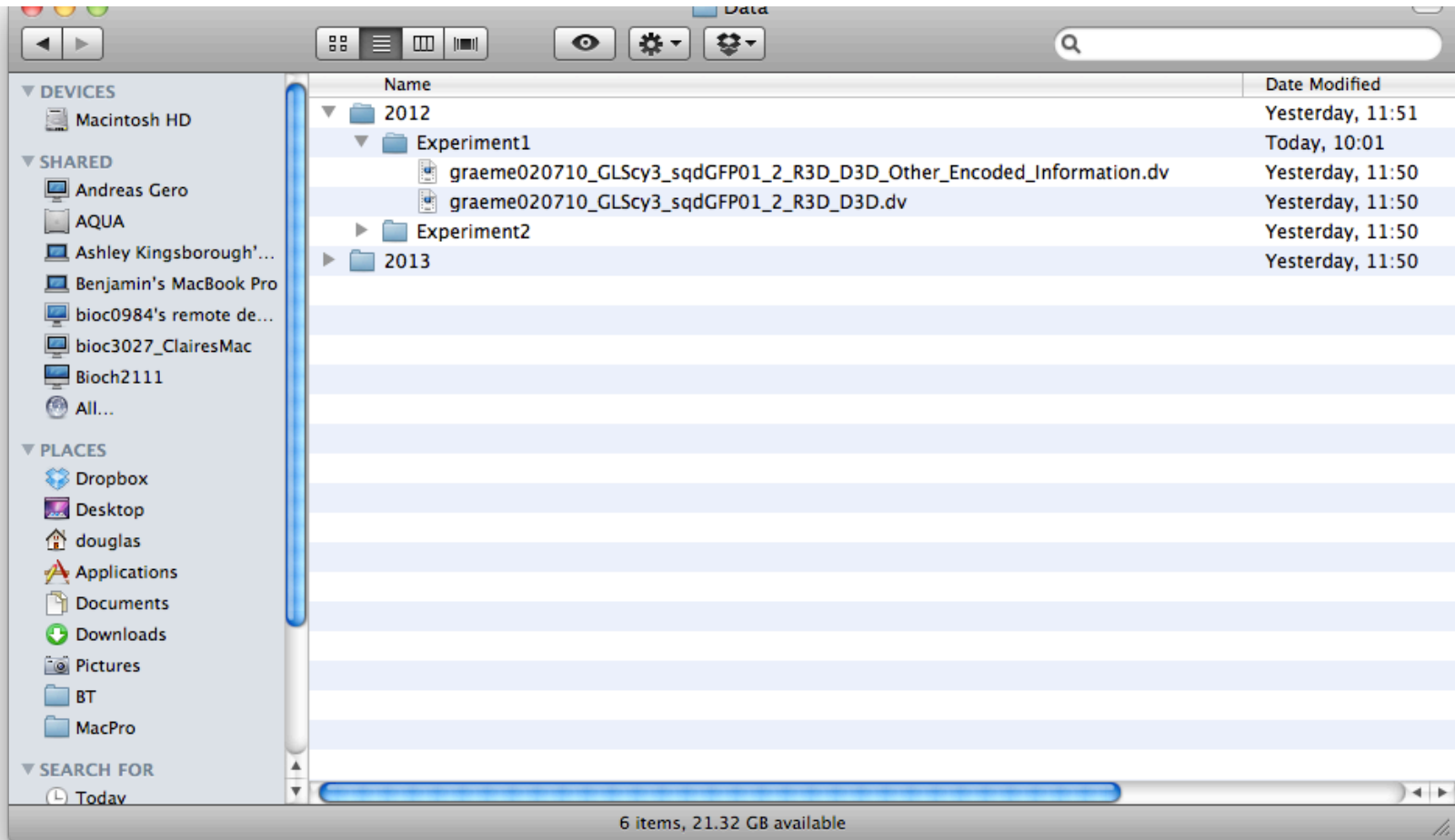
- Reliable
- Network Availability
- Managed by Experts

Organization - Hierarchy



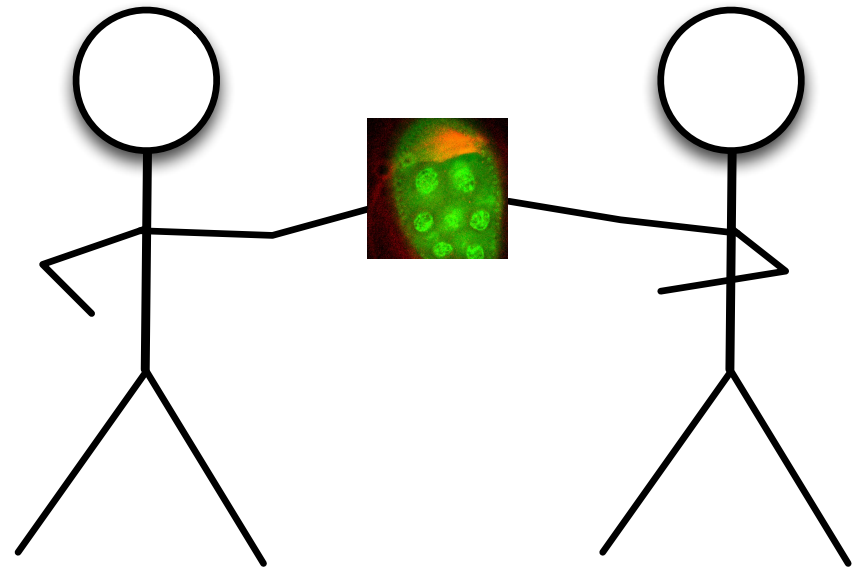
- Methodical
- Organized

Data linked directly to metadata



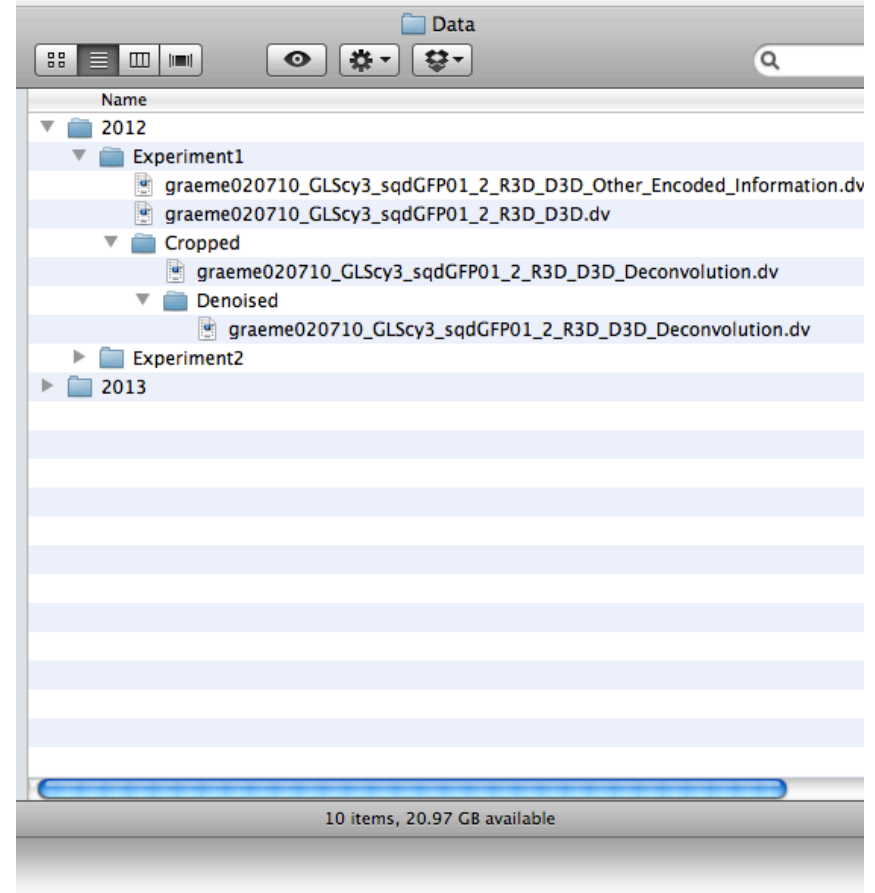
General Problems

- What if you want to share your data with others?



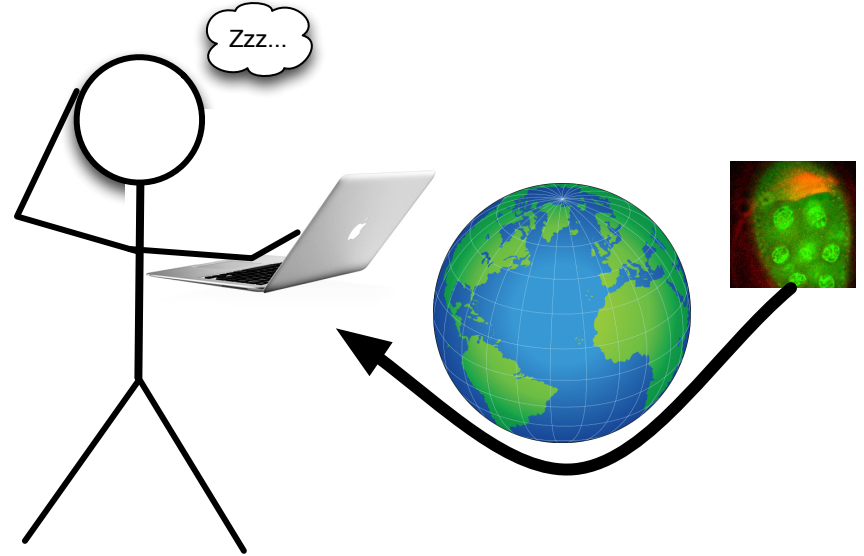
General Problems

- What if your organizational hierarchy begins to get unwieldy?
- Data duplication and re-duplication and re...



General Problems

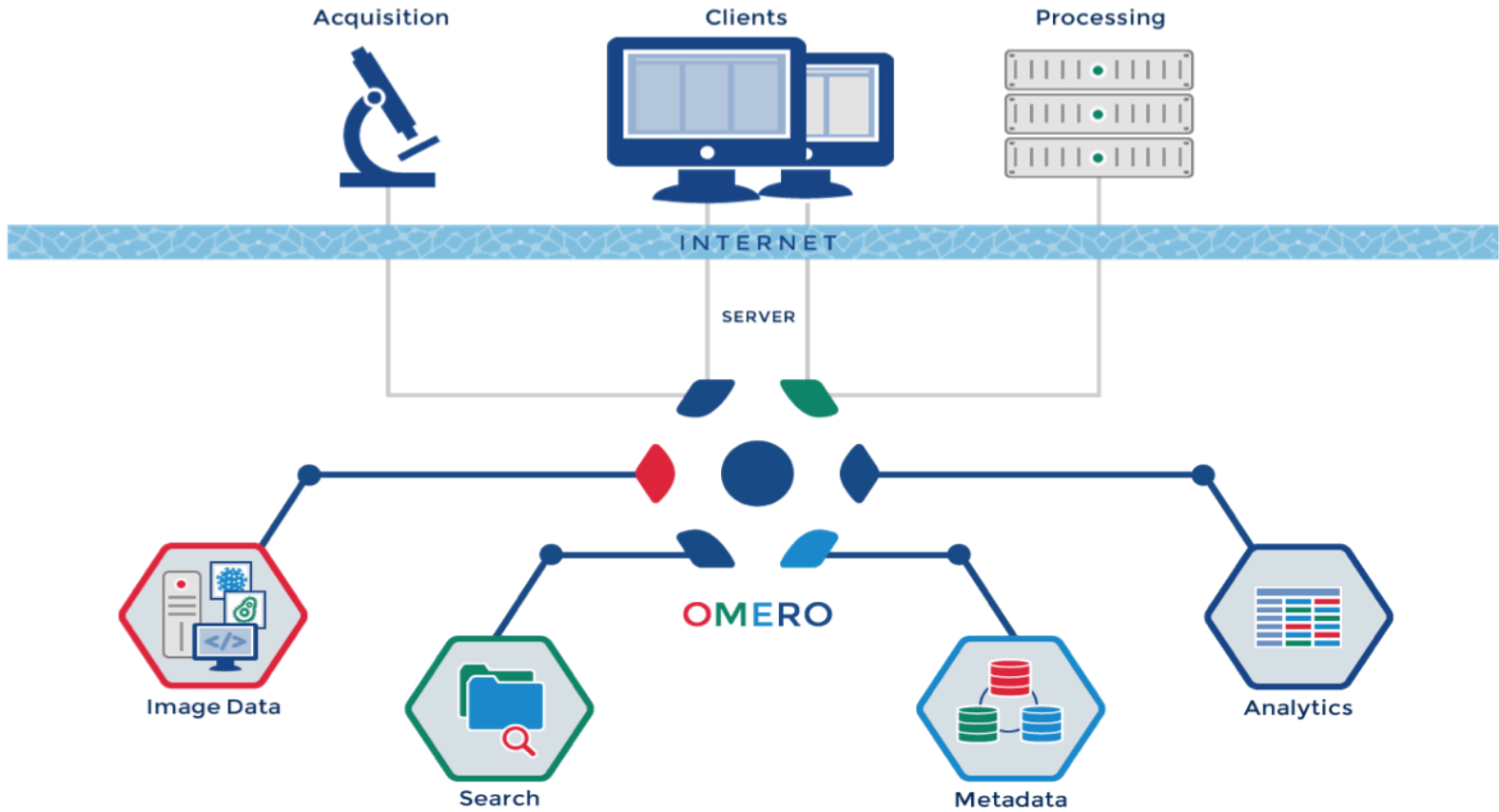
- What if you're on the other side of the world from your data
 - Microscopy pixel data is BIG!
 - What about just metadata?





<https://www.openmicroscopy.org>

What is it?



Data Visualization

The screenshot displays the 'Douglas Russell's Data Manager' application. The main workspace shows a grid of 27 microscopy images, with the text 'Workspace: 27 of 27 images' above them. The images are arranged in a 3x9 grid, showing various cellular structures in different colors (green, red, yellow). The left sidebar contains a 'Projects' tree view with a hierarchy: Davis [1], Micron [2], Douglas Russell, TestCopy1 [1], Orphaned Images, Graeme Ball, Decon_Sedat [4], ImageAnalysisRequests2012 [1], SIMcheck [1], testData [6], 3D_Large [3], Colocalization [2], OMX_SI [7], Tracking [3], VelocityImport [28], and VelocityImport2 [27]. Below the tree are tabs for Screens, Attachments, Tags, Images, Administration, and Search. The right sidebar has tabs for General, Acquisition, and Preview. Under 'General', it shows 'Dataset ID: 692' and 'VelocityImport2' with a green checkmark. There is a 'Description' field, an 'Annotations' section with 'All' selected, and 'rate', 'tag', and 'attachment' fields. A 'Comments' field is also present. At the bottom of the right sidebar is a 'Located in' dropdown menu.

Embedded Metadata

The screenshot displays a software interface with a workspace containing 27 images. The workspace title is "4_20_2012_grkMe31B_localiswithage_mvd2 [rmptt_20120217_Me31Bgrk_stage10_11] (May 25, 2012)". The images are arranged in a grid, with the top-left image selected. The right-hand side of the interface features a metadata panel with the following sections:

- General** (selected)
- Acquisition**
- Preview**

Companion Files

Original Metadata

SeriesMetadata

Tag	Value
Pixel width (in microns)	0.12764917342002743
Name	rmptt_20120217_Me31Bgrk_stage10_11
Pixel height (in microns)	0.12764917342002743
Camera/Detector	Hamamatsu C9100-13
Z step (in microns)	0.2
Objective magnification	100.0
Channel #2	RFP fs
Channel #1	GFP fs

Microscope

Image

Objective

Nominal Magnification 100

Immersion Other

Correction Other

[Show unset fields](#)

GFP fs

Info

Name GFP fs

[Show unset fields](#)

Detector

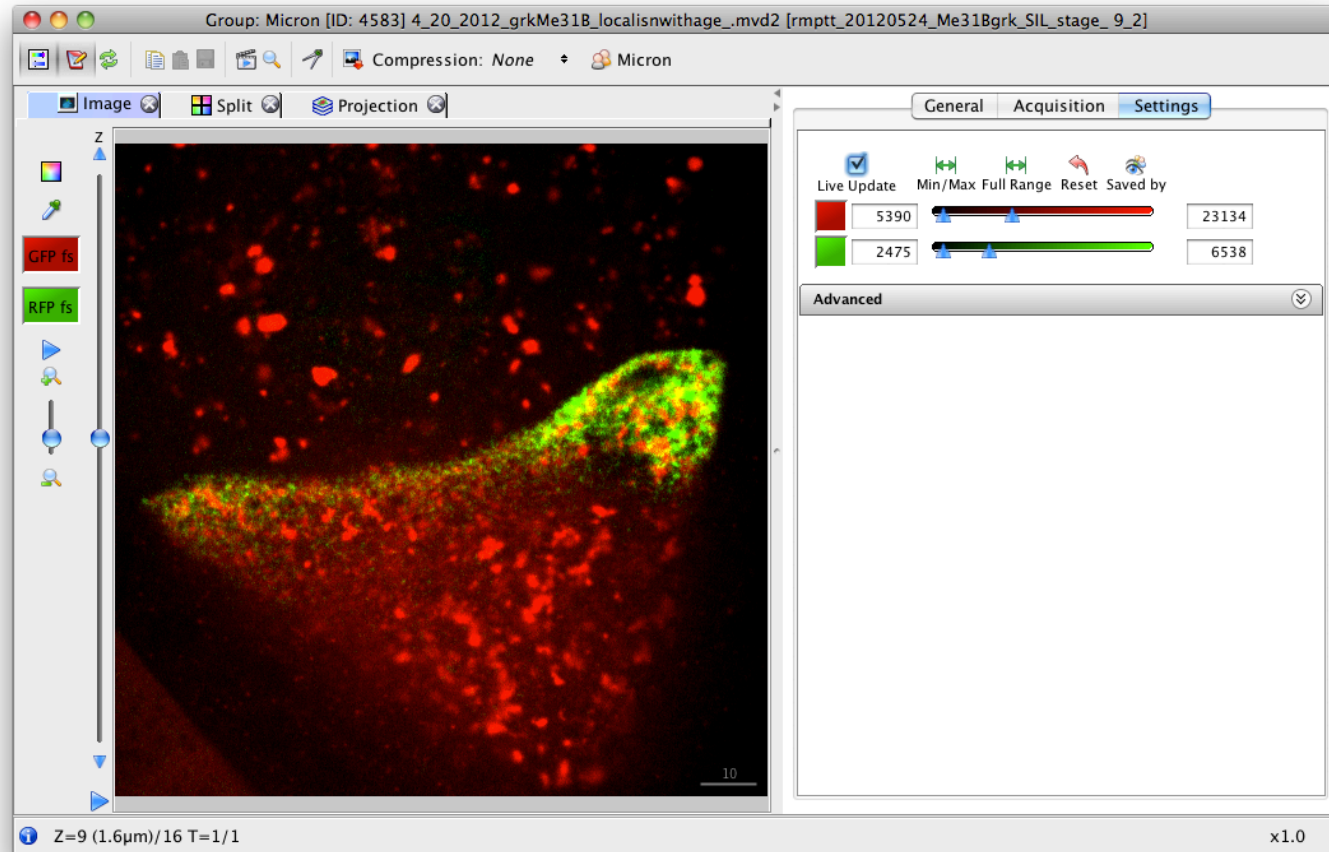
Model Hamamatsu C9100-13

Type Unknown

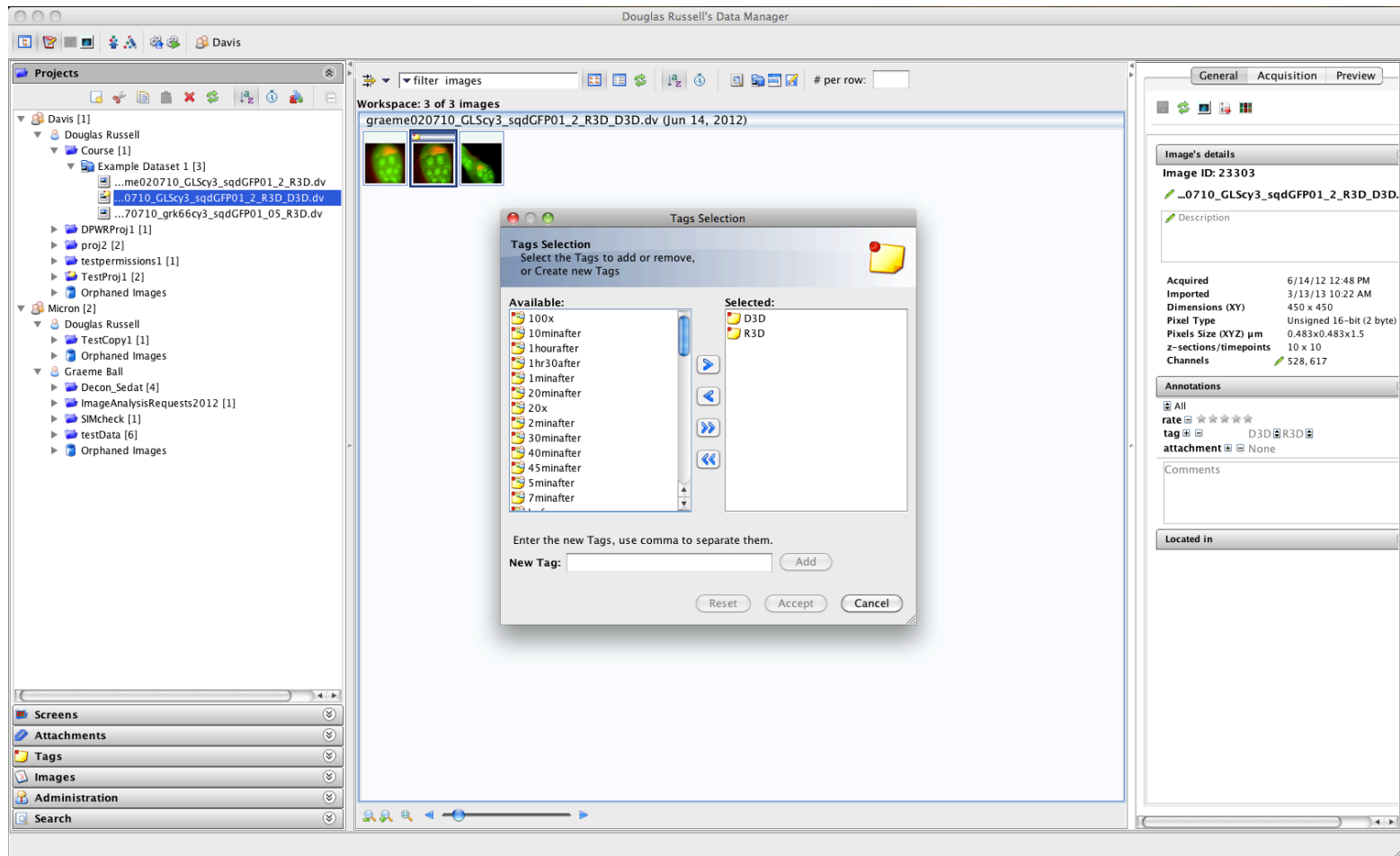
[Show unset fields](#)

Exposure Time

Data Visualization



Metadata Annotations



Metadata Search

The screenshot displays a software interface for metadata search. On the left is a sidebar with a navigation menu containing: Projects, Screens, Attachments, Tags, Images, Administration, and Search. The Search section is active, showing a search box with the text "D3D" and a search button. Below the search box is a "Context" section with a dropdown menu set to "Davis". There are checkboxes for "Name", "Comments", "URL", "Description", "Tags", and "Attachments". The "Tags" checkbox is checked. At the bottom of the sidebar are "Search" and "Cancel" buttons. Below the sidebar, the following information is displayed: Group: Davis, Tags: 0, Name: 81.

The main workspace area is titled "Workspace: 81 of 81 images". It features a toolbar with icons for filter images, view, refresh, and other functions, along with a "# per row:" input field. Below the toolbar is a grid of image thumbnails. The thumbnails are arranged in a grid and show various biological or scientific images, including grayscale and color (red, green, yellow) images. The grid is titled "Davis".

Region of Interest

The screenshot displays a microscopy software interface with the following components:

- File Explorer:** Shows a project structure under "Example Dataset 1 [3]" with files like "me020710_GLScy3_sqdGFP01_2_R3D.dv".
- Manager Table:** A table listing ROI information:

ROI	id	Z	T	Type	Text	Visi...
[1]	1	6	1	<input type="radio"/>		<input checked="" type="checkbox"/>
	--	6	1	<input type="radio"/>		<input checked="" type="checkbox"/>

- Main Image Viewer:** Displays a 3D volume rendering of cells. A circular ROI is highlighted on a green channel. The interface includes a Z-axis slider, a T-axis slider, and a status bar at the bottom showing "Z=6 (7.5µm)/10 T=1/10" and "3s 3s".



**The solution for reading proprietary microscopy data
and metadata**

<http://loci.wisc.edu/software/bio-formats>

Bio-Formats

- Currently reads 127 Formats
- Capable of writing several formats
- Uses standard OME Data model for all data – specifically OME-Tiff
- Used in OMERO, ImageJ and many other tools

OMERO Advantages

- Centralized data, but accessible from anywhere through lightweight interfaces
- Desktop (All platforms) and Web Clients
- Managed by Experts
- Original data always preserved
- APIs provided for writing customized tools
- Compatible with some tools already, e.g. ImageJ

OMERO Advantages

- Easier to share and collaborate with colleagues/group leader
- Searchable
- Homogeneous Organization - Data is accessible and organized even after user is gone
- Integration with analysis tools
- Scripting Services - can access annotations, ROI, pixels, etc.

Try it?

- Server – Linux/Windows/Mac
- Virtual Box ‘Virtual Appliance’
- Clients – Linux/Windows/Mac/Web
- Biochemistry and Dunn school – email me!