

OMERO

Facility Manager Training Day

Cambridge, July 2016

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The OME Consortium



Open Microscopy Environment
Centre for Gene Regulation & Expression
School of Life Sciences, University of Dundee
Dundee, Scotland, UK

Programme for the day

- Introduction to OMERO
- Managing OMERO users and groups
- **Coffee**
- Importing images into an OMERO server
- **Lunch**
- Managing and organizing data
- **Coffee**
- Integrating OMERO with analysis and acquisition tools
- Training your users

Introduction to OMERO

- *“Scientific Data”* paradigm
- What is OMERO?
- Sharing data with OMERO
- Publishing with OMERO
- Analyzing with OMERO
- Questions

The Standard Paradigm



You



Applications

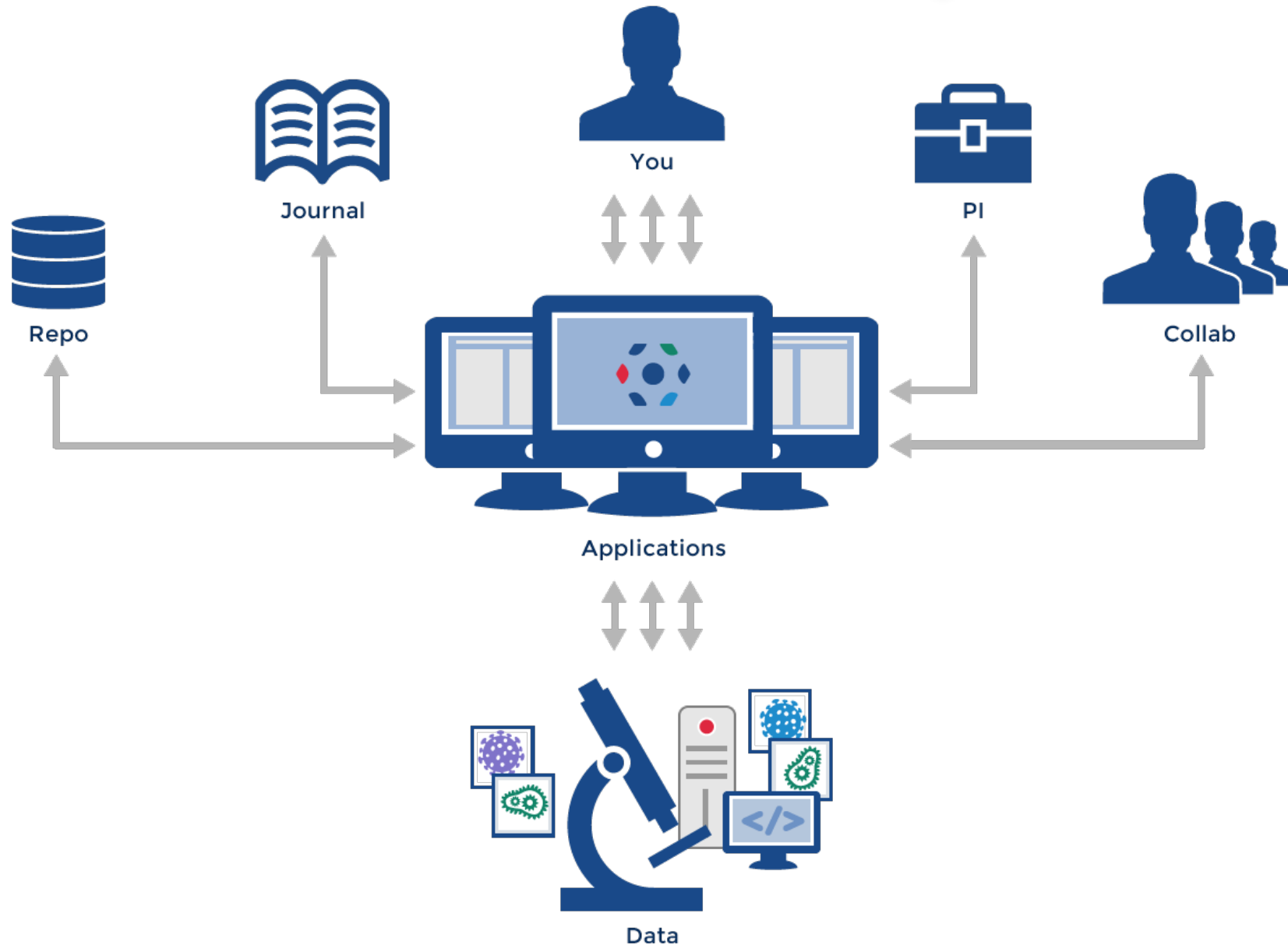


Data

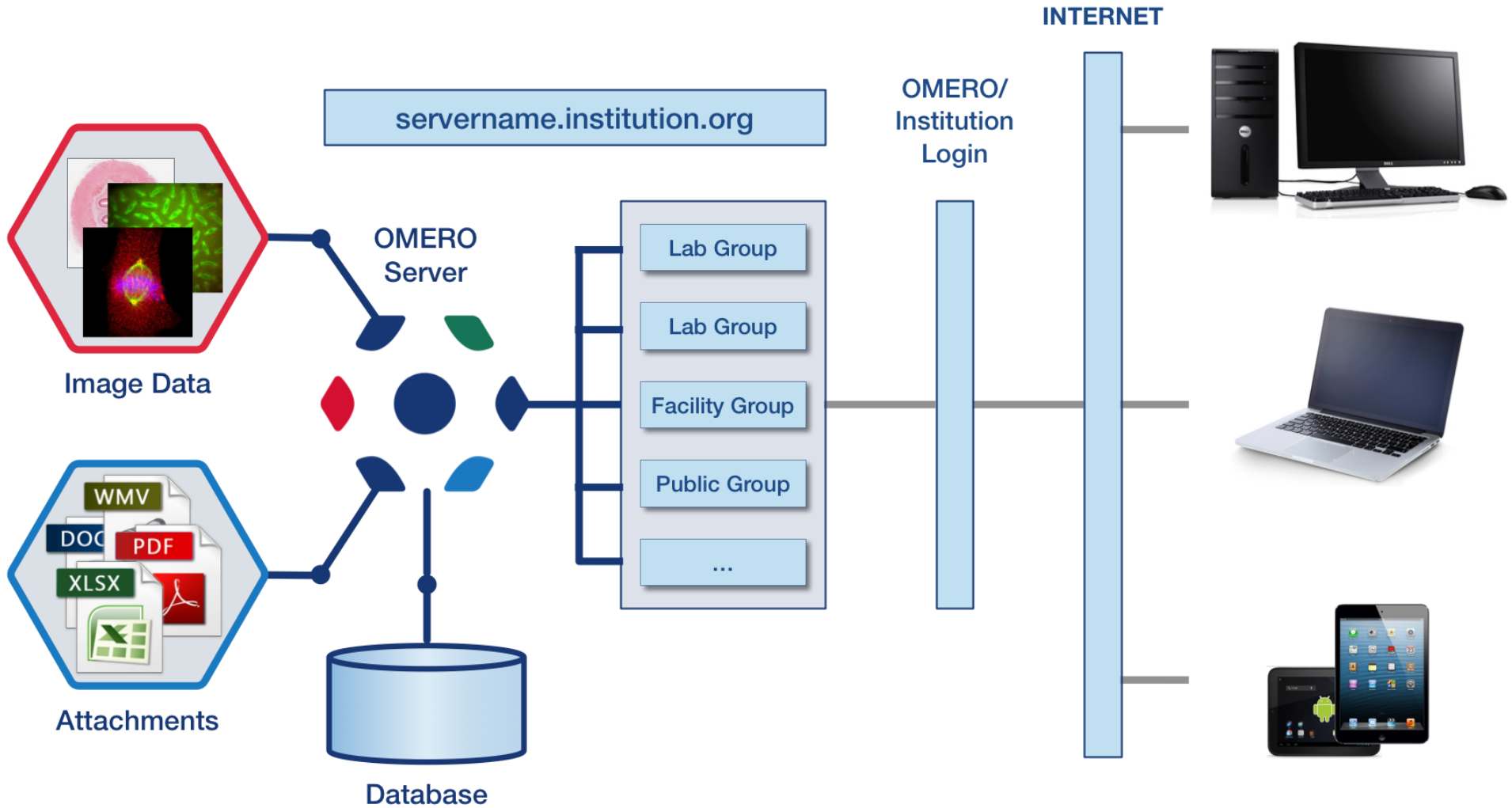
What about

- Organizing your data?
- Sharing data with coworkers and colleagues?
- Analyzing data?
- Publishing data?

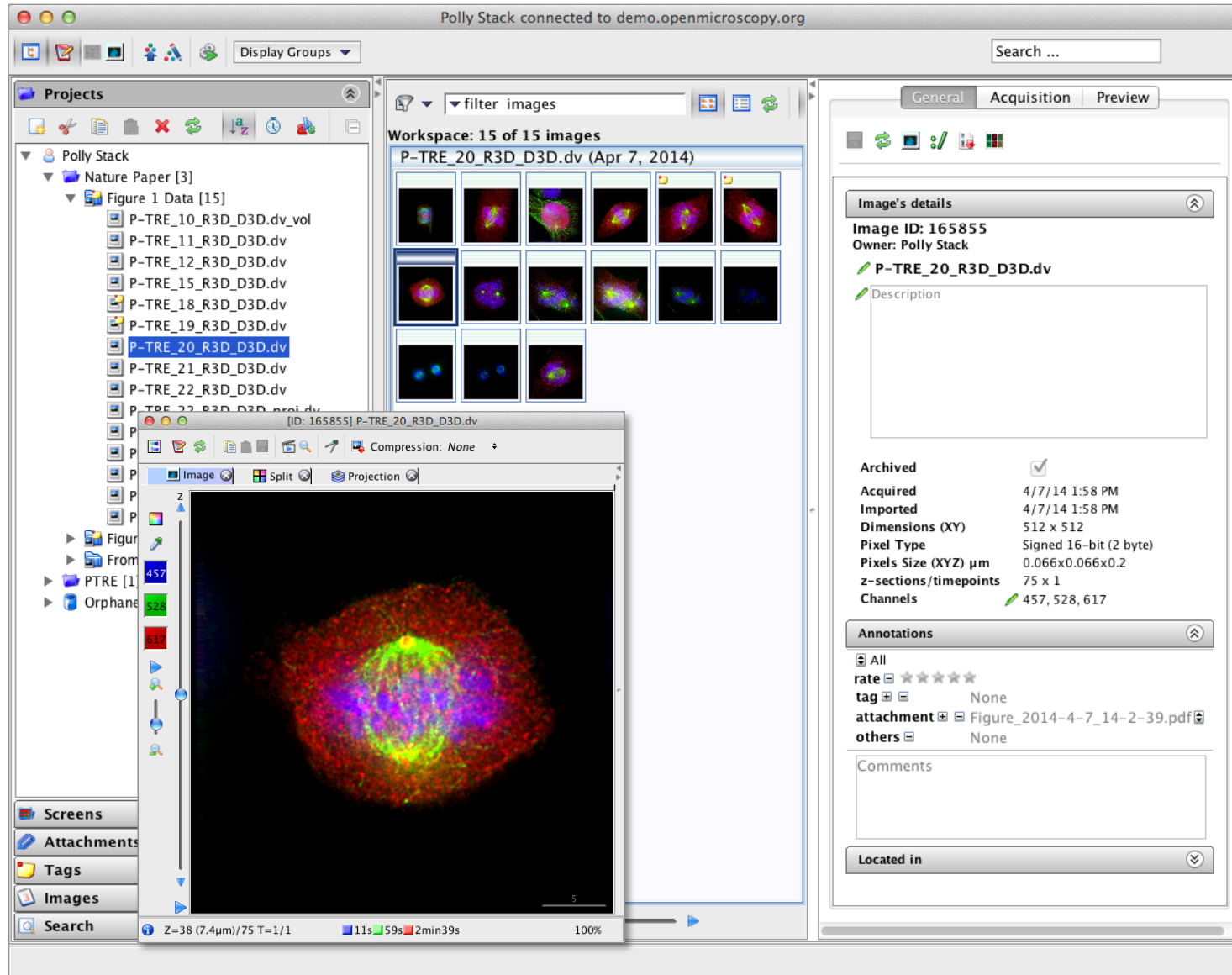
The “Scientific Data” Paradigm



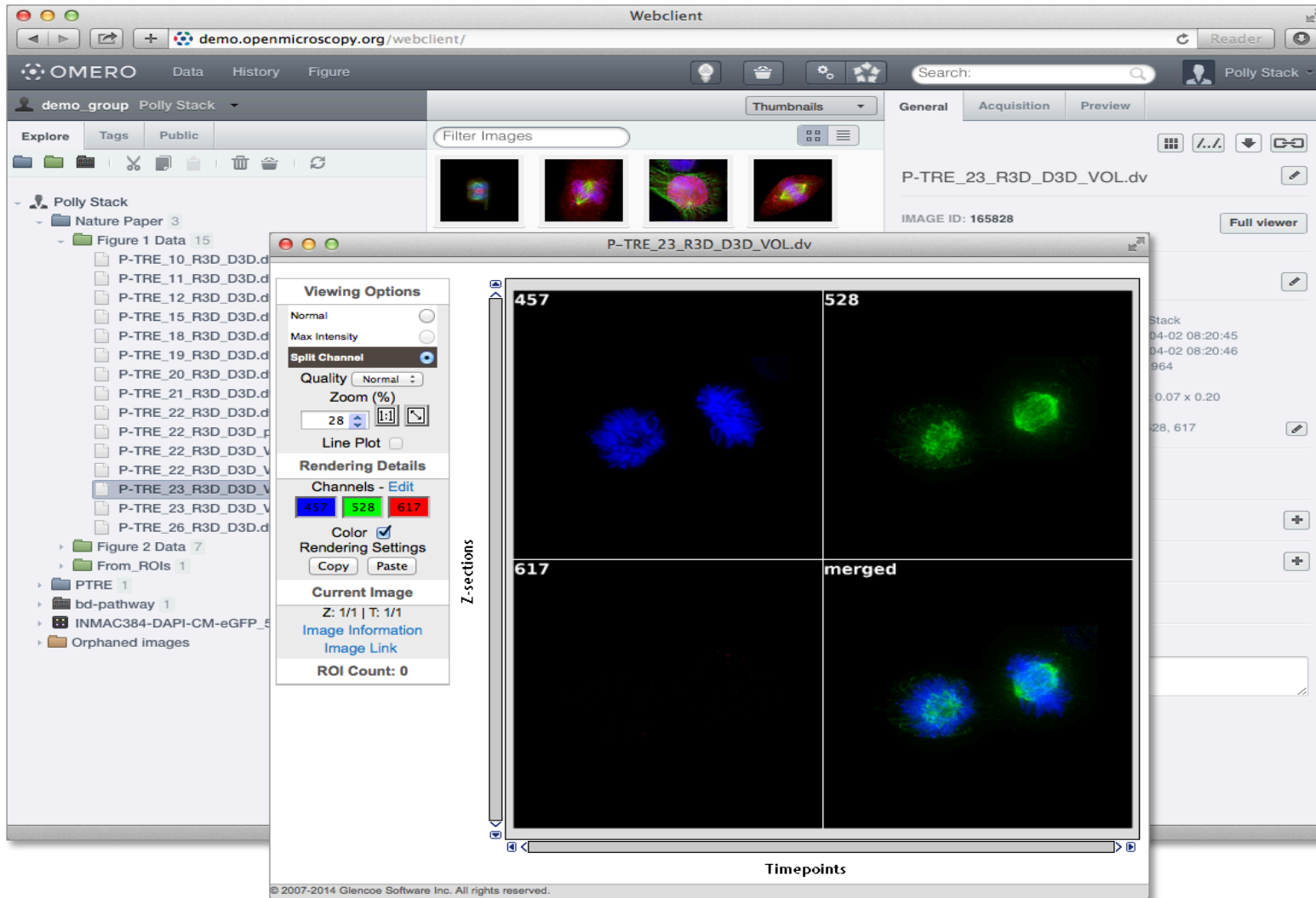
OMERO setup



OMERO.insight: Desktop Based Application



OMERO.web: Web Based Application



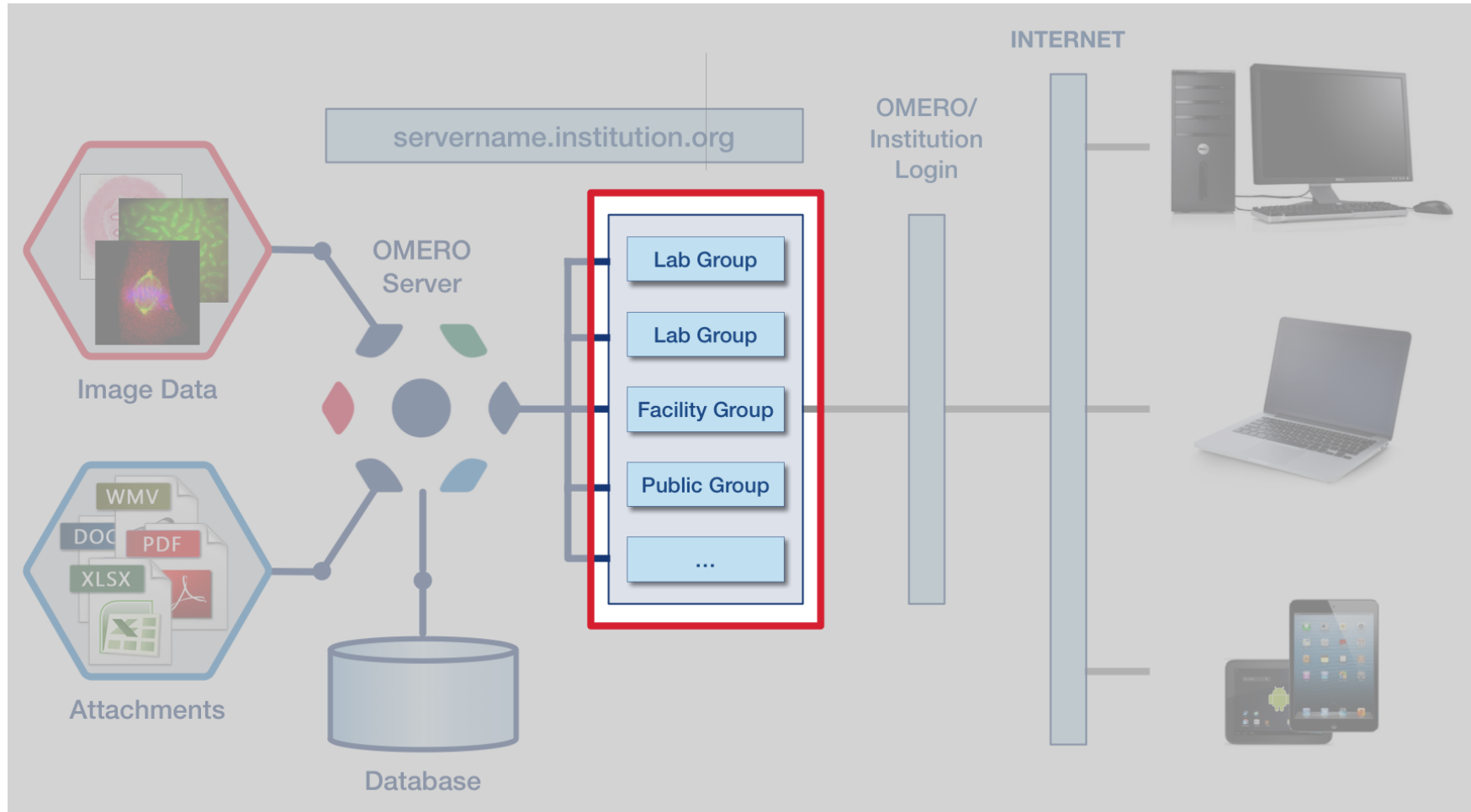
OMERO.py: Command Line Application

```
1. bash
bash #1 cblackburn@nec... #2 bash #3
24 | ome-user-21 | ome-user-21 | ome-user-21 | ome | Yes | False | 5,4 |
25 | ome-user-22 | ome-user-22 | ome-user-22 | ome | Yes | False | 5,4 |
26 | ome-user-23 | ome-user-23 | ome-user-23 | ome | Yes | False | 5,4 |
27 | ome-user-24 | ome-user-24 | ome-user-24 | ome | Yes | False | 5,4 |
28 | ome-user-25 | ome-user-25 | ome-user-25 | ome | Yes | False | 5,4 |
29 | ome-user-26 | ome-user-26 | ome-user-26 | ome | Yes | False | 5,4 |
30 | ome-user-27 | ome-user-27 | ome-user-27 | ome | Yes | False | 5,4 |
31 | ome-user-28 | ome-user-28 | ome-user-28 | ome | Yes | False | 5,4 |
32 | ome-user-29 | ome-user-29 | ome-user-29 | ome | Yes | False | 5,4 |
33 | ome-user-30 | ome-user-30 | ome-user-30 | ome | Yes | False | 5,4 |
(34 rows)
ls30778-2:openmicroscopy colin$ omero group list
Using session 5d20879e-96d1-4fdf-ab0a-c71c2069d528 (ome-trainer-2@tadpole.dyn.lifesci.dundee.ac.uk:4064). Idle timeout: 10 min. Current group: Lab1
id | name | perms | ldap | # of owners | # of members
-----+-----+-----+-----+-----+-----
0 | system | rw---- | False | 1 | 2
1 | user | rwr-r- | False | 0 | 33
2 | guest | rw---- | False | 0 | 1
3 | Lab4 | rw---- | False | 0 | 2
4 | Lab2 | rwr--- | False | 0 | 32
5 | Lab1 | rwr--- | False | 0 | 32
6 | Lab3 | rwrw-- | False | 0 | 2
(7 rows)
ls30778-2:openmicroscopy colin$
```



SHARING DATA WITH OMERO

OMERO group and user system



Security Model

PERMISSIONS	 Read	 Annotate	 Write	 Privacy
 Private	✓	✓	✓	 You
 Group-Read	✓	✗	✗	
 Group-Annotate	✓	✓	✗	 Your Group
 Group-Write	✓	✓	✓	
 Public-Read	✓	✗	✗	
 Public-Annotate	✓	✓	✗	
 Public-Write	✓	✓	✓	Anyone



PUBLISHING WITH OMERO

OMERO: Data Publication

The screenshot displays the OMERO web interface. At the top, there is a header for the "Centre for Gene Regulation & Expression" and the "University of Dundee" logo. Below this is a navigation menu with links for Home, News, Events, Features, Research, Funding, Impact, Staff, Resources, Publications, and Contact. The main content area features a profile for "Jason Swedlow", identified as a "Professor of Quantitative Cell Biology" at the "College of Life Sciences, University of Dundee, Dundee".

Overlaid on the profile is a window titled "P-TRE_10_R3D_D3D.dv" showing a microscopy image viewer. The viewer's address bar contains the URL: https://nightshade.openmicroscopy.org/webgateway/img_detail/3933597/. The viewer includes a "Viewing Options" panel on the left with settings for "Normal" view, "Max Intensity", "Split Channel", "Quality" (Normal), and "Zoom (%)". The "Rendering Details" panel shows three channels: 457 (blue), 528 (green), and 617 (red). The "Current Image" panel displays "Z: 43/85 | T: 1/1" and provides links for "Image Information" and "Image Link". The "ROI Count" is 0. The main image area shows a 3D reconstruction of a cell with a vertical "Z-sections" slider and a horizontal "Timepoints" slider. The image shows a cell with red, green, and blue channels, representing different biological structures.

Below the viewer, a text snippet is visible: "of new daughter cells. Proper chromosome...". To the right, a thumbnail image shows a similar cell division image. Below the thumbnail, the text reads: "INCENP (red) localization in a dividing cell, also stained for microtubules (green) and DNA (blue). Click on the thumbnail to view and manipulate the image in OMERO."

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OMERO

Data Publication: Image Data Repository

The screenshot displays the OMERO web interface. At the top, there is a navigation bar with 'Data', 'History', and 'Help' menus. Below this is a search bar and a user profile for 'Public User'. The main area is divided into three sections:

- Left Panel (Explore):** A tree view showing a hierarchy of data. Under 'Demo data', there is a folder 'idr0015-UNKNOWN-taraoceans/screenA_44' containing numerous sub-items representing different image acquisition events.
- Center Panel:** A large grid of small image thumbnails, with one larger image selected and displayed in a detailed view below.
- Right Panel (General):** Metadata for the selected image, including 'TARA_HCS1_H5_G100008302_G1000083', 'Plate ID: 303', 'Owner: Demo User', and 'Creation Date: 2015-10-05 02:15:01'. It also lists various annotations such as 'SAMPLE_BARCODE_URL', 'STATION_LABEL', and 'EVENT_LABEL'.

Below the main interface, there are two additional components:

- Viewing Options:** A sidebar on the left of the detailed image view, containing controls for 'Normal' view, 'Max Intensity', 'Split Channel', 'Quality', 'Zoom (%)', 'Line Plot', 'Rendering Details', 'Channels', 'Grayscale', 'Interpolate', and 'Current Image' (Z: 11/20 | T: 1/1).
- Data Table:** A table titled 'TARA OCEANS' providing details for a specific event. It includes a QR code, start/end dates, coordinates, pump information, and a detailed log of operations.

TARA OCEANS Data Table:

TARA OCEANS		Tara.UTC	YYYY	MM	DD	HH	MM	###	EVENT_PUMP_01
Start	N	06	40.257	W	153	03.945			1 DAY
End	N	06	51.534	W	153	06.659			
OPERATORS		DEPTH_Intended (m)		CABLE_Length (m)		Angle (deg)		Speed (m/s)	
JP		SURFACE						1.0	
OPERATION	START TIME (HH:MM)	END TIME (HH:MM)	PUMP RATE (Hz)	COMMENTS					
Rinsing Pump:	17:57	18:02	60						
Filling 200L (B&V):	18:03	18:10	60						
Filling 200L GPSS (PROT&G):	18:11	18:36	20						
Filling 200L (B&V):									
Flow through GPSS (when 5um net is not avail.) (indicate pauses)	18:52	21:27	20	Upper 5um net probably broken					
	21:36	23:10	20						
	23:33	01:24	20						
PUMPING_Depth_Max (m)		PUMPING_Depth_Min (m)		PUMPING_Duration (HHMM)					
Depth_SRF (m)	Depth_TopDCM (m)	Depth_DCM (m)	Depth_BotDCM (m)	Depth_BotML (m)					

OMERO.figure

OMERO.figure - Porter et al. x

will-moore.github.io/figure/demo/#file/1

OMERO File Edit Help Can't Save Porter et al, Bod1: 2007 Add Image Delete Export PDF

DNA AuroraB tubulin merged

Control siRNA Bod1 siRNA

Control siRNA Bod1 siRNA

Control siRNA Bod1 siRNA

Control siRNA Bod1 siRNA

Info Preview Labels

Z

C 0°

15/28 T 1/1

484 1731

1021 2725

2504 4009

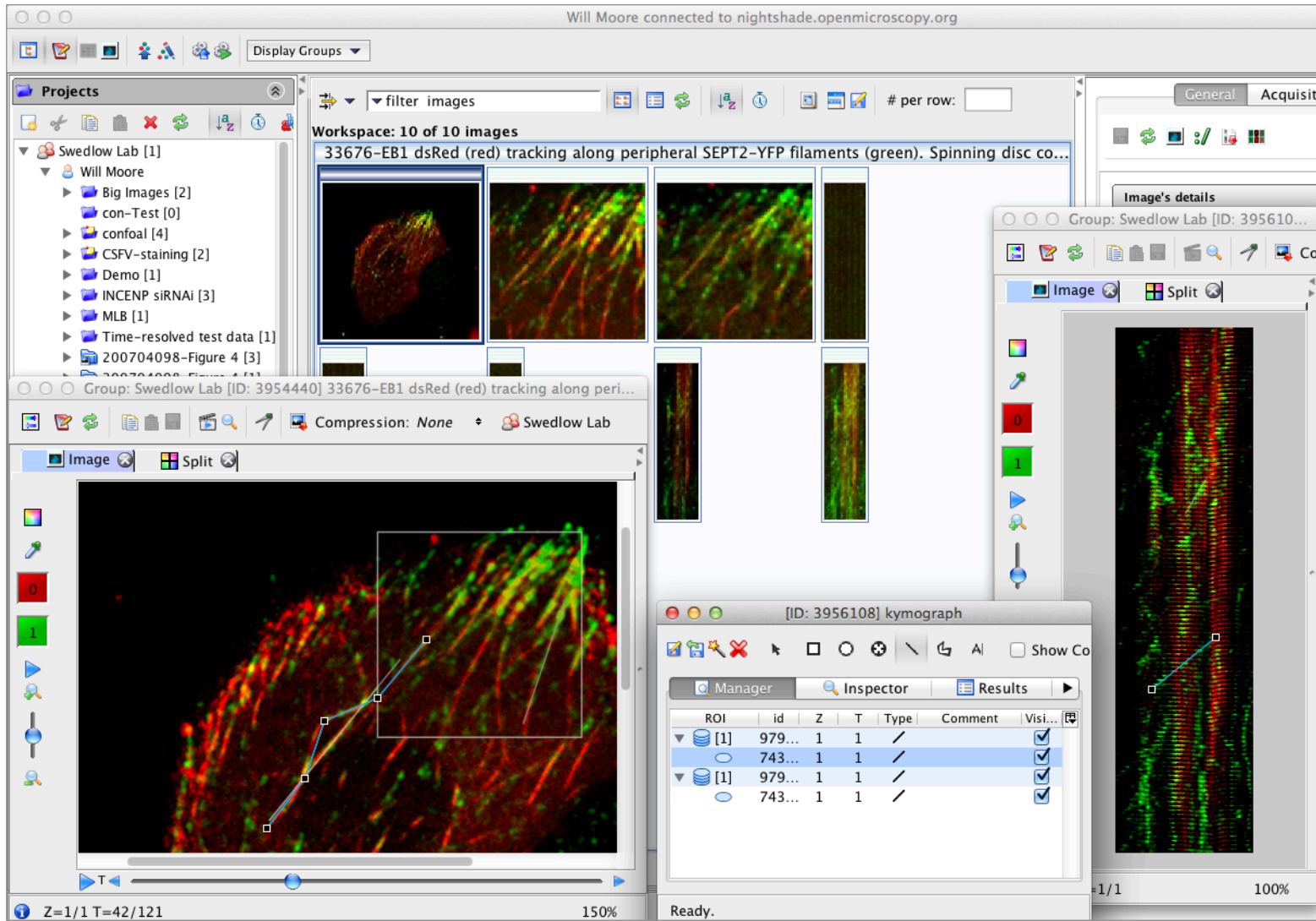
Zoom: 100%

125



ANALYSIS WITH OMERO

OMERO.scripts: Kymographs example



ImageJ and OMERO



Hoechst_ND - n000001.tif (33.3%)

35.84x27.31 inches (2688x2048); 16-bit; 11MB

ROI Manager

0001-0009
0002-0017
0003-0011
0004-0010
0005-0008
0006-0016
0007-0025
0008-0018
0009-0023
0010-0025
0011-0037
0012-0033
0013-0034
0014-0027
0015-0030
0016-0032
0017-0023
0018-0037

Add [t]
Update
Delete
Rename...
Measure
Deselect
Properties...
Flatten [F]
More »
 Show All
 Labels

Label	Area	Mean	StdDev	Mode	Min	Max	X	Y
1	Hoechst_ND - n000001.tif	4.35556E-2	2.30549E3	4.88510E2	2.51500E3	1.51600E3	3.45700E3	1.97412E0
2	Hoechst_ND - n000001.tif	1.21600E-1	3.33402E3	8.96595E2	4.09500E3	1.51600E3	4.09500E3	2.36955E0
3	Hoechst_ND - n000001.tif	3.64444E-2	2.49201E3	5.14563E2	1.71900E3	1.55400E3	3.54300E3	9.42481E0



Hoechst_ND - n000001.tif

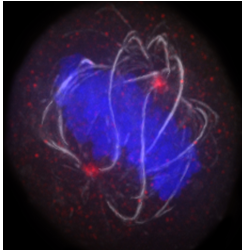
Viewing Options

Normal
Max Intensity
Split Channel
Quality (Normal)
Zoom (%)
Line Plot
Rendering Details
Channels - Edit
Grayscale
Rendering Settings
Interpolate
Current Image
Z: 1 | T: 1 | 1
Scale bar
Image Information
Image Link
ROI Count: 1476
Show ROIs Hide

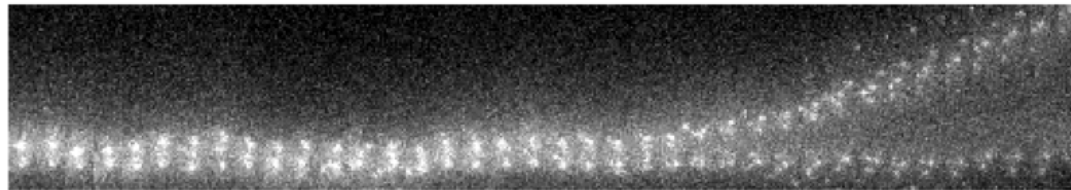
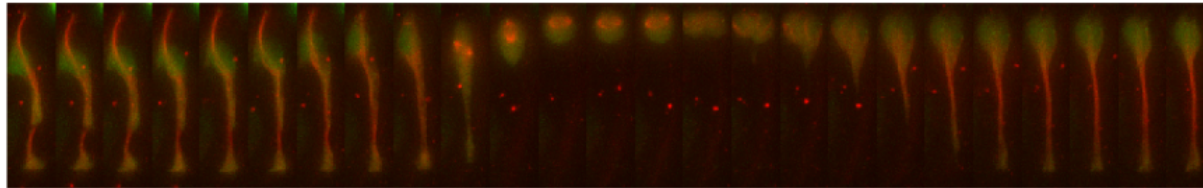
ROIs

ID	Z	T	Text	Preview	Visibility
6051	0001-0009			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6052	0002-0017			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6053	0003-0011			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6054	0004-0010			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6055	0005-0008			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6056	0006-0016			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6057	0007-0025			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6058	0008-0018			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6059	0009-0023			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6060	0010-0025			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6061	0011-0037			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6062	0012-0033			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6063	0013-0034			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6064	0014-0027			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6065	0015-0030			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6066	0016-0032			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6067	0017-0023			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6068	0018-0037			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6069	0019-0036			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6070	0020-0038			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6071	0021-0042			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6072	0022-0044			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Timepoints



OMERO.mtools: Matlab-based analysis



objectSelector

1. Choose channels to measure.
2. Click on the object in the top window that you want to measure from.
3. Click on the object in the bottom window that you want to measure to.
4. Click the "Accept" button.

Accept

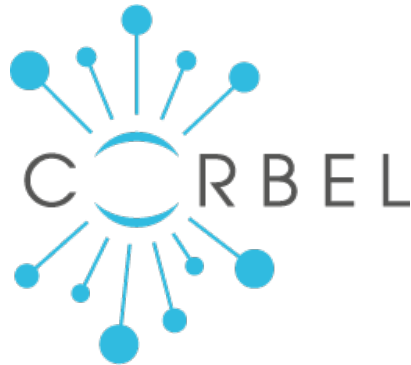
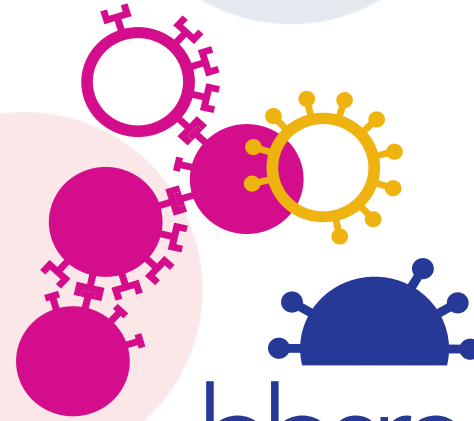
T = 1

Z = 3

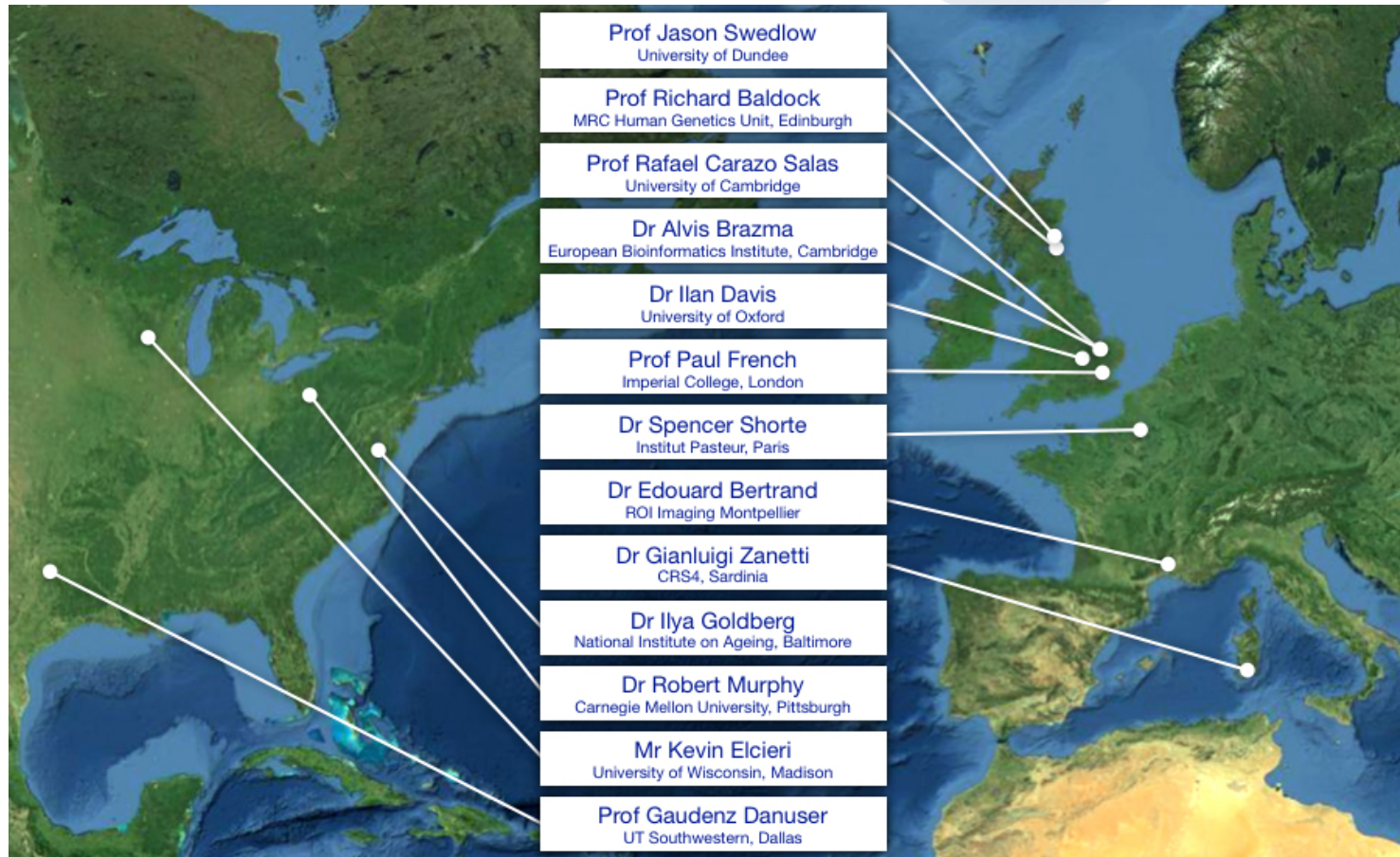
Some useful links

- OMERO Downloads:
 - <http://downloads.openmicroscopy.org/omero/>
- OMERO Help Pages:
 - <http://help.openmicroscopy.org/>
- OMERO Forums:
 - <https://www.openmicroscopy.org/community/>
- OMERO demo server:
 - <http://help.openmicroscopy.org/demo-server.html>

Thank to Funders



OME Consortium



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EMBL-EBI, Glencoe Software