

OMERO

Users Training day

Cambridge, December 2017

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University of Dundee
The OME Consortium



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

Programme of the day

- Short introduction to OMERO
- Managing images (Workflow 1 – z stacks)
- **Coffee**
- Viewing, analyzing and publishing images using OMERO plugins (OMERO.iviewer, FPBioimage, OMERO.figure Workflow 1 – z stacks continued)
- **Lunch**
- Filtering and data search, analysis using Fiji features (OMERO.insight plugin for Fiji, Workflow 2 – timelapse images)
- **Coffee**
- Publishing with OMERO (OMERO.figure – in depth, Workflow 2 – timelapse continued)

Outline

- Scientific Data paradigm
- What is OMERO
- Analyzing with OMERO
- Sharing data with OMERO
- Publishing with OMERO
- Questions

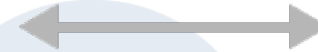
The Standard Paradigm



You



Applications

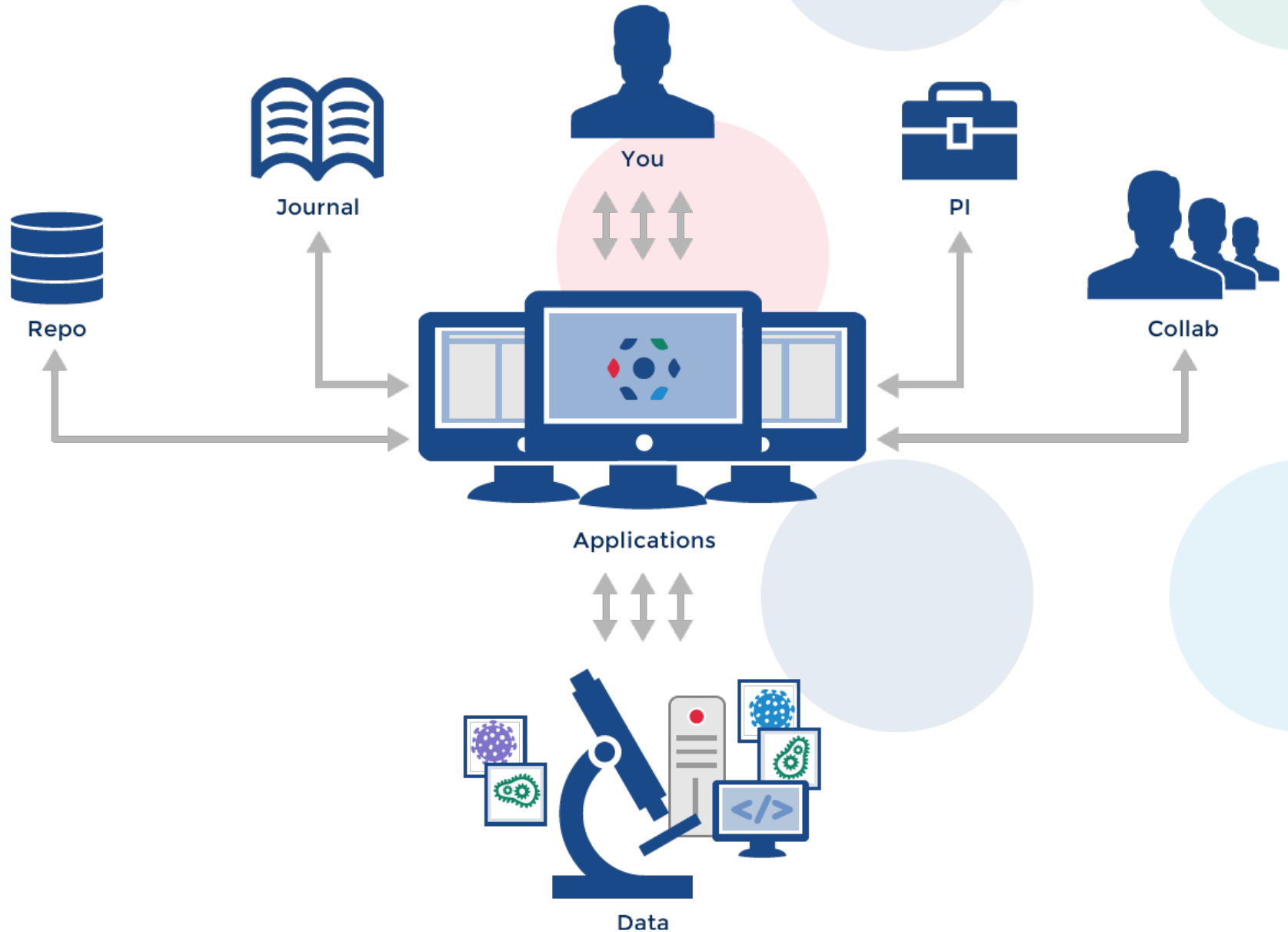


Data

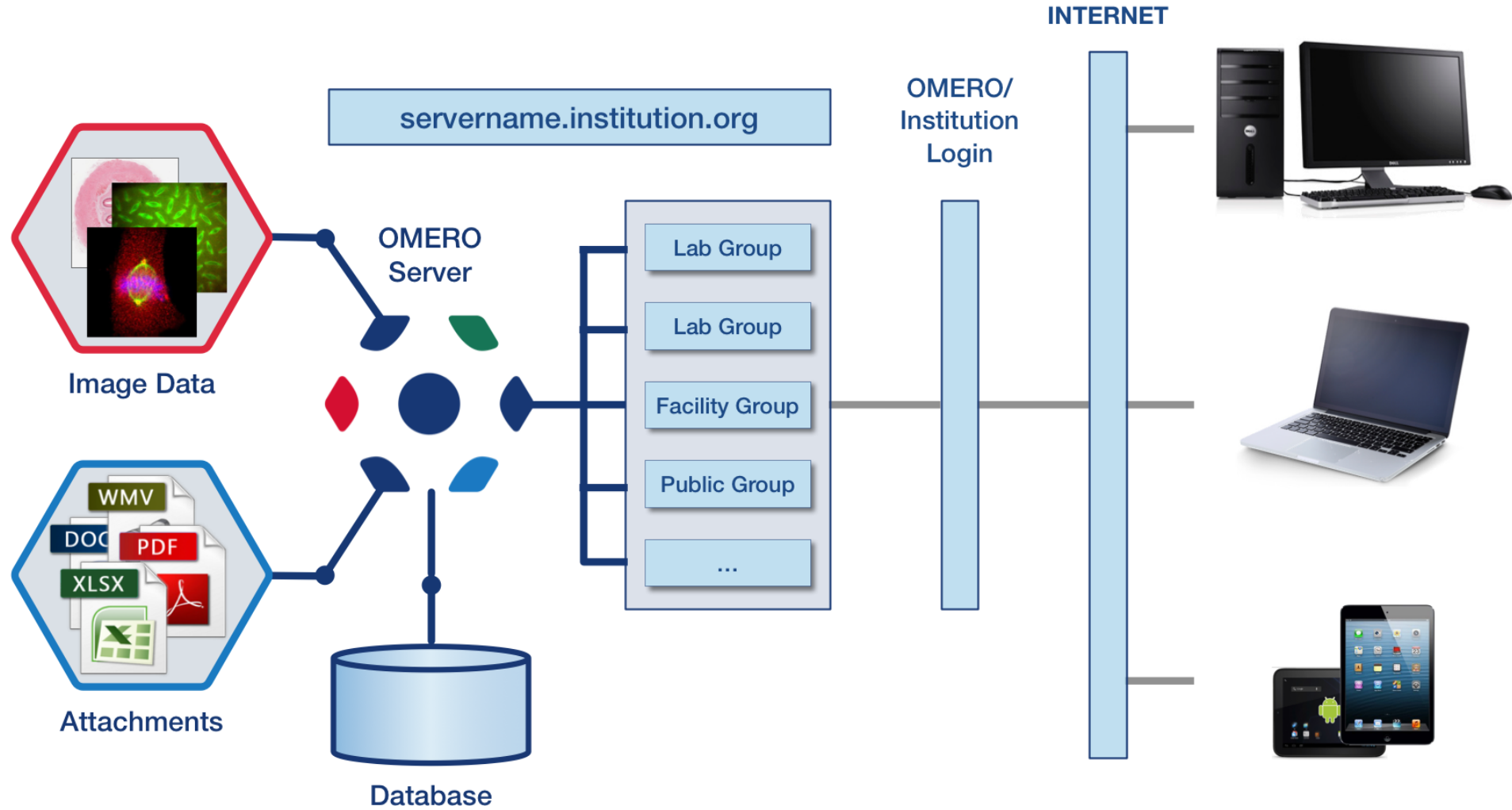
What about

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

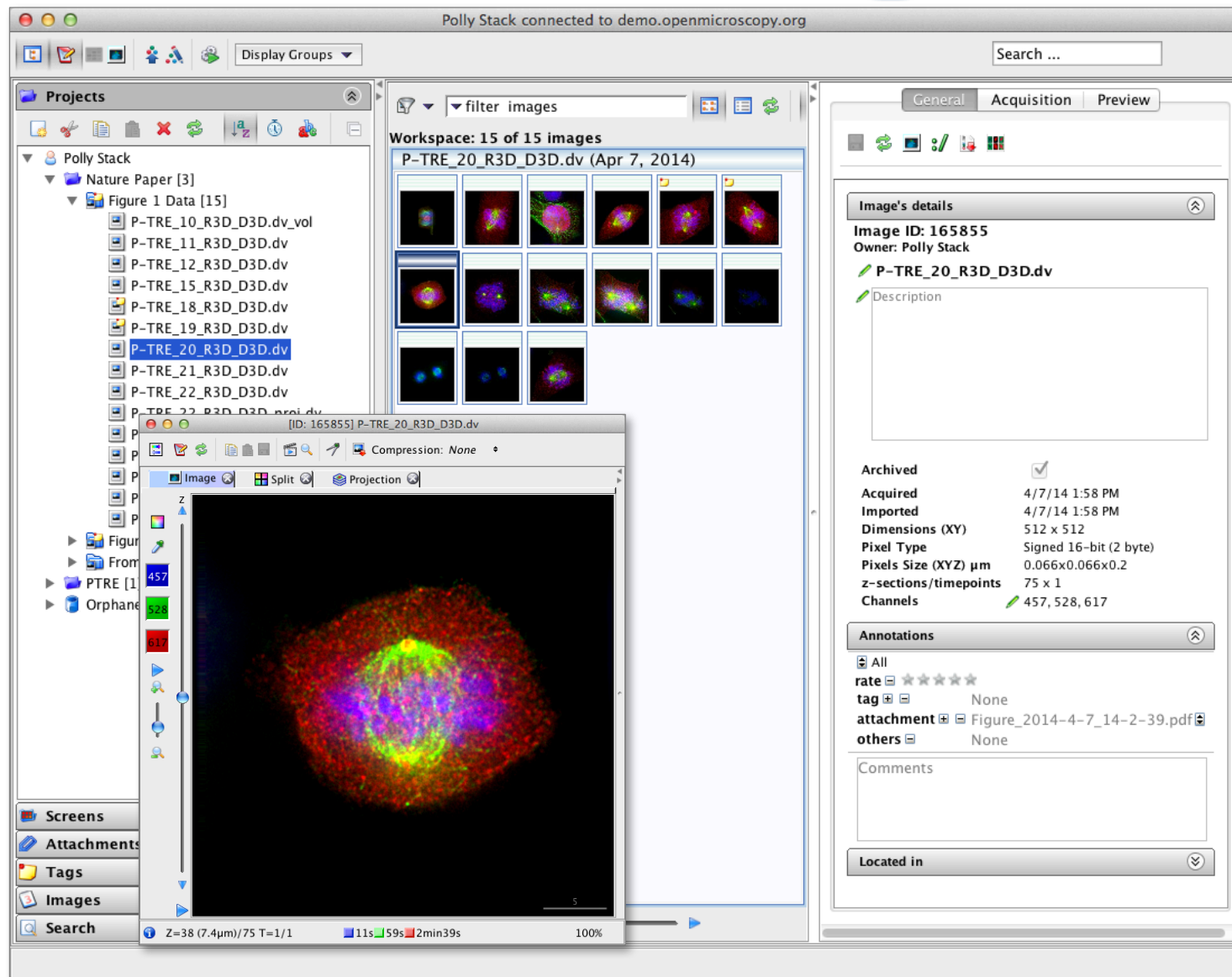
The “Scientific Data” Paradigm



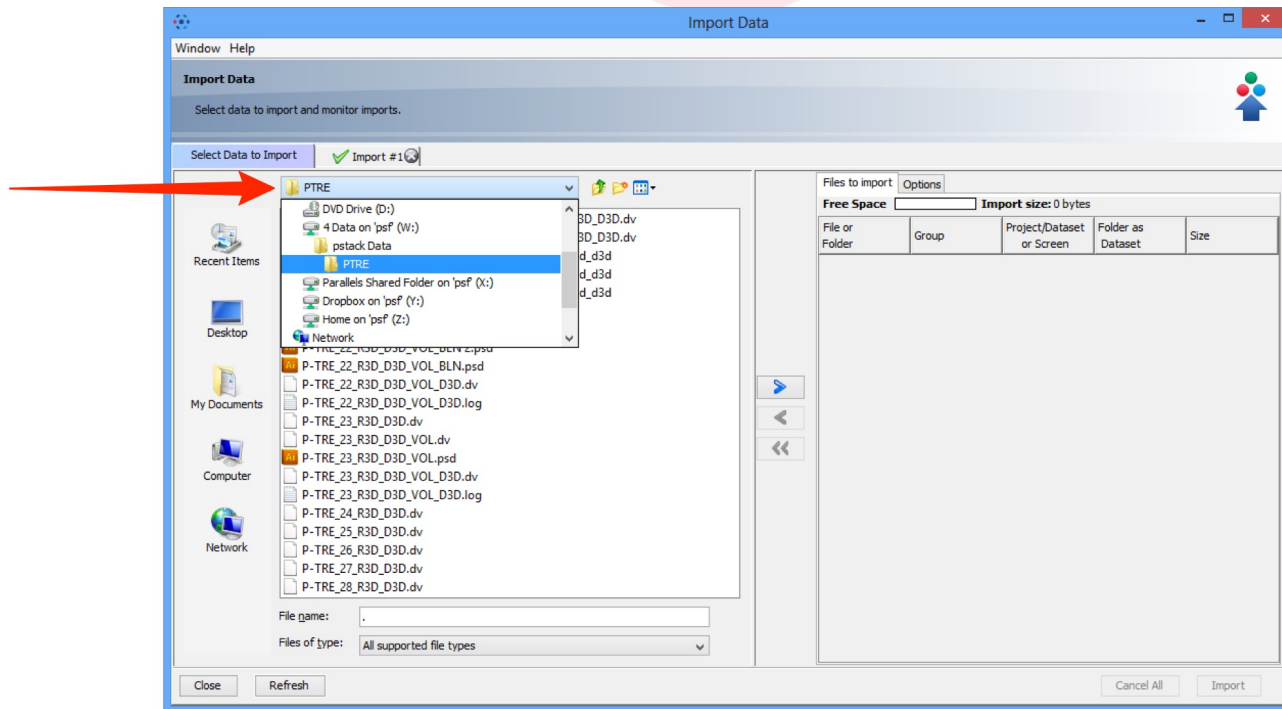
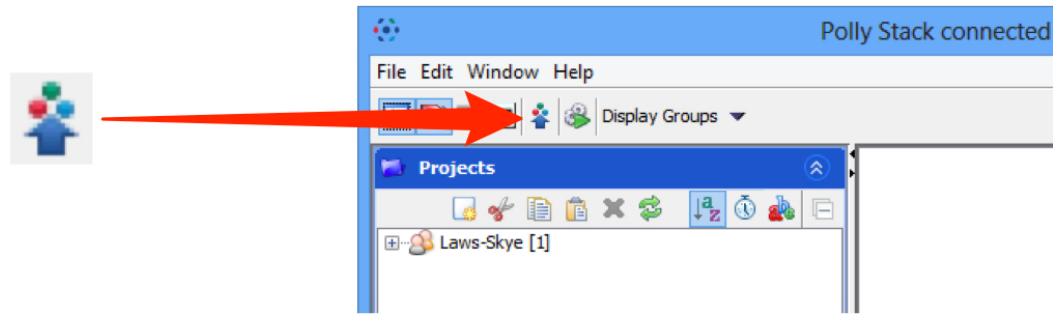
OMERO setup



OMERO.insight: Desktop Based Application



Import Image Data into OMERO



OMERO.web: Web Based Application

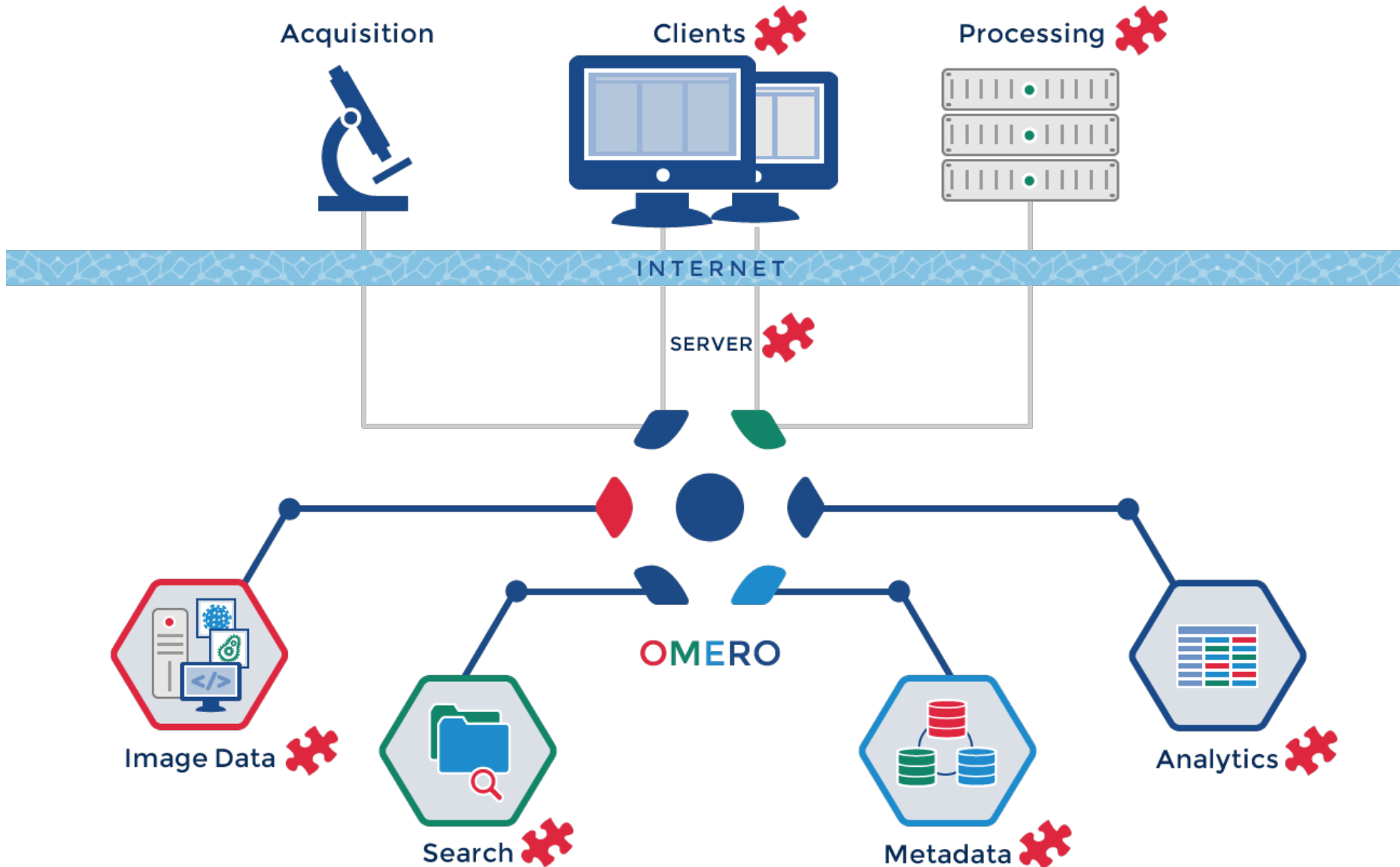
The screenshot displays the OMERO.web webclient interface. The browser address bar shows the URL `demo.openmicroscopy.org/webclient/`. The interface is divided into several sections:

- Left Panel (File Browser):** Shows a tree view of the `Polly Stack` group. The selected item is `P-TRE_23_R3D_D3D_VOL.dv` under the `Figure 1 Data` folder.
- Center Panel (Image Grid):** Displays a grid of 15 image thumbnails. The selected image is highlighted with a blue border.
- Right Panel (Image Details):** Shows the details for the selected image `P-TRE_23_R3D_D3D_VOL.dv`.
 - General Tab:** Displays the image ID `165828` and a `Full viewer` button.
 - Add Description:** A text input field for adding a description.
 - Owner:** Polly Stack
 - Acquisition Date:** 2014-04-02 08:20:45
 - Imported Date:** 2014-04-02 08:20:46
 - Dimensions (XY):** 964 x 964
 - Pixels Type:** uint8
 - Pixels Size (XYZ) (µm):** 0.07 x 0.07 x 0.20
 - Z-sections/Timepoints:** 1 x 1
 - Channels:** 457, 528, 617
- Other Sections:** Includes sections for **RATING** (No ratings), **TAGS**, **ATTACHMENTS**, **OTHERS**, and **COMMENT** (with an `Add Comment` button).
- Image Contained In:** A section with a `Load hierarchy...` link.



ANALYSIS WITH OMERO

The *Extensible* OMERO Platform



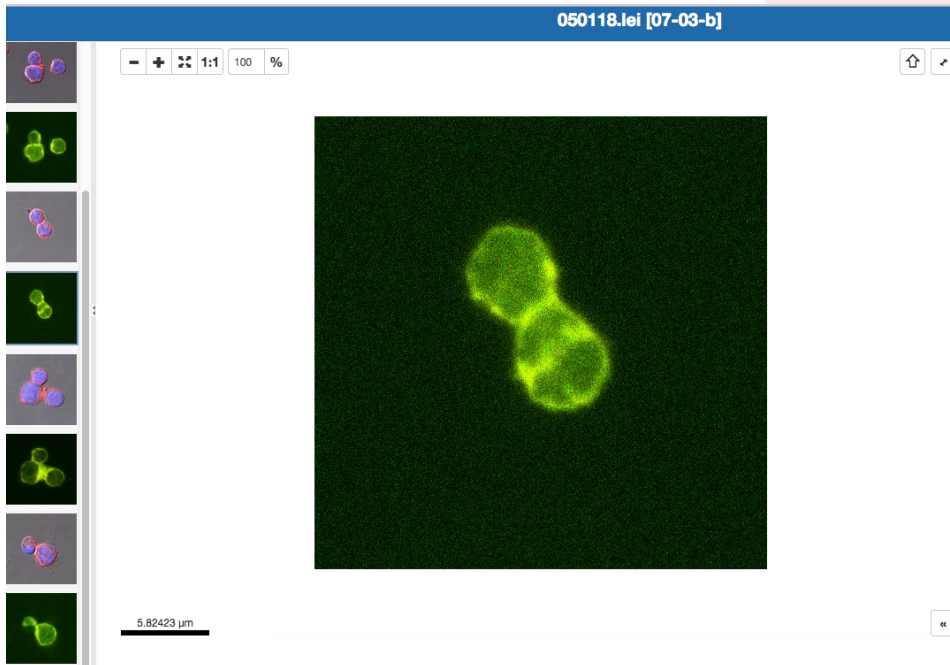
 Plugins Welcome

Examples of Analysis Integration

- **OMERO.iviewer** – plugin for viewing and
- **ImageJ/Fiji, Icy**– Pluggable, desktop Image processing tools (Java)
- **FPBioimage** – 3D viewer from **Cambridge**
- **R** – statistical analysis software
- **CellProfiler**– HCS segmentation and features (Python)
- **mTools**– Otsu, basic segmentation (Matlab)
- **ORBIT** – Image analysis, specialized on pathology images
- **WND-CHRM**-- weighted nearest neighbor machine learning (Python)
- **ThunderSTORM** and **PALMSiever**– Localisation SRM (ImageJ, Matlab)
- **OMERO2CV**– LSFM Multi-View Reconstruction (C++, OpenCV, ITK)
- **Columbus Acapella**[®]-- commercial Big Data processing...

Viewing and analyzing Images - OMERO.iviewer

- *Google for OMEERO.iviewer*
- *Go to YouTube and search for OMEERO.iviewer*
- *See also Workshop OMEERO.web*



The screenshot shows the OMEERO.iviewer settings panel. The panel has tabs for "Info", "Settings", and "ROIs". Below the tabs, there are buttons for "Save", "Save to All", "Undo", "Redo", "Copy", and "Paste". There are also checkboxes for "Grayscale" (unchecked) and "Show Histogram" (checked). The histogram shows a green line representing the intensity distribution of the image. Below the histogram, there are two PMT settings: "PMT 1" with a value of 81 and a range from 0 to 2152, and "PMT 3" with a value of 137 and a range from 0 to 1475. There are also buttons for "Min/Max", "Full Range", and "Imported". At the bottom, there is a "User Settings:" section with a small thumbnail of the image and the text "user-4 user-4".

First Person Bioimage – 3D viewer from Cambridge, now in OMER0.web

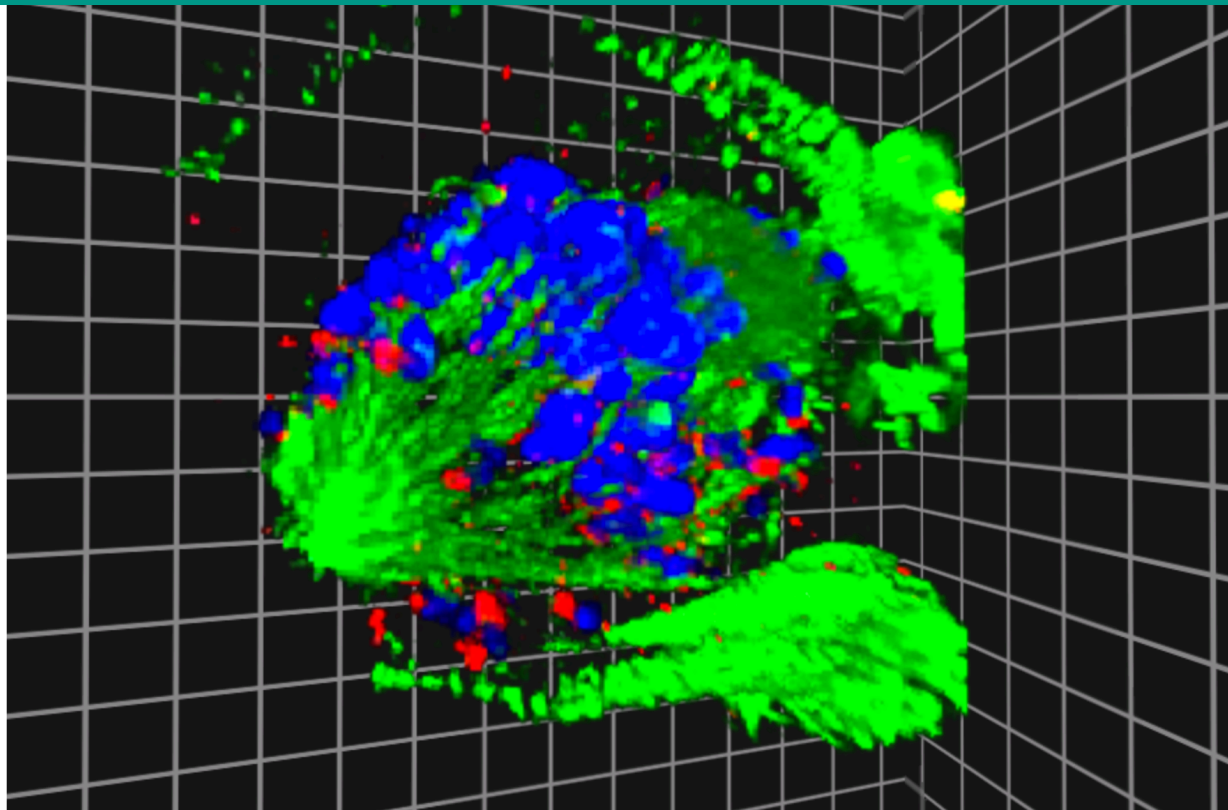
© [Marcus Fantham](#)

See the paper in [Nature Photonics](#)



UNIVERSITY OF
CAMBRIDGE

First Person Bioimage



ImageJ and OMERO

(Fiji Is Just) ImageJ

x=93, y=12, z=0, value=255

C4.pattern.tif--OMERO ID:4177196
c:1/2 t:1/23 (c:2/2 t:23/23 - C4.pattern); 305x240

ROI Manager

Add [t]
Update
Delete
Rename...
Measure
Deselect
Properties...
Flatten [F]
More >

Results

	Area	Mean	StdDev	Min
92	2486	0	0	0
93	1351	0	0	0
94	926	0	0	0
95	1095	0	0	0
96	1346	0	0	0
97	843	0	0	0
98	979	0	0	0
99	1904	0	0	0
00	1559	0	0	0
01	1492	0	0	0
02	628	0	0	0
03	2787	0	0	0
04	2002	0	0	0
05	1098	0	0	0
06	1240	0	0	0
07	1845	0	0	0
08	1147	0	0	0
09	1326	0	0	0
10	2314	0	0	0
11	2348	0	0	0
12	1855	0	0	0

Area Distribution
300x240 pixels; RGB; 281K

List Copy Log 526 93

C4.pattern.tif v3.3.0

Info Settings ROIs [412]

Save Undo Redo Show Comments

0027-0214-0121 10

Z 1 T 14

Show	Z	T	Comment
<input checked="" type="checkbox"/>	1	13	0026-0204-0116
<input checked="" type="checkbox"/>	1	13	0026-0205-0193
<input checked="" type="checkbox"/>	1	13	0026-0206-0217
<input checked="" type="checkbox"/>	1	13	0026-0207-0229
<input checked="" type="checkbox"/>	1	14	0027-0208-0029
<input checked="" type="checkbox"/>	1	14	0027-0209-0042
<input checked="" type="checkbox"/>	1	14	0027-0210-0083
<input checked="" type="checkbox"/>	1	14	0027-0211-0103
<input checked="" type="checkbox"/>	1	14	0027-0212-0098
<input checked="" type="checkbox"/>	1	14	0027-0213-0115
<input checked="" type="checkbox"/>	1	14	0027-0214-0121
<input checked="" type="checkbox"/>	1	14	0027-0215-0196
<input checked="" type="checkbox"/>	1	14	0027-0216-0220
<input checked="" type="checkbox"/>	1	14	0028-0217-0009
<input checked="" type="checkbox"/>	1	14	0028-0218-0064
<input checked="" type="checkbox"/>	1	14	0028-0219-0102
<input checked="" type="checkbox"/>	1	14	0028-0220-0120
<input checked="" type="checkbox"/>	1	14	0028-0221-0113
<input checked="" type="checkbox"/>	1	14	0028-0222-0195

Attachments 2

measurements.csv (31.61 KB)

ORBIT

- *ORBIT IMAGE ANALYSIS*
- <http://www.orbit.bio/>
- *Compatible with OMERO 5.4.0*

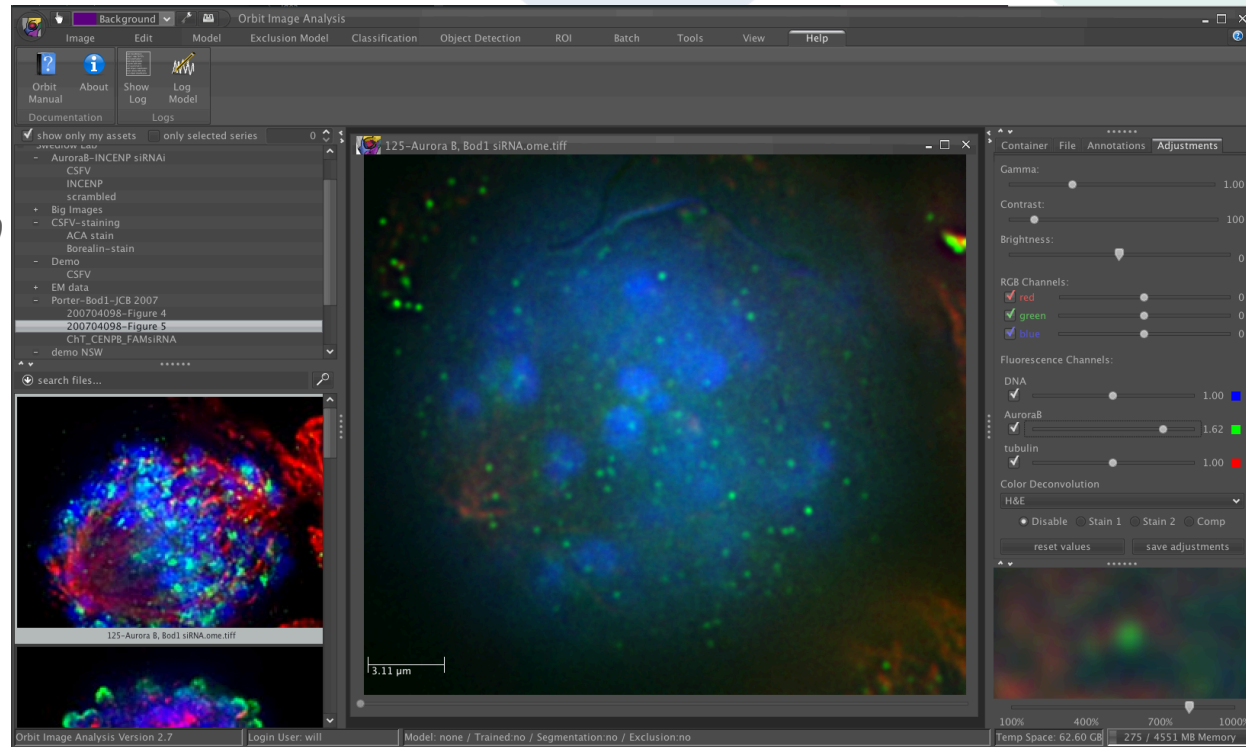
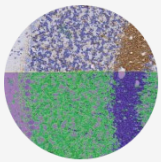


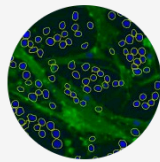
IMAGE ANALYSIS

Sophisticated image analysis features



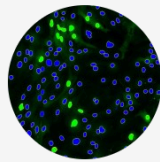
TISSUE QUANTIFICATION

Compute the ratio of different tissue classes, e.g. percentage of collagen in a tissue.



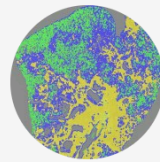
OBJECT SEGMENTATION

Segment objects like cells or nerves.



OBJECT CLASSIFICATION

Assign classes to objects based on their features.



ANNOTATIONS & ROI

Annotations and trainable exclusion maps for ROI definition.

OMERO.scripts: Kymographs example

The screenshot displays the OMERO web interface. At the top, it shows the user 'Will Moore' connected to 'nightshade.openmicroscopy.org'. The main workspace contains 10 images, with the title '33676-EB1 dsRed (red) tracking along peripheral SEPT2-YFP filaments (green). Spinning disc co...'. A large image viewer in the foreground shows a kymograph of the selected image, with a blue line indicating a region of interest (ROI). A 'kymograph' window is open, displaying a table of ROIs:

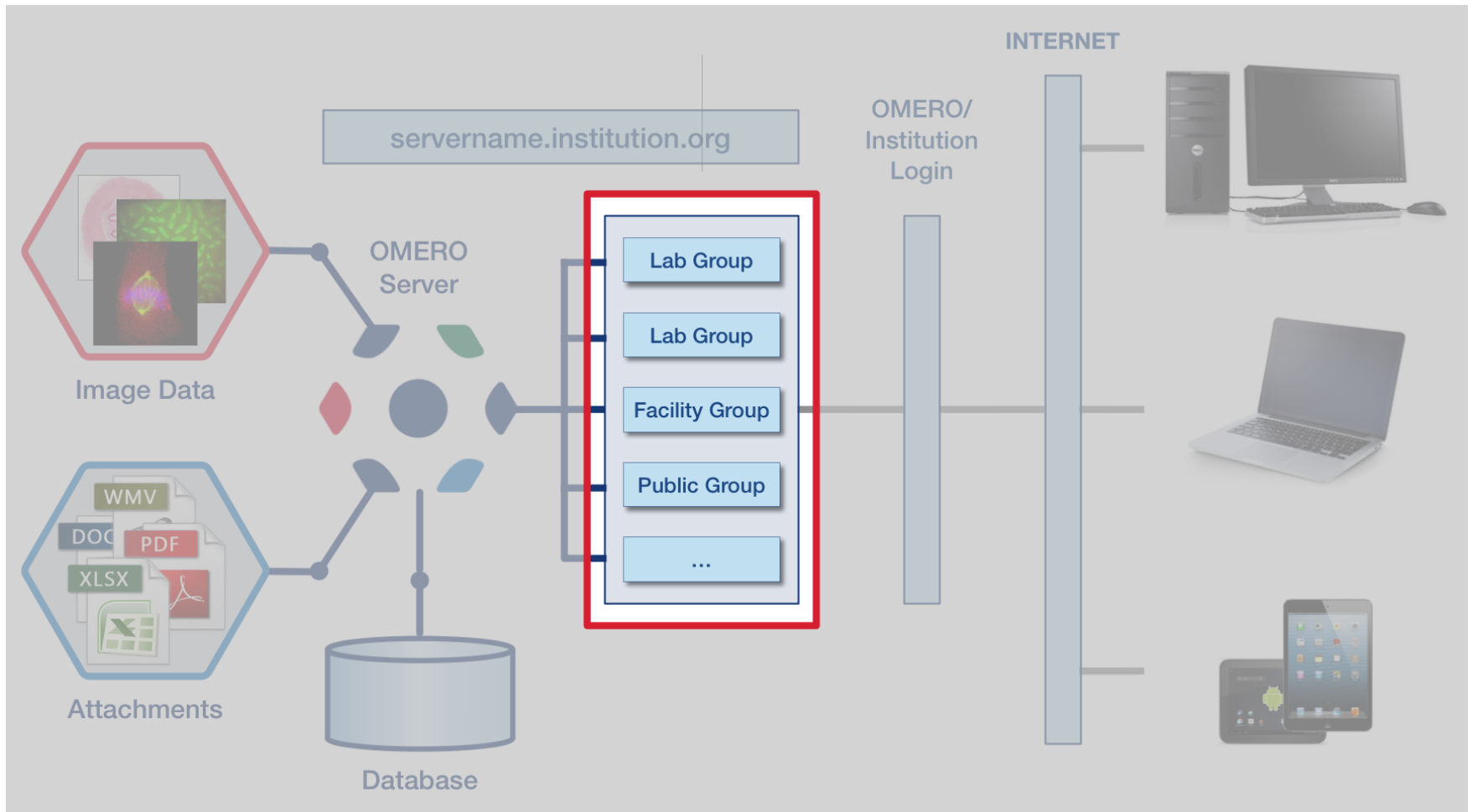
ROI	id	Z	T	Type	Comment	Visi...
[1]	979...	1	1	/		✓
[1]	743...	1	1	/		✓
[1]	979...	1	1	/		✓
[1]	743...	1	1	/		✓

The interface also includes a 'Projects' sidebar, a 'Workspace' toolbar, and an 'Image details' panel on the right. The status bar at the bottom indicates 'Z=1/1 T=42/121' and '150%' zoom.



SHARING DATA WITH OMERO

OMERO group and user system



Security Model



Group-Private

Can only read your own data



Group-Read

Can read but not annotate others' data



Group-Annotate

Can read and annotate others' data



Group-Write

Can read and edit others' data



PUBLISHING WITH OMERO

OMERO: Data Publication - images on website

The image shows a screenshot of the OMERO website. At the top, there is a header for the 'Centre for Gene Regulation & Expression' at the University of Dundee. Below the header is a navigation menu with links for Home, News, Events, Features, Research, Funding, Impact, Staff, Resources, Publications, and Contact. The main content area displays the profile of Jason Swedlow, Professor of Quantitative Cell Biology. A window titled 'P-TRE_10_R3D_D3D.dv' is overlaid on the page, showing a detailed view of a microscopy image. The window includes a 'Viewing Options' panel with settings for Normal view, Max Intensity, Split Channel, Quality (Normal), Zoom (100%), and Line Plot. The 'Rendering Details' panel shows three channels: 457 (blue), 528 (green), and 617 (red). The image itself is a 3D reconstruction of a cell, showing a complex structure with red, green, and blue components. A vertical 'Z-sections' slider and a horizontal 'Timepoints' slider are visible. The background page shows a snippet of text describing the discovery of a new protein, Bod1, and its role in cell division. A thumbnail image of the cell is also visible, with a caption: '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.'

OMERO: Data Publication – raw data

OPEN
BIOLOGY



Advanced

Home

Content

Information for

About us

Sign up

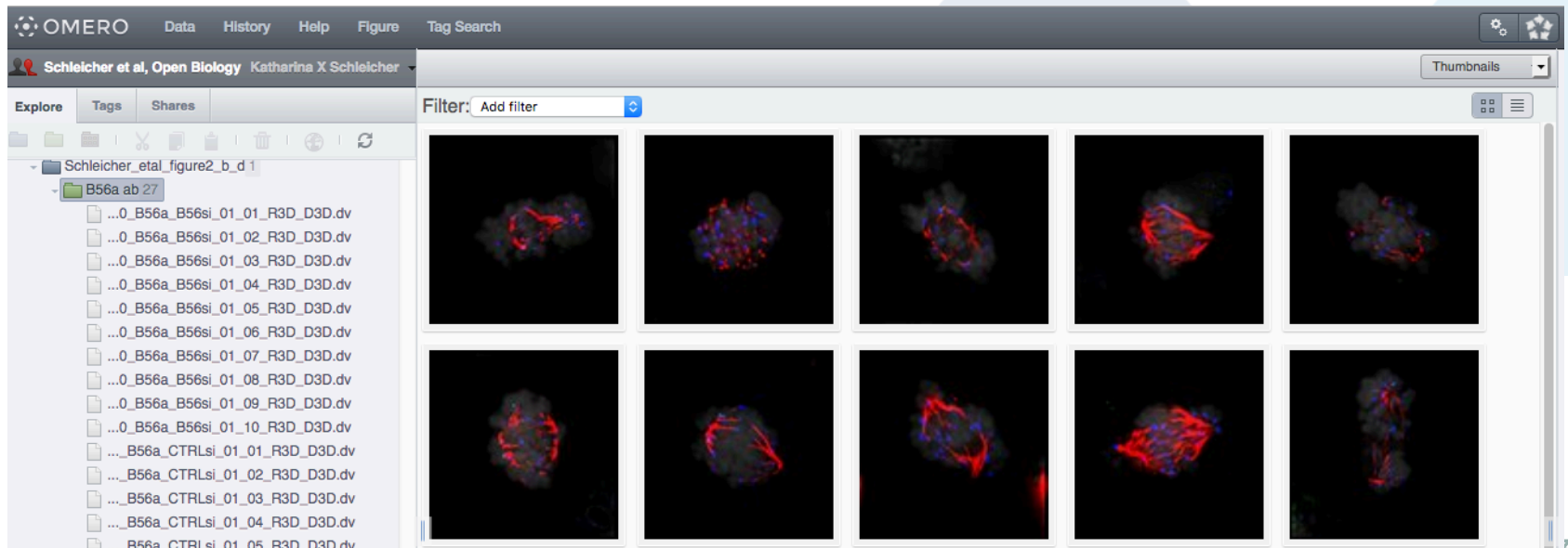
Submit



The Ndc80 complex targets Bod1 to human mitotic kinetochores

Katharina Schleicher, Michael Porter, Sara ten Have, Ramasubramanian Sundaramoorthy, Iain M. Porter, Jason R. Swedlow

Published 15 November 2017. DOI: [10.1098/rsob.170099](https://doi.org/10.1098/rsob.170099)



OMERO

Data Publication: Image Data Resource



Image Data Resource

Welcome to the Image Data Resource (IDR). This online, public data repository seeks to store, integrate and serve image datasets from published scientific studies.

[Take a look at the data](#)

OMERO Data Publication: Image Data Resource

The screenshot displays the OMERO web interface. At the top, there are navigation tabs for 'Data', 'History', and 'Help'. 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-tara oceans/screenA 44' containing numerous image files with names like '...13_09_28_19_45_25_chamber-U00-V01'.
- Center Panel:** A grid of 15 small image thumbnails, numbered 9 through 15.
- Right Panel (General):** Metadata for the selected image. It includes:
 - General: TARA_HCS1_H5_G100008302_G1000083, 04--2013_12_02_21_30_23_chamber--U00-V01
 - Plate ID: 303
 - Owner: Demo User
 - Creation Date: 2015-10-05 02:15:01
 - ANNOTATIONS: A list of key-value pairs such as 'SAMPLE_BARCODE_URI', 'STATION_LABEL', 'EVENT_LABEL', etc.

Below the main interface, there is a detailed view of a single image. On the left, 'Viewing Options' include 'Normal', 'Max Intensity', 'Split Channel', 'Quality', 'Zoom (%)', 'Line Plot', 'Rendering Details', 'Channels - Edit', 'Grayscale', 'Rendering Settings', 'Interpolate', 'Current Image', and 'ROI Count: 0'. The image itself shows a large, detailed biological specimen with several smaller circular insets. Below the image is a 'Timepoints' slider. To the right of the image is a data table for a specific event.

TARA OCEANS Data Table:

TARA UTC		YYYY	MM	DD	HH	MM	###	EVENT_PUMP	01
Start	End	Station							
2011	09	10	17	57					TARA_129
2011	09	11	01	24					129

Start	LAT	DD	MM MMM	LON	DDD	MM MMM	PUMP#	DAY / NIGHT
N	06	40.257	W	153	03.945		1	DAY
End	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 5µm net is not avail.) (indicate pauses)	18:52	21:27	20	Upper 5µm 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

Winner of the SLS innovator of the Year

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

Labels

Info Preview Labels

Z

15/28 T 1/1

484 1731

1021 2725

2504 4009

Zoom: 100%

125

Some useful links

- OMERO Downloads:

- <https://downloads.openmicroscopy.org/omero/>

- OMERO Help Pages:

- <http://help.openmicroscopy.org/>

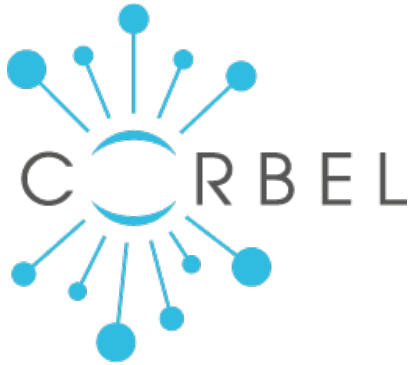
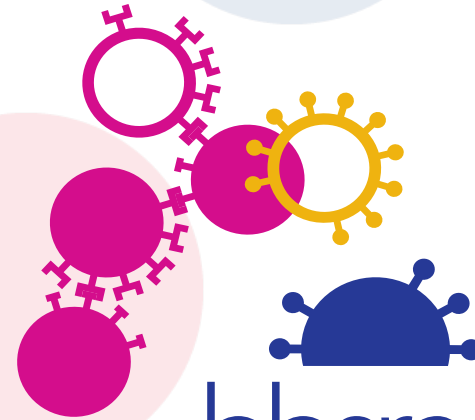
- OMERO Forums:

- <https://www.openmicroscopy.org/community/>

- OMERO demo server:

- <http://help.openmicroscopy.org/demo-server.html>

Thank to Funders



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