



Databinge Meeting Report: Frontiers in Microscopy Technology and Strategies for Bioimaging Centers Network

Janelia, Feb 25-28, 2018

Jeff, Databinge, Mar 9, 2018

It's a long title...

Frontiers in Microscopy Technology and Strategies for
Bioimaging Centers Network

Themes:

Microscope Technology

Core Facilities (the Janelia AIC for example)!

Data

Networks of Core Facilities!!

Networks of Networks of Core Facilities!!!

Technology: scopes.

- First Keynote was a tech driven talk by NIH investigator Hari Schroff
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- Discussed various SIM super resolution scopes
- Instant-SIM from visitech. It's like the olympus that we demoed in LSI.
- As well as the “dual view inverted light sheet microscope” or dispim commercialized by ASI scientific, you can go see it at SfN.
- Example: <https://elifesciences.org/articles/10070>
- Take home message: “Better computation = better microscopy”

Technology: reagents.

- Second keynote was Luke Lavis:
- Janelia Fluor dyes: <https://www.janelia.org/open-science/janelia-fluor-dyes>
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- doi:10.1038/nmeth.3256 (creation of JF dyes)
- doi: 10.1007/978-1-4939-7265-4_15 (HaloTag, SnapTag, <https://en.wikipedia.org/wiki/HaloTag>)
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- Working on functional indicators:
- <https://www.sciencedirect.com/science/article/pii/S0959438817302416#fig0005>
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- Take home message: “Better reagents = better microscopy”

Access to technology: Core Facilities

- Janelia has a unique core facility called the Advanced Imaging Center (the manager was a co-organizer of this meeting)
- Why AIC?
- Janelia's scientists develop a lot of advanced scopes.
- Time to a commercial, turn key system is long 5++ years.
- In the meantime how to scientists access the technology?
- The AIC is one solution: <https://www.janelia.org/open-science/advanced-imaging-center-aic>

AIC: technology example LLSM

- Lattice light sheet is a high resolution, high speed variant of the light sheet microscope developed by the Betzig lab.
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4336192/>
- Multiple paths to use:
- Plans are available through Janelia after signing an NDA.
- Licensed to Zeiss to develop full, turn-key system. Zeiss sub-licensed to 3i, so you can buy the prototype version.
- OR:
- Apply to the AIC and do the experiment at Janelia.

AIC: a life sciences observatory

- Janelia houses the scopes.
- There is an application process.
- First they recommend contacting them for a technical consultation.
- <https://www.janelia.org/open-science/advanced-imaging-center-aic/call-proposals>
- Applications are first reviewed by Janelia as to whether the project warrants the use of the requested equipment. A second review includes external scientists and judges the scientific impact as well.
- If selected, your group goes to Janelia to do the proposed experiment.
- Costs are covered by the HHMI and Gordon and Betty Moore Foundation.

AIC: What's available?

- Suite of scopes that is aimed at single cell and developmental studies
- Lattice Light Sheet Microscope
- IPALM: Interferometric photoactivation and localization microscopy (higher resolution)
- acMFM: Aberration-Corrected Multifocal Microscope (fast imaging, single particle tracking)
- Live Cell Multicolor Structured Illumination Microscope (SIM). Flexible live cell super-resolution (to be retired)
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- Upcoming: Simultaneous Multiview (SimView) with Autopilot.
http://tomerlab.org/wp-content/uploads/2016/05/Tomer_2012_NatMeth.pdf
- Light sheet variant geared toward long time lapse imaging of embryos, including mouse. Autopilot is software that actively control the optomechanics of the microscope to keep image quality up when the sample is changing size and shape (growing).

AIC: personnel

- There are 3 application scientists specializing in the various scopes.
- 6 months ago they hired a data scientist to help with the users with the data once collected.

DATA

- The light sheet microscope in particular has highlighted the need for data management and data handling/tools.
- In terms of management we heard from Jason Swedlow (IDR) and a national effort in Australia.
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- Jeremy Freeman from CZI talked about open source tools.

Image Data Resource: IDR

- <https://idr.openmicroscopy.org/about/>
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- curation through publication approach.
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- Database of image data from published studies.
- “which have value beyond simply supporting an original publication”
- Meta-data searchable and made available by a web interface and OMERO API

Australia.

- Centre for Microscopy, Characterization, and Analysis
University of Western Australia.
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- hot off the microscope approach
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- Core Facilities are setup such that as data is taken it is “ingested” into a national data repository with links to high performance computing and cloud computing resources.

Data handling/tools

- Jeremy Freeman (CZI)
- They want to facilitate the adoption of common, open source data analysis tools.
- Did this by funding meetings between labs and helping to develop a common pipeline for the test case of image based transcriptomics.
- <https://github.com/chanzuckerberg/starfish>
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Networks (& networks of) of Core Facilities

- Australia, UK and Europe all have more cohesive bioimaging communities than does (North) America.
- European Light Microscopy Initiative: meetings, courses, workshops, interaction with equipment vendors.
- <https://www.embl.org/elmi/>
- EuroBioImaging: pan-european access to imaging infrastructure. Similar to AIC. Application, scientists travel to do experiments.
- <http://www.eurobioimaging.eu>
- Global BioImaging brings together people from bioimaging communities world-wide
- Exchange of Experience, Training, and Shadowing Programs.
- <http://www.eurobioimaging.eu/global-bioimaging>
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- Will there be a North America BioImaging?...