TRAINING

Workshop on Management of Large CryoEM Facilities
WHAT IS TRAINING?

• Training

noun: the action of teaching a person or animal a particular skill or type of behavior.

"This is where you'll be working. Don't worry if it's a little confusing at first. We'll have a few training sessions."
THE SCOPE OF TRAINING

**Facility**
- SOPs
- safety
- responsibilities
- review

**User**
- knowledge
- instrumentation
- computation
- ID / access
- testing
- communication
NEED FOR TRAINING AT SEMC

Breakdown of projects

- Single particle: 70%
- 2dx/helical: 7%
- Other: 1%
- FIB-SEM: 19%
- Tomography: 3%

Experience

- Beginner/Novice: 83%
- Intermediate: 14%
- Expert: 3%
SEMC USERS HAVE ACCESS TO

...these available resources

I
Instrumentation

II
Personnel

III
Administration/Training

IV
Computing

...given they follow these policies:

General policies

User policies

Lab use

Consumables

LN2 storage

Staff assistance

External vs Internal user responsibilities

Microscope use

Krios clipping

Safety

After hours

Training
TRAINING RESOURCES:

SEMC personnel

- Ashleigh Raczkowski, Senior Technician
- Crystal Premo, Administrator
- Sargis Dallakyan, Res. Programmer
- Anchi Cheng, Res. Staff Scientist
- Venkat Dandey, Post Doc.
- Yong Zi Tan, Grad. Student
- Carl Negro, Res. Programmer
- Alex Noble, Post Doc.
- Kelsey Jordan, Technician
- Priyamvada Acharya, Embedded Post Doc.
- Ed Eng, Staff Scientist
- Ashleigh Raczkowski, Senior Technician
- Kelsey Jordan, Technician
- Laura Kim, Research Associate
- Bill Rice, EM Manager
- Crystal Premo, Administrator
- Clint Potter, Director
- Julia Brasch, Embedded Post Doc.
- Phil Baldwin, Staff Scientist
- Bridget Carragher, Director
- Zhening Zhang, Res. Scientist
- Carl Negro, Res. Programmer
- Micah Rapp, Grad Student
- Giovanna Scapin, Embedded Scientist
- Laura Kim, Research Associate
- Priyamvada Acharya, Embedded Post Doc.
- Clint Potter, Director
EXPERTISE AND REDUNDANCY

- TEM/SEM Tomography
- microED
- TEM/SEM Single-particle processing
- SEM/TEM Exploratory studies (FIB-SEM)
- Sample prep lab
- TEM Exploratory studies (single-particle)
- Sample prep lab

- Bill Rice
  EM Manager
- Ed Eng
  Staff Scientist
- Laura Kim
  Research Associate
- Ashleigh Raczkowski
  Senior Technician
- Kelsey Jordan
  Technician
- Bill Rice
  EM Manager
- Ed Eng
  Staff Scientist
- Laura Kim
  Research Associate
- Ashley Raczkowski
  Senior Technician
- Kelsey Jordan
  Technician
LEVERAGING RESOURCES:

5 people SEMC operations team

Ashleigh Raczkowski Senior Technician
Bill Rice EM Manager
Ed Eng Staff Scientist
Kelsey Jordan Technician
Laura Kim Research Associate

Hundreds of users

7 EMs, sample prep lab, auxiliary instrumentation & administration

FEI Titan Krios#1 / #2 / #3
FEI Tecnai F20
JEOL 1230
FEI Tecnai Biotwin
FEI Helios 650

FEI Tecnai
JEOL 1230
FEI Helios 650
## TRAINING SCHEDULE AT SEMC

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
<th>Title</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>feedback</td>
<td>yearly</td>
<td>General user meeting</td>
<td>State of the center</td>
</tr>
<tr>
<td>knowledge</td>
<td>yearly</td>
<td>SEMC EM Course</td>
<td>Theory behind EM</td>
</tr>
<tr>
<td>computation</td>
<td>quarterly</td>
<td>SEMC Appion workshop</td>
<td>Data processing workshops</td>
</tr>
<tr>
<td>access</td>
<td>monthly</td>
<td>SEMC New User Orientation</td>
<td>Facility use and Safety Training</td>
</tr>
<tr>
<td>troubleshooting</td>
<td>weekly</td>
<td>User Project Discussion Meetings</td>
<td>Training for independent use of the microscopes and other SEMC resources</td>
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<tr>
<td>instrumentation</td>
<td>daily</td>
<td>Advanced Leginon use / 1-1 training appointments</td>
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Sample preparation [neg-stain & cryo]

Leginon intro/use of screening microscopes

**Appointments:** *Mon @ 11am, Thurs @3pm & @4pm*
# Training Schedule at SEMC

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*Offered once a month*

**SEM/TEM users**

- **9:30 am**  New user orientation (SEMC conf room) [Ed]
- **10:30 am** Photo & Tour [Ed]
- **10:50 am** Safety (SEMC conf room) [Bill]
- **11:30 am** Lab overview & ID badge creation
  - Sample prep overview (Lab) [Ashleigh/Kelsey]
  - ID badge creation [Bill]

- **12:00 pm** Lunch (on your own)

**TEM users**

- **1:00 pm**  Leginon overview (SEMC conf room) [Ed]
- **1:30 pm**  Microscope practical (T12 or F20 room) [Laura]
- **3:45 pm**  Wrap up and brief project meetings [SEMC staff]
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<td>Data processing workshops</td>
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**Cycle offered once a quarter**

**Month 1**
- **Single particle analysis (2 parts)**
  - **Part I**
    - Appion basics.
    - Tools to generate a particle stack and an initial model from micrographs.
  - **Part II**

**Month 2**
- **Part II**
  - 3D reconstruction, refinement and validation.

**Month 3**
- **Part III**
  - Tomography tools.
  - Tomography (1 part)
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## Directors

- Clint Potter (Director)
- Bridget Carragher (Director)

## Staff

- Bill Rice (EM Manager)
- Ed Eng (Staff Scientist)
- Ashleigh Raczkowski (Senior Technician)
- Kelsey Jordan (Technician)
- Laura Kim (Research Associate)

EMG @ nysbc.org
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<td>Up to date policies and information</td>
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<tr>
<td>other EM facilities</td>
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<td>EM supplies</td>
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TEM COMPETENCY

Open signup EMs

Users will be first trained on the J1230 and T12:
• Required to take New User training session
• Required to purchase or assemble their own user tool kit.
• Initial sessions require supervision.

To become independent on the EM the user must demonstrate:
• Able to collect images manually or through Leginon.
• On 2 separate occasions in front of 2 different staff members demonstrate holder care, sample insertion and sample retraction.
• Knows start up and end-of-day shutdown procedures

Moving to the F20:
• User working with a staff member & instrument not being used.
• User screened cryo-grids on the T12.
• Staff comfortable with leaving the user unattended.
• Required to take DE-20 training.

24-hour access:
• Must obtain a C-14 from the FDNY for 24-hour access.
• Must qualify for each instrument.

Pre-allocated EMs
USER TOOLKITS
PROJECT WORKFLOW: GENERAL USE

TEM
- Project submission/meeting with staff
- 1-day exploratory session
- Training session
  - Supervised EM sessions
  - Independent EM sessions
- New user training
- Appion training part I: basics/SPA
- Appion training part II: 3D SPA
- Holey grid making workshop
- 24-hr access training

SEM
- Project submission/meeting with staff
- 1-day exploratory session
- Staff runs samples
- Appion training part III: Tomography
- Aligned data given to user
- Amira training
EM COMPETENCY

Open signup EMs
- JEOL 1230 + Gatan US4000 4K CCD
- FEI Tecnai 12 + TVIPS F416 4K CMOS

Pre-allocated EMs
- FEI Tecnai F20 + TVIPS F416 4K CMOS Direct Electron DE-20
- FEI Helios 650 + 4K ETD, TLD, ICE

Application required to use
- FEI Titan Krios1 + FEI Falcon 3 Direct Detector
- Gatan K2 Summit Direct Detector
- Gatan K2 Summit Direct Detector

Minimal staff assistance
Full staff assistance
STAFF ASSISTED USE ONLY

- Minimize downtime
  Maximize efficiency

- Staff aligns instrument &
  loads samples

- User selects ROIs.

**Equipment**

- FEI Helios 650 + 4K ETD, TLD, ICE
- FEI Titan + FEI Falcon 3 Direct Detector
- FEI Titan + FEI Falcon 3 Direct Detector
- FEI Titan + FEI Falcon 3 Direct Detector

**Detectors**

- Gatan K2 Summit Direct Detector
- Gatan K2 Summit Direct Detector
- Gatan K2 Summit Direct Detector
Since January 2015, 103 users attended new user orientation.
**TRAINING** is teaching, or developing in oneself or others, any skills and knowledge that relate to specific useful competencies. **Training** has specific goals of improving one's capability, capacity, productivity and performance.

Questions?