**BioFrontiers Institute**

UNIVERSITY OF COLORADO **BOULDER**

BioF

# User Training:
# The Foundation of a Successful Core

Joe Dragavon, Director
BioFrontiers Advanced Light Microscopy Core
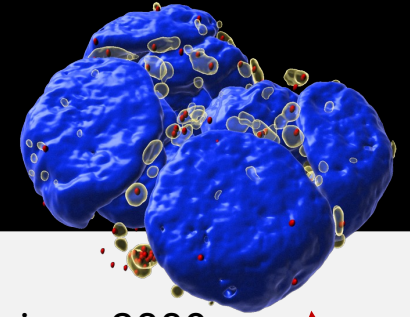biof-imaging@colorado.edu
RRID: SCR_018302

# Who am I and what experience do I have?

**Dr. Joe Dragavon**
Director
Advanced Light Microscopy Core
BioFrontiers Institute

- Worked microscopy Cores since 2009
- Became Director of the ALMC in 2014
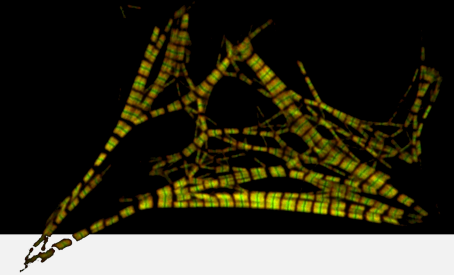
# Who am I and what experience do I have?

**Dr. Joe Dragavon**
Director
Advanced Light Microscopy Core
BioFrontiers Institute

- Worked microscopy Cores since 2009
- Became Director of the ALMC in 2014

If you get bored, pretty images can be found here

BioFrontiers Institute
UNIVERSITY OF COLORADO **BOULDER**

# Who am I and what experience do I have?

**Dr. Joe Dragavon**
Director
Advanced Light Microscopy Core
BioFrontiers Institute

- Worked microscopy Cores since 2009
- Became Director of the ALMC in 2014

ALMC 10-year Stats

|  | 3-Year Average | 10-Year Total |
|---|---|---|
| **Unique Users** | 175 | 729 |
| **Unique Labs** | 59 | 126 |
| **Hours of Use** | 12,341 | 126,854 |
| **Trainings** | 123.7 | A lot (825) |

BioFrontiers Institute
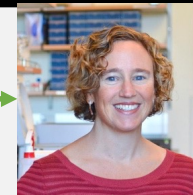UNIVERSITY OF COLORADO **BOULDER**

# BFALMC Structure (2023)
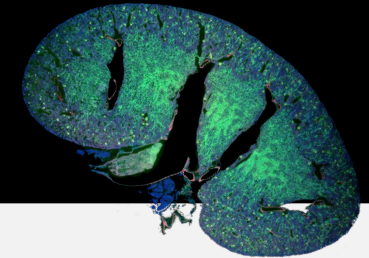


**Dr. Joe Dragavon**
Director
(2014)

**Prof. Amy Palmer**
Faculty Advisor

**Dr. Jian Tay**
Image Analysis
Specialist
(2017)

- Day-to-day operations
- Facility management
- Beckman Center for Light
  Sheet Microscopy Oversight
- QOI Co-Lecturer
- Instrument maintenance
  and support
- User trainings and support
- Commercial Image Analysis
  support
- Grant writing
- Strategy development
- Building instrument support

**Dr. Evolene Premillieu**
Beckman Center
Light Sheet Specialist
(2023)

Responsibilities

- Custom Image Analysis
  (MATLAB)
- QOI Co-Lecturer
- General analysis
  guidance and facility
  support
- Web Support

- Bruker TruLive 3D
- Single Objective Light
  Sheet
- Web Support

Guidance
Supervision + Responsibilities

CU BioFrontiers Institute
UNIVERSITY OF COLORADO **BOULDER**

# User Training – Part of the Core Circle of Life

**More Users = More Trainings**

User Training

A robust training program is the **foundation for my Core**

As your reputation grows, **more PIs** will want to work with you. This will result in **additional and consistent Users**.
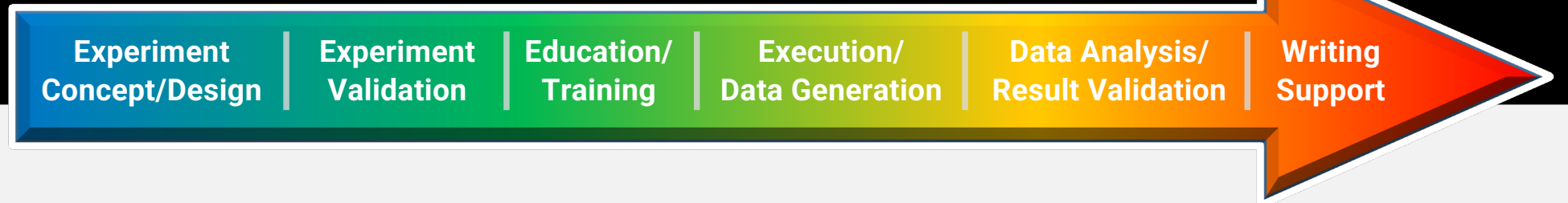
Use the training to form a **professional relationship** to make your more integral to their success.

**If your Users trust you, so will their PI**. Over time, you become valuable resource with a solid reputation.

Assist your Users to facilitate Research Success. **Your Users will rely on you for this**.

Relationships are built on trust: **Helping the Use become successful will mean they will trust you feedback more** (and they will tell others!).

CU BioFrontiers Institute
UNIVERSITY OF COLORADO **BOULDER**

# Onboarding and Support Pipeline

| Experiment Concept/Design | Experiment Validation | Education/ Training | Execution/ Data Generation | Data Analysis/ Result Validation | Writing Support |
|---|---|---|---|---|---|

## 1. Initial meeting for Experiment Design
- Concepts/goals discussed
- Appropriate experiment(s) designed

## 2. Validation Experiments
- Controls are tested
- Acquisition workflow validated

## 3. Education and Training
- Microscopy theory
- Train to autonomy
- 3 - 6 hours each

## 4. Execution and Data Acquisition
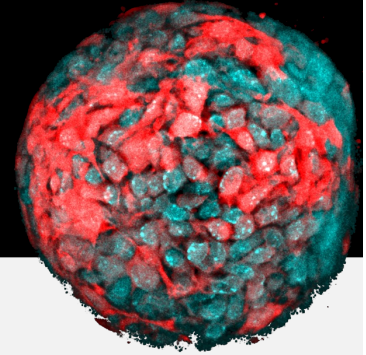- Troubleshooting
- Experiment refinement

## 5. Image and Data Analysis
- Statistics
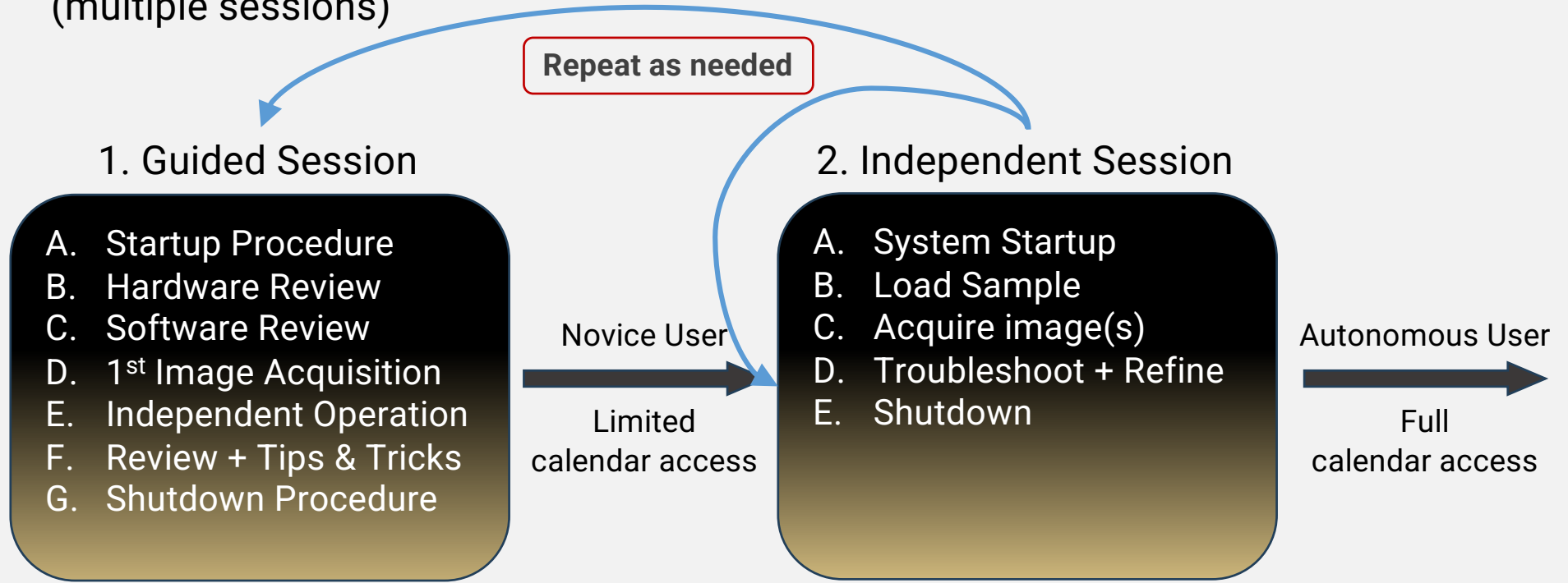- Automated analysis
- Robustness/efficiency

## 6. Writing Support
- Grant applications
- Publications

# 3. Education and (long, but slow) Training

My trainings take 3 – 6 hours (or more), depending on the system. (multiple sessions)

Repeat as needed

## 1. Guided Session

A. Startup Procedure
B. Hardware Review
C. Software Review
D. 1st Image Acquisition
E. Independent Operation
F. Review + Tips & Tricks
G. Shutdown Procedure

Novice User

Limited calendar access

## 2. Independent Session

A. System Startup
B. Load Sample
C. Acquire image(s)
D. Troubleshoot + Refine
E. Shutdown

Autonomous User

Full calendar access

# 3. Education and (long, but slow) Training
# Part 1: Guided Session
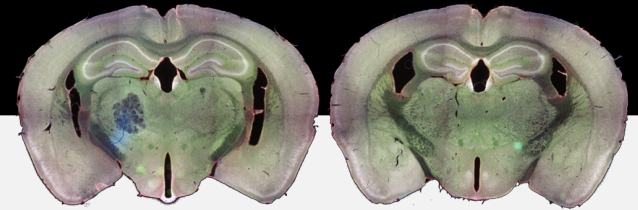
## A. Startup Procedure

- This should be posted near the instrument, and switches labeled
- The User should power on the system

## B. Hardware review

- What are all the boxes?
- How to load a sample
- How to navigate using the controller

### 1. Guided Session

**A. Startup Procedure**
**B. Hardware Review**
C. Software Review
D. 1st Image Acquisition
E. Independent Operation
F. Review + Tips & Tricks
G. Shutdown Procedure

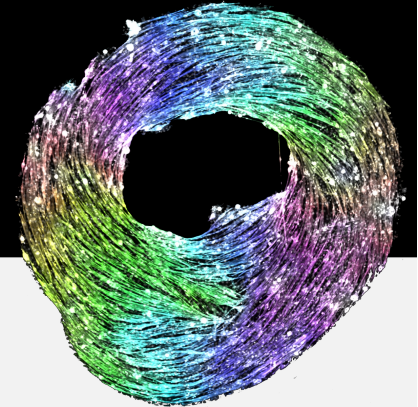| Experiment Concept/Design | Experiment Validation | Education/ Training | Execution/ Data Generation | Data Analysis/ Result Validation | Writing Support |
|---|---|---|---|---|---|

rs Institute
ITY OF COLORADO **BOULDER**

# 3. Education and (long, but slow) Training Part 1: Guided Session

## C. Step-by-step software review

- Go over all the panels of the software BEFORE pushing a button
- At certain steps, slow down and explain the finer details/importance
  - What is pixel binning and why is it important?
  - What is saturation?
  - What is Nyquist sampling?

## D. User-led/instructor-guided sample collection

- Have the User load your standard sample
  - I use the same sample every time (I know that it will work)
  - Surprises during a training create confusion and doubt
- Have the User control the mouse and click the buttons
- Tell them what will happen BEFORE they click something

### 1. Guided Session

- A. Startup Procedure
- B. Hardware Review
- **C. Software Review**
- **D. 1st Image Acquisition**
- E. Independent Operation
- F. Review + Tips & Tricks
- G. Shutdown Procedure

BioFrontiers Institute
UNIVERSITY OF COLORADO **BOULDER**

# 3. Education and (long, but slow) Training
# Part 1: Guided Session
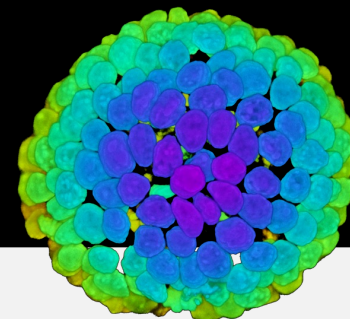
**E.  Independent operation**

- Turn the software off and remove the sample
- On their own, have the User load the sample and collect a standard set of images
  - E.g. Tiled images, multicolor images, Nyquist
  - I want the User to feel quite independent
  - Note: I leave the room during this part for at least 10 minutes

**F.  Operation Review and Tips and Tricks**

- Do the images look correct?
  - As I know the sample, I know what correct images should look like
- Provide tips and tricks to improve image quality/performance
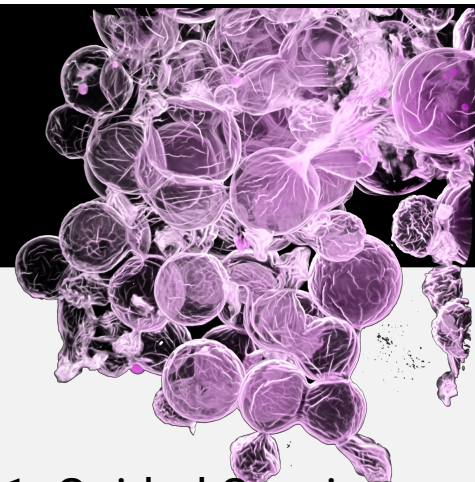- Repeat independent acquisition if necessary

## 1. Guided Session

A.  Startup Procedure
B.  Hardware Review
C.  Software Review
D.  1st Image Acquisition
**E.  Independent Operation**
**F.  Review + Tips & Tricks**
G.  Shutdown Procedure

**BioFrontiers Institute**
UNIVERSITY OF COLORADO **BOULDER**

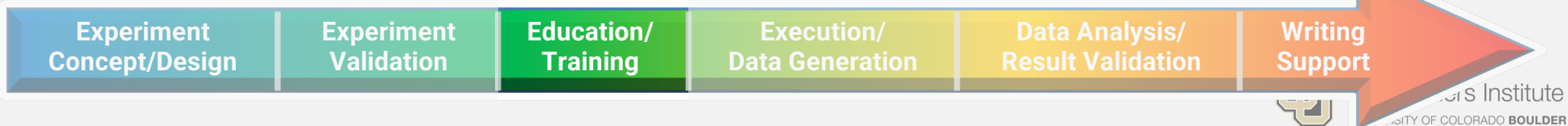# 3. Education and (long, but slow) Training Part 1: Guided Session

**G. Review Shutdown Procedure**

- This should also be posted
- Include how they should contact you if there is a problem!
  - **I include my personal cell phone number**
- Remind the User you are there to help
  - Their success is my success
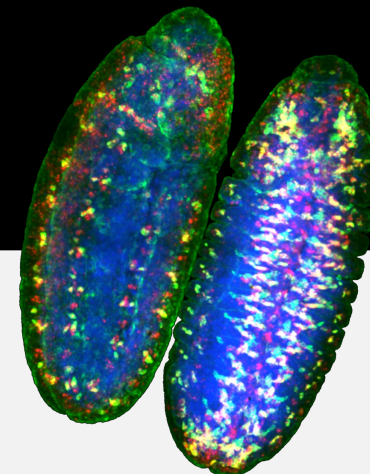  - **When my Users are working, I am on call**

1. Guided Session

A. Startup Procedure
B. Hardware Review
C. Software Review
D. 1$^{st}$ Image Acquisition
E. Independent Operation
F. Review + Tips & Tricks
G. **Shutdown Procedure**

| Experiment Concept/Design | Experiment Validation | Education/ Training | Execution/ Data Generation | Data Analysis/ Result Validation | Writing Support |
|---|---|---|---|---|---|

ers Institute

ITY OF COLORADO **BOULDER**

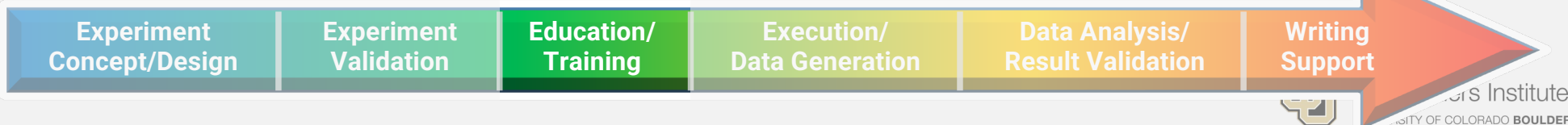# 3. Education and (long, but slow) Training
# Part 2: Independent Session

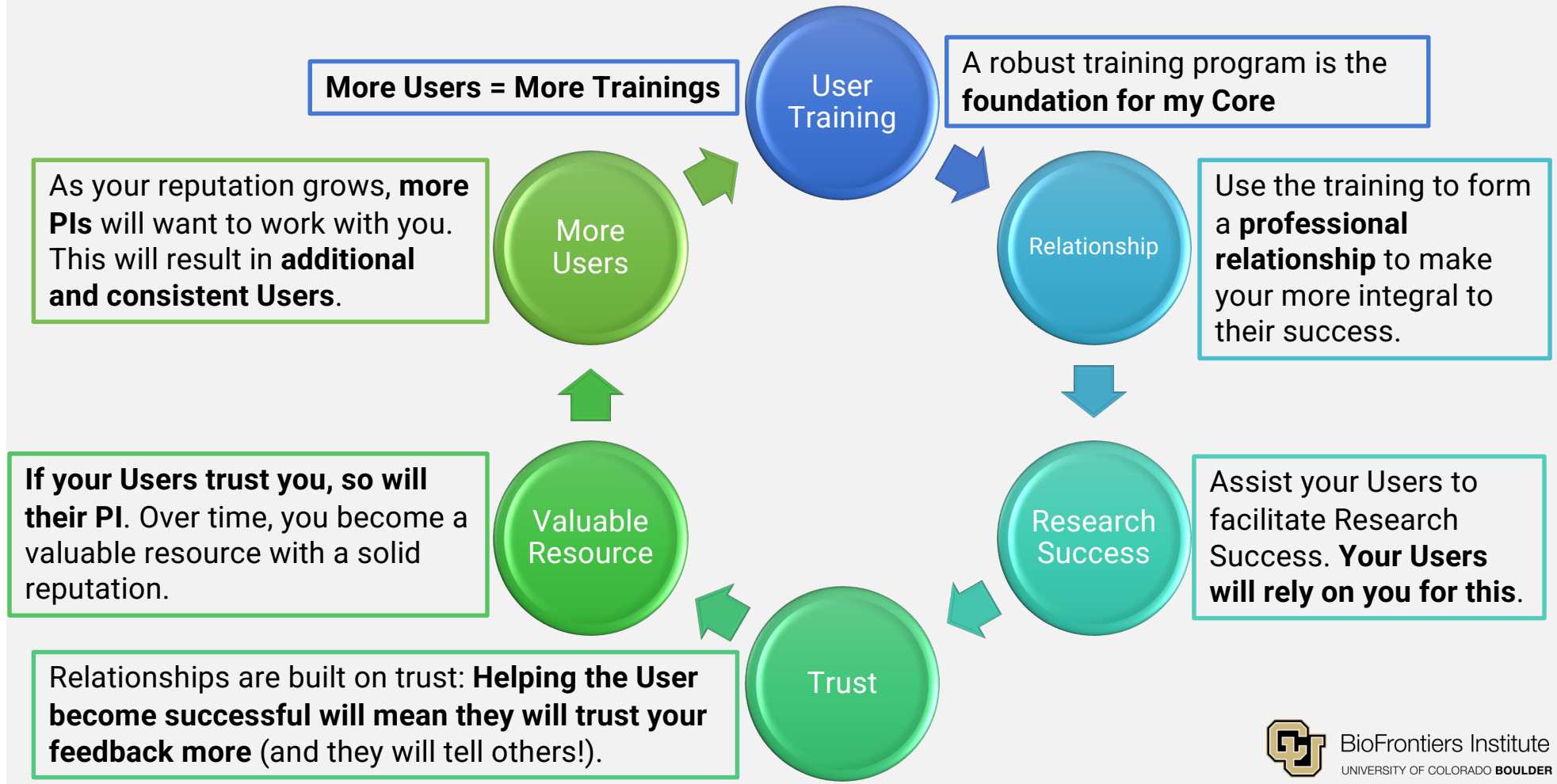## A. Coordinate with the User for the Independent Session

- I want to be available to help, but not hovering in the room
- Check in multiple times throughout the session
- The User needs to gain confidence in what they are doing
  - **I have other things to do**
- Remind the User you are there to help

2. Independent Session

A. System Startup
B. Load Sample
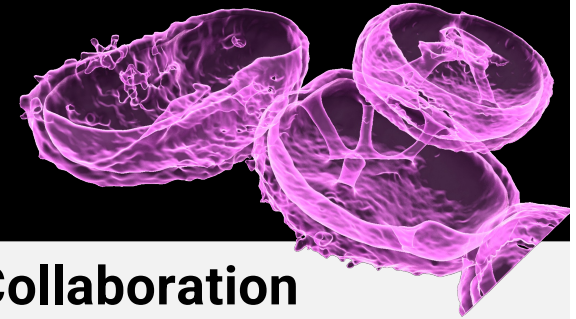C. Acquire image(s)
D. Troubleshoot + Refine
E. Shutdown

| Experiment Concept/Design | Experiment Validation | Education/ Training | Execution/ Data Generation | Data Analysis/ Result Validation | Writing Support |
|---|---|---|---|---|---|

# User Training – Part of the Core Circle of Life

**More Users = More Trainings**

**User Training**

A robust training program is the **foundation for my Core**

As your reputation grows, **more PIs** will want to work with you. This will result in **additional and consistent Users**.

**More Users**

**Relationship**

Use the training to form a **professional relationship** to make your more integral to their success.

**If your Users trust you, so will their PI**. Over time, you become a valuable resource with a solid reputation.

**Valuable Resource**

**Research Success**

Assist your Users to facilitate Research Success. **Your Users will rely on you for this**.

Relationships are built on trust: **Helping the User become successful will mean they will trust your feedback more** (and they will tell others!).

**Trust**
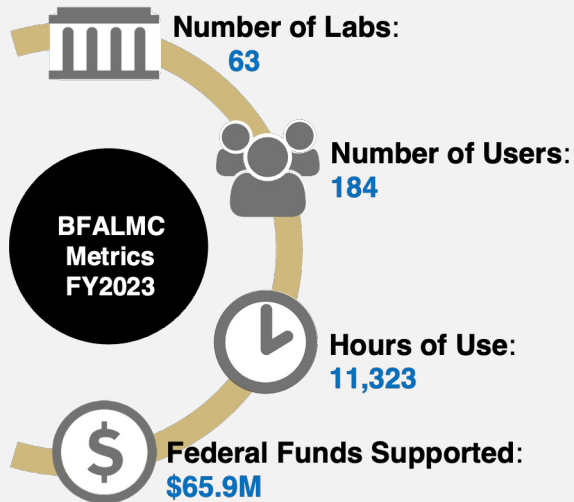
BioFrontiers Institute
UNIVERSITY OF COLORADO **BOULDER**

# Facility Impact

We are more than a Service Center, we are a **Center for Collaboration**

## 2023 University-Wide Impact

BFALMC Metrics FY2023

Number of Labs: 63

Number of Users: 184

Hours of Use: 11,323

Federal Funds Supported: $65.9M

## Number of CU publications resulting from ALMC support



Publications: 200
Citations: 8,223
H-Index: 43
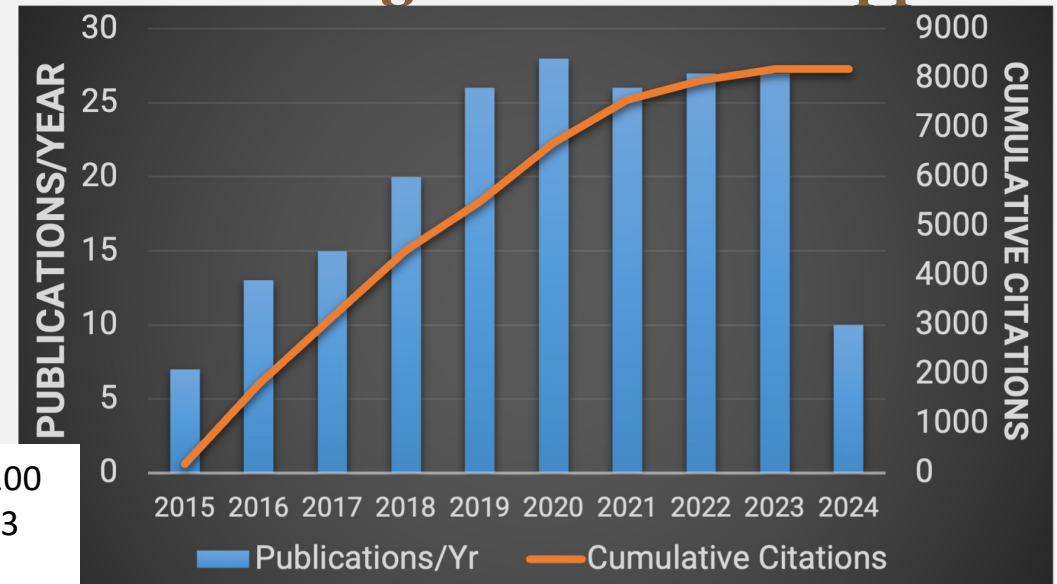
# Acknowledgements

## BioFrontiers Institute
### UNIVERSITY OF COLORADO BOULDER

### BioFrontiers and CU Boulder
All Faculty and Staff
ALMC Members
- Jian Tay
- Evolene Premillieu
- Amy Palmer

All my Users+PIs+Dept Chairs
Research and Innovation Office
- Karen Regan
- Massimo Ruzzene
- Alicia Aldeman

## External Funding

NIH National Institutes of Health

ARNOLD & MABEL
BECKMAN
FOUNDATION

**Thank you for listening**

ABRF 2024 ANNUAL MEETING
Preparing today's cores for tomorrow's needs
ABRF
Research · Technology
Communication · Education
35 YEARS
MINNEAPOLIS, MN • APRIL 21-24, 2024

### ABRF Colleagues
- Ashlyn Montgomery
- Andy Chitty
- Claudius Mundoma
- Rich Cole
- Mark Sanders
- Sheena Mische
- Susan Weintraub
- LMRG, EdComm, 2024 PC

BioF

# Probing Questions
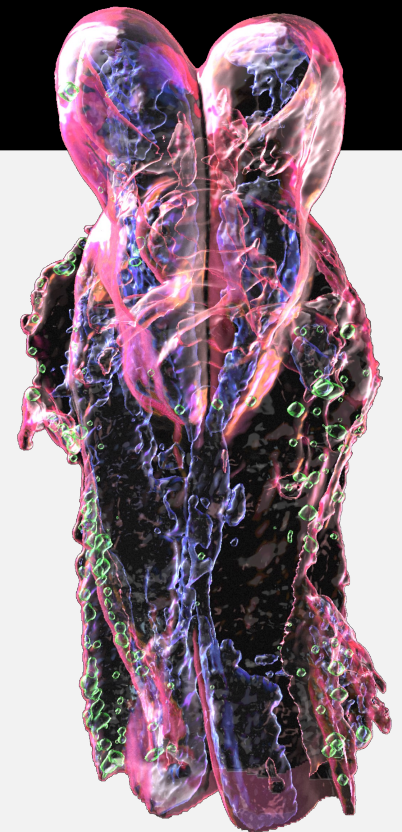
**A. Pre-training content?**

- Presentations/videos/websites
- Pre-training quiz?
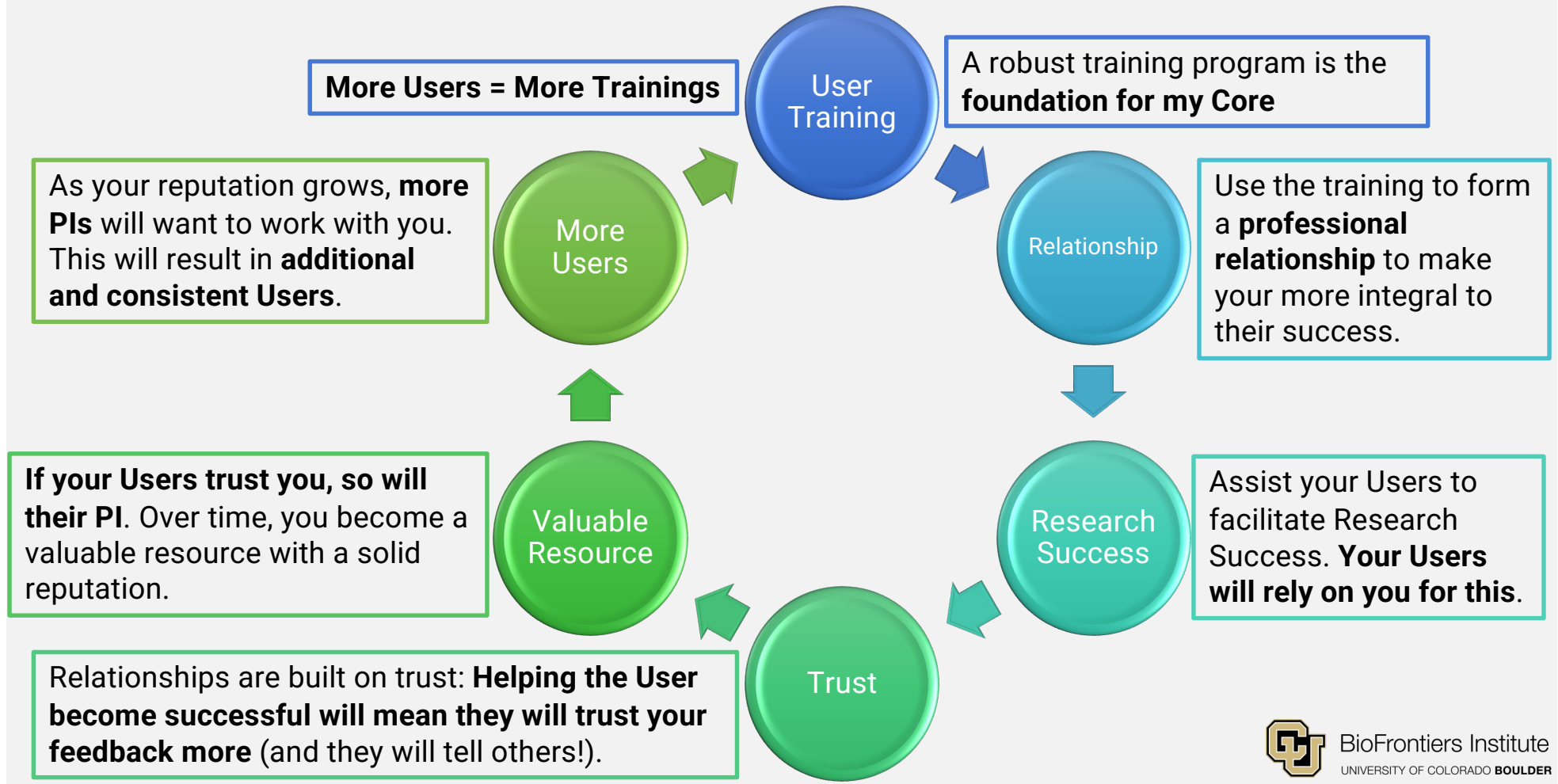
**B. Post-training quiz/follow-up?**

- How do you evaluate if a User is ready?

**C. Start with Standard Samples or User Samples**

- Depends on the technology
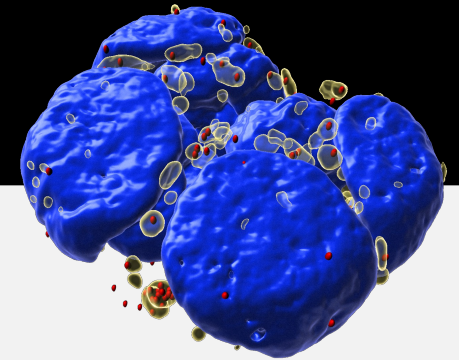- Many Users don't know how to prepare samples

# User Training – Part of the Core Flywheel Effect

**More Users = More Trainings**

**User Training**

A robust training program is the **foundation for my Core**

As your reputation grows, **more PIs** will want to work with you. This will result in **additional and consistent Users**.

**More Users**

**Relationship**

Use the training to form a **professional relationship** to make your more integral to their success.

If your Users trust you, so will **their PI**. Over time, you become a valuable resource with a solid reputation.

**Valuable Resource**

**Research Success**

Assist your Users to facilitate Research Success. **Your Users will rely on you for this**.

Relationships are built on trust: **Helping the User become successful will mean they will trust your feedback more** (and they will tell others!).

**Trust**

BioFrontiers Institute
UNIVERSITY OF COLORADO **BOULDER**

# Bonus Slides

# 1. Initial Meeting for Research Discussion

## A. Get to know the User
- Face-to-face meeting
- Guage their understanding of the research and technology

## B. Experimental design review
- Concepts/goals discussed
- Appropriate experiments/controls designed

## C. Set trial and training day/time
- Find a time that works for us (and the instrument)
- Preview what is involved in the training
- Advise the User on what to bring

| Experiment Concept/Design | Experiment Validation | Education/ Training | Execution/ Data Generation | Data Analysis/ Result Validation | Writing Support |
|---|---|---|---|---|---|

...rs Institute

...SITY OF COLORADO **BOULDER**

# 2. Validation experiments
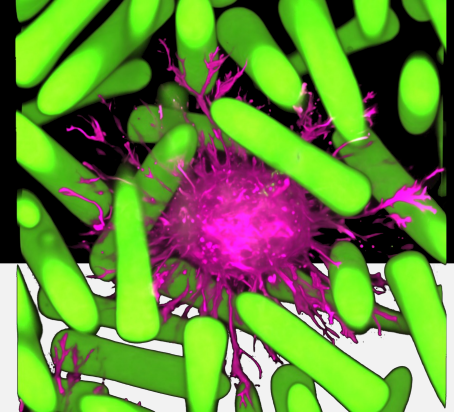
**A. Start with the controls**

- Demonstrating the instrument on the extremes builds confidence
- Provides some immediate data

**B. Talk while pushing the buttons**

- Introduces the User to the system, removing some of the mystique
- If possible, allow the User to collect an image or two

**C. Get to know the User more**

- Demonstrate that you are knowledgeable, but approachable

| Experiment Concept/Design | Experiment Validation | Education/ Training | Execution/ Data Generation | Data Analysis/ Result Validation | Writing Support |
|---|---|---|---|---|---|

# 4. Execution/Data Generation
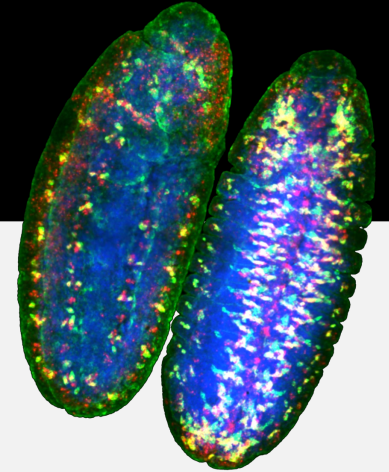
## A.  Independent sessions

- Review the calendar
  - Keep an eye on your newer/less confident Users
- Walk through the facility regularly
  - Users can seem reticent to reach out if they are uncertain
  - So, watch them work and help out in real time!
- Promote the acknowledgement of the Core (maybe mention co-authorship…)

| Experiment Concept/Design | Experiment Validation | Education/ Training | Execution/ Data Generation | Data Analysis/ Result Validation | Writing Support |
|---|---|---|---|---|---|

# 5. Data Analysis/Result Validation
# 6. Writing Support
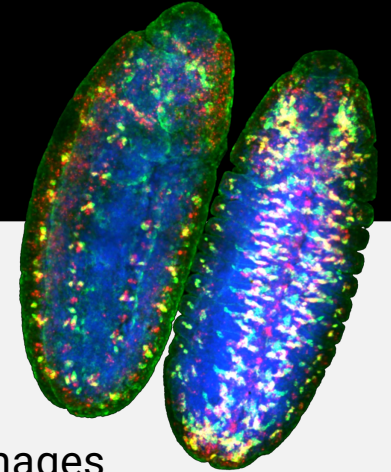
**A.  Users need help analyzing their data**

- Provide guidance/point them towards relevant resources
  - Many of us don't have enough bandwidth to do a deep dive here
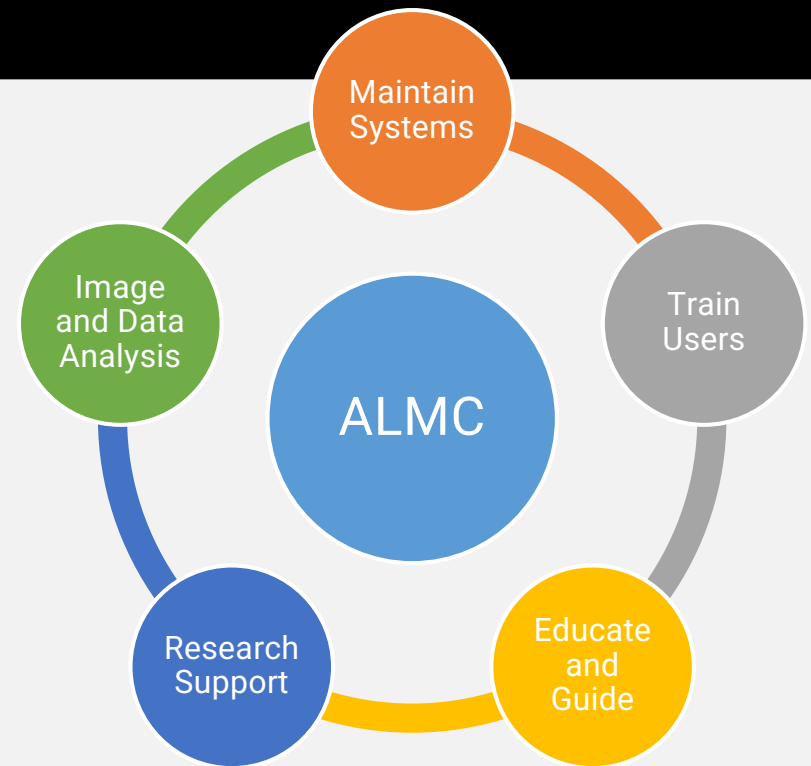- Talk about proper lab notebook keeping and to regularly analyze their images

**B.  Offer to review the relevant sections of their papers**

- Ensure proper details are in the methods
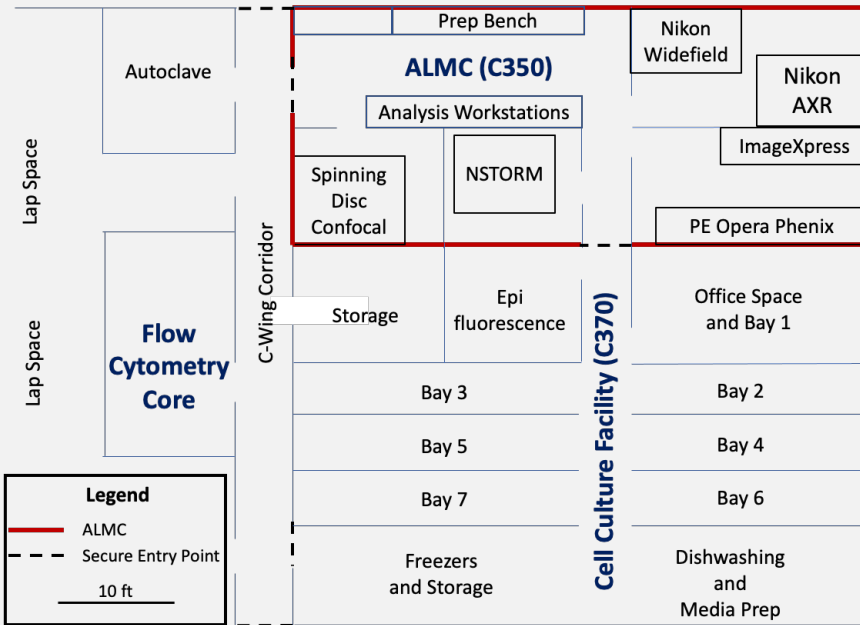- Make sure you are correctly acknowledged (your RRID should be included)

| Experiment Concept/Design | Experiment Validation | Education/ Training | Execution/ Data Generation | Data Analysis/ Result Validation | Writing Support |
|---|---|---|---|---|---|

...rs Institute
...ITY OF COLORADO **BOULDER**
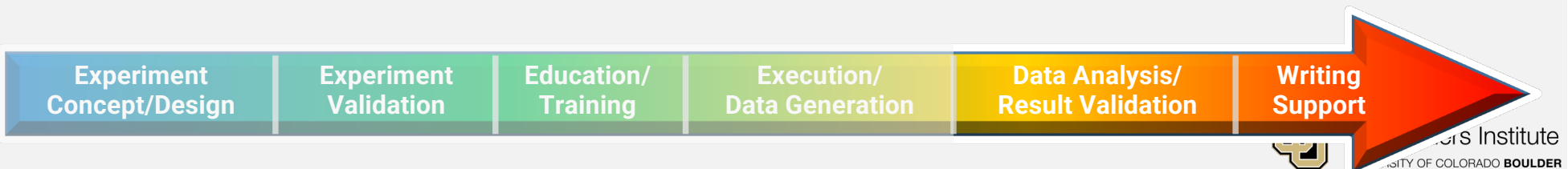
# Our Mission:

1. <u>Advance the available imaging and analysis capabilities</u> to meet the needs of our current and future investigators

2. Promote microscopy and data analysis <u>education to increase</u> rigor and impact

3. <u>Facilitate the success</u> of all that may need our resources by enabling access and by providing expert guidance and assistance

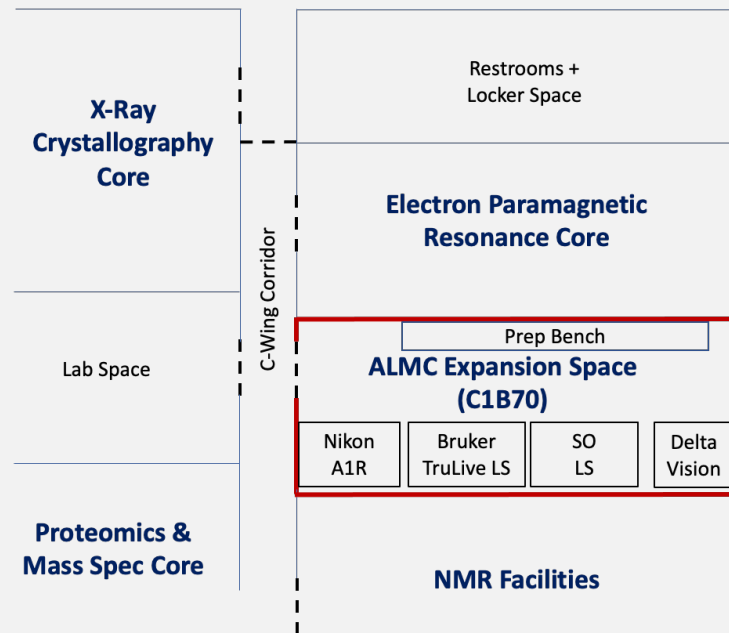4. Increase the efficiency of our research by reducing duplication and <u>maximizing space utilization</u>

# ALMC Location



**JSCBB 3rd Floor, C-wing Main Corridor**

Autoclave

Lap Space

Lap Space

**Flow Cytometry Core**

C-Wing Corridor

Prep Bench

**ALMC (C350)**

Analysis Workstations

NSTORM

Spinning Disc Confocal

Storage

Epi fluorescence

Bay 3

Bay 5

Bay 7

Freezers and Storage

**Cell Culture Facility (C370)**

Nikon Widefield

Nikon AXR

ImageXpress

PE Opera Phenix

Office Space and Bay 1

Bay 2

Bay 4

Bay 6

Dishwashing and Media Prep

**Legend**

ALMC

Secure Entry Point

10 ft

**Total Space: 1300 sq ft**

**JSCBB Basement, C-wing Main Corridor**

**X-Ray Crystallography Core**

C-Wing Corridor

Lab Space

**Proteomics & Mass Spec Core**

Restrooms + Locker Space

**Electron Paramagnetic Resonance Core**

Prep Bench

**ALMC Expansion Space (C1B70)**

Nikon A1R

Bruker TruLive LS

SO LS

Delta Vision

**NMR Facilities**

**+ IVIS Lumina in the vivarium**

Research

Management

Administration

Education

BioFrontiers Institute
UNIVERSITY OF COLORADO **BOULDER**

# CU Boulder
# Shared Instrumentation Network

## Microscopy and Imaging

- Light Microscopy Core Facility
- BioFrontiers Advanced Light Microscopy Core
- Biochemistry Krios Electron Microscopy
- Boulder Electron Microscopy Services Core Facility
- Flow Cytometry Shared Core
- Intermountain Neuroimaging Consortium

## Shared Instrumentation + Resource Centers

- BioCore: Shared Instrumentation
- Shared Instruments Pool in Biochemistry
- Biochemistry Cell Culture Facility
- Stem Cell Research & Technology Resource Center
- Green Labs Shared Ultra-Low Temperature Freezers
- CU Research Computing

## NMR and Mass Spectrometry

- Biochemistry Nuclear Magnetic Resonance Facility
- Central Analytical Laboratory and Mass Spectrometry Facility
- Nuclear Magnetic Resonance Facility
- Stable Isotope Mass Spectrometry Facility

## Materials + Biological Characterization and Nanofabrication

- Colorado Shared Instrumentation in Nanofabrication and Characterization
- CU Electron Microprobe Laboratory
- CU Facility for Electron Microscopy of Materials
- Biomolecular X-ray Crystallography Core
- Materials Research X-ray Diffraction Facility
- Materials Instrumentation and Multimodal Imaging Core
- Polymeric and Optical Materials Characterization Shared Facility
- W. M. Keck Optical Metrology Lab and JILA Micro/Nanofabrication Facility
- Raman Microspectroscopy Laboratory

# Our Analysis Tools