

Facility Guidelines

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Gaining facility access

I want to access the facility.
What do I do?



The workflow below describes how to gain access to the instrumentation and resources found within the BioFrontiers ALMC. We aim to get to know you and to understand your imaging needs, ensure that you are trained on the correct microscope, and provide guidance on proper image and data analysis. We also aim to make you aware of the multitude of resources that are at your disposal when working with us.

Training steps

1. Contact the Facility

- Please send us an email for a training request at biof-imaging@colorado.edu.

2. Initial Meeting

- You should receive an automated reply containing a link to our Microsoft Bookings page. Please use this page to schedule an initial meeting with **Joe Dragavon**.
- In this meeting, Joe will discuss your research and imaging needs.
- The appropriate microscope will be identified, and your Practical Training session arranged.

3. Practical Training

- We will go over proper instrument start-up and shutdown, overview the operational software, collect standard data sets on known samples, and practice with your samples.
- Upon completion, you will be a **Novice User**, which restricts your access to working hours (M-F, 9am – 5pm). This is to allow you to familiarize yourself with the microscope, while ensuring that our staff are on-hand if you run into problems.

4. Independent Session

- At least 2 hours of independent use on the microscope using your samples are required before you can proceed to the next step.
- The samples and data should be representative of your research needs, and will form the basis of the Image and Data Analysis meeting.

5. Image and Data Analysis

- Upon completion of your Independent Sessions, please send a new email to biof-imaging@colorado.edu to request Image and Data Analysis training. Use the Microsoft Bookings link in the reply email to schedule a meeting with **Jian Tay**.
- The purpose of this meeting is to connect with Jian, who is our Biological Image Analysis Group Leader. These meetings are typically short, ~10 - 30 minutes.
- At the meeting, Jian will review the services that he provides for the ALMC, our collaboration pipeline, as well as look over your initial images and analysis plan. He is also happy to discuss any of the following:
 - Basic image analysis concepts
 - Your data management and sharing plan
 - Arranging additional supported sessions

6. Full Instrument Access

- Upon completion of steps 1 – 5, you will be granted **Autonomous** status with unrestricted access to the microscope!

Data storage

Want to store your data? Contact BIT-Help (BioFrontiers Users) or Research Computing to learn about their cloud storage options!

- BioFrontiers IT: bit-help@colorado.edu
- Research Computing: rc-help@colorado.edu

Recognizing the core

It is essential that the staff and use of the BioFrontiers Advanced Light Microscopy Core is recognized in your publications, presentations, and posters. Proper recognition allow us to demonstrate our impact on the local scientific community and helps us procure funding to acquire new imaging technologies and provide cutting edge services.

Consider co-authorship

Our personnel are scientists and deserve to be appropriately credited as co-authors in any publication, presentation, and poster, that utilize our work.

To help you determine the appropriate level of credit, here are some examples of contributions that should count towards co-authorship:

- Contributing to an imaging protocol
- Developing code for image and/or data analysis
- Data collection (e.g., acquiring datasets which are used in publication)
- Production of any image and/or data analysis that leads to a figure or result in a paper
- Contribution to writing, including methods, in a paper

The following are examples that should be acknowledged but might not necessarily count towards co-authorship:

- Routine training on microscope operation
- Troubleshooting microscope operating issues
- Assistance with uploading code on GitHub etc.

Acknowledgement statements

All work resulting from your use of the facility and our staff must include an acknowledgement statement. Sample acknowledgement statements, including funding information can be found in the expandable boxes below.

Nikon A1R Laser Scanning Confocal

The imaging work was performed at the BioFrontiers Institute's Advanced Light Microscopy Core (RRID: SCR_018302). Laser scanning confocal microscopy was performed on an Nikon A1R microscope supported by NIST-CU Cooperative Agreement award number 70NANB15H226.

Nikon AXR Laser Scanning Confocal

The imaging work was performed at the BioFrontiers Institute's Advanced Light Microscopy Core (RRID: SCR_018302). The Nikon AXR Laser Scanning Confocal is supported by NIH Grant 1S10OD034320.

Nikon NSTORM

For super resolution imaging: The imaging work was performed at the BioFrontiers Institute's Advanced Light Microscopy Core (RRID: SCR_018302). Super resolution microscopy was performed on a Nikon Ti-E microscope supported by the Howard Hughes Medical Institute.

For TIRF microscopy: The imaging work was performed at the BioFrontiers Institute's Advanced Light Microscopy Core (RRID: SCR_018302). TIRF microscopy was performed on a Nikon Ti-E microscope supported by the Howard Hughes Medical Institute.

Nikon Spinning Disk Confocal

The imaging work was performed at the BioFrontiers Institute's Advanced Light Microscopy Core (RRID: SCR_018302). Spinning disc confocal microscopy was performed on Nikon Ti-E microscope supported by the BioFrontiers Institute and the Howard Hughes Medical Institute.

Nikon Widefield

The imaging work was performed at the BioFrontiers Institute's Advanced Light Microscopy Core (RRID: SCR_018302). The Nikon Ti-E Widefield is supported by NIH grant R01CA107098S1.

Bruker TruLive3D

The imaging work was performed within the Beckman Center for Advanced Light Sheet Microscopy and Data Science within the BioFrontiers Institute's Advanced Light Microscopy Core (RRID: SCR_018302). The Bruker TruLive3D is supported by the Arnold and Mabel Beckman Foundation.

Molecular Devices ImageXpress

The imaging work was performed at the BioFrontiers Institute's Advanced Light Microscopy Core (RRID: SCR_018302). The Molecular Devices ImageXpress is supported by NIH grant 1S10RR026680-01A1.

Revvity Opera Phenix

The imaging work was performed at the BioFrontiers Institute's Advanced Light Microscopy Core (RRID: SCR_018302). The Revvity Opera Phenix is supported by NIH grant 1S10OD025072.

Imaris Workstation

The data analysis and visualization work was performed at the BioFrontiers Institute's Advanced Light Microscopy Core (RRID: SCR_018302). The Analysis Workstation and the software package Imaris were supported by NIH 1S10RR026680-01A1.

Elements Workstation

The data analysis and visualization work was performed at the BioFrontiers Institute's Advanced Light Microscopy Core (RRID: SCR_018302).

Staff-assisted Image Analysis

Image and data analysis was performed by <name of staff> at the BioFrontiers Institute's Advanced Light Microscopy Core (RRID: SCR_018302).

Published?

Let us know when your article is published: <https://forms.gle/iMm2jYHYi572sPx88>

Reporting damage

The ALMC is a shared resource used by many researchers and labs throughout CU Boulder. It is therefore incredibly important that you report any damage **immediately** by sending an email to biof-imaging@colorado.edu or via [Microsoft Teams](#).

We get it - mistakes happen. Telling us right away allows us to service or schedule repairs to mitigate the damage or reduce the downtime on the microscope.

Please report any damage whether or not you are responsible for it. If something is not working right for you, it is likely affecting other people as well.

Data management and storage policy

The ALMC does not store data or guarantee that data will be stored on your behalf. It is our policy that you are personally responsible for your data stored on our computers. It is therefore your responsible to transfer data and maintain your own backups.

Please note that:

- The microscope and analysis workstations are not backed up. Critical failures may result in the loss of any and all data that were on the computer.
- If storage space is needed, data could also be deleted without further notice from our computers. This is to avoid users having to reschedule their experiments because the hard drives are full.

In other words, please back up your data after each imaging or analysis session.

What data should I store?

We recommend that you store all imaging data in its native file format. For our Nikon microscopes, this will be the ND2 format.

If you must export images (e.g., if you are using the Opera Phenix), you should always select "Uncompressed TIFF". This format will preserve the raw pixel values, as captured by the camera.

All other formats, including compressed TIFFs, JPEGs, and GIFs, will apply a compression algorithm to reduce file size which modifies the original values of the image. This is fine for display purposes but could constitute image manipulation if used for quantitative image analysis.

Reading native file formats

The native image file formats can generally be opened using [Fiji](#) (ImageJ) or by using our [BioformatsImage toolbox](#) in MATLAB. If you need help working with these tools, please email Jian at biof-imaging@colorado.edu.

Data storage options

Below is a list of several places to consider for data storage. We have tried to list the pros and cons of each option, so please read carefully.

BIT storage

If you are eligible, we strongly recommend using the BioFrontiers IT (BIT) storage servers for data storage. The servers can be mounted as network drives directly on our microscope and analysis computers, and file transfers are generally fast as they are directly connected via the university's network. The servers are also backed up in case of hardware issues. However, you currently cannot share files with users who are not affiliated with the university (i.e., if they do not have an identikey)

This service is available if you are a BioFrontiers faculty or affiliated with the BioFrontiers Institute (e.g., council members). This option is unfortunately not available for external researchers or commercial entities.

To learn more about this service, determine if you are eligible, and receive the latest usage fees, please email bit-help@colorado.edu.

PetaLibrary

The [PetaLibrary](#) is a CU Boulder Research Computing service that can be used to store and share your data. This service does allow you to share data with external researchers. However, please note that the service only stores a single copy of your data, which could be lost if there is a critical hardware failure. Hence, you should take steps to maintain a separate backup of your data.

For more details, please contact rc-help@colorado.edu.

Commercial cloud storage options

Commercial cloud storage options, such as Google Drive, Microsoft OneDrive, and AWS are also potentially good locations for data backup and sharing. However, please note that usage fees can be quite high depending on the service you pick.

We strongly discourage the use of your CU Boulder Google or Microsoft OneDrive account for storage as upon your departure, the data will be deleted. If you plan to use these services, we suggest you sign up and pay for your own personal account.

External hard drives

External hard drives can be used to transfer your data from our computers. However, we strongly recommend that you maintain at least a second copy of the hard drive as a backup. In general, we do not recommend using a single external hard drives as your primary data backup method as the data are not readily shareable nor backed up in case of disk failure. Instead, we encourage you to consider cloud storage options as they often have several layers of backups in case something goes wrong.