Strategies for Rapid Development and Implementation of Virtual Microscopy Training
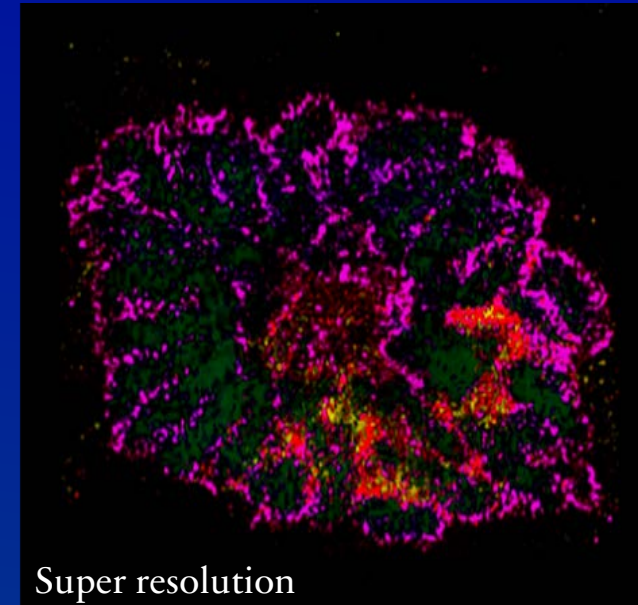
Christina Baer, PhD

Director, SCOPE imaging core facility
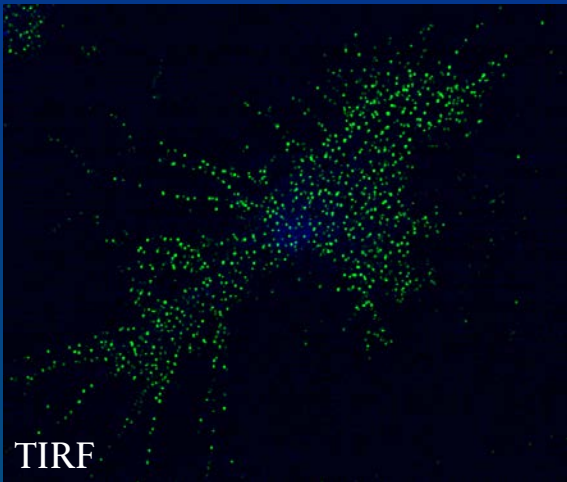
Assistant Professor, Microbiology and Physiological Systems

University of Massachusetts Medical School
UMASS

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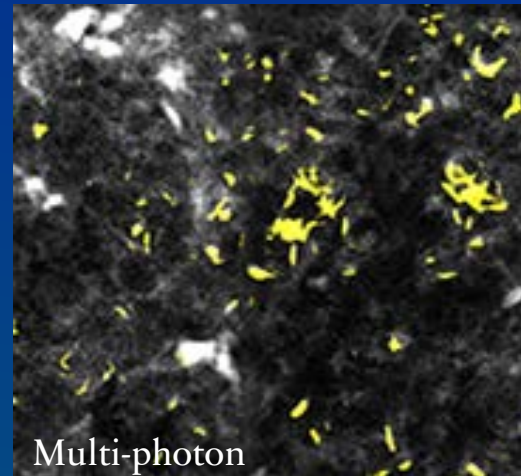# SANDERSON CENTER FOR OPTICAL EXPERIMENTATION

- Microscopy approaches
  - Structured illumination microscopy (SIM) and STORM/PALM
  - TIRF microscopy
  - Multi-photon microscopy
  - Fluorescence Correlation Spectroscopy (FCS)
  - Confocal microscopy
  - Live cell time lapse Imaging
  - Lightsheet microscopy
  - Automated whole slide imaging
  - MERFISH spatial transcriptomics
  - BSL3 imaging

- Complete microscopy support from sample prep to analysis
  Imaging sample preparation protocol, modifications to microscopes as needed, quantitative image analysis support for each project
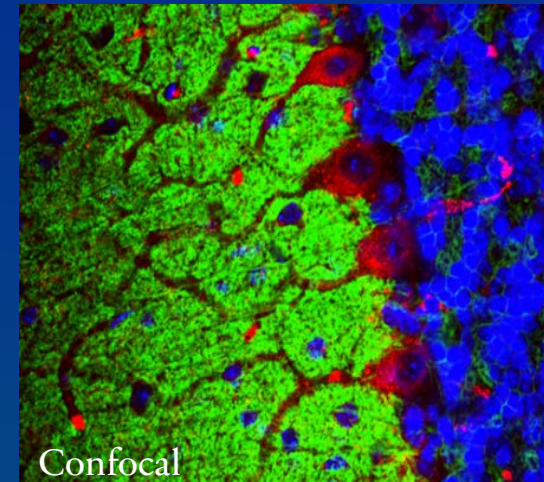

Super resolution

Kaufman Lab - PMM

TIRF

Rock Lab - Pathology

Multi-photon

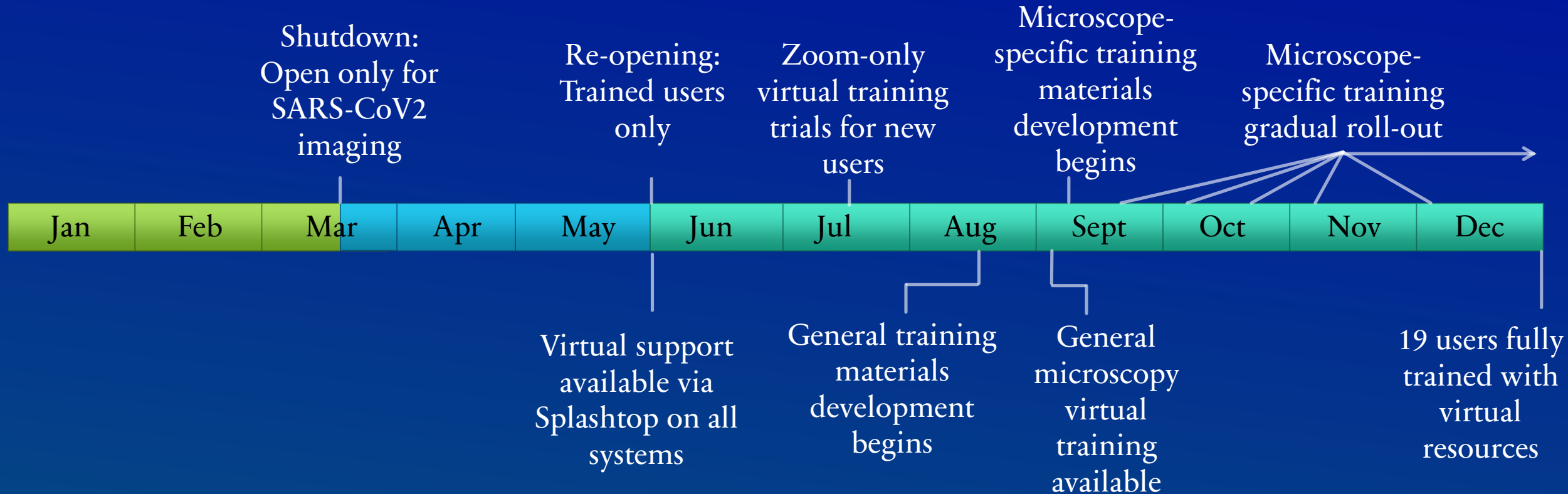*Sassetti Lab - MaPS*

Confocal

Brass Lab - MaPS

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SCOPE FACILITY BY THE NUMBERS

- 14 light microscopes
  - 2 service contracts
  - 1 Director, no other staff
- 3,000 sq ft lab space with systems in individual rooms
- 70 annual users
- 55 trainings per year
- Established in 2018

SCOPE users:

- Graduate students, postdocs, and technicians
- No engineering or physics department at UMMS
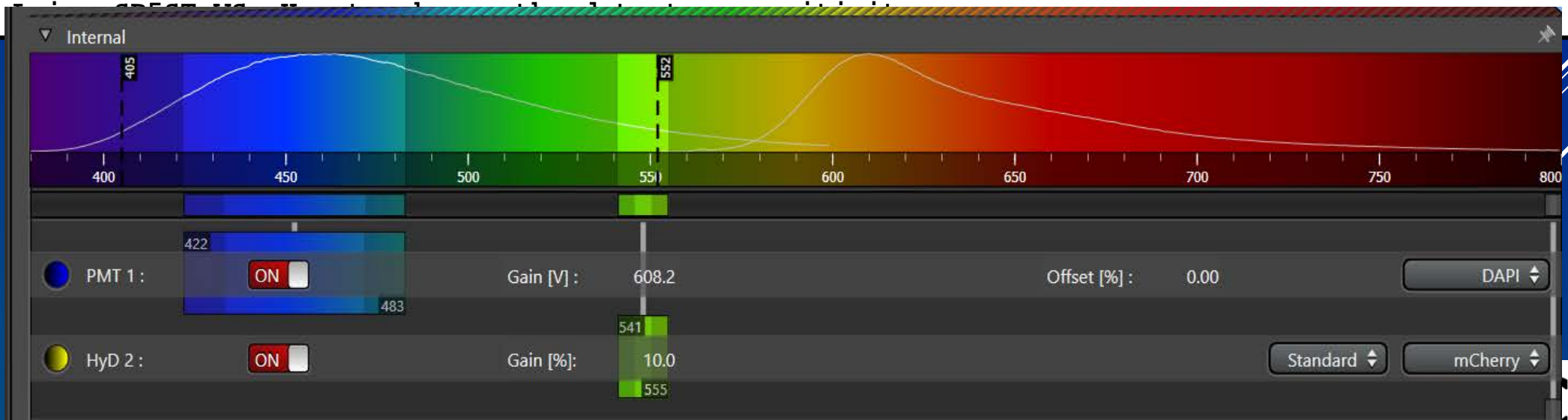- Biology-focused research with an emphasis on human disease

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2020 EVENTS IN THE SCOPE

Shutdown: Open only for SARS-CoV2 imaging

Re-opening: Trained users only

Zoom-only virtual training trials for new users

Microscope-specific training materials development begins

Microscope-specific training gradual roll-out

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec |

Virtual support available via Splashtop on all systems

General training materials development begins

General microscopy virtual training available

19 users fully trained with virtual resources

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REMOTE TRAINING:
AN OPPORTUNITY FOR ADDITIONAL USER EDUCATION

Improve overall baseline microscopy knowledge level amongst users

```
[13:11] Christina.Baer: if you want help improving this image, I'm happy to do that, it's up to you
[13:12] Leica-SP5ST-WS: Yes, adjust other parameter not laser power
[13:12] Christina.Baer: to get better images, you need more signal to the detectors
[13:12] Christina.Baer: we either do that by changing the laser power or we change the detector sensitivity
[13:13]
```

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MICROSCOPES **TRAINING** **IMAGE ANALYSIS** **RNASCOPE** **IMAGING WEEK** **CONTACT US** **ABOUT**

Training

- **General training for all users**
- **Widefield training** ›
- **Confocal training** ›
- **FCS training**
- **TIRF training** ›
- **Super resolution training** ›
- **Multi-Photon training** ›

SCOPE TRAINING PROCEEDURE

1. Users complete general training.

2. Users complete instrument-specific training. Please contact the SCOPE to confirm the microscope you will be trained to use prior to beginning the instrument specific training.

3. Users schedule two live remote virtual training sessions. Users will provide their own samples to be imaged by the SCOPE staff during these 2 hour long sessions.

4. Users receive accesss to the SCOPE facility and to the online scheduling system following the completion of this training.

Thank you for your patience as we adjust our training model to comply with COVID-19 safety precautions. We are adding training modules for additional systems frequently.

Email us to be added to the training alerts list to get updates on the training availability for specific systems.

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umassmed.edu/scope/training/

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UMASS MEDICAL SCHOOL

MICROSCOPES | TRAINING | IMAGE ANALYSIS | RNASCOPE | IMAGING WEEK | CONTACT US | ABOUT

Training

- **General training for all users**
- **Widefield training** ›
- **Confocal training** ›
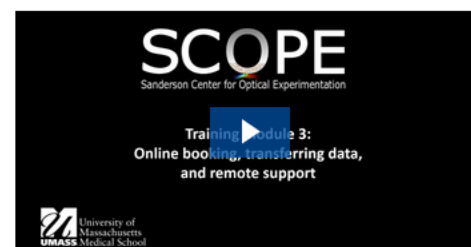- **FCS training**
- **TIRF training** ›
- **Super resolution training** ›
- **Multi-Photon training** ›

General training for all users

Please note that there are training quizzes linked at the end of some modules.

You must click the link and complete these quizes to receive credit for completing the training.

SCOPE
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▶
Training module 1:
Introduction to Resources
and Approaches
University of Massachusetts Medical School

SCOPE
Sanderson Center for Optical Experimentation
▶
Training module 2:
Multi-user microscope safety
protocols
University of Massachusetts Medical School

SCOPE
Sanderson Center for Optical Experimentation
▶
Training module 3:
Online booking, transferring data,
and remote support
University of Massachusetts Medical School

SCOPE
Sanderson Center for Optical Experimentation
▶
Training module 4:
Objectives
University of Massachusetts Medical School

SCOPE
Sanderson Center for Optical Experimentation
▶
Training module 5:
Taking images for quantitative
analysis
University of Massachusetts Medical School

SCOPE
Sanderson Center for Optical Experimentation
▶
Training module 6:
Imaging success begins with
sample prep
University of Massachusetts Medical School

umassmed.edu/scope/training/training-for-all-users/
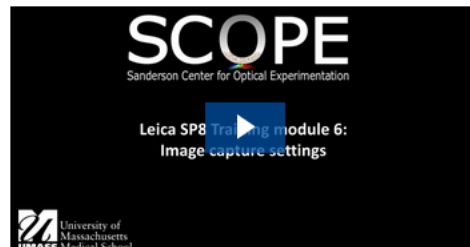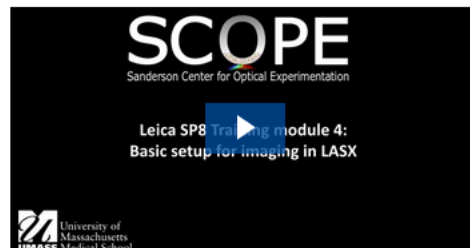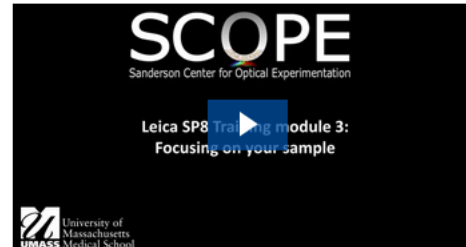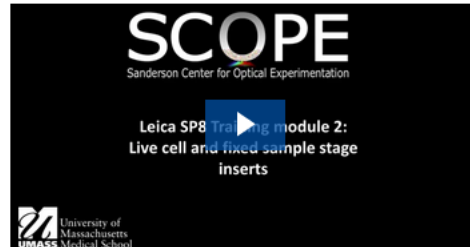
Confocal training

Leica SP8 confocal training

Nikon A1 confocal training

Leica SP5 confocal training

Leica SP8 confocal training

Please note there are quizzes linked at the end of these training modules.

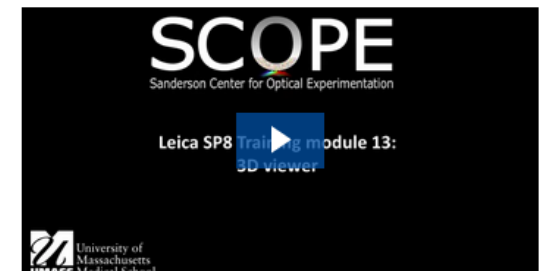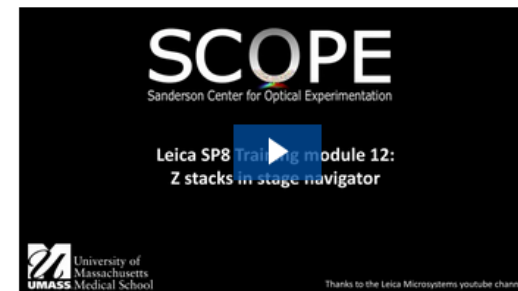**You must click the link and complete the quizzes to receive credit for this training.**
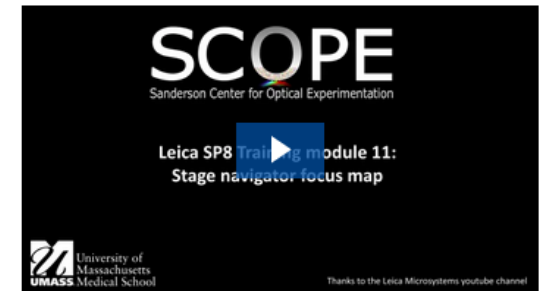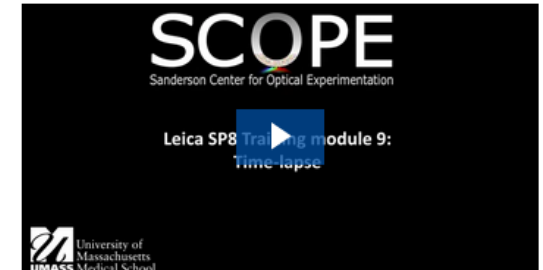

The training modules below are advanced topics for specific sample types. There are no training quizzes for these modules.

For 120 nm super resolution imaging, please view the Lightning module.

For time lapse imaging of live samples, please view the Time-Lapse module.

For whole tissue slice or large area imaging, please view the three Stage Navigator modules.

ANATOMY OF A MODULE

- Narrated presentation with fully original content
  - Facility information and policies
  - Instrument specific training

- Presentations that incorporate existing video content
  - General training concepts
  - Instrument operation modes with content from manufacturers

- Single-take video recording with narration
  - Instrument specific training where active use is most instructive

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BEST PRACTICES FOR VIRTUAL MODULES
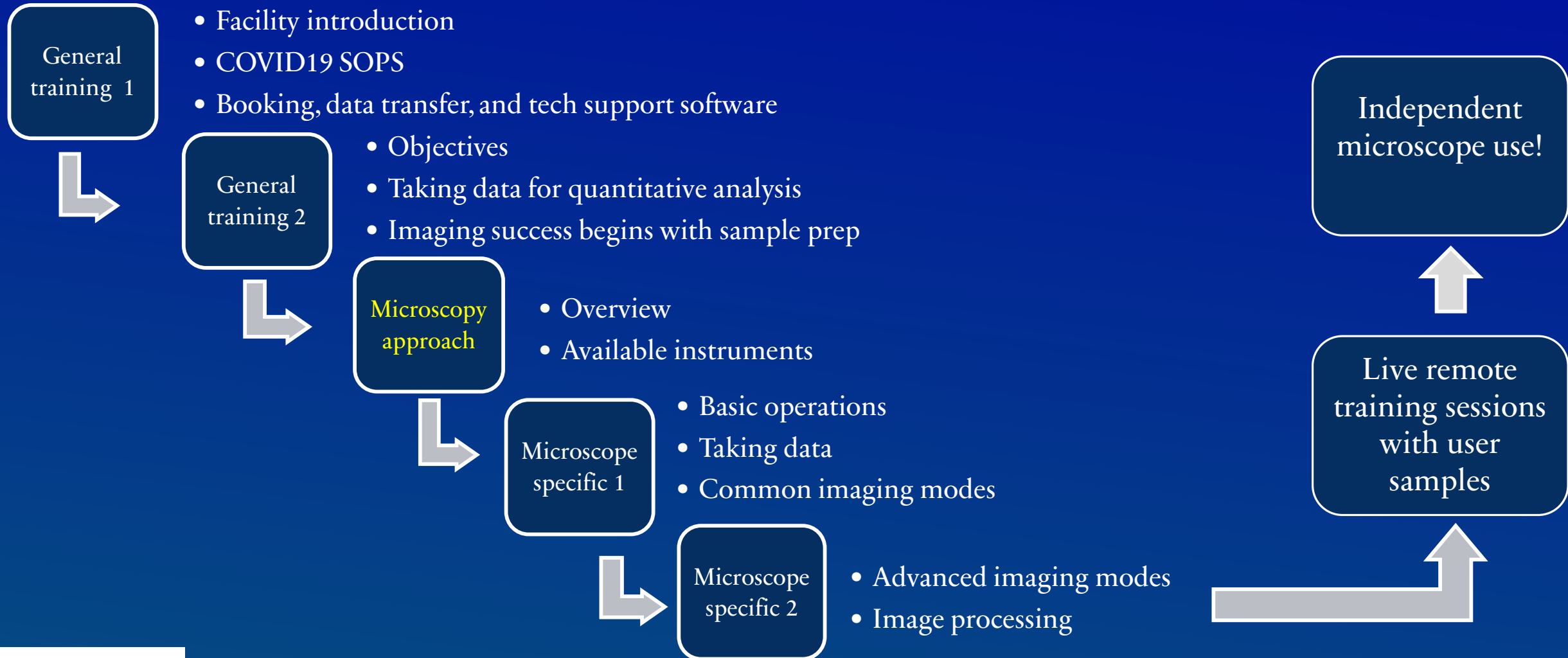
- ▶ Develop a plan with your audience in mind.

- ▶ Limit module length to 10-15 minutes.

- ▶ Script content when possible to enable closed captioning.

- ▶ Use as much existing material as you can.

- ▶ Leverage live video training to fill in the gaps.

- ▶ View your training materials as living resources with future updates planned.

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ADVANTAGES TO ONLINE TRAINING

▶ Creating your own training content tailored to your users enhances retention of critical information.

▶ Track user compliance and training with required quizzes.

▶ Identify users that need more attention early on.

▶ Periodic users will go back to videos repeatedly for review.

   ▶ Saves you time in the long-run!

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FUTURE VIRTUAL TRAINING WORKFLOW

General training 1

- Facility introduction
- COVID19 SOPS
- Booking, data transfer, and tech support software

General training 2

- Objectives
- Taking data for quantitative analysis
- Imaging success begins with sample prep

Microscopy approach

- Overview
- Available instruments

Microscope specific 1

- Basic operations
- Taking data
- Common imaging modes

Microscope specific 2

- Advanced imaging modes
- Image processing

Independent microscope use!

Live remote training sessions with user samples

umassmed.edu/scope/training/

RESOURCES FOR CREATING TRAINING CONTENT

- Software used: Splashtop, Snagit, Zoom
- Website management: Episerver, Wistia video server, Qualtrics
- Content used:
  - Microcourses youtube channel
  - Leica Microsystems youtube channel
  - The Tutorial *(Jonkman et al, Nature Protocols, 2020)*
  - Stowers Institute for Medical Research youtube channel
  - Nikon youtube channel

- BINA resource listing: bioimagingna.org
- RMS resource listing: https://www.rms.org.uk/resources-downloads/online-microscopy-talks.html

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