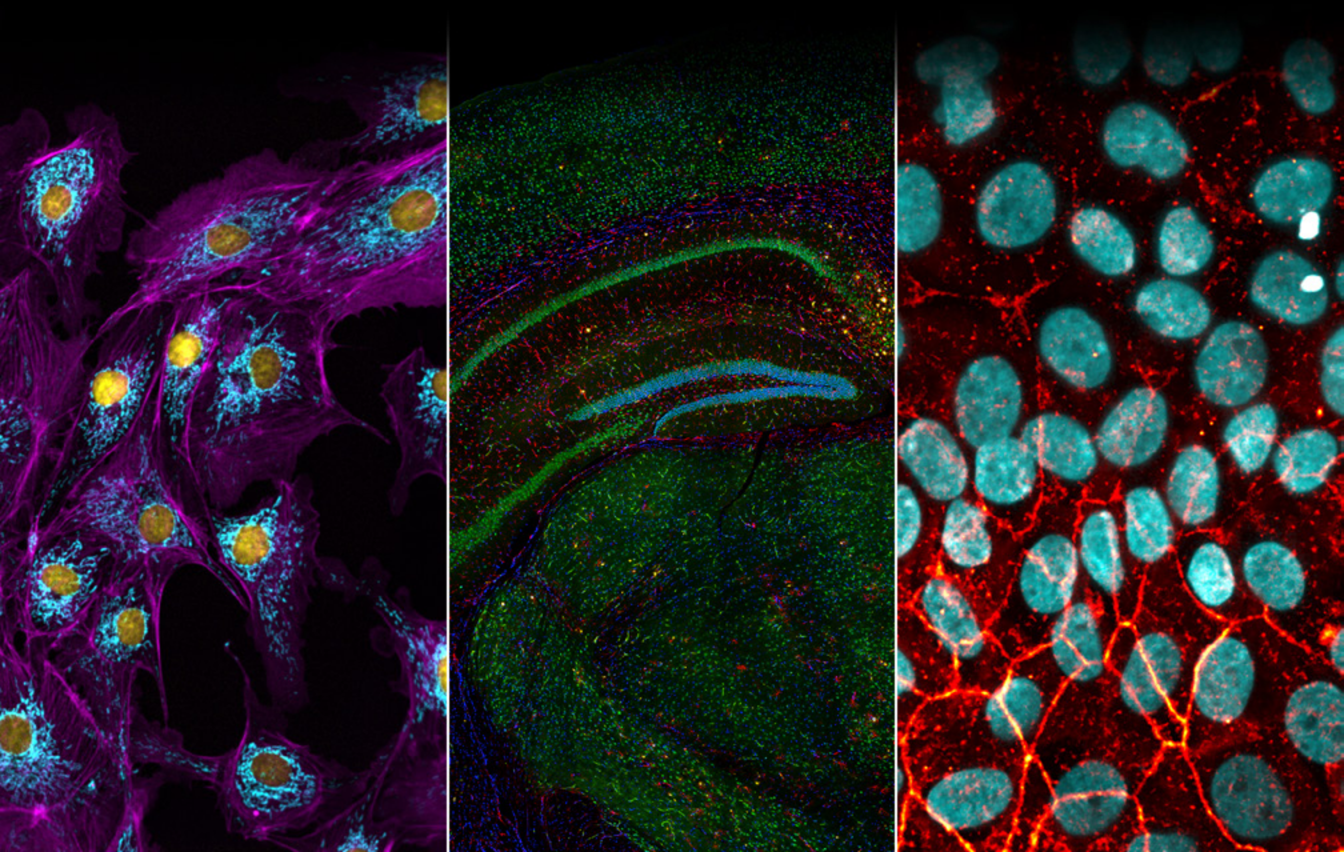
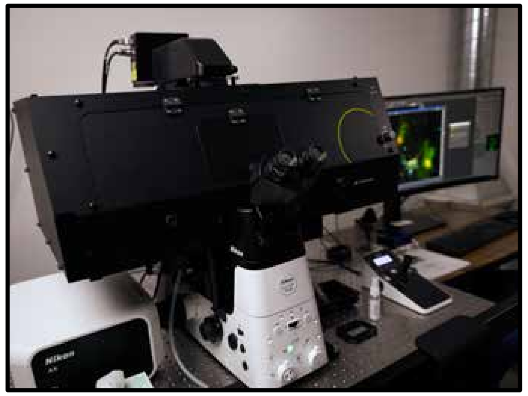
THE UNIVERSITY OF ARIZONA
Cancer Center

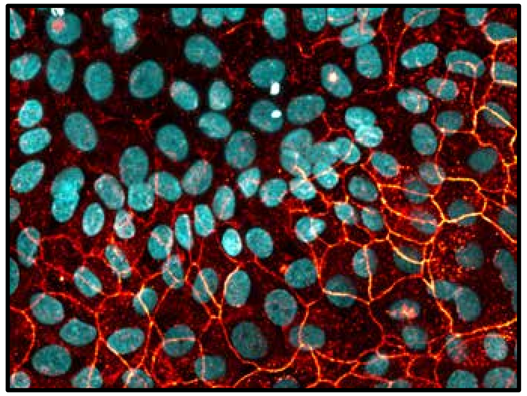
NIKON
Center of Excellence

Microscopy
Shared Resource



Nikon AX R Laser-Scanning Confocal Microscope





Instrument Description

The Nikon "AX R" system is an inverted laser-scanning confocal microscope and is our most capable instrument. The AX R has both a traditional, high-resolution Galvano scanner and a **high-speed Resonant scanner** with up to 2K X 2K resolution, making this instrument capable of both high-resolution and high-speed imaging. The AX R offers the largest selection of laser lines, allowing the microscope to **excite up to 7 fluorophores** with clear spectral separation. This instrument has the widest range of objectives lenses, including a **long working distance 20x 0.7NA** objective with 2.3mm of working distance and water-immersion 40x 1.25NA objective paired an **automated water immersion dispenser**, ideal for long-term, live cell and multi-well plate imaging.

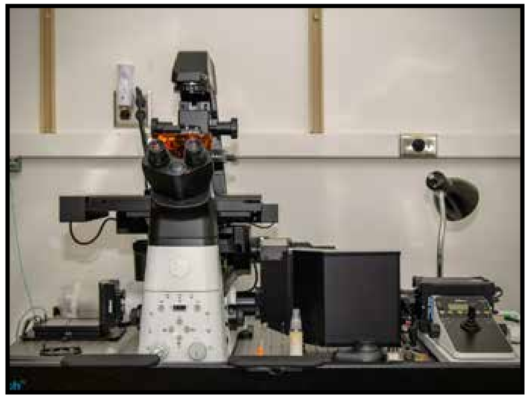
Instrument Features

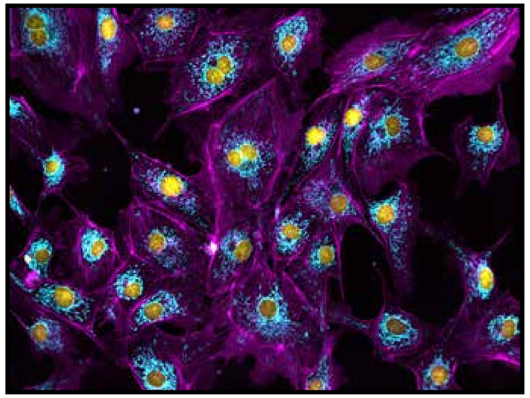
- High-resolution image acquisition with Galvano scanner (up to 8K X 8K)
- High-speed image acquisition with Resonant scanner (up to 2K X 2K)
- Live cell imaging (humidity, temperature, and CO2 regulation)
- Advanced multichannel imaging (up to 7 fluorophores per sample)
- Piezo stage with 600µm travel for precise, high-speed zstack imaging
- Automated water dispenser for automated multi-well imaging using the water-immersion 40x objective.

Instrument Details

Available Lasers	405nm / 445nm / 488nm / 515nm / 561nm / 594nm / 640nm / 730nm
Available Objective Lenses	4x Plan Apo (NA = 0.20; WD = 20mm; Phase) 10x Plan Apo (NA = 0.45; WD = 4mm; Phase) 20x Plan Apo (NA = 0.80; WD = 800µm; DIC) 20x Long WD (NA = 0.70; WD = 2.3mm; DIC) 40x Plan Apo (NA = 0.95; WD = 250µm; DIC) 40x W Apo W1 (NA = 1.25, WD = 200µm; DIC) 60x Oil Plan Apo (NA = 1.42; WD = 150µm; DIC)
Available Detectors	Metal-Alkali (Fixed) GaAsP PMT (Adjustable) GaAsP PMT (Adjustable) GaAsP PMT (Fixed) Transmitted Light Detector (TD)
Dichroic Mirrors/ Beam Splitter	DM 405nm / 488nm / 561nm / 640nm / 730nm DM 405nm / 445nm / 514nm / 594nm / 730nm BS 80 / 20
Supported Samples	Slides (1 x 3 and 2 x 3; No. 1.5 coverslips) Glass-bottom Dishes (35mm/60mm; No. 1.5 coverslips) Glass-bottom Multi-well Plates (all well sizes) Glass-bottom Chamber Slides (all well sizes)

Nikon Crest Spinning-Disk Confocal Microscope





Instrument Description

The Nikon "Crest" system is an inverted, spinning-disk confocal microscope that allows for high-throughput, confocal imaging of cell and tissue samples. The Crest Spinning-Disk features a **wide selection of laser lines** (UV - IR) and is ideal for applications that require the increased resolution and contrast of confocal imaging, with the speed of a widefield microscope. The Crest system is equipped with a stage-top environmental incubator for live cell imaging and a **back-illuminated sCMOS camera**, making it ideal for imaging living samples (cells, organoids, etc.) with minimal phototoxicity. The Crest features both **fluorescence and color cameras**, enabling users to image datasets with IHC and fluorescent samples.

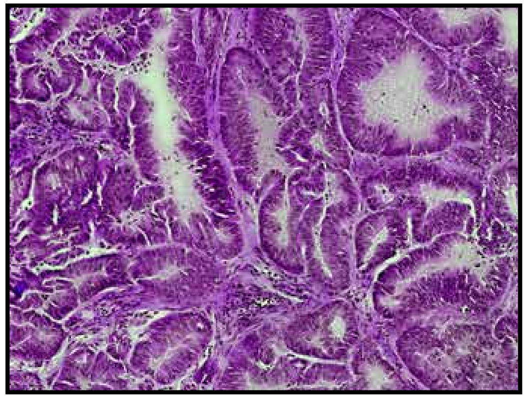
Instrument Features

- Confocal imaging (Crest X-Light V2 Spinning-Disk Optics)
- Nikon DS-Fi3 Color and Photometrics Prime 95B sCMOS cameras
- Live cell imaging (humidity, temperature, and CO_2 regulation)
- Laser selection for wide spectral coverage (UV - IR wavelengths)
- CFP/YFP filter sets for FRET imaging
- Hardware triggering for rapid multichannel acquisition

Instrument Details

Available Lasers	405nm / 445nm / 477nm / 520nm / 545nm / 635nm / 730nm
Available Objective Lenses	4x Plan Apo (NA = 0.13; WD = 16.5mm; Phase) 10x Plan Fluor (NA = 0.30; WD = 15.2mm; Phase) 20x Plan Apo (NA = 0.75; WD = 1mm; DIC) 40x Plan Apo (NA = 0.95; WD = 250µm; DIC) 60x Oil Plan Apo (NA = 1.40; WD = 130µm; DIC)
Available Cameras	**Photometrics Prime 95B (fluorescence)** Back-illuminated sCMOS sensor with 95% QE Pixel size = 11µm Sensor Size = 1608 x 1608 **Nikon DS-Fi3 (color)** Color CMOS sensor Pixel Size = 2.4µm Sensor Size = 2880 x 2048
Emission Filters	DAPI - 438nm / 24nm CFP - 485nm / 20nm GFP - 511nm / 20nm YFP - 560nm / 25nm Cy3 - 595nm / 31nm Cy5 - 685nm / 40nm Cy7 - 819nm /44nm
Supported Samples	Slides (1 x 3 and 2 x 3; No. 1.5 coverslips) Glass-bottom Dishes (35mm/60mm; No. 1.5 coverslips) Glass-bottom Multi-well Plates (all well sizes) Glass-bottom Chamber Slides (all well sizes)

Nikon BioPipeline SLIDE High-Content Microscope



Instrument Description

The Nikon “BioPipeline” is an automated, widefield slide scanning system equipped with a Marzhauser Slide Express 2 loader with a 120-slide capacity for high-throughput imaging. Unlike many slide scanning systems, the BioPipline supports **high-resolution fluorescence imaging** and can acquire a wide range of fluorophores (UV - IR). The BioPipeline also has the unique feature of having optics for **Polarized Light Microscopy**, enabling high-contrast imaging of birefringent samples. This system is equipped with high-NA objectives from 2x - 40x and supports both 1 x 3 and 2 x 3 glass slides to accommodate a wide range of imaging needs. The BioPipeline systems is offered as a **Slide Scanning Service** at the MSR and is ideal for projects that require imaging large datasets in an automated fashion.

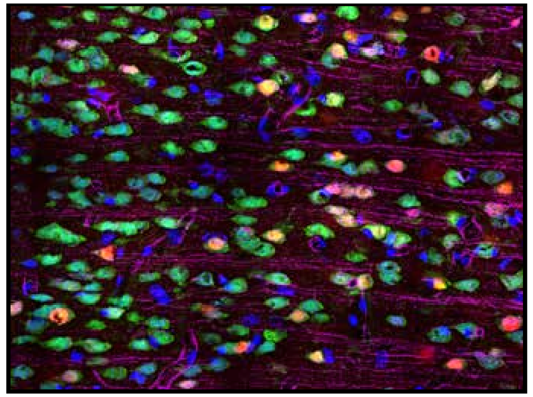
Instrument Features

- High-resolution fluorescence imaging with wide spectral coverage (UV - IR wavelengths)
- Optics for Polarized Light Microscopy
- High-NA objective lenses from 2x - 40x
- High-throughput imaging service designed large datasets with quick turnaround needs

Instrument Details

Available Lasers	390nm / 440nm / 475nm / 510nm / 555nm / 637nm / 748nm
Available Objective Lenses	2x Plan Apo (NA = 0.1; WD = 8.5mm) 4x Plan Apo (NA = 0.2; WD = 20mm) 10x Plan Apo (NA = 0.45; WD = 4mm) 20x Plan Apo (NA = 0.75; WD = 1mm) 40x Plan Apo (NA = 0.95; WD = 250µm)
Available Cameras	Hamamatsu ORCA-Flash4.0 V3 (fluorescence) Front-illuminated sCMOS sensor with 82% QE Pixel Size = 6.5µm Sensor Size = 2048 x 2048 Nikon DS-Fi3 (color) Color CMOS sensor Pixel Size = 2.4µm Sensor Size = 2880 x 2048
Emission Filters	DAPI - 432nm / 36nm CFP - 474nm / 42nm GFP - 515nm / 30nm YFP - 544nm / 24nm Cy3 - 595nm /O31nm Cy5 - 680nm/42nm Cy7 - 809nm/81nm
Supported Samples	Slides only (1 x 3 and 2 x 3)

Nikon SoRa Spinning-Disk Confocal Microscope



Instrument Description

The Nikon “SoRa” system is our most advanced spinning-disk confocal and merges the advantages of confocal imaging with a 2x increase in resolution using “SoRa mode”, making this both a **confocal and super resolution** microscope. The SoRa spinning-disk confocal microscope is equipped with an environmental chamber (capable of generating hypoxic conditions) and the **high-resolution sCMOS Kinetix camera**, making it ideal for super resolution imaging of live samples (cells, organoids, etc.) with minimal phototoxicity. Unlike most spinning-disk microscopes, the SoRa is equipped with an **Opti-Microscan Galvano Scanner**, enabling experiments that require localized photostimulation or FRAP.

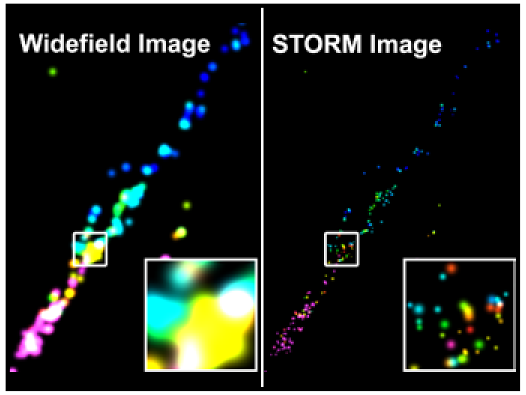
Instrument Features

- Confocal imaging (Yokogawa CSU-W1 Optics)
- Super resolution optics for 2x increase in resolution (using SoRa Mode)
- Piezo stage with 600µm travel for precise, high-speed zstack imaging
- Live cell imaging (humidity, temperature, and CO_2 regulation)
- Hypoxia imaging (N_2 regulation)
- Opti-Microscan Fast Galvano Scanner for Photomanipulation (FRAP, photoconversion, photostimulation, etc.)

Instrument Details

Available Lasers	405nm / 488nm / 561nm at 100mW 640nm at 125mW
Available Objective Lenses	10x Plan Apo (NA = 0.45; WD = 4mm; Phase) 20x Plan Apo (NA = 0.75; WD = 1mm; DIC) 40x Sil Plan Apo (NA = 1.25; WD = 300µm; DIC) 60x Oil Plan Apo (NA = 1.40; WD = 130µm; DIC) 100x Sil Plan Apo (NA = 1.35; WD = 300µm; DIC)
Available Camera	Photometrics Kinetix Back-illuminated sCMOS sensor with 95% QE Pixel size = 6.5µm Sensor Size = 3200 x 3200
Emission Filters	DAPI - 455nm / 50nm GFP - 525nm / 36nm Cy3 - 605nm / 52nm Cy5 - 705nm / 72nm
Supported Samples	Slides (1 x 3 and 2 x 3; No. 1.5 coverslips) Glass-bottom Dishes (35mm/60mm; No. 1.5 coverslips) Glass-bottom Multi-well Plates (all well sizes) Glass-bottom Chamber Slides (all well sizes)

Nikon N-STORM Super Resolution Microscope



Instrument Description

The Nikon "Storm" system is an N-STORM super resolution microscope, capable of achieving 20nm XY and 50nm Z resolution - **10X increase in resolution over a traditional fluorescence microscope**. STochastic Optical Reconstruction Microscopy (STORM) is our most advanced imaging modality offered at the MSR and is ideal for experimental questions requiring nanoscale resolution. This instrument is capable of acquiring **up to 3 fluorescence channels** and has the optics to acquire 3D STORM images. Due to the advanced nature of STORM imaging, the MSR offers an **Assisted STORM Imaging Service** to assist users with no background in STORM. This service includes the preparation of MSR supplied STORM buffers and MSR staff performing the STORM imaging with user guidance.

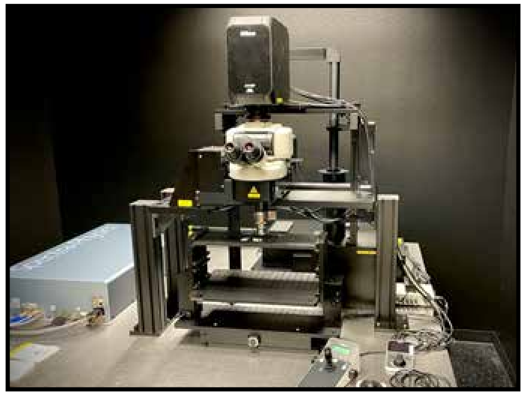
Instrument Features

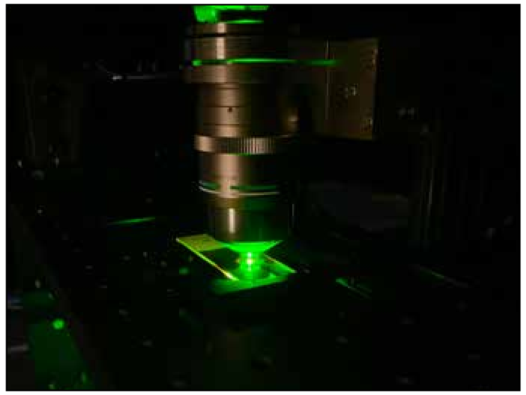
- Super resolution imaging (20nm XY and 50nm Z resolution)
- Optics to acquire up to 3 fluorescence channels (488nm / 561nm / 640nm)
- 3D STORM imaging (with astigmatism lens)
- Photoactivated Localization Microscopy (PALM) imaging for samples with photoconvertible fluorescent proteins

Instrument Details

Available Lasers	405nm / 488nm / 561nm at 100mW 640 nm at 125mW
Available Objective Lenses	20x Plan Apo (NA = 0.75; WD = 1mm; DIC) 100x Oil SR Plan Apo (NA = 1.49; WD = 120µm; DIC)
Available Camera	Andor iXon Ultra 897 Back-illuminated EMCCD sensor Pixel size = 16µm Sensor Size = 512 x 512
Emission Filters	DAPI - 455nm / 50nm GFP - 525nm / 36nm Cy3 - 605nm / 52nm Cy5 - 705nm / 72nm
Supported Samples	**IMPORTANT: Samples must in the format below** Glass-bottom Dishes (35mm) with No. 1.5 coverslips Recommended No. 1.5H coverslips Mattek P35G-0.170-14-C Unmounted samples only (store in 1x PBS)

Nikon AX R Multiphoton Microscope





Instrument Description

The Nikon "AX R MP" microscope is an upright multiphoton system ideal for intravital imaging and imaging thick (>200µm) samples. The AX R MP is equipped with **dual IR lasers** (1 tunable and 1 fixed) for fast, multichannel MP imaging and a **high-speed Resonant scanner** with up to 2K X 2K resolution. The AX R MP has the ability to acquire **second harmonics generation** for label-free imaging of collagen matrix. This system has a wide selection of objective lenses specific for multiphoton imaging, including a two water-dipping objectives (10x 0.5NA and 20x 1.0NA) and a multi-immersion 20x 1.0NA objective lens with a 8.2mm working distance. Due to the advanced nature of multiphoton imaging, the MSR offers an **Assisted Multiphoton Imaging Service** to assist users with no background in MP imaging.

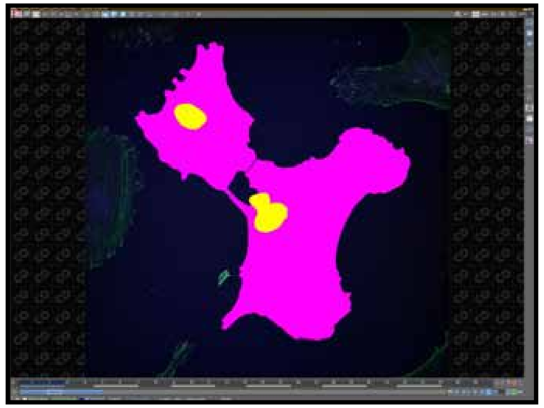
Instrument Features

High-speed imaging with Resonant scanner
Dual IF lasers (1 tunable and 1 fixed) for fast multichannel MP imaging
Second harmonics generation for label-free imaging of collagen matrix
Piezo stage with 800µm travel for precise, high-speed zstack imaging
Prior motorized XYZ desk with metric breadboard to accommodate custom intravital setups

Instrument Details

Available Lasers	InSight X3+ Tunable Ti:S Laser: 820nm - 1300nm InSight X3+ Fixed Laser: 1045nm
Available Objective Lenses	10x Glyc Plan Apo (NA = 0.5; WD = 5.5mm) 20x Plan Apo (NA = 0.75; WD = 1.0mm) 20x W Apo (NA = 1.0; WD = 2.8mm) 20x Glyc (NA = 1.0; WD = 8.2mm)
Available Detectors	GaAsP PMT (with fixed 405nm Dichroic Mirror) GaAsP PMT (with fixed 488nm Dichroic Mirror) GaAsP PMT (with fixed 594nm Dichroic Mirror) GaAsP PMT (with fixed 685nm Dichroic Mirror)
Emission Filters	DAPI/SHG - 450nm / 50nm GFP - 525nm / 50nm RFP/Far Red - 600nm / 50nm and 650nm Long Pass
Supported Samples	Slides (1 x 3 and 2 x 3) Dishes (60mm only) Custom intravital imaging setups Prior H189 motorized stage desk; metric breadboard

MSR Image Analysis Workstation



Instrument Description

The MSR Image Analysis Workstation is a dedicated analysis computer offered to users conducting analysis of imaging datasets. While this workstation provides a streamlined workflow when acquiring images on Nikon microscopes offered in the MSR, users acquiring images outside of the MSR (i.e. images acquired on non-Nikon systems) can also perform image analysis on this workstation. The MSR offers 3 servies related to image analysis: **Image Analysis Training**, **Image Analysis Script Development**, and **Image Analysis Full Service**. Please refer to our **Instrument and Service Rates document** for a full description of each service. If you are interested in using this instrument, please contact the MSR Manager (marco@arizona.edu) for access.

Instrument Rates

All Image Analysis Services	$50/hr (UArizona) $75/hr (Non-Profit) $100/hr (For-Profit)	**Unassisted Use**	$0/hr

Instrument Details

Computer Name	COM-05162
OS	Windows 10 Enterprise
CPU	Intel Xeon 3.7GHz (8 cores)
GPU	NVIDIA Quadro RTX 4000 8GB
Memory	128GB DDR4 2666MHz
Storage	1x **512GB** M.2 Turbo SSD 1x **1TB** M.2 Turbo SSD 1x **6TB** HDD
Available Software	Nikon NIS Elements AR ImageJ/Fiji QuPath Cell Profiler

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Instrument and Service Rates

Service Name	Description	Rates
Microscope Training/ Training Refresher	Training for the Crest, AX R, and SoRa confocal microscopes. Training generally takes 2 -4 hrs, depending on familiarity with the imaging technique, Nikon hardware, and software.	$110/hr (UArizona) $160/hr (Non-Profit) $220/hr (For-Profit)
Assisted Confocal Imaging Service	MSR staff performs imaging for users, based on user-specified parameters. Assisted imaging is available for the Crest, AX R, and SoRa confocal microscopes.	$110/hr (UArizona) $160/hr (Non-Profit) $220/hr (For-Profit)
Assisted STORM Imaging Service	MSR staff provides assisted STORM imaging for users with no background in STORM. This includes guidance with fluorphore selection, STORM imaging buffer preparation, and STORM image acquisition with user guidance.	$150/hr (UArizona) $220/hr (Non-Profit) $300/hr (For-Profit)
Assisted Multiphoton Imaging Service	MSR staff provides assisted Multiphoton imaging for users with no background in MP. This includes objective len calibration, alignment of tunable and fixed lasers, and setup of ancillary equipment.	$150/hr (UArizona) $220/hr (Non-Profit) $300/hr (For-Profit)

Instrument Name	Rates
Nikon Crest Spinning-Disk Confocal Microscope **Nikon AX R Laser-Scanning Confocal Microscope** **Nikon SoRa Spinning-Disk Confocal Microscope**	**Trained Users:** $35/hr (UArizona) $55/hr (Non-Profit) $70/hr (For-Profit)
Nikon BioPipeline SLIDE High-Content Microscope Offered as a MSR service only	**Slide Scanning Time** Time required to scan slides. **$15/hr (UArizona)** **$20/hr (Non-Profit)** **$30/hr (For-Profit)** **Imaging Specialist Time** Time required to setup imaging workflow, clean slides (if needed), and process/export data. **$110/hr (UArizona)** **$160/hr (Non-Profit)** **$220/hr (For-Profit)**
Nikon N-STORM Super Resolution Microscope	**$110/hr (UArizona)** **$160/hr (Non-Profit)** **$220/hr (For-Profit)** Experienced users only: Users that plan to regularly use this instrument and supply all STORM imaging buffers can contact the MSR Manager (marco@arizona.edu).
Nikon AX R Multiphoton Microscope	**$110/hr (UArizona)** **$160/hr (Non-Profit)** **$220/hr (For-Profit)** Experienced users only: Users that plan to regularly use this instrument, can contact the MSR Manager (marco@arizona.edu).

Microscopy Shared Resource

Instrument and Service Rates

Service Name	Description	Rates
Overnight Imaging (6pm - 8am)	Users that need to perform extended live cell imaging or automated imaging routines can schedule Overnight Imaging as a block of time (14hrs). Imaging that occurs before and after Overnight Imaging is charged at the Trained User rate.	$140 (UArizona) $220 (Non-Profit) $280 (For-Profit) Service is charged as a 14hr block/night
Image Analysis Training	MSR staff trains users on how to use image analysis platforms to build their own analysis pipeline. Currently, MSR is training users in ImageJ/Fiji, QuPath, and Nikon NIS Elements software platforms.	$50/hr (UArizona) $75/hr (Non-Profit) $100/hr (For-Profit)
Image Analysis Script Development	MSR staff develops an image analysis script for users to perform semi- to fully-automated image analysis. MSR staff meets with users to design a custom analysis script based on quantification needs Currently, the MSR develops analysis scripts in for users in either QuPath or Nikon NIS Elements.	$50/hr (UArizona) $75/hr (Non-Profit) $100/hr (For-Profit)
Image Analysis Full Service	MSR staff performs all image analysis and data export based on user-specified quantification needs. Analysis will be performed in either QuPath or Nikon NIS Elements, depending on the complexity of the analysis.	$50/hr (UArizona) $75/hr (Non-Profit) $100/hr (For-Profit)

FAQs

1. Can I bring live, biological samples to the MSR? Are there incubators or biosafety cabinets available for use?

a. Yes. The MSR supports live samples (up to BSL2 level) and users have access to 70% ETOH, paper towels, and nitrile gloves in each microscope room. Furthermore, all trained MSR users will have access to the MSR laboratory (UACC 0979) which includes a cell culture room with CO2 incubators, 37° bead bath, 4° fridge and -20° freezer, and general lab items (centrifuges, vortexes, micropipettes, etc.)

2. Do I need previous microscope experience to use the microscopes available at the MSR? Are there any training materials that I need before training?

a. No. Users are not required to have any background in the imaging method being utilized on the microscopes. Microscope training meets users where they are and is designed to make users fully independent.

3. I have used a confocal microscope before, do I still need training?

a. Yes. All new users to the MSR will undergo instrument training regardless of previous experience. This is to ensure that all users have been trained the same way before using MSR microscopes. However, the training scales to a user's experience level and users with prior experience will be trained in less time.

4. What sample types (slides, dishes, chamber slides, multiwell plates, etc.) are compatible on MSR microscopes?

a. Supported sample types for each instrument vary, however, the details for each instrument (including supported samples) can be found in the "Learn More" section for each microscope.

5. Is there night and weekend access for MSR users?

a. Yes. All trained users have 24/7 building and room access and can schedule time on MSR confocal microscopes at any time. Building and room access will be made available during the training process.

6. Are there different microscope rates at different times of the day/week?

a. Yes. There are two different rates for trained users when using any of our 3 confocal microscopes – Unassisted and Overnight Imaging. The Unassisted rate ($35/hr) is from 8am – 6pm and the Overnight Imaging ($10/hr) is from 6pm – 8am, Monday – Sunday (no weekend rate). This rate change happens automatically in iLabs and does not need to be specified by the user when making the reservation. For full dvetails regarding our rates for each instrument, please visit our iLabs page and log in using your UA credentials (https://ua.ilab.agilent.com/service_center/6084/?tab=about).

Microscopy Shared Resource

Management

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For instrument training, or for more information on any of the MSR's services, please contact Marco Padilla-Rodriguez at marco@arizona.edu