FRALIN LIFE SCIENCES INSTITUTE
VIRGINIA TECH

Facility for Advanced Imaging & Microscopy

OVERVIEW

The Faciltiy for Advanced Imaging and Microscopy (FAIM) is dedicated to light microscopy needs, including confocal and super resolution. The mission of FAIM is to provide investigators with the tools and training required to address their specific research questions and needs.

FAIM Website

SERVICES OFFERED

Assistance

Assistance with using microscopes for untrained users who will not need much immediate imaging.

Training

Training for regular microscope users to access and operate a microscope independently.

Ongoing support for all users and potential users of the facility.

Consultations

Microscope matching — What's the right tool for the job?

Microscope trials — Does this instrument provide the images I need to answer my question?

Experimental design — How can I get started with this protocol/ project? Is it compatible with imaging?

Post-processing and analysis — How do I get started with processing and analyzing my images?

Workshops

Workshops, seminars, informational newsletters and educational resources regarding microscopy, the facility, and image processing and analysis will be regularly offered.

EQUIPMENT

Nikon SoRa

- 50µm spinning disk confocal
- 405, 445, 488, 514, 561, 594, and 640nm ex
- 2 Hamamatsu Orca-FusionBT 16-bit cameras

Nikon AXR with NSPARC and STEDYCON

- Point scanning confocal with 25mm FOV
- 405, 445, 488, 515, 561, 594, 640, and 730nm ex
- Detectors: 3 GaAsP, 1 MA PMT, 1 NSPARC array detector

STEDYCON – resolution down to 30nm

- 405, 488, 561, and 640nm ex
- 775nm pulsed STED laser
- Detectors: 3 time gated APDs

Zeiss LSM 880 – Fralin Hall

- Point scanning confocal with 20mm FOV
- 405, 458, 488, 514, 543, 594, 633nm ex
- Detectors: 2 PMTs, 1GaAsP array detector

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FRALIN LIFE SCIENCES INSTITUTE
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Flow Cytometry Lab

OVERVIEW

Flow cytometry is an essential and versatile analytical tool with numerous applications in basic research and clinical medicine. It can rapidly measure multiple characteristics of thousands of individual cells, thus quantifying different types of cells in complex, heterogeneous populations. The additional capability of cell sorting enables investigators to purify or enrich a particular cell type from a mixed population, allowing for further study.

The Flow Cytometry Laboratory is located in Steger Hall, which is part of the Fralin Life Sciences Institute.

Our services are available to all Virginia Tech faculty, staff, and students, as well as to investigators outside the University. Current and former clients include scientists in the Colleges of Science, Agriculture & Life Sciences, Engineering, Natural Resources & Environment, Veterinary Medicine, the Virginia Tech Carilion School of Medicine and Research Institute, the Edward Via College of Osteopathic Medicine, and numerous corporate entities in the New River Valley and Roanoke areas.

TECHNOLOGY HIGHLIGHTS

What is Flow Cytometry?

- Cytometry is the measurement of chemical and/or physical characteristics of cells.
- In FLOW cytometry these measurements are made as cells in fluid suspension pass one by one through a measurement apparatus, the flow cytometer.
- Traditional Flow cytometers measure fluorescence intensity and light scatter.
- Imaging cytometers measure size, shape, location, and texture in addition to intensity.
- Distinct measurements are taken from each cell in a sample, giving a distribution as opposed to an average.

How does it Work?

- Cells pass one at a time through focused laser beams.
- The light that emerges from each cell is collected.
- The collected light is evaluated by graphical presentation.
- For sorting, cells of interest are captured and purified (>98% purity in most cases).
- For imaging, pixels are tracked down the detector surface and reconstructed by the software.

EQUIPMENT

Amnis ImageStreamMark II Imaging Cytometer

The ImageStream combines the speed and objectivity of flow cytometry with the detailed imagery of microscopy to allow you to objectively and quantitatively describe biological processes based on cell size, shape, and fluorescence location, texture, and signal intensity.

This open platform enables new methods of research and improves traditional flow- and imaging-based applications. It is equipped with 405nm, 488nm, and 642nm excitation sources and is able to analyze up to twelve parameters simultaneously. It has 20X, 40X, and 60X objective lenses and Enhanced Depth of Field technology. It can process several thousand cells per second.

BD FACSARIA Fusion Flow Cytometer

The Fusion is a cell sorter that can also be used as an analyzer. It is equipped with 488nm, 640nm, and 405nm excitation sources and is equipped to analyze up to fifteen parameters simultaneously.

The Fusion is capable of processing up to 70,000 events per second and sorting up to four different cell populations at once. It is also equipped with an Automatic Cell Deposition Unit (ACDU) that allows sorting of cells into plates or onto slides.

COMMON APPLICATIONS

- Apoptosis and viability
- Cytokines
- Fluorescent proteins
- Cell sorting
- Proliferation
- Cytometric bead arrays
- Intracellular markers
- Cell receptors
- Activation molecules
- Cell counting
- DNA content & cell cycle
- Rare event analysis
- Microbial viability
- Phagocytosis

For questions, or to schedule a consultation or experiment, contact Melissa Makris at mmakris@vt.edu.

FRALIN LIFE SCIENCES INSTITUTE
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Genomics Sequencing Center

OVERVIEW

The Fralin Life Sciences Institute Genomics Sequencing Center (GSC) at Virginia Tech is a dedicated multi-user resource for the development and application of Next-Generation Sequencing (NGS) technologies.

CONSULTATION

- Experimental design
- Grant support
- DNA/RNA prep & submission
- Training & teaching
- DNA/RNA QC & approval

TECHNOLOGIES

- Illumina NovaSeq 6000
- Illumina NextSeq 2000
- Illumina MiSeq
- Oxford Nanopore Promethion 24
- ABI 3730 for Sanger
- Vii7 for qPCR

PromethION 24

NextSeq 1000

10X Chromium

NovaSeq

MiSeq

ABI 3730

ABI Vii7

APPLICATIONS

- Whole-Genome
- Methylation
- Transcriptome (mRNA, Total RNA, small RNA)
- Long Read Sequencing
- Metagenome (165, Shot-Gun)
- Low Input, Degraded samples
- Single Cell RNA Seq

CONTACT INFORMATION

Megan Naff
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For Next-Gen Sequencing
Megan Naff and Jennifer Jenrette
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For Sanger Sequencing
Kristin Lee
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LOCATION:
Steger Hall | Room 220
1015 Life Science Circle | Blacksburg, VA 24061
***Ask for the GSC at the 2nd floor administrative suite**

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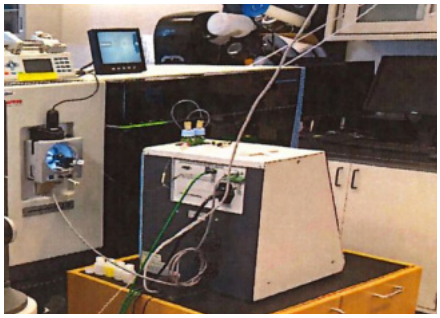
Mass Spectrometry Incubator

OVERVIEW

Mass spectrometry tools are used for the analysis and quantification of proteins (proteomics) and small molecules (metabolomics).



Proteomics

Services

- Gel band identification
- Untargeted/Bottom-Up Proteomics (label-free)
- Targeted Proteomics
- Post-translational modifications (phosphoproteome, acetylome)

Instrumentation

ThermoFisher Orbitrap Fusion Lumos with ETD — A tribrid MS interfaced with an EASY nLC1200. Resolving power up to 500,000 FWHM and acquisition rates of up to 20 Hz for both Orbitrap and linear ion trap MS^n analyses. Front end ETD feature for peptide PTM analyses. PharmaFluidics □PAC™ pillar array columns and interface.

Small Molecules

Services – High Resolution

- Metabolites - Untargeted profiling of biological samples
- Lipidomics - Profiling of the lipids
- Accurate mass analysis. Mass within 5 PPM both MS and MSMS fragmentation available

Services – Quantitative/Targeted

- PFAS (EPA Draft Method 1633)
- Amino acids, Auxin, Steroid hormones
- Custom method development available

Instrumentation

Shimadzu LCMS9030 with a Nexera LC40 UPLC. QTOF for high resolution work (30,000 FWHM). Dual Ionization Source (ESI and APCI).

Waters Synapt G2-S HDMS with an Acquity I-Class UPLC. A high-resolution hybrid QTOF instrument (30,000 FWHM) with ion mobility capabilities.

Shimadzu LCMS8060 with a Nexera LC30 UPLC. Triple quadrupole for targeted and quantitative analyses. ESI probe. System also has a photodiode array (UV) detector available (LC-UV).

Hybrid Instrument

Bruker timsTOF fleX MALDI-2 with a Vanquish Neo UPLC — Collaboration with the NSF Materials Innovation Platform User Faciltiy (GlycoMIP). Mass range: 20-40,000m/z, Acquisition rate: >100 Hz in PASEF mode, Mass resolution: 60,000; Mass accuracy: less than 2 ppm (external std). MALDI and ESI options (Thermo Neo Vanquish UPLC).

Mass spectrometry imaging -- tissue analysis for location of specific species (10mm resolution).

CONTACT INFORMATION:

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Keith Ray – wkray@vt.edu

COLLEGE OF SCIENCE VIRGINIA TECH
CENTER FOR BIOSTATISTICS AND HEALTH DATA SCIENCE

FRALIN LIFE SCIENCES INSTITUTE VIRGINIA TECH

Center for Biostatistics and Health Data Science

OVERVIEW

The mission of the Center for Biostatistics and Health Data Science (CBHDS) is to achieve excellence in Virginia Tech's health- and medically-related research portfolio through fostering collaborations across biostatistics, data science, health analytics, computer science, engineering, bioinformatics, biology, database management and integration, project coordination, clinical practice, health economics, translation and public policy.

The Center seeks to accomplish this mission through the following means:

- Identify, integrate and coordinate expertise and resources pertinent to the areas of biostatistics, statistics, health analytics, data science, epidemiology, data management, informatics, health economics, etc. to provide a central support hub for health- and medically-related research.
- Promote the use and awareness of appropriate contemporary analytic methods in health- and medically-related research projects.
- Provide training and mentorship to statisticians, analysts, and data scientists relative to communication and collaboration with biomedical and health researchers.
- Through effective interdisciplinary collaboration, gain an understanding of disease etiologies, adopt effective treatment and prevention strategies, and positively impact mental health, physical health and quality of life.

Alexandra L. Hanlon, Ph.D.

Director, Center for Biostatistics and Health Data Science

Co-Director, iTHRIV Biostatistics, Epidemiology, and Research Design (BERD) Methods Core

Associate Professor of Practice, Department of Statistics

For more information, please scan the QR code, visit https://biostat.centers.vt.edu/, or email biostats@vt.edu

4 Riverside Circle,
Roanoke, VA 24016

CBHDS: Resources

For more information please scan the QR code

CBHDS offers a variety of biostatistics and bioinformatics resources both internal and external to Virginia Tech. Our resources are funded by institutional support, the NIH CTSA iTHRIV grant mechanism, direct grant, and contract support.

- Institutional and CTSA funds provide support for grant preparation, short-term consultation, and other in-kind resources.
- Direct support is provided for CBHDS faculty and staff named as co-investigator or key personnel on grants/contracts with NIH, other agencies, foundations, and industry partners.

CBHDS: Biostatistics

Christopher Grubb, Ph.D., Research Scientist,
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CBHDS focuses on providing collaborative statistical support for experimental design, survey design and execution, data management planning, statistical analysis planning, and subsequent analysis for researchers in the biomedical domain. Our expertise and efforts cover the full lifecycle of research experimentation, from preliminary design, to initial data collection and quality reporting, to advanced statistical modeling, analysis, and visualization.

CBHDS: Epidemiologic Methods

Rachel Silverman, Ph.D., Research Scientist,
rsilverman@vt.edu

CBHDS applies quantitative epidemiology to study design & implementation, data collection, management, analyses, interpretation, & dissemination, and application of health-science research focused on populations.

Data-driven and systematic approachs to minimize biases when:

- Assessing and comparing disease risk, incidence, and prevalence.
- Identifying correlations and potential risk factors, confounders, mediators, and effect-modifiers.
- Assessing effectiveness of an intervention.
- Assessing test accuracy & reliability.
- Designing mathematical models.

CBHDS: Bioinformatics

Xuemei Missi Zhang, Ph.D., Research Scientist,
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The CBHDS Bioinformatics team has a unique and diverse set of skills and expertise. We are committed to understanding your biological research questions and the experimental design and techniques that you plan to apply. This diverse set of skills and expertise is important for successfully meeting the needs of our client collaborators in various fields including neuroscience, life sciences, animal science, food science, plant science, oncology, etc. We strive to support various research communities and to meet different research needs through collaborating with internal and external researchers and students.