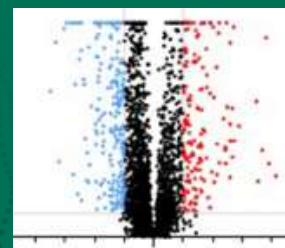
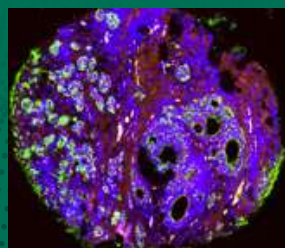
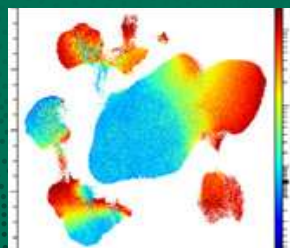


UVM LARNER COLLEGE OF MEDICINE

CENTER FOR BIOMEDICAL SHARED RESOURCES

FIRESTONE MEDICAL RESEARCH BUILDING



RESEARCH IS AT OUR CORE

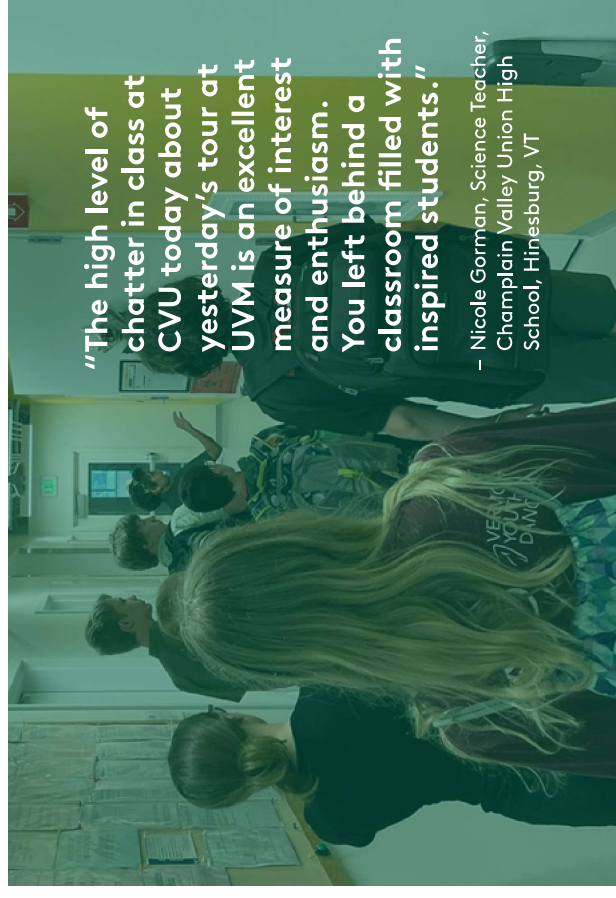
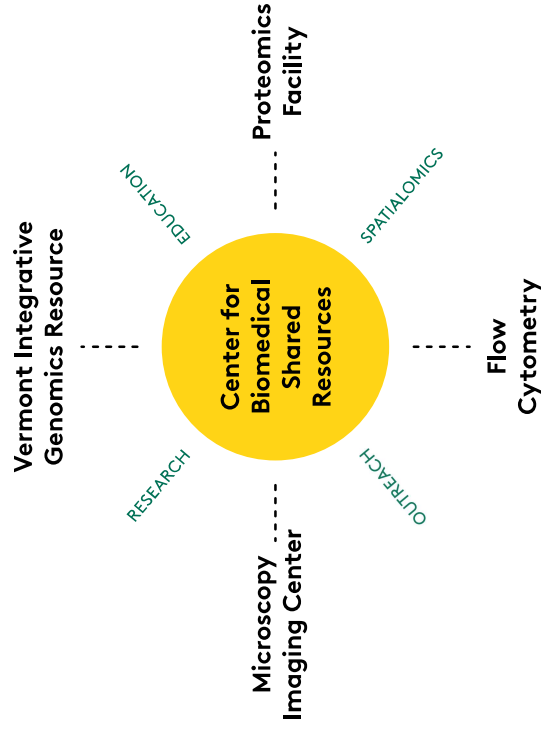
Overview

Northern New England is among the most rural in the U.S., and is home to many exceptional scientists. One of their ongoing challenges is access to cutting-edge and sustainable research resources that provide staff with the necessary support to advance research and enhance collaborations.

To address this challenge, the University of Vermont (UVM), an institution of research excellence that serves the region and beyond, has created a new center — the Center for Biomedical Shared Resources (CBSR) — that integrates shared resource cores and capabilities in its new Firestone Medical Research Building.

The CBSR uses an innovative, dynamic, integrated model of cores based on team science. This pioneering approach and its associated technologies allow faculty, students, and investigators throughout the region to foster interdisciplinary collaborations and advance world-class discoveries. The CBSR cores collaborate in projects of “spatialomics.”

This new model lies at the heart of CBSR, building on the collaboration of investigators, scientists from multiple disciplines, and a leadership team with diverse, yet complementary, skills and expertise. Through merging scientific expertise and technologies with innovative leadership, the CBSR achieves economies of scale, reduced costs, and enhanced sustainability of the shared resource facilities. Through cross-core collaborations, the CBSR fosters emergent methodologies with support for innovative research design, analyses, education, and training benefitting hundreds of investigators and trainees throughout Northern New England and beyond. This is an approach that cost-effectively provides unique and critical services, spurring world-class developments in biomedical and health care delivery research.



“The high level of chatter in class at CVU today about UVM is an excellent measure of interest and enthusiasm. You left behind a classroom filled with inspired students.”

– Nicole Gorman, Science Teacher,
Champlain Valley Union High
School, Hinesburg, VT

Education and Outreach

The Center for Biomedical Shared Resources is a state-of-the-art center designed to support and amplify a wide range of complex research needs.

A central tenet of the CBSR is to provide comprehensive design consultation, appropriate methodology selection (both current and emerging), technical and analytical assistance, as well as support for publications and grant applications for both higher education and commercial clients.

The CBSR leverages complementary world-class technologies and expertise, while fostering innovative and collaborative approaches to research design and practices. As an education and training hub, programs and courses are developed and provided through expanded outreach, webinars, existing networks, regional programs, remote consultation, and training opportunities. CBSR’s integrated educational program is unique, providing support to students and investigators throughout the region.

This comprehensive, integrated service ensures access to cutting-edge and sustainable components of the research ecosystem, to support investigators throughout the region and all stages of their research.

Inside:

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- 5 Microscopy Imaging Center
- 6 Vermont Biomedical Research Network Proteomics Facility
- 7 Vermont Integrative Genomics Resource

Flow Cytometry and Small Particle Detection Facility

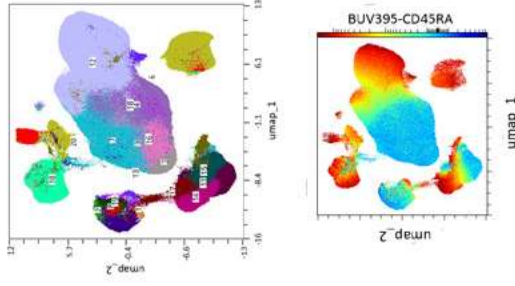
Roxana del Rio-Guerra, Ph.D.,
SCYM, Director
roxana.del-rio@med.uvm.edu

The Harry Hood Bassett Flow Cytometry and Small Particle Detection facility is designed as a multi-user resource for the high-speed analysis, cell sorting, and characterization of small particles. The facility has the technical and scientific expertise to provide for the strategic designing, validating, implementing, and analyzing of multicolor flow cytometry experiments for a wide variety of preclinical and clinical research, including but not limited to immunophenotype, functional assays (e.g., proliferation, cytokine production, cell maturation/differentiation, viability), DNA cell cycle analysis, flowRNA, cell sorting on bulk or single cell for transcriptomic analysis (e.g., 10X Genomics). We foster collaborations and develop methods to address the future needs of our users.

The facility is equipped with four cytometers: the Beckman CytoFlex (B/2, R/2), MACSQuant VYB (V/2, B/2, Y/4), and Cytek Aurora (UV/V/B/R, 54 channels) analytical cytometers, as well as the BD FACS Aria III high-speed cell sorter (V/5, B/2, Y/4, R/2). FACS Aria III can operate for Bio-Safety level II samples. The facility houses the Particle Metrix ZetaView Twin NTA. This is a nanoparticle tracking analyzer to measure concentration, fluorescence, electrophoretic mobility, and sub-populations of individual nanoparticles, such as extracellular vesicles (EVs), exosomes, viruses, or virus-like particles (405/488 nm, 2 LP filters).

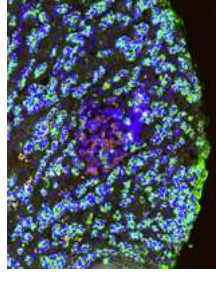
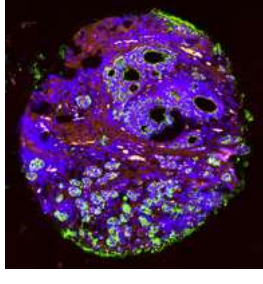
Services include:

- Training analyzers (cytometers and NTA)
- Training in flow cytometry analysis (FlowJo software)
- Absolute cell counting
- Cell viability
- Multicolor panel design and standardization
- Data analysis and interpretation
- Size, concentration, and zeta potential of nanoparticles
- Cell sorting (bulk and single cell for genomic assays)



Microscopy Imaging Center

The Microscopy Imaging Center (MIC) is dedicated to assisting investigators in all aspects of sample preparation, as well as collection and analysis of images for biological and materials research applications. The MIC consists of multiple microscopy-based imaging systems and state-of-the-art technology for image analysis, providing rigorous, quality-assured, morphologically oriented services for clients. Please visit med.uvm.edu/mic for a full list of instruments. The MIC is staffed by experienced laboratory technologists and research professionals who can provide guidance with experimental design, sample preparation, tissue sectioning, high-resolution microscopy-based imaging, and data analysis and interpretation.



Services include:

- Morphologic services and consultation at the light and electron microscopy level
- No-cost training for labeling procedures, equipment use, and image analysis
- Light and electron microscopic immunocytochemistry
 - Fluorescence, peroxidase, colloidal gold
- Multiplex staining
 - Akoya Phenocycler
 - Nanostring GeoMx
 - Nikon A1R confocal with spectral detector
- Preparation of paraffin and frozen sections
- Special histological staining
- Testing of new antibodies, optimizing immunohistochemical protocols, and developing new staining techniques
 - Manual staining or automated with Leica BOND RXm autostainer
- Morphometry and stereology
- Image analysis
 - Indica Labs HALO, MetaMorph, Velocity, ImageJ, NIS Elements
- Collaborative grant preparations for equipment procurement

Vermont Biomedical Research Network Proteomics Facility

Ying Wai Lam, Ph.D.
Director
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The Vermont Biomedical Research Network (VBRN) proteomics facility enables investigators to use an array of state-of-the-art mass spectrometry-based techniques for proteomics experiments. These range from routine protein identification and characterization of post-translational modifications and protein interactions to large-scale quantitative proteomic analyses using stable isotopes.

Since its inception in 2006, the facility has worked with more than 100 internal and external users each year, supported 190+ publications, and 50+ grants from various funding agencies.

The facility is equipped with newly installed mass spectrometers, (Orbitrap Eclipse Tribrid, and Exploris 240) and has proven expertise in training investigators in experimental design and proteomics methods, while assisting with data interpretation, manuscript preparation, and grant submission. Central to our mission is our ongoing practice of developing collaborations and methods to address future user needs (e.g. structural proteomics). We have helped incorporate proteomics into undergraduate curricula at many Vermont colleges, and recently established a robust internship program to prepare undergraduates for careers in STEM.

Services include:

- Identification of target proteins, protein interacting partner, and post-translational modifications
- Large-scale quantitative proteomics (differential proteomes, interactomes, and PTMs) using stable isotopes — SILAC, dimethyl labeling, Tandem Mass Tags (up to 18 plex)
- Absolute quantification of proteins using isotopically labeled standards
- Quantification of target peptides using Parallel Reaction Monitoring and Skyline

Funding

The VBRN Proteomics Facility (RRID: SCR_018667) is supported partly through NIH P20GM103449 from the IDeA (Institutional Development Award) Networks of Biomedical Research Excellence (INBRE) Program of the NIGMS.

Vermont Integrative Genomics Resource

Julie Dragon, Ph.D.
Director
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The Vermont Integrative Genomics Resource (VIGR) offers a full range of genomics and bioinformatics services, including consultation for experimental design, data generation, troubleshooting assays, full service to bioinformatics analyses, and support for data management and publication.

Advanced Genome Technologies Core (AGTC) employs the most current instrumentation including:

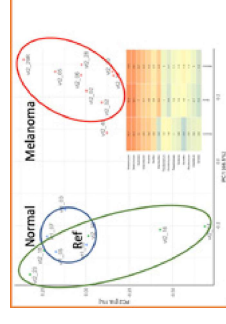
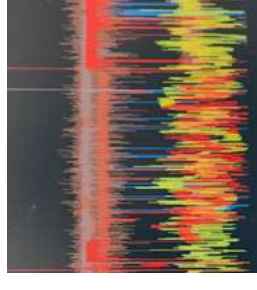
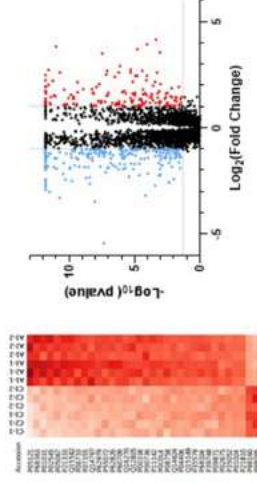
- High-throughput sequencing of whole genomes, amplicons, direct RNA, metagenomics and microbiome, and small RNAs, using the Singular G4 sequencer plus the Illumina MiSeq sequencer for short reads or the Oxford Nanopore GridION and PromethION2 Solo for long read sequencing
- Single-cell genomic analysis using the 10x Single Cell Genomics System
- Chromosome conformation capture, ddPCR, and qPCR

In addition, ATGC provides a wide array of nucleic acid-based services including DNA/RNA extraction, PCR and PCR troubleshooting, primer design, human cell line authentication, quantitative PCR, nucleic acid and protein quantification.

Bioinformatics Shared Resource (BSR) provides cutting edge bioinformatics analysis that includes data processing, visualization, archival storage, and deposition in public repositories. Services also include:

- Nextgen and third-generation sequence alignment and quantification
- Variant calling and comparative expression and pathway analysis
- Model development, machine learning, advanced data mining, and data science training

BSR uses nextflow-core standardized, containerized pipelines as well as custom pipelines, provide custom reports, text describing methodology, manuscript-quality figures, and assistance in the deposition of data into public databases. BSR implements new bioinformatics tools to support analyses of multiple and integrated data types and leverages the Vermont Advanced Computing Cluster (VACC) for high performance computing ("bluemoon" cpu and "big green" gpu) and data storage.



CBSR Clients

AI BIOSCIENCES, INC.	HAZELETT STRIP-CASTING CORPORATION	ST. MICHAEL'S COLLEGE
AGILENT TECHNOLOGIES	HOUSTON METHODIST HOSPITAL	SUPERIOR TECHNICAL CERAMICS
ALBANY COLLEGE OF PHARMACY AND HEALTH SCIENCES	IIB-INTECH	THE WILLIAM H. MINER AGRICULTURAL RESEARCH INSTITUTE
ALNYLAM PHARMACEUTICALS	JET PROPULSION LABORATORY	TUFTS UNIVERSITY
ANALYTICAL SERVICES, INC.	JOHNS HOPKINS UNIVERSITY	UVM MEDICAL CENTER
BETA TECHNOLOGIES	LIV PROCESS, INC.	UMEA UNIVERSITY
BIOMOSAICS INC.	LYNDON STATE COLLEGE	UNIVERSITY OF COLORADO
BIOMEDICAL RESEARCH INSTITUTE OF NEW JERSEY	MAINE MEDICAL CENTER RESEARCH INSTITUTE	UNIVERSITY OF CONNECTICUT
BIOTEK INSTRUMENTS	MAINE MEDICAL CENTER-MAINEHEALTH	UNIVERSITY OF HAWAII AT MANOA
CHAMPLAIN CABLE CORPORATION	MIDDLEBURY COLLEGE	UNIVERSITY OF MAINE
CLARKSON UNIVERSITY	MISSISSIPPI STATE UNIVERSITY	UNIVERSITY OF MASSACHUSETTS AMHERST
COLORADO STATE UNIVERSITY	MONTANA STATE UNIVERSITY IN BOZEMAN	UNIVERSITY OF MASSACHUSETTS MEDICAL SCHOOL
COLD REGIONS RESEARCH AND ENGINEERING LABORATORY (CRREL)	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)	UNIVERSITY OF NEW HAMPSHIRE
CORNELL UNIVERSITY	NRG SYSTEMS	UNIVERSITY OF NORTH DAKOTA
DEKA RESEARCH AND DEVELOPMENT	NATIVEENERGY	UNIVERSITY OF ROCHESTER
DARTMOUTH	NEW MEXICO STATE UNIVERSITY	UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) - U.S. FOREST SERVICE
DARTMOUTH HITCHCOCK MEDICAL CENTER	NEW YORK INSTITUTE OF TECHNOLOGY	VT DEPARTMENT OF HEALTH
EMERSON ELECTRIC	NICHEVISION FORENSICS, LLC	VT FISH & WILDLIFE
FIBERSTAR, INC.	NORWICH UNIVERSITY	VERNAL BIOSCIENCES
FOOD SCIENCE CORPORATION	NOVARTIS INSTITUTES FOR BIOMEDICAL RESEARCH	VIRGINIA COMMONWEALTH UNIVERSITY
GENERAL MILLS, INC	PERRIGO NUTRITIONALS	WEILL CORNELL MEDICINE
GEORGETOWN UNIVERSITY	QUANTASPEC	WEST VIRGINIA UNIVERSITY
GREEN MOUNTAIN COLLEGE	SUNY PLATTSBURGH	
GREENLAND INSTITUTE OF NATURAL RESOURCES	SEPTERNA	

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