MEMORANDUM OF UNDERSTANDING AMONG ACADEMIC RESEARCH INSTITUTIONS REGARDING RECIPROCAL ACCESS TO SHARED RESOURCES

BACKGROUND

This Memorandum of Understanding ("MOU") is entered into by and between the eleven undersigned academic research institutions: Christopher Newport University, William & Mary, Eastern Virginia Medical School, George Mason University, James Madison University, Norfolk State University, Old Dominion University, University of Virginia, Virginia Commonwealth University, Virginia Polytechnic Institute and State University, and Virginia State University (individually an "Institution" and collectively, the "Institutions"). The Institutions enter into this agreement to enhance collaboration, cooperation and interaction between public institutions of higher education within the Commonwealth of Virginia in a manner that effectively and efficiently uses existing resources at each Institution. The Institutions believe that such collaboration will be facilitated by execution of this MOU, which supersedes the prior MOU effective June 22, 2017.

The Institutions have individually made significant investments to acquire specialized equipment and establish unique research cores supporting basic and clinical research. To further enhance the availability of these existing resources, the Institutions seek to share, in an economical manner, specialized technical services and access to equipment and expertise for research purposes.

This MOU sets forth the understanding of the Institutions concerning reciprocal access to shared resources. The purpose of the MOU is to document (a) the intent of each Institution to provide reasonable access, as capacity will permit, to its specifically identified shared resources and (b) the policies and conditions governing such access. For purposes of this MOU, "Shared Resources" means the research equipment and expertise, cores, facilities and/or services specifically identified by an Institution that shall be made available to the other Institutions pursuant to this MOU.

I. General Understanding:

A. The Institutions shall cooperate in good faith to encourage access to each Institution's respective Shared Resources, for research purposes. Pursuant to the MOU, an Institution may designate investigators as those faculty

members of an Institution who seek to use Shared Resources in support of research ("Investigators").

1. Each Investigator must be a member of the faculty, or under the direct supervision of such a faculty member, at his/her respective Institution. Each Institution shall appoint a Shared Resource Director who will serve as an Institutional point of contact for requests to use Shared Resources.

2. Investigators desiring to use a Shared Resource at another Institution must first contact the appropriate Shared Resource Director at the other Institution to confirm availability of access and learn of any specific policies governing access. Once this is done, the point of contact at both Institutions should be notified that samples and/or data will be sent and to arrange for billing information to be provided.

3. Fees charged to an Institution by another Institution shall equal the fees charged to the Investigators at their own Institution for internally funded activity. Further, the fees charged shall not include, and shall be in addition to, any expense properly allocated by the providing Institution as an indirect cost on Subawards or Subcontracts, in accordance with the providing Institution's indirect cost rate agreement.

4. Each Institution shall invoice for use of a Shared Resource as requested by each Investigator, with the requesting Investigator providing appropriate billing information to the Institution before the Shared Resource is provided, as set forth in this MOU.

5. The Institutions shall review performance under this MOU biannually, and based on such review shall propose appropriate amendments to the MOU, including but not limited to soliciting other higher education institutions within the Commonwealth of Virginia to become signatories to this MOU. Any amendments to this MOU shall be binding as to an Institution only upon the execution of such amendment by a duly authorized signatory of the Institution.

B. Each Institution shall give priority for use of Shared Resources to Investigators at their home Institution. An Investigator at an Institution wishing to use a Shared Resource at another Institution may do so on an 'as available' basis. Investigators shall have priority for Shared Resource

access at their home Institution. As availability permits, Investigators shall have access to the Shared Resources of other Institutions. In special recognition of the frequently irreplaceable nature of samples housed within a Shared Resource primarily concerned with acquisition and distribution of clinical tissue samples (i.e., a biorepository), access to tissue samples from an Institution will require a determination by the respective scientific director of such resources at such Institution that granting access will not disruptively impact the potential future needs of investigators at the home Institution.

C. This MOU extends to the Shared Resources at the respective Institutions as indicated on Exhibit B and as may be updated by an Institution.

D. Additional Institutions wishing to participate in this MOU can do so, subject to approval by the majority of the current Institutions and agreeing to this MOU by executing the Shared Resources Member Addendum in a form substantially similar to the one attached as Appendix A.

II. Term; Renewal; Termination

A. This MOU shall be effective as of July 1, 2022 (the "Effective Date"), and shall remain in full force and effect until the 5th anniversary of the Effective Date, unless terminated earlier in accordance with this MOU. Unless terminated earlier, this MOU shall automatically renew for additional five-year terms.

B. An Institution may terminate this MOU at will solely with respect to such Institution by providing 60 days advance written notice to the other Institutions.

III. Administration:

A. Investigators who seek to use a Shared Resource shall contact the specific Shared Resource Director and the Administrator at their home Institution as set forth on Exhibit A attached hereto. Before services are provided, the ordering Institution will provide order information to the supplying Institution. The point of contact at the supplying Institution will be responsible for submitting an invoice for payment for services provided to Investigators and for providing copies of the invoices to the point of contact

at the ordering Institution. Shared Resource Directors will keep a log of all reciprocal users.

B. Each Institution will have an oversight committee to review usage capacity. If an Institution determines, in its sole discretion, that another Institution is making excessive use of Shared Resources, that Institution shall notify the relevant Administrator and the two Institutions shall work in good faith to reach an understanding about future usage of Shared Resources. Such understanding may include a temporary or permanent moratorium on such usage of Shared Resources. If the relevant Institutions cannot reach an understanding, the Institution providing the Shared Resources may terminate this MOU with respect to the relevant Institution only, and/or with respect to specific Shared Resources. Such termination of access rights shall be made in a writing delivered to the Administrator of the Institution being denied access rights.

C. Investigators from the Institutions will be invited to attend annual Shared Resource Retreats to be held at times and locations to be mutually agreed upon by the Institutions.

IV. Intellectual Property:

A. Except in making the Shared Resources known to faculty, no Institution may use the other Institutions' names, logos or marks, or any derivative thereof, without the prior written permission of the Institution whose name, logo or marks, or derivative thereof, are proposed to be used.

B. Ownership and other rights in and to intellectual property of the Institutions shall not be affected by this MOU. The Institutions intend for ownership of intellectual property rights to vest in the employer of the individual inventors and/or authors according to the intellectual property policy of the Investigator's institution. Unless otherwise agreed to in a writing signed by duly authorized representatives of an Institution, mere usage of a Shared Resources shall not entitle the provider of the Shared Resource to any ownership or usage rights of intellectual property belonging to another Institution.

C. All right, title and interest in and to any data generated by the provider of the Shared Resources in performance of work for another Institution shall vest exclusively in the Institution paying for or receiving such Shared Resources (the "Requesting Institution"). Unless otherwise expressly agreed to by the Requesting Institution, any data generated by the provider of the Shared Resources as a result of performing work for

the Requesting Institution shall not be retained by the provider Institution, but shall instead either be sent to the Requesting Institution or destroyed per the instructions of the Requesting Institution.

V. Liability and Insurance:

A. No Institution is, by virtue of this MOU, the agent of any of the other parties to this MOU, and no Institution shall be liable for the wrongful acts or negligence of the other parties to this MOU. Each Institution understands that use of the other Institutions' Shared Resources may involve exposure to potentially hazardous conditions.

B. IN NO EVENT SHALL ANY PARTY TO THIS MOU BE LIABLE TO ANOTHER PARTY HERETO FOR INCIDENTAL, SPECIAL, INDIRECT, LOST PROFITS, LOST REVENUE, LOST OPPORTUNITY OR CONSEQUENTIAL LOSS, DAMAGE OR EXPENSE ARISING FROM OR IN RELATION TO THIS MOU.

VI. Confidentiality:

A. Each Institution agrees not to disclose, except as required by law, to any third party or to use, directly or indirectly, for a period of five years after disclosure, any proprietary and confidential research data or other similar information of which the Institution may become aware as a result of using Shared Resources of the other Institutions, or as a result of having other institutions use its Shared Resources. For the avoidance of doubt, such information shall be marked "confidential" and "proprietary" at the time of disclosure.

B. Notwithstanding the preceding provision, the obligations of the Institution receiving confidential information (the "Receiving Institution") from another Institution do not include: (i) information that, at the time of disclosure, was published, known publicly, or otherwise in the public domain; (ii) information that, after disclosure, is published, becomes known publicly, or otherwise becomes part of the public domain through no fault of the Receiving Institution; (iii) information that, prior to the time of disclosure, is known to the Receiving Institution as evidenced by its written records and is not then subject to an obligation of confidentiality to any third party; or (iv) information that, after disclosure, is made available to the Receiving Institution in good faith by a third party under no obligation of confidentiality and without restriction on its further disclosure by the Receiving Institution.

VII. Conduct Compliance:

A. Each Institution shall require all employees, agents and students (if applicable) who use Shared Resources provided under this MOU to observe all applicable policies, rules and regulations of the Institution providing the Shared Resources.

B. Each Institution shall comply with all applicable laws and legal requirements in connection with the activities contemplated by this MOU.

C. This MOU shall be governed in all respects by the laws of the Commonwealth of Virginia without regard to its rules regarding conflict of laws. Any action to enforce the obligations of this Agreement shall be brought and maintained exclusively in the state courts of the Commonwealth of Virginia.

[Signature Page Follows]

CHRISTOPHER NEWPORT UNIVERSITY

_____

[NAME]

COLLEGE OF WILLIAM AND MARY

Dennis M. Manos

_____

[NAME]

EASTERN VIRGINIA MEDICAL SCHOOL

_____

[NAME]

GEORGE MASON UNIVERSITY

_____

[NAME] ANDRE W. MARSHALL

JAMES MADISON UNIVERSITY

_____

[NAME]

NORFOLK STATE UNIVERSITY

Javaune Adams-Gaston, Ph.D.

_____

Javaune Adams-Gaston, Ph.D., President

OLD DOMINION UNIVERSITY

_____

[NAME]

JAMES MADISON UNIVERSITY

Anthony Tongen

Anthony Tongen

NORFOLK STATE UNIVERSITY

_____

[NAME]

OLD DOMINION UNIVERSITY

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Morris Foster

UNIVERSITY OF VIRGINIA

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Stewart P. Craig

VIRGINIA COMMONWEALTH UNIVERSITY

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P. Srirama Rao

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

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VIRGINIA STATE UNIVERSITY

[NAME]

UNIVERSITY OF VIRGINIA

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VIRGINIA COMMONWEALTH UNIVERSITY

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P. Srirama Rao

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

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[NAME]

VIRGINIA STATE UNIVERSITY

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CHRISTOPHER NEWPORT UNIVERSITY

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WILLIAM AND MARY

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Dennis Manos

EASTERN VIRGINIA MEDICAL SCHOOL

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Helen Heselius
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Helen Heselius

GEORGE MASON UNIVERSITY

_____

[NAME]

CHRISTOPHER NEWPORT UNIVERSITY

[NAME] QUENTIN REID

WILLIAM AND MARY

Dennis Manos

EASTERN VIRGINIA MEDICAL SCHOOL

[NAME]

GEORGE MASON UNIVERSITY

[NAME]

EXHIBIT A

Shared Resource Directors for each Institution:

Christopher Newport University

Lynn Lambert, Ph.D.
Associate Provost for Research and Dean of Graduate Studies
Christopher Newport University
Newport News, VA 23606
757-594-7544
llambert@cnu.edu

Eastern Virginia Medical School

David Mu, PhD, Professor
Associate Dean for Research Administration
Director of MEdical sTudent Research Opportunities (METRO)
757-446-0373
mud@evms.edu

Betty Virok
Manager, Research Support Facilities
757-446-5658
virokeb@evms.edu

George Mason University

Michael Laskofski, Associate Vice President of Research Operations
George Mason University
Office of Sponsored Programs
4400 University Drive, MSN: 4C6
Fairfax, Virginia 22030
Phone: (703) 993-4573
Email: mlaskofs@gmu.edu

James Madison University

Dr. Keith Holland, Associate Vice Provost for Research and Innovation
(hollansk@jmu.edu)

Norfolk State University

Michael O. Keeve, Ph.D.
Dean, College of Science, Engineering, and Technology

mokeeve@nsu.edu
(757)823-8180

Old Dominion University
Karen Eck
Assistant Vice President for Research
Office of Research
4111 Monarch Way, Suite 203
Norfolk, VA 23508
keck@odu.edu

University of Virginia
Jay W. Fox, Ph.D
Professor of Microbiology, Immunology and Cancer Biology and
Director of Research Infrastructure
jwf8x@virginia.edu

Virginia Commonwealth University
Paul Fawcett, Ph.D.
Assistant Professor of Internal Medicine and
Director of Research Infrastructure
paul.fawcett@vcuhealth.org
(804) 827-0975

Virginia State University
M. Omar Faison
mfaison@vcu.edu
(804) 524-3690

Virginia Tech
Sarah Glenn, Associate Director of Facility Development and Technical Operations at Fralin Biomedical Research Institute
sglenn@vtc.vt.edu

William & Mary – Applied Research Center Core Laboratories
Jonathan Frey
jfrey@wm.edu
(757) 221-4388

Douglas Beringer
dbberinger@wm.edu
(503) 347-4847

William & Mary – Gloucester Campus – Virginia Institute of Marine Science
James Brinster
jebrister@vims.edu
(804) 684-7255

EXHIBIT B

SHARED RESOURCES AVAILABLE AT EACH INSTITUTION

OLD DOMINION UNIVERSITY

Account Code	Project Director	Account Title	Account Short Title	Status	PI Home Department Code
956200-010	BRITCHER, C.	VIPER DYNAMOMETER / INSTRU LAB	VIPER LAB	A	MECHANICAL AND AEROSPACE ENGINEERIN(
956500-010	ELSAYED-ALI, H.	ARC EQUIPMENT USAGE	ARC EQUIPMENT	A	APPLIED RESEARCH CENT
957300-010	CATRAVAS, J.	FLOW CYTOMETRY FACILITY	FACS-ARIA	A	FRANK REIDY CENTER FO BIOELECTRICS
958100-010	PLATSOUCAS, C.	CENTER-ISOTOPE*TRACE ELEMENTS	CENTER-ISOTOPE*	A	BIOLOGICAL SCIENCES
958100-020	DAINES, D.	ELECTRON MICROSCOPY LAB	ELECTRON MICROS	A	BIOLOGICAL SCIENCES
958100-021	DAINES, D.	DNA SEQUENCER	DNA SEQUENCER	A	BIOLOGICAL SCIENCES
958100-022	DAINES, D.	BIOLOGY VEHICLE USAGE	BIOLOGY VEHICLE	A	BIOLOGICAL SCIENCES
958110-001	DAINES, D.	RESEARCH FACULTY-MARSHALL, H.	RES FAC-MARSHAL	A	BIOLOGICAL SCIENCES
958200-010	DONAT, J.	CBP WQL-CC AUTOANALYZER	CBP WQL-CC AUTO	A	CHEMISTRY & BIOCHEMISTRY DEPT
958200-011	DONAT, J.	CBP WQL-CC C/N ANALYZER	CBP WQL-CC C/N	A	CHEMISTRY & BIOCHEMISTRY DEPT
958200-012	DONAT, J.	CBP WQL-CC SPECTROPHOTO	CBP WQL-CC SPEC	A	CHEMISTRY & BIOCHEMISTRY DEPT
958200-013	DONAT, J.	CBP WQL-CC STD ANALYSES	CBP WQL-CC STD	A	CHEMISTRY & BIOCHEMISTRY DEPT
958200-014	DONAT, J.	CBP WQL-CC FIELD EQUIPMENT	CBP WQL-CC FIEL	A	CHEMISTRY & BIOCHEMISTRY DEPT
958200-015	DONAT, J.	CBP WQL-CC R/V BAYRUNNER	CBP WQL-CC R/V	A	CHEMISTRY & BIOCHEMISTRY DEPT
958200-020	HATCHER, P.	MAJOR INSTRUMENTATION CLUSTER	COSMIC	A	CHEMISTRY & BIOCHEMISTRY DEPT
958200-021	HATCHER, P.	CENTER-IRMS	IRMS	A	CHEMISTRY & BIOCHEMISTRY DEPT
958500-010	HARVEY, R.	R/V FAY SLOVER	R/V FAY SLOVER	A	OCEAN, EARTH & ATMOSPHERIC SCIENCE
958500-011	HARVEY, R.	RESEARCH VESSEL-SMALL BOATS	RESEARCH VESSEL	A	OCEAN, EARTH & ATMOSPHERIC SCIENCE
958500-012	HARVEY, R.	ELECTRONIC SUPPORT	ELECTRONIC SUPP	A	OCEAN, EARTH & ATMOSPHERIC SCIENCE

958500-020	DARBY, D.	ELECTRON PROBE MICROANALYZER	EPMA-ELECTRON	A	OCEAN, EARTH & ATMOSPHERIC SCIENCE
958600-010	PLATSOUCAS, C.	VIRTUAL ENVIRONMENTS LABS	VIRTUAL ENVIRON	A	CTR FOR COASTAL PHYSICAL OCEAN
958600-011	ATKINSON, L.	CCPO PROFILER COST CTR	CCPO PROFILER C	A	CTR FOR COASTAL PHYSICAL OCEAN
958600-012	SEDWICK, P.	ICP - MS FACILITY	ICP - MS CC	A	CTR FOR COASTAL PHYSICAL OCEAN
958800-010	FOSTER, M.	ANIMAL CARE FACILITY	ANIMAL CARE FAC	A	OFFICE OF RESEARCH
958800-011	FOSTER, M.	ANIMAL CARE OPERATIONS	ANIMAL CARE OPS	A	OFFICE OF RESEARCH
959300-010	RANJAN, D.	CS COST CENTER	CS COST CENTER	A	COMPUTER SCIENCES

EXHIBIT B

SHARED RESOURCES AVAILABLE AT EACH INSTITUTION

Christopher Newport University

Spectroscopy Instrumentation Cluster

Instrument	Make	Model	Accessories
400 MHz NMR	IEOL	400 YH	Autosampler
ICP-OES	Shimadzu	ICPE-9810	Autosampler
FT-IR	Shimadzu	IR Tracer-100	OATR 10
X-Ray Spectrometer	Bruker AXS GmbH	54 Pioneer	
X-Ray Diffractometer	Rigaku	Miniflex II	
UV-VIS Spectrophotometer	Shimadzu	UV-2600	
Spectroflourometer	Shimadzu	RF-600	

Chromatography Instrumentation Cluster

Instrument	Make	Model	Accessories
Organic Elemental Analyzer	Thermoscientific	Flash 2000	Autosampler
HPLC	Shimadzu	LC-40	Autosampler, Photodiode Array Detector, Conductivity Detector

Combination Instrumentation Cluster

Instrument	Make	Model	Accessories
LC-MS	Thermofisher	Ultimate 3000/LCQ-Fleet	
GC-MS	Shimadzu	GS-2010	Autosampler

Miscellaneous Instrumentation Cluster

Instrument	Make	Model	Accessories
Surface Area and Porosity analyzer	IEOL	ASAP 2020	
Thermal Analyzer	NETZCH	T6 209 F Tarsus	
Differential Scanning Calorimeter	Shimadzu	DSC-60 PLUS	

Neuroscience Equipment

Instrument	Make	Model	Accessories
EEG	Cortech Solutions	ActiveTwo System	64 active electrodes
Eye Tracking	Tobii Pro	X3-120	

Eastern Virginia Medical School (EVMS)

George L. Wright Jr. Center for Biomedical Proteomics –

Located within the Leroy T. Canoles Jr. Cancer Research Center and houses a variety of mass spectrometers and other instruments for protein isolation, separation, identification, characterization and data analysis

- Mass spectrometers
- HPLC & UHPLC systems
- Qualitative/Quantitative Proteome Analysis & De Novo sequencing and PTM characterization
- ArcturusXT Laser Capture Microdisection Instrument

Microscopy and Imaging Core –

Provides technical assistance and training in microscopy and image analysis

- JEOL Transmission Electron Microscope
- In vivo and in vitro Fluorescence, Brightfield, DIC, Polarized light Olympus upright and inverted microscopes
- Nikon Coolscope slide reader
- In vivo and in vitro Zeiss 880 Laser Confocal microscope
- ONI Nanoimager Microscope
- IVIS Small Animal Imaging (Vivarium)

Molecular Core –

Houses state-of-the-art instrumentation for the analysis of DNA, RNA, and protein

Flow Cytometry Core –

Measures individual cells in a stream of fluid for cell phenotyping, cell cycle analysis, cell signaling, and protein modification

- Cytek-upgraded FACSCaliber
- BD FACSAria Fusion
- Bio-Rad Bio-Plex MAGPIX Multiplex Reader
- Amnis ImageStreamX Mark II Imaging Flow Cytometer
- Meso Scale Discovery Meso Quick Plex

Biorepository and Histology Lab –

College of American Pathologists (CAP) accredited facility that procures, processes, and stores over 70,000 human specimens and the associated data

- nanoString nCounter FLEX Analysis System

- Tissue microarray design & construction

EVMS-Sentara Healthcare Analytics and Delivery Science Institute (HADSI)–

Provides funding, grant writing assistance, data analysis, and research support

George Mason University

ANIMAL CARE AND USE:
George Mason University manages two state-of-the-art vivarium facilities that have capacity for mice, rats, hamsters, rabbits, and ferrets up to BSL-3, one on the Fairfax Campus and one of the Science and Tech Campus. The contact for these core facilities is David Myers; Animal Care Program Manager, Research Development, Integrity, and Assurance; iacuc@gmu.edu; 703-993-6118; http://oria.gmu.edu/research-with-humans-or-animals/animal-care-and-use/

RESEARCH COMPUTING:
The Office of Research Computing (ORC) offers the following on-campus research computation options are:
- The Hopper cluster has been installed in the Aquia Data Center for large scale computation needs of researchers in the university.
- Requesting a virtual computer for research from ORC This is for research related computations that cannot be done on university researchers' desktops or laptops.

The contact for these resources is: Jayshree Sarma; Director of Research Computing; jsarma@gmu.edu; 703-993-4397; http://orc.gmu.edu/.

HIGH CONTAINMENT IN VITRO AND IN VIVO INFECTIOUS DISEASE CORE
Mason's 52,000 square-foot Biomedical Research Laboratory (BRL) is a NIAID-funded regional biocontainment facility fully approved and licensed for work by the CDC and USDA and is accredited by AAALAC. It operates as a central core facility to advance research and develop novel diagnostics, therapeutics, and vaccines against viral and bacterial infectious agents. The facility houses multiple species (mice, rats, hamsters, rabbits, and ferrets) and has a variety of established animal models, with an emphasis on aerosolized exposures. Assisted work by BSL-3 trained staff is available for each of the cores available in the BRL. The Cores include:
1) BSL-3 in vitro core: Cell culture and multicellular model systems; Cell culture based verification, validation, and mechanism of action studies; Protocol and assay development; Infectious assessment services; Compliance determination; and Risk Assessments and safety recommendations
2) BSL-3 in vivo core: Animal studies (mice, rats, hamsters, rabbits, ferrets); IACUC protocol development and approval; Animal procedure and assay development; Husbandry, care, and sample collection services
3) Aerobiology Core: Animal challenge model development; Inoculum growth and characterization; Assay development; Aerosol challenges (equipment: Biaera Aero 3G; whole

body, nose-only, and face-only exposure chambers; and Bioquell Hydrogen Peroxide Vapor Generator)
4) Imaging and Flow Cytometry Core: Flow Cytometry (FACS Aria II); Nikon Ti2 Wide Field Fluorescent Microscope; Arcturus Laser Capture Microdissection; Mediso LFER 150 PET/CT animal imager, and IVIS Lumina II.

Contact:
Farhang Alem, Interim Director, BRL
falem@gmu.edu, (703)993-7180

MAGNETIC RESONANCE IMAGING:

The Mason 3T MRI Facility houses a Siemens Prisma 3T Magnetom for human brain and whole body MRI. This facility is equipped with 32 channel phased array head coil, 16 channel shoulder coil, and multiple other head/neck/ spine, body, and flex coils. Applications include sequences for neuro, angio, cardiac, body, onco, breast, ortho, 2D and 3D ASL, SWI, and spectroscopy imaging. A 64 channel, MR compatible EEG system is also available. Visual displays include an Eiki projector. An ARRT certified MR Technologist is available for scanner operation.
Contact:
James Thompson Department of Psychology
jthompsz@gmu.edu, (703)993-9356

PROTEOMICS:

The **Tissue Processing and Imaging Laboratory** is equipped with histology equipment to embed and cut paraffin and frozen tissue sections with a Tissue Tek VIP Tissue Processor, Thermo microtome MH325, Harvard Apparatus vibratome, and Leica CM1850UV cryostat. Five laser capture microdissection systems in the laboratory are used to isolate enriched cell populations under direct microscopic visualization (2 Arcturus XT Automated Laser Capture Microdissection Systems, and 3 Arcturus PixCell II/Ile Laser Capture Microdissection Systems). A cytospin centrifuge and RoboSep magnetic cell sorting instrument are also available for processing biological fluids. Imaging capabilities include an Olympus BX51 microscope outfitted with a digital camera, phase contrast and fluorescence, as well as an Olympus BX51 dual head, light microscope with a digital camera.

The **Mass Spectrometry Laboratory** uses specialized chromatography, electrophoresis, and cell fractionation systems, combined with high-performance mass spectrometers (Orbitrap Fusion, LTQ-Orbitrap, Triple Quadrupole, and MALDI- TOF-TOF), to separate and analyze components of tissue, serum and other physiological samples, resulting in protein characterization, identification and biomarker discovery. The laboratory is equipped with 4 mass spectrometers that are capable of identifying and quantitating femtomole levels of biomolecules such as peptides and proteins.

The **Nanofabrication Laboratory** is equipped to manufacture hydrogel nanoparticles used for biomarker discovery and the development of diagnostic tests. A novel protein painting technology developed in the lab identifies hot spots of protein-protein interaction.

The **CAP/CLIA Clinical Proteomics Laboratory**, operates under the College of American Pathologists (CAP) and Clinical Laboratory Improvement Amendments (CLIA) guidelines to:

- Provide a unique opportunity to assess and evaluate new proteomic technologies under rigorous clinical guidelines
- Accelerate the verification and validation of promising candidate biomarkers in a clinical diagnostic setting
- Implement unique clinical trials and diagnostic tests

The CAP Clinical Proteomics Laboratory uses an Aushon 2470 Automated, High-Throughput Protein Arrayer, and a Dako robotic autostainer to generate protein arrays and perform immunohistochemistry for analysis of tissue and cellular samples for biomarker discovery. An Immulite 1000 Immunoassay instrument is also available to measure protein analytes and perform clinical tests.

Contact:
Virginia Espina, PhD
Center for Applied Proteomics and Molecular Medicine
vespina@gmu.edu, (703)993-8062

METABOLOMICS SEQUENCING:

The **Metabolomics Laboratory** houses several chromatography instruments, including a GC FID, GC-NPD, and semi-preparative and preparative HPLCs. The metabolomics platform is centered on an Agilent 7890A Gas Chromatograph with 5975C Mass Spectrometer, an Agilent 1290 Infinity LC with a 6530 QToF (MS/MS), and an Agilent 1100 LC-MSD (with interchangeable ESI, APPI, and APCI sources). Coupled with custom designed software algorithms and the commercially purchased Agilent Mass Profiler Professional software package, these instruments enable a comprehensive examination of volatile and non-volatile metabolites present in biological samples

Contact:
Robin Couch, PhD
Department of Chemistry & Biochemistry rcouch@gmu.edu
(703)993-4770

GENOMIC SEQUENCING:

The **MicoBiome Analysis Center** has a separate PCR room with 10 PCR machines, an ABI 3130xl sequencer, a Life Technology RT PCR instrument, an Ion Torrent PGM sequencer (4 million reads/run), an Ion Torrent S5 (80 million reads/run), and high-end computational facilities. The computational facilities include 10 iMac computers, a 48 processor HP workstation, two development HP servers, and access to a 640 node SGI cluster. A wide array of bioinformatics software is accessible through networked computers within the DNA research labs.

Contact:
Pat Gillevet, PhD Microbiome Analysis Center pgilleve@gmu.edu
(703)993-1057

NUCLEAR MAGNETIC RESONANCE:

The **NMR Laboratory** is equipped with a Bruker AVANCE III HD 400 MHz NMR instrument for multi-dimensional magnetic resonance spectroscopy experiments, including structure determination/confirmation of small molecules. It' s Diffusion Ordered Spectroscopy (DOSY) capabilities enable investigation of intermolecular interactions. The instrument is equipped with Broker's SMART Probe technology for enhanced resolution and an automatic sample changer for processing up to 24 samples.
Contact:
Mikell Paige, PhD
mpaige3@gmu.edu, (703)993- 1075

NANOFABRICATION FACILITY:
Mason completed construction of a 1,946 square foot class 1000 clean room and characterization laboratory. The university is currently purchasing equipment for installation and will establish the nanofabrication core in 2023 as the laboratory becomes operational.
Contact:
Amy Adams
avanmete@gmu.edu , (703) 993- 2672

James Madison University

Madison Accelerator Laboratory (Scottie Pendleton)

Siemens Medical Linear Accelerator

- Bremsstrahlung photon beam
  - Endpoint energies: 6 MeV and 15 MeV
  - Beam current: 0.01-15 mA avg, 0.15-1.5 A peak (3 μs square pulse at 100-300 Hz pulse repetition rate)
  - Dose at 100 cm: 0.1-500 Gy/min
- Electron beam
  - Energies: from 4-14 MeV
  - Beam current: 0.01-15 mA avg, 0.15-1.5 A peak (3 μs square pulse at 100-300 Hz pulse repetition rate)
  - Dose at 100 cm: 0.5-1200 Gy/min

X-Ray Imaging
Nucletron 40-140 kVp medical source with 1-3 mm spot size -
Digital imaging, 2D images up to 350x430 mm with Carestream HPX-DR Large Format Detector
3D imaging capability with Digitome software

Detectors
Selection of high purity germanium (HPGe) detectors with relative efficiencies up to 60% with background shielding.
Selection of NaI detectors up to 4" crystal
Silicon charged particle detectors for use with vacuum chamber, high resolution or fast preamps
DAQs for all detectors

Vacuum Chamber
8" cube vacuum chamber with windows and BNC feedthroughs capable of down to 10^{-5} Torr

Light Microscopy and Imaging Facility (Dr. Kristopher Kubow, Director)

- **Nikon Eclipse Ti-2** (inverted; color/DIC/fluorescence/high-content-acquisition)
- **Nikon TE2000 C2si Laser Scanning Confocal and Widefield Microscope** (inverted)
- **Leica DM6b** (color/DIC/polarization/fluorescence)
- **Zeiss Axioscope.A1** (color/fluorescence)
- **Olympus CX41** (color/phase contrast)
- **Zeiss SV6 Stemi Stereoscope**
- **Leica Macroscope**
- **Image Analysis Workstations**
- **WideTEK25 Large-Format Flat-Bed Scanner**
- **Afinia 3D Printer**

Psychology Animal Research Facility (rodent, mouse, pigeon) (Dr. Dan Holt, Dr. Suzie Baker, Dr. Melanie Soup-Knox): This is an animal vivarium research space with separate housing rooms for mice, rats, and pigeons, testing spaces for "field" observation, operant equipment and rooms (various arrangements possible for both rat and pigeon), maze systems (e.g., elevated plus maze), sleep deprivation equipment, and pharmacy and surgery suites.

Eye Tracking Laboratory – Tobii (Dr. Krisztina Jakobsen, Dr. Jeff Andre): Allows for data collection and analysis of eye movements in children and adults. Our stationary equipment allows for more laboratory based data collection and our eye glass equipment allows for more "in the field" data collection.

One Simple Decision Driving Simulator (Dr. Theresa Enyeart Smith): Virtual Driver Interactive company: https://driverinteractive.com/. Here is the link to the One Simple Decision Simulator: https://driverinteractive.com/products/one-simple-decision/

Guava Muse Cell Analyzer by Luminex (Dr. Raihan Khan or Dr. Catherine Zeman): A system that allow for benchtop flow cytometry at the single cell level providing a variety of Muse assays: https://www.luminexcorp.com/muse-cell-analyzer/#overview.

Nursing Simulation Labs (Dr. Melody Eaton): A School of Nursing space housing 6 high fidelity simulation labs; critical care (1), med/surg (2), women's care (1), pediatrics (1), and general purpose (1). Each lab is equipped with at least one high fidelity patient simulator controlled by a computer in the universal control room. Within each lab there is an intravenous pump, workstation on wheels with a MacBook laptop and barcode scanner, touchscreen patient monitor, standardized mobile consumable cart, and customary furniture and patient care accessories. An integrated, web-based audiovisual system provides recording and playback capability for simulations and debriefing using PTZ cameras and choir microphones. The control area is equipped with stations that overlook each room via one-way glass where simulation experts facilitate experiences following a standardized simulation template according to best practice.

Nursing Standardized Patient Suite (Dr. Melody Eaton): A dedicated space that portrays the primary care setting and includes a waiting area, bathroom, and 4 patient care rooms. Exam rooms feature an exam table, integrated wall-mounted diagnostic panels, exam supplies, and interview style furniture. Each room is internet capable for access to documentation programs. Users have access to a MacBook laptop, barcode scanner, and mobile workstation. The suite is ideal for interprofessional and collaborative experiences that would typically occur in a primary care setting. Audiovisual recording capability is possible via PTZ cameras and choir microphones. A mobile, one way privacy screen is also available for semiprivate direct observation.

JMU Microfabrication Cleanroom (Dr. David Lawrence)
This cleanroom facility houses the following microfabrication equipment:

- **MBRAUN electron-beam evaporation system** – This thin film deposition system has a 4-pocket carousel allowing the sequential deposition of up to four materials.

- **Edwards Auto 500 DC magnetron sputtering system** – This system has three guns for thin film deposition from 3”-diameter source targets.
- **Neutronix Quintel 4006 contact mask aligner** – This system enables pattern transfer by photolithography.
- **KLA-Tencor P-7 surface profiler** – This instrument enables measurement of coating thickness and surface roughness.
- **Additional support equipment and capabilities** include spin coaters, oxidation and annealing furnaces, wet chemical etching, oxygen plasma etching/cleaning, and electrical characterization.

JMU Advanced Thermal Fluids Laboratory (Dr. Karim Altaii)

- **Engineering Laboratory Design Inc. 18” Open Circuit Subsonic Wind Tunnel** with a 36” x 18” x 18” (L x W x H) test section, capable of flow velocities up to 45 m/s.
  - Supporting equipment including a drag dynamometer, multi-axis load cells, and flow visualization equipment
- **Engineering Laboratory Design Inc. 45CM Closed Circuit Water Tunnel** with a 150 cm x 45 cm x 45 cm (L x W x H) test section, capable of 2.2 m/s flow velocities.
  - Supporting equipment including die injection systems and high speed cameras
- **Particle Image Velocimetry (PIV) System**
  - 100W, 100 ns/CW pulse duration, 1053.527 nm wavelength, Nd:YLF laser
  - 2x Potron Fastcam SA3 high speed cameras
  - 2x FLIR Extech i5 IR cameras and a Fluke Ti10 IR camera

Norfolk State University

- **Transmission Electron Microscope Hitachi HT7800**

An Evolutionary Era of 120kV Transmission Electron Microscopy (TEM) with the Hitachi HT7800: New Technologies, Digital Designs, Automation, Ionic Liquids, and More! With sub-2 angstrom resolution and the highest contrast in its class, the HT7800 incorporates advanced technologies to yield an electron microscope capable of easy operation by new and experienced users alike, whereby providing dual imaging modes, higher efficiency, excellent imaging quality, increased ergonomics, and adaptability for future needs.

- **J. A. Woolam V-VASE Ellipsometer**
- **Nanonics SPM Multiview 2000/4000**
- **Microtrac Wave II**
- **Zeiss Axio Imager Z2m**
- **Bruker DektakXT**

University of Virginia (https://med.virginia.edu/core-facilities/cores-2/)

- Advanced Microscopy Facility
- Antibody Engineering and Technology Core
- Bioinformatics Core
- Biomolecular Analysis Facility
- BioNMR Facility
- Biorepository and Tissue Research Facility
- Exercise Physiology Core
- DNA Sciences Core
- Flow Cytometry Core
- Genetically Engineered Murine Model Core
- Molecular Electron Microscopy Core
- Molecular Imaging and Radiochemistry Core
- Research Histology Core
- Stem Cell Core
- Tissue Culture Facility

Virginia Commonwealth University

- Bioimaging and Applied Research Core (https://research.vcu.edu/cores/barc/)
- Cancer Mouse Models Shared Resource (https://www.massey.vcu.edu/research/cores/cmmc/)
- Flow Cytometry Core Facility (https://www.massey.vcu.edu/research/cores/flow-cytometry/)
- Lipidomics & Metabolomics Core Facility (http://www.biochemistry.vcu.edu/Research/lipidomics_core.html)
- Microscopy Core Facility (http://www.anatomy.vcu.edu/microscopy/)
- Nanomaterials Characterization Core: (http://nano.vcu.edu/)
- Genomics Core Facility (https://research.vcu.edu/cores/genomics//)
- Structural Biology Core Facility (https://isb3d.pharmacy.vcu.edu/resources/)
- Tissue and Data Acquisition and Analysis Core Facility (https://www.massey.vcu.edu/research/cores/tdaac/)
- Transgenic and Knock-out Mouse Core Facility (https://www.massey.vcu.edu/research/cores/tmf/)
- Mid-Atlantic Twin Registry (https://matr.vcu.edu/)

Virginia State University

Molecular Biology laboratory which includes

- Illumina MiSeq sequencing system
- Illumini NextSeq Whole Genome Sequencing System
- Real time PCR platform

VIRGINIA TECH RESOURCES

1) **Magnetic Resonance Imaging (MRIs) for human subjects – two Siemens large bore 3.0 Tesla Prismas and two 3.0 Tesla Trios**

The facility has four Siemens 3.0 Tesla MRIs including two Siemens MAGNETOM Prisma 3T MRIs and two Siemens MAGNETOM Trio 3T MRIs. The state-of-the-art Prisma whole body 3T MR systems use a gradient system with max amplitude of 80 mT/m at a slewrate of 200 T/m/s and an all-digital RF system for higher SNR and improved stability. The facility also include two Siemens MAGNETOM Trio 3T scanners, one located at the Fralin Biomedical Research Institute at VTC in Roanoke and one located at the Virginia Tech Corporate Research Center in Blacksburg. The Trios are whole body 3T MR systems that uses a gradient system with max amplitude of 40 mT/m at a slewrate of 200 T/m/s. These systems can be used with a 12-channel head matrix or a body coil. These systems are equipped for advanced, high-resolution structural imaging, diffusion tensor imaging (DTI), and functional MRI (echo planar imaging).The Prisma systems can be used with the following coils: 64 channel head/neck; 20 channel head/neck; Tx/Rx CP Head; Tx/Rx 15 channel knee; Loop coil; Spine matrix; Body 18. They are equipped for advanced, high-resolution structural imaging, diffusion tensor imaging (DTI), functional MRI (echo planar imaging), and Arterial Spin Labeling (ASL). Supplementary Equipment includes Hitachi Multimedia Projector (back-projection); Stimulus computer running NEMO (in-house stimulus program) and MATLAB with PsychToolbox; Current Designs 8-Button Bimanual Fiber Optic Response Pad; Harvard Apparatus Syringe pumps for sensory studies; Other equipment that must be requested includes: Optoacoustics FOMRI III TM + adaptive noise cancelling; Tobii eyetracker for behavioral studies.

Locations:

Siemens MAGNETOM Trio: Room R1082, 2 Riverside Circle, Roanoke, VA
Siemens MAGNETOM Trio: Research Building 26, Virginia Tech Corporate Research Center, Blacksburg, VA
Siemens MAGNETOM Prisma: Room R1081, 2 Riverside Circle, Roanoke, VA
Siemens MAGNETOM Prisma: Room G404, 4 Riverside Circle, Roanoke, VA

Facility Contact:

Duy Phan (dqphan@vtc.vt.edu)

Internal rate:

$500/hour

2) **Magnetic Resonance Imaging (MRI) with PET Insert for mice - Bruker small bore BioSpec 94/20 USR Scanner with PET insert; simultaneous MRI and PET data acquisition**

The BioSpec 94/20 USR scanner is a multipurpose 9.4 Tesla high field MR scanner with high power gradient amplifier. The gradient strength is 660mT/m and the maximum linear slew rate is 4570Tm/s. The PET insert specifically designed for the system allows simultaneous MRI and PET data acquisition. Physiological Maintenance/Monitoring: The scanner is equipped with a Harvard Apparatus isoflurane anesthesia system, SAII respiration and ECG monitoring and gating system, Thermo Scientific SC150-S13 heated feedback-controlled circulating bath and Harvard Apparatus PHD 2000 Infusion pump.

Location:

Room G412, 4 Riverside Circle, Roanoke VA
Facility Contacts:
Maosen Wang, Ph.D. (maosen@vtc.vt.edu)
Internal rate:

MRI/PET	$250
MRI/PET Extended Run	$150
MRI PET Contrast ml	$ 57

3) **Computed Tomography (CT) for human or companion animal imaging; Siemens Somatom Confidence RT Pro CT Scanner**

The CT system generates and processes cross-sectional images of human or animal patients by computer reconstruction of X-ray transmission data to be used to aid in diagnosis, treatment preparation, and radiation therapy planning. It includes: 64-slice configuration; gantry is equipped with speaker and microphone systems to allow for communication between the patient and operator through the control box; Electromagnetic compatibility; scan modes include: topogram, sequence, spiral, multiscan, and adaptive 4D spiral; Image manipulation is allowed via 3D reconstruction ability in axial, sagittal, and coronal planes; Various kernel and window options are available; system allows a larger field of view on larger patients; LAP lasers installed on exterior of scanner can be used for radiation therapy planning purposes. Animal patients must come prepared, including appropriate sedation; human patients require physician's orders and patient history; all scans are performed by the facility director. Various contrasts (veinous, angio, or other); Image reconstruction images in different planes of view; custom slice thickness; Views of the head, neck, chest, pelvis, and extremities.

Location:
Room G407, 4 Riverside Circle, Roanoke, VA
Facility contact:
McKenzie Duncan; msduncan@vt.edu
Internal rate:
$450/hour

4) **Micro PET/CT Si78. Bruker small bore for mice**

The Bruker Micro PET/CT Si78 features homogeneous, high-resolution, and quantitative PET/CT imaging with a large field of view of 80x up to 200 mm; low dose X-ray technology, full body 3D CT scanning, the ParaVision 360 software and a high-precision motorized sample transport system. 18F-FDG PET and 2D and 3D CT imaging applications. Physiological Maintenance/Monitoring: The system is equipped with a Harvard Apparatus isoflurane anesthesia system, SAII respiration and ECG monitoring and gating system, Thermo Scientific SC150-S13 heated feedback-controlled circulating bath and Harvard Apparatus PHD 2000 Infusion pump.

Location:
Room G411, 4 Riverside Circle, Roanoke VA
Facility Contact:
Maosen Wang, Ph.D. (maosen@vtc.vt.edu, 540-526-2371
Internal rates:

Micro PET/CT	$250
Micro PET/CT Tracer mCi	$ 31

5) **Spinning Disk Confocal Microscope**

The Nikon SoRa Inverted Spinning Disk Confocal Microscope uses multiple pinholes or slits to project a series of 1,000 or more parallel excitation light beams onto the specimen in a multiplexed pattern. The Nikon SoRa (super resolution by optical reassignment) provides conventional confocal scanning, SoRa at 2.5X and 4X resolution, and TIRF imaging captured by 3 hamamatsu cameras. It allows a 1.4X improvement in lateral resolution beyond the optical diffraction limit. The Nikon SoRa can collect super resolution fluorescence images as well as conventional confocal, TIRF, wide field, and transmitted light images (bright field and DIC). The scope has
10x, 20x, 20X water, 25X silicon, 40X water, 60x TIRF oil, and 60x oil objectives. A water adjustment system allows for the proper water to be applied throughout the experiment while a stage-top incubator adjusts temperature and CO2. The iLas2 and photostimulation with galvo scanner provides 360 degree TIRF imaging. Lasers: LunF-XL solid state laser combiner with 405, 445, 488, 514, 561, 594 and 640nm imaging lines and 405, 473 stimulation lines; Filters: DAPI, GFP, RFP, Cy5; Cameras: 3 Hamamatsu Back-Thinned Orca Fusion CMOS cameras; Software: NIS Elements, 2D/3D deconvolution, iLas2; Computer: HP Z8 microscope computer and separate workstation for analysis.

Location:
Room 1036, 4 Riverside Circle, Roanoke VA
Facility Contact:
Christie Lacy (christie21@vtc.vt.edu)
Internal rate:
$22/hour

6) **Scanning Serial Block Face Electron Microscope; Thermo Fisher Scientific Apreo VolumeScope**

The Thermo Fisher Scientific Apreo VolumeScope is a scanning serial block face electron microscope for automated acquisition of large volumes. VolumeScope is a Serial Block-face Imaging (SBFI) instrument for automated acquisition of large volumes. It integrates with Thermo Fisher Scientific SEM platform. The key enabling technologies, hardware, and software include. The system has Novel Field Emission Electron Optics for both high resolution and exceptional contrast, meeting all imaging needs at low beam currents. It is fully-integrated, compact, stage-mounted ultra-microtome for in-situ sectioning. It enables direct correlation of images from any light microscope covering large volumes

Location:
Room 2306A, 4 Riverside Circle, Roanoke VA
Facility Contact:
Christie Lacy (christie21@vtc.vt.edu)
Internal rate:
$20/hour

7) **Transmission Electron Microscope with Cryo Capacity; FEI Tecnai G2 Spirit Twin Transmission Electron Microscope (EM); general purpose, high resolution instrument.**

The FEI Tecnai G2 Spirit Twin Transmission Electron Microscopy (EM) is a general-purpose-high resolution instrument. Provides low-dose observation of beam sensitive samples and 2D and 3D images. Features include: an FEI Tecnai G2 Spirit Bio-Twin TEM operating at 20-120 kV 0.2nm line resolution; LaB6 emitter and an FEI Eagle 2K, 200 kV HS Charge Couple Device (CCD) camera; Pelco easiGlow system for glow-discharging EM grids; and Silicon nitride microchips for functionalization.

Location:
Room R2029, 2 Riverside Circle, Roanoke VA
Facility Contact:
Christie Lacy (christie21@vtc.vt.edu)
Internal rate:
$34/hour

8) **Whole room human calorimeters**

The respiration calorimeter facility includes one large room (9' x 12') and a smaller flex chamber (4' x 7') in a push-pull configuration to measure metabolic rate and relative substrate utilization of a human study subject with response time of a few minutes. Accommodates adult studies up to 23 hours and moderate levels and duration of exercise. Study subjects will be in the age range of adolescent to adult. Study subjects will weigh between 30 and 150 kg (30 kg at rest: VO2=0.145l·min-1, VCO2=0.123 l·min-1, RQ=0.85). Accommodates a 110 kg (fat free mass) person exercising at 30mL/kg/min for 60 minutes (VO2=3 l·min-1, VCO2 = 2.4 l·min-1, RQ=0.8). Exercise levels will be at or below 80% max. Exercise duration will be 10-40 minutes. Interior Dimensions: Width = 9’ (2.7 m); Length = 12’ (3.7 m); Height = 10’ (3.0 m); Volume = 30.0 m3. Two large pass throughs for trays during extended study meals. Bed, toilet, sink, desk, and internet connected smart TV.

Location:
Room 2113, 4 Riverside Circle, Roanoke, VA
Facility Contact:
Charlie Stylianos (kstylian@vt.edu)
Internal rate:
TBD

9) **MR guided focused ultrasound**

The INSIGHTEC Exablate Neuro V2 Focused Ultrasound System can deliver ultrasound energy deep in the brain to create a lesion with no incisions. Focused ultrasound is guided by magnetic resonance imaging (MRI). At the Fralin Biomedical Research Institute, the technology is paired with a Siemens MAGNETOM Prisma 3T imaging system that is part of the research institute's large bore MRI facilities.

Location:
Room G404, 4 Riverside Circle, Roanoke VA
Facility Contact:
Maosen Wang, Ph.D. (maosen@vtc.vt.edu)
Internal rate:
TBD

William & Mary Resources

1. On the Williamsburg campus of William & Mary access to core equipment is organized through a single central location in the Applied Research Center Core Laboratories. Generally, the labs contain equipment for analysis and imaging of hard materials, soft materials, with emphasis on nanoscale examination of surface. Details can be found at https://www.wm.edu/sites/arc/index.php

2. On the Gloucester campus of William & Mary access to core seawater research laboratories is organized through VIMS asset managers at the below link https://www.vims.edu/about/service_facilities/seawaterlab/index.php

3. Marine research vessel core operations https://www.vims.edu/research/marine_ops/index.php

APPENDIX A

Shared Resources Member Addendum

A majority of current Institutions voted to allow the undersigned to become an Institution under the MEMORANDUM OF UNDERSTANDING AMONG ACADEMIC RESEARCH INSTITUTIONS REGARDING RECIPROCAL ACCESS TO SHARED RESOURCES on or around _____. The undersigned hereby acknowledges receipt of the Memorandum of Understanding dated XXXX, 2022 ("MOU"), and agrees to abide by the terms therein.

Institution:

By:

Name:

Title:

Date:

EXHIBIT A

Shared Resource Directors for each Institution:

EXHIBIT B

SHARED RESOURCES AVAILABLE AT EACH INSTITUTION