VirginiaTech
Invent the Future

Core Research Resources Available at Virginia Tech

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Philosophy on Cores and Research Resources

- Common research resources (cores) are designed to make available to the faculty the best possible equipment and services necessary to facilitate interdisciplinary research and collaboration at a reasonable cost

Colleges/Institutes with Core Facilities in the Life Sciences

- College of Veterinary Medicine
- College of Agriculture and Life Sciences
- College of Science
- Institute for Critical Technology and Applied Science
- Virginia Bioinformatics Institute

College of Veterinary Medicine

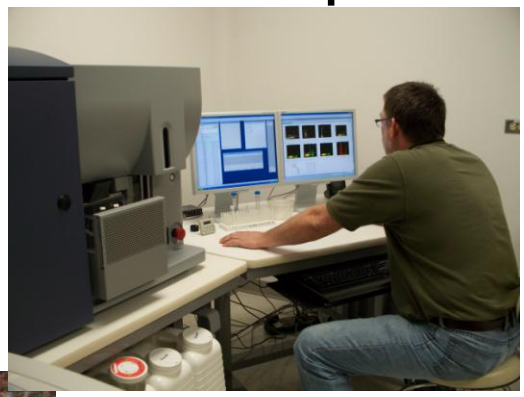
- Morphology Service Laboratory
  - Scanning and transmission EM
  - semi- and ultra thin-sectioning
  - light microscopy
- Services provided
  - computerized morphometric and three-dimensional reconstruction studies of electron micrographs
  - gross specimen photography

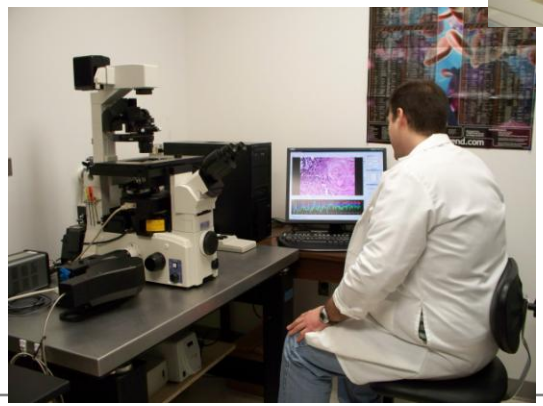
Advanced Separation and Imaging of Living Cells Infrastructure Core

- BD FACS Aria Flow Cytometer & Cell Sorter
- Coulter EPICS XL-MCL benchtop analyzer
- Veritas Laser Capture Microdissection System
- Nikon LiveScan Swept Field Confocal Microscope System

Technical expertise available

- Multi-parameter analysis
- Data analysis
- Cell sorting
- Experiment troubleshooting
- Instrument training
- Publication quality graphics





Diagnostic Imaging Research Lab

- Services available
  - Computer tomography
  - Magnetic resonance imaging
  - Digital fluoroscopy
  - Nuclear medicine
  - Ultrasound
  - Large and small animal radiography
- Staffing
- Four registered radiologic technologists
- Five board-certified veterinary radiologists
- Two radiology residents in training
  - See Poster

College of Science

- Analytical Services Laboratory
  - NMR Spectroscopy
    - Bruker 600 (multinuclear, PFG, CP-MAS)
    - JEOL EclipsePlus 500 (multinuclear, VT, PFG)
    - Varian UnityPlus 400 (multinuclear, VT)
    - Varian Inova 400 (multinuclear, VT, PFG, robot)
    - Varian wide-bore 400 (includes imaging probe)
    - Bruker Avance 300 (dedicated to solid-state)
  - Mass Spectrometry
    - Agilent LC-ESI-TOF with accurate mass capability and full-robotic capability
    - Thermo TSQ LC-ESI-Triple Quad
    - HP MSD low-resolution GCMS
  - Infrared Spectroscopy
    - Midac FTIR (single bounce diamond ATR)
    - Midac FTIR (transmission)
  - See Poster

Surface analysis laboratory

- Equipment
  - Perkin-Elmer model 5300 x-ray photoelectron spectrometer (XPS or ESCA)
  - Model 610 scanning Auger system (AES)
  - The secondary ion mass spectrometer (SIMS), model 3500

- Capabilities
  - Atomic composition, bonding state, angular dependent measurements, depth profiling, positive and negative ion spectra, scanning electron microscopy.

Crystallography Laboratory

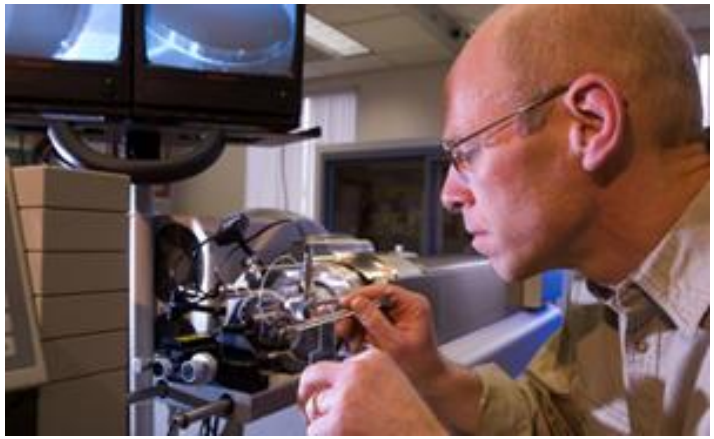
- PX-scanner from Oxford Diffraction
  - possibility of checking growing protein
  - crystals in-situ
- Nova diffractometer system
  - Used to determine the crystal structures of proteins and macromolcules
- Gemini diffractometer system
  - Used to determine crystal structures, especially of molecular crystals
- The Xcalibur-1 and 2 diffractometer systems
  - Used to study the evolution of crystal structure
- Single crystal diffractometer
  - Used for extremely precise measurements of lattice parameters of crystals.

Lazer Ablation-ICPMS Laboratory

- Agilent 7500ce ICPMS coupled with a Geolas laser ablation system
  - Capable of:
    - Major and trace element analysis with detection limits of < 1 µg/g for most elements
    - 5 µm spatial resolution
    - Homogenization optics for controlled ablation of solids/liquids (in fluid inclusions)
    - An octopole reaction cell allowing for the analysis of Ca(40) and Fe(56) resulting in lower detection limits for both elements
    - Sophisticated and easy to use (in-house) developed software for data reduction
      - See Poster

College of Agriculture and Life Sciences Fralin Life Sciences Institute

- Proteomics/Metabolomics Core
  - Thermo-Finnigan DecaXP system capable of Desorption Electrospray Ionization (DESI) and nanoLC-tandem mass spectrometry.
  - Applied Biosystem API 3200 LC/MS/MS system as well as a 3200 QTRAP for metabolomics work.
  - Applied Biosystems 4000 QTRAP and a 4800 MALDI TOF/TOF



- Keck Confocal Microscope Facility
  - State-of-the-art Zeiss LSM510 confocal microscope
- Keck Transgenic Plant Greenhouse
  - A 3500 sq. ft. greenhouse dedicated to the growth of transgenic plants

ICTAS

- Research: Created to lower barriers between faculty, and stimulate, catalyze and promote interdisciplinary trans-disciplinary research at the intersection of science, engineering, biology and social sciences.
- Learning: To enhance educational experience of students in cutting-edge technologies.
- Outreach & Engagement: To develop innovative and elegant solutions to promote sustainable economic development, and enhance quality of life in the Commonwealth of Virginia, the United States, and the world at large.

Infrastructure: Nanoscale Characterization and Fabrication Laboratory

The NCFL was created to provide researchers with the tools to work in converging disciplines. Established in 2007, the facility is equipped with more than $10 million in highly specialized equipment. It seeks to help researchers investigate novel phenomena and build transforming technologies that solve critical challenges.

Specialized equipment includes field emission scanning electron microscope, focused ion beam, emission scanning electron microscope, transmission electron microscope, secondary ion mass spectrometer, photoelectron spectrometer, laser scanning microscope, atomic force microscope (integrated with a Nikon confocal microscope, triboIndenter (automated mechanical test instrument using controlled indentation of surfaces), NanoMAN (nanoscale atomic force microscope), and 3D digital video microscope. Additional equipment managed by collaborating groups include an NMR and a suite of 3 X-ray CT scanners

Administration of Cores

- Most cores are administered through an individual College or Department
- A few cores are administered through, or in conjunction with, a university Institute or Center
- Most cores are located in dedicated research space provided by the unit.
- A core is usually the responsibility of the associate Dean for research or director of the institute. However, most cores are usually managed on a day-to-day basis by a faculty member.
- Most cores are organized as cost recovery centers with charges for the services provided.

Staffing and funding of cores

- Most cores are staffed with technicians funded, in part or whole, by the College or unit. Charges for services are usually collected to cover operating costs (e.g., consumables, service contracts, equipment repair, and replacement), and may also apply to staff salaries.

- All rates for the usage of service centers are negotiated with and set by the university controller's office. To keep the on campus rate within reach of researchers only partial recovery of instrument depreciation is included. For off campus users of the service center, 100% of expense may be applied.

- Most are available by appointment

Current issues affecting core operations

- Ability to attract and retain a high quality technical staff
- Lack of firm budget on a long-term basis
- State budget cuts. Escalating costs of service contracts. Escalating fees that may deter users.
- Aging equipment that is too expensive to replace.
- Under utilization of some cores.
- The allotment of technical staff to departments, centers, and institutes is determined by the central administration. This allotment is not sufficient to fund all the staff needed to manage and run the research instrumentation in the service centers. However, it also means that research programs do not directly bear the full cost of salaries associated with service centers.