BioMed Facilities and Resources Module

Facilities & Other Resources

Brown University's Division of Biology and Medicine comprises the Program in Biology, the Medical School, and the Program in Public Health. The Division is home to five basic biology departments offering undergraduate and graduate courses, 14 clinical departments, and two hybrid departments (with both clinical and campus-based faculty). The Division of Biology and Medicine is the administrative home for faculty whose primary roles are in research, education, or clinical care in the domains of biology, medical science, and public health. This organizational structure encourages multidisciplinary instruction and research, a hallmark of education at Brown. Faculty within the Division and its teaching hospital partners attract $200 million in external research funding per year.

Support for Graduate Students in the Division of Biology and Medicine. All predoctoral students offered admission to graduate programs are guaranteed five years of financial support contingent upon making satisfactory progress toward the degree. This support includes stipend, health insurance, and remission of tuition and fees. Support comes from a combination of resources including Division Fellowships, Predoctoral Training Grants, Research Grants, Teaching Assistantships and individual fellowships. Current available predoctoral and postdoctoral federal training grant support is shown in TABLE 1. In addition, an R25 grant from NIHLB (PI Dr Sharon Rounds) supports minority undergraduate summer research training. An R25 grant from NIGMS (PI Dr Andrew Campbell) supports URM graduate education. At this time, over one third of our PhD students are supported as Research Assistants via faculty research grants. These are not individually listed in this application, however one criteria of eligibility for faculty to serve as a research mentor is external research funding.

The Office of Graduate and Postdoctoral Studies within the Division of Biology and Medicine was created in January 2006 to focus on and enhance the training environment for the roughly 285 graduate students and 100 postdocs within the Division of Biology and Medicine. In creating this office, the Dean of Medicine and Biological Sciences, made a commitment not only to growth in the overall numbers of our trainees, but also to increasing the diversity of this group and enriching trainees' preparation as scholars within the university setting and in their future career paths. Nancy L. Thompson, PhD serves as Associate Dean for Graduate and Postdoctoral Studies. Her office, located in the Arnold Laboratory, 97 Waterman St., oversees admissions, recruitment, tracking, support, and professional development for students in all of our graduate programs. Graduate Programs within the Division of Biology and Medicine are primarily interdepartmental in structure. Pre-doctoral students benefit from this multidisciplinary training environment and strong extramural research-funding base. Each Division Graduate Program has its own administrative offices, support staff, and dedicated space for students along with computer and internet access in the vicinity of the faculty research laboratories. There are further student computer clusters and associated hardware (printers and scanners) and fully supported software at the Libraries and CIT (Computing Information Technology) center. Each student is assigned office space.

Career Development Center, Meeting St**.** assists in CV and interview preparation, etc and is staffed with grad-student-dedicated personnel.
http://careerdevelopment.brown.edu/undergrads/index.php

Sheridan Center for Advanced Teaching and Learning, 96 Waterman St. This key resource, available to all students and faculty, is directed by Rebecca More. Among other offerings, the Center provides assistance in syllabus development and conducts seminars and workshops leading to three Certificate levels. Many graduate students partake in training offered here as part of their professional development.
http://www.brown.edu/Administration/Sheridan_Center/

Writing Center, A free academic support service for all members of the Brown Community. The Center is staffed by graduate students from a variety of academic disciplines. Staff members are experienced writers and teachers who participate in ongoing training in composition theory and practice. In addition to holding one-on-one conferences, Writing Center Associates offer various workshops on writing for interested groups. Writing Center conferences generally last an hour. Writing Center Associates are prepared to discuss all stages of the writing process, from finding a topic up through revision and editing strategies. Associates can help writers deal with writer's block, audience awareness, argumentation, organization, grammar, research skills, the conventions of academic writing, and issues of clarity and style.
http://www.brown.edu/Student_Services/Writing_Center/

Research Facilities
Graduate student education and research training in Biology and Public Health at Brown benefit from a wide range of cutting edge facilities, instrumentation, and other resources to support these endeavors. Graduate students carry out their research in well-equipped faculty research laboratories in multiple locations across campus linked by a frequent shuttle bus service. A listing and short description of major facilities follows but further information may be obtained via the Brown BioMed website including:
Centers/Institutes/Programs: http://biomed.brown.edu/research/cip
BioMed Core Facilities: http://biomed.brown.edu/research/facilities
Laboratories: http://biomed.brown.edu/research/labs

Sidney Frank Life Sciences Building, 185 Meeting Street. This new 173,000 gross square foot building, occupied in November 2006 consolidated most of the Division's wet lab research space in one city block. The building contains 34 labs and 51 lab modules. The open floor plan of the facility promotes collaboration among scientists and benefits trainees. These partnerships provide the context in which biomedical research will ultimately translate into the tools for clinical care. It also features a new Magnetic Resonance Imaging (MRI) facility housing a whole-body 3T MRI system and eventually a small bore, high-field 9.4T MRI system, as well as a state- of-the-art electron microscopy facility. In addition, it houses a large common area, conference rooms, and the 99-seat Markewitz Auditorium for classes and lectures. *Faculty trainers in Graduate Programs in Neuroscience and Molecular Biology, Cell Biology and Biochemistry are located here*.

Magnetic Resonance Imaging Facility (MRF): The University has established a unified, research-dedicated MRI Facility located in the Sidney Frank Hall for Life Sciences, adjacent to space dedicated to the Leduc Imaging Facility. The MRF has approximately 3,000 sq ft of space. In the core, secure space of ~2,000 sq ft, there are two bays, one for a whole-body 3T and a second intended for a small-bore, high-field MRI system, a shared equipment room, separate control rooms for each MRI system, a changing room, a testing room for human research participants, an experimental animal preparation room, a storage room and a large interconnecting utility room. The whole-body bay has a 3T TIM Trio scanner (Siemens Medical Systems) equipped with 32 receiver channels for significant gains in signal to noise ratio and acquisition speed. MRF resources include a 32-channel head coil, small animal coils, a high performance gradient insert for small animal imaging and small animal coils, visual stimulus presentations capabilities, SMI Eyetracker, an Avotec Silent Scan Audio system with sound attenuating headset, an InVivo physiological monitoring system, an infrared patient monitoring system, experimental control computers, button response boxes, a 64-channel MRI compatible EEG system, a mock scanner for participant training and a high performance computing cluster for data analysis.

The Laboratories for Molecular Medicine (LMM): 70 Ship St. The LMM is composed of 105,000 square feet devoted to research in genetics, genomics, proteomics, structural biology, pharmacology, and pathology. There are three core facilities within the LMM. The transgenic facility generates mutant mice for investigators. The

X-Ray Diffraction facility houses two major data collection systems used extensively for the elucidation of 3-D structures of many biological macromolecules. There is also a Mass Spectrometry Facility housing an LTQ-FTICR mass spectrometer. The facility is within a few blocks of major research buildings of Woman & Infants Hospital and Rhode Island Hospital which house other Brown faculty and research centers affiliated with the Division. *Faculty trainers in Graduate Programs in Molecular, Cell Biology, and Biochemistry; Molecular Pharmacology and Physiology and Pathobiology are located here.*

Brown University's Public Health Program: 121 S. Main St. Public Health research and training recently relocated to this newly acquired building. The facility includes research and instructional space and houses the Center for Statistical Sciences, as well as 9 other nationally renowned public health research centers. *Faculty trainers in Graduate programs in Biostatistics, Epidemiology, and Health Services Research are located here*.

Biomedical Center: 171 Meeting St. Immediately adjacent to the Sidney Frank Life Sciences Building, this building houses research laboratories for several departments and faculty, as well as a BioMed Stockroom. *Graduate trainers in Graduate Programs in Pathobiology, Molecular Pharmacology and Physiology, Artificial Organs, Biomaterials and Biotechnology, Biomedical Engineering, Ecology and Evolutionary Biology are located here.*

Sciences Library: 201 Thayer St. Brown faculty, students, and staff have access to both print and electronic resources at the Sciences Library. The print collection supports study and research in the fields of medicine, psychology, neural science, environmental science, biology, chemistry, geology, physics, engineering, computer science, and pure and applied mathematics.

- Access over 20,000 online journals, of which 60% are in science, technology, and medicine. On campus, these are available through Josiah, Brown's online catalog (library.brown. edu/search) or from the subject list of e-journals (dl.lib.brown.edu/eresources/ejournals.php). From off-campus, users can gain access through "Off-Campus Access Service" at http://dl.lib.brown.edu/libweb/proxy.php
- The $4M Friedman Study Center is a 24/5 student study space featuring 27,000 square feet of study and social space on three levels of the Sciences Library. The Center is staffed by expert library and technology experts and has wireless connectivity, a café, seminar rooms to support group projects, individual study spaces, multimedia terminals and more
- One-on-one assistance, individual and group orientations, and in-depth training.
- Search PubMed, Biological Abstracts and other databases and link directly to journal articles via "LibX"
- Access interdisciplinary databases such as: Academic Search Premier, Lexis/Nexis and Web of Science (includes Science Citation Index).
- Access over 100,000 e-books: http://dl.lib.brown.edu/eresources/ebooks.php
- Interlibrary loan services
- Use of EndNote and RefWorks, bibliographic management programs. http://www.brown.edu/Facilities/University_Library/eresources/refworks.html

Watson Center for Information Technology: 115 Waterman St. Brown University holds an extensive list of site licenses for computing including compilers, numerical libraries, mathematical problem-solving environments, visualization software, statistical packages, and productivity software. For Unix platforms: Mathematica, Matlab, NAG ASLI Software Suite, Portland Group Inc. (PGI) Compilers, Splus, Tecplot. For Mac and Windows platforms: Matematica 6.0, MatLab r2008b, NVivo 8, S-Plus 8, SAS 9.13, SPSS 17, Stata SE 10.0. Students have access to several computer teaching labs that are equipped with either internet connected dual boot Macintosh computers or Sun workstations for programming/instruction on multiple platforms.

Animal Facility: Brown University has a centralized laboratory animal facility with animal housing and support areas. The animal care and use program and facilities undergo a comprehensive inspection and evaluation every

three years by the independent Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC) International. Accreditation has been granted continuously since 1971. The University maintains compliance with the Public Health Service Policy on Humane Care and Use of Laboratory Animals (A3284-01) and has a United States Department of Agriculture registration as a research facility under the Animal Welfare Act. The animal program is under the direction of veterinarians who are board certified by the American College of Laboratory Animal Medicine. The facility accommodates a broad range of laboratory animal species. Specialized housing areas and equipment include an aquatic room; a quarantine space with environmental isolation caging for rodents received from noncommercial sources; a rodent housing suite with environmental isolation cubicles/caging and a "clean/dirty" flow path for materials and personnel; and a biohazard rodent housing/procedural suite with features surpassing CDC Biosafety Level 2 criteria. There are three dedicated animal surgical suites. Veterinary technicians may be consulted for surgical assistance and other animal procedures on a fee-for-service basis. All research involving animals must be approved by the Institutional Animal Care and Use Committee.

Mouse Transgenic and Knockout Core: Staffed by a PhD-level director and dedicated micro- injection technical staff, this core supports investigators through generation of transgenic and mutant mice. Services include targeted mutagenesis of embryonic stem cells; generation of ES cell chimeras; production of transgenic mice via pro-nuclear injections of DNA; re-derivation of mice by embryo transfer; and guided support through all steps in a targeted mutagenesis project. Individual investigators are responsible for genotyping, husbandry, and breeding of generated mouse strains.

Computing Services: Arnold Laboratory, 97 Waterman St. In addition to the Brown campus-wide resources of the Center for Information Technology, a Division Computing Services Office supports instructional, administrative, and research-based technology needs for both campus and hospital-based faculty and staff. The office assists with trouble-shooting computer problems, installation of software and hardware, computer configuration management, the purchase of new equipment, network planning, and configuration, and all Division information technology management and planning.

Center for Statistical Sciences: 121 Main Street. The primary mission of the Center for Statistical Sciences (CCS) is to provide a focus of statistical expertise for the Brown research community and to foster research and statistical education at Brown. CSS faculty expertise covers a broad range of areas in applied statistics. These include statistical methods for the assessment of diagnostic technology; design and analysis of clinical trials; statistical methods for health services and outcomes research; longitudinal data analysis; meta-analysis; statistical methods for psychiatry and the behavioral sciences; analysis of observational studies; and statistical methods for genomics and proteomics. In addition to research in statistical theory and methods, Center faculty and staff are involved in a variety of interdisciplinary projects both within and outside of Brown.

Center for Advanced Scientific Computation and Visualization (CCV): 180 George St. The Center houses a supercomputing and immersive virtual reality laboratory. The laboratory includes the linux cluster, the main powerhouse supercomputer; the IBM SP Cluster, a 148-processor Scalable POWERparallel cluster; and the CAVE, 'CAVE Automatic Virtual Environment' which is an 8' cube projecting on 3 walls and the floor, Intersense and Polhemus sensors are used to provide tracking, and CrystalEyes shutter-LCD glasses are used for stereo (3D) viewing capabilities.

Biomolecular Nuclear Magnetic Resonance Facility: Located at the Laboratories of Molecular Medicine, the Biomolecular NMR Facility houses one Bruker NMR instrument operating at 500 MHz. The main use of this NMR instrument is high- resolution NMR spectroscopy of biomacromolecules. An AVANCEII 500 MHz spectrometer (DRU receiver) is equipped with four independent channels dedicated to 1H,13C,15N, and 2H (2H-TX board). Two automated tuning and matching probes are available for the 500 MHz instrument: a room temperature TXI HCN z-gradient probe and a TCI HCN z-gradient cryoprobe. The instrument is controlled via

TopSpin 1.3 on a Linux-based computer.

Genomics and Proteomics Core-COBRE Center for Cancer Signaling Network/COBRE for Perinatal Biology/Brown University: The Core facility offers state of the art equipment, technical expertise, support and consultation for cutting edge research in the areas of genomics and proteomics. Equipment available for general users include ultra centrifuges with a variety of fixed angle and swing bucket rotors, analytical 3 color fluorescent cell sorting capability (FACSCalibur from Becton Dickinson), Licor Odyssey and GE 9410 Typhoon scanners, 2x Applied Biosystems HT7900 (equipped with 96, 384-well and TLDA blocks) quantitative PCR machines with a centrifuge suitable for TLDA card preparation, a Nanodrop 1000 analyzer for quantification of nucleic acids, a Spectra Max M5 plate reader, an Invitrogen Countess Cell Counter as well as a scintillation counter. Equipment solely dedicated to Affymetrix technology includes 2 Eppendorf PCR machines, a hybridization oven, 2 Affymetrix 450 Fluidics Stations and a high resolution GeneChip Scanner 3000 7G and an Agilent Bioanalyzer. High quality DNA or RNA samples submitted by researchers are processed by Core staff for subsequent microarray experiments. Researchers can be provided with either quality controlled raw output data for their own bioinformatics analysis or basic data analysis through the facility. Software available for this analysis includes Affymetrix Expression Console, Partek's Genomics Suite and Ingenuity Pathway Analysis (IPA). The Core Facility has recently upgraded its existing GenePix 4000B glass slide scanner and purchased all the equipment required to offer the complementary glass slide based array technology, such as Agilent dual color arrays, from start to finish. The facility is equipped with one -80 °C freezer, two -20 °C freezers as well as a refrigerator for sample and reagent storage. Additionally, facility hosts regular technology training seminars presented by scientists from equipment vendors providing researchers with the opportunity to either become familiar with a technology or develop a deeper understanding of the capabilities and hence maximize the resource effectiveness. The Core Facility also mediates a weekly DNA sequencing service in cooperation with Woods Hole Marine Biology Laboratory. Further information is available under http://www.brown.edu/Research/CGP/index.php

Water Flume: The Department of Ecology and Evolutionary Biology was awarded a grant from the NSF to establish a core research facility for a 3,500-gallon water flume. Measuring 80 cm in width, 60 cm in height, and 440 cm in length, the flume is based on a re-circulating design with the flow loop arranged in a horizontal configuration. With its ability to regulate flow rate patterns up to 1 m/s, the flume offers researchers a wide array of simulated conditions. Principal investigators use the flume to replicate situations normally found in the field.

Plant Environmental Center: 91 Waterman Street. The Plant Environmental Center, supported by the Department of Ecology and Evolutionary Biology, is a growing facility devoted to plant biology research. Spread out over 3 research greenhouses encompassing 5,000 square feet, the space includes a teaching plant collection, a classroom laboratory, and research facilities. There is also a 2,000 square foot Conservatory, housing many different plant families. In addition to this space there are five E7/2 conviron plant growth chambers, and a 180-sq-ft. walk-in growth chamber, used by grad students and faculty.

Bioimaging Facility: The Leduc Bioimaging Facility**,** open to all investigators, provides equipment and training dedicated to high-resolution imaging in the life sciences. The facility offers its services in the Sidney Frank Life Sciences Building and in the Laboratories for Molecular Medicine. The facility in Sidney Frank includes a Philips 410 transmission electron microscope, a Hitachi 2700 scanning electron microscope, a Zeiss Axiovert 200M fluorescence microscope, a Zeiss Lumar fluorescence stereomicroscope, a Zeiss-Photometrics luminescence microscope, a Leica TCS SP2 AOBS confocal laser scanning microscope, a Zeiss LSM510 Meta confocal laser scanning microscope, FluidVis 3D visualization, and MetaMorph 7.0 image analysis software. The facility also maintains equipment for sample preparation, including a critical point dryer, sputter coater, and microtomes for ultrathin sectioning. The facility in the Laboratories for Molecular Medicine includes a Zeiss Axiovert 200M

fluorescence microscope, a Zeiss LSM410 confocal laser scanning microscope, a Zeiss LSM710 confocal laser scanning microscope, and MetaMorph 7.0 image analysis software. The facility's manager and director provide training in microscopy, image analysis, and ultrathin sectioning. In addition, a digital imaging specialist is available for application support.

Molecular Pathology Core Research Laboratory: The Molecular Pathology Core provides technical expertise and scientific equipment necessary to evaluate and diagnose pathological alterations following exposure paradigms ranging from the simple chemical exposure to the more complex chemical mixtures. Routine procedures as well as methodology for specialty staining are offered. The core enables investigators to apply histopathological and immunohistochemical methods in order to visualize morphology through various microscopic techniques. The research laboratory is open to all graduate students, faculty, and staff. Equipment available includes an Arcturus PixCell IIe laser capture microdissection system with fluorescence upgrade, a Nikon 50i 5-headed light microscope with digital camera and projector, and a ScanScope CS system from Aperio Technologies. The core also offers expertise in transmission and scanning electron microscopy.

Molecular Pathology Core-COBRE Center for Cancer Research and Development: The molecular pathology core laboratory provides instrumentation and supports personnel in research efforts for both the COBRE mentors and their junior associates. The 1250 square foot facility is equipped with an Arcturus AutoPix automated laser capture microdissection instrument, Olympus BX41 with CoolSnap Camera from Media Cybernetics and Image Pro-Plus Software, Stratagene MX4000 quantitative Real Time PCR system, BioRad iCycler, Agilent BioAnalyser, Ventana Discovery automated immunohistochemistry processor, microtome and cryostat, Beecher tissue arrayer and 40 cubic feet of 80 degrees Celsius freezer space for the tumor bank.

Proteomics Core-COBRE Center for Cancer Research and Development: The purpose of this core includes making state-of-the-art protein and analysis/purification instrumentation and techniques available for specific research projects, assist investigators in choosing appropriate methods and techniques for specific research objectives, provide a means for investigators to become directly involved in protein analysis at a level not possible with commercial suppliers, and provide expertise in protein bioinformatics. Equipment includes the Ciphergen ProteinChip Series 4000, CiphergenExpress Data Manager Software and Analysis Module. The multifunctional Series 4000 provides a complete solution for biomarker discovery as well as biomarker interaction analysis and assay development. Other equipment includes HPLC and micro HPLC systems, an advanced ChemTech peptide synthesizer Model 496 MOS used for synthesis of peptides with up to 40-50 amino acids, and the hybridoma facility.

Marine Biological Laboratories: Located in Woods Hole, Massachusetts (approximately 70 miles from the Brown University campus), this research institution includes the WM Keck Ecological and Evolutionary Genetics Facility at the Josephine Bay Paul Center, which is equipped for high-throughput DNA template production and sequencing. The facility operates two Applied Biosystems 3730XL capillary sequencers (96- or 384-well plate format) and contains additional support instrumentation including a colony picker, thermocyclers, centrifuges, and micoarrayer. The facility also operates a Roche 454 GS20 instrument for massively parallel pyrosequencing.

The Rhode Island Genomics and Sequencing Center: This Center facilitates interdisciplinary genomics research for RI EPSCoR institutions. The Center has a multitude of equipment for training and research. The Applied Biosystems 3130xl Genetic Analyzer is a fully automated fluorescence-based genetic analysis system. The Center includes a refrigerated centrifuge, a thermal speedvac centrifuge, and an Eppendorf epMotion 5075 VAC automated pipetting workstation. The Center offers access to an Omnilog Phenotype microarray system and *two real time PCR systems (Stratagene Mx3005P and Roche LC-480),* as well as a QIAGEN BioRobot 8000 Gene Expression- a series of molecular biology workstations designed for high-throughput , walk away nucleic acid purification. *Imaging services are also available using a Zeiss Axioplan 2 microscope equipped with a*

PASCAL laser-scanning confocal module and an AxioCam high-resolution digital camera.

Facilities Planning and Operations: is a core service group that supports all matters pertaining to physical facilities within the Division of Biology and Medicine. It comprises three main components: Planning, Design and Construction, Facility Services, and Support Operations. The Support Operations group encompasses Stores Operations, Machine Shop, Copy Centers, Mail Services and Information Centers. Stores Operations offers over 900 stocked research supply items at two sites, provides laboratory gases and services for the research operations, and coordinates the shipping and receiving services for all of the Division's facilities. The Machine Shop, staffed by our Senior Instrument Maker, provides consultation and technical services ranging from equipment repair to full design and fabrication services. The Division's Mail Services, Copy Centers, and Information Centers provide the necessary administrative support to the Division's operations.

Safety Office: Brown University employs an Institutional Safety Officer, conducts safety training of new personnel including graduate students conducting research and oversees procedures for review and approval of any research involving hazardous substances.

Other Centers and Institutes

Center for Alcohol and Addiction Studies
The center brings together more than 130 faculty and professional staff across eleven University departments and eight affiliated hospitals to promote the identification, prevention, and effective treatment of alcohol and other drug use problems in our society through research, education, training, and policy advocacy.

Center for Excellence in Women's Health
The Center is dedicated to improving the health and health care for all women by working with academic and community partners and collaborating with public and private health care providers throughout the state.

Center for Gerontology and Health Care Research
The Center for Gerontology and Health Care Research is a multi-disciplinary research center with a special focus on the diverse health and social service needs of persons with chronic illnesses, especially older adults.

Center for the Study of Human Development
Child and Adolescent Development is the primary focus of the research and teaching of the faculty affiliated with this multidisciplinary center.

International Health Institute
International Health Institute was founded in 1988 to promote, develop, and coordinate the international health activities of Brown University, its faculty, and its students by applying an interdisciplinary approach to the development of research, education, and training.

Center for Computational Molecular Biology
The Center for Computational Molecular Biology sponsors research at the intersection of computer science, biology and related disciplines, particularly in the areas of genomics and proteomics research.

Center for Biomedical Engineering
The Center for Biomedical Engineering provides students and faculty with the tools they need to conduct research in biomedical engineering, a dynamic field based upon the application of the tools of engineering to the subject matter of biology.

Hallett Center for Diabetes and Endocrinology
The Hallett Center, located at Rhode Island Hospital, pursues clinical and basic research on diabetes and other

endocrine diseases that will increase our understanding of causal mechanisms and define new approaches to treatment.

Liver Research Center
The Liver Research Center is a 13,000 square foot facility emphasizing molecular biology of liver diseases. Fellows may participate in many of the established studies, i.e. genomics and pathogenesis of HCC.

Marine Biology Laboratory
The Marine Biology Laboratory (MBL), in Woods Hole, Massachusetts, hosts year-round research programs in cellular, developmental, and reproductive biology; molecular biology and evolution; neurobiology and sensory physiology; ecology; global infectious diseases; and marine biotechnology and aquaculture. In the summer months, distinguished scientists from around the world gather to do research at the MBL.

Sleep for Science Research Laboratory
The Sleep for Science Research Lab exists to produce new knowledge about sleep and circadian rhythms in humans and to contribute to training the next generation of sleep scientists.

TB/HIV Research Laboratory
Brown's TB/HIV Research Lab is dedicated to research into the prevention and treatment of two infectious diseases of global importance - human immunodeficiency virus (HIV) and tuberculosis (TB). Its primary focus is the development of vaccines for human immunodeficiency virus (HIV) and tuberculosis (TB).

X-Ray Diffraction Facility
The structural biology laboratory houses a state-of-the-art macromolecular X-ray diffraction facility.