

The University of Rochester, founded in 1850, is one of the nation's leading private universities. With just over 4,500 undergraduates, Rochester is one of the smallest and most collegiate in character among the top research universities in the nation. The University is comprised of several Academic Divisions, namely:

Arts, Sciences, and Engineering  
Eastman School of Music  
School of Medicine and Dentistry  
School of Nursing  
William E. Simon Graduate School of Business Administration Margaret Warner Graduate  
School of Education and Human Development,

as well as these Medical, Research, and Cultural Components:

University of Rochester Medical Center  
Strong Health  
Laboratory for Laser Energetics  
Memorial Art Gallery  
Eastman Theatre  
University of Rochester Press  
Center for Optics Manufacturing  
Susan B. Anthony Center for Women's Leadership  
C. E. K. Mees Observatory (Bristol Hills)

Research at the University of Rochester takes place on several campuses and across various schools, and is broadly evident in every aspect of the University's mission. Rochester faculty and their respective programs are notable by the breadth, depth, and the impact of their research and discoveries. Centers and institutes complement the work conducted within individual academic departments. A partial list of centers and institutes, as well as academic departments devoted to research and training relevant to this proposal follows. The University (and its affiliates and partners) carry on diverse programs in fundamental, as well as applied science, in addition to world-class biomedical research. Select examples of centers, facilities and resources, listed below, demonstrate the University's ongoing commitment to cutting edge, state-of-the-art research, and its integrated approach to training the next generation of scientists and engineers in the natural sciences, physical sciences, and engineering.

## **SELECT INTERDISCIPLINARY CENTERS**

### *Laboratory for Laser Energetics*

This research facility features the Omega—the world's most powerful ultraviolet laser. The OMEGA EP Laser System was complete in 2008. The new laser consists of four beamlines in a NIF-like architecture, with two of the beams capable of supporting picosecond operation.

### *Aab Institute of Biomedical Sciences*

The Institute is the centerpiece of a 10-year, \$400 million strategic plan to expand the Medical Center's research programs in the basic sciences. The Institute is organized into six interdisciplinary research centers: Center for Aging and Developmental Biology, Department of Biomedical Genetics, Center for Cardiovascular Research, Center for Pediatric Biomedical Research, Center for Oral Biology, and the Center for Vaccine Biology and Immunology.

### *The UR Fusion Science Center*

Funded by the U.S. Department of Energy, the University of Rochester was selected to host one of two Fusion Science Centers. The FSC for Extreme States of Matter develops an understanding of the physics of creating extreme states of matter using a combination of high-energy drivers (compression) and high-intensity lasers (heating). The work culminates in integrated experiments using both aspects.

*The Rochester Center for Biomedical Ultrasound (RCBU)*

RCBU was created at the University of Rochester to unite professionals in engineering, medical, and applied science communities at the University of Rochester, Rochester General Hospital, and the Rochester Institute of Technology.

*The Clinical and Translational Science Institute*

The Institute is a national leader in the expanding field of clinical and translational research. With funding from the National Institutes of Health, the CTSI assembles the people and resources that aid scientists and physicians at the University of Rochester and across upstate New York collaborate to produce innovative science and technology that improves health.

*The Center for Entrepreneurship*

Launched by the Ewing Marion Kauffman Foundation grant awarded to the University in 2003, the center serves to identify and create new partnerships with students, alumni, local businesses, and non-profit organizations; coordinates and publicizes school-based experiences, including courses and signature programming; informs faculty of grant and bridging fellowship opportunities; and encourages collaboration among the schools engaged in entrepreneurship education at the University of Rochester.

*James P. Wilmot Cancer Center*

The Cancer Center provides care, conducts significant cancer-related research, translates advances in the basic sciences into meaningful cancer treatments, and provides postdoctoral education.

*Center for Future Health*

This is a multidisciplinary research laboratory where physicians, engineers, and scientists create advanced medical technology on a personal scale.

*Environmental Health Sciences Center*

Recipient of a Center grant from the National Institute of Environmental Health Sciences, the center recognizes a large and dedicated faculty with common interests and goals focusing on environmental toxicology.

*Center for Navigation and Communication Sciences*

Center for Navigation and Communication Sciences, supported by the National Institute on Deafness and Other Communication Disorders is specifically dedicated to research on the sensory, motor, and integrative mechanisms underlying these essential functions.

*Neuroscience at Rochester*

This center bridges several academic departments and programs at the Medical Center and the School of Arts and Sciences. Covering a broad range of disciplines, faculty and staff in these areas work together to encourage collaboration and promote research and instructional programs in neuroscience.

*Rochester Center for Brain Imaging*

The goal of the Rochester Center for Brain Imaging (RCBI) is to provide researchers at the University of Rochester, as well as neighboring institutions, with access to a state-of-the-art 3T magnet for research using magnetic resonance imaging (MRI).

*The Center for Computation and the Brain*

The center brings together the growing number of researchers at the University of Rochester interested in computational approaches to the study of intelligence. CCB is dedicated to advancing an understanding of human cognition and to creating artificial intelligence through the use of mathematical analysis and computational modeling.

#### *Center for Visual Science*

An internationally renowned research group, the Center is dedicated to understanding the neural basis of vision. The center brings together scientists from a variety of disciplines with the common goal of pursuing excellence in vision research that spans the development of the visual system to the interaction between visual perception and memory.

#### *Center for Photoinduced Charge Transfer*

Housed in the Chemistry, Biology and Earth Sciences building, the Center for Photoinduced Charge Transfer (CPCT) was one of the eleven original NSF Science and Technology Centers with a mission to pursue fundamental research in the area of photoinduced charge transfer through a unique university-industrial collaboration involving UR, Eastman Kodak, and Xerox. Photoinduced charge transfer is the fundamental process by which light energy is converted to potential energy associated with separation of electrical charge.

#### *The Robert E. Hopkins Center for Optical Design and Engineering*

The center exists to provide students at the Institute of Optics the opportunity to learn optical design, engineering, fabrication, and testing. The work of the Center connects the fundamentals of optics to current and emerging applications in optical engineering and applied optics.

#### *The University created the Center for Research Computing (CRC)*

The CRC provides researchers across the University with the physical computational resources (e.g. processing, storage, and visualization hardware), software tools (e.g. compilers, libraries, applications) and expertise (e.g. training on general and specific HPC topics, applications, and development tools; assistance in porting and tuning application; consultation on applying HPC to specific scientific problems) necessary support to utilize high-performance computation fully in their research activities. CRC maintains three high-performance computing (HPC) systems totaling more than 24 teraFLOPS of computing power, 200 terabytes of disk storage, and a variety of software applications and tools. All CRC resources are supported and maintained by a professional technology team in the University's new state-of-the-art data center in operation since 2009.

#### *URinc*

The goal in establishing the URinc is to provide a facility accessible campus-wide for the conceptualization, fabrication, metrology and prototyping of novel nano-scale devices applicable in the diverse fields of optics (e.g. optical methodologies for fluidic particle sorting), physics (e.g. single atom spectroscopy), chemical engineering (e.g. fuel cell membrane technology), chemistry (e.g. nanoparticle condensation), and cutting-edge materials (e.g. OLED and nano-porous membranes). All individual URinc faculty have well equipped laboratories for investigating structures and systems fabricated at the Center. These include laser spectroscopy, low temperature transport, biomedical, scanning optical and other often unique capabilities.

## **LIBRARY RESOURCES**

The River Campus Libraries hold over 2.5 million volumes and provide access to an extensive collection of electronic resources. The libraries include several unit and departmental libraries throughout River Campus.

*Rush Rhees Library:* The primary UR undergraduate library is headquartered in the landmark Rush Rhees Library. The Humanities collections in the Rush Rhees Library date from 1850 and have been built over the course of more than 150 years in support of teaching and research at the University of Rochester. Subject librarians are available to consult with faculty and student research projects; librarians are actively involved in graduate and undergraduate student training in the use of the literature and various search engines.

*University of Rochester Carlson Library of Science and Engineering:* The UR science and engineering library serves as important resource for students, faculty and staff. Each STEM discipline taught at the University of Rochester has a dedicated professional librarian and a rich variety of resources available free of charge to the university community, including access to vast scientific databases, hundreds of online scientific journals, books and reference materials, and research tools. STEM librarians are actively involved in undergraduate student and graduate training in the use of the literature and various search engines.

*Edward G. Miner Library:* The medical library is a resource for health care and medical research. The Miner Library's print collections include more than 230,000 volumes. Located at the Medical Center adjacent to River Campus and a short walk from the main undergraduate campus, the library maintains an extensive collection of rare books and manuscripts as well as access to online databases. All students, staff, and faculty are welcome to use this facility free of charge.

## **SELECT UR SHARED RESEARCH RESOURCES**

### **Department of Biology**

Stereo and Light Microscopes  
Spectrophotometers  
PCR Thermocyclers  
Electrophoresis Apparatus  
EKG machines

### **Department of Brain and Cognitive Science**

Molecular Biology Laboratory  
Neurochemistry Laboratory  
Laser interferometers  
Image computers, including a virtual reality engine and helmet-mounted display system

### **Department of Chemistry**

Laser Facility  
Mass Spectrometer Facility  
Nuclear Magnetic Resonance Spectrometer Facility  
Computational Facilities  
X-Ray Crystallographic Facility  
Confocal Microscopy Facility

### **Department of Earth and Environmental Sciences**

Stable Isotopes in the Environment, Analytical Laboratory (SIREAL)  
The Rare Gas Laboratory  
Thermo Electron X7 ICP-MS  
Cosmogenic Isotope Laboratory  
X-ray diffractometer  
Petrographic Microscopes

**Department of Mathematics**

Advanced Computational Facilities  
PC and Linux computers and advanced mathematical software

**Department of Physics and Astronomy**

Gannett House (C.E. Mees Observatory)  
S.W. Barnes Research Laboratory  
Surface Analysis Facility  
Video Conferencing Services

**Rochester Center for Brain Imaging**

Magnetic Resonance Imaging  
3T MRI Center

**Center for Visual Studies**

CVS Computing  
Electronics Shop  
Mechanics Shop  
Histology Laboratory  
Confocal Microscopy Facility  
Electron Microscope Facility

**Statistics**

Computing Laboratory

**Department of Biomedical Engineering**

Biomechanical Testing Laboratory  
Microscopy Laboratory  
Cell Culture Laboratory  
Quantitative Physiology and Bioinstrumentation Lab

**Department of Chemical Engineering**

Synthetic Laboratory  
Gel Permeation Chromatography  
Optical Microscopy  
Contact angle Goniometer

**Department of Computer Science**

32-processor IBM pSeries 690 (“Regatta”) Machine  
8- and 16-processor SunFire Multiprocessors  
32- and 128-core Sun Niagara Machines

**Department of Electrical Engineering**

Quantum Opto-Electronics Equipment  
Medical Imaging Facilities

**Department of Mechanical Engineering**

Wide-angle XRD equipment  
Electron, atomic force, and optical microscopy  
Computational modeling facility

**The Institute of Optics**

River Campus Electron Microscopy Facility  
Single molecule spectroscopy facility  
Confocal microscopy  
Quantum Imaging Instrumentation

**The Laboratory for Laser Energetics**

Electronics Shop  
Optical Manufacturing Shop  
Optical Fabrication Shop  
Omega Laser

**URMC Research Core Facilities:** URMC Research Core Facilities provide services to all researchers at the University of Rochester. These include the Biomolecular Interaction Laboratory; Biosafety Level 3 (BSL-3) Core; Cold Storage Core (CSC); Confocal and Conventional Microscopy Core (CCMC); Electron Microscope Research Core; Flow Cytometry and Immunologic Analysis; Functional Genomics Center; Gene Targeting and Transgenic Core; High Throughput Screening (HTS) Core; Molecular Imaging Core; Multiphoton Core Facility; Proteomics Center; and University Vivarium.