



The University of Chicago
Division of the Biological Sciences and the Pritzker School of Medicine
Office of Shared Research Facilities

Boilerplate document for grant preparation

The Biological Sciences Division (BSD) of the University of Chicago has a strong commitment to shared research (core) facilities housing state-of-the-art technologies available to all research faculty, staff and students on campus. Each core facility is managed by a full-time professional Technical Director with oversight by a Faculty Director. The Technical Director and his/her staff oversee the day-to-day operation and also provide user training. In addition, each core facility has a Faculty Advisory Committee that meets periodically to review operations, evaluate the need for integration of new technologies, and advise the facility regarding faculty needs.

The BSD recognizes that core facilities are extremely valuable partners in research efforts and require continued and significant investment. The priority of the Core Facilities within the BSD is manifested in its support of the core facility infrastructure, administration and oversight. The core infrastructure is included on the standing agenda of the Research Advisory Council (RAC) which is advisory to the Dean and makes recommendations regarding strategic research issues and resource allocations. The centralized administrative support unit within the BSD (the Office of Shared Research Facilities) is funded entirely by Divisional resources and provides centralized management support. Since 2001, over \$15 million of institutional funds have been identified for investment in the Core Facilities. The funding has provided for new equipment, operational support, start-up funding for newly developed cores, and dedicated information systems for data management.

The Core Facilities of the Biological Sciences Division are centrally managed through the BSD's Office of Shared Research Facilities (OSRF). OSRF serves as the home department for the cores and provides operational management support, fiscal management, human resources support, information technology support, grant support and coordinated strategic planning for the facilities. The institutional approach to core facility management increases efficiencies by reducing unnecessary redundancy in technologies and in assuring open access to researchers.

Major Core Research Facilities

Animal Resource Center: The Animal Resources Center (ARC), which reports to the Dean of the Biological Sciences Division of The University of Chicago, is responsible for the care and use of all animals on campus used for teaching and research. The Animal Resources Center is directed by Dr. George Langan, DVM. The ARC is comprised of five sections: Administration, Compliance and Training, Clinical Services, Operations and Husbandry, and a Diagnostic Laboratory. The ARC manages seven centralized animal holding facilities, a diagnostic laboratory, and a centralized surgical clinic. The

Carlson Animal Research Facility (CARF), located in the medical center, is the largest of the ARC facilities. CARF provides multi-species housing, centralized surgical resources with operating suites, recovery rooms, treatment rooms, pharmacy, radiology, imaging suite, mouse return room, and a biohazard facility for conducting studies with hazardous substances. The rodent barrier facilities are all maintained specific pathogen free, according to The University of Chicago exclusion list, and mice are housed in individually ventilated cages. Additional facilities exist for housing the University transgenic production core and the rodent quarantine facility. The University of Chicago is AAALAC accredited.

Biomolecular NMR Facilities: A special NMR facility for structural studies is located in the Cummings Life Sciences Center and directed by Dr. Shohei Koide. High-resolution nuclear magnetic resonance (NMR) spectroscopy provides detailed information on the three-dimensional structure, dynamics, and interactions of biological macromolecules in solution. This facility houses two 600MHz and one 500MHz NMR spectrometers that are capable of performing most demanding solution NMR experiments for proteins and nucleic acids.

Biophysics: In the era of genomics-driven biology, one must be able to study not only the sequences of genes, but the structures and functions of the molecules they encode, both the proteins and functional RNAs. Characterizing the structure and dynamics of these molecules is crucial to understanding the basis of nearly every cellular function. The purpose of this facility, directed by Dr. Tobin Sosnick and located in W102 Center for Integrative Science, is to provide unimpeded access to state-of-the-art and well maintained biophysics equipment, integral to the research community at the University of Chicago. The equipment allows measurement of thermodynamic properties including stability using CD spectrometry, and binding constants using analytical ultracentrifugation, and ITC calorimetry. Secondary structure content can be studied by CD spectrometry which also can monitor conformational transitions. Over-all size and shape can be determined from rotational correlation times measured using light scattering or time-resolved fluorescence anisotropy.

Biostatistics: This facility is closely associated with the Department of Health Studies. It is located in the Billings Hospital under the direction of Dr. Ronald Thisted and provides statistics expertise for both animal and human studies. The Biostatistics Laboratory provides University researchers with biostatistical, epidemiological, and health services research expertise in a collaborative setting. Investigators may request assistance with study design, protocol development, sample-size determination, preparation of grant proposals, randomization, data analysis and interpretation, and manuscript preparation. Investigators are encouraged to inquire about collaboration at the earliest feasible time, generally during the planning stage of a study or proposal.

Brain Research Imaging Center: The Brain Research Imaging Center is dedicated to research of the central nervous system. The BRIC plays an important role in the work of a number of departments and crosses University Divisional boundaries with impact on both the Biological and Social Sciences. The facility, located in the P corridor of the

Medical Complex, houses a 3T GE magnet which provides a technological advantage in brain research studies particularly functional MRI and spectroscopy.

Cellular & Tissue-based Processing cGMP: The mission of the Cellular and Tissue-Based Processing cGMP facility, located in Kovler Laboratory and co-directed by Drs. Michael Millis and Louis Philipson, is to serve as a resource and to support investigators in meeting requirements set by the FDA for cell, gene and tissue translational therapies for Phase I and II human clinical trials. The cGMP facility provides a clean-room environment in which to transition research from the laboratory bench to clinical phase trials.

DNA Sequencing and Genotyping: This facility is under the direction of Dr. Conrad Gilliam and located in R021 BSLC. The facility operates two Applied Biosystems 3730XL and one 3130XL genetic analyzers for small and high throughput users. Templates and primers may be submitted for complete sequencing and analysis or sequencing reactions may be submitted for analysis only. Moderate- to high-throughput genotyping is handled by a Sequenom MassArray system. The core offers shot-gun subcloning of large genomic templates with optional downstream high-throughput sequencing, and offers a miniprepping service for moderate to high-copy plasmids. Technical consultations for DNA preparation and interpretation of results, as well as archival data storage, are provided at no charge.

Electron Microscopy: The Electron Microscopy is a joint BSD/PSD facility co-directed by Dr. Robert Josephs and Dr. Norbert Scherer. Users have access to an FEI Tecnai F30 scanning/transmission electron microscope. The facility is located in ESB23 in the Center for Integrative Science. The group provides preparation and viewing services for transmission electron microscopy. Physical Science services include: phase-contrast TEM imaging which provides information on materials structures at atomic resolution; diffraction contrast imaging which is used for morphology and defect investigation; STEM Z-contrast imaging which presents information not only on crystal structure but also on chemical composition at atomic resolution; electron diffraction that can be used for crystal structure and orientation investigation; elemental analysis using X-ray energy-dispersive spectrometry; and tomography for 3D structure determination. Biological Science services include: tissue embedding; sectioning; immunogold-labeling; negative staining; and imaging.

EM Cryopreservation and Tomography: The EM CPT facility is located in ESB07 in the Center for Integrative Science and directed by Dr. Laurens Mets. Electron tomography of samples prepared by high-pressure freezing allows accurate three-dimensional reconstruction of biological samples at 5 – 7 nm resolution. This method is proving to be indispensable for understanding how molecular structures are linked to cellular architecture and function. An added benefit will be the capacity to perform high-quality immunoelectron microscopy of rapidly frozen samples.

Frank W. Fitch Monoclonal Antibody Facility: This facility, located in 049 Kovler Laboratory, is directed by Dr. Anne Sperling. The Frank W. Fitch Monoclonal Antibody

Facility provides a growing range of services focusing on the generation of monoclonal antibodies and purification of antibody supernatants. The use of homogeneous monoclonal antibodies has become an essential tool in the rapidly growing interdisciplinary approach to biomedical technology and research at the University of Chicago. The Facility provides the only hollow-fiber bioreactor instrumentation to a broad user base on campus. In addition to technology, the facility provides the benefit of many years of experience in novel antibody production. The facility continues to respond to the demand for new and improved technology. Education in the use of the technology is provided by personalized one-on-one protocol development and consultation. The facility has an extensive reference library containing references pertinent to the technological focus of the facility.

Flow Cytometry: This facility is directed by Dr. Anne Sperling. The Flow Cytometry Facility serves the faculty by providing access to state-of-the-art technology and quantitative analytical approaches to measure molecular and cellular function. The facility is designed to meet the wide-spread needs for specialized cytologic analysis and continues to respond to the demand for new and improved technology. The primary location, located in 037 Kovler Laboratory houses 2 high-speed cell sorters (DakoCytomation MoFlo HTS and BD FACSAria) and 3 bench top analyzers (Two BD LSR II instruments and a BD FACScan). The facility maintains 3 satellite locations with bench top instrumentation: S319 AMB: BD FACSCanto and BD FACSCalibur HTS with high throughput capability; R111 BSLC: BD FACSCanto; R409 BLSC: FACSCanto. The main facility also has ancillary fluorescence detection equipment including a BioPlex system for bead-based analyte assays, an ELISpot analyzer and a fluorescence plate reader. Fluorescence microscopes complement the analytical capacity of the flow cytometers.

Functional Genomics: The Functional Genomics Facility, located in G405 AMB under the direction of Dr. Richard Quigg, provides resources for investigating gene function with a focus on applying microarray and oligonucleotide technology. As a service facility, the FGF provides expertise and equipment for all phases of array-based services, ranging from sample preparation through to data analysis and management for UC investigators as well as qualified external users. As a research facility, the FGF pursues various research and development projects, including a comprehensive microarray reproducibility study, critical evaluation of signal-dependent thresholds for significant changes, and optimization of protocols for Affymetrix genechip array hybridization. FGF also functions as an educational resource. Facility equipment includes a variety of Affymetrix microarray platforms, ABI Real-Time PCR technologies, Codelink arrays, Agilent DNA Microarray platform, and a variety of customized services and data analysis support.

General Clinical Research Center: The mission of the combined adult and pediatric General Clinical Research Center (GCRC), under the direction of Dr. Roy Weiss, is to provide the resources and environment to the faculty of the University of Chicago to conduct human subject research of the highest scientific merit. Our priority is to support investigator-initiated research projects that receive primary funding from other components of the National Institutes of Health. A broad range of studies of normal and abnormal function of the human body, and investigations into the cause, progression, prevention, control, and cure of human disease are conducted under CRC auspices.

Greenhouse: A greenhouse facility including 7500 sq ft of bench space divided into several rooms that can be independently controlled and accessed, plus five additional large environmentally controlled rooms and an adjoining well equipped laboratory are located on top of the Biological Sciences Learning Center. University endowed funds support 1.5 staff positions to maintain this facility and care for the plants.

Human Immunological Monitoring: The development of new immune-based therapies, such as cancer vaccines and novel cytokines, and the elucidation of the mechanism of action of currently available treatments, require careful monitoring of scientific endpoints to determine the optimal biologically active dose and schedule of these agents. The purpose of the Human Immunologic Monitoring Facility, directed by Dr. Thomas Gajewski and located in 057 Kovler Laboratory, is to perform such assays in the context of clinical trials in human patients. This service enables a range of clinical researchers, who may not themselves have the expertise or laboratory commitment to carry out these assays, to measure immunologic endpoints in participating study subjects.

Human Tissue Research Center: A Pathology based core facility directed by Dr. Mark Lingen, the HTRC is to provide investigators with a centralized infrastructure to optimize the efficiency and costs related to research involving human biospecimens. The HTRC occupies 2,500 square feet of newly remodeled space within Pathology and functions as an integrated unit. Thus, duplication of personnel, equipment, and information systems are avoided, and coordination of activities is assured. The HTRC now comprises three integrated facilities: Biospecimen Bank (BSB), Laser Capture Microdissection (LCM), and Pathology Image Analysis (PIA). Currently the HTRC provides services for the collection of clinically-annotated human tissues, as well as blood/serum/plasma/saliva for cancer-related research. In addition, the Core provides collaborative support and services for histopathology, LCM, tissue microarray preparation (TMA), and nucleic acid extraction. In this way, we provide a coordinated, centralized, and dedicated program for the procuring, processing, dispersing and assessing all types of biospecimens.

Immunohistochemistry: The IHC Facility is located in 051 Kovler Laboratory and directed by Dr. Anthony Montag. It provides the following services for human and animal research tissues: tissue embedding, frozen and paraffin tissue sectioning, tissue staining (H&E and up to 3-color immuno-staining), in situ hybridization, development of novel antibody panels and references and expertise regarding IHC and tissue procurement.

Integrated Microscopy: The Integrated Microscopy Facility is directed by Dr. Ben Glick. The Integrated Microscopy Facility (IMF) functions as a supervised, user-based Core providing state-of-the-art microscopy imaging capabilities to all University investigators. The primary mission of the Facility is to provide a valuable, unique service to the University community by furnishing high-quality microscopy instrumentation, image analysis tools, and expert assistance. The facility can accommodate live cell imaging in multiple formats. The N710 location houses 4 bright-field and fluorescence light microscopes (Axioplan, Axioskop, Axiovert 100tv, and Axiovert 200m) and a stereomicroscope. The Abbott 120/129 location houses multiple microscopes including a Leica SP2 Laser scanning microscope, an Olympus Fluoview laser scanning

microscope, the Olympus IX81 live-cell microscope, a Leitz upright scope, an Axiovert 135, Leica SP5 2 photon confocal microscope and an Olympus DSU spinning disk confocal.

Institute for Biophysical Dynamics Nanobiology: The development of a Nanobiology Facility within the Institute for Biophysical Dynamics (IBD) is a joint venture between the Biological and Physical Sciences Divisions. This facility, under the direction of Dr. Norbert Scherer, serves as a user service facility as well as an equipment and method development laboratory. It is located in the Center for Integrative Sciences. The mission is to provide state-of-the-art imaging and molecular manipulation instrumentation to a wide user group (ranging from Physics and Chemistry to Biochemistry, Cell Biology and Medicine) and to develop new microscopy instrumentation and methods to address a range of research needs. The Microscopy Suite consists of a general purpose atomic force microscope (AFM), a dedicated molecular "puller" AFM, and a near-field scanning optical microscope (NSOM). A dedicated time-resolved fluorescence and microscopy apparatus is funded for development and plans for other microscope developments are in progress.

Mechanical-Technical Shop: The BSD Mechanical-Technical Shop is a machine shop directed by Michael Graziano who has over 25 years of design and machining experience. The facility specializes in designing and building custom devices for research, from behavioral apparatuses to specialized microscope chambers and so on. The Shop can also accommodate requests for modifications to existing equipment and will perform equipment repairs. The Shop is located in the Surgery Brain Research Institute, room JS-115.

Pharmacology: The Pharmacology Core Facility directed by Dr. Eileen Dolan, offers analytical and biochemical services. Analytical services include HPLC assays for drugs in biological fluids and method development. Biochemical services include isolation of blood components (plasma ultrafiltrate, granulocytes, and lymphocytes). The Biochemical Core also offers pharmacological assays (HPLC/spectral analysis), assessment of markers of drug resistance (AGT analysis, DPD, GST and GSH analysis) and collection of tumor specimens including isolation of DNA and RNA.

Proteomics: The Proteomics Core Facility located in 161 CLSC and directed by Dr. Stephen Kron, is a mass spectrometry facility dedicated to the characterization of proteins and peptides. This facility provides access to state-of-the-art mass spectrometers (Agilent XCT Ion Trap, ABI Qstar Pulsar Quadrupole TOF MS, and ABI 4700 Maldi TOF/TOF MS) and ancillary HPLC instrumentation. The facility provides advice and instrument training to users as well as standard "drop-off" protein identification, de novo protein sequencing, simple molecular weight, high mass accuracy molecular weight, 1 and 2 dimensional gel electrophoresis, solution isoelectric focusing, spectral interpretation and method development consulting services.

Scientific Visualization and Image Analysis: The Scientific Visualization and Image Analysis Core Facility is a shared facility designed to provide high speed and parallel

processing capabilities and hardwired 3D visualization and virtual reality capabilities to researchers at the University of Chicago. It is directed by Dr. Mary Ellen Geiger.

Small Animal Imaging: The Functional & Molecular Imaging Facility is developing multiple imaging modalities for rodents and small primates. This group of facilities include the existing MRIS and Optical Imaging labs and the developing modalities of Ultrasound, micro-PET, CT and SPECT.

- **Magnetic Resonance Imaging Spectroscopy (MRIS):** The MRIS Imaging facility, directed by Dr. Greg Karczmar, houses a 9.4T magnet. The system is used for imaging of model systems to investigate mechanisms of disease and to aid in the design of methods which can later be implemented on clinical systems. In addition, the facility provides an important teaching resource, aiding graduate students, residents and postdoctoral fellows to develop a thorough understanding of all areas of biomedical research and provides a powerful new research tool for investigators throughout the University campus.
- **Optical Imaging Core Facility:** The OICF is located in the Carlson Animal Facility and is directed by Dr. Chin-Tu Chen. The Optical Imaging Core Facility (OICF) provides quantitative fluorescence and bioluminescence imaging services for *in vivo* and *in vitro* studies of small animals and specimens using three different imaging modalities. The facility's imaging instruments include the Xenogen IVIS 200 imaging system, the Olympus OV100 *in vivo* imaging system, and the VisEN Fluorescence Molecular Tomography imaging system. All three *in vivo* optical imaging systems allow for multiple images to be acquired from the same animal so users can track physiological changes occurring within an animal over the course of seconds to minutes and days to weeks.

Transgenic Mice/Embryonic Stem Cell Facility: The core facility, under the direction of Dr. Kathleen Millen, provides a large number of services to University of Chicago investigators including: transgenic mouse production, ES cell technology mouse production (from ES culture, gene targeting through blastocyst injection), timed mouse pregnancies, and embryo rederivation in conjunction with the Animal Resources Center (ARC). We also provide timed pregnant females of various strains and other mouse breeding services. The facility maintains microinjection microscopes as well as surgical dissection scopes. The facility is located in the hospital complex with the animal procedure facilities located within the Animal Resource Center barrier facility.