

## Core Boilerplates

The BSD has a strong commitment to shared (core) research 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.

The BSD recognizes that core facilities are extremely valuable partners in our research efforts and require continued and significant investment. Two divisional entities exemplify this commitment:

1. an active standing faculty committee, the Research Resources Oversight Committee, serves as an institutional “board of directors” and meets monthly to advise the Dean on institutional investment of financial and space resources in the facilities, to implement his recommendations, and to review facility operations;
2. a centralized administrative support unit, the Office of Shared Research Facilities (OSRF), serves as the home department for the shared core facilities (<http://osrf.bsd.uchicago.edu/>). The OSRF provides operational management support, highly efficient fiscal management, HR support, grant support, and coordinated strategic planning for the facilities. Between FY16 – FY20, 28.6% of the OSRF and cores operational funding comes from divisional support and 9.0% comes from Cancer Center support. In addition to these divisional units, each facility is served by a Faculty Oversight Committee that addresses user input and user requests for development of new services. Combined, this oversight structure provides expert supervision and responsiveness to faculty-demanded services and innovations.

Many of the existing BSD core facilities were established with divisional resources and continue to be underwritten with BSD funds. Between FY16 and FY20, \$19.6M of institutional funds were identified for capital investment in shared research facilities to provide new equipment and technology. This continued investment will ensure that the core facilities will continue to be maximally useful to students and faculty alike.

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### [Advanced Electron Microscopy \(updated 12/2/2020\)](#)

The Advanced Electron Microscopy (AEM) Core facility currently has over 16 million dollars in assets, including 6 Electron Microscopes. Additional details can be obtained on the AEM website: <https://voices.uchicago.edu/advancedem/>. The facility is split into 2 locations, one dedicated to sample preparation, occupying over 2000 sq ft in the Gordon Center for Integrative Sciences, and a newly renovated space dedicated to high resolution cryoEM and volume imaging in the Franklin McLean Research Institute (over 2800 sq ft) housing our 3 electron microscopes, computer workstations and room for future equipment by enclosed passages which also connects the medical centers and the research laboratories. Our electron microscopes include:

- 1) FEI Talos 200kV cryo-electron screening microscope
- 2) FEI Tecnai F30 300kV 3D electron tomography/ STEM tomography
- 3) FEI Tecnai Spirit 120kV routine electron microscope for room-temp and Cryo screening
- 4) Thermo/FEI Krios G3i: High resolution Cryo-SPA and Cryo-Tomography
- 5) Thermo/FEI VolumeScope): Large volume block-face SEM
- 6) Thermo/FEI Aquilos:: Cryo-Dual Beam SEM for thinning samples for cryo-tomography

The facility also contains 2 VitroBot Mark IV plunge freezers, Bal-Tec high-pressure freezer, 2 Leica freeze-substitution devices, an Edwards evaporator, 2 Leica ultramicrotomes, a Fishione dual-axis high tilt holder for tomography, Gatan 626 cryo-holder and Elsa cryo holder, Gatan plasma cleaner, Leica Ace 600 carbon and sputter coater, computer workstations, ancillary laboratory equipment such as light microscopes, wet lab bench space, a CO2 incubator, fume hoods, a 400 TB FTP and 500 TB FTP data server, and general consumables related to electron microscopy. The AEM Faculty Director is Robert Keenan. The AEM Core Facility is staffed by Dr. Jotham Austin, II (Core Facility Director), Dr. Tera Lavoie (Core Technical Director) Dr. James Fuller (BMB cryoEM Research Associate), and Ms. Yimei Chen (Core Assistant Technical Director). Core may be identified in publications as The University of Chicago Advanced Electron Microscopy (RRID:SCR\_019198).

**Animal Resources Center (updated 11/2020)**

The University of Chicago Animal Resources Center (ARC) has a PHS assurance with OLAW and is a USDA registered research facility. The animal care program has been accredited by AAALAC International since 2002. There are 5 full time veterinarians, including the Attending Veterinarian, Dr. George Langan, who support the animal care and use program at The University of Chicago. All but one of the veterinarians are board certified by the American College of Laboratory Animal Medicine. There are 3 veterinarians participating in our lab animal medicine residency. In addition, there are 7 veterinarian technicians who along with the veterinarians are responsible for the veterinary care for all animals at the University.

The ARC is approximately 125,000 sq ft of animal housing and procedural space in six facilities. There are facilities designed to accommodate both large and small animal species, but the majority of the facilities are dedicated to housing barrier mice, approximately 20,000 cages at any given time. Barrier mice are housed in positively pressurized individually ventilated cage racks and changed in biological safety cabinets. Caging and bedding are autoclaved prior to use and cages are provided with irradiated food and acidified water. There are specialized areas for research involving surgical, behavioral and biohazardous (ABSL 2) studies and an off campus location for ABSL3 studies.

Animal care technicians (ACT) are responsible for providing daily husbandry and observing animals for signs of illness or abnormal behavior. Each animal is observed at least once a day. The procedure for reporting and recording animals that appear to be ill or behaving in an abnormal manner varies with the species and severity of the problem. In an emergency situation (regardless of species), the ACT immediately notifies the clinical veterinarian, the husbandry supervisor and/or the veterinary technician for the facility by paging or phone call. The animal is attended to and information is entered in the medical record for USDA covered species or an AHOD (Animal Health Observation Document) is produced for rodents or exotic species.

If a sick rodent is found during routine health observation, the ACT completes the AHOD to identify the animal and list their observations. The AHOD's are collected by a veterinary technician, special services technician or facility supervisor and the health problem evaluated. Following and the clinical veterinarian occurs as necessary. Information regarding resolution, treatment and monitoring is noted on the AHOD form and a plan for treatment is indicated.

If a large animal species is found with a health problem during routine health observations, the ACT either notifies the veterinary technicians or clinical veterinarian directly or by pager or phone. The veterinary technicians and/or the clinical veterinarian evaluate the animal and develop a treatment plan.

All animal facilities are staffed 7 days a week with the regular animal care staff. An on-call husbandry supervisor oversees the weekend and holiday husbandry staff. A veterinary technician is present all day on weekends, and for abbreviated hours during holidays, to provide treatment and care to large animal species. A husbandry supervisor and veterinarian are on-call at all times. Signs are posted in each facility alerting investigative staff how to contact a veterinarian and husbandry supervisor in the event of an emergency.

#### **Bioinformatics (updated 1/2021)**

The Bioinformatics Core, affiliated with the Center for Research Informatics, provides centralized bioinformatics resources for the Biological Sciences Division. The Director is Dr. Mengjie Chen, assistant professor of Medicine and Human Genetics. The bioinformatics scientists, including one MS and six PhDs, have extensive formal background and education in biology, plus years of experience in applying computational, bioinformatics, and biostatistics methods to solving biological problems. The Biocore works with PIs on experimental design, grant and manuscript writing, software and platform development, and state-of-the-art analyses and interpretation. Current expertise includes whole genome or exome sequencing, cancer genomics studies, CRISPR screening, and next generation sequencing (NGS) data sets including RNA-seq, RIP-seq, ChIP-seq, scRNA-seq, and ATAC-seq. The Biocore facility has access to a high-performance computing (HPC) cluster, and lab storage shares that are HIPAA compliant and backed up nightly.

#### **Biomolecular NMR Facilities (updated 11/23/2020)**

A dedicated NMR facility for structural biology and metabolomics studies is located in the Cummings Life Sciences Center and directed by Dr. Stephen Meredith. Dr. Joseph Sachleben, an experienced NMR spectroscopist, oversees its daily operation, and he is also responsible for implementation of new experiments, user training and consultation. The facility houses two NMR spectrometers: a 500 MHz Bruker AVANCE III and a 600 MHz Bruker AVANCE IIIHD. These instruments are capable of performing the most demanding solution NMR experiments. All spectrometers are capable of variable temperature operation with a maximum range of  $-5^{\circ}\text{C}$  to  $150^{\circ}\text{C}$ . A Gilson 215 sample preparation robot and a SampleExpress sample changer provides automated sample preparation and acquisition of spectra on series of samples for epitope and small scale metabolomic analysis. Software packages for data processing and structure calculation are installed on workstations in the facility. In addition, as a member of a Chicago-area NMR consortium (University of Illinois at Chicago, Northwestern University, and University of Chicago), University of Chicago investigators have guaranteed access to two high-field solution state NMR spectrometers equipped with cryoprobes (800 and 900 MHz) as well as high field solid-state NMR equipment (400 MHz and 750 MHz) located at the nearby University of Illinois at Chicago.

#### **Biophysics Core Facility (updated 12/15/20)**

The Biophysics core is directed by Dr. Ronald Rock and Dr. Elena Solomaha and located in the Gordon Center for Integrative Science. The core provides a complete set of instruments for quantitative characterization of macromolecules and relevant biological systems. Laser light scattering, fluorometry, CD spectrometry, and spectrophotometry determine absolute properties of macromolecules: weight, size, hydrodynamic radius, composition, polarization, intramolecular distances, and the presence of certain functional groups. These complementary techniques, coupled with thermodynamic and interactional data from bulk techniques such as surface plasmon resonance (SPR) spectroscopy and calorimetry, yield a comprehensive, robust, and reliable portrait of the molecule of interest and its biological activity. The facility also offers instrumentation, such as the multimode plate reader and Seahorse extracellular flux analyzer, for direct measurement of cellular and macromolecular activity. The Biophysics Core Facility instruments:

Extracellular Flux Analyzer: Seahorse ECF, Agilent

Isothermal Titration Calorimetry: ITC 200, Malvern

Circular Dichroism Spectrometer: Jasco J-1500, Jasco

Surface Plasmon Resonance. Biacore 8K

Static/Dynamic Light Scattering: NanoStar, DynoPro, DAWN HELEOS, Wyatt Technology

Fluorescence Spectroscopy: Flurolog-3 Yobin Yvon-Horiba; Synergy Neo HST, BioTek

Luminescence: Synergy Neo HST, BioTek

Spectroscopy: Agilent 8453, Agilent; Synergy Neo HST, BioTek

Molecular Imaging: FX Pro Plus Imager, Bio-Rad; ChemiDoc TM XRS+ System, Bio-Rad

Core may be identified in publications as The University of Chicago Biophysics Core Facility (RRID:SCR\_017915).

### **Biostatistics (updated 11/23/2020)**

The Biostatistics Laboratory is affiliated with the Department of Public Health Sciences and is located in Billings Hospital (3<sup>rd</sup> floor of MARP). The Scientific Director of the core is Dr. Donald Hedeker and the Technical Director is Dr. Theodore Karrison. The facility provides statistical collaborative support for basic science, animal, and human studies, including early and late phase clinical trials as well as observational studies. Investigators may request assistance with study design, protocol development, sample-size determination, preparation of grant proposals, randomization, data analysis and interpretation, and manuscript preparation. The Biostatistics Laboratory is currently staffed with three masters-level biostatisticians, five PhD-level biostatisticians, a Research Professional, and two data scientists. The Core also operates a “biostatistics clinic,” which is can be utilized for short-term consultations.

### **Cytometry and Antibody Technology Facility (updated 11/2020)**

<https://voices.uchicago.edu/ucflow/> This facility is directed by Dr. Anne Sperling. The main facility is located in the Biological Sciences Learning Center and has a satellite facility in the Albert Merritt Billings Hospital. The CAT Facility serves the faculty by providing access to state-of-the-art technology in quantitative analytical approaches to measure molecular and cellular function. The facility is designed to meet the widespread

needs for specialized cytometric analysis and continues to respond to the demand for new and improved technology. The CAT facility supports a Helios mass cytometer, which allows for the detection of 40+ parameters on a cell-by-cell basis. It also supports two 5-laser (355nm, 405nm, 488nm, 561nm and 640nm) Cytex Aurora flow spectral analyzer which allows for the measurement on 40+ fluorophores on every single cell. Currently the main facility employs 5 standard cytometers, including a BD Accuri C6 (488 and 640nm laser with 4 parameter detectors), a ThermoFisher Attune with 4 lasers (405nm, 488nm, 561nm and 640nm) and 14 detectors, two custom 4 laser (405nm, 488nm, 561nm, and 640nm) / 15 parameter detectors BD LSR-Fortessa (one equipped with a 96 well HTS unit) and a LSR-Fortessa X20 equipped with 5 lasers (UV, 405nm, 488nm, 561nm, and 640nm) and 18 parameter detectors. In addition, the CAT facility has 2 BD FACSAriaII high-speed cell sorters with 4 lasers (405nm, 488nm, 561nm and 640nm) and 15 parameter detectors, as well as a BDFACS Aria Fusion cell sorter equipped with 5 lasers (UV, 405nm, 488nm, 561nm, and 640nm) and 18 parameter detectors. This last instrument, incased in a BSL2 laminar flow hood, is dedicated solely for users processing human patient samples in a translational research setting. All of the cell sorters are equipped with 96-well plate robotic arm attachments, various nozzle tip sizes (70um – 130um) and temperature control (4C – 37C). The CAT Facility also hosts a MACSQuant Tyto cell sorter equipped with 3 lasers (488nm, 405nm, and 638nm) and 8 fluorescence detectors which process cells within a closed cartridge, offering full biosafety and protection against microbial contamination. The satellite facility has a custom-built BD LSRII equipped with 4 lasers (405nm, 488nm, 561nm, and 640nm) and 12 parameter detectors. Additionally, the facility has an imaging cytometer, the EMD-Millipore ImageStreamX MkII, which has 4-lasers (405nm, 488nm, 561nm, 640nm) and two 6-channel CCD cameras to collect up to 10-color fluorescence image data from thousands of cells per second. The facility also has a dedicated Luminex bead analyzer from Millipore and a Quickplex SQ120 from Meso Scale Discovery to perform multiplex cytokine assays. Trained users are provided 24-hour access on any of these instruments with the exception of the Helios mass cytometer, which is operated by the staff of the facility. The core may be identified in publications as The University of Chicago Cytometry and Antibody Technology Facility (RRID: SCR\_017760).

### **Cellular Screening Center (updated 11/2020)**

The Cellular Screening Center (CSC) is a high-throughput screening facility that performs small molecule and siRNA screens. It has over 200,000 small molecules distributed among 11 diverse compound libraries, as well as the Dharmacon Human siGENOME siRNA library. The CSC is also a center for cell line models and currently holds over 250 cell lines with an emphasis on cancer cell lines. The CSC is directed by Dr. Geoffrey Greene and located in the Knapp Center for Biomedical Discovery. Dr. Carman Ip, the technical director, manages the day-to-day operation of the facility. CSC lab space houses a BioBubble softwall cleanroom area for the screens. It is certified to be ISO 5 cleanroom standard. This enclosure ensures a high degree of confidence in assays due to the vastly reduced risk of contamination in this environment. The CSC robotic deck includes a workstation robot for sample prep, plate design and around the clock screens. It is

integrated with 3 readers, 4 liquid handlers and 2 storage spaces. The Spinnaker robot is able to provide self-correcting precision and sample tracking with its built-in machine vision system. It has 4-axis to reach for a variety positions as needed. The Momentum automation software allows the ease of integration of various workflows on demand.

CSC has partnered with the Center for Research Informatics (CRI) at The University of Chicago to maintain CSC databases. All data that is obtained from the four readers are automatically stored at a remote server where it is backed up nightly. The CSC has bioinformatics support to maintain the security of the data, the availability of data, and to aid in data analysis. The core may be identified in publications as The University of Chicago Cellular Screening (RRID:SCR\_017914).

#### **Cellular and Tissue-Based Processing cGMP Facility (updated 12/8/2020)**

The Cellular and Tissue-Based Processing cGMP Facility is located in the Kovler Laboratory building. The faculty director is Amittha Wickrema, Ph.D. Diane Ostrega, M.S., M.B.A, has served as the Technical Director since the facility's inception in 2001. They have over 45 years' combined experience in clinical and basic and translational research. The facility is staffed by a small core group of technologists trained to carryout cell processing and quality functions for investigator initiated and pharma sponsored studies. The mission of the facility is to provide a laboratory environment as well as resources and consultative services for preparing cellular and biological products suitable for infusion into patients. The facility is FDA registered and follows regulations consistent with FDA guidance documents for manufacture and handling of 351 and 361 cellular therapy products. The facility is furnished with positive and negative pressure clean rooms, Biological Safety Cabinets, instrumentation for cell isolation, high-speed cell sorting, cryopreservation and assay and endotoxin analysis. The facility is accredited by the College of American Pathologists (CAP).

#### **Genomics Core Facility (updated 12/14/2020)**

The Genomics Core Facility is located in the Knapp Center for Biomedical Discovery and directed by Dr. Yoav Gilad, Professor in the Department of Human Genetics. In addition to Dr. Gilad the core has a dedicated staff of 11 people including 3 PhD level scientists. The major services provided are Next Generation DNA Sequencing, DNA microarrays and Sanger DNA Sequencing. For single cell applications the Facility operates a 10X Genomics Chromium Controller, a Takara iCell 8 and a MissionBio Tapestri to generate NGS libraries.

- Next Generation Sequencing: The Facility utilizes Illumina MiSEQ, NextSeq500, HiSEQ 4000 and NovaSEQ6000 instruments to perform DNA sequencing (whole genome, ChIP, Exome and other) and RNA sequencing services.
- Microarray Analysis: The Facility owns and operates an Illumina IScan

- Sanger DNA Sequencing and Genotyping: The Facility operates two Applied Biosystems 3730XL and one 3130XL genetic analyzers for small and high throughput users.

Other services offered include technical consultations, nucleic acid purification, sample processing and library construction. Plate and micro-volume readers are provided for client use.

The Genomics Core is supported by the Cancer Center Support Grant (P30 CA014599). It may be identified in publications as The University of Chicago Functional Genomics (RRID:SCR\_019196).

***Human Disease & Immune Discovery Core Facility (updated 01/2021)***

<https://voices.uchicago.edu/hdid/> This facility is directed by Professor Bana Jabri and is located on the 1<sup>st</sup> floor of Knapp Center for Biomedical Discovery. The HDID Facility serves the scientific community by providing access to 2 state of the art multiparameter flow cytometry instruments.

Aurora from Cytex is a spectral flow cytometry analyzer. Equipped with 5 lasers: UV 355nm, Violet 405nm, Blue 488nm, Yellow-Green 561nm, Red laser at 640nm and 64 fluorescence detectors covering the whole spectrum of emission from each laser line. This instrument was successfully used to generate data based on the staining with panel of 42, and theoretical maximum number of fluorochroms that Aurora instrument can quantify simultaneously is 62.

S6 FACSymphony cell sorter is the newest generation instrument from BD Biosciences. It's equipped with 5 lasers and 30 fluorescence detectors (100mW UV laser at 355nm - 8 detectors; 100mW Violet laser at 408nm - 8 detectors; 150mW Blue laser at 488nm - 6 detectors; 150mW Yellow-Green laser at 561nm - 5 detectors; 140mW Red laser at 638nm - 3 detectors). In addition to highly multiparameter capabilities S6 cell sorter can be used to physically separate up to 6 unique cell population simultaneously (6-way sorting).

HDID core facility is also well equipped with modern laboratory equipment that allow for samples processing and antibodies staining prior flow cytometry acquisition. We also provide access to powerful computer workstation that is used for data analysis and visualization.

***Human Tissue Research Center (updated 11/30/2020)***

<http://htrc.uchicago.edu> A pathology-based, CAP-accredited core facility directed by Dr. Mark Lingen. The effective procurement, storage, distribution, and analysis of human biospecimens are of critical importance to biomedical research The Human Tissue Resource Center (HTRC) provides investigators with a centralized infrastructure to optimize the efficiency and costs related to research involving human biospecimens. In this

way, the core provides a coordinated, centralized, and dedicated program for the procurement, processing, dispersing, and assessment of all types of biospecimens. Thus, duplication of personnel, equipment, and information systems is avoided, and coordination of activities is assured. The HTRC is comprised of four integrated subcores: biospecimen bank (BSB), laser capture microdissection (LCM), and pathology image analysis (PIA), and immunohistochemistry (IHC).

The HTRC offers efficient and cost-effective options for:

- Biobanking of solid tissues, lymphocytes and bodily fluids including serum, plasma, saliva, and urine
- Pathological verification and analysis of tissue samples
- Histological services including routine tissue formalin fixation, processing, paraffin embedding, microtomy, H&E staining, in situ hybridization, and immunostaining
- Tissue microarray (TMA) fabrication
- Laser capture microdissection (LCM)
- Quantitative image analysis of immunohistochemistry on conventional and tissue microarray sections, including tissue scoring, rare event detection, microvascular density counting, ploidy analysis, integrated optical density analysis, and tissue microarray scoring

The core may be identified in publications as The University of Chicago Human Tissue Resource Center (RRID:SCR\_019199).

#### **Human Immunological Monitoring (updated 12/14/2020)**

The HIM Facility, directed by Dr. Thomas Gajewski, provides laboratory support to UCCCC investigators who conduct novel immunotherapy clinical trials. The services include standardized, state-of-the-art immune monitoring assays to measure immunologic endpoints and biologic effects of pharmacologic agents using lymphocytes as a surrogate tissue, as well as the newly established multidimensional biobanking protocols for fresh patient tumor biopsies, PBMCs, serum, and stool to study tumor gene expression and mutations, germline polymorphisms, systemic metabolomics, and gut microbiota. In addition, the HIM Facility has developed multiplex immunofluorescence staining panels to visualize and quantify various immune cell subsets within the tumor. The HIM Facility also provides services including sample management, reporting, shipping, protocol development, and manuscript preparation. The core may be identified in publications as The University of Chicago Human Immunological Monitoring Core (RRID:SCR\_017916).

#### **Human Imaging Research Office**

The Human Imaging Research Office (HIRO) in The University of Chicago's Biological Sciences Division provides a dedicated infrastructure to assist with issues related to the acquisition, collection, and distribution of clinical imaging examinations and associated

data for use in research. The HIRO provides services for almost all types of medical imaging, including: X-ray (radiographs, fluoroscopy, angiography, cardiac cath), DXA, CT, MRI, ultrasound (general, echocardiography, vascular, ob/gyn), nuclear medicine (planar, SPECT, MIBG), PET, ophthalmology imaging, endoscopy and bronchoscopy, and many types of specialty imaging. The HIRO was created with three primary responsibilities: (1) coordinate the acquisition of images for clinical research per the study protocol's imaging guidelines and parameters, (2) provide reliable and consistent assessment of disease response for clinical research, and (3) manage and distribute medical imaging exams for research purposes in a compliant manner. The HIRO's services ensure research-related imaging fulfills protocol requirements and allow investigators to obtain HIPAA- and IRB-compliant clinical research data. The HIRO currently provides assistance for over 350 clinical research studies from 15 sections and departments within our medical center. The HIRO has fulfilled over 10000 requests for medical imaging data, delivering over 112000 imaging examinations and related reports to investigators for research purposes. The HIRO has supported clinical trials at our institution that are sponsored by numerous different companies, including: AbbVie, AstraZeneca, Astellas, Bayer, Biogen, Boston Scientific, Bristol-Myers Squibb, Hoffman-La Roche, Genentech, Gilead, GlaxoSmithKline, InCyte, Janssen, MedImmune, Medtronic, Merck, Novartis, Pfizer, and Sanofi Aventis. The HIRO has also supported clinical trials at our institution that are sponsored by cooperative groups like ACOSOG, ACRIN, Alliance, CALGB, COG, ECOG, GOG, NCI, and RTOG. Implementation of the HIRO has increased the level of satisfaction and interaction among investigators, research subjects, radiologists, and other imaging professionals. The core may be identified in publications as The University of Chicago Human Imaging Research Office (RRID:SCR\_018372).

### **Integrated Light Microscopy (updated 12/1/2020)**

The Integrated Light Microscopy Facility (ILMF) 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, user training, image analysis tools, and expert assistance. The ILMF is directed by Dr. Benjamin Glick and managed by three full-time technical directors. Together Dr. Vytas Bindokas, Dr. Christine Labno and Ms. Shirley Bond have a combined 70 years of microscopy experience with specialties in live cell imaging, physiologic measurements, clinical immunopathology, and immunostaining (including antibody generation and testing) as well as extensive experience in image processing and analysis. The main location is a custom-designed space in the Knapp Center for Biomedical Discovery (KCBD) room 1250, and houses 14 microscopes, including four with superresolution capability (the Leica Ground State Depletion superresolution/TIRF microscope, lattice Lightsheet, the Leica SP5 II STED-CW superresolution confocal, and Leica SP8 3D STED-3X white-light laser spectral confocal). Other systems in the KCBD location include a NEW Leica Stellaris8 WLL Falcon WLL confocal system, two Olympus DSU spinning disk confocal systems, a

stereomicroscope, CaliberID upright scanning confocal microscope, a La Vision ultra II cleared sample lightsheet microscope, and two brightfield and fluorescence light microscopes. The facility can accommodate live cell imaging in multiple formats, including the Zeiss Lightsheet Z1 SPIM system, the 3-I Lattice Lightsheet system, the Olympus VivaView incubator microscope, three systems with full-wrap incubation chambers (two with CO<sub>2</sub>) and three stage-top incubation systems. Two high-resolution digital slide scanners are operated as a drop-off service. These scanners yield digital slides containing detail equivalent up to 80x magnification for color histology and multi-color fluorescence materials. The Abbott 129 satellite location houses three microscopes including a Leica SP5 2-photon laser scanning confocal, a 3-I Marianas laser spinning disk confocal, and an Axiovert 135 fluorescence/DIC microscope. The facility offers high-end analysis software (MetaMorph, Arivis Vision4D, Imaris, Huygens Pro, ImageJ, etc), free temporary networked data storage, and workstations (two are very high-end computation and graphics capable) for data analyses and presentation (including virtual reality). Details and policies can be found on the Core website. <https://voices.uchicago.edu/confocal/>

### ***Integrated Small Animal Imaging Research Resource (updated 1/4/2021)***

The Integrated Small Animal Imaging Research Resource (iSAIRR) offers a broad spectrum of imaging modalities and techniques for in vivo imaging of small animals and ex vivo imaging of tissue/organ specimens. The Facility's goal is to provide UChicago investigators with state-of-the-art, quantitative multi-modality imaging technologies to advance in-vivo molecular and physiological research of a broad range of disease and cancer models to accelerate pre-clinical development of novel therapeutics. Currently, iSAIRR subcores feature magnetic resonance imaging and spectroscopy (MRIS); optical imaging; micro-positron emission tomography, single photon emission computed tomography, and computed tomography (microPET/SPECT/CT); and ultrasound.

### **Services**

- Consultation to assist users in planning and designing experimental procedures and animal imaging protocols
- Development and testing of new imaging contrast agents and new imaging methods
- Processing of acquired raw data to produce reconstructed/processed images
- Image analysis
- Development and testing of new imaging contrast agents and new imaging methods
- Magnetic resonance imaging and scanning of tissues, cells materials, and animal models of cancer and ex vivo surgical specimens to provide information on 3D anatomy, hemodynamic parameters, tumor oxygenation, energy metabolism, metabolic markers, calcium dynamics, etc.
- Development and testing of new imaging contrast agents and new imaging methods

- Hands-on optical imaging (fluorescence and bioluminescence) or optical imaging services to assess gene expression, protein-protein interactions, tumor growth, vascularization, etc.
- CT, PET, and SPECT imaging of small live animals, tissues, cells, materials, ex vivo specimens, mummified or other specimens, including high-resolution detailed 3D anatomy by CT, quantitative metabolic imaging by PET, various functional/physiologic/molecular imaging using radiotracers by PET and/or SPECT
- Large animals PET
- Ex-vivo biodistribution and autoradiography of tissues and organs
- Animal preparation and handling, induction and maintenance of anesthesia, performance of animal surgical procedures, physiological monitoring and recording during imaging sessions, injection of imaging probes/drugs/other interventions, physiologic sampling and measurements, catheter implantation, and inoculation of tumor cell lines

The core may be identified in publications as The University of Chicago Integrated Small Animal Imaging Research Resource (RRID:SCR\_017923).

***Transgenic Mice/Embryonic Stem Cell Facility (updated 11/2020)***

<http://transgenic.bsd.uchicago.edu> The core facility, under the direction of Dr. Kay Macleod, provides a large number of services to University of Chicago investigators including: transgenic mouse production including site directed transgenics (TARGATT), transgenic and gene targeting vector design and construction, CRISPR/Cas9 RNA injections, ES cell technology- based mouse production (from blastocyst injection of murine ES cells), and embryo re-derivation in conjunction with the Animal Resources Center (ARC). The facility also provides timed pregnant females of various strains and other mouse breeding services. The facility maintains several lines of mice (FLPe, Mox 2Cre, ROSA26 R/G, Tomato Red/GFP) to provide critical mouse strains at low cost to those investigators generating mice with conditional gene deletions. The state-of-the-art facility maintains all equipment necessary to perform the above operations. The molecular and tissue culture lab is located in the Knapp Center for Biomedical Discovery (KCBD) building and the animal procedure facilities located within the Animal Resources Center barrier facility in the Gordon Center for Integrative Science (GCIS).