# Table of Contents

## Annual Report FY14

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table of Contents</td>
<td>ii</td>
</tr>
<tr>
<td>Overall Financial Summary</td>
<td>1</td>
</tr>
<tr>
<td>Cores Administration</td>
<td>2</td>
</tr>
<tr>
<td>Cell Imaging Facility</td>
<td>4</td>
</tr>
<tr>
<td>Centralized Zebrafish Animal Resource Facility</td>
<td>8</td>
</tr>
<tr>
<td>DNA Peptide Synthesis Facility</td>
<td>12</td>
</tr>
<tr>
<td>DNA Sequencing Facility</td>
<td>17</td>
</tr>
<tr>
<td>Drug Discovery Facility</td>
<td>22</td>
</tr>
<tr>
<td>Electron Microscopy Facility</td>
<td>26</td>
</tr>
<tr>
<td>Flow Cytometry Facility</td>
<td>31</td>
</tr>
<tr>
<td>Genomics Facility</td>
<td>36</td>
</tr>
<tr>
<td>Machine Shop Facility</td>
<td>40</td>
</tr>
<tr>
<td>Mass Spectrometry &amp; Proteomics Facility</td>
<td>43</td>
</tr>
<tr>
<td>Metabolic Phenotyping Facility</td>
<td>47</td>
</tr>
<tr>
<td>Metabolomics Facility</td>
<td>51</td>
</tr>
<tr>
<td>Mutation Generation &amp; Detection Facility</td>
<td>56</td>
</tr>
<tr>
<td>Nuclear Magnetic Resonance Facility</td>
<td>62</td>
</tr>
<tr>
<td>Small Animal Imaging Facility</td>
<td>68</td>
</tr>
<tr>
<td>Small Animal Ultrasound Facility</td>
<td>72</td>
</tr>
</tbody>
</table>
Core Facilities Overall Financial Summary

Revenue & Expenses

- The Core Facilities budget for FY14 was $5 million with an expense total of $5.8 million. Approximately $3 million in expenses went to salaries and benefits while $2.8 million was spent on equipment and operating supplies.
- In FY14, $3.2 million in services were billed.
- Budget:

Cell Imaging and Electron Microscopy received capital equipment in FY13 which was partially paid for in FY14.
★ These facilities received no operating support from the VP.
Cores Administration

Overview
The Health Sciences Center (HSC) Core Facilities operate under central administration headed by Drs. Andrew Weyrich and John Phillips. They are assisted by Ms. Brenda Smith, Ms. Esther Kim, and Mr. Jeff Ware. The Cores Administration office is responsible for the personnel management and financial affairs of the Core Facilities, as well providing community services for the School of Medicine (SOM), for example the X-ray film developer and Irradiator are managed through the office. All facilities operate on a charge-back basis, although the percent recovery of operating expenses for each facility varies greatly, the goal of the HSC Core Facilities is to make necessary technology and the expertise to operate available to all faculty and students at the University of Utah.

Personnel
- Andrew Weyrich, Ph.D., Associate Dean for Basic and Translational Sciences, Director HSC Core Facilities
- John Phillips, Ph.D., Associate Director HSC Core Facilities
- Brenda Smith, Administrative Manager
- Esther Kim, Administrative Assistant
- Jeff Ware, Accountant

2014 Annual Update
- In FY12, the billing process took approximately 2 weeks to complete. In FY13, our team developed a LEAN project to improve the process to 4 days due to employee cross-training and the implementation of new billing standards.
- The goals for the Cores Administration office for FY14 were to improve the billing process time to 3 business days and to create an internal tracking system using File Maker Pro that will provide real time balances of each Cores budget. A shadow system will track orders sent to the business office allowing the directors to view the balance of their activity accounts. The directors will be able to access this tracking system by simply logging in and selecting either the Account Summary or the Detail Transaction Reports.
- In FY14, the Cores Administration office successfully reduced the amount of time to process billing to 2 business days. The internal tracking system was created and lists each account balance in real time. Each director can access the system by logging in and reviewing their reports. This tracking system stores different fiscal year data.
- First Annual Retreat was proposed and run. Results were better understanding of what cores did, how cores could interact, how cores could organize to provide better services and data. Worked with Admin Core to develop standards for Faculty Advisory meetings and roles.

Cores Administration Revenue & Expenses
- VP of Research Support: $266,000
- FY14 revenue: $155,856
- FY14 expenses: $396,181
- FY14 Revenue from services*: 
*This represents the income from the 5% administrative fee charged to each core, based on collected revenue from billed services.

**Advisory Board Committee**
Last meeting date: January 10, 2014
- Andy Weyrich, Director, Core Facilities
- Joseph Yost, Professor, Neurobiology and Anatomy
- Mark Yandell, Professor, Human Genetics
- John Phillips, Associate Director, Core Facilities
- Dennis Winge, Professor, Hematology
- David Stillman, Professor, Pathology
- Wes Sundquist, Professor, Biochemistry
- Stephen Lessnick, Professor, Pediatric Hematology
- Carl Wittwer, Professor, Pathology
- Eric Schmidt, Professor, Medicinal Chemistry

**Addendum**
- Faculty Oversight Committee Guidelines can be found for all cores at the following link: [http://www.cores.utah.edu/?page_id=3725](http://www.cores.utah.edu/?page_id=3725)
Cell Imaging Facility

Overview
The Cell Imaging Facility provides training and consultation on the use of confocal microscopy, widefield automated microscopy, two-photon, and software analysis tools for quantitative analysis of image data. The facility has two Olympus FV1000 Spectral confocals, two Nikon A1 confocals, and a Multi-photon confocal from Prairie. A Nikon Ti automated microscope for live cell imaging has both Spinning Disk Confocal and Widefield capabilities. A Zeiss Axioscan Z1 slide scanner is available for automated archiving of histology and fluorescence data. Automated microscopes with one of four different stage incubators are available (CO2, temperature, humidity) and also available for live cell imaging. Nikon Elements, Metamorph, Imaris and Volocity software are available for 2D and 3D analysis of image data.

Services
The training and equipment provided by the facility is aimed at reducing the startup time and degree of expertise necessary for an individual user to design and execute experiments requiring microscopy and image processing.

Equipment
- Two Olympus FV1000 Confocal Microscopes
- Nikon A1 Confocal Microscope
- Nikon A1R Confocal Microscope
- Prairie Multi-Photon Confocal Microscope
- Zeiss Axioscan Z1 automated slide scanner with 100 slide loader
- Nikon Widefield/Spinning Disk Confocal Microscope
- Olympus CCD Widefield Microscope
- EVOS FL Widefield Microscope
- Nikon Ti Automated Microscope

Personnel
- Christopher Rodesch, Ph.D., Director
- Michael J. Bridge, Ph.D., Research Associate
- Michael Redd, Ph.D., Research Associate

2014 Annual Update
New Equipment
- In July 2013, the Cell Imaging Facility added a Prairie Multi-photon confocal microscope
- In June 2014, a Zeiss Axioscan Z1 with 100 slide loader came online with funding from the Internal School of Medicine Equipment competition (Grainger)

New Services
- Mike Redd can perform zebrafish based imaging experiments for an hourly rate
- Cell based quantification is available on the Imaris workstation

Revenue/Expenses
- VP of Research Support for normal operating expenses: $170,000
- VP of Research Support for Two-Photon Scope: $495,599 (note: remainder of cost was transferred in FY2013).
- FY14 revenue: $133,215
- FY14 expenses: $244,473
- FY14 revenue generated from services:

Advisory Board Committee
Last meeting date: February 20th, 2014
- Gabrielle Kardon, Associate Professor, Human Genetics
- Kristen Kwan, Assistant Professor, Human Genetics
- Jody Rosenblatt, Assistant Professor, Oncological Sciences
- Josh Bonkowsky, Associate Professor, Neurobiology and Anatomy
- Adam Douglass, Assistant Professor, Neurobiology and Anatomy
- Jason Shepherd, Assistant Professor, Neurobiology and Anatomy
- Matt Wachowiak, Associate Professor, Neurobiology and Anatomy

FY14 Scientific Impact
Research Support
- Revenue by Campus Affiliation

# of grants: 137
# of investigators: 107
### Revenue by Department

- Internal Medicine
- Neurobiology and Anatomy
- Human Genetics
- Oncological Sciences
- Pharmaceutics & Pharmaceutical Chemistry
- Pediatrics
- Surgery
- Biochemistry
- Pathology
- Pharmacology and Toxicology
- Radiation Oncology
- Biology
- Medicinal Chemistry
- Anesthesiology
- Bioengineering
- Mechanical Engineering
- Electrical & Computer Engineering
- Orthopedics
- Radiology
- Ophthalmology/Visual Sciences
- Neurology
- Exercise and Sport Science
- Obstetrics/Gynecology
- Chemistry

### Top Users

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Li, Dean</td>
<td>NIH, HUNTS</td>
</tr>
<tr>
<td>Dorsky, Richard</td>
<td>NIH</td>
</tr>
<tr>
<td>Kardon, Gabrielle</td>
<td>NIH</td>
</tr>
<tr>
<td>Bonkowsky, Josh</td>
<td>NIH, NIDDK</td>
</tr>
<tr>
<td>Redd, Michael</td>
<td>NIH, HUNTS</td>
</tr>
<tr>
<td>Capecchi, Mario</td>
<td>HHM</td>
</tr>
<tr>
<td>Yost, Joseph</td>
<td>NIH</td>
</tr>
<tr>
<td>Sundquist, Wesley</td>
<td>NIH, DHHS, HCI, University</td>
</tr>
<tr>
<td>Bhaskara, Srividya</td>
<td>Department</td>
</tr>
<tr>
<td>Williams, Megan</td>
<td>Edward Mallinckrodt Jr. Foundation</td>
</tr>
</tbody>
</table>
Publications


Centralized Zebrafish Animal Resource Facility

Overview
The Centralized Zebrafish Animal Resource (CZAR) Facility provides state-of-the-art systems for housing, breeding, and performing experiments with zebrafish, an emerging vertebrate model system. It comprises of 5000 fish tanks maintained on 4 independent recirculating water systems, and houses a large number of wildtype and mutant zebrafish strains. The communal laboratory design encourages intellectual and experimental synergism among research groups, facilitating 1) large genetic screens carried out as collaborations between multiple laboratories; 2) collaborative research projects that require shared use of specific genetically marked or mutagenized animals; 3) development and distribution of resources and new technologies that advance the research efforts of all laboratories on campus; 4) a teaching environment in which the newest technologies and resources are disseminated quickly; and 5) training and experimental support for laboratories wishing to try pilot zebrafish experiments. Currently, the facility is used by 12 large laboratories and supports an additional six to ten small-scale user groups.

Services
The CZAR Facility is responsible for the daily care and maintenance of the zebrafish and aquatic systems. The facility provides the following services:
- Housing and maintaining zebrafish, monitoring their care, and providing specialized nursery care and diets resulting in high survival rates of young fry
- Establishing practices and providing oversight to ensure the safety and health of the animals in compliance with IACUC standards and regulations
- Propagating wildtype lines and providing animals from these lines to investigators
- Providing laboratory bench space and supplies to perform experiments
- Providing shared-use equipment including 7-8 microinjection stations and bright field stereomicroscopes, and 3 fluorescence stereomicroscopes.
- Providing education and training to investigators and students on an individual basis
- Providing specialized centralized services performed by the permanent staff, such as sperm cryopreservation and storage
- Providing quarantine facilities to house the zebrafish from outside sources to generate clean lines to import into the facility
- Instituted user feedback systems to monitor husbandry success through efficiency of mating data and nursery survival rates

Equipment
- M205 FA Leica Microscope
- Zeiss Microscope
- Olympus Microscope
- 7 microinjection stations with bright field stereomicroscopes
- Analog camera and monitor to facilitate teaching microinjection in real time
Personnel

- Maurine Hobbs, Ph.D., Director
- Sharon Johnson, Senior Laboratory Specialist (Zebrafish Husbandry and WT Line Maintenance)
- Talmage Long, Technician (Dedicated Nursery Manager)

2014 Annual Update

New Equipment

- In April 2013, the Zeiss microscope was upgraded with an LED light source
- In February 2014, Injection station 1 was fitted with an analog camera and monitor to facilitate teaching microinjection to new users
- In May 2014, temperature sensors were installed throughout the facility to help monitor the quality of temperature control, and record deviations that could affect zebrafish health

New Services

- Charges for cryopreservation and storage of fish line sperm were introduced in 2013
- In 2013 improvements to the web interface and web calendar for equipment sign up were completed
- In June 2014, Ms. Johnson began a program to maintain WT or transgenic lines for any lab for a nominal fee
- The CZAR Facility now offers a “Fish School” course for new users to learn best practices in handling and caring for their zebrafish, as well as how to tell male and female zebrafish apart

Revenue/Expenses

- VP of Research Support: $115,000
- Total FY14 revenue: $270,384
- Total FY14 expenses: $399,249

Grants

June 2014, Dr. Grunwald was awarded a $500,000 G20 grant to expand the CZAR Facility by 51% in the next year. University will match award ~600,000.

- FY14 revenue from services:

Note: revenue for FY13 and FY14 is maximal due to facility limitations.
Advisory Board Committee
Last meeting Date: June 9, 2014
- David Grunwald, Professor, Human Genetics
- Josh Bonkowsky, Associate Professor, Neurobiology and Anatomy and Pediatrics
- Richard Dorsky, Associate Professor, Neurobiology and Anatomy
- Kristen Kwan, Assistant Professor, Human Genetics
- Amnon Schlegel, Assistant Professor, Internal Medicine
- Rodney Stewart, Assistant Professor, Oncological Sciences
- Jack Taylor, Director, Office of Comparative Medicine
- Joseph Yost, Professor, Neurobiology and Anatomy and Pediatrics

FY14 Scientific Impact
Research Support
- Revenue by Campus Affiliation

![Pie chart showing revenue by campus affiliation]

- Revenue by Department

![Pie chart showing revenue by department]
Top Users

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Grunwald, David</td>
<td>NIH</td>
</tr>
<tr>
<td>2</td>
<td>Schlegel, Amnon</td>
<td>DHHS</td>
</tr>
<tr>
<td>3</td>
<td>Dorsky, Richard</td>
<td>NIH</td>
</tr>
<tr>
<td>4</td>
<td>Yost, Joseph</td>
<td>NIH</td>
</tr>
<tr>
<td>5</td>
<td>Bonkowsky, Josh</td>
<td>NIH</td>
</tr>
<tr>
<td>6</td>
<td>Cairns, Bradley</td>
<td>NIH, HHMI</td>
</tr>
<tr>
<td>7</td>
<td>Rosenblatt, Jody</td>
<td>NIH</td>
</tr>
<tr>
<td>8</td>
<td>Tavtigian, Sean</td>
<td>NIH</td>
</tr>
<tr>
<td>9</td>
<td>Vetter, Monica</td>
<td>NIH, Department</td>
</tr>
<tr>
<td>10</td>
<td>Tristani-Firouzi, Martin</td>
<td>American Heart Association</td>
</tr>
</tbody>
</table>

Publications

DNA Peptide Facility

Overview

The DNA Peptide Facility provides researchers with chemical synthesis of custom oligonucleotides and oligopeptides. The facility synthesizes standard DNA/RNA oligos and peptides with multiple purity options, ranging from crude to HPLC. This Core has the ability to incorporate a wide array of specialty modifications, including fluorophore-labeling and functional group derivatization via amino-, thiol-, and modifications compatible with click chemistry. The goal of the facility is to provide quality service with speedy turnaround times.

Services

- Routine and custom DNA synthesis
- Routine and custom RNA synthesis
- Routine and custom Peptide synthesis
- Peptide Purification

Equipment

- ABI 3900 DNA Synthesizer (2)
- ABI 394 DNA Synthesizer (3)
- ABI 433 Peptide Synthesizer
- ABI 433 Peptide Synthesizer
- Beckman Coulter System Gold 125P HPLC System
- Beckman Coulter System Gold 126 HPLC System
- Hewlett Packard Series 1100 HPLC system (2)
- Beckman Coulter DU800 Spectrophotometer
- BioTek Epoch Plate Reader Spectrophotometer

Personnel

- Mike Hanson, Ph.D., Director
- Scott Endicott, Research Associate
- Karen Freedman, Lab Specialist
- Chandra Hayes, Lab Aide
- Sheyenne Shamsa, Lab Aide
- Francisco Samaniega, Lab Aide
- Amanda Jarvis, Lab Aide

2014 Annual Update

New Equipment

- The DNA Peptide Facility did not obtain any additional equipment in FY14

New Services

- The DNA Peptide Facility did not implement any additional services in FY14

Revenue/Expenses

- VP of Research Support: $0
- FY14 revenue: $561,896
- FY14 expenses: $529,804
FY14 revenue generated from services:

Advisory Board Committee
Last meeting date: August 2014
- Eric Schmidt, Professor, College of Pharmacy
- Jen Heemstra, Assistant Professor, Chemistry
- John Weis, Professor, Pathology

FY14 Scientific Impact
Research Support
- Revenue by Campus Affiliation

# of grants: 149
# of investigators: 205
Top Users

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BioFire Diagnostics</td>
<td>Off Campus</td>
</tr>
<tr>
<td>2</td>
<td>Burrows, Cynthia</td>
<td>NIH, NSF</td>
</tr>
<tr>
<td>3</td>
<td>Tavtigian, Sean</td>
<td>NIH, HCI</td>
</tr>
<tr>
<td>4</td>
<td>Sundquist, Wesley</td>
<td>NIH, DHHS</td>
</tr>
<tr>
<td>5</td>
<td>Li, Dean</td>
<td>NIH</td>
</tr>
<tr>
<td>6</td>
<td>Weyrich, Andy</td>
<td>NIH</td>
</tr>
<tr>
<td>7</td>
<td>Heemstra, Jan</td>
<td>NIH</td>
</tr>
<tr>
<td>8</td>
<td>Wittwer, Carl</td>
<td>NIH</td>
</tr>
<tr>
<td>9</td>
<td>Rutter, Jared</td>
<td>NIH, NSF</td>
</tr>
<tr>
<td>10</td>
<td>ARUP</td>
<td>Off Campus</td>
</tr>
</tbody>
</table>

Publications


DNA Sequencing Facility

Overview
The DNA Sequencing Facility provides DNA sequencing services and employs the latest technologies to generate high quality data with a fast turnaround time and competitive prices. In support of DNA sequencing activities, the facility utilizes state-of-the-art DNA sequencers and lab robotics such as the Ion Torrent PGM and Proton, the Qiagen Q24 Pyrosequencer, and the Biomek FX for liquid handling needs. Data from standard DNA sequencing services are typically reported to customers within 24 hours. Sample information can be submitted online and sequencing data files are also available online for download using a simple and secure interface.

Services
DNA Sequencing Services
- Standard DNA sequencing
- Primer walking on clones
- Mutation detection and resequencing custom projects
- Ion Torrent NGS sequencing
- Pyrosequencing

Robotics
- Biomek FX with Span-8 and 96 head

Other Services
- Lab consumables for sample submission
- Life Technologies freezer program

Equipment
Sequencers
- Ion Torrent PGM
- Ion Torrent Proton
- Qiagen Q24 Pyrosequencer
- Applied Biosystems 3730xI

Liquid Handlers
- Biomek FX

Personnel
- Derek Warner, Director
- Michael Powers, Senior Laboratory Specialist
- Anna Adamson, Lab Specialist

2014 Annual Update
New Equipment
- In April 2013, the DNA Sequencing Facility purchased and installed an Advanced Analytical Fragment Analyzer for sample quantification of RNA and DNA samples prior to NGS and other downstream applications

New Services
- Support for Ion Torrent NGS is now available
- Prices have been updated for sequencing supplies
- Ion Torrent Proton is available for Exome Sequencing and RNA Seq runs and are now being brought online
Revenue/Expenses
- VP of Research Support: $0
- FY14 revenue: $399,748
- FY14 expenses: $581,460
- FY14 revenue generated from services:

Advisory Board Committee
Last meeting date: June 30, 2014
- Monica Vetter, Professor, Neurobiology & Anatomy
- Colin Dale, Associate Professor, Biology
- Robert Weiss, Professor, Human Genetics

FY14 Scientific Impact
Research Support
- Revenue by Campus Affiliation

# of grants: 134
# of investigators: 187
Revenue by Department

- Biology
- Internal Medicine
- Pediatrics
- Neurobiology and Anatomy
- Biochemistry
- Oncological Sciences
- Human Genetics
- Ophthalmology/Visual Sciences
- Pathology
- Surgery
- Exercise and Sport Science
- Neurology
- Bioengineering
- Chemistry
- HSC Cores
- Civil & Environmental Engineering
- Anthropology
- Dermatology
- Radiology
- Pharmacology and Toxicology
- Anesthesiology
- Medicinal Chemistry
- Pharmaceutics & Pharmaceutical Chemistry
- Psychiatry
- Neurosurgery
- Orthopaedics
- Nutrition
- HCI
- Physics & Astronomy

Top Users

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Diana Stafforini</td>
<td>Department</td>
</tr>
<tr>
<td>2</td>
<td>Elizabeth Leibold</td>
<td>NIH</td>
</tr>
<tr>
<td>3</td>
<td>Matthew Mulvey</td>
<td>NIH</td>
</tr>
<tr>
<td>4</td>
<td>Christopher Gregg</td>
<td>New York Stem Cell Foundation</td>
</tr>
<tr>
<td>5</td>
<td>Denise Dearing</td>
<td>NSF</td>
</tr>
<tr>
<td>6</td>
<td>Douglas Grossman</td>
<td>Department</td>
</tr>
<tr>
<td>7</td>
<td>Kevin Jones</td>
<td>NIH</td>
</tr>
<tr>
<td>8</td>
<td>Markus Babst</td>
<td>NIH</td>
</tr>
<tr>
<td>9</td>
<td>Djordje Atanackovic</td>
<td>Department</td>
</tr>
<tr>
<td>10</td>
<td>Kathryn Swoboda</td>
<td>Department</td>
</tr>
</tbody>
</table>
20 Publications


Drug Discovery Facility

Overview
The Drug Discovery Facility provides compound collections for screening. The facility delivers low-cost and efficient access to chemical libraries for screening, to equipment for automation, and to synthetic chemistry support for the characterization and validation of compounds for potential use as therapeutics, diagnostics and biological tools.

Uniqueness
The University of Utah possesses the scientific and medical talent, innovation research culture, and state-of-the-art research facilities to contribute substantially to the discovery of small molecule drugs. However, significant challenges still remain in translation of basic scientific discoveries into potential human therapeutics. The uniqueness of the Drug Discovery Facility is it coordinates the cooperative efforts of individual research groups in a wide variety of different drug discovery studies, ultimately leading to discover novel chemical probes and new pharmaceutical lead compounds.

The most valuable assets at the facility are the private/proprietary chemical collections that could result in new intellectual property. These unique molecules of therapeutic potential offer the facility to assist in the translation of fundamental discoveries in biology into novel therapeutics and commercial opportunities. It’s anticipated that the discovery of candidate lead compounds from the facility will stimulate interest in commercial development of technology at the University of Utah through licensing agreements with pharmaceutical industry partners and the production of new start-up biotechnology companies.

Services
High-throughput screening
- Small molecule chemical libraries
- Pooled CRISPR-Cas9 libraries
- Assay development
- Consultation on target identification/validation, hit to lead optimization, PK/PD/Efficacy
- Chemical support for drug discovery

Equipment/Compound Collection
Automated Liquid Handling Stations:
- Tecan EVO100/MCA96 Liquid Handler with sterile bio-hoods
- Tecan EVO100/MCA384 Liquid Handler with sterile bio-hoods
- CyBio(Matrix) 96/384 Liquid Handler
- Matrix PlateMate Plus 384 Liquid Handler
- HP D300 Digital Dispenser
- Bio-tek Plate Washer with stacker

Automated Detection Systems:
- ImageXpress XLS Automated High-Content System
- Bio-tek Plate Synergy 4 Plate Reader with stacker

CRISPR Libraries:
- The genome-scale CRISPR-Cas9 knockout (GeCKO) v2 library
- Subset CRISPR libraries: a) human Lentiviral sgRNA library-kinases, and b) human Lentiviral sgRNA library-nuclear proteins

Commercial Compound Libraries:
- Chembridge 49K Diverset
Microsource Spectrum Collection
NIH Clinical Collection
Epigenetics Screening Library
Kinase Inhibitor Library
NCI Diversity Set IV
Natural Products Set II

Private/Proprietary Chemical Collections:
UUPCC – University of Utah Private Chemical Collection
Dept of Chemistry Library
Ireland Natural Product Collection

Personnel
Bai Luo, Ph.D., Director

2014 Annual Update

New Equipment:
ImageXpress XLS Automated High-Content System - capable of providing automated cellular imaging in fluorescent modes for fixed- or live-cell assays

New Compound Collection:
NIH Clinical Collection - 446 compounds that have been in phase I-III clinical trials and have not been represented in other arrayed collection
Epigenetics Screening Library - 75 small molecules that are known to modulate the activity of a variety of epigenetic ‘writers and erasers’ and ‘reader’ proteins
NCI Diversity Set IV - 1596 compounds with diverse pharmacophores which were derived from the almost 140,000 compounds available for distribution from the Developmental Therapeutics Program (DTP) repository at NCI/NIH
Natural Products Set II - 120 natural product compounds from Developmental Therapeutics Program (DTP) repository at NCI/NIH

New CRISPR Libraries:
The genome-scale CRISPR-Cas9 knockout (GeCKO) v2 library consists of 122,417 unique guide sequences targeting 19,052 human genes and including 1000 control (non-targeting) sgRNAs
Subset CRISPR libraries: a) human Lentiviral sgRNA library-kinases, and b) human Lentiviral sgRNA library-nuclear proteins

New Services:
Web-based secured UUPCC compound management system - capable of 1) compound searching by compound ID, relevant chemical properties or structure and substructure, 2) compound ordering for complete set copies, subset plate copies, or individually cherry-picked compounds, 3) inventory tracking and maintaining accurate compound quantity/volume balances
CRISPR screening
Cell-base high-content screening

Revenue/Expenses
VP of Research Support: $242,104
FY14 Revenue: $27,028
FY14 Expense: $290,914
FY14 revenue generated from services:

Advisory Board Committee
Last meeting date: December 17, 2013
- Darrell Davis, Professor, College of Pharmacy
- Ryan Looper, Associate Professor, Chemistry Department
- John Phillips, Professor, Internal Medicine
- Jared Rutter, Professor, Department of Biochemistry
- Bryan Welm, Assistant Professor, Surgery
- Hari Vankayalapati, Research Assistant Professor, HCI

FY14 Scientific Impact
Research Support
- Revenue by Campus Affiliation
Top Users

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Li, Dean</td>
<td>NIH</td>
</tr>
<tr>
<td>Schlegel, Amnon</td>
<td>DHHS</td>
</tr>
<tr>
<td>Tavtigian, Sean</td>
<td>NIH</td>
</tr>
<tr>
<td>Phillips, John</td>
<td>NIH</td>
</tr>
<tr>
<td>Longo, Nicola</td>
<td>DHHS</td>
</tr>
<tr>
<td>Bild, Andrea</td>
<td>Department</td>
</tr>
<tr>
<td>Holmen, Sheri</td>
<td>NIH</td>
</tr>
<tr>
<td>VanBrocklin, Matthew</td>
<td>NIH</td>
</tr>
<tr>
<td>Navigen Pharmaceuticals Inc.</td>
<td>Off Campus</td>
</tr>
<tr>
<td>Recursion Pharmaceuticals Inc</td>
<td>Off Campus</td>
</tr>
</tbody>
</table>

Publications

Goals for FY15
Integrate new functionalities
- Synthetic and Medicinal Chemistry Facility
- LC-MS NMR Facility
- Cell Imaging Facility
Expand capabilities
- Upgrade Bio-teq plate reader (7 year old)
- Enhance Utility of UUPCC Library
Expand business
- Move to main campus
- Institutional seed funding
- Library compound sharing with other institutes
Electron Microscopy

Overview
The Electron Microscopy (EM) Facility utilizes transmission electron microscopy (TEM) and scanning electron microscopy (SEM) imaging to determine cellular structures, the morphology of biological macromolecules, the three-dimensional structures of biological macromolecules, and the size and structure of nanoparticles. The EM Facility also prepares specimens for the microscope. The EM facility has 3 spatially distinct locations to best serve the needs of the clinical and research groups, the main facility is in SMBB, the clinical facility is housed in Bldg. 585 and the cryo-EM equipment is located in Biology.

Services
Clinical Services:
- Thin-section electron microscopy of tissue biopsies (technical component of clinical EM)

Research Services:
- Training on the TEMs, SEM, microtomes, sample preparation, and 3D image reconstruction
- Sections ("thick" and "thin") cut on microtome and ultramicrotome
- Record images on transmission or scanning electron microscopes
- Procedures for observing tissues and cellular specimens including embedding, drying, osmification, and storage
- Procedures for observing particulate and macromolecular samples including staining, metal coating, drying, and cryogenic TEM

Equipment
- FEI Tecnai 12, transmission electron microscope
- JEOL JEM-1400 Plus, transmission electron microscope
- Two Hitachi 7100, transmission electron microscopes
- FEI Tecnai F20, transmission electron microscope
- Hitachi S-2460N, scanning electron microscope
- Leica (UC7, UC6, and UCT) and Reichert (Ultracut E), ultramicrotomes
- Leica JUNG RM2055, microtome
- Two FEI Vitrobots, vitrification robots
- Gatan K2 Summit, direct electron detector (with FEI Tecnai F20)
- Two automatic tissue processors
- Laboratory microwave oven
- Sputter coater
- Glow discharger
- High-pressure freezer
- Freeze substitution machine
- Critical-point dryer

Personnel
- David Belnap, Ph.D., Director
- Nancy Chandler, Senior Laboratory Specialist
- Linda Nikolova, Senior Laboratory Specialist
- Jared Stratton, Laboratory Technician
• Megan Kent, Laboratory Technician
• Shiane Escobedo, Laboratory Technician

2014 Annual Update

New Equipment
• JEOL JEM-1400 Plus, transmission electron microscope
• Leica UC7 ultramicrotome with cryogenic attachment
• Gatan K2 Summit, direct electron detector, purchased FY14, installed 8/2014.

New Services
• The Electron Microscopy Facility moved to the Sorenson Molecular Biotechnology Building (USTAR) during FY14
• Cryogenic ultramicrotome sectioning

Revenue/Expenses
• VP of Research Support: $94,000
• FY14 revenue: $557,204
• FY14 expenses: $657,907
• FY14 revenue generated from services:

Clinical Revenue
Advisory Board Committee
Last meeting date: October 2, 2013
- Adam Frost, Assistant Professor, Department of Biochemistry
- Erik Jorgensen, Distinguished Professor, Department of Biology
- Mary Bronner, Professor, Department of Pathology

FY2014 Scientific Impact
Research Support
- Revenue by Campus Affiliation
• Revenue by Department

- Biochemistry
- Chemistry
- Biology
- Pharmaceutics & Pharmaceutical Chemistry
- Bioengineering
- Internal Medicine
- Pediatrics
- Chemical Engineering
- Physics & Astronomy
- Pathology
- Medicinal Chemistry
- Material Science & Engineering
- Exercise and Sport Science
- Oncological Sciences
- Metallurgical Engineering
- Neurobiology & Anatomy
- Scientific Computing & Imaging Institute
- Civil & Environmental Engineering
- Orthopaedics
- Human Genetics
- Graduate
- Mechanical Engineering
- HSC Cores
- Institute of Clean and Secure Energy
- Surgery
- Ophthalmology/Visual Sciences
Top Users

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ARUP</td>
<td>Off Campus</td>
</tr>
<tr>
<td>2</td>
<td>Scripps</td>
<td>Off Campus</td>
</tr>
<tr>
<td>3</td>
<td>Frost, Adam</td>
<td>NIH</td>
</tr>
<tr>
<td>4</td>
<td>Primary Children’s Medical Center</td>
<td>Off Campus</td>
</tr>
<tr>
<td>5</td>
<td>Sundquist, Wesley</td>
<td>NIH, DHHS</td>
</tr>
<tr>
<td>6</td>
<td>Tricore Reference Labs</td>
<td>Off Campus</td>
</tr>
<tr>
<td>7</td>
<td>St. Johns</td>
<td>Off Campus</td>
</tr>
<tr>
<td>8</td>
<td>Jorgensen, Erik</td>
<td>HHMI</td>
</tr>
<tr>
<td>9</td>
<td>Nano Institute of Utah</td>
<td>NIH</td>
</tr>
<tr>
<td>10</td>
<td>Bartl, Michael</td>
<td>NSF</td>
</tr>
</tbody>
</table>

Publications


Goals for FY15

- Obtain high-quality TEM data with FEI Tecnai F20 and Gatan K2 Summit camera
- Establish cryo-sectioning as a frequently used method
- Maintain high-quality clinical services
- Improve clinical services by establishing remote capability
- Establish tomography as a frequently used method
Flow Cytometry Facility

Overview
The Flow Cytometry Facility offers quantitative, multiparameter fluorescence analysis, and cell sorting services that assists over 90 investigators including a subset of industry clients. The expertise and instrumentation to perform most flow cytometric assays that have been described in the literature are available within the expertise of the collective personnel and the physical resources of the Flow Cytometry Facility. The facility offers investigators the entire spectrum of cytometric experiment management, if desired, all the way from initial design consultation to the creation of graphics for publication.

Uniqueness
The Flow Cytometry facility is recognized for the most part as an instrumentation based service lab. However, we believe that education is a crucial component for the growth and sustainability of the facility. First of all, facility staff is encouraged to maintain state of the art knowledge in order to pass this information along to the users. Secondly, we believe that education in the field of flow cytometry for users will lead to more successful experimental outcomes which will in turn increase overall usage. To this end, we provide multiple levels of education from one on one consultation to routine seminars covering a variety of topics. Although this may not be absolutely unique when compared to other Core facilities, it is a noticeable quality of our services when compared to other non-centralized instrumentation on campus.

Services
The assays offered by the facility range from routine cell cycle analysis and immunophenotyping to complex multi-laser applications and high speed cell sorting. Examples of the assays available include, but are not limited to the following:

- DNA content/cell cycle measurement
- Immunofluorescence analyses
- Characterization of cell populations based on scattered light intensity measurements and autofluorescence
- Cell sorting including viable, sterile cell sorting
- Intracellular calcium flux
- A range of apoptosis assays
- Fluorescence Resonance Energy Transfer (FRET)
- Nanoparticle characterization
- Bivariate and univariate chromosome analysis
- Receptor-ligand interactions
- Cell proliferation studies including BrdU incorporation and CFSE tracking
- Viability assays (membrane exclusion and metabolic viability)
- Various function assays including oxidative metabolism, neutrophil function (oxidative burst, phagocytosis) cytoplasmic pH, membrane potential
- Kinetic analyses
- Signal transduction pathway analyses (simultaneous assessment of multiple intracellular phosphorylated epitopes combined in complex multi-color assays)
- Sample preparation and staining
Consultation and training is provided in order to define projects in the early stages of development to make optimal and efficient use of flow cytometry. The staff will prepare samples including staining, data collection, quality control, data analysis/interpretation, and creation of graphics. Alternatively, if the investigator chooses, the facility can provide consultation only on any of the above services so that the research is entirely in the hands of the investigator.

**Equipment**

**Sorters**
- BD FACSArray
- Propel Labs Avalon

**Analyzers**
- BD FACScanto
- Cytek DxP
- BD FACSscan

**Personnel**
- James Marvin, Director
- Chris Leukel, Senior Laboratory Specialist

**FY14 Annual Update**

**New Equipment**
- None

**New Services**

In March 2014, the Flow Cytometry Facility started a service agreement with the Pathology Department. For $20,000 a year, the facility provides instrument quality control, routine maintenance, and management of service contracts for a BD FacsCanto, BD-X20, and a BD Fortessa. In addition to providing maintenance on instrumentation, the facility also provides training for new users.

**Revenue/Expenses**
- VP of Research Support: $25,000
- FY14 revenue: $261,184
- FY14 expenses: $283,228
- FY14 revenue generated from services:
Advisory Board Committee
Last meeting date: June 30, 2014
- Ryan O'Connell, Assistant Professor, Pathology
- Thomas O'Hare, Associate Professor, Hematology
- Gerald Spangrude, Professor, Hematology
- Matthew Williams, Assistant Professor, Pathology
- Charles Goolsby, Professor of Pathology, Northwestern University

FY14 Scientific Impact
Research Support
- Revenue by Campus Affiliation

# of grants: 86
# of investigators: 90
Top Users

<table>
<thead>
<tr>
<th></th>
<th>Department/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ARUP</td>
</tr>
<tr>
<td>2</td>
<td>Prchal, Josef</td>
</tr>
<tr>
<td></td>
<td>Leukemia Society, Mount Sinai</td>
</tr>
<tr>
<td>3</td>
<td>Williams, Matthew</td>
</tr>
<tr>
<td></td>
<td>Department</td>
</tr>
<tr>
<td>4</td>
<td>Welm, Bryan</td>
</tr>
<tr>
<td></td>
<td>NIH</td>
</tr>
<tr>
<td>5</td>
<td>Bhaskara, Srividya</td>
</tr>
<tr>
<td></td>
<td>Department</td>
</tr>
<tr>
<td>6</td>
<td>4Life Research</td>
</tr>
<tr>
<td></td>
<td>Off Campus</td>
</tr>
<tr>
<td>7</td>
<td>Zimmerman, Guy</td>
</tr>
<tr>
<td></td>
<td>NIH</td>
</tr>
<tr>
<td>8</td>
<td>Hildebrandt, Gerhard</td>
</tr>
<tr>
<td></td>
<td>Department</td>
</tr>
<tr>
<td>9</td>
<td>Westenfelder, Christof</td>
</tr>
<tr>
<td></td>
<td>Kidney Foundation Fund</td>
</tr>
<tr>
<td>10</td>
<td>Boudina, Sihem</td>
</tr>
<tr>
<td></td>
<td>NIDDK</td>
</tr>
</tbody>
</table>
Publications


Goals for FY15

For the most part, the facility is not looking to fill any essential gaps in services or instrumentation over the next fiscal year. However we believe there is room for improvement with the quality of a few of our services. The facility is now providing oversight for the instruments located in the Pathology Department. Although this has been a significant value added for the users in Pathology, we feel that there is an opportunity to streamline training to be more efficient. The initial phases of this agreement turned out to have a large component of IT involvement along with a sizable amount of time dedicated to finalizing expectations. With all of this behind us, we can now focus more attention to standardized training and management. Also, we will be continuing our pursuit of offering the highest quality cell sorting services. As with the Pathology instruments, we have identified a few areas where we can be more efficient and increase productivity on the cell sorters within the lab.

There is also potential for utilizing a significant portion of our surplus budget to revisit the acquisition of a Laser Scanning Cytometer. However this would be a large purchase with a sizable impact to the budget in years to come so this decision will be made in cooperation with the advisory board along with other potential users of the new technology.
Genomics Facility

Overview
The Genomics Facility offers a variety of genetic analysis services including full service genotyping, from PCR setup through analysis, and assistance to researchers performing genotyping projects. The facility has commercial and custom sets of fluorescently labeled microsatellite markers that can be used for whole genome linkage studies and fine mapping projects. Researchers can select genes or regions of interest and the facility designs and optimizes the PCR primers, performs the initial PCR, runs the sequencing reactions, and analyzes the data using SoftGenetics Mutation Surveyor software.

Services
Fragment Analysis
- Full service genotyping from PCR setup through analysis
- Capillary Runs
- Microsatellite Instability
- Loss of Heterozygosity
- Multiplex Ligation Dependent Amplification

SNP Genotyping
- Taqman SNP Genotyping
- Illumina GoldenGate SNP Genotyping
- Whole-Genome Genotyping and Copy Number Variation Analysis
- Methylation Analysis
- Open Array Genotyping

DNA Sequencing
- Mutation Detection

Real Time PCR
- Gene Expression

Equipment
- One AB 7900HT systems
- Illumina iScan
- Quantstudio 12k Flex Real-Time PCR System

Personnel
- Derek Warner, Director
- Michael Klein, Manager

2014 Annual Update
New Equipment
- No new instrumentation for FY14

New Services
- No new services for FY14

Revenue/Expenses
- VP of Research Support: $0
- FY14 revenue: $204,389
- FY14 expenses: $153,787
FY14 revenue generated from services:

Advisory Board Committee
Last meeting date: June 30, 2014
- Gerald Krueger, Professor, Dermatology
- Deborah Neklason, Research Associate Professor, Huntsman Cancer Institute
- Nicola Camp, Professor, Genetic Epidemiology

Addendum
- Faculty Oversight Committee Guidelines
  http://www.cores.utah.edu/?page_id=3725

FY14 Scientific Impact
Research Support
- Revenue by Campus Affiliation

# of grants: 55
# of Investigators: 86
Revenue by Department

- Human Genetics
- Internal Medicine
- Neurology
- Surgery
- Family & Preventive Medicine
- Pediatrics
- Biology
- Anesthesiology
- Psychiatry
- Ophthalmology and Visual Sciences
- Chemistry
- Civil & Environmental Engineering
- Obstetrics
- Neurobiology & Anatomy
- Oncological Sciences
- Pathology
- Pharmacology & Toxicology
- Exercise and Sport Science
- Nutrition
- Bioengineering
- Neurosurgery
- Biochemistry
- Pharmaceutics & Pharmaceutical Chemistry

Top Users

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Leppert, Mark</td>
<td>Department</td>
</tr>
<tr>
<td>2</td>
<td>Pulst, Stefan</td>
<td>Norda</td>
</tr>
<tr>
<td>3</td>
<td>Cannon-Albright, Lisa</td>
<td>American Association for Cancer, U.S. Department of Finance</td>
</tr>
<tr>
<td>4</td>
<td>Hunt, Steven</td>
<td>NIH</td>
</tr>
<tr>
<td>5</td>
<td>NYU</td>
<td>Off Campus</td>
</tr>
<tr>
<td>6</td>
<td>Cannon-Albright, Lisa</td>
<td>DOD W81XWH-11-1-0342</td>
</tr>
<tr>
<td>7</td>
<td>Weiss, Robert</td>
<td>DHHS</td>
</tr>
<tr>
<td>8</td>
<td>Taylor, Jack</td>
<td>Department</td>
</tr>
<tr>
<td>9</td>
<td>Gruber, Peter</td>
<td>Department</td>
</tr>
<tr>
<td>10</td>
<td>Carrell, Douglas</td>
<td>Department</td>
</tr>
</tbody>
</table>
Publications

1. Ashizawa, T., et al., *Clinical characteristics of patients with spinocerebellar ataxias 1, 2, 3 and 6 in the US; a prospective observational study*. Orphanet J Rare Dis, 2013. 8: p. 177.


Machine Shop

Overview
The Machine Shop Facility is equipped with a full complement of lathes, drills, mills, welders, grinders, and CNC systems, staffed by experienced machinists capable of turning an idea into reality. The machinists provide consultation to assist with the design process for products ranging from precise surgical instruments to large-scale testing equipment. They also fabricate as well as repair the devices and parts out of carbon-steel, stainless steel, brass, copper, plastics, and other materials depending upon the requirements of design specifications.

Services
- Device Design/Engineering
- Milling
- Turning
- Drilling
- Grinding
- Soldering
- Welding of steel, aluminum, and other types of fabrication
- Sawing
- Repair and Maintenance

Equipment
- CNC Mills
- Traditional Mills
- Lathes
- Grinders
- Welders
- Wood Working Equipment
- Planers
- Band & Table Saws
- Sharpening Equipment
- Polishing Equipment

Personnel
- Kent Bachus, Ph.D., Director
- Ed Kinder, Manager
- Kim Slusser, Machinist
- Barry Evans, Machinist

2014 Annual Update
New Equipment
- The Machine Shop Facility did not obtain any additional equipment in FY14

New Services
- The Machine Shop Facility continues to supply improved plastic fabrication

Revenue/Expenses
- VP of Research Support: $45,000
- FY14 revenue: $163,126
- FY14 expenses: $232,107
FY14 revenue generated from services:

Advisory Board Committee
- Perry Renshaw, Professor, Psychiatry
- Stephen Andrues, Materials Management Facilitator, Facilities Engineering
- Steve White, Professor, ADD Program

FY14 Scientific Impact
Research Support
- Revenue by Campus Affiliation

# of grants: 12
# of investigators: 52
- Revenue by Department

<table>
<thead>
<tr>
<th>Top Users</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>White, Steve</td>
</tr>
<tr>
<td>2</td>
<td>Andrues, Steve</td>
</tr>
<tr>
<td>3</td>
<td>Myriad Genetics</td>
</tr>
<tr>
<td>4</td>
<td>Primary Children's Medical Center</td>
</tr>
<tr>
<td>5</td>
<td>Meisner, Steve</td>
</tr>
<tr>
<td>6</td>
<td>Bates, Jonathon</td>
</tr>
<tr>
<td>7</td>
<td>Renshaw, Perry</td>
</tr>
<tr>
<td>8</td>
<td>Vutara Inc.</td>
</tr>
<tr>
<td>9</td>
<td>Clausing, Alishia</td>
</tr>
<tr>
<td>10</td>
<td>Rodesch, Chris</td>
</tr>
</tbody>
</table>

- Publications
  - There were no known publications acknowledging this facility in FY14
Overview

The Mass Spectrometry & Proteomics Facility is geared toward supporting proteomics research as well as providing basic mass spectrometry (MS) support for a broad range of research and sample types, such as polymers, natural products, small synthetic molecules, peptides, large intact proteins, and nucleic acids. The facility is equipped with several high-performance mass spectrometers, including a state-of-the-art FTMS instrument (LTQ-FT; ThermoElectron) with nano-LC and nano-ESI ionization, and a state-of-the-art Maldi/ToF/ToF instrument (UltrafleXtreme; Bruker Daltonics) with tissue-imaging capabilities. LC/MS/MS instruments in the lab are equipped with nano-LC for ultimate sensitivity and chromatographic performance. The mission of this facility is to provide the highest quality mass spectrometry analyses for protein and other biomolecule investigations.

Services

A range of proteomics, FTMS, and general and tissue-imaging MS services are available. In addition, the facility periodically participates in an international proteomics proficiency evaluation conducted by the Association of Bimolecular Resource Facilities (ABRF) to ensure the competency of the facility compared with other leading proteomics laboratories for the structural analysis of proteins and peptides. The following services are provided to investigators:

Proteomics Services:
- Protein ID from SDS Gel
- Protein ID from Solution
- Protein ID from Complex Isolates in Solution and IP Pull-down Experiments
- Identification of Protein Modifications/Post-translational Modifications
- Intact Protein MW Analysis
- Peptide Screening with MS/MS (FTMS) and accurate mass de novo sequencing
- Disulfide Linkage Characterization
- Identification of Sulfur-containing peptides
- “Top-Down” and “Bottom-Up” Proteomics
- Protein Expression/Quantification Analysis
- Custom Database Searching
- FTMS Services
- Accurate mass measurement-external calibration (Positive Ion)
- Accurate mass measurement-internal calibration (Positive Ion)
- Accurate mass measurement (Negative Ion)
- Peptide Sequencing with MS/MS and accurate mass de novo sequencing
- Identification of Sulfur-containing peptides
- High-resolution mass spectrometry (HR-MS) analysis

General MS Services
- ESI/MS
- ESI/MS/MS
- Nucleic Acids
• LC/MS
• LC/MS/MS
• Maldi/ToF/ToF
• Special Project/Method Development

Tissue-Imaging MS Services
• Cryostat Tissue Sectioning and Maldi Plate Setup
• Tissue Section Preparation and Setup
• Maldi/ToF Imaging of Tissue Sections
• Software Data Processing and Image Generation
• Software Data Processing and Image Generation-by User

Equipment
Mass Spectrometers
• LTQ-FT
• UltrafleXtreme
• LCQ-Deca
• Voyager DE-STR
• Quattro-II
• Q-ToF-2

HPLC Systems
• Two Eksigent 1D nanoLC systems
• One Eksigent 2D-Ultra system
• Two HP1100 systems
• One Shimadzu 10AD system
• One Leica CM1950 cryostat system

Personnel
• Chad Nelson, Ph.D., Director
• Krishna Parsawar, Ph.D., Assistant Director

2014 Annual Update
New Equipment
• In May 2014, the Mass Spectrometry & Proteomics Facility received an Internal Equipment Grant award to purchase proteomics software (i.e. Proteome Discoverer (Thermo) and PEAKS Studio 7 (Bioinformatics Solutions, Inc))

Revenue/Expenses
• VP of Research Support: $167,000
• FY14 revenue: $122,408
• FY14 expenses: $259,739
FY14 revenue generated from services:

Advisory Board Committee
Last meeting date: August 2014
- Darrell Davis, Professor, College of Pharmacy
- Guy Zimmerman, Professor, Associate Chair, Internal Medicine
- Jared Rutter, Professor, HCI

FY14 Scientific Impact
Research Support
- Revenue by Campus Affiliation

University Academic
University Non-Academic
Off Campus Academic
Off Campus Commercial

# of grants: 60
# of investigators: 68
Revenue by Department

- Top Users

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sundquist, Wesley</td>
<td>NIH</td>
</tr>
<tr>
<td>2</td>
<td>Singh, Ila</td>
<td>NIH</td>
</tr>
<tr>
<td>3</td>
<td>Sharma, Sunil</td>
<td>Department</td>
</tr>
<tr>
<td>4</td>
<td>Hageman, Gregory</td>
<td>Department</td>
</tr>
<tr>
<td>5</td>
<td>Minteer, Shelley</td>
<td>Department</td>
</tr>
<tr>
<td>6</td>
<td>Hanson, Mike</td>
<td>Department</td>
</tr>
<tr>
<td>7</td>
<td>Kopecek, Jindrich</td>
<td>NIH, Department</td>
</tr>
<tr>
<td>8</td>
<td>MS2 Array LLC</td>
<td>Off Campus</td>
</tr>
<tr>
<td>9</td>
<td>Life Technologies</td>
<td>Off Campus</td>
</tr>
<tr>
<td>10</td>
<td>Texas Heart Institute</td>
<td>Off Campus</td>
</tr>
</tbody>
</table>

- Publications

- There were no known publications acknowledging this facility in FY14
Metabolic Phenotyping

Overview
The Metabolic Phenotyping Facility offers several services to help investigators evaluate metabolic phenotypes in multiple model organisms. Services include mitochondrial bioenergetics (respirometry for tissue and isolated mitochondria, Seahorse XF24 for cells, isolated mitochondria and tissue slices), determination of whole animal energy expenditure using the Columbus Instruments Oxymax Lab Animal Monitoring System, determination of body composition by NMR, determination of circulating metabolite and hormone concentrations using the multiplexing technology (MAGPIX and Luminex 200), Body temperature measurements using telemetry (E-Mitter). The facility also offers services on more complex projects that require detailed in vivo metabolic phenotyping such as glucose and insulin tolerance tests and glucose clamps. In addition, the facility offers protocol consultation and data analysis as needed.

Services
- Mitochondrial Bioenergetics
- Metabolic chambers
- NMR
- Body temperature
- Biomarker quantification with the Luminex MAGPIX and Luminex 200
- Multiplex assays
- Glucose and insulin tolerance tests
- Euglycemic-hyperinsulinemic clamps

Equipment
- Seahorse Flux (XF24) Analyzer
- Six Columbus Instruments metabolic chambers
- NMR
- E-Mitter
- Luminex MAGPIX & Luminex 200 System

Personnel
- Sihem Boudina, Ph.D., Interim Director
- Shaobo Pei, Manager
- Robert Cooksey, Specialist
- Deborah Jones, Specialist

2014 Annual Update

Equipment
- In June 2013, the Metabolic Phenotyping Facility received, via transfer, the Luminex 200 Multiplexing System that can handle up to 100 analytes/well

New Services
- The Metabolic Phenotyping Facility can now offer remote body temperature and movement measurement in small rodents
- Gene expression analysis using multiplex technology

Revenue/Expenses
- VP of Research Support: $71,500
- FY14 revenue: $63,312
- FY14 expenses: $101,502
- FY14 revenue generated from services:

![Graph showing revenue by month and campus affiliation for FY12, FY13, and FY14.]

**Advisory Board Committee**
Last meeting date: August 20, 2013
- Don McClain, Professor, Endocrinology, Metabolism & Diabetes
- Jared Rutter, Professor, Biochemistry
- Carl Thummel, Professor, Human Genetics

**FY14 Scientific Impact**
Research Support
- Revenue by Campus Affiliation

![Pie chart showing revenue distribution by campus affiliation for FY14.]

# of grants: 17
# of investigators: 21
Top Users

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Higgins, Thomas</td>
<td>AO North America</td>
</tr>
<tr>
<td>2</td>
<td>Boudina, Sihem</td>
<td>NIH</td>
</tr>
<tr>
<td>3</td>
<td>Li, Dean</td>
<td>NIH, Juvenile Diabetes Research Foundation</td>
</tr>
<tr>
<td>4</td>
<td>Weyrich, Andy</td>
<td>NIH, NHLB</td>
</tr>
<tr>
<td>5</td>
<td>Rutter, Jared</td>
<td>NIH</td>
</tr>
<tr>
<td>6</td>
<td>Symons, John</td>
<td>American Diabetes Association</td>
</tr>
<tr>
<td>7</td>
<td>Kardon, Gabrielle</td>
<td>NIH</td>
</tr>
<tr>
<td>8</td>
<td>McClain, Don</td>
<td>NIH</td>
</tr>
<tr>
<td>9</td>
<td>Vettore Bio</td>
<td>Off Campus</td>
</tr>
<tr>
<td>10</td>
<td>Jones, Kevin</td>
<td>NIH</td>
</tr>
</tbody>
</table>
Metabolomics Facility

Overview
The Metabolomics facility provides analysis of metabolites found within a tissue, biological fluid, whole organism, culture, or other biological source. Currently metabolomics is a comparative science; the facility usually analyzes the differences found between biological samples that have been subjected to a treatment. This can be a genetic mutation, drug treatment, etc. Most analyses are relative, therefore the facility can only make judgments on individual metabolites such as comparing the relative amounts of succinate between a mutant and a wild type but not compare the levels of succinate and fumarate within the same group or between groups. No one method is fully capable of completely profiling the metabolome. To maximize the number of metabolites observed, the facility is equipped with three chemical analysis platforms, GC-MS, LC-MS, and NMR.

Services
The primary mission of the facility is the metabolomics profiling of biological samples including serum, urine, tissues, Drosophila, C. elegans, yeast, and bacteria. The following metabolites can be analyzed from many biochemical pathways:

- Amino acids
- TCA cycle intermediates
- Organic acids including lactic acid and pyruvate
- Carbohydrates
- Nucleotides
- Lipids including sterols
- Di and tri peptides including glutathione

The facility processes every sample using two distinct but overlapping procedures, a targeted analysis and a non-targeted analysis. The targeted analysis is used to search every chromatogram for known metabolites. The non-targeted analysis uses data mining software to detect chromatographic peaks that are altered in two different conditions. This procedure is done with Principle Components Analysis (PCA) and Partial Least Squares-Discriminate Analysis (PLS-DA).

Equipment
Chemical Analysis Platforms:

- Waters GCT Premier gas chromatograph-mass spectrometer (GC-MS)
- Agilent 5973 gas chromatograph-quadrupole mass spectrometer (GC-MS)
- Agilent 6520 Ultrapressure liquid chromatograph-quadrupole time of flight mass-spectrometer (UPLC-QTOF-MS)
- Agilent 6550 Ultrapressure liquid chromatograph-quadrupole time of flight mass-spectrometer (UPLC-QTOF-MS)
- Varian 500 MHz NMR with data processed by the Chenomx software suite

Personnel

- James Cox, Ph.D., Director
- Ren Miao, Ph.D., Laboratory Technician
- Alan Mascheck, Ph.D., Research Associate
2014 Annual Update

New Equipment
- Agilent 6550 QTOF, which is a highly sensitive and state of the art mass spectrometer for polar metabolite analysis

New Services
- Full lipid profiling by LC-MS
- Stable isotope label flux analysis by GC-MS

Revenue/Expenses
- VP of Research Support: $265,363
- FY14 revenue: $101,272
- FY14 grant revenue: $38,587
- FY14 expenses: $386,955
- FY14 revenue generated from services:

Advisory Board Committee
Last meeting date: February 20, 2013
- Dennis Winge, Professor, Hematology
- John Phillips, Research Associate Professor, Hematology
- Carl Thummel, Professor, Department of Human Genetics
FY14 Scientific Impact
Research Support

- Revenue by Campus Affiliation

- Revenue by Department:

# of grants: 24
# of investigators: 32
Top Users

<table>
<thead>
<tr>
<th>Rank</th>
<th>Name</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Diabetes-Metabolomics Pilot Project</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>University of Iowa</td>
<td>Off Campus</td>
</tr>
<tr>
<td>3</td>
<td>Wasatch Scientific Services</td>
<td>Off Campus</td>
</tr>
<tr>
<td>4</td>
<td>Sieburth, Leslie</td>
<td>NSF</td>
</tr>
<tr>
<td>5</td>
<td>Schmidt, Eric</td>
<td>NIH</td>
</tr>
<tr>
<td>6</td>
<td>McClain, Don</td>
<td>NIH</td>
</tr>
<tr>
<td>7</td>
<td>MD Anderson</td>
<td>Off Campus</td>
</tr>
<tr>
<td>8</td>
<td>Weyrich, Andy</td>
<td>NIH</td>
</tr>
<tr>
<td>9</td>
<td>University of Arizona</td>
<td>Off Campus</td>
</tr>
<tr>
<td>10</td>
<td>Utah State University</td>
<td>Off Campus</td>
</tr>
</tbody>
</table>

Publications


Mutation Generation & Detection Facility

Overview
The Mutation Generation & Detection (MGD) Facility specializes in providing customized Engineered DNA Nucleases in either the TALEN or Crispr systems. These DNA Nucleases are cutting edge technology used to perform targeted genomic engineering that modifies a specific genomic region of interest in multiple model systems, including Zebrafish, Drosophila, C. elegans, Mus Musculus, and mammalian cell lines. The facility also provides customized TALE or Crispr activator or repressor proteins for activation or repression of gene expression. The facility also offers services to identify induced genomic modification using High Resolution Melt Analysis (HRMA). Our support includes hardware, reagents, and expert advice for optimizing and performing HRMA. Lastly, the facility has initiated a partnership with the Mouse Transgenic Facility to provide services to create Knockout Mouse models using either TALEN or Crispr DNA Nucleases.

Services
TALEN Services
- TALEN plasmid pair design and construction
- 2X TALEN plasmid pair design and construction (same gene)
- 0.5X TALEN plasmid design and construction
- Remake Failed TALEN to different exon in same target gene
- Different Destination Vector

Crispr Services
- 1X CRISPR design and construction
- 2X CRISPR design and construction
- Design and Delivery of donor molecules

High Resolution Melt Analysis
- BioFire LightScanner Access Fee
- HRMA PCR plates (10 pack)
- HRMA PCR sealing film (10 pack)
- Idaho Technology LightScanner MasterMix 100 rxns
- Idaho Technology LightScanner MasterMix 500 rxns
- Mineral Oil (500ml bottle)
- HRMA Training
- Help with optimization and analysis of HRMA assays
- Custom Mutation Detection upon request

Equipment
- BioFire LightScanner
- 3X Eppendorf Mastercycler ProS
- Eppendorf Centrifuge 5430
- QWC Mercury Elite-Al Pro External Hard drive
- Illumina Eco
Personnel
- Timothy Dahlem, Ph.D., Director

2014 Annual Update
New equipment:
- 2X Eppendorf Centrifuge 5424
- Innova42 Bacterial Shaker
- Innova43 Bacterial Shaker
- 27” iMac Desktop

New Services:
- Fly injection services will no longer be offered
- All CRISPR services were new for FY14
- Custom Mutation Detection Services were new for FY14
- Started partnership with Mouse Transgenic Facility to provide injection services

Revenue/Expenses
- VP of Research Support: $0
- FY14 revenue: $162,300
- FY expenses: $134,324
- FY14 revenue generated from services:

Advisory Board Committee
Last meeting date: July 23, 2014
- David Grunwald, Department of Human Genetics (Senior Faculty Advisor)
- Dana Carroll, Department of Biochemistry
- Ryan O’Connell, Department of Pathology
- Lewis Charles Murtaugh, Department of Human Genetics
FY14 Scientific Impact
Research Support

- Revenue by Campus Affiliation

- Revenue by Department

- Human Genetics
- Oncological Sciences
- Neurobiology & Anatomy
- Internal Medicine
- Pathology
- Biochemistry
- Pediatrics
- Medicinal Chemistry
- Ophthalmology/Visual Sciences

# of grants: 24
# of investigators: 30
Top Users

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Science Exchange Inc.</td>
<td>Off Campus</td>
</tr>
<tr>
<td>2</td>
<td>Helmholtz Zentrum Munchen</td>
<td>Off Campus</td>
</tr>
<tr>
<td>3</td>
<td>Cairns, Bradley</td>
<td>NIH</td>
</tr>
<tr>
<td>4</td>
<td>Yost, Joseph</td>
<td>NIH</td>
</tr>
<tr>
<td>5</td>
<td>Weizmann Institute of Science</td>
<td>Off Campus</td>
</tr>
<tr>
<td>6</td>
<td>University of Iowa</td>
<td>Off Campus</td>
</tr>
<tr>
<td>7</td>
<td>Grunwald, David</td>
<td>NIH</td>
</tr>
<tr>
<td>8</td>
<td>O’Connell, Ryan</td>
<td>NIH</td>
</tr>
<tr>
<td>9</td>
<td>Karolinska Institute</td>
<td>Off Campus</td>
</tr>
<tr>
<td>10</td>
<td>University of Pennsylvania</td>
<td>Off Campus</td>
</tr>
</tbody>
</table>

Collaboration and Support of Other HSC and University Facilities

DNA Sequencing Facility: The MGD Facility spent $6,147 in securing sequencing in FY14.

DNA Peptide Facility: The MGD Facility spent $7,819 in securing DNA reagents in FY14.

Mouse Transgenic Facility: The MGD Facility has directly brought in 5 different projects to the Mouse Transgenic Facility totaling $18,000 in chargebacks. These projects were initiated in the MGD Facility.

Non-billable Invoice Hours

One of the central purposes of the MGD Facility is to be a resource of education for researchers on the University of Utah campus. The facility achieves this aim in official ways such as seminars given directly to different departments on campus. However, the central avenue for education by the facility are informal one-on-one, in person communication with researchers. In FY14, the facility spent more than 100 hours teaching University of Utah researchers about Engineered DNA nuclease technology and mutation detection by HRMA.

Known grant applications awarded, submitted, or in preparation mentioning MGD Facility as a crucial resource

Granted:
- Grant type: DP2 NIH New Innovator Award
- PD/PI: Ryan O’Connell
- Grant Title: Utilizing TALEN technology to regulate human microRNAs
- Funding Source: NIH GM
- Total Project Period: 09/2013-07/2018

Submitted or in Preparation:
- 1. RO1-A1
  - PD/PI: Diane Ward
  - Grant Title: Receptor Mediated Endocytosis
  - Funding Source: NIHLB
  - Grant Award Number: HL26922
  - Total Project Period: 06/01/15-05/01/20
  - Annual Amount: $250,000 (Total: $1,250,000 direct)
- 2. RO1
  - PD/PI: Amnon Schlegel
  - Grant Title: Intestinal Lxr Activation In Delaying Atherosclerosis
  - Funding Source: NIH
  - Grant Award Number: 1RO1HL126707-01
Total Project Period: 04/05/15-03/31/20
Annual Amount: $250,000 (Total: $1,250,000 direct)

3. K22
   PD/PI: Kenneth K.C. Bramwell
   Funding Source: NIAID
   Grant Title: Impact of Human GUSB Alleles on Experimental Lyme Disease
   Total Project Period: 07/01/15-06/30/17
   Annual Amount: $125,000 (Total: $250,000 direct)

4. NSF 13-510
   PD/PI: Gillian Stanfield
   Funding Source: NSF
   Grant Title: Cellular and Molecular Mechanisms of Sperm Competition in the Nematode C. elegans
   Total Project Period: 07/01/14-06/30/17
   Annual Amount: $123,708 direct $57,374 indirect (Total: $543,245)

5. R21
   PD/PI: John Weis
   Funding Source: NIH (NIAID)
   Grant Title: Role of Ifitm and vATPase function in the innate immune response
   Total Project Period: 04/01/2015-03/31/2017
   Grant Award Number: 1R21AI112719-01A1
   Annual Amount: $150,000 direct (Total: $300,000 direct)

6. RO1
   PD/PI: Michael T. Howard
   Funding Source: NIH/NIGMS
   Grant Title: The effects of dietary selenium on translational control of protein synthesis
   Total Project Period: 04/01/2015-03/31/2020
   Grant Award Number: Status Submitted- awaiting review
   Annual Amount: $250,000 direct (Total $1,250,000)

7. NSF standard application
   PD/PI: Ellen J. Pritham
   Funding Agency: National Science Foundation
   Grant title: Transposable elements and regulatory evolution
   Total Project Period: 7/1/14-6/30/17

8. RO1
   PD/PI: Kristen Kwan
   Funding Source: NIH/NEI
   Grant Title: Hedgehog Signaling and Cilia in Choroid Fissure Morphogenesis and Coloboma
   Total Project Period: 04/01/15-03/31/20
   Grant Award Number: 1R01EY025378-01
   Annual Amount: $250,000 direct (Total $1,250,000)
Publications
Nuclear Magnetic Resonance Facility

Overview
The Nuclear Magnetic Resonance (NMR) Facility enables the structure determination of proteins, nucleic acids, and natural products and provides analytical NMR services for the Health Sciences community. Three NMR spectrometers (400, 500, and 600 MHz instruments) are available to researchers in Utah. Through a special arrangement with the Davis and Sundquist research groups, the facility also has access to 800 and 900 MHz instruments located in Colorado. NMR training or demonstration of NMR skills is required prior to scheduling and operating the spectrometers. The NMR Facility has several Linux workstations for offline data processing, analysis, and structure calculation. The staff has substantial expertise in NMR spectroscopy of proteins, nucleic acids, and natural products. The facility collaborates with research groups on and off campus.

Services
- NMR data collection and analysis with or without staff collaboration
- NMR training for individuals and groups as well as formal courses in NMR spectroscopy

Equipment
- Varian Mercury 400 MHz NMR spectrometer (University of Utah, SK H)
- Varian Inova 500 MHz NMR spectrometer (University of Utah, BPRB)
- Varian Inova 600 MHz NMR spectrometer with HCN cryogenic probe (University of Utah, BPRB)
- DD2 800 MHz NMR spectrometer with HCN cryogenic probe (University of Colorado-Boulder)
- DD2 900 MHz NMR spectrometer with HCN cryogenic probe (University of Colorado-Denver)

Personnel
- Jack Skalicky, Ph.D., Director
- Dennis Edwards, Technician
- Jay Olsen, Technician

2014 Annual Update
New Equipment
- The NMR Facility upgraded the 600 MHz cryogenic system in FY14
- The NMR Facility upgraded RH LINUX on the NMR computers

New Services
- The NMR Facility did not implement additional services in FY14

Revenues/Expenses
- VP of Research Support: $92,000
- FY14 revenue generated from services: $49,339
- FY14 expenses: $150,978
• FY14 revenue generated from services:

Advisory Board Committee
Last meeting date: April 2013
- Darrell Davis, Professor, College of Pharmacy
- Wesley Sundquist, Professor, Department of Biochemistry
- Eric Schmidt, Professor, College of Pharmacy
- Additional member

FY14 Scientific Impact
- Revenue by Campus Affiliation

# of grants: 38
# of investigators: 31
Top Users

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sundquist, Wesley</td>
<td>NIH</td>
</tr>
<tr>
<td>2</td>
<td>Schmidt, Eric</td>
<td>NIH</td>
</tr>
<tr>
<td>3</td>
<td>Barrows, Louis</td>
<td>NIH</td>
</tr>
<tr>
<td>4</td>
<td>Ireland, Chris</td>
<td>NIH</td>
</tr>
<tr>
<td>5</td>
<td>Davis, Darrell</td>
<td>Department</td>
</tr>
<tr>
<td>6</td>
<td>Prestwich, Glenn</td>
<td>Department</td>
</tr>
<tr>
<td>7</td>
<td>Oregon Health &amp; Science University</td>
<td>Off Campus</td>
</tr>
<tr>
<td>8</td>
<td>Poulter, C. Dale</td>
<td>NIH, CHA, University of IL At Urbana-Cha</td>
</tr>
<tr>
<td>9</td>
<td>VioGen Biosciences</td>
<td>Off Campus</td>
</tr>
<tr>
<td>10</td>
<td>Balagurunathan, Kuberan</td>
<td>Virginia Commonwealth University</td>
</tr>
</tbody>
</table>
Publications


Small Animal Imaging Facility

Overview
The Small Animal Imaging Facility extends the benefits of modern diagnostic medical imaging systems to the studies of anatomy and physiology in small animals. The facility operates an MRI scanner, FMT scanner, and a CT/SPECT/PET scanner. The scanners are equipped with supporting and monitoring hardware that allows a wide variety of imaging experiments, including longitudinal studies, to be performed on live animals and specimens. Imaging scientists, full-time imaging personnel, and animal support technicians are available for technical consultation and experimental assistance.

Services
The Small Animal Imaging Facility has a variety of modalities to choose from such as MRI, CT, PET, SPECT, and Fluorescence imaging. Examples of scanning capabilities include the following:

7 Tesla small animal MRI system
- Diffusion-weighted and diffusion tensor imaging
- Relaxometry (T1, T2, T2*) mapping
- Perfusion MRI
- Functional and awake-state functional MRI
- MR angiography
- Cardiac MRI
- NMR spectroscopy (localized and non-localized)
- Chemical shift imaging
- Parallel imaging techniques

CT scanners
- Automatic transition between modes and seamless coordination of CT, SPECT, and PET data
- System can be configured as an ultra-high resolution preclinical CT scanner; a high-resolution, high-sensitivity preclinical SPECT scanner; or as a dual modality preclinical SPECT/CT scanner
- The Inveon 2-Head SPECT Module is designed to efficiently detect gamma rays ranging in energy from 30 keV to 250 keV, the SPECT system is ideal for use with most single photon-emitting radionuclides
- Includes two Inveon Research Workplace workstations for multimodality image review, fusion, and analysis which CT, PET, SPECT, and MR data in DICOM and Siemens Inveon CT, PET, and SPECT formats, as well as raw data import

FMT mouse system
- 4 channel excitation with near-infrared laser diodes at 635, 670, 745, and 785 nm, maximizing tissue penetration depth and permitting multiplexed analysis of biological pathways
- System can configured as an ultra-high resolution preclinical CT scanner; a high-resolution, high-sensitivity preclinical SPECT scanner; or as a dual modality preclinical SPECT/CT scanner
The Small Animal Imaging Facility also includes an Instrument Development Lab which primarily provides infrastructure for the construction of custom RF coils. These are often necessary to optimize the data quality for a given MRI application. The facility also houses basic machining tools (including a Milling machine) for making experimental apparatus's such as scanning platforms and stereo taxa.

**Equipment**
- 7 Tesla Bruker BioSpec MRI Scanner
- Inveon Multimodality System
- VISEN (now Perkin Elmer) FMT 2500™ Fluorescence Molecular Tomography

**Personnel**
- Edward Hsu, Ph.D., Director
- Osama Abdullah, Ph.D., Imaging Specialist
- Samer Merchant, Imaging Specialist
- Brian Watson, Laboratory Aide
- Huashan Zou, Research Student

**2014 Annual Update**

**New Equipment**
- No major equipment was added in FY14

**New Services**
- Awake-state functional MRI
- Large-FOV high-resolution CT

**Revenue/Expenses**
- VP of Research Support: $150,000 ($100,000 from Dr. Tom Parks)
- FY14 revenue: $176,001
- FY14 expenses: $270,265
- FY14 revenue generated from services:
Advisory Board Committee
Last meeting date: March 29, 2013
- John Hoffman, Professor, HCI
- John Phillips, Research Associate Professor, Hematology
- Jack Taylor, Director, Office of Comparative Medicine
- Rob MacLeod, Professor, SCI
- Dennis Parker, Professor, Radiology Research

FY14 Scientific Impact
Research Support
- Revenue by Campus Affiliation

- Revenue by Department

# of grants: 17
# of investigators: 28
Top Users

<table>
<thead>
<tr>
<th>Rank</th>
<th>User</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hsu, Edward</td>
<td>NIH</td>
</tr>
<tr>
<td>2</td>
<td>Yap, Jeffrey</td>
<td>Sarcoma Alliance</td>
</tr>
<tr>
<td>3</td>
<td>Bachus, Kent</td>
<td>Department</td>
</tr>
<tr>
<td>4</td>
<td>McKeller, Stephen</td>
<td>Department</td>
</tr>
<tr>
<td>5</td>
<td>Coats, Brittany</td>
<td>Knight Templar</td>
</tr>
<tr>
<td>6</td>
<td>MacLeod, Rob</td>
<td>Nora Eccles Treadwell Foundation</td>
</tr>
<tr>
<td>7</td>
<td>Anderson, Jeffrey</td>
<td>NIH</td>
</tr>
<tr>
<td>8</td>
<td>Queensland Museum</td>
<td>Off Campus</td>
</tr>
<tr>
<td>9</td>
<td>Kopecek, Jindrich</td>
<td>NIH</td>
</tr>
<tr>
<td>10</td>
<td>Ostafin, Agnes</td>
<td>NIH</td>
</tr>
</tbody>
</table>

Publications

Small Animal Ultrasound Facility

Overview
The Small Animal Ultrasound Facility has two state-of-the-art VisualSonics 2100 ultrasound machines capable of imaging mice, rats, and other animal models with excellent spatial and temporal resolution. The facility has probes that cover the spectrum from 9-70 MHz (standard human clinical ultrasound covers the spectrum from 2.5-12 MHz). These machines are capable of real-time 2D imaging as well as a full spectrum of Doppler techniques (pulsed-wave, color, tissue, power). One of the two machines is also capable of 3D imaging and contrast imaging (both targeted and non-targeted). Software is available for advanced image analysis of cardiac mechanics with speckle tracking that allows analysis of strain and strain rate. These tools allow near histologic resolution imaging of live animals, and are well suited to challenging applications such as the resolving the rapid heart rates of mice, or the microscopic size and function of early and mid-gestation embryos, and everything in between. The facility has long been an extremely important tool in the practice of clinical medicine because it offers real-time imaging providing understanding of anatomy and physiology, is non-invasive, and can be repeated serially.

Services
The facility has the capability for anesthesia and monitoring of mice and rats, and will support training laboratory personnel in the design of protocols and the use of the equipment for acquiring images. An off-line image analysis station is also available for later review and analysis of studies.

- Ultrasound imaging access
- Training in use of equipment
- Experiment design and assistance with protocol optimization
- Off-line image review and analysis

Equipment
- Two VisualSonics 2100 ultrasound machines
- Off-line image analysis station and network storage for backing-up data files

Personnel
- Kevin Whitehead, M.D., Director
- Kandis Carter, Laboratory Technician
- Tiehua Chen, Laboratory Technician

Revenue/Expenses
- VP of Research Support: $20,000
- Total FY14 revenue: $21,852
- Total FY14 expenses: $30,837
FY14 revenue generated from services

Advisory Board Committee:
Last meeting date: April 15, 2013
- Andy Weyrich, Associate Dean for Basic and Translational Sciences
- Craig Selzman, Associate Professor, Cardiothoracic Surgery
- Brent Wilson, Assistant Professor, Cardiology

FY14 Scientific Impact
Research Support
- Revenue by Campus Affiliation

- # of grants: 17
- # of investigators: 15
Top Users

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Selzman, Craig</td>
<td>NIH</td>
</tr>
<tr>
<td>2</td>
<td>Franklin, Sarah</td>
<td>NIH</td>
</tr>
<tr>
<td>3</td>
<td>Li, Dean</td>
<td>NIH</td>
</tr>
<tr>
<td>4</td>
<td>Kim, Sung-Wan</td>
<td>NIH</td>
</tr>
<tr>
<td>5</td>
<td>Weyrich, Andy</td>
<td>NIH</td>
</tr>
<tr>
<td>6</td>
<td>McKeller, Stephen</td>
<td>NIH, NHLBI</td>
</tr>
<tr>
<td>7</td>
<td>Soorappan, Rajasekaran</td>
<td>NIH</td>
</tr>
<tr>
<td>8</td>
<td>Christian, Jan</td>
<td>NIH</td>
</tr>
<tr>
<td>9</td>
<td>Brunelli, Luca</td>
<td>Department</td>
</tr>
<tr>
<td>10</td>
<td>Kopecek, Jindrich</td>
<td>NIH</td>
</tr>
</tbody>
</table>

Publications