HEALTH
UNIVERSITY OF UTAH

2018 Annual Report

HSC CORES
UNIVERSITY OF UTAH

HSC Cores
Research Facilities

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HEALTH
UNIVERSITY OF UTAH

HSC CORES
Facilities

Overall Financial Summary

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Revenue & Expenses

- HSC Core Facilities budgeted $6.53 million for FY18, with expenses totaling to $6.14 million. Approximately $3.47 million in expenses went to salaries and benefits while $2.68 million was spent on equipment and operating supplies.
- In FY18, $4.91 million in services were billed, and collected form all units combined. An overhead fee of 5% ($266,796) was used for administrative support.

Core Research Facilities

Core	FY18 Expenses	Total Revenue	SVPHS	VPR	RIF
Administration	$559,676	$679,796	$413,000		
BIDAC	$77,729	$95,564	$35,000		
Cell Imaging	$346,434	$361,223	$165,000		
DNA Peptide	$388,795	$400,228			
DNA Sequencing	$379,872	$343,169			
Drug Discovery	$136,770	$130,439	$80,000		$17,350
Electron Microscopy	$742,361	$758,884	$20,000	$50,000	
Flow Cytometry	$468,258	$527,586			
Genomics	$220,473	$289,027			
Machine Shop	$259,279	$226,633	$15,000		
Mass Spectrometry & Proteomics	$346,936	$275,244	$151,000		
Metabolic Phenotyping	$212,707	$254,616	$160,000		
Metabolomics	$836,830	$788,822	$533,225		
Mutation Generation & Detection	$164,533	$133,844	$15,000		
Nuclear Magnetic Resonance	$133,813	$142,578	$100,000		
Preclinical Imaging	$224,538	$277,856	$50,000	$100,000	$27,377
Small Animal Ultrasound	$42,720	$32,256	$10,000		
Zebrafish (CZAR)	$468,567	$471,413	$137,000		

Service Recharge Centers

Service Recharge Center	FY18 Expenses	Total Revenue	SVPHS	VPR	RIF
Genetics Science Learning Center	$531,961	$816,428			
Iron & Hematology	$12,929	$24,255			
Material Sciences-Engineering	$74,716	$63,485			
National Center Veterans Studies	$1,416	$24,010			
Nuclear Engineering	$10,610	$16,972			
Scalable Analytics & Informatics	$77,036	$169,425			
Transgenic Mouse	$631,931	$652,982	$437,369		
USTAR Center Genetic Discovery	$34,647	$149,315			

Cores Administration

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Overview

The Health Sciences Center (HSC) Core Facilities Administration reports to Dr. John Phillips, who reports to Dr. Monica Vetter. The administrative office is managed by Ms. Brenda Smith, with assistance from Ms. Audrey Gallagher, Ms. Terra Curley, and Mr. Jonathan Conger. Responsibilities of the Core Administration office include - personnel management, budget preparation, financial affairs, ordering of supplies, and tracking expenses for all 26 Core Facilities and Service Recharge Centers. In addition, the Administrative Core supports general research infrastructure for the community, e.g. maintaining the X-ray film developer in the SOM and the research irradiator logging and access requests. All cores and recharge centers operate on a charge-back basis, with the Administration Core recovering 5% of the revenue collected for these billing and collection services. The management of the administrative office is performed by the HSC Core Advisory Board.

Personnel

John Phillips, Ph.D., Director HSC Core Facilities
Brenda Smith, Director of Finance
Audrey Gallagher, Administrative Manager
Terra Curley, Accountant
Jonathan Conger, Administrative Assistant

2018 Annual Update

- In FY18, the Cores Administration office was successfully able to process billing in 1 business day even though the amount of billed revenue has increased to 26 labs. The new HSC scheduling/billing system validates chartfields with the University's CIS system. This has eliminated the majority of billing errors.
- In FY18 the core billed 4.91 million; however, what is most impressive of this past year was the collection rate for billed services was **100%**. We have developed an account management system to allow each Director to view revenue and expenses in real time. The tracking system stores fiscal data so that historical comparisons between revenue and expenses can be performed as well as proof of expenses, and operational analysis.
- The two new Service/Recharge Centers (National Center for Veterans Studies and USTAR Center Genetic Discovery) are now managed through the administrative office to increase accountability and reduce expenses associated with billing and collections.
- The fifth annual retreat was held on September 22nd. Approximately 100 people attended. Directors had an opportunity to discuss methods for maintaining market share, engaging researchers to provide higher quality data analysis and methods to track usage. Nanofab, BIDAC, Nuclear Engineering and Emergency Preparedness all made presentations showing their services.
- The electronic inventory system created for capital equipment tracking is still being heavily used by additional departments and groups in Health Sciences and Main Campus. Upgrades for FY18 allow more reporting and tracking of equipment and better access from hand held devices. As of August 2018, there are 61 Departments, and 3,735 items entered into the system. These items are located in 653 rooms across campus. The total asset value of these items is $45.2 million. This system continues to expand and is free to use by any group on campus.

- In FY18, a new purchasing system was created which tracks expenses and revenue in real time. The system is reconciled to the management reports in CIS.

FY2019 Goals

- Upgrade the electronic inventory system
- Upgrade the resource/billing system

Cores Administration Revenue & Expenses

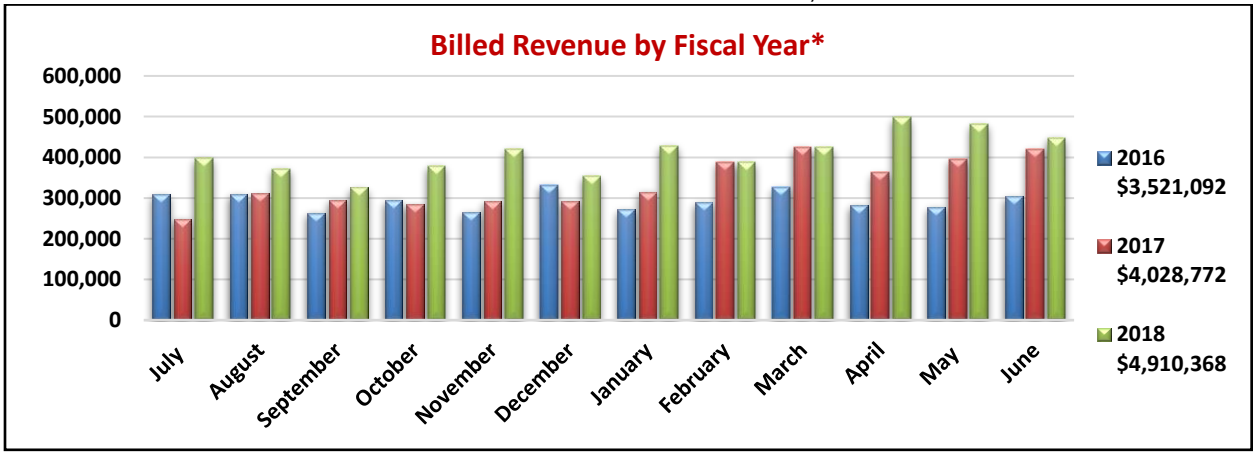
FY18 Expenses: Total $559,676

The Cores Administration Budget covers the following expenses:

- Salaries/Benefits: $407,195
- Fixed Expenses (IT Support for 76 staff, developer, x-ray, software): $152,481
- Unanticipated equipment repairs and replacement: $79,290

FY18 Revenues: Total $679,796

- VP of Health Sciences Support: $413,000
- FY18 Revenue Generated from Services: $266,796



* This represents the income from the 5% administrative fee charged to each core, based on collected revenue from billed services; legend displays 5% of annual revenue collected for each fiscal year.

Advisory Board Committee

Last meeting date: January 30, 2018
Andy Weyrich[1], Associate Dean for Basic and Translational Sciences
Joseph Yost[1], Professor, Neurobiology and Anatomy
Mark Yandell, Professor, Human Genetics
John Phillips[1], Director, Core Facilities
Dennis Winge, Professor, Hematology
David Stillman[1], Professor, Pathology
Wes Sundquist, Professor, Biochemistry
Brad Cairns[1], Professor, Huntsman Cancer Institute
Carl Wittwer, Professor, Pathology
Eric Schmidt, Professor, Medicinal Chemistry
[1] in attendance

Addendum

The administrative core ensures that all cores maintain a regular faculty advisory committee meeting that conforms to the following guidelines:
cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

Biomedical Image & Data Analytics Core

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Overview

The mission of the Biomedical Image and Data Analysis Core (BIDAC) facility is to provide advanced medical computing, scientific visualization and data analytics services to research groups at the University of Utah. We offer services and consulting that range from standard image processing tasks (image registration, image segmentation) to more advanced group-wise studies, including morphometric analysis and deep learning (artificial intelligence). BIDAC leverages the computational resources and software development infrastructure of the Scientific Computing and Imaging (SCI) Institute. In partnership with CHPC and the HSC Core imaging facilities, we are actively developing new services that are based on the needs of HSC researchers and Core users. As a resource for advanced medical computing and data analytics, our goal is to further the scientific mission of the University of Utah by significantly enhancing the capabilities and competitiveness of HSC research laboratories.

Services

BIDAC offers a range of services including consulting, training, image processing, image analysis, image visualization, workflow development, software prototyping, and algorithm development. Main services that have been developed and/or used during FY2018 include:

- Deep learning analysis (artificial intelligence) for biomedical image classification and regression. We have been developing expertise in applying, comparing and fine-tuning state-of-the-art Convolutional Neural Networks (CNN) to enable robust biomedical image classification and/or image regression.
- Big data engineering workflow for inpatient and outpatient medical imaging, enabling subsequent machine learning analysis**.** In partnership with researchers from Radiology, the Enterprise Data Warehouse (EDW) and the Center for High Performance Computing (CHPC), we have developed software and hardware infrastructure to support secured data transfer (from the hospital PACS), HIPAA-compliant data storage and data management of large radiological datasets to enable deep learning and natural language processing analyses. A clinical study of interest focuses on retrospective 2D chest X-ray images.

Personnel

Clement Vachet, Director

2018 Annual Update

Grant Support - BIDAC performed preliminary work and/or provided letters of support for the following grant submissions:

- NIH R21 – Tracy Frech, PhD, Dept. Internal Medicine
- NIH Common Fund Initiative – Alexander Lex, SCI Institute
- NIH R21 – Joyce Schroeder, Dept. Radiology

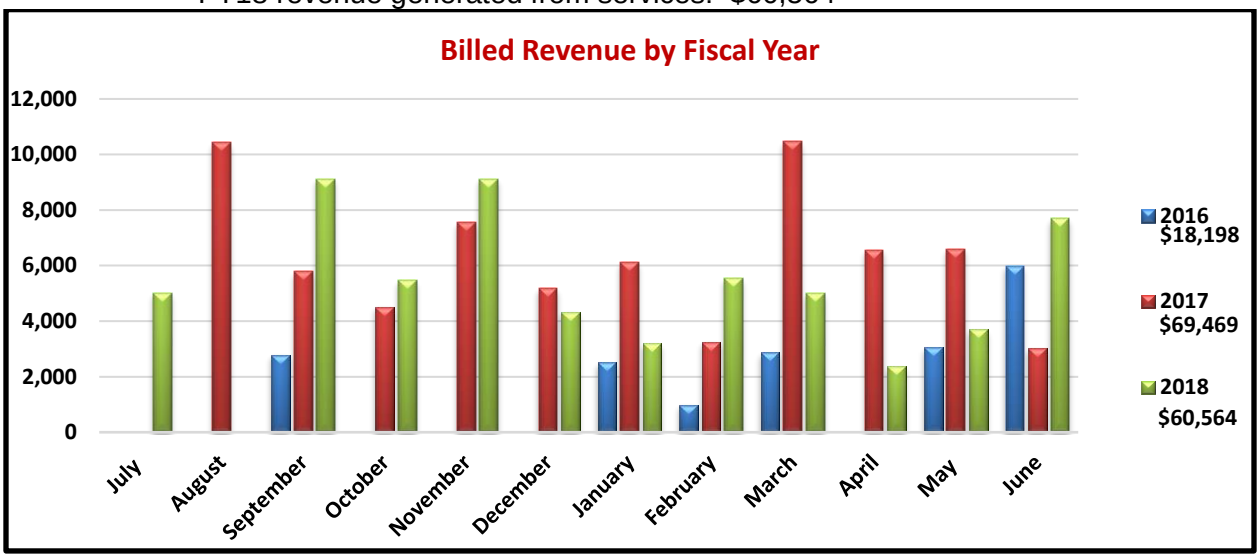
Inter-disciplinary collaborations - projects to enhance imaging capabilities have been performed with the Center for High Performance Computing (CHPC) and with several Health Sciences Cores (directly or involving end-users).

Revenue/Expenses

FY18 Expenses: **Total $77,729**

FY18 Revenue: Total $95,564

- VP of Health Sciences Support: $ 35,000
- FY18 revenue generated from services: $60,564



* Legend displays total annual revenue by year earned.

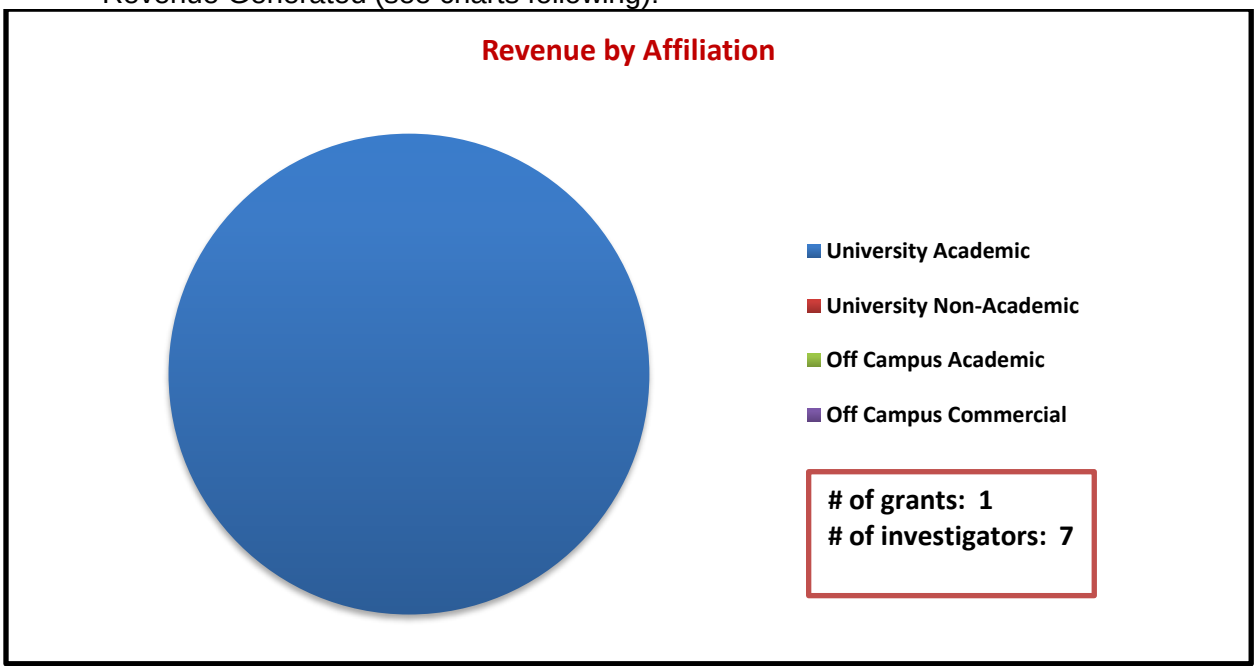
Advisory Board Committee

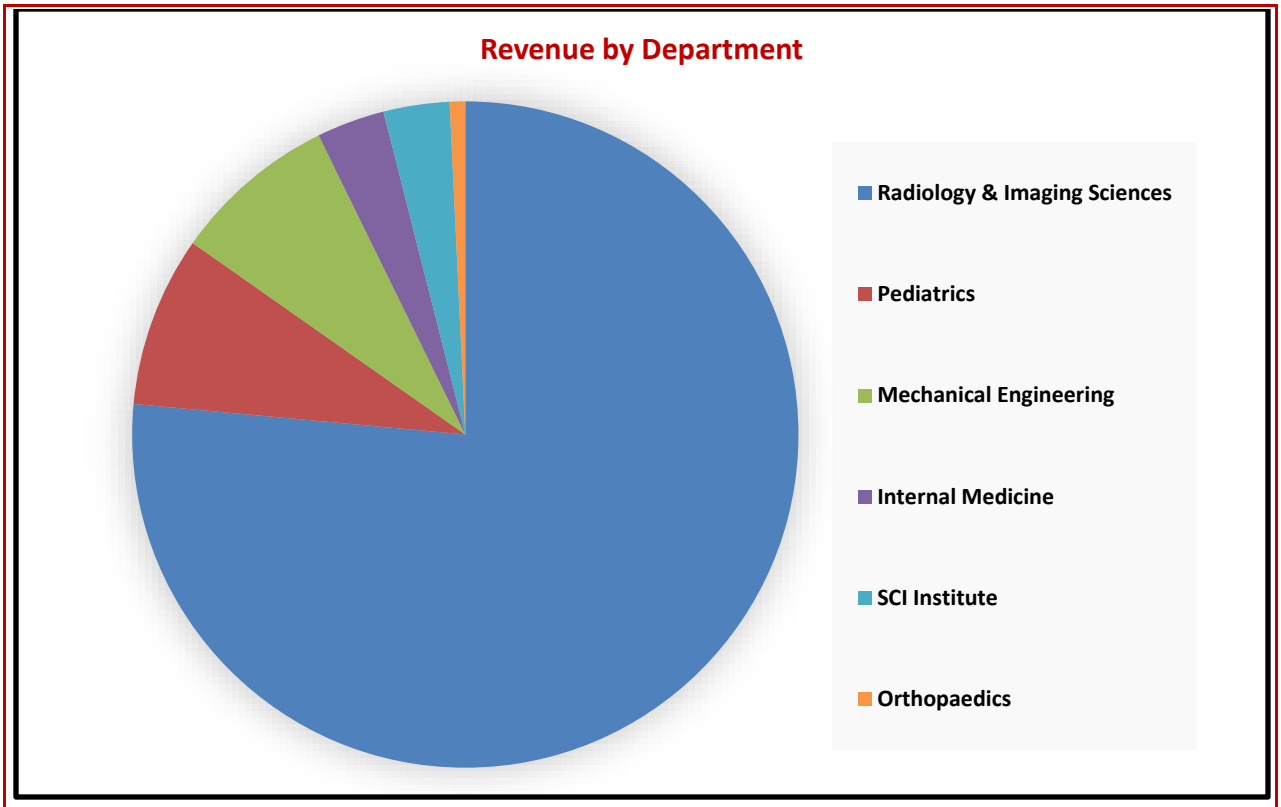
Edward DiBella, PhD, Prof. Radiology and Imaging Sciences, Director UCAIR
Florian Solzbacher, PhD, Professor Electrical & Computer Engineering, Director CEI
Tolga Tasdizen, PhD, Associate Professor Electrical & Computer Engineering

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):





Top Users

1	Jones, Gregory	Department
2	Minoshima, Satoshi	Department
3	Yearley, Jeff	Department
4	Monson, Ken	Henry Jackson Foundation
5	Koening, Curry	Department
6	Butson, Christopher	Department
7	Henninger, Heath	Department

Cell Imaging

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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 Zeiss 880 Airyscan confocal, a Leica SP8 White light laser confocal, Two Olympus FV1000 Spectral confocals, two Nikon A1 confocals, and a Multi-photon confocal from Prairie. In addition, two Nikon Ti automated microscope and two spinning disk confocals (CSU10, W1) are available for live cell imaging. 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, one with Hypoxia) 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. Services are offered at multiple locations in an effort to provide the service within proximity to the user base.

Equipment

HSC Location

- Olympus FV1000 Confocal Microscope
- Nikon A1 Confocal Microscope
- Nikon A1R Confocal Microscope
- Prairie Multi-Photon Confocal Microscope
- Zeiss Axioscan Z1 automated slide scanner with 100 slide loader
- EVOS FL Widefield Microscope
- Nikon Ti Automated Microscope

HCI Location

- Leica SP8 confocal with white light laser
- Nikon Ti Automated Microscope
- Nikon Ti Automated Microscope with CSU10 Spinning disk confocal
- Ibidi stage incubator with C02, temperature and hypoxia control

SMBB Location

- Olympus FV1000 Confocal Microscope

Biology ASB Location

- Olympus IX81 Automated Microscope
- Zeiss 880 Airyscan Confocal
- Vutara super resolution and Optera Swept Field Confocal

Personnel

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

2018 Annual Update

New Services

- Consultation is available at four locations, 230ASB in Biology, SMBB Nanofab center, 5221 HCI and Building 585 HSC

New Equipment

- Spinning disk confocal in Biochemistry, W1 from Visitek

Goals 2019

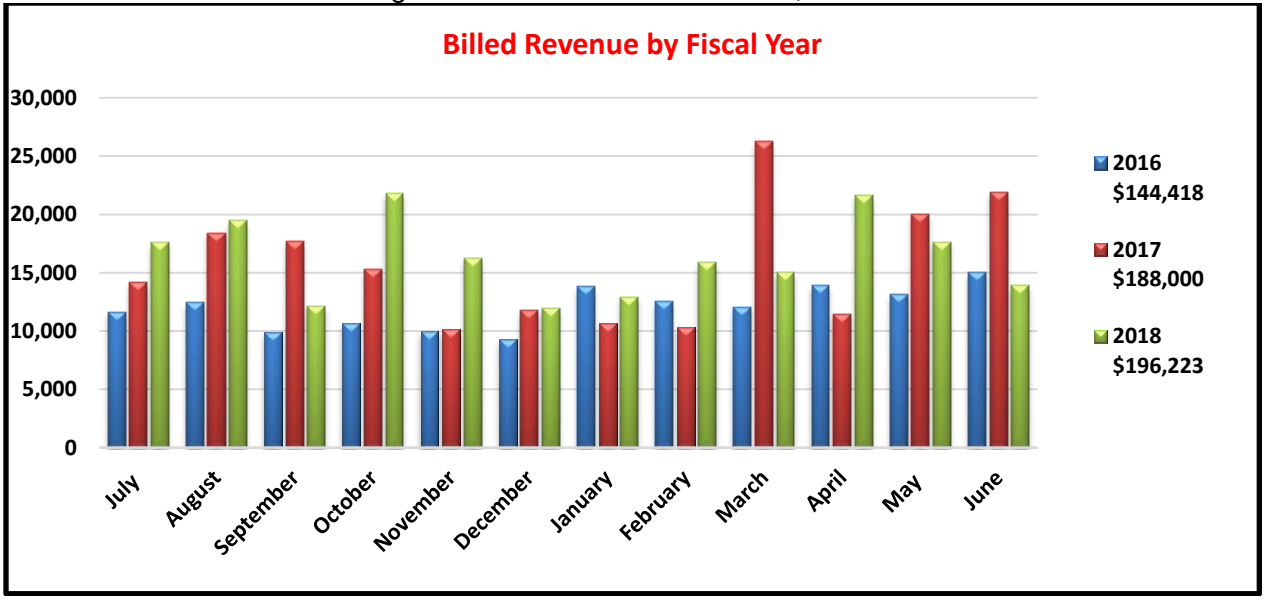
Grants have been submitted for two new confocal instruments. Replacement of aging devices will need to be a priority in FY2019. Optimizing acknowledgement of the core for manuscripts published with data generated from the core is very important in developing a strategy to acquire additional equipment.

Revenue/Expenses

FY18 Expenses: Total $346,434

FY18 Revenue: Total $361,223

- VP of Health Sciences Support for normal operating expenses: $165,000
- FY18 revenue generated from services: $196,223



* Legend displays total annual revenue by year earned.

Advisory Board Committee

Last meeting date: June 6th, 2018.
Marcus Babst, Associate Professor, Biology
Josh Bonkowsky, Associate Professor, Neurobiology and Anatomy
Bruce Edgar, Professor, Oncological Sciences
Kristen Kwan, Assistant Professor, Human Genetics
Michelle Mendoza, Associate Professor, Oncological Sciences
Minna Roh, Associate Professor, Biochemistry
Yan-Ting Shi, Associate Professor, Nephrology
Lukas Timmins, Associate Professor, Biomedical Engineering

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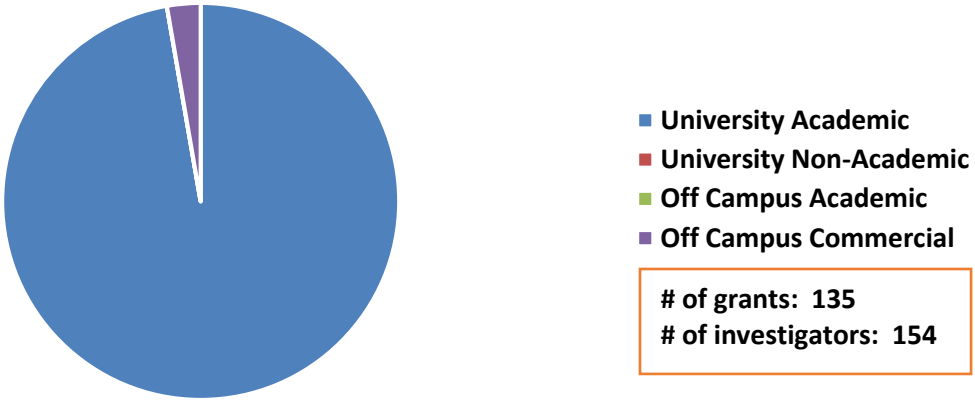
FY18 Scientific Impact

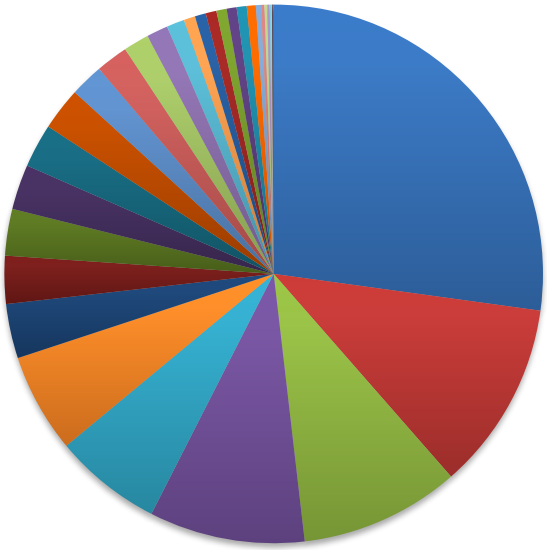
Research Support

Revenue Generated (see charts following):

Revenue by Affiliation



Revenue by Department



- Oncological Sciences
- Biology
- Pathology
- Nutrition & Integrative Physiology
- Pharmaceutics & Pharmaceutical Chemistry
- Bioengineering
- Neurology
- Orthopaedics
- College of Engineering
- Physical Therapy & Athletic Training
- Mechanical Engineering
- Molecular Medicine
- Dermatology
- CCTS
- Anesthesiology
- College of Pharmacy
- Obstetrics & Gynecology
- Neurobiology & Anatomy
- Human Genetics
- Internal Medicine
- Surgery
- Biochemistry
- Neurosurgery
- Pediatrics
- Pharmacology & Toxicology
- Medicinal Chemistry
- Chemistry
- CVRTI
- Core Research Facilities
- Dentistry
- Chemical Engineering
- Elec & Computer Engineering
- Exercise & Sport Science
- Ophthalmology & Visual Sciences

Top Users

1	Rosenblatt, Jody	NIH
2	Mendoza, Michelle	NIH
3	Jorgensen, Erik	HHMI
4	Yost, H Joseph	NIH
5	Weiss, Jeffrey	NIH, Georgia Tech University
6	Phadnis, Nitin	NIH
7	Kardon, Gabrielle	NIH, March of Dimes
8	Edgar, Bruce	HCI
9	Mulvey, Matthew	NIH, Department
10	Beckerle, Mary	Department

Centralized Zebrafish Animal Resource (CZAR)

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Overview

The CZAR Facility provides state-of-the-art systems for housing, breeding, and doing experiments with zebrafish, an emerging vertebrate model system. The CZAR currently houses approximately 5000 fish tanks with a capacity of 7750 tanks maintained on 5 independent recirculating water systems. The communal laboratory space also increased, providing additional areas for Zebrafish mating, embryo microinjection, and afternoon embryo production in an Alternate Light Cycle room. The 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. This centralized communal space has been instrumental in the University's ability to attract and recruit two new Zebrafish faculty members in the last year, 10 laboratories that have large-scale commitments to zebrafish research and 14 additional smaller-scale groups currently use the CZAR.

The expanded facility houses approximately 125,000-150,000 fish, including a large number of wild type and mutant fish strains. The CZAR staff strives to improve and optimize zebrafish husbandry practices within the facility by monitoring and troubleshooting observed health issues, testing new diets, and addressing concerns raised by users.

Services

The CZAR Core Facility is responsible for the daily care and maintenance of the fish and aquatic systems. The facility provides the following services:

- Housing and maintaining zebrafish, monitoring their health, 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 wild type lines and providing animals from these lines to investigators.
- Providing laboratory bench space and supplies to perform experiments
- Providing and maintaining shared-use equipment including 7-8 microinjection stations with bright field stereomicroscopes, and 3 fluorescence stereomicroscopes.
- Providing education and training to investigators and students individually
- Providing specialized centralized services performed by the permanent staff, such as *in vitro* fertilization, sperm cryopreservation and storage
- Providing Quarantine facilities to house fish from outside sources to generate clean lines to import into the facility.
- Monitor husbandry success through mating success and nursery survival data.

- Propagating individual lab WT or transgenic lines for a nominal fee. This service can be requested through the Cores web site.
- Offering a “Fish School” course for new users to learn best practices in handling and caring for their fish, as well as how to tell male and female fish apart.

Equipment

- M205 FA Leica Fluorescence Microscope
- Zeiss Fluorescence Microscope with LED light source
- Olympus Fluorescence Microscope
- 7 microinjection stations with bright field stereomicroscopes
- Analog camera and monitor to facilitate teaching microinjection in real time
- Temperature sensors throughout facility to help monitor the quality of temperature control, and record deviations that could affect fish health.

Personnel

Maurine Hobbs, PhD, Director
Sharon Johnson, Senior Laboratory Specialist - Zebrafish Husbandry and WT line maint.
Talmage Long, Technician - Nursery Manager
Nathan Baker, Lab Aide

2018 Annual Update

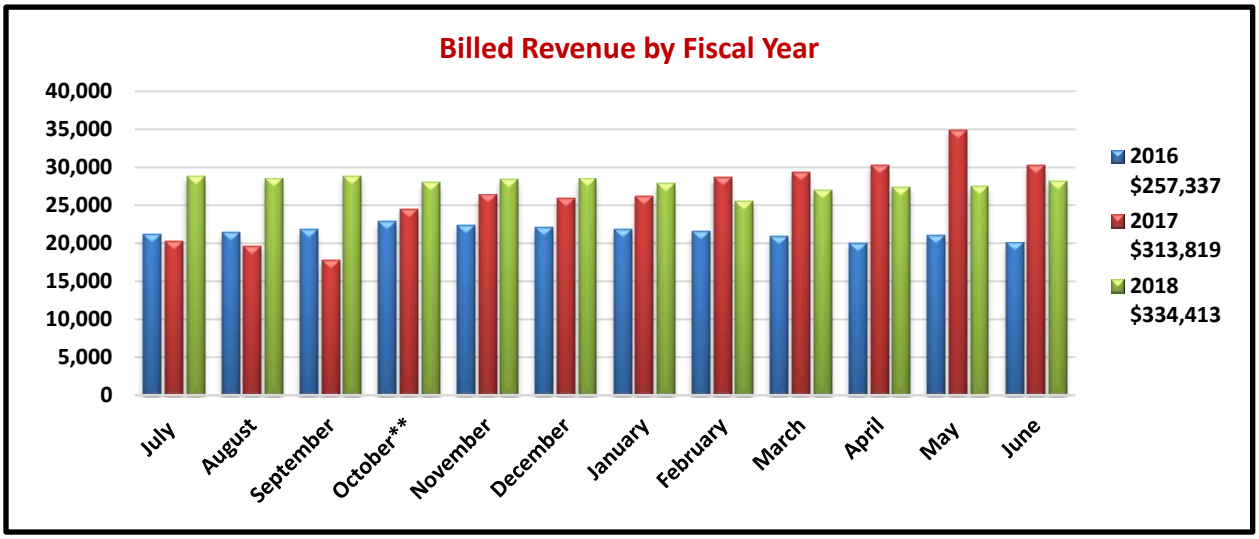
New Services

- In May 2018, a new 1000 tank capacity fish system was installed in the Crocker Science Center building. The CZAR has provided expertise and support services to help the Crocker Science Research Zebrafish (CBRZ, aka ‘sea breeze’) facility ready to accept and support research zebrafish.

Revenue/Expenses

FY18 Expenses: Total $468,567
FY18 Revenue: Total $471,413

- VP of Health Sciences Support: $137,000
- Total FY18 Revenue Generated from Services: $334,413



* Legend displays total annual revenue. NOTE: Revenue for FY15 & FY16 is maximal due to facility limitations.
**Beginning in October 2016, the increased revenue shows the new tanks coming online

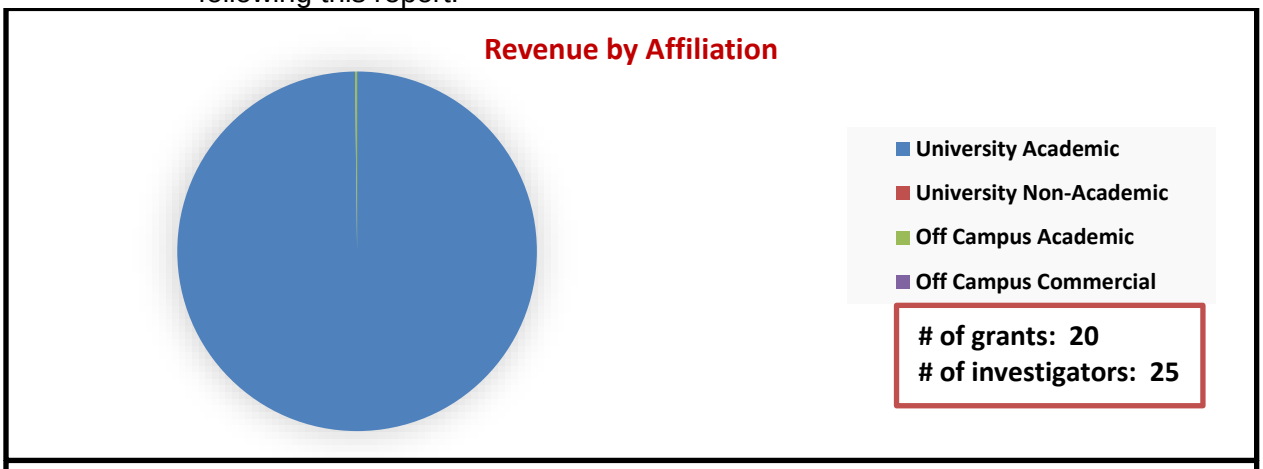
Advisory Board Committee

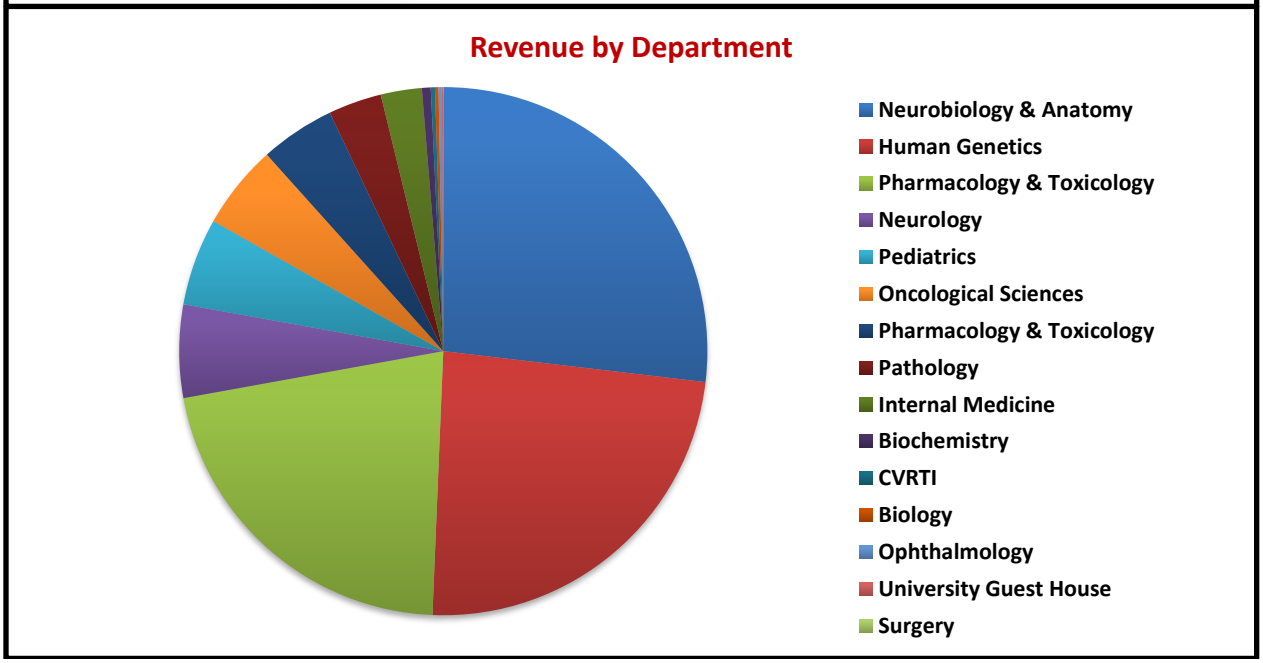
Last meeting date: 11/08/2017
Richard Dorsky, Associate Professor, Neurobiology and Anatomy- Chair
David Jonah Grunwald, Professor, Human Genetics
Joshua Bonkowsky, Associate Professor, Neurobiology and Anatomy and Pediatrics
Kristen Kwan, Assistant Professor, Human Genetics
Amnon Schlegel, Assistant Professor, Internal Medicine
Rodney Stewart, Assistant Professor, Oncological Sciences
Roger Van Andel, Director, Office of Comparative Medicine
Randall Peterson, Dean, College of Pharmacy
H. Joseph Yost, Professor, Neurobiology and Anatomy and Pediatrics

FY18 Scientific Impact

Research Support

- Grunwald, Title: Expansion of a Zebrafish Research Core Facility, Grunwald, 1G20OD018369-01, NIH, $500,000, 06/01/2014 – 05/31/2015.
- Grants supported by this core, as of July 2018, are listed as an appendix following this report.





Top Users

1	Peterson, Randall	Department
2	Yost, H Joseph	NIH
3	Grunwald, David	NIH
4	Kwan, Kristen	NIH
5	Bonkowsky, Josh	NIH, European Leukodystrophy Assoc., Department
6	Dorsky, Richard	NIH
7	Douglass, Adam	NIMH, NSF, Department
8	Keefe, Kristen	Department
9	Rosenblatt, Jody	NIH
10	Schlegel, Amnon	Department

Publications

1. Lambert, C. J. et al. An automated system for rapid cellular extraction from live zebrafish embryos and larvae: Development and application to genotyping. PLoS One 13, e0193180, doi:10.1371/journal.pone.0193180 (2018).
2. Gao, J., Stevenson, T. J., Douglass, A. D., Barrios, J. P. & Bonkowsky, J. L. The Midline Axon Crossing Decision Is Regulated through an Activity-Dependent Mechanism by the NMDA Receptor. eNeuro 5, doi:10.1523/ENEURO.0389-17.2018 (2018).
3. Strachan, L. R. et al. A zebrafish model of X-linked adrenoleukodystrophy recapitulates key disease features and demonstrates a developmental requirement for abcd1 in oligodendrocyte patterning and myelination. Hum Mol Genet 26, 3600-3614, doi:10.1093/hmg/ddx249 (2017).
4. Murphy, P. J., Wu, S. F., James, C. R., Wike, C. L. & Cairns, B. R. Placeholder Nucleosomes Underlie Germline-to-Embryo DNA Methylation Reprogramming. Cell 172, 993-1006 e1013, doi:10.1016/j.cell.2018.01.022 (2018).
5. Xie, Y. et al. Lef1-dependent hypothalamic neurogenesis inhibits anxiety. PLoS Biol 15, e2002257, doi:10.1371/journal.pbio.2002257 (2017).
6. Schoppik, D. et al. Gaze-Stabilizing Central Vestibular Neurons Project Asymmetrically to Extraocular Motoneuron Pools. J Neurosci 37, 11353-11365, doi:10.1523/JNEUROSCI.1711-17.2017 (2017).
7. Klatt Shaw, D. et al. Intracellular Calcium Mobilization Is Required for Sonic Hedgehog Signaling. Dev Cell 45, 512-525 e515, doi:10.1016/j.devcel.2018.04.013 (2018).
8. Jurynec, M. J. et al. A hyperactivating proinflammatory RIPK2 allele associated with early-onset osteoarthritis. Hum Mol Genet 27, 2383-2391, doi:10.1093/hmg/ddy132 (2018).
9. Lui, N. C. et al. Lhx1/5 control dendritogenesis and spine morphogenesis of Purkinje cells via regulation of Espin. Nat Commun 8, 15079, doi:10.1038/ncomms15079 (2017).
10. Wambaugh, M. A., Shakya, V. P. S., Lewis, A. J., Mulvey, M. A. & Brown, J. C. S. High-throughput identification and rational design of synergistic small-molecule pairs for combating and bypassing antibiotic resistance. PLoS Biol 15, e2001644, doi:10.1371/journal.pbio.2001644 (2017).
11. Tu, J., Xu, M., Parvez, S., Peterson, R. T. & Franzini, R. M. Bioorthogonal Removal of 3-Isocyanopropyl Groups Enables the Controlled Release of Fluorophores and Drugs in Vivo. J Am Chem Soc 140, 8410-8414, doi:10.1021/jacs.8b05093 (2018).
12. Sips, P. Y. et al. Identification of specific metabolic pathways as druggable targets regulating the sensitivity to cyanide poisoning. PLoS One 13, e0193889, doi:10.1371/journal.pone.0193889 (2018).
13. Jin, Y. N. et al. Noncanonical translation via deadenylated 3' UTRs maintains primordial germ cells. Nat Chem Biol, doi:10.1038/s41589-018-0098-0 (2018).
14. Basu, S. et al. Small Molecule Inhibitors of NFkB Reverse Iron Overload and Hepcidin Deregulation in a Zebrafish Model for Hereditary Hemochromatosis Type 3. ACS Chem Biol, doi:10.1021/acschembio.8b00317 (2018).

HEALTH
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Active Grant Support of Zebrafish Research

Associated with the UofU CZAR Core Facility FY18

Zebrafish Investigator	Grant Title	Funding Source	Annual Amount of Direct Cost Funding
Bonkowsky	Trans-Cellular Activation Of Transcription To Analyze Dopaminergic Axon Reorganization	NIH/NIMH	$300,000
Bonkowsky	Characterization Of Genetic Pathways Regulating Connectivity Disruption In Hypoxic Injury	March Of Dimes	$88,000
Cairns	Howard Hughes Medical Institute	HHMI	$619,981
Dorsky	Regulation Of Hypothalamic Radial Glia By Wnt Signaling	NIH/NINKS	$250,000
Grunwald	Expansion of a Zebrafish Research Core Facility	NIH Office of the Director	$500,000
Grunwald	Gene targeting in zebrafish: building models to assay disease genes	NIH NTNL INST CHILD	$182,525
Grunwald	A toolkit for gene-targeting in zebrafish	NIH NTNL INST CHILD	$383,170
Kwan	Hedgehog Signaling and Cilia in Choroid Fissure Morphogenesis and Coloboma	NIH NTNL EYE INSTITUTE	$335,250
Li	Endothelial Toll-Like Receptor Signaling and Inflammation		$366,912
Mulvey	Bacterial Invasion And Trafficking Within The Bladder	NIH/NIAIDIA BETE	$250,000
Rosenblatt	The Role Of Extrusion In Controlling Epithelial Homeostasis	NIH/NIGMED	$207,475
Rosenblatt	The Role Of Extrusion In Controlling Epithelial Homeostasis	NIH/NIGMED	$75,000
Schlegel	Molecular Genetics Of Lipid Metabolism	NIH/NIDDIAB ETE	$209,888
Stewart	Foxd3-Dependent Pathways In Neural Crest Migration And Metastasis	American Cancer Society	$150,000
Tavtigian	Classifying DNA Mismatch Repair Gene Variants of Unknown Significance	NCI	$520,565
Tristani-Firouzi	“Zebrafish Model Organism Core For The Cardiovascular	NIH	$164,000
Yost	Genome-Wide Analysis Of Cardiac Development In Zebrafish	NIH/NHLBI	$1,570,415
Yost	Developmental Biology Training Grant	NIH/NICHD	$253,526
		Total Current Grants, Annual Direct Costs:	**$7,130,167**

DNA Peptide

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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
- Amino Acid Analysis

Equipment

- Dr. Oligo 192 DNA Synthesizer
- ABI 3900 DNA Synthesizer
- ABI 394 DNA Synthesizer (2)
- 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
Jan Mees, Lab Aide
Meredith Ford, Lab Technician
Evan Shaw, Lab Technician

2018 Annual Update

New Equipment

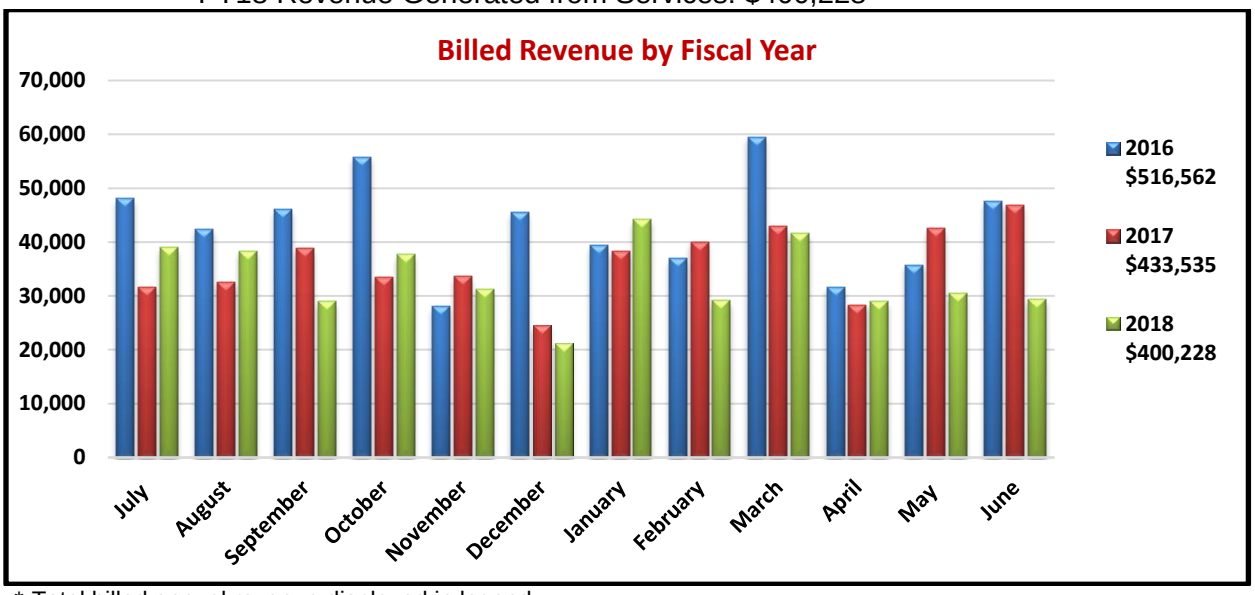
- The DNA Peptide Facility now offers a 25 nmole DNA Synthesis service. These prices make the facility much more competitive with commercial vendors.

Revenue/Expenses

FY18 Expenses: **Total $388,795**

FY18 Revenue: **Total $400,228**

- VP of Health Sciences Support: $0
- FY18 Revenue Generated from Services: $400,228



* Total billed annual revenue displayed in legend.

Advisory Board Committee

Last meeting date: August 2014.

Raphael Franzini, Professor, College of Pharmacy

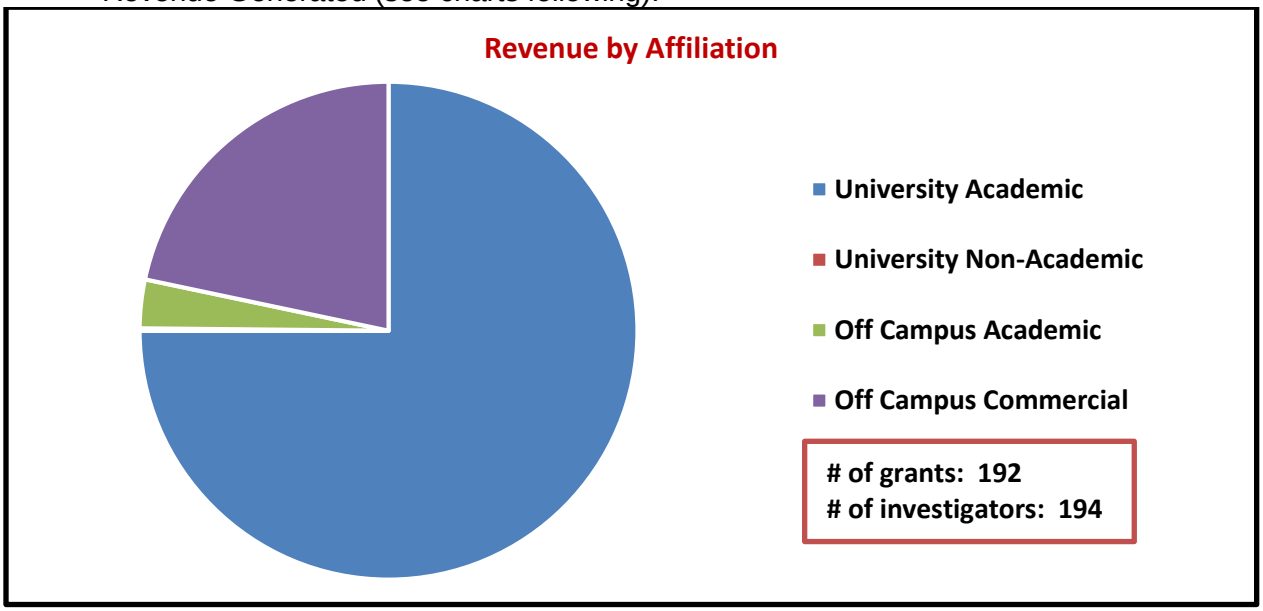
Jen Heemstra, Assistant Professor, Chemistry

John Weis, Professor, Pathology

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):



HEALTH
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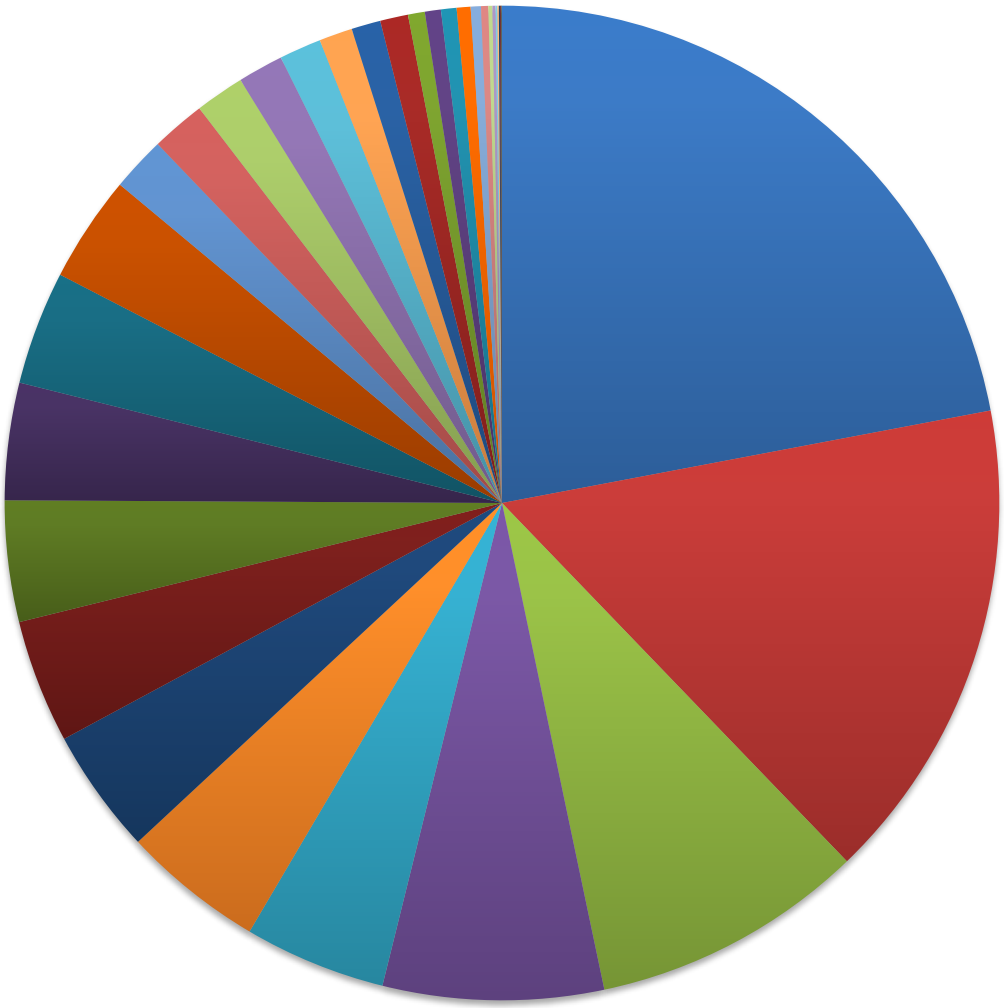
Revenue by Department



- Biochemistry
- Chemistry
- Pathology
- Internal Medicine
- Human Genetics
- Biology
- Core Research Facilities
- Medicinal Chemistry
- Neurobiology & Anatomy
- Oncology Sciences
- Bioengineering
- Pediatrics
- Molecular Medicine
- Ophthalmology & Visual Sciences
- College of Pharmacy
- Neurology
- Orthopaedics
- Pharmaceutics & Pharmaceutical Chemistry
- Dentistry
- HCI
- Surgery
- College of Engineering
- Psychiatry
- Nutrition & Integrative Physiology
- Obstetrics & Gynecology
- Pharmacology & Toxicology
- Mechanical Engineering
- Exercise & Sport Science
- Neurosurgery
- Dermatology
- Anesthesiology
- Chemical Engineering
- Family & Preventative Medicine
- Physical Therapy & Athletic Training
- Microbiology & Immunology

Top Users

1	BioFire Diagnostics	Commercial
2	Burrows, Cynthia	NIH
3	Sundquist, Wesley	NIH, DHHS
4	Rutter, Jared	HHMI
5	Heemstra, Jennifer	Department, NIH, NSF, RCSA, Sonata Biosciences
6	Davey Hicks, Crystal	HSC Cores
7	Deans, Tara	NSF, Office of Naval Research
8	Kent, Jana	CoDiagnostics – Commercial
9	Schmidt, Eric	NIH, Department
10	Hill, Christopher	NIH, Department

Publications

1. Electrochemical Detection of *E. coli* O157:H7 in Water after Electrocatalytic and Ultraviolet Treatments Using a Polyguanine-Labeled Secondary Bead Sensor. Beeman MG, Nze UC, Sant HJ, Malik H, Mohanty S, Gale BK, Carlson K. Sensors (Basel). 2018 May 10;18(5). pii: E1497.
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12. Campbell, R. A., A. Vieira-de-Abreu, J. W. Rowley, Z. G. Franks, B. K. Manne, M. T. Rondina, L. W. Kraiss, J. J. Majersik, G. A. Zimmerman, and A. S. Weyrich. 2017. 'Clots Are Potent Triggers of Inflammatory Cell Gene Expression: Indications for Timely Fibrinolysis', *Arterioscler Thromb Vasc Biol*, 37: 1819-27.
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DNA Sequencing

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Overview

The DNA Sequencing Facility provides DNA sequencing services and employs the latest technologies to generate high quality data with the goal of rapid sample turnaround at competitive prices. DNA sequencing is accomplished with the use of 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 the same day as they are run. Sample information can be submitted online and sequencing data files are available online for download using a simple and secure interface. The next generation sequencing platform used has many advantages over other services, including price and sample turnover.

Services

DNA Sequencing

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

Cell Line Authentication

- Human Cell Line Authentication by STR

Robotics

- Biomek FX with Span-8 and 96 head

Fragment Analysis

- RNA quality determination (RIN equivalents)
- Fragment sizing and concentrations

Other Services

- Lab consumables for sample submission
- Life Technologies freezer program

Equipment

Sequencers

- Ion Torrent Proton
- Qiagen Q24 Pyrosequencer
- Applied Biosystems 3730xl

Liquid Handlers

- 1 Biomek FX programmable liquid sample dispensers
  Fragment Analysis
- AATI Fragment Analyzer

Personnel

Derek Warner, Director
Michael Powers, Senior Laboratory Specialist

2018 Annual Update

New Services

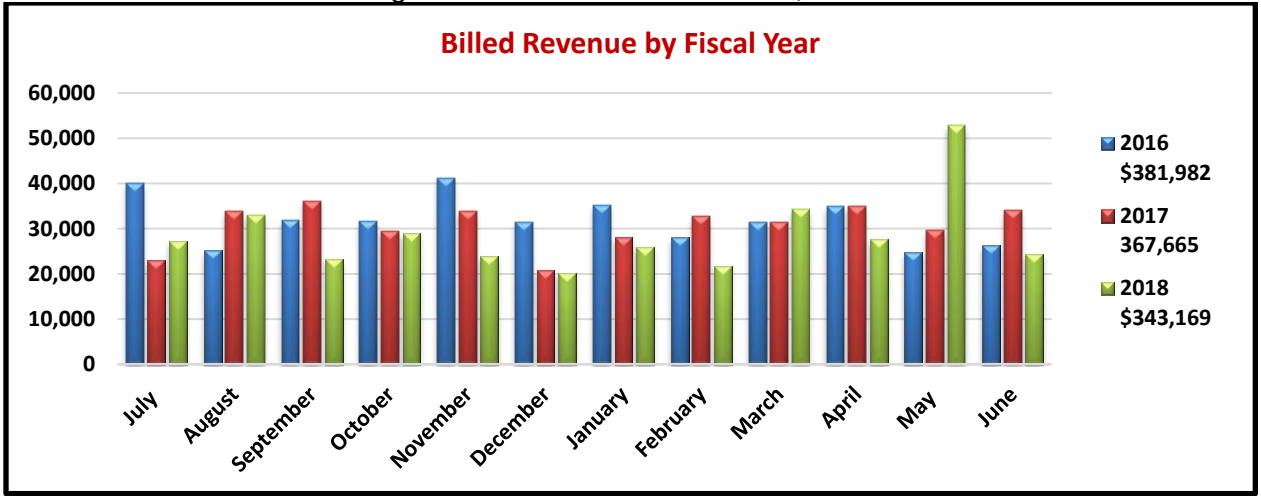
- We added the ability to send out Illumina sequencing through two contracted providers. Labs simply need to provide the DNA or RNA and data will be returned in approximately 3 weeks.

Revenue/Expenses

FY18 Expenses: **Total $379,872**

FY18 Revenue: **Total $343,169**

- VP of Health Sciences Support: $0
- FY18 revenue generated from services: $343,169



* Total annual revenue displayed in legend

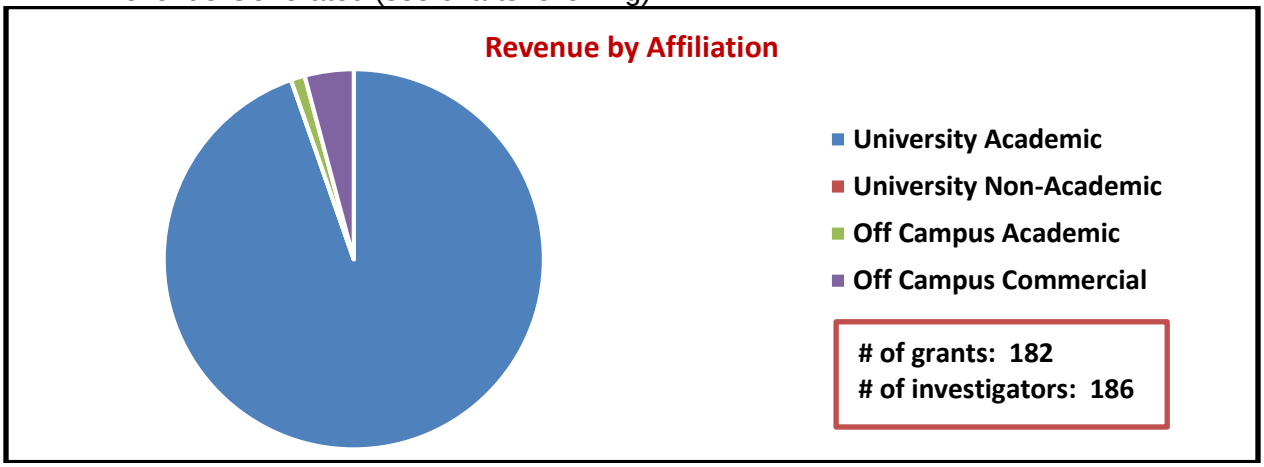
Advisory Board Committee

Last meeting date: October 27, 2017
Lynn Jorde, Professor, Human Genetics
Colin Dale, Associate Professor, Biology
Robert Weiss, Professor, Human Genetics]
Emily Coonrod, Associate Director, Personalized Health

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):



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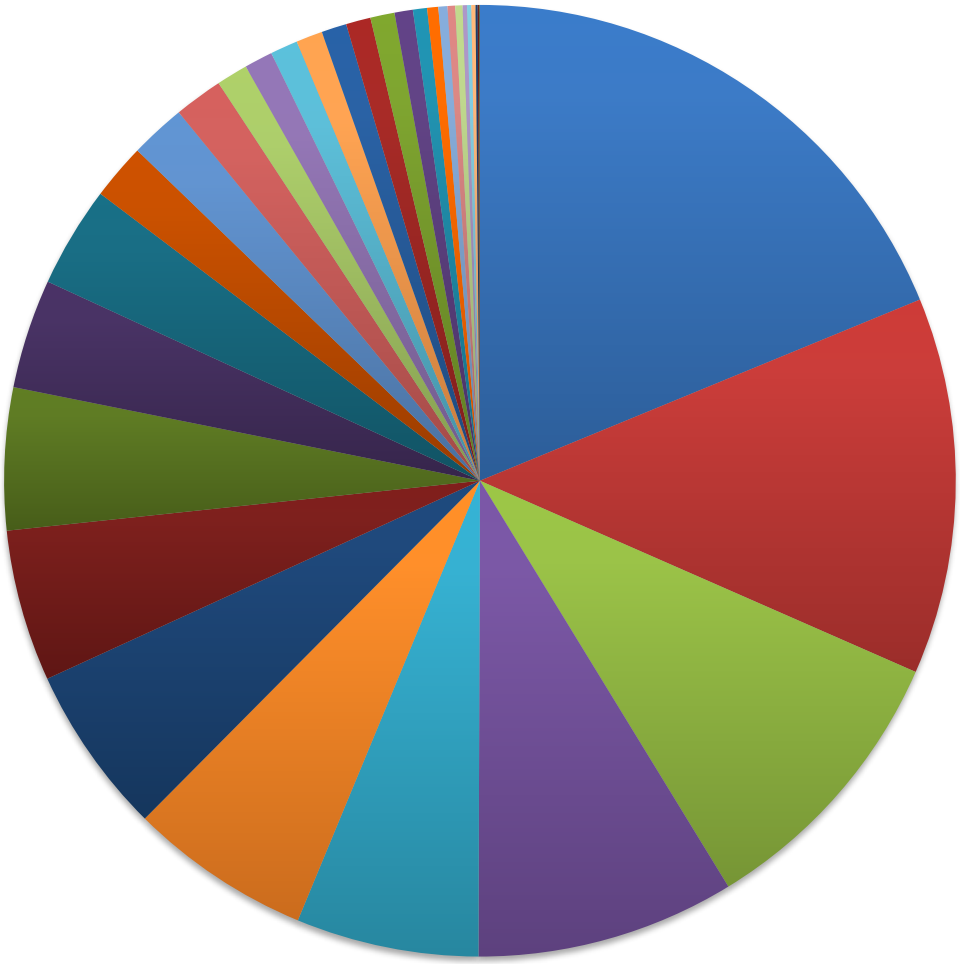
Revenue by Department



- Human Genetics
- Biochemistry
- Internal Medicine
- Biology
- Pediatrics
- Ophthalmology & Visual Sciences
- Oncological Sciences
- Neurobiology & Anatomy
- Chemistry
- Neurology
- Pathology
- Molecular Medicine
- Core Research Facilities
- College of Pharmacy
- Orthopaedics
- Dermatology
- Anthropology
- Psychiatry
- Surgery
- Pharmacology & Toxicology
- Pharmaceutics & Pharmaceutical Chemistry
- Bioengineering
- Neurosurgery
- HCI
- Civil & Environmental Engineering
- Nutrition & Integrative Physiology
- Medicinal Chemistry
- CCTS
- Dentistry
- College of Engineering
- Medicine
- Physics & Astronomy
- Exercise & Sport Science
- Microbiology & Immunology

Top Users

1	Jorde, Lynn	NIH, Geneuro, Department
2	Sundquist, Wesley	NIH, DHHS, Department
3	Hageman, Gregory	Department
4	Pulst, Stefan	Department
5	Schiffman, Joshua	NIH, Children's Hosp. Philadelphia, Dept.
6	Parkinson, John S	NIH
7	Yost, H Joseph	NIH
8	Tavtigian, Sean	Department
9	Rodan, Aylin	NIH
10	Chou, Hung-Chieh	American Diabetes Assoc., JDRF

Publications

1. Alenko, Anton, Aaron M. Fleming, and Cynthia J. Burrows. 2017. 'Reverse Transcription Past Products of Guanine Oxidation in RNA Leads to Insertion of A and C opposite 8-Oxo-7,8-dihydroguanine and A and G opposite 5-Guanidinohydantoin and Spiroiminodihydantoin Diastereomers', *Biochemistry*, 56: 5053-64.
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Drug Discovery

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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 stuides, 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 is 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 biotechnology companies.

Services

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

Viral Packaging Service

- Small/large scale viral (lentivirus, adenovirus, adeno-associated virus) packaging, titrations, concentrations and transductions of cells of interest.
- Lentivirus delivery of Cas9 and sgRNA

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
- HP D300 Digital Dispenser
- Axygen Platemax semi-automatic plate sealer
- KingFisher Duo Prime – Automated DNA/RNA extraction, protein/cell purification

Automated Detection Systems:

- Molecular Devices ImageXpress XLS Automated High-Content System
- Bio-tek Plate Neo 2 Plate Reader with stacker

CRISPR Libraries:

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

Commercial Compound Libraries:

- Chembridge Diverset EXP(50K) and CL (50K)
- Microsource Spectrum Collection
- NIH Clinical Collection
- Epigenetics Screening Library
- Kinase Inhibitor Library
- NCI Diversity Set IV
- Natural Products Set III
- Enamine 3D Diversity Set (50K)
- NIH Approved Oncology Drugs Set II
- NIH Natural Products Set IV
- Mechanistic Set III
- University of Utah metabolite library v1.0

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

2018 Annual Update

New Equipment:

- **KingFisher Duo Prime System – Automated DNA/RNA Extraction and Protein/Cell Purification**: The KingFisher Duo Prime can control the collection and release of magnetic particles and transfer them from vial to vial in a 96-well plate format. It can be used with diverse types of magnetic beads, and there are multiple kits available for specific assays. Routine uses include DNA/RNA extraction, cell isolation, immunoprecipitation, small-scale protein purification, affinity selection and isolation of circulating nucleic acids

New Service:

- **Viral Packaging Service production** - Small/large scale viral (lentivirus, adenovirus, adeno-associated virus) packaging, titrations, concentrations and transductions of cells of interest.

New Compound Collection:

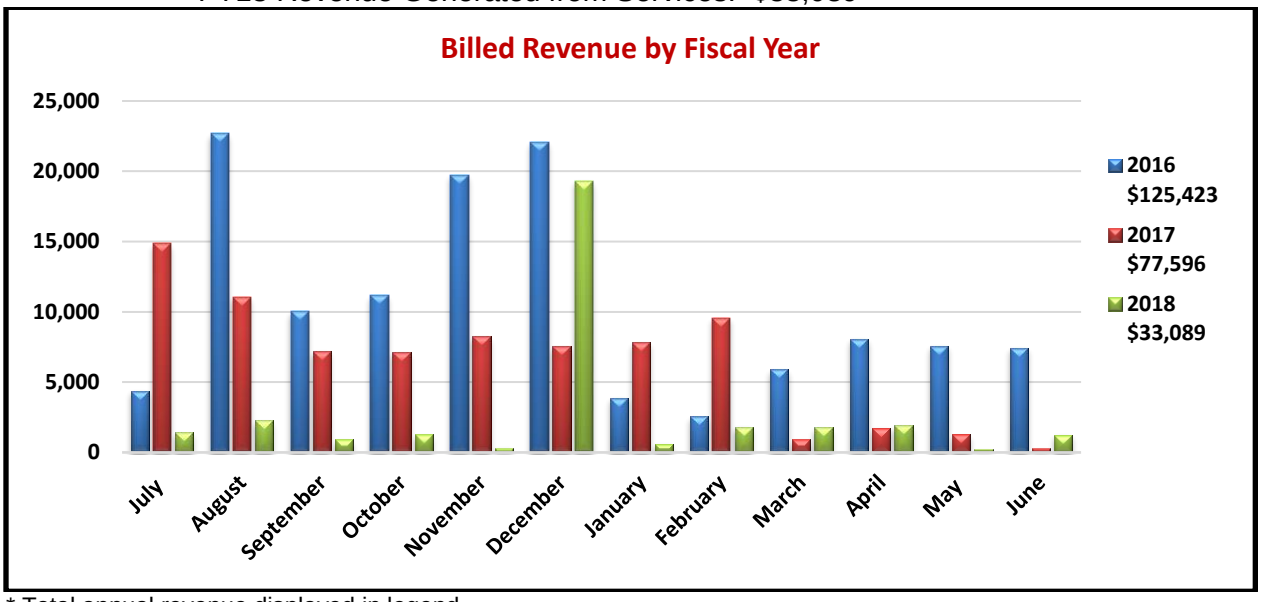
- **University of Utah metabolite library v1.0:** The University of Utah metabolite library v1.0 is composed of 453 endogenous and exogenous, primary and secondary metabolites observed, measured, or predicted in human tissues. Metabolites in the library include, but are not limited to, sugars, amino acids, nucleotides, cofactors, signaling molecules, and various precursors, intermediates, and byproducts thereof. All compounds are at 10 mM and solvated in DNase, RNase, Protease, free deionized water (acidic, basic, or neutral pH) or DMSO.

Revenue/Expenses

FY18 Expenses*:* Total $136,770

FY18 Revenue: **Total $130,439**

- VP of Health Sciences Support: $80,000
- VP of Research RIF Funds: $17,350
- FY18 Revenue Generated from Services: $33,089



* Total annual revenue displayed in legend.

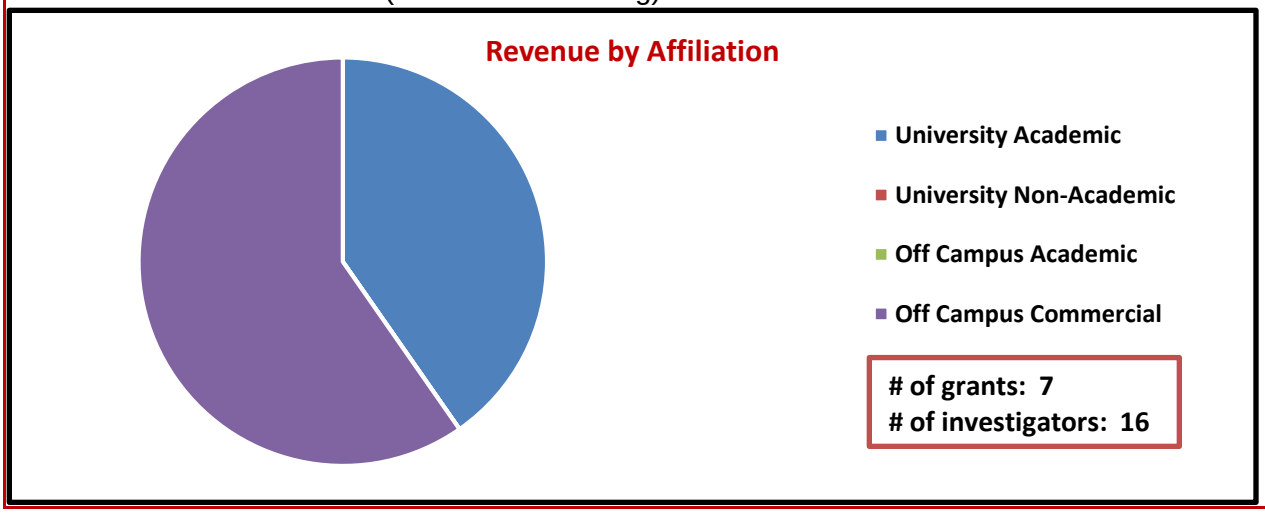
Advisory Board Committee

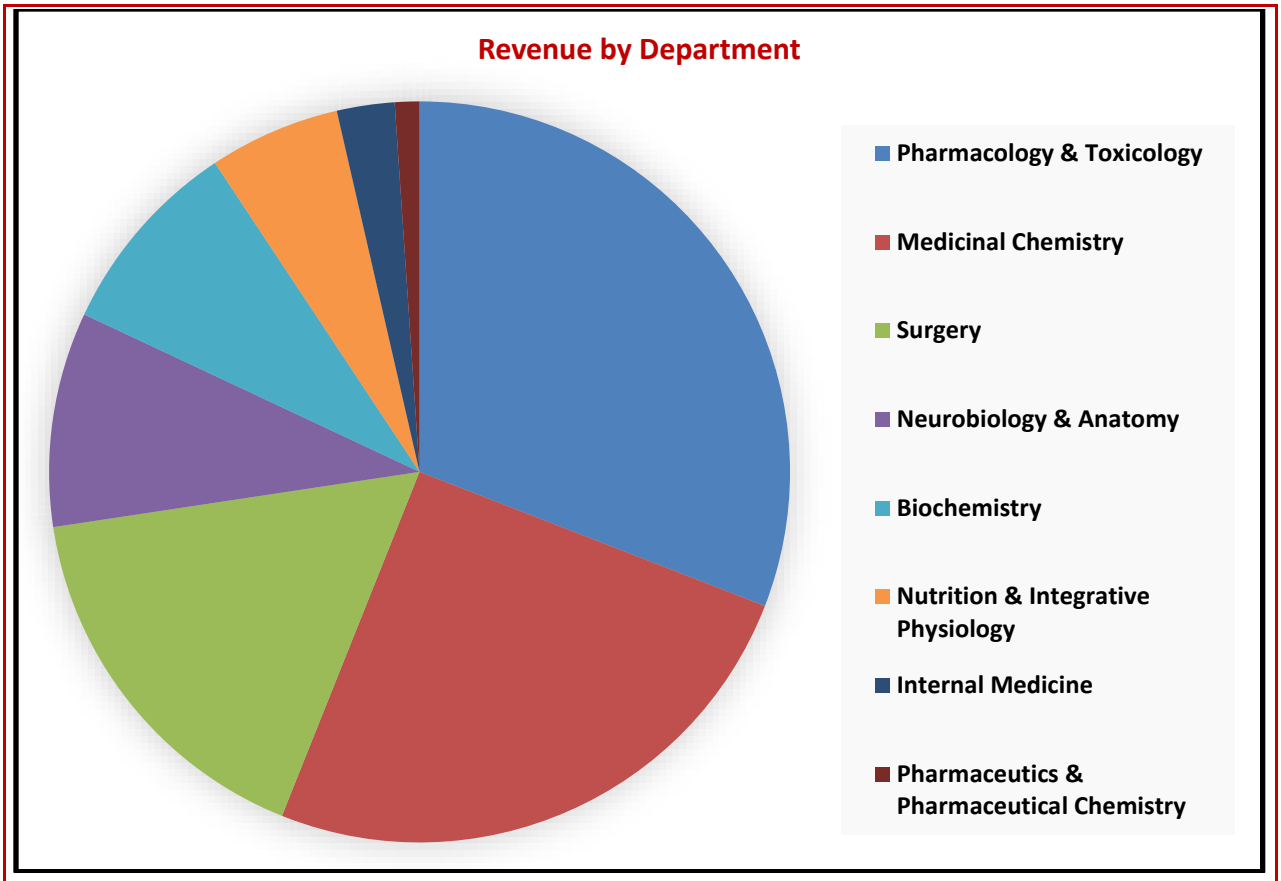
Last meeting date: June 18, 2018.
Darrell Davis, Professor, College of Pharmacy
Ryan Looper, Associate Professor, Chemistry Department
John Phillips, Professor, Internal Medicine
Jared Rutter, Professor, Department of Biochemistry
Bryan Welm, Associate Professor, HCI

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):





Top Users

1	Vettore Bio	Commercial
2	Bild, Andrea	Department
3	Franzini, Raphael	USTAR, Department
4	Holmen, Sheri	NIH
5	Rutter, Jared	HHMI
6	Williams, Megan	NIH
7	Summers, Scott	NIH
8	Sharma, Sunil	HCI
9	Sherwin, Catherine	Department
10	Schmidt, eric	NIH

Publications

1. Philip B, et al. Mutant IDH1 Promotes Glioma Formation In Vivo. Cell Rep. 2018 May 1;23(5):1553-1564
2. Brady SW et al. Combating subclonal evolution of resistant cancer phenotypes. Nat Commun. 2017; 8: 1231.

Electron Microscopy

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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 and other small particles. The EM Facility also prepares specimens for the microscope. The EM facility has five spatially distinct locations to serve the needs of the clinical and research groups. The main facility is in SMBB, and two TEMs are located there. Each of the following buildings house one TEM: RB LAB, BIOL, ASB, and CSC. Experiments requiring SEM are done in collaboration with microscopes owned by the Surface Analysis Laboratory.

Services

Clinical Services:

- Thin-section electron microscopy of tissue biopsies (technical part of clinical EM)

Research Services:

- Training on the TEMs, microtomes, sample preparation, and 3D image reconstruction
- Sections ("thick" and "thin") cut on microtome and ultramicrotome
- Record images on transmission or scanning electron microscopes
- Prepare and image tissues and cellular specimens via embedding, drying, osmification, and thin-sectioning
- Prepare and image particulate and macromolecular samples by staining, metal coating, drying, and cryogenic TEM
- Image specimens via three-dimensional electron microscopy
- Remote access to TEMs

Equipment

- ThermoFisher Tecnai 12, transmission electron microscope
- JEOL JEM-1400 Plus, transmission electron microscope
- Two Hitachi 7100, transmission electron microscopes
- ThermoFisher Tecnai F20, transmission electron microscope
- ThermoFisher Titan Krios, transmission electron microscope, available Fall 2018
- Leica (UC7, UC6, and UCT) and Reichert (Ultracut E), ultramicrotomes
- Leica JUNG RM2055, microtome
- ThermoFisher Vitrobot, vitrification robot
- Gatan K2 Summit, direct electron detector (Tecnai F20)
- Gatan K2/K3, direct electron detector (Titan Krios)
- Gatan BioQuantum energy filter (Titan Krios)
- Two automatic tissue processors
- Two laboratory microwave ovens
- Sputter coater
- Glow discharger
- High-pressure freezer
- Freeze substitution machine
- Critical-point dryer
- Access to high-performance computing nodes (CHPC)

Personnel

David Belnap, Ph.D., Director
Nancy Chandler, Senior Laboratory Specialist
Linda Nikolova, Senior Laboratory Specialist
Willisa Liou, Senior Laboratory Specialist
Bryan Gustafson, Laboratory Technician

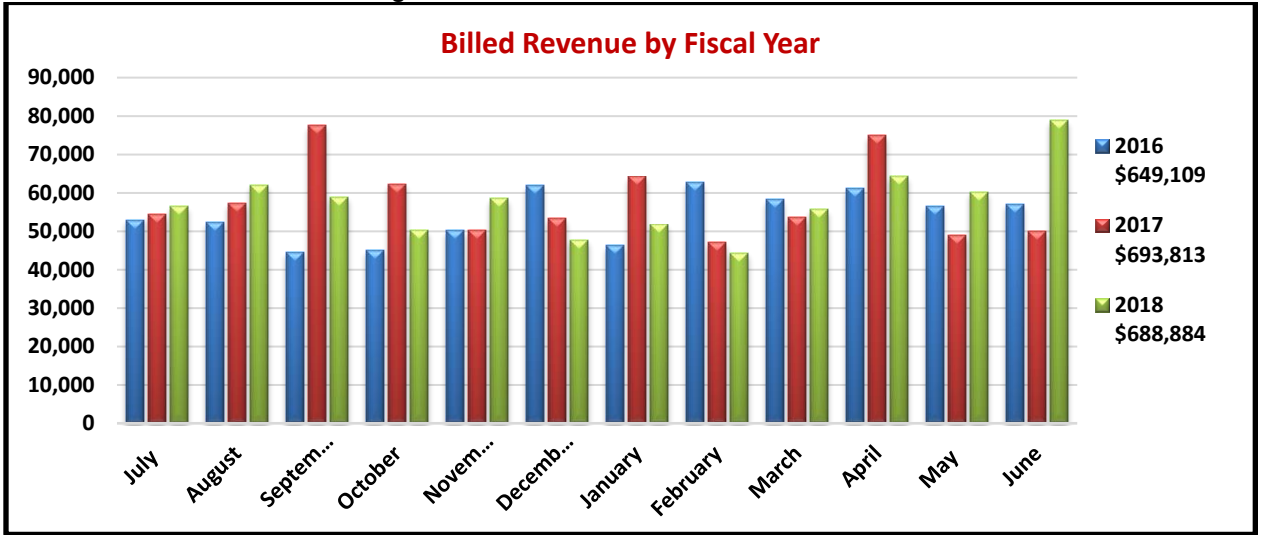
Goals for FY19

- Obtain high-quality TEM data from new Titan Krios microscope
- Maintain high-quality clinical services
- Increase research usage
- Increase usage of microscopes
- With opening of CSC, improve efficiency of labs by consolidation or other means

Revenue/Expenses

FY18 Expenses: Total $742,361
FY18 Revenue: Total $758,884

- VP of Health Sciences Support: $20,000
- VP of Research Support : $50,000
- FY18 revenue generated from services: $688,884



*Legend displays total annual revenue by year earned.

Advisory Board Committee

Last meeting date: March 2, 2017.
Erik Jorgensen, Distinguished Professor, Department of Biology
Patricia Revelo, Professor, Department of Pathology
Erhu Cao, Assistant Professor, Department of Biochemistry
Richard Rabbitt, Professor, Department of Bioengineering

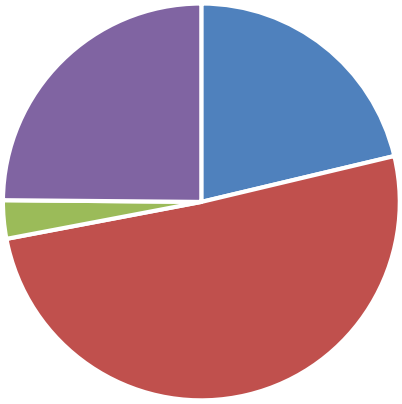
HEALTH
UNIVERSITY OF UTAH

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):

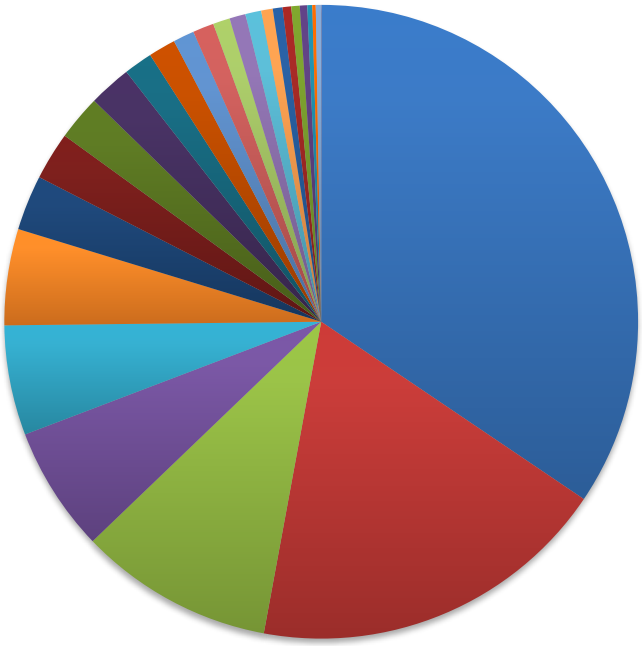
Revenue by Affiliation



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

# of grants: 58
# of investigators: 85

Revenue by Department



- Biochemistry
- Biology
- Human Genetics
- Pathology
- Pharmaceutics & Pharmaceutical Chemistry
- Internal Medicine
- Neurobiology & Anatomy
- College of Pharmacy
- Molecular Medicine
- Chemistry
- Oncological Sciences
- Pediatrics
- Physics & Astronomy
- Bioengineering
- Surgery
- Pharmaceutical Chemistry
- Mechanical Engineering
- Neurosurgery
- Pharmaceutics
- Pharmacology & Toxicology
- Opthalmology & Visual Sciences
- HCI
- Medicinal Chemistry
- Dentistry
- College of Engineering
- CVRTI

Top Users

1	ARUP	University Non-Academic
2	Saint John’s	Off Campus Commercial
3	TriCore	Off Campus Commercial
4	Poplar Healthcare	Off Campus Commercial
5	Jorgensen, Erik	HHMI
6	Primar Childrens Medical Center	Off Campus Commercial
7	Sundquist, Wesley	NIH, DHHS, Department
8	Utah State University	Off Campus Academic
9	Hill, Christopher	Department
10	Lane, Thomas	NIH

Flow Cytometry

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Overview

The Flow Cytometry Facility offers quantitative, multi-parameter 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 mostly as an instrumentation based service lab. However, we believe that education is a crucial component for the growth and sustainability of the facility. First, facility staffs are 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 that 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 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 FACSAria-5 laser
- Propel Labs Avalon-2 laser
- BD FACSAria-4 laser

Analyzers

- BD FACSCanto
- BD LSRFortessa
- Beckman Coulter Cytoflex
- BD Celesta
- Cytek DxP

Personnel

James Marvin, Director
Tessa Galland Lab Technician
Nidhi Choksi Lab Technician
Gabriel DeNiro Lab Technician

FY18 Annual Update

New Equipment

- In order to keep pace with growing demand both instrument purchases and upgrades were accomplished in FY18. Both of the BD FacsAria cell sorters were upgraded with additional detectors. Now, with the exception of one laser both instruments are identical and users are free to rotate between them based on availability. The Cytoflex had an additional laser, and detectors added, along with a 96 well plate loader. Finally, in order to accommodate the growing demands of the main campus, another Cytoflex instrument was purchased and installed in the Crocker Science Center.

Staffing

- Both Tessa Galland and Nidhi Choksi are continuing their education and training in the flow cytometry facility. The lab has also added a part time undergraduate assistant (Gabriel DeNiro) to help with one large project that requires significant sample prep and sorting. This project is primarily done on nights and weekends.

Goals for FY19

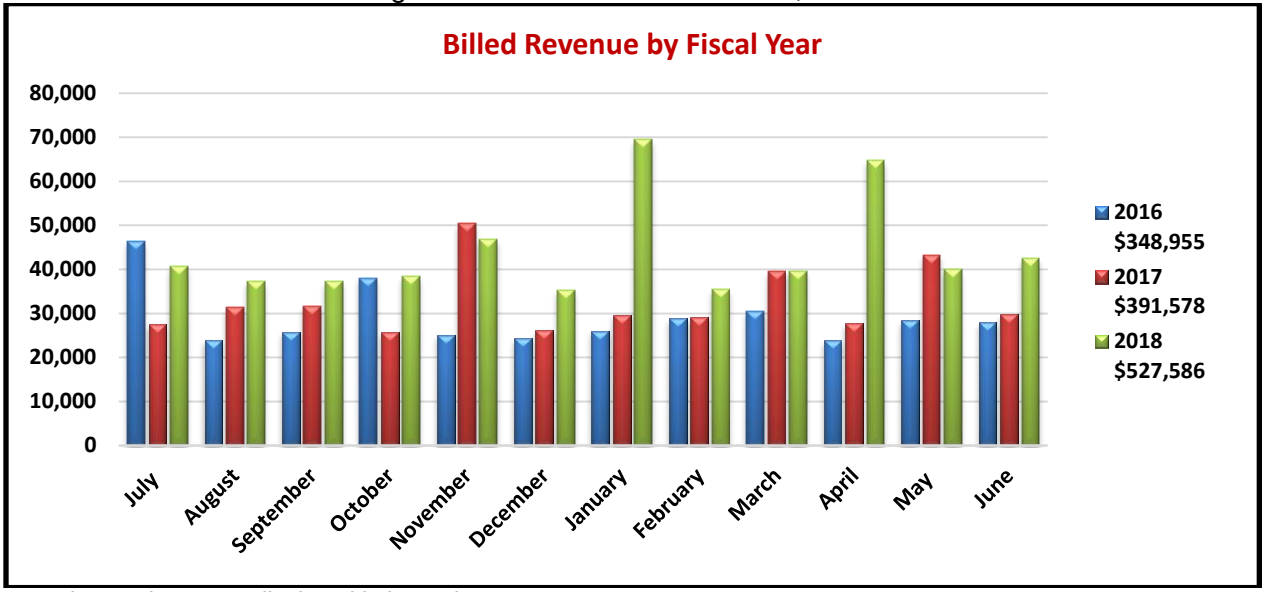
In FY16, the facility managed 5 instruments. In FY19, the facility will be managing 15 instruments. This incredible growth has been primarily in satellite facilities. Currently instruments are located in EEJ Medical Research Building, Human Genetics, HCI, Wintrobe, and the Crocker Science Center. The facility is planning to hire an additional staff member to keep up with growing cell sorting demands and the significant increase in quality control and quality assurance measures within the lab. Once the facility has caught up with instrument demands, the focus will be on providing the educational and training opportunities that have not taken place at the appropriate intervals.

Revenue/Expenses

FY18 Expenses: Total $468,258

FY18 Revenue: Total $527,586

- VP of Research Support (RIF): $0
- FY18 revenue generated from services: $527,586



***** Total annual revenue displayed in legend.

Advisory Board Committee

Last meeting date: Oct 2017

Ryan O'Connell, Assistant Professor, Pathology

Thomas O'Hare, Associate Professor, Hematology

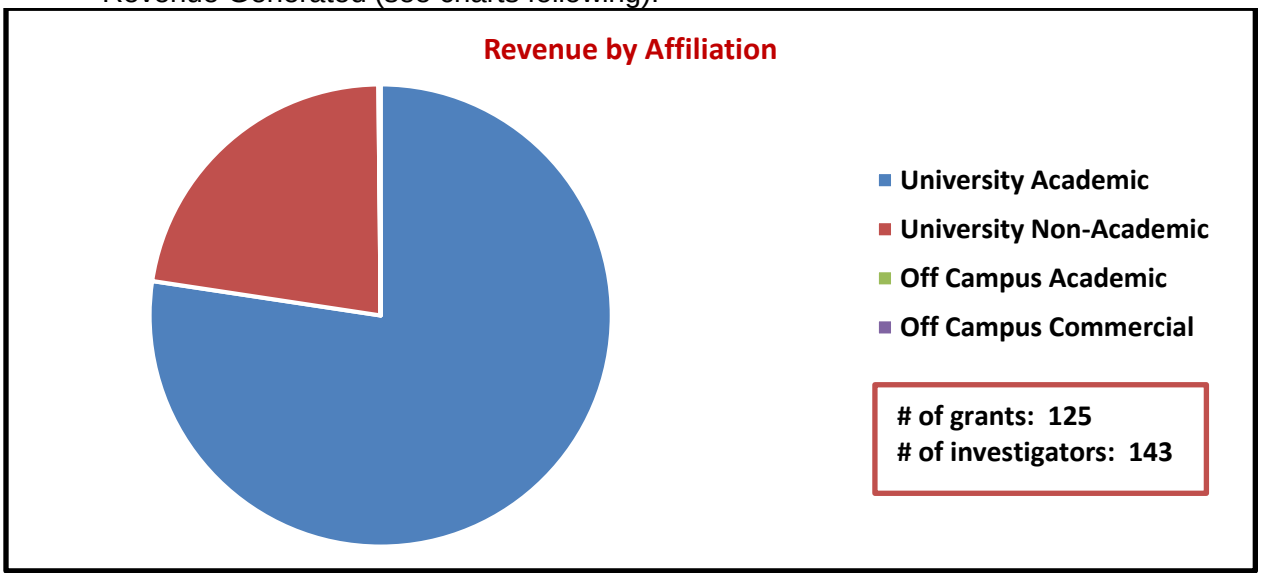
Daniel Leung, Assistant Professor, Internal Medicine

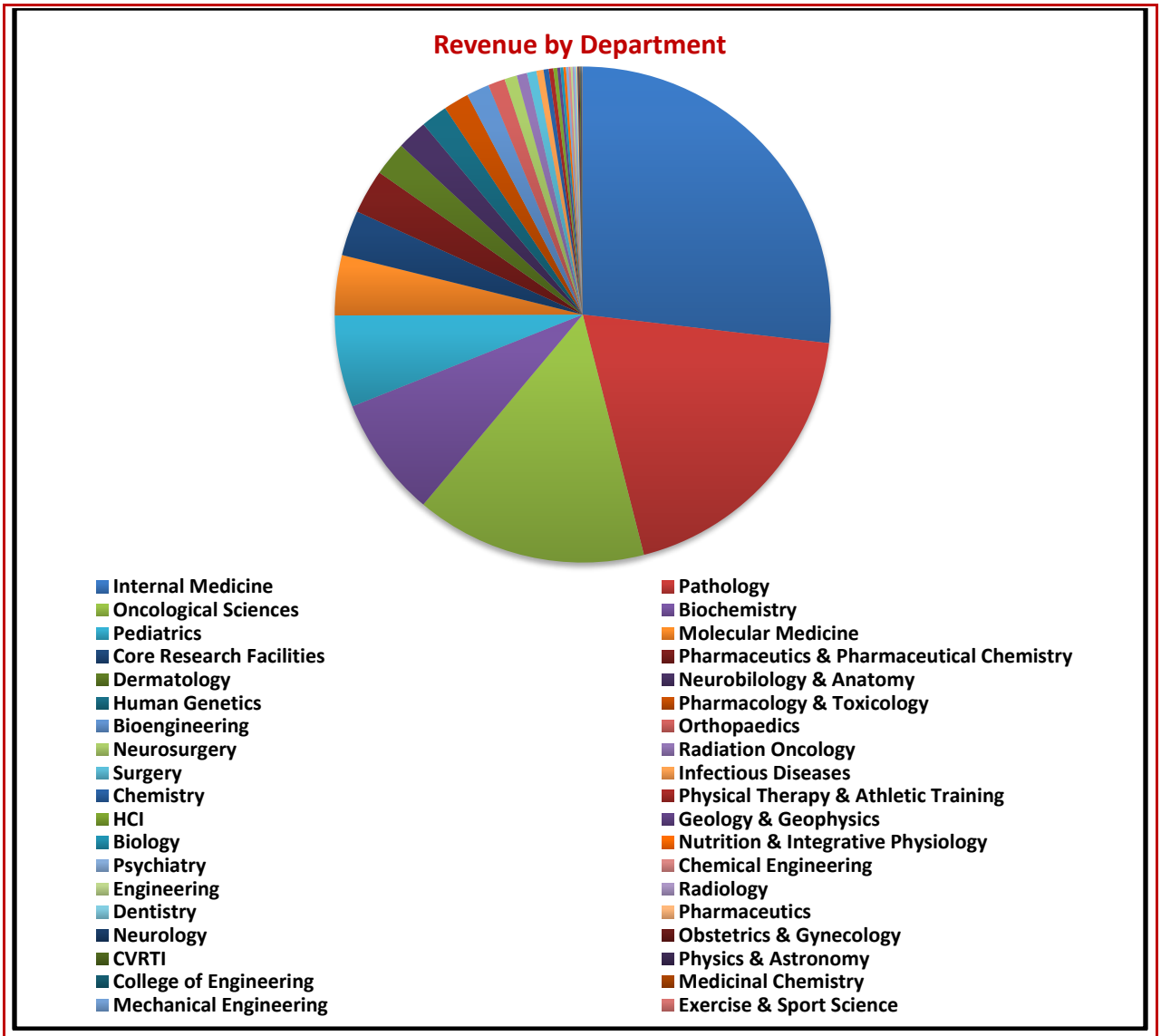
Matthew Williams, Assistant Professor, Pathology

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):





Top Users

1	ARUP	Off Campus
2	Camp, Nicola	Department
3	Deininger, Michael	NIH, Department, Foundation for Cancer Research
4	Williams, Matthew	NIH, Department
5	Schiffman, Joshua	Department
6	Atanackovic, Djordje	HCI, Nora Eccles Treadwell Foundation, IMF, Department
7	Welm, Alana	Army Medical Research Acquisition
8	Weyrich, Andy	NIH, NHLBI
9	Cairns, Bradley	HHMI
10	Rutter, Jared	HHMI, Nora Eccles Treadwell Foundation

Publications

1. M. Abdel-Mohsen *et al.*, CD32 is expressed on cells with transcriptionally active HIV but does not enrich for HIV DNA in resting T cells. *Science translational medicine* **10**, (Apr 18, 2018).
2. M. S. Bennett, S. Trivedi, A. S. Iyer, J. S. Hale, D. T. Leung, Human mucosal-associated invariant T (MAIT) cells possess capacity for B cell help. *Journal of leukocyte biology* **102**, 1261 (Nov, 2017).
3. S. W. Brady *et al.*, Combating subclonal evolution of resistant cancer phenotypes. *Nature communications* **8**, 1231 (Nov 1, 2017).
4. S. Choi *et al.*, RNA activating-double stranded RNA targeting flt-1 promoter inhibits endothelial cell proliferation through soluble FLT-1 upregulation. *PloS one* **13**, e0193590 (2018).
5. M. F. Cusick, J. E. Libbey, D. J. Doty, A. B. DePaula-Silva, R. S. Fujinami, The role of peripheral interleukin-6 in the development of acute seizures following virus encephalitis. *Journal of neurovirology* **23**, 696 (Oct, 2017).
6. A. B. DePaula-Silva, F. L. Sonderegger, J. E. Libbey, D. J. Doty, R. S. Fujinami, The immune response to picornavirus infection and the effect of immune manipulation on acute seizures. *Journal of neurovirology*, (Apr 23, 2018).
7. C. Gorbea, T. Mosbruger, D. Cazalla, A viral Sm-class RNA base-pairs with mRNAs and recruits microRNAs to inhibit apoptosis. *Nature* **550**, 275 (Oct 12, 2017).
8. C. Gorbea, T. Mosbruger, D. Cazalla, A viral Sm-class RNA base-pairs with mRNAs and recruits microRNAs to inhibit apoptosis. *Nature* **550**, 275 (Oct 12, 2017).
9. J. J. Grist *et al.*, Induced CNS expression of CXCL1 augments neurologic disease in a murine model of multiple sclerosis via enhanced neutrophil recruitment. *European journal of immunology* **48**, 1199 (Jul, 2018).
10. L. Guo *et al.*, Antiplatelet antibody-induced thrombocytopenia does not correlate with megakaryocyte abnormalities in murine immune thrombocytopenia. *Scandinavian journal of immunology* **88**, e12678 (Jul, 2018).
11. W. L. Heaton *et al.*, Autocrine Tnf signaling favors malignant cells in myelofibrosis in a Tnfr2-dependent fashion. *Leukemia*, (Apr 18, 2018).
12. T. B. Huffaker *et al.*, Antitumor immunity is defective in T cell-specific microRNA-155-deficient mice and is rescued by immune checkpoint blockade. *The Journal of biological chemistry* **292**, 18530 (Nov 10, 2017).
13. E. C. Larson *et al.*, Mycobacterium tuberculosis reactivates latent HIV-1 in T cells in vitro. *PloS one* **12**, e0185162 (2017).
14. L. Li, J. Yang, J. Wang, J. Kopecek, Amplification of CD20 Cross-Linking in Rituximab-Resistant B-Lymphoma Cells Enhances Apoptosis Induction by Drug-Free Macromolecular Therapeutics. *ACS nano* **12**, 3658 (Apr 24, 2018).
15. L. Li, J. Yang, J. Wang, J. Kopecek, Drug-Free Macromolecular Therapeutics Induce Apoptosis via Calcium Influx and Mitochondrial Signaling Pathway. *Macromolecular bioscience* **18**, (Jan, 2018).
16. A. B. Macedo *et al.*, Influence of biological sex, age and HIV status in an in vitro primary cell model of HIV latency using a CXCR4 tropic virus. *AIDS research and human retroviruses*, (Jun 21, 2018).
17. J. K. Paquette *et al.*, Genetic Control of Lyme Arthritis by Borrelia burgdorferi Arthritis-Associated Locus 1 Is Dependent on Localized Differential Production of IFN-beta and Requires Upregulation of Myostatin. *Journal of immunology* **199**, 3525 (Nov 15, 2017).
18. W. Qiang *et al.*, Mechanisms of resistance to the BCR-ABL1 allosteric inhibitor asciminib. *Leukemia* **31**, 2844 (Dec, 2017).
19. J. C. Schell *et al.*, Control of intestinal stem cell function and proliferation by mitochondrial pyruvate metabolism. *Nature cell biology* **19**, 1027 (Sep, 2017).
20. A. Seguin *et al.*, Reductions in the mitochondrial ABC transporter Abcb10 affect the transcriptional profile of heme biosynthesis genes. *The Journal of biological chemistry* **292**, 16284 (Sep 29, 2017).
21. M. A. Szaniawski *et al.*, SAMHD1 Phosphorylation Coordinates the Anti-HIV-1 Response by Diverse Interferons and Tyrosine Kinase Inhibition. *mBio* **9**, (May 15, 2018).
22. H. Than *et al.*, Ongoing clonal evolution in chronic myelomonocytic leukemia on hypomethylating agents: a computational perspective. *Leukemia*, (Mar 27, 2018).
23. P. D. B. Tiburcio *et al.*, Functional requirement of a wild-type allele for mutant IDH1 to suppress anchorage-independent growth through redox homeostasis. *Acta neuropathologica* **135**, 285 (Feb, 2018).
24. E. Tyagi *et al.*, Loss of p16(INK4A) stimulates aberrant mitochondrial biogenesis through a CDK4/Rb-independent pathway. *Oncotarget* **8**, 55848 (Aug 22, 2017).
25. K. Vazquez-Arreguin *et al.*, BRCA1 through Its E3 Ligase Activity Regulates the Transcription Factor Oct1 and Carbohydrate Metabolism. *Molecular cancer research : MCR* **16**, 439 (Mar, 2018).
26. K. Vazquez-Arreguin *et al.*, BRCA1 through Its E3 Ligase Activity Regulates the Transcription Factor Oct1 and Carbohydrate Metabolism. *Molecular cancer research : MCR* **16**, 439 (Mar, 2018).
27. J. M. Wagner *et al.*, General Model for Retroviral Capsid Pattern Recognition by TRIM5 Proteins. *Journal of virology* **92**, (Feb 15, 2018).

28. J. M. Wagner *et al.*, General Model for Retroviral Capsid Pattern Recognition by TRIM5 Proteins. *Journal of virology* **92**, (Feb 15, 2018).
29. S. K. Whiteside *et al.*, IL-10 Deficiency Reveals a Role for TLR2-Dependent Bystander Activation of T Cells in Lyme Arthritis. *Journal of immunology* **200**, 1457 (Feb 15, 2018).
30. M. S. Zabriskie *et al.*, A novel AGGF1-PDGFRb fusion in pediatric T-cell acute lymphoblastic leukemia. *Haematologica* **103**, e87 (Feb, 2018).
31. O. Zurita Rendon *et al.*, Vms1p is a release factor for the ribosome-associated quality control complex. *Nature communications* **9**, 2197 (Jun 6, 2018).
32. Campbell, R. A., Z. Franks, A. Bhatnagar, J. W. Rowley, B. K. Manne, M. A. Supiano, H. Schwertz, A. S. Weyrich, and M. T. Rondina. 2018. 'Granzyme A in Human Platelets Regulates the Synthesis of Proinflammatory Cytokines by Monocytes in Aging', *J Immunol*, 200: 295-304.
33. Fidler, T. P., E. A. Middleton, J. W. Rowley, L. H. Boudreau, R. A. Campbell, R. Souvenir, T. Funari, N. Tessandier, E. Boilard, A. S. Weyrich, and E. D. Abel. 2017. 'Glucose Transporter 3 Potentiates Degranulation and Is Required for Platelet Activation', *Arterioscler Thromb Vasc Biol*, 37: 1628-39.
34. Schwertz, H., J. W. Rowley, G. G. Schumann, U. Thorack, R. A. Campbell, B. K. Manne, G. A. Zimmerman, A. S. Weyrich, and M. T. Rondina. 2018. 'Endogenous LINE-1 (Long Interspersed Nuclear Element-1) Reverse Transcriptase Activity in Platelets Controls Translational Events Through RNA-DNA Hybrids', *Arterioscler Thromb Vasc Biol*, 38: 801-15.

Genomics

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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

Real Time PCR

- Gene Expression

Equipment

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

Personnel

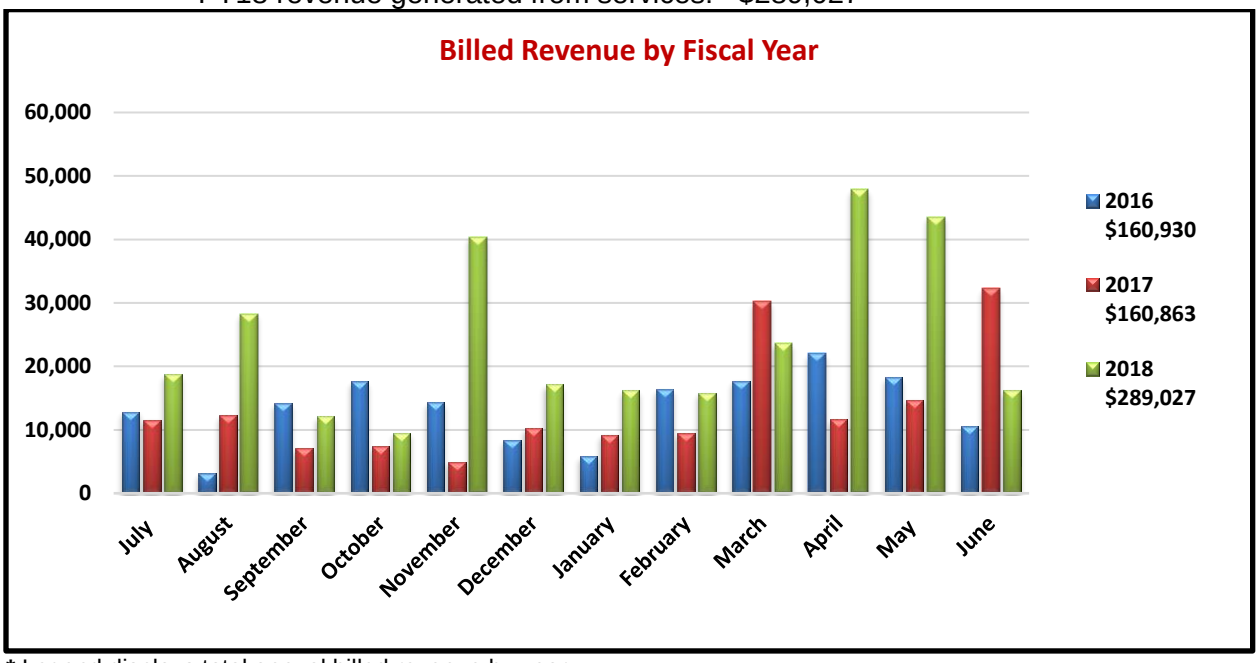
Derek Warner, Director
Michael Klein, Manager

Revenue/Expenses

FY18 Expenses: **Total $220,473**

FY18 Revenue: **Total $289,027**

- VP of Health Sciences Support: $0
- FY18 revenue generated from services: $289,027



***** Legend displays total annual billed revenue by year.

Advisory Board Committee

Last meeting date: February 21, 2017

Gerald Krueger, Professor, Dermatology

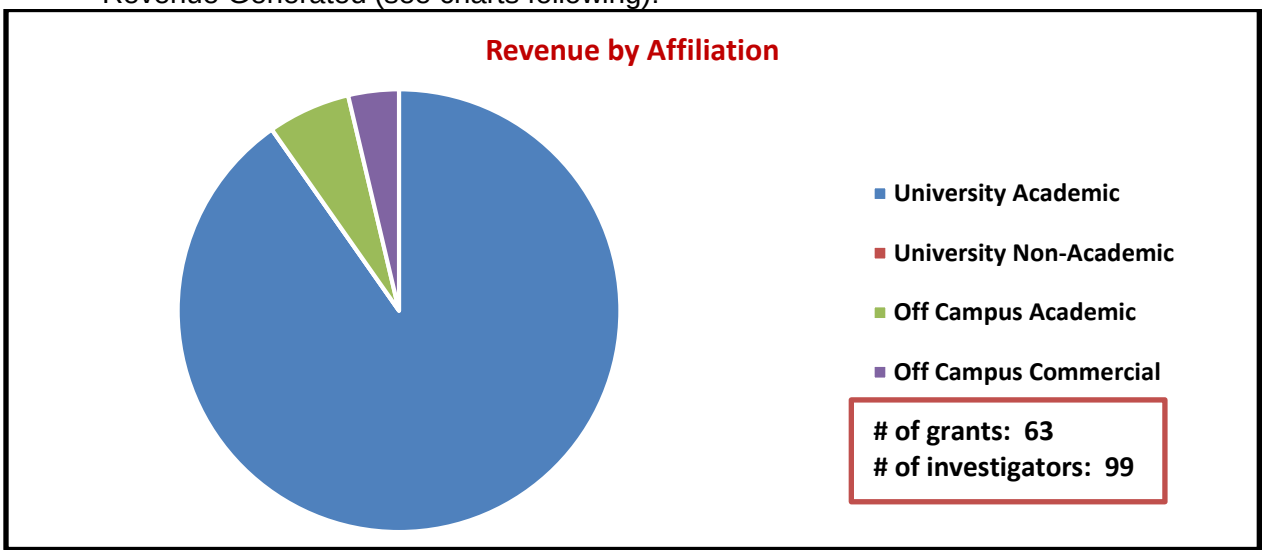
Deborah Neklason, Research Associate Professor, Huntsman Cancer Institute

Nicola Camp, Professor, Department of Medicine/Human Genetics

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):



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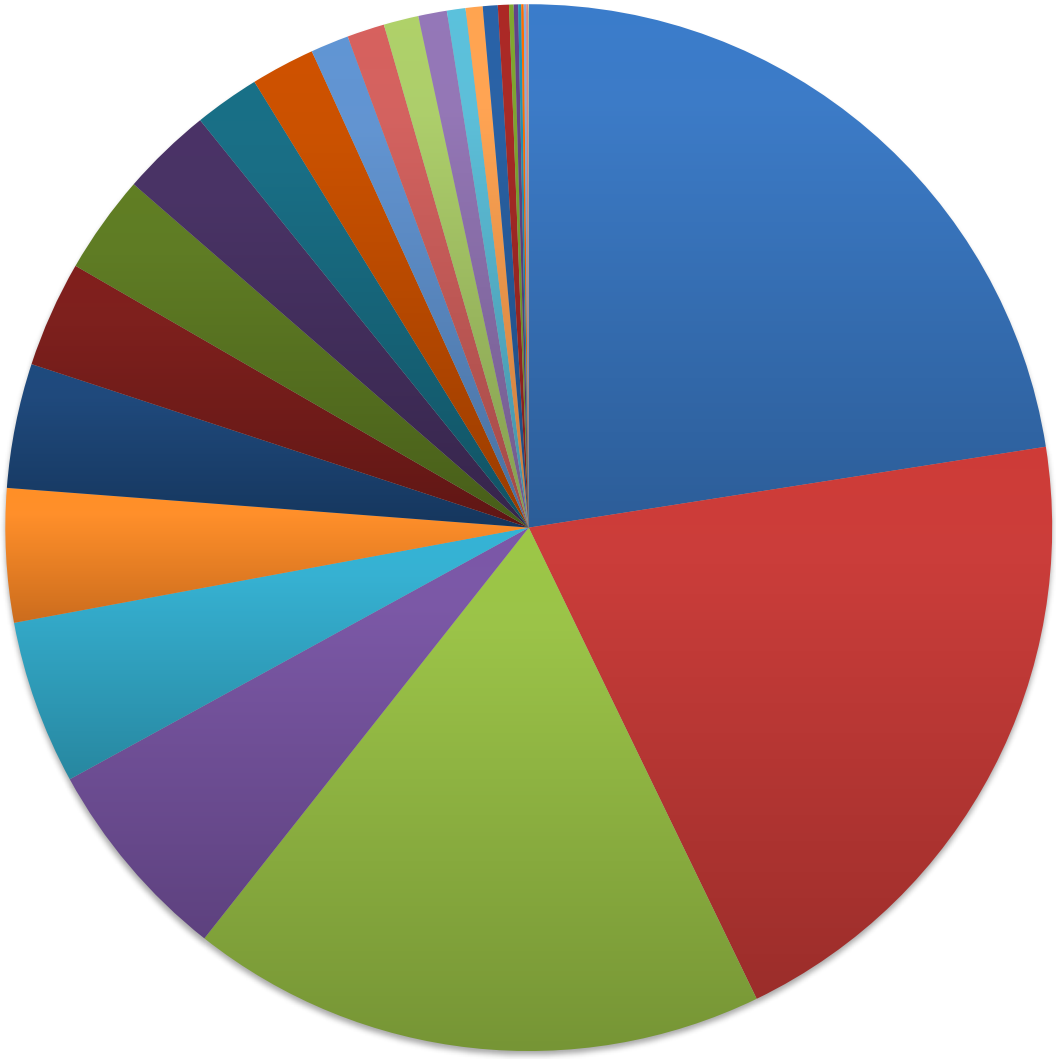
Revenue by Department



- Obstetrics & Gynecology
- Internal Medicine
- Neurology
- Human Genetics
- Psychiatry
- Ophthalmology
- Pediatrics
- College of Pharmacy
- Oncological Sciences
- Surgery
- Molecular Medicine
- Nutrition & Integrative Physiology
- HCI
- Pharmacology & Toxicology
- Orthopaedics
- Biology
- Pharmaceutics & Pharmaceutical Chemistry
- Chemistry
- Biochemistry
- Neurobiology & Anatomy
- Bioengineering
- Chemical Engineering
- Exercise & Sport Science
- Pathology
- Physical Therapy and Athletic Training
- CCTS
- Medicinal Chemistry

Top Users

1	Hotaling, James	FDTN for Embryonic Competence
2	Pulst, Stefan	Department
3	Camp, Nicola	NIH
4	Coon, Hilary	NIMH
5	Weiss, Robert	NIH, NIDDK, Department
6	DeAngelis, Margaret	Macular Degeneration Foundation
7	Peterson, Randall	Department
8	University of Arizona	Off Campus Academic
9	Carrell, Douglas	Department
10	Recursion Pharmaceuticals	Commercial

Publications

1. Bosco, A., et al. (2016). "Glial coverage in the optic nerve expands in proportion to optic axon loss in chronic mouse glaucoma." Exp Eye Res 150: 34-43.
2. Breen, K. T., et al. (2016). "Loss of Fractalkine Signaling Exacerbates Axon Transport Dysfunction in a Chronic Model of Glaucoma." Front Neurosci 10: 526.
3. Deering-Rice, C. E., et al. (2016). "Characterization of Transient Receptor Potential Vanilloid-1 (TRPV1) Variant Activation by Coal Fly Ash Particles and Associations with Altered Transient Receptor Potential Ankyrin-1 (TRPA1) Expression and Asthma." J Biol Chem 291(48): 24866-24879.
4. Farhang, N., et al. (2017). "* CRISPR-Based Epigenome Editing of Cytokine Receptors for the Promotion of Cell Survival and Tissue Deposition in Inflammatory Environments." Tissue Eng Part A 23(15-16): 738-749.
5. Pflieger, L. T., et al. (2017). "Gene co-expression network analysis for identifying modules and functionally enriched pathways in SCA2." Hum Mol Genet 26(16): 3069-3080.
6. Scoles, D. R., et al. (2017). "Antisense oligonucleotide therapy for spinocerebellar ataxia type 2." Nature 544(7650): 362-366.
7. Stover, J. D., et al. (2017). "CRISPR Epigenome Editing of AKAP150 in DRG Neurons Abolishes Degenerative IVD-Induced Neuronal Activation." Molecular Therapy 25(9): 2014-2027.

Machine Shop

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Overview

The Machine Shop Facility is equipped with a full complement of lathes, drills, mills, welders, grinders, and CNC systems, staffed by experienced machinists and engineers capable of turning an idea into reality. The Shop Staff 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 devices and parts made from carbon-steel, stainless steel, brass, copper, plastics, and other materials depending upon the requirements of design specifications.

Services

- Device Design/Engineering from basic concept to finished product
- Milling
- Turning
- Drilling
- Grinding
- Soldering
- Welding of steel, aluminum, and other types of fabrication
- Sawing
- Repair and Maintenance
- The Machine Shop Facility continues to supply fast plastic fabrication using technology developed in our shop.

Equipment

- CNC Mills
- Traditional Mills
- Manual Lathes and CNC Lathe
- Grinders
- MIG, TIG, Gas, Arc, and Spot welders
- Wood Working Equipment
- Band & Table Saws
- Sharpening Equipment
- Polishing Equipment

Personnel

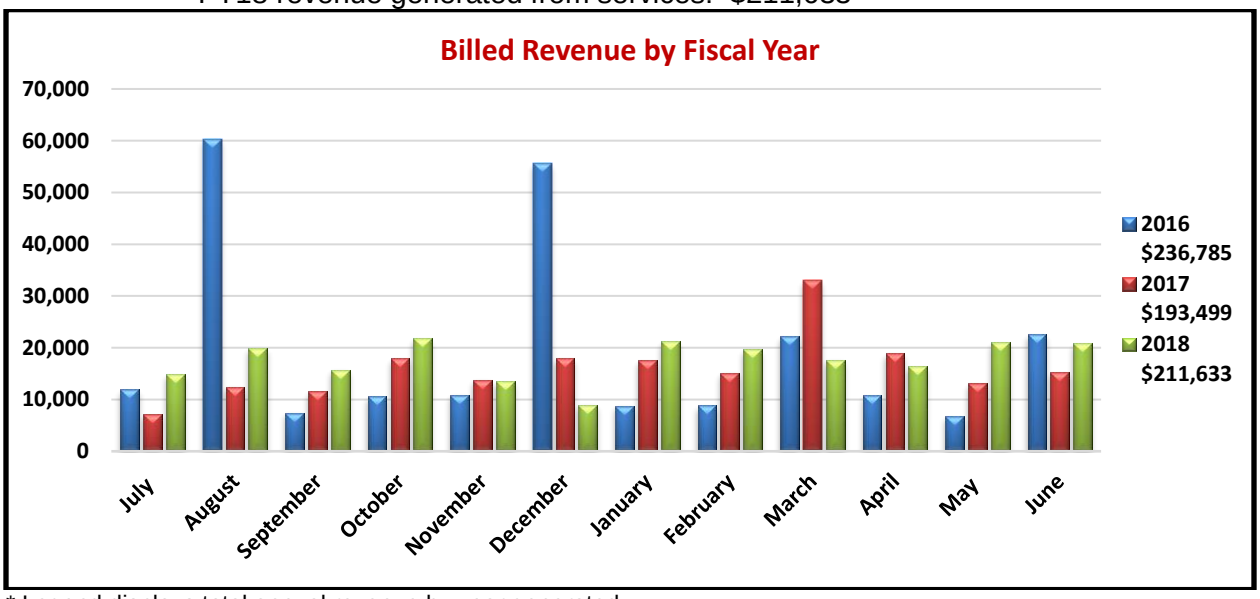
Barry Evans, Engineer, Director
Kim Slusser, Machinist, Surgical Tool Expert
Mike Sanches, Machine Operator, Research Specialist, Graphic Artist
Shawn Colby, Machinist, Director in Training

Revenue/Expenses

FY18 Expenses: **Total $259,279**

FY18 Revenue: Total $226,633

- VP of Health Sciences Support: $15,000
- FY18 revenue generated from services: $211,633



* Legend displays total annual revenue by year generated.

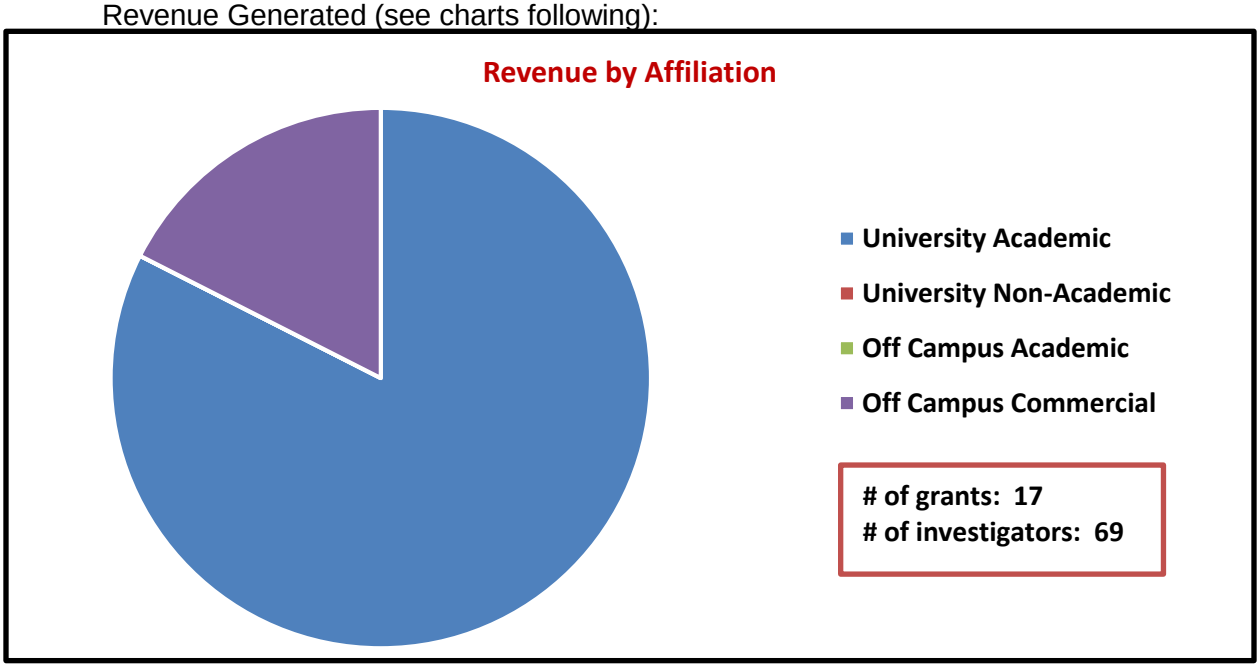
Advisory Board Committee

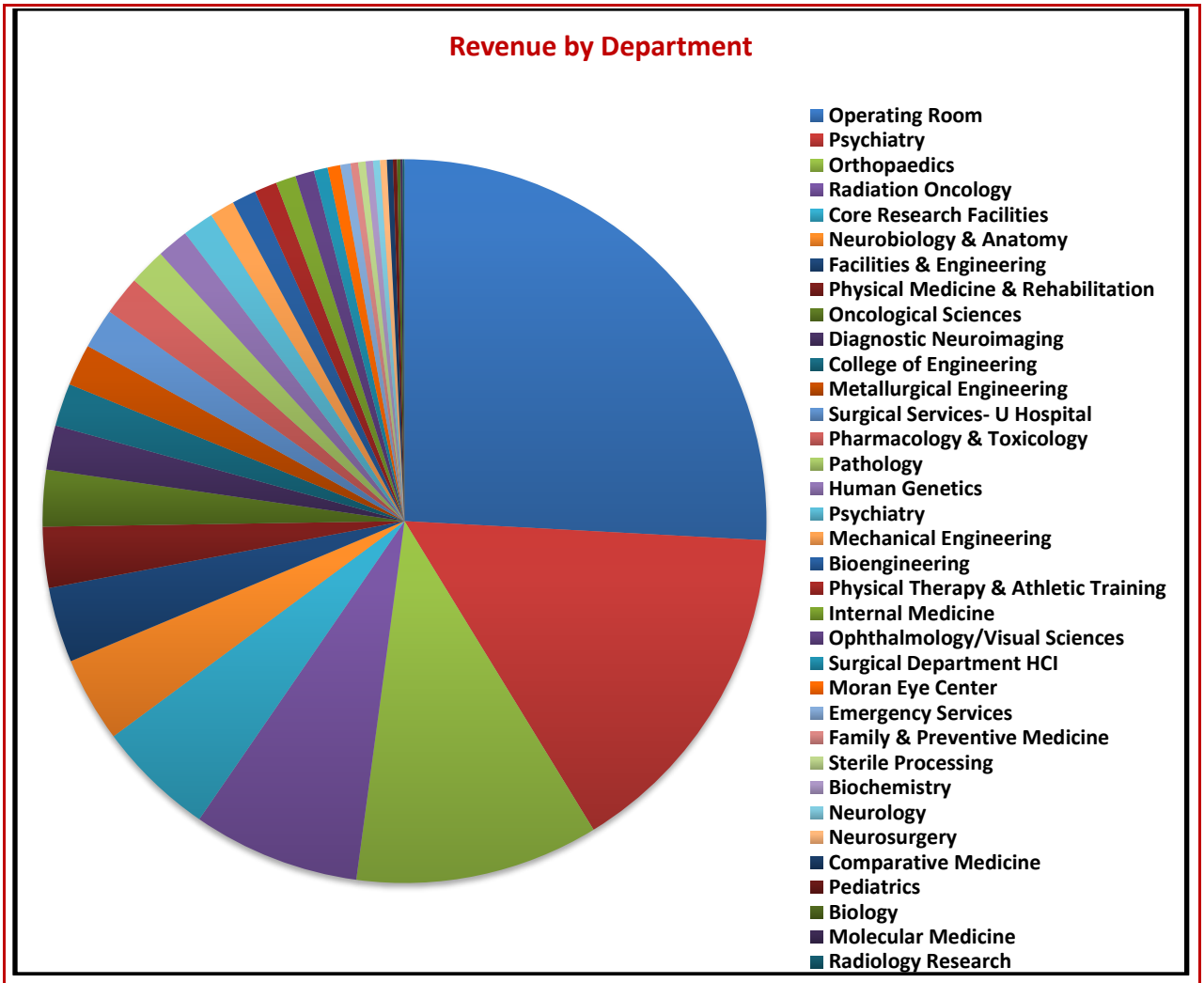
Perry Renshaw, Professor, Psychiatry
Michelle Ford, Materials Management Facilitator, Facilities Engineering
Kyle Thomson, Researcher, Add Program

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):





Top Users

1	Ford, Michelle	Department
2	Renshaw, Perry	VA
3	Myriad Genetics	Commercial
4	Meisner, Steve	Department
5	Primary Children's Medical Center	Commercial
6	Wachowiak, Matt	NSF
7	Weiss, Jeffrey	NIH, Department
8	Rodesch, Chris	HSC Cores
9	Vanderwerff, Ryan	Department
10	Floyd, Candace	Department

Mass Spectrometry & Proteomics

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Overview

The Mass Spectrometry & Proteomics Facility supports proteomics research and provides basic mass spectrometry (MS) services 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 facility seeks 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.

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

- New! Thermo QExactive HF
- Bruker UltrafleXtreme
- Waters Q-ToF-2
- Bruker Maxis II HD for high mass accuracy intact protein analysis.

HPLC Systems

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

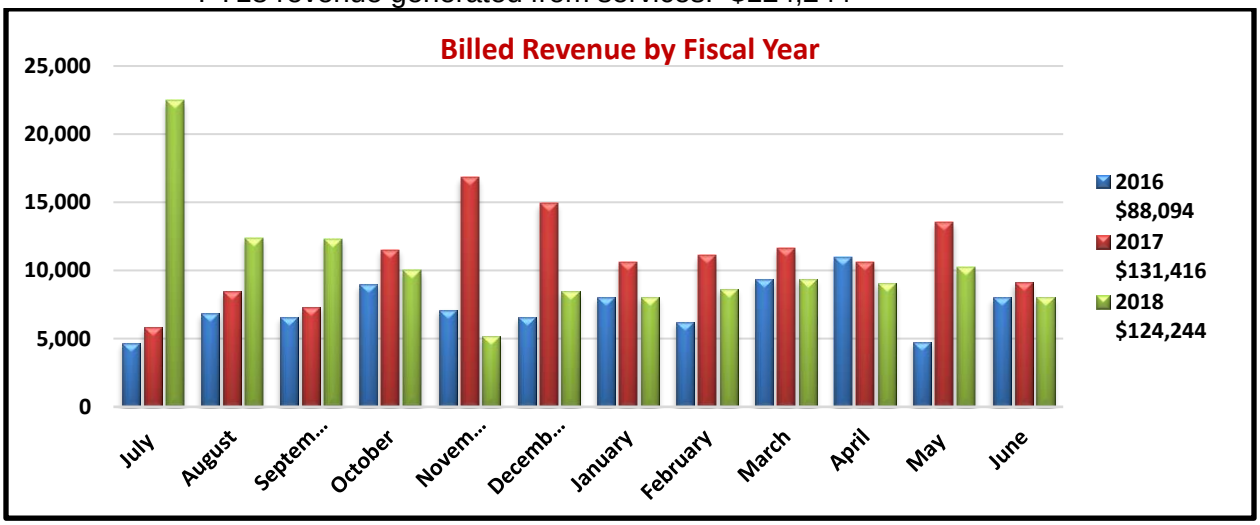
Personnel

James Cox, Ph.D., Director
Krishna Parsawar, Ph.D., Assistant Director
Sandra Osburn, PhD., Research Associate

Revenue/Expenses

FY18 Expenses: **Total $346,936**
FY18 Revenue: **Total $275,244**

- VP of Health Sciences Support: $151,000
- FY18 revenue generated from services: $124,244



* Legend displays total annual revenue by year earned.

Advisory Board Committee

Darrell Davis, Professor, Medicinal Chemistry
Wes Sundquist, Professor, Biochemistry
Michael Kay, Professor, Biochemistry

HEALTH
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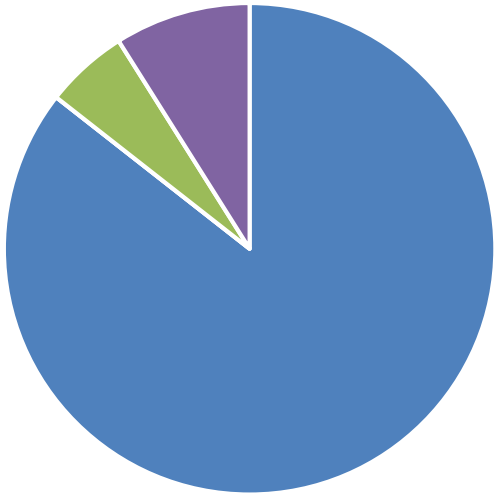
FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):

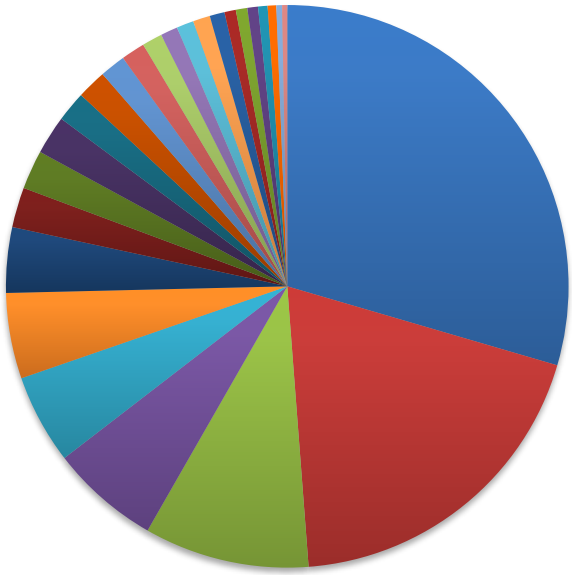
Revenue by Affiliation



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

# of grants: 57
# of investigators: 72

Revenue by Department



- Biochemistry
- Biology
- Medicinal Chemistry
- Internal Medicine
- College of Pharmacy
- Molecular Medicine
- Chemistry
- Bioengineering
- Core Research Facilities
- Human Genetics
- Pharmaceutics & Pharmaceutical Chemistry
- Pathology
- Oncological Sciences
- HCI
- Radiology
- Dentistry
- Obstetrics & Gynecology
- Pediatrics
- Mechanical Engineering
- Neurobiology & Anatomy
- Surgery
- Pharmacotherapy
- Nano Institute
- Engineering
- Ophthalmology & Visual Sciences
- College of Engineering

Top Users

1	Olivera, Baldomero	NIH, US Agency for International Development
2	Hill, Christopher	NIH, Department
3	Sundquist, Wesley	NIH, Department, DHHS
4	Nu Skin	Commercial
5	Texas A&M University	Off Campus Academic
6	Peterson, Randall	Department
7	Prestwich, Glenn	NIH
8	Weyrich, Andy	NIH
9	Schmidt, Eric	NIH
10	Chou, Hung-Chieh	American Diabetes Assoc., JDRF

Publications

1. Post-Translational Tyrosine Geranylation in Cyanobactin Biosynthesis. Morita M, Hao Y, Jokela JK, Sardar D, Lin Z, Sivonen K, Nair SK, Schmidt EW. *J Am Chem Soc.* 2018 May 16;140(19):6044-6048.
2. Enzymatic N- and C-Protection in Cyanobactin RiPP Natural Products. Sardar D, Hao Y, Lin Z, Morita M, Nair SK, Schmidt EW. *J Am Chem Soc.* 2017 Mar 1;139(8):2884-2887.
3. Sdano MA, Fulcher JM, Palani S, Chandrasekharan MB, Parnell TJ, Whitby FG, Formosa T, Hill CP. A novel SH2 recognition mechanism recruits Spt6 to the doubly phosphorylated RNA polymerase II linker at sites of transcription. *Elife.* 2017 Aug 16;6. pii: e28723.
4. Monroe N, Han H, Shen PS, Sundquist WI, Hill CP. Structural basis of protein translocation by the Vps4-Vta1 AAA ATPase. *Elife.* 2017 Apr 5;6. pii: e24487.
5. Trettin KD, Sinha NK, Eckert DM, Apple SE, Bass BL. Loquacious-PD facilitates Drosophila Dicer-2 cleavage through interactions with the helicase domain and dsRNA. *Proc Natl Acad Sci U S A*. 2017 Sep 19;114(38):E7939-E7948.

Metabolic Phenotyping

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Overview

The Metabolic Phenotyping Core (MPC) offers several standardized and high quality metabolic and physiologic tests for phenotypic characterization of animal models of diabetes and other metabolic disorders. These metabolic and physiologic phenotyping tests include determination of whole body glucose metabolism and insulin sensitivity of animals by glucose and insulin tolerance tests and glucose clamps, assessment of whole animal energy expenditure using the Columbus Instrument's Oxymax Lab Animal Monitoring System, determination of body composition by Bruker Minispec NMR and determination of circulating hormones, growth factors and cytokine concentrations using the Luminex xMAP multiplex technology (MAGPIX and Luminex 200). In addition, MPC performs tests to map the metabolic phenotype of different cell types and tissues using Agilent-Seahorse XF24 and XF^{e}96 analyzers. The MPC also helps the scientists to optimize phenotyping tests. MPC's goal is to expedite medical and biological research efforts by providing academic and non-academic researchers access to advanced metabolic phenotyping tests at a reasonable price.

Services

- Mitochondrial Bioenergetics Agilent-Seahorse XF^{e}96 extracellular flux analyzers
- Cellular energy metabolism using Agilent-Seahorse XF24 and XF^{e}96 extracellular flux analyzers
- Assessment of energy balance in mice using CLAMS Metabolic chambers
- Body Composition using Bruker Minispec NMR
- High throughput biomarker screening and quantification using Luminex technology
- Multiplexed protein analyte (hormone, growth factors, cytokines, adipokines, myokines and intracellular factors) quantification using MAGPIX and Luminex-200
- Whole body glucose metabolism and insulin sensitivity- Glucose, insulin tolerance tests
- Isolation of Pancreatic islets
- Beta cell mass, cell proliferation and cell death
- Chronic exposure of mice to cold/warm temperature
- Radiometric enzyme assays- glycogen synthase and phosphorylase activities in metabolic tissues

Equipment

- Seahorse Flux Analyzer XF24
- Seahorse Flux Analyzer XF^{e}96
- Eight Columbus Instruments metabolic chambers equipped with temperature-controlled enclosure.
- Eight Columbus Instruments CLAMS metabolic chambers equipped with running wheels and with the capability to measure core body temperature and heart rate.
- Bruker Minispec NMR
- Luminex MAGPIX
- Luminex 200 System
- Powers Scientific rodent incubators

Personnel

Anil Laxman, Ph.D., Director

2018 Annual Update

Equipment

- Eight Columbus Instruments CLAMS metabolic chambers equipped with running wheels and with the capability to measure core body temperature and heart rate.

New Services

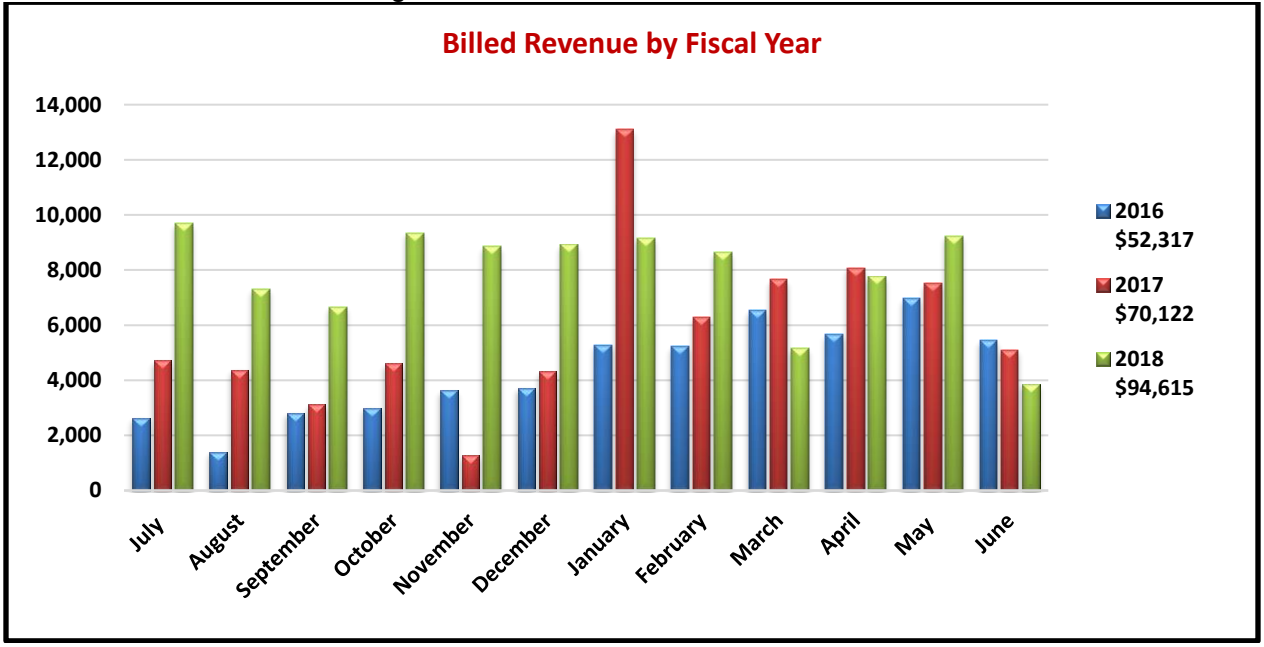
- MPC has recently purchased a CLAMS system with eight metabolic chambers using funds provided by VP of Health Sciences support and a generous contribution from Diabetes and Metabolism Center. This has increased the number of metabolic chambers in MPC from eight to sixteen thus allowing energy metabolism measurements by indirect calorimetry simultaneously in sixteen animals. The new CLAMS chambers have running wheel, which allows investigators to measure energy expenditure during exercise. This system is equipped with a telemetry system capable of measuring core body temperature and heart rate.

Revenue/Expenses

FY18 Expenses: **Total $212,707**

FY18 Revenue: Total $254,615

- VP of Health Sciences Support: $85,000
- VP of Health Sciences Support: $75,000 (for Metabolic Phenotyping CLAMS)
- FY18 revenue generated from services: $94,615



* Legend displays total annual revenue by year earned.

Advisory Board Committee

Last meeting date: November 2017

Jared Rutter, Professor, Biochemistry

Carl Thummel, Professor, Human Genetics

Simon J. Fisher, Professor, Internal Medicine

HEALTH
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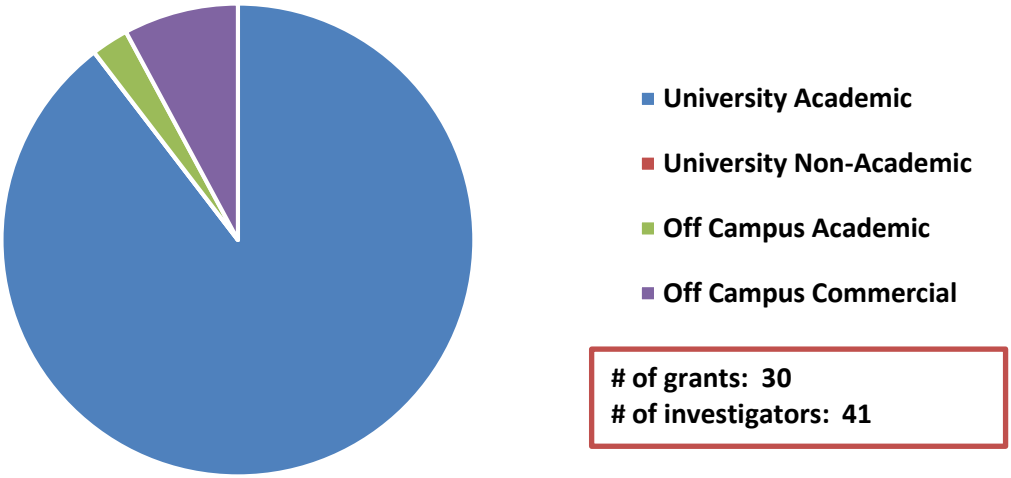
FY18 Scientific Impact

Research Support

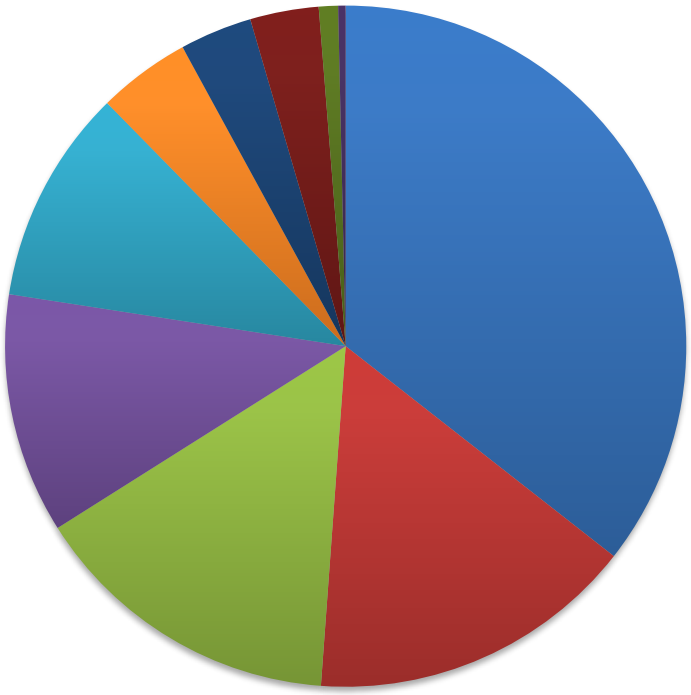
Revenue Generated (see charts following):

Revenue by Affiliation



# of grants: 30
# of investigators: 41

Revenue by Department



- Nutrition & Integrative Physiology
- Molecular Medicine
- Internal Medicine
- Biochemistry
- Pathology
- Oncological Sciences
- Orthopaedics
- Physical Therapy & Athletic Training
- Pharmacology & Toxicology
- Exercise & Sport Science

Top Users

1	Summers, Scott	NIH, Department
2	Chaurasia, Bhagirath	Department, U of U Research Foundation
3	Recursion Pharmaceuticals	Commercial
4	Ward, Robert	NIDDK
5	Villanueva, Claudio	NIH, Department
6	Boudina, Sihem	NIH
7	O'Connell, Ryan	NIH
8	Ward, Diane	NIH
9	Odelberg, Shannon	NIH
10	Drummond, Micah	NIH

Letter of Support for Grants

1. Katsu Funai's application for Innovative Basic Science Award from American Diabetes Association to study the role of LPCAT3 in skeletal muscle insulin action.
2. Owen Chan's application for Innovative Basic Science Award from American Diabetes Association titled "Contribution of Glutamate Oxidation to the Development of Counterregulatory Failure".
3. Yufeng Huang's NIH R01 application titled "Gene therapy with Tie2 agonism for protection of pancreatic beta cells and renal glomeruli in diabetes".
4. Kuberan Balagurunathan's NIH R01 application to study the role of Hs3st1/5 in the regulation of whole body glucose metabolism and insulin sensitivity (Role: Co-Investigator, Anil Laxman)

Publications

1. Schell, J.C., Wisidagama, D.R., Bensard, C., Zhao, H., Wei, P., Tanner, J., Flores, A., Mohlman, J., Sorensen, L.K., Earl, C.S., et al. 2017. Control of intestinal stem cell function and proliferation by mitochondrial pyruvate metabolism. *Nat Cell Biol* 19:1027-1036.
2. Kumar, A., Katz, L.S., Schulz, A.M., Kim, M., Honig, L.B., Li, L., Davenport, B., Homann, D., Garcia-Ocana, A., Herman, M.A., et al. 2018. Activation of Nrf2 is Required for Normal and ChREBPalpha-Augmented Glucose-Stimulated beta-Cell Proliferation. *Diabetes*.
3. Bharath, L.P., Cho, J.M., Park, S.K., Ruan, T., Li, Y., Mueller, R., Bean, T., Reese, V., Richardson, R.S., Cai, J., et al. 2017. Endothelial Cell Autophagy Maintains Shear Stress-Induced Nitric Oxide Generation via Glycolysis-Dependent Purinergic Signaling to Endothelial Nitric Oxide Synthase. *Arterioscler Thromb Vasc Biol* 37:1646-1656.
4. Soboleva, T., Esquer, H.J., Anderson, S.N., Berreau, L.M., and Benninghoff, A.D. 2018. Mitochondrial-Localized Versus Cytosolic Intracellular CO-Releasing Organic PhotoCORMs: Evaluation of CO Effects Using Bioenergetics. *ACS Chem Biol*.

Metabolomics

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

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

- Agilent 5977B gas chromatograph-quadrupole mass spectrometer (GC-MS).
- Agilent 5973 gas chromatograph-quadrupole mass spectrometer (GC-MS)
- Agilent 6530 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)
- Agilent 6490 Triple quadrupole UPLC-MS for the targeted quantification of metabolites, lipids and peptides
- Agilent 7200 gas chromatograph-quadrupole time of flight mass spectrometer (GC-QTOF)

New Equipment

- New! Sciex 6500 QTRAP Triple quadrupole UPLC-MS for the targeted quantification of metabolites, lipids and peptides

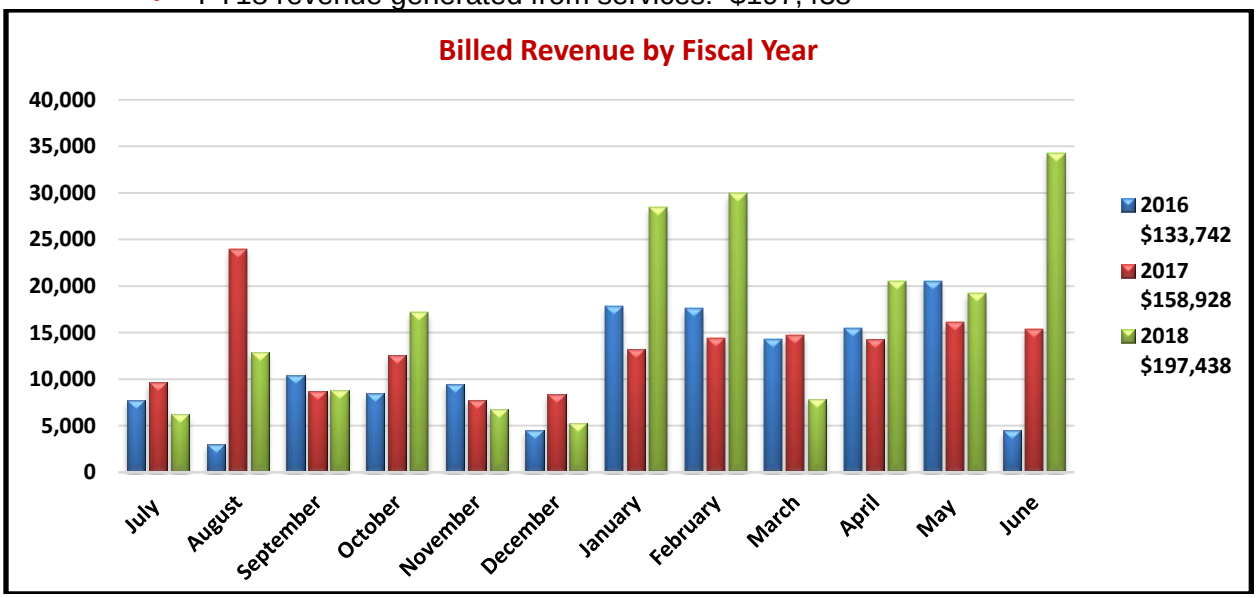
Personnel

James Cox, Ph.D., Director
Alan Maschek, Ph.D., Research Associate
Leon Catrow, Ph.D., Research Associate
Tyler Van Ry, B.S. Technician
Brad Naylor, Ph.D. Post-Doc

Revenue/Expenses

FY18 Expenses: **Total $836,830**
FY18 Revenue: **Total $788,822**

- VP of Health Sciences Support : $533,225
- Baylor Grant: $58,159
- FY18 revenue generated from services: $197,438



* Legend displays total annual revenue by year earned.

Advisory Board Committee

Last meeting date: May 21, 2018.

- Dennis Winge, Professor, Department of Hematology
- Carl Thummel, Professor, Department of Human Genetics
- William Holland, Assistant Professor, Department of Nutrition & Integrative Physiology
- Jared Rutter, Professor, Department of Biochemistry

HEALTH
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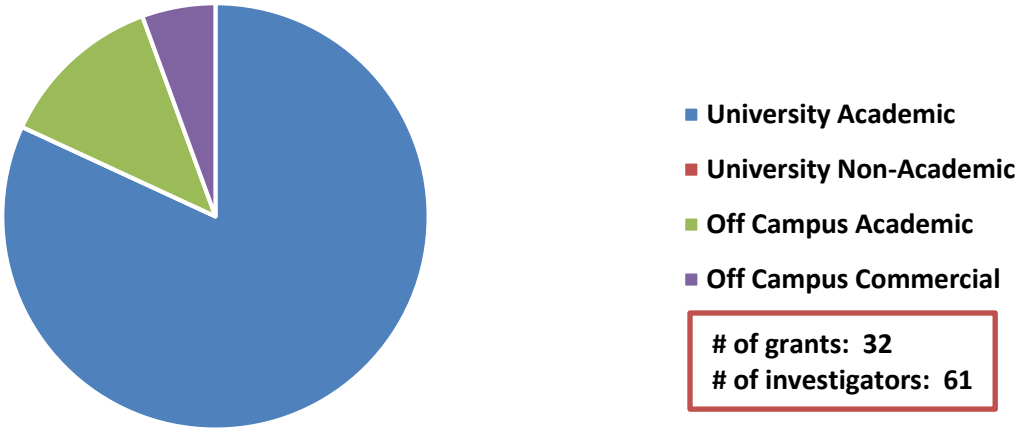
FY18 Scientific Impact

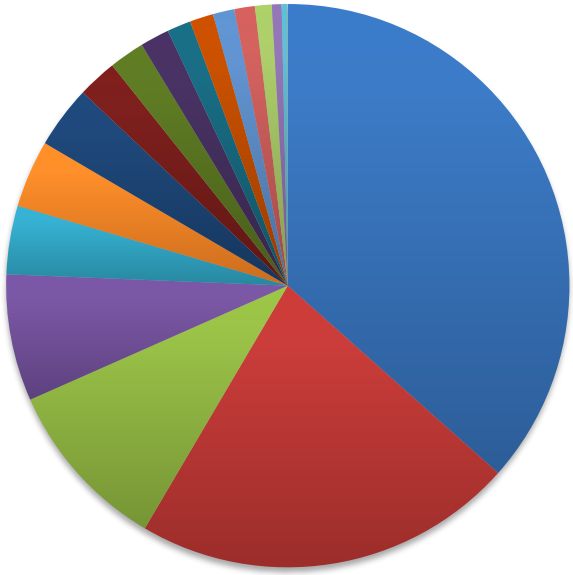
Research Support

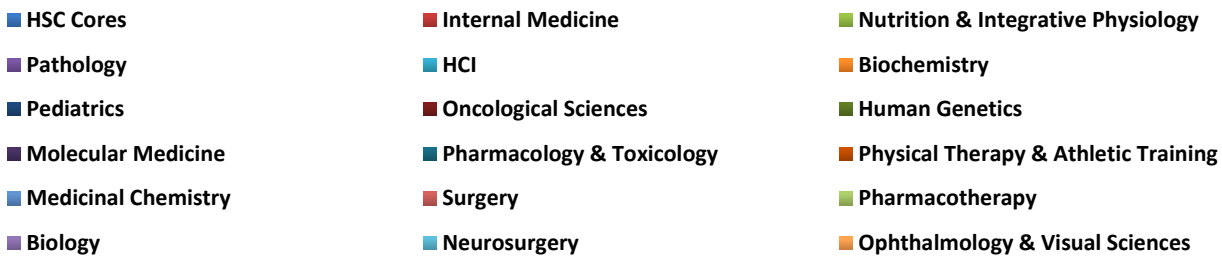
Revenue Generated (see charts following):

Revenue by Affiliation



Revenue by Department





Top Users

1	Cox, James	Baylor College of Medicine
2	Phillips, John	NIH
3	Summers, Scott	NIH, Department
4	Recursion Pharmaceuticals	Commercial
5	Ulrich, Neli	NCI
6	Deininger, Michael	NIH
7	Harvard University	Off Campus Academic
8	Joss-Moore, Lisa	Department
9	Ward, Diane	NIH
10	Massachusetts General Hospital	Commercial

Publications

1. Shibayama JW, Tracy CM, Miller MR, Makaju A, Szulik MW, Oka S, Yuzyuk TN, Cox JE, Kumar A, Lozier BK, Wang L, Llana JG, Sabry A, Cawley KM, Barton DW, Han YH, Boudina S, Fiehn O, Tucker HO, Zaitsev AV, Franklin S. Accepted, *PNAS*.
2. Kumar D, Rahman H, Tyagi E, Liu T, Li C, Lu R, Lum D, Holmen SL, Maschek JA, Cox JC, VanBrocklin MW, Grossman D. Aspirin suppresses PGE2 and activates AMP kinase to inhibit melanoma cell motility, pigmentation and selective tumor growth in vivo. Accepted, *Cancer Prevention Research.*
3. Burch, JS, Marcero JR, Maschek JA, Cox JE, Jackson LK, Medlock AE, Phillips JD, Dailey HA. Glutamine via α-ketoglutarate dehydrogenase provides succinyl-CoA for heme synthesis during erythropoiesis. *Blood* 2018:blood-2018-01-829036
4. Ward DM, Chen OS, Li L, Kaplan J, Bhuiyan SA, Natarajan SK, Bard ME, Cox JE. Altered sterol metabolism in budding yeast affects mitochondrial iron-sulfur (Fe-S) cluster synthesis. *J Biol Chem*. 2018 Jul 6;293(27):10782-10795. PMC6036212
5. Szaniawski MA, Spivak AM, Cox JE, Catrow JL, Hanley T, Williams ESCP, Tremblay MJ, Bosque A, Planelles V. SAMHD1 Phosphorylation Coordinates the Anti-HIV-1 Response by Diverse Interferons and Tyrosine Kinase Inhibition. *MBio*. 2018 May 15;9(3). PMC5954222.
6. Deering-Rice CE, Nguyen N, Lu Z, Cox JE, Shapiro D, Romero EG, Mitchell VK, Burrell KL, Veranth JM, Reilly CA. Activation of TRPV3 by Wood Smoke Particles and Roles in Pneumotoxicity. *Chem Res Toxicol*. 2018 Apr 30. PMID: 29658714.
7. Libbey JE, Sanchez JM, Doty DJ, Sim JT, Cusick MF, Cox JE, Fischer KF, Round JL, Fujinami RS. Variations in diet cause alterations in microbiota and metabolites that follow changes in disease severity in a multiple sclerosis model. *Benef Microbes*. 2018 Apr 25;9(3):495-513. PMC5918152.
8. Pires KM, Buffolo M, Schaaf C, David Symons J, Cox J, Abel ED, Selzman CH, Boudina S. Activation of IGF-1 receptors and Akt signaling by systemic hyperinsulinemia contributes to cardiac hypertrophy but does not regulate cardiac autophagy in obese diabetic mice. *J Mol Cell Cardiol.* 2017 Dec;113:39-50. PMC5689477.
9. Rauckhorst AJ, Gray LR, Sheldon RD, Fu X, Pewa AD, Feddersen CR, Dupuy AJ, Gibson-Corley KN, Cox JE, Burgess SC, Taylor EB. The mitochondrial pyruvate carrier mediates high fat diet-induced increases in hepatic TCA cycle capacity. *Mol Metab.* 2017 Nov;6(11):1468-1479. PMC5681281.
10. Simcox J, Geoghegan G, Maschek JA, Bensard CL, Pasquali M, Miao R, Lee S, Jiang L, Huck I, Kershaw EE, Donato AJ, Apte U, Longo N, Rutter J, Schreiber R, Zechner R, Cox J, Villanueva CJ. Global Analysis of Plasma Lipids Identifies Liver-Derived Acylcarnitines as a Fuel Source for Brown Fat Thermogenesis. *Cell Metab.* 2017 Sep 5;26(3):509-522.e6. PMC5658052.
11. Sterol Oxidation Mediates Stress-Responsive Vms1 Translocation to Mitochondria. Nielson JR, Fredrickson EK, Waller TC, Rendón OZ, Schubert HL, Lin Z, Hill CP, Rutter *J. Mol Cell*. 2017 Nov 16;68(4):673-685.e6.

Mutation Generation & Detection

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Overview

The Mutation Generation & Detection (MGD) Core Facility supports researchers by securing, developing, and optimizing the latest DNA nuclease technologies, reagents, and protocols for targeted genome modification. Currently, the MGD core specializes in providing customized Engineered DNA Nucleases in either the TALEN or CRISPR-Cas9 formats. These systems work in multiple model systems, including *D. rerio*, *D. melanogaster*, *C. elegans*, *P. falciparum*, *S. cerevisiae*, *T. castaneum*, mammalian cell lines, *A. aegypti*, and *M. Musculus*. The MGD Core 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. Beyond these two main services, the MGD Core has established partnerships with the Mouse Transgenic Facility and the Centralized Zebrafish Resource Center to create engineered mouse and zebrafish models, respectfully, using CRISPR DNA Nucleases. The MGD Cores also provides custom HRMA genotyping services, custom CRISPR validation services, and custom donor molecule services. To date the MGD Core has helped further the research of over 100 different laboratories around the world by providing more than 525 unique TALEN and CRISPR reagents. The MGD Core is also a member of the Utah Center for Iron and Heme Disorders. The mission of this facility is to support researchers by securing, developing, and optimizing the latest DNA nuclease technologies, reagents, and protocols for targeted genome modification.

Services

TALEN Services

- TALEN plasmid pair design and construction
- 2X TALEN plasmid pair design and construction (same gene)
- 0.5X TALEN effector plasmid design and construction
- Different Destination Vector

Crispr Services

- 1X CRISPR plasmid design and construction
- 2X CRISPR plasmid design and construction
- 1X CRISPR sgRNA RNA production
- Control non-targeting Crispr plasmid

High Resolution Melt Analysis

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

Additional Services

- Mouse Transgenic Injection (partnership with Mouse Transgenic Facility)
- Blastocyst Validation of CRISPR reagents (partnership with Mouse Transgenic Facility)
- Short ssDNA donor design and production
- Long ssDNA design and production
- dsDNA donor design and production
- Custom RFLP genotyping of mutant and transgenic mice
- Custom HRMA genotyping in *D. rerio*, *D. melanogaster*, and mouse embryos
- Production of transgenic *D. rerio* using CRISPR reagents
- Production of CRISPR and donor constructs for generating transgenic *D. melanogaster*

Equipment

- BioFire LightScanner
- 3X Eppendorf Mastercycler ProS
- Eppendorf Centrifuge 5430
- 2X Eppendorf 5424 Microcentrifuges
- 27" Apple iMac Desktop with QWC Mercury Elite-AI Pro External Hard drive
- Illumina Eco
- Innova 43 bacterial Shaker
- Innova 42 bacterial Shaker
- Frigidaire -20°C Freezer
- Lonza 4D Nucleofector system:
  - 4D-Nucleofector Core Unit
  - 4D-Nucleofector X Unit
  - 4D-Nucleofector Y Unit
  - 4D-Nucleofector 96-well Shuttle
- CCI Biological Safety Cabinet
- NapCo Model 6300 CO2 Incubator
- ThermoFisher TSX600 -80C Freezer
- Sorvall RT 6300 Centrifuge
- ASUS ZenBook 3 Deluxe Laptop

Personnel

Crystal Davey, Ph.D., Director, current
Timothy Dahlem, Ph.D., Director, 2011-November 2017
Trang Satterlee, Lab Technician

2018 Annual Update

New Equipment

- ASUS ZenBook 3 Deluxe Laptop

New Services

The MGD Core has developed one new service continues to expand the functionality of its current services by constructing new unique CRISPR expression constructs.

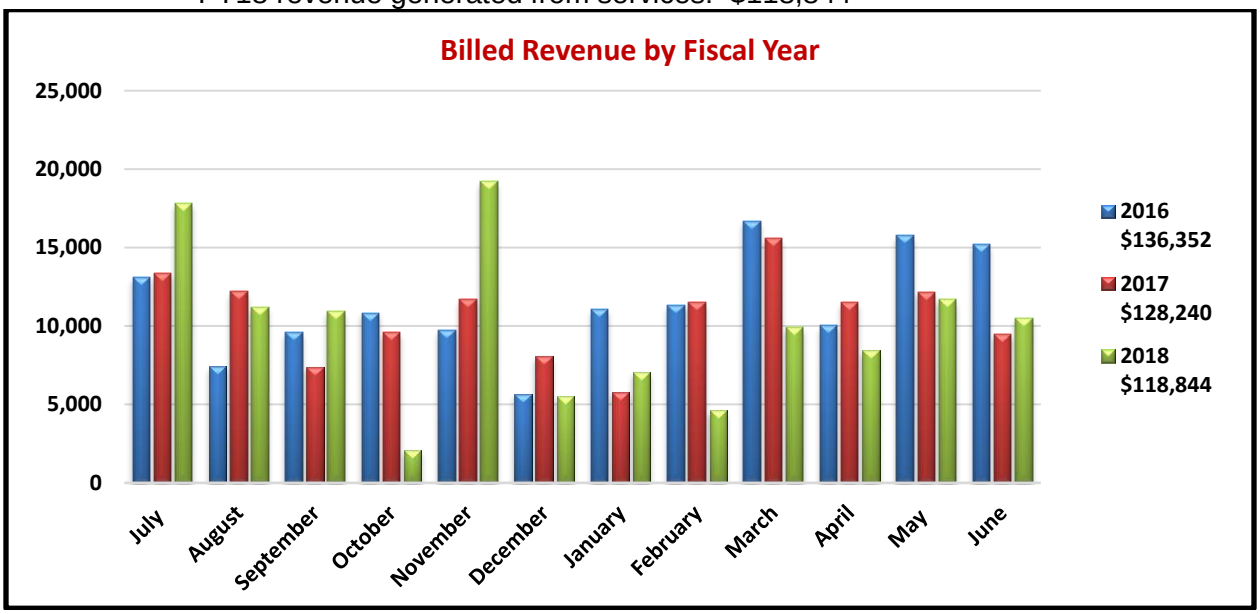
- Production of CRISPR and donor constructs to generate transgenic *D. melanogaster*
- Crispr Transfection Reagents with mCherry marker gene
- Crispr Transfection Reagents with Blasticidin selection gene

Revenue/Expenses

FY18 Expenses: **Total $164,533**

FY18 Revenue: **Total $133,844**

- VP of Health Sciences Support: $15,000
- FY18 revenue generated from services: $118,844



* Legend displays total annual revenue by year earned.

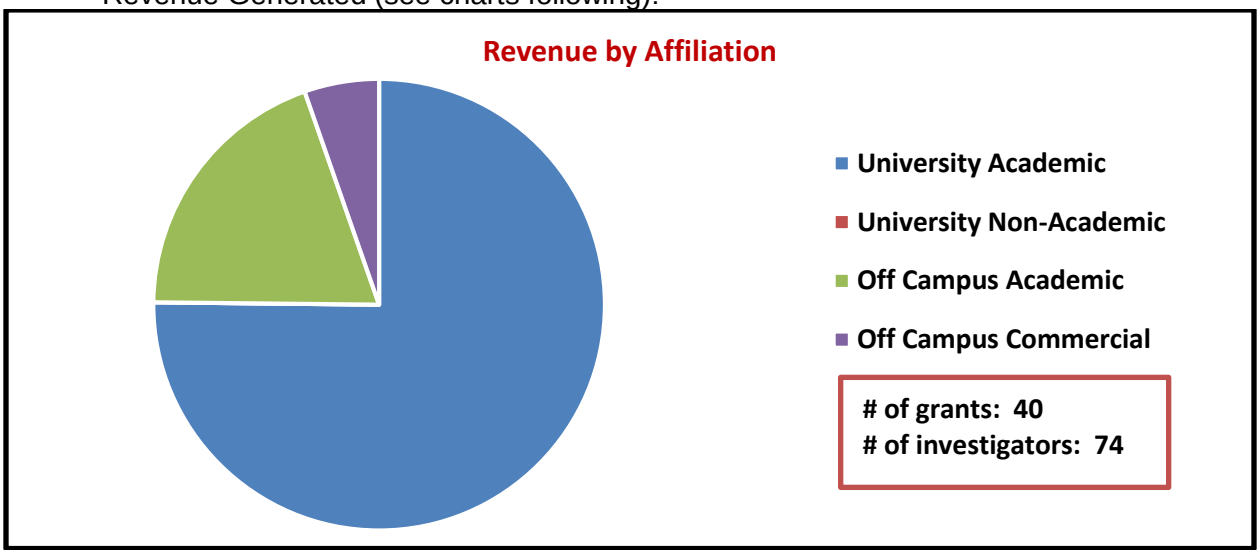
Advisory Board Committee

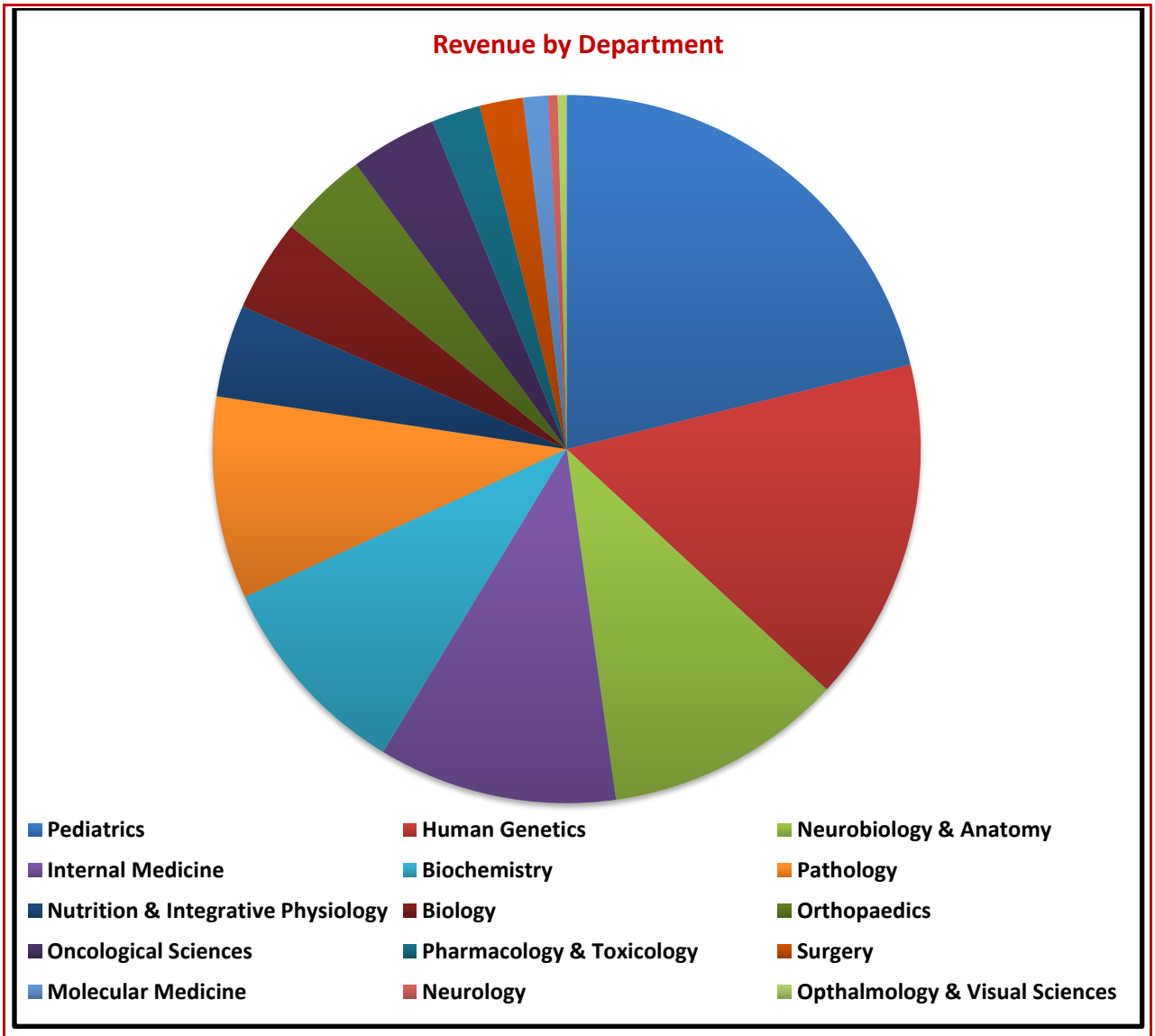
Last meeting date: October 13, 2017.
David Grunwald, Department of Human Genetics (Senior Faculty Advisor)
Dana Carroll, Department of Biochemistry
Ryan O'Connell, Department of Pathology
Lewis Charles Murtaugh, Department of Human Genetics

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):





Top Users

1	Bonkowsky, Josh	NIH, Department, European Leukodystrophy Association
2	Kwan, Kristen	NIH
3	Evason, Kimberley	HCI, Department
4	Sundquist, Wesley	Department
5	University of Nebraska	Off Campus Academic
6	Shapiro, Michael	NIH, NSF
7	Grunwald, David Jonah	NIH
8	Jones, Kevin	NIH
9	Gregg, Christopher	NIH
10	Moon, Anne	Department

Collaboration and Support of Other HSC and University Facilities

Dr. Ryan O'Connell Lab

The MGD Core has partnered directly with Dr. Ryan O'Connell on the production of custom Crispr reagents for his lab. As part of this collaboration, Dr. O'Connell covered 10% of the MGD Core Director's salary requirements for seven months of FY'18.

Center for Iron and Heme Disorders

The MGD is one of three Cores that make up the Utah Center for Iron and Heme Disorders (CIHD). The CIHD provides 10% of the MGD Core Director's salary requirements and covers the full salary of the MGD Core's part time Laboratory Technician.

DNA Sequencing Facility

The MGD Core spent $4316.00 with the DNA Sequencing Core in FY18.

DNA Peptide Facility

The MGD Core spent $9583.92 with the DNA/Peptide Synthesis Core in FY18.

Mouse Transgenic Facility

During FY18 the MGD Core's partnership with the Mouse Transgenic Facility to produce transgenic mouse models has directly brought in 24 different projects to the Mouse Transgenic Facility totaling at least $101,500 in chargebacks for that facility. All of these projects were initiated in the MGD Facility.

Total charge back impact of the MGD Core on other University Core Research facilities is $86,649.92

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 MGD Core achieves this aim in official ways such as seminars given directly to different departments on campus. However, the central avenue of education by the MGD Core is informal one-on-one, in person communication with researchers. In the past, the MGD Core has tracked these interactions, but due to the number and randomness of these interactions in FY'16, the MGD Core stopped tracking them. Based on previous numbers the MGD Core estimates that it spends around 250-300 hours per year in direct interaction with researchers.

Letters of Support

Written and provided to faculty for support of grant applications:

1. LOS for Dr. Jayant Agarwal R21 proposal: "Targeted genomic recombination at mutation sites to aid in tumor detection and treatment." February 2018
2. LOS for Dr. Josh Bonkowsky R01 proposal: "Identifying and Characterizing Modifiers of Adrenoleukodystrophy. " September 2017
3. LOS for Dr. Harry A. Dailey, February 2018
4. LOS for Drs. Allie Grossmann & John Hyngstrom: NCI SPORE Grant. May 2018
5. LOS for Dr. Kent Lai. July 2017
6. LOS for Dr. Kent Lai. October 2017
7. LOS for Dr. Dean Tantin RO1 proposal: "Role of Transcription Coactivator Oca-B in Gene Poising and Immunological Memory." February 2018
8. LOS for Dr. Diane M. Ward Friedreich's Ataxia Research Association (FARA) proposal: "Mitochondrial Oxidants and frataxin." August 2017

Publications

1. Barnea, M., et al. (2018). "Massive osteopetrosis caused by giant, non-functional osteoclasts in R51Q SNX10 mutant mice." bioRxiv
2. Escobar-Aguirre, M., et al. (2017). "Microtubule-actin crosslinking factor 1 (Macf1) domain function in Balbiani body dissociation and nuclear positioning." PLoS Genet 13(9): e1006983.
3. Gao, J., et al. (2018). “The Midline Axon Crossing Decision Is Regulated through an Activity-Dependent Mechanism by the NMDA Receptor.” eNeuro 0389-17.2018
4. Hoffman, L., et al. (2017). "Mechanical signals activate p38 MAPK pathway-dependent reinforcement of actin via mechanosensitive HspB1." Mol Biol Cell 28(20): 2661-2675.
5. Lambert, C. J., et al. (2018). "An automated system for rapid cellular extraction from live zebrafish embryos and larvae: Development and application to genotyping." PLoS One 13(3): e0193180.
6. Liu, K. C., et al. (2018). "Inhibition of Cdk5 Promotes beta-Cell Differentiation From Ductal Progenitors." Diabetes 67(1): 58-70.
7. Sedykh, I., et al. (2017). "Zebrafish zic2 controls formation of periocular neural crest and choroid fissure morphogenesis." Dev Biol 429(1): 92-104.
8. Shankaran, S. S., et al. (2017). "CRISPR/Cas9-Directed Gene Editing for the Generation of Loss-of-Function Mutants in High-Throughput Zebrafish F0 Screens." Curr Protoc Mol Biol 119: 31 39 31-31 39 22.
9. Strachan, L. R., et al. (2017). "A zebrafish model of X-linked adrenoleukodystrophy recapitulates key disease features and demonstrates a developmental requirement for abcd1 in oligodendrocyte patterning and myelination." Hum Mol Genet 26(18): 3600-3614.
10. Vazquez-Arreguin, K., et al. (2018). "BRCA1 through Its E3 Ligase Activity Regulates the Transcription Factor Oct1 and Carbohydrate Metabolism." Mol Cancer Res 16(3): 439-452.

Nuclear Magnetic Resonance

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Overview

The Nuclear Magnetic Resonance core provides NMR services for the research community at the University of Utah, outside academic institutions and for profit companies. We provide access to five different high field NMR spectrometers (400, 500, 600, 800 and 900 MHz instruments; see Equipment below) located on the University of Utah Health Sciences campus and the University of Colorado Boulder and Denver campuses. The 600, 800 and 900 instruments are equipped with state of art consoles and high sensitivity cryogenic HCN probes ideal for protein and natural products research. The 400 and 500 are equipped with Mercury and Inova consoles respectively and conventional probes making them ideal for small molecule and natural products research. For data processing and analysis, we have a central server and five Linux workstations at the Structural Biology Computing Center (SBCC; Department of Biochemistry) with full access to SBGrid (www.sbgrid.org), a suite of structural biology software for NMR and XRAY data processing, analysis and structure determination.

Our staff has substantial experience characterizing small molecules, natural products, nucleic acids, carbohydrates and proteins using NMR spectroscopy. Our business model stresses user based data collection and analysis and thus we provide practical NMR training for individuals and groups on an as needed basis and teach formal NMR spectroscopy courses.

Services

- NMR data collection and analysis with/without staff
- NMR training for individuals and groups
- Formal courses in NMR spectroscopy

Equipment

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

Personnel

Jack Skalicky, Ph.D., NMR Core Director and Res. Associate Professor of Biochemistry
Dennis Edwards, RF Technician; 35+ years of NMR hardware repair

2018 Annual Update

New Equipment

- The Closed Cycle Chiller (CCC) cold head was replaced in FY 2018 (this service is required every 2-3 years for optimal operation of the 600 cryoprobe)
- Facilities added a new cooling loop in BPRB. This upgrade now provides reliable cooling water for more stable operation of the CCC helium compressor.

New Services

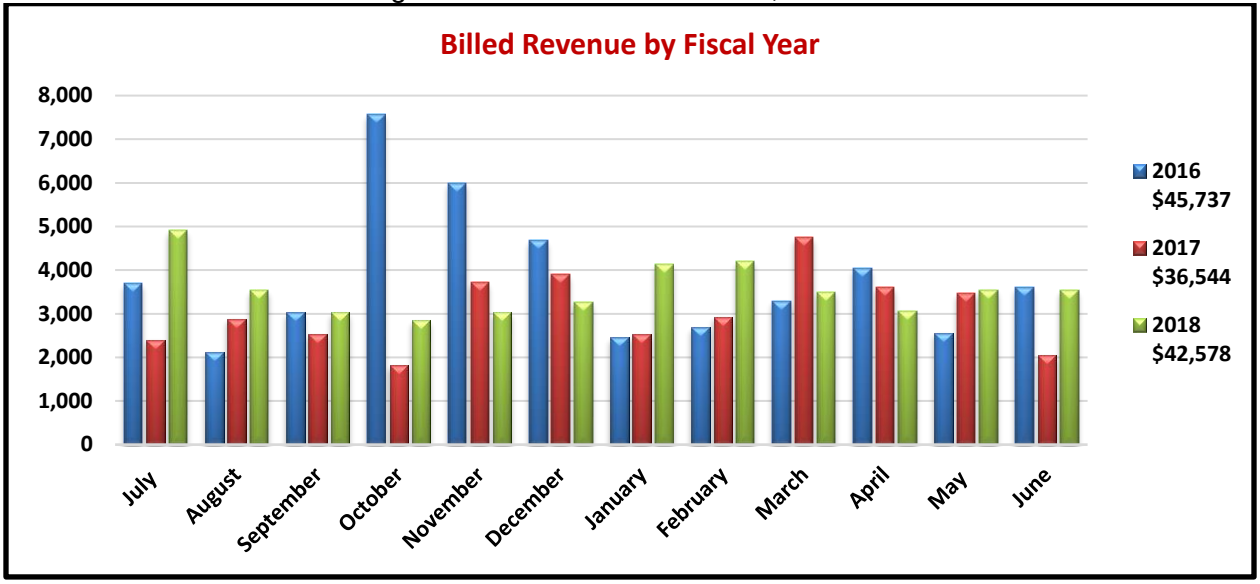
- The NMR Facility did not implement additional services in FY18

Revenues/Expenses

FY18 Expenses: **Total $133,813**

FY18 Revenue: **Total $142,578**

- VP of Health Sciences Support: $100,000
- FY18 revenue generated from services: $42,578



* Legend displays total annual revenue by year earned.

Advisory Board Committee

Last updates: June/July 2017.

Darrell Davis, Eric Schmidt and Jaclyn Winter, Department of Medicinal Chemistry

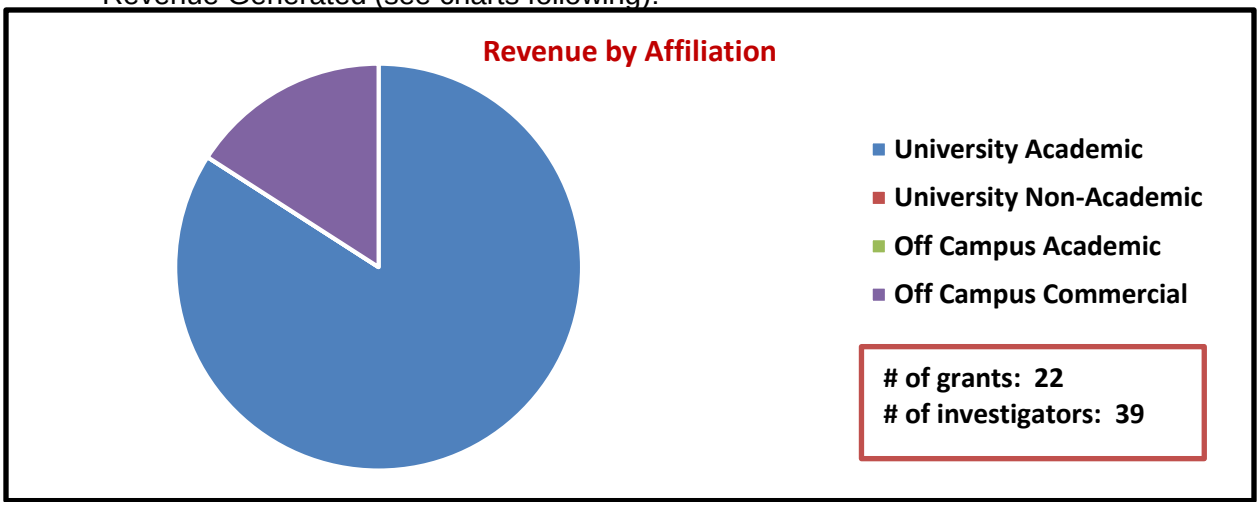
Wesley Sundquist, Department of Biochemistry

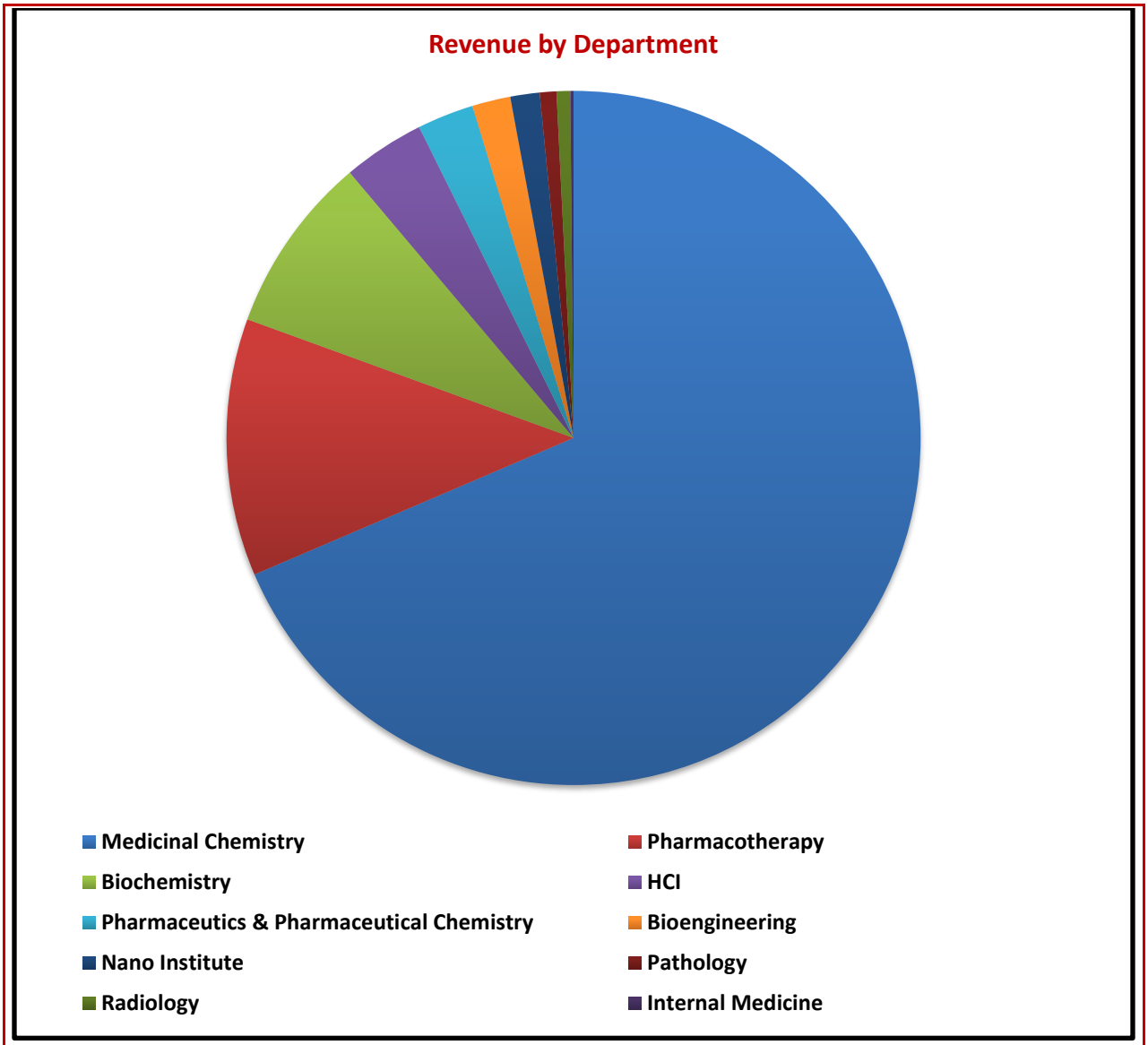
Jessica Kramer, Department of Bioengineering

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):





Top Users

1	Schmidt, Eric	NIH
2	Franzini, Raphael	USTAR, Department
3	Winter, Jaclyn	Department
4	Davis, Darrell	Department
5	Haygood, Margo	NIH
6	Chou, Hung-Chieh	NIH, JDRF, Department
7	Foldax	Commercial
8	Chandrasekharan, Mahesh	NIH
9	Barrios, Amy	American Chemical Society
10	Prestwich, Glenn	Department

Publications

1. Nam JP, Kim S, Kim SW. Design of PEI-conjugated bio-reducible polymer for efficient gene delivery. Int J Pharm. 2018 Jul 10;545(1-2):295-305.
2. Yellepeddi VK, Mohammadpour R, Kambhampati SP, Sayre C, Mishra MK, Kannan RM, Ghandehari H. Pediatric oral formulation of dendrimer-N-acetyl-l-cysteine conjugates for the treatment of neuroinflammation. Int J Pharm. 2018 Jul 10;545(1-2):113-116.
3. Tu J, Xu M, Parvez S, Peterson RT, Franzini RM. Bioorthogonal Removal of 3-Isocyanopropyl Groups Enables the Controlled Release of Fluorophores and Drugs in Vivo. J Am Chem Soc. 2018 Jun 27.
4. Disotuar MM, Petersen ME, Nogueira JM, Kay MS, Chou DH. Synthesis of hydrophobic insulin-based peptides using a helping hand strategy. Org Biomol Chem. 2018 Jun 27.
5. Wozniak CE, Lin Z, Schmidt EW, Hughes KT, Liou TG. Thailandamide: a fatty acid synthesis antibiotic that is co-expressed with a resistant target gene. Antimicrob Agents Chemother. 2018 Jun 18.
6. Yang L, Wang M, Slattum PM, Bunes BR, Wang Y, Wang C, Zang L. Donor-Acceptor Supramolecular Organic Nanofibers as Visible-Light Photoelectrocatalysts for Hydrogen Production. ACS Appl Mater Interfaces. 2018 Jun 13;10(23):19764-19772.
7. Liu GW, Prossnitz AN, Eng DG, Cheng Y, Subrahmanyam N, Pippin JW, Lamm RJ, Ngambenjawong C, Ghandehari H, Shankland SJ, Pun SH. Glomerular disease augments kidney accumulation of synthetic anionic polymers. Biomaterials. 2018 Jun 2.
8. Morita M, Hao Y, Jokela JK, Sardar D, Lin Z, Sivonen K, Nair SK, Schmidt EW. Post-Translational Tyrosine Geranylation in Cyanobactin Biosynthesis. J Am Chem Soc. 2018 May 16;140(19):6044-6048.
9. Smith TE, Pond CD, Pierce E, Harmer ZP, Kwan J, Zachariah MM, Harper MK, Wyche TP, Matainaho TK, Bugni TS, Barrows LR, Ireland CM, Schmidt EW. Accessing chemical diversity from the uncultivated symbionts of small marine animals. Nat Chem Biol. 2018 Feb;14(2):179-185.
10. Davulcu O, Peng Y, Brüschweiler R, Skalicky JJ, Chapman MS. Elevated μs-ms timescale backbone dynamics in the transition state analog form of arginine kinase. J Struct Biol. 2017 Dec;200(3):258-266.
11. Cheng D, Liu X, Xie Y, Lv H, Wang Z, Yang H, Han A, Yang X, Zang L. A. Ratiometric Fluorescent Sensor for Cd(2+) Based on Internal Charge Transfer. Sensors (Basel). 2017 Nov 2;17(11).
12. Currie SL, Doane JJ, Evans KS, Bhachech N, Madison BJ, Lau DKW, McIntosh LP, Skalicky JJ, Clark KA, Graves BJ. ETV4 and AP1 Transcription Factors Form Multivalent Interactions with three Sites on the MED25 Activator-Interacting Domain. J Mol Biol. 2017 Oct 13;429(20):2975-2995.
13. Wu G, Nielson JR, Peterson RT, Winter JM. Bonnevillamides, Linear Heptapeptides Isolated from a Great Salt Lake-Derived Streptomyces sp. Mar Drugs. 2017 Jun 24;15(7).
14. Issac M, Aknin M, Gauvin-Bialecki A, Pond CD, Barrows LR, Kashman Y, Carmeli S. Mollecarbamates, Molleureas, and Molledihydroisoquinolone, o-Carboxyphenethylamide Metabolites of the Ascidian Didemnum molle Collected in Madagascar. J Nat Prod. 2017 Jun 23;80(6):1844-1852.
15. Xu M, Tu J, Franzini RM. Rapid and efficient tetrazine-induced drug release from highly stable benzonorbornadiene derivatives. Chem Commun (Camb). 2017 Jun 6;53(46):6271-6274.
16. Distel DL, Altamia MA, Lin Z, Shipway JR, Han A, Forteza I, Antemano R, Limbaco MGJP, Tebo AG, Dechavez R, Albano J, Rosenberg G, Concepcion GP, Schmidt EW, Haygood MG. Discovery of chemoautotrophic symbiosis in the giant shipworm Kuphus polythalamia (Bivalvia: Teredinidae) extends wooden-steps theory. Proc Natl Acad Sci U S A. 2017 May 2;114(18):E3652-E3658
17. Peng Y, Hansen AL, Bruschweiler-Li L, Davulcu O, Skalicky JJ, Chapman MS, Brüschweiler R. The Michaelis Complex of Arginine Kinase Samples the Transition State at a Frequency That Matches the Catalytic Rate. J Am Chem Soc. 2017 Apr 5;139(13):4846-4853.
18. Lane DD, Fessler AK, Goo S, Williams DL, Stewart RJ. Sustained tobramycin release from polyphosphate double network hydrogels. Acta Biomater. 2017 Mar 1;50:484-492.
19. Sardar D, Hao Y, Lin Z, Morita M, Nair SK, Schmidt EW. Enzymatic N- and C-Protection in Cyanobactin RiPP Natural Products. J Am Chem Soc. 2017 Mar 1;139(8):2884-2887.
20. Biswas S, McCullough BS, Ma ES, LaJoie D, Russell CW, Garrett Brown D, Round JL, Ullman KS, Mulvey MA, Barrios AM. Dual colorimetric and fluorogenic probes for visualizing tyrosine phosphatase activity. Chem Commun (Camb). 2017 Feb14;53(14):2233-2236
21. Wu N, Zhang Y, Wang C, Slattum PM, Yang X, Zang L. Thermoactivated Electrical Conductivity in Perylene Diimide Nanofiber Materials. J Phys Chem Lett. 2017 Jan 5;8(1):292-298. doi: 10.1021/acs.jpclett.6b02639. Epub 2016 Dec 21. PubMed PMID: 27991796.

Preclinical Imaging

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Overview

The Preclinical (formerly Small Animal) Imaging Facility extends the benefits of modern diagnostic medical imaging technologies to the studies of anatomy and physiology in small animals. The facility operates one of each MRI, PET/SPECT/CT and fluorescence tomography scanners. The instruments 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 Preclinical Imaging Facility has a variety of modalities to choose from such as MRI, PET/SPECT/CT, and near-infrared fluorescence imaging. Examples of scanning capabilities include the following:

7 Tesla small animal MRI systems

- 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/PET/SPECT 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 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 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 taxes.

Equipment

- 7 Tesla Bruker BioSpec MRI Scanner
- Siemens Inveon CT/PET/SPECT System
- VISEN (now Perkin Elmer) FMT 2500™ Fluorescence Molecular Tomography

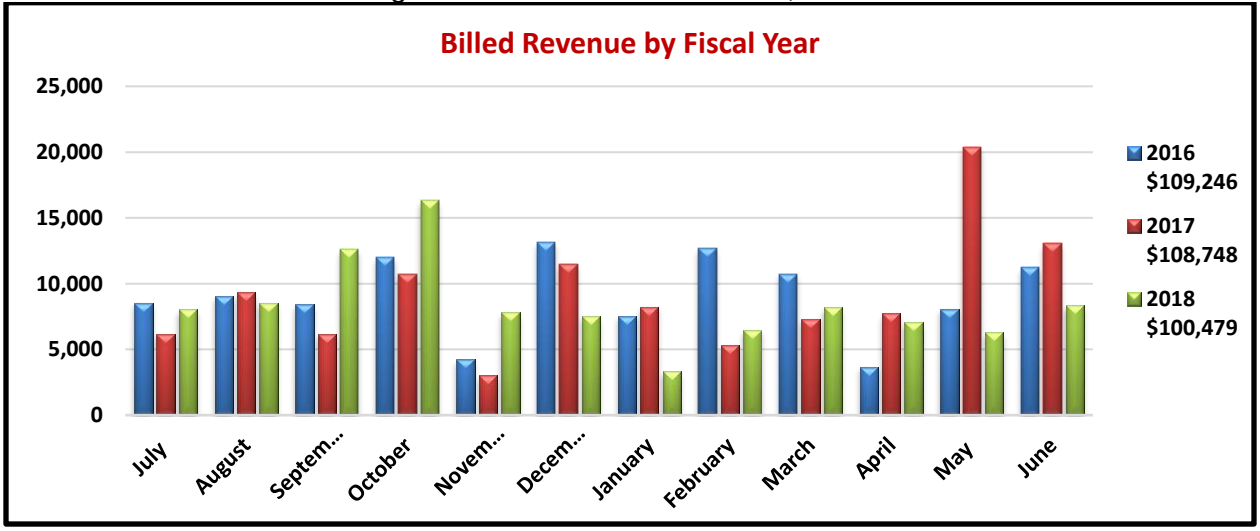
Personnel

Edward Hsu, Ph.D., Director
Samer Merchant, M.S., Imaging Specialist
Adam Schmidt, Research Assistant
Gavin Yeip, Research Assistant

Revenue/Expenses

FY18 Expenses: **Total $224,538**
FY18 Revenue: **Total $277,856**

- VP of Health Sciences Support: $50,000
- VP of Research Support: $100,000, (RIF) $27,377 (Spectral Camera ASM)
- FY18 revenue generated from services: $100,479



***** Legend displays total annual revenue by year earned.

Advisory Board Committee

Last meeting date: April 1, 2018.
Rob MacLeod, Professor, Bioengineering/SCI/CVRTI
John Phillips, Research Associate Professor, Hematology
Roger Van Andel, Director, Office of Comparative Medicine
Edward DiBella, Professor, Radiology
Donna Cross, Associate Professor, Radiology

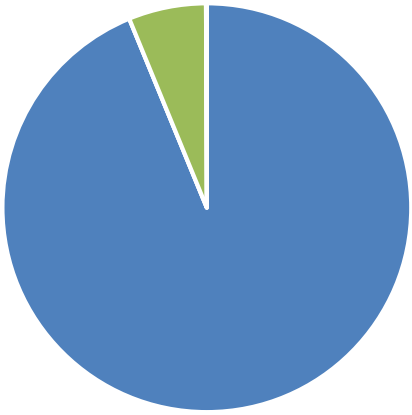
HEALTH
UNIVERSITY OF UTAH

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):

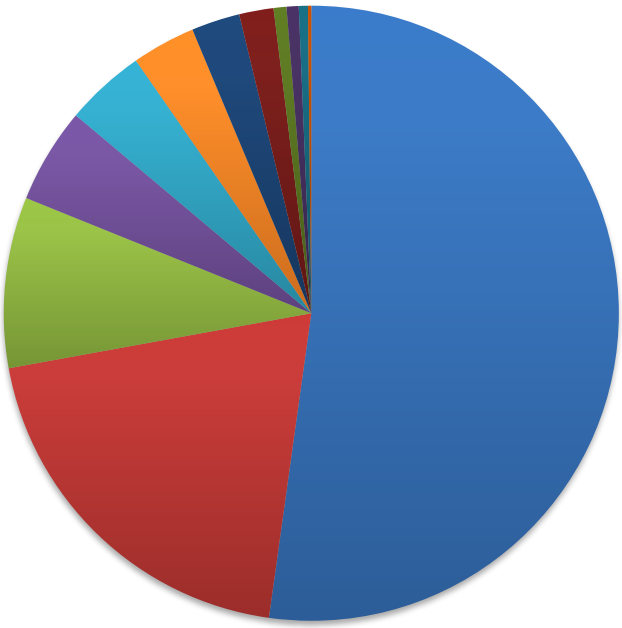
Revenue by Affiliation



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

# of grants: 10
# of investigators: 21

Revenue by Department



- Radiology & Imaging Sciences
- Internal Medicine
- Bioengineering
- Surgery
- Core Research Facilities
- Biology
- Orthopaedics
- Pediatrics
- Neurosurgery
- Geology & Geophysics
- Obstetrics & Gynecology
- Pharmaceutics & Pharmaceutical Chemistry

Top Users

1	Cross, Donna	Department
2	Whitehead, Kevin	NIH, Department
3	Hsu, Edward	Department
4	Timmins, Lucas	Department
5	MacLeod, Rob	Nora Eccles Treadwell Foundation
6	Schachner, Emma	Louisiana State University
7	Shapiro, Michael	NSF
8	Alt, Jeremiah	Flight Attendant Medical Research
9	Ranjan, Ravi	NIH
10	Jones, Kevin	NIH

Publications

1. Barrott, J. J., Zhu, J. F., Smith-Fry, K. M., Susko, A. T., Nollner, D. B., Yap, J. D., et al. The influential role of bcl2 family members in synovial sarcomagenesis. Molecular Cancer Research, 15(12), 1733-1740, (2017).
2. Schachner, E., Sedlmayr, J., Schott, R., Lyson, T., Sanders, R., & Lambertz, M. Pulmonary anatomy and a case of unilateral aplasia in a common snapping turtle (Chelydra serpentina): Developmental perspectives on cryptodiran lungs. Journal of Anatomy, 231(6), 835-848, (2017).
3. Shin, C., Robinson, J., Sonnen, J., Welker, A., Yu, D., Vanbrocklin, M., & Holmen, S. HBEGF promotes gliomagenesis in the context of Ink4a/Arf and Pten loss. Oncogene,36(32), 4610-4618, (2017).
4. Nicholas Frazier, Localized hyperthermia for enhanced targeted delivery of polymer therapeutics (Unpublished doctoral dissertation). University of Utah, Salt Lake City, Utah, (2017).
5. Low, SA, Galliford, Cv, Yang, Jy, Low, PS, & Kopecek, J. Healing efficacy of fracture-targeted GSK3β inhibitor-loaded micelles for improved fracture repair. Nanomedicine (Lond) 12(3): 185-193, (2017).
6. Gomez AD, Zou H, Bowen ME, Liu X, McKellar SH, Hsu EW. Right ventricular fiber structure as a compensatory mechanism in pressure overload: a computational study. J. Biomech. Eng. 139:10.11115, (2017)
7. Barrott, Jared J., Illum, Benjamin E., Jin, Huifeng, Hedberg, Matthew L., Wang, Yanliang, Grossmann, Allie, Jones, Kevin B. Paracrine osteoprotegerin and [beta]-catenin stabilization support synovial sarcomagenesis in periosteal cells. Journal of Clinical Investigation, 128(1), 207-218, (2018).
8. Huttenlocker, A., Grossnickle, D., Kirkland, J., Schultz, J., & Luo, Z. Late-surviving stem mammal links the lowermost Cretaceous of North America and Gondwana. Nature, 558(7708), 108-112, (2018).
9. Julander, J., Siddharthan, V., Park, A., Preston, E., Mathur, P., Bertolio, M., . . . Morrey, J. Consequences of in utero exposure to Zika virus in offspring of AG129 mice. Scientific Reports, 8(1), 9384, (2018).

Small Animal Ultrasound

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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

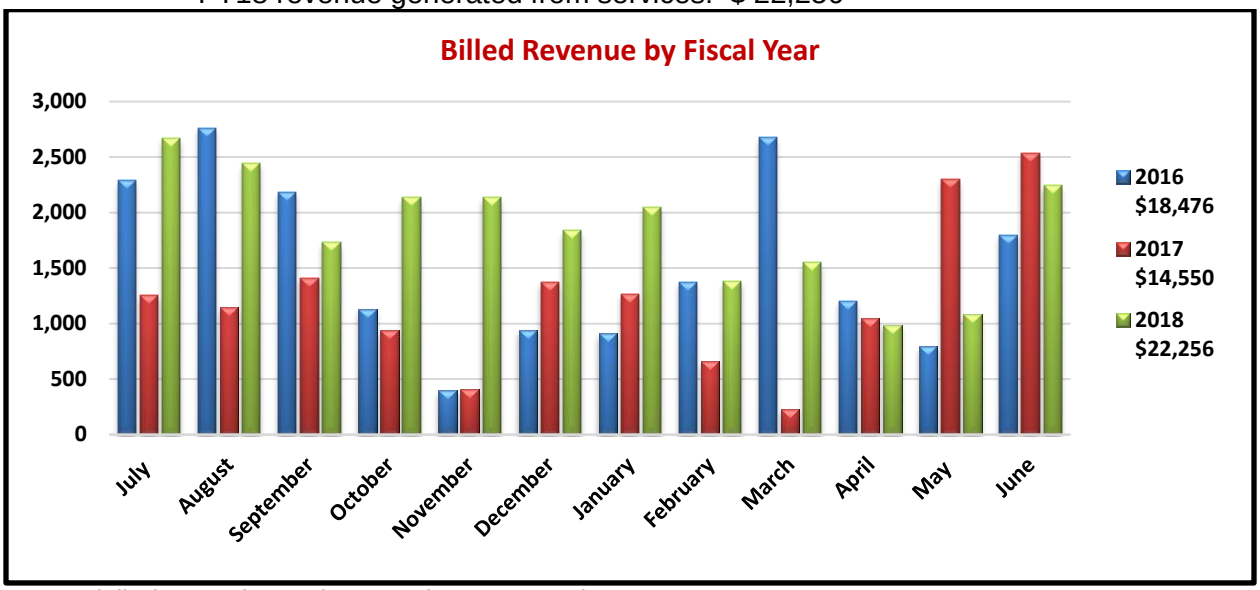
Kevin Whitehead, M.D., Director
Kandis Carter, Laboratory Technician
Tiehua Chen, Laboratory Technician

Revenue/Expenses

FY18 Expenses: **Total $42,720**

FY18 Revenue: **Total $32,256**

- VP of Health Sciences Support: $10,000
- FY18 revenue generated from services: $ 22,256



***** Legend displays total annual revenue by year earned.

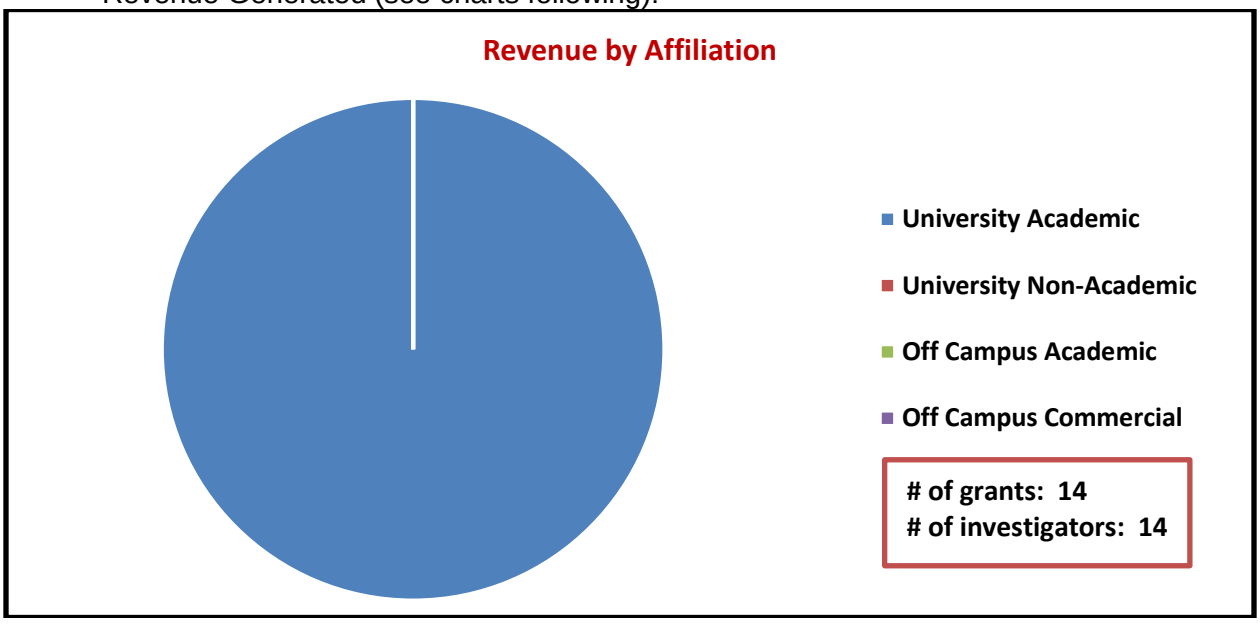
Advisory Board Committee

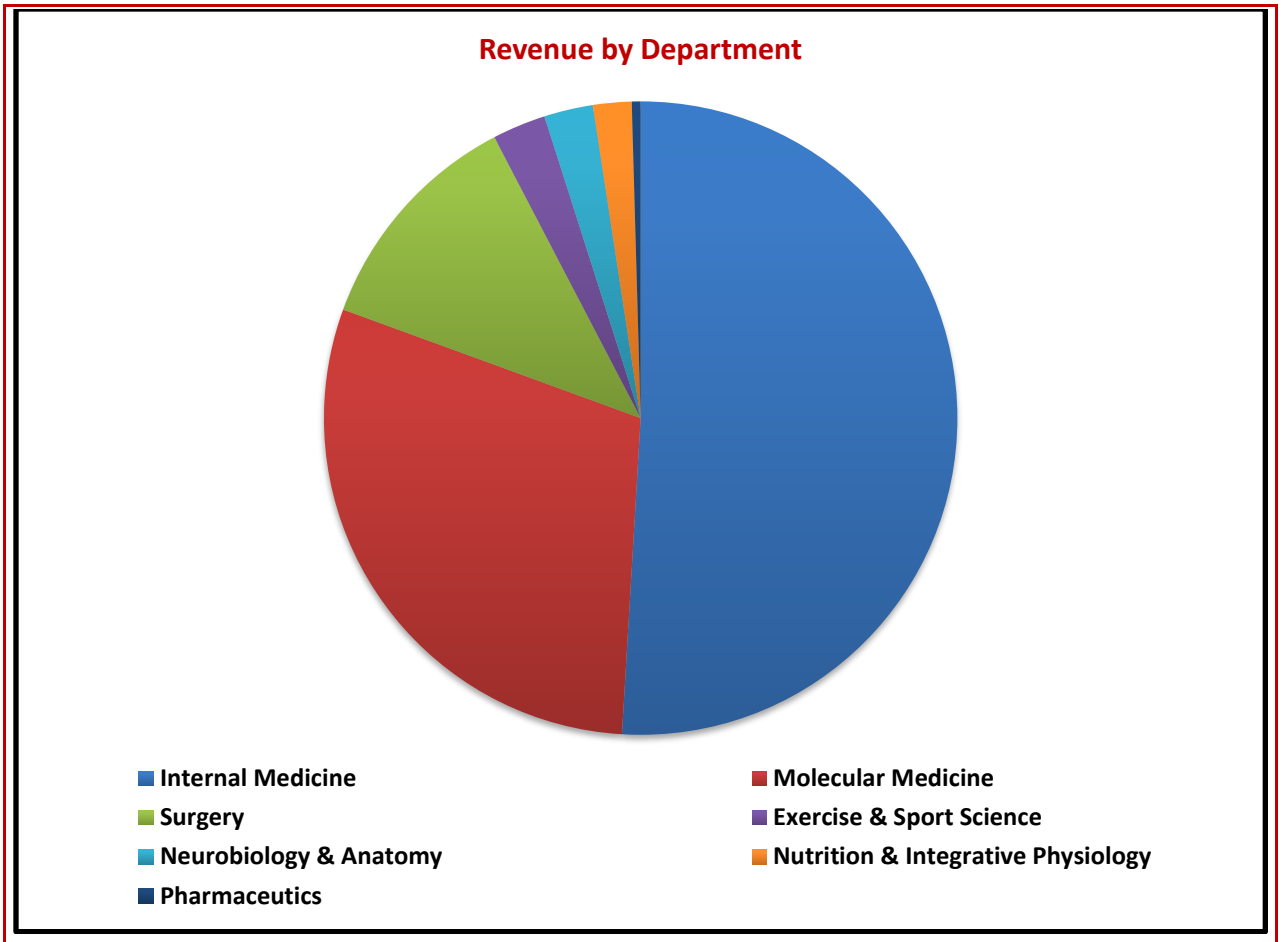
Last meeting date: April 15, 2013.
Andy Weyrich, Associate Dean for Basic and Translational Sciences
Craig Selzman, Associate Professor, Cardiothoracic Surgery
Brent Wilson, Assistant Professor, Cardiology

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):





Top Users

1	Drakos, Stavros	Doris Duke Foundation
2	Franklin, Sarah	NIH
3	Selzman, Craig	USTAR
4	Boudina, Sihem	NIH
5	Shiu, Yan-Ting	NIH
6	Sachse, Frank	Nora Eccles Treadwell Foundation
7	Odelberg, Shannon	NIH
8	Donato, Anthony	NIH
9	Rutter, Jared	HHMI, Nora Eccles Treadwell Foundation
10	Lesniewski, Lisa	NIH

Publications

1. Franklin, Sarah., *et al*. The chromatin-binding protein Smyd1 restricts adult mammalian heart growth. *American Journal of Physiology* 311**,** H1234-H1247 (2016).
2. Machin, D. R., Leary, M. E., He, Y., Shiu, Y. T., Tanaka, H., Donato, A. J. Ultrasound Assessment of Flow-Mediated Dilation of the Brachial and Superficial Femoral Arteries in Rats. *J. Vis. Exp.* (117), e54762, doi:10.3791/54762 (2016).

Service Recharge Centers

Overview

The HSC Administration Office also manages Service/Recharge Centers. These Centers are not cores but follow most of the same guidelines as the HSC Cores. The Administration Office processes the billing, collections and ordering of supplies for these Centers. Each Center receives monthly reports showing revenue and expenses and has access to the internal tracking system which shows in real time what their account balances are. The Administration Office charges a fee of 5% on revenue collected from billed services. These Centers are listed on the HSC Cores website under Service/Recharge Centers. If it is determined at a later time that a Center would benefit from becoming a Core, then all guidelines must be followed. Service/Recharge Centers are primarily created to provide services to the University Community but can also provide services to external customers. The administration of these facilities is performed by the home department. Only recharge activity for these groups is managed by the Administrative Office, this is partly due to the efficient billing system that has been developed in collaboration with our IT support group managed by Mr. Rick Haycock.

Genetic Science Learning Center

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Overview

The GSLC specializes in translating complex science and health concepts for those who are not experts in a particular field. They produce award-winning educational materials and programs that make science and health easy for everyone to understand.

Uniqueness

The GSLC produces the most highly used online life science education resource in the world. Each year its Learn.Genetics and Teach.Genetics websites are visited by over 16 million individuals who view over 60 million pages and come from every country. These sites, thus, provide an unparalleled, international dissemination mechanism for educational materials developed through collaborative projects with faculty.

The GSLC has received numerous awards for the educational materials it produces. Among others, these include the first award of the *Science* Prize for Online Resources in Education from *Science Magazine* and AAAS.

The GSLC has over 20 years of experience in producing educational materials for patients, the public, and students and teachers at the K-12 and higher education levels. They collaborate with faculty and more to produce materials for large and small projects.

The GSLC's team is unique among US academic institutions that produce science and health education materials, in that it includes expertise in science and health writing, science research, instructional and educational material design, multimedia animation and interactivity, graphic design, video production, video game and app development, original music composition and audio engineering, and research and evaluation of educational materials and programs; other groups outsource some of these functions.

Services

- Educational material design and production, including materials that are culturally and linguistically appropriate for diverse audiences
- Science and health writing
- Instructional design
- Multimedia animation and interactivity
- 3D animation
- Graphic design for online and print-based materials
- Video production, including script writing and videography
- Original music composition and audio engineering for video and multimedia materials
- Video game development
- App development
- Website development
- Developing and providing culturally and linguistically appropriate education programs for the lay public, and grade K to 12 students and teachers
- Science and health education research studies
- Evaluation of education materials and programs (small-scale projects)
- Development of valid assessment (test) items for evaluating the efficacy of educational materials and programs

An initial consultation is provided in order to define a project's scope and budget. For grant proposals, text describing the GSLC and its contributions to the project, a budget and justification are provided. Once a project is agreed to and/or funded, a project lead is assigned, who serves as the primary GSLC contact for the project.

Personnel

Louisa A. Stark, PhD, Director
Kevin Pompei, MEd, Administrative Director
Peter Anderson, BFA, Creative Director
Kagan Breitenbach, BMu, Specialty Media Coordinator
Dina Drits-Esser, PhD, Senior Research Associate
Kristin Fenker, PhD, Post-doctoral Fellow
Amy J. Hawkins, PhD, Post-doctoral Fellow
Sheila Homburger, MS, Science Content Manager
John Maxwell Kelly, BFA, Graphic Artist
Molly Malone, BS, Senior Education Specialist
Ryan Perkins, BFA, Graphic Designer
Julia Peterson, Graphic Artist
Steve Reest, BS, MLS, Program Assistant
Harmony Starr, BS, Media Production Manager

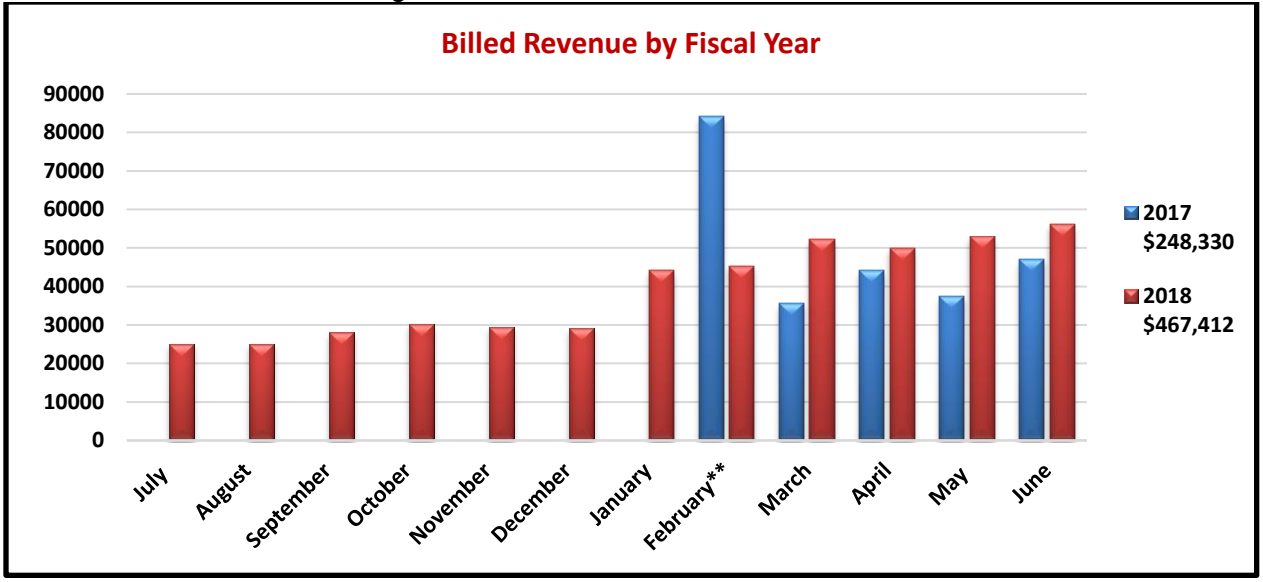
Goals for FY18

The GSLC will continue to produce high quality, award-winning educational materials. We will work to inform researchers and units across the University of Utah campus and elsewhere about our capabilities and our availability to collaborate on projects. In this way, we will seek to increase our visibility and expand our users.

Revenue/Expenses

FY18 Expenses: **$531,961**
FY18 Revenue: **$816,428**

- Other Revenue Sources: $349,016
- FY18 revenue generated from services: $467,412



* Legend displays total annual revenue by year earned.
** Management by Core Administration 2017.

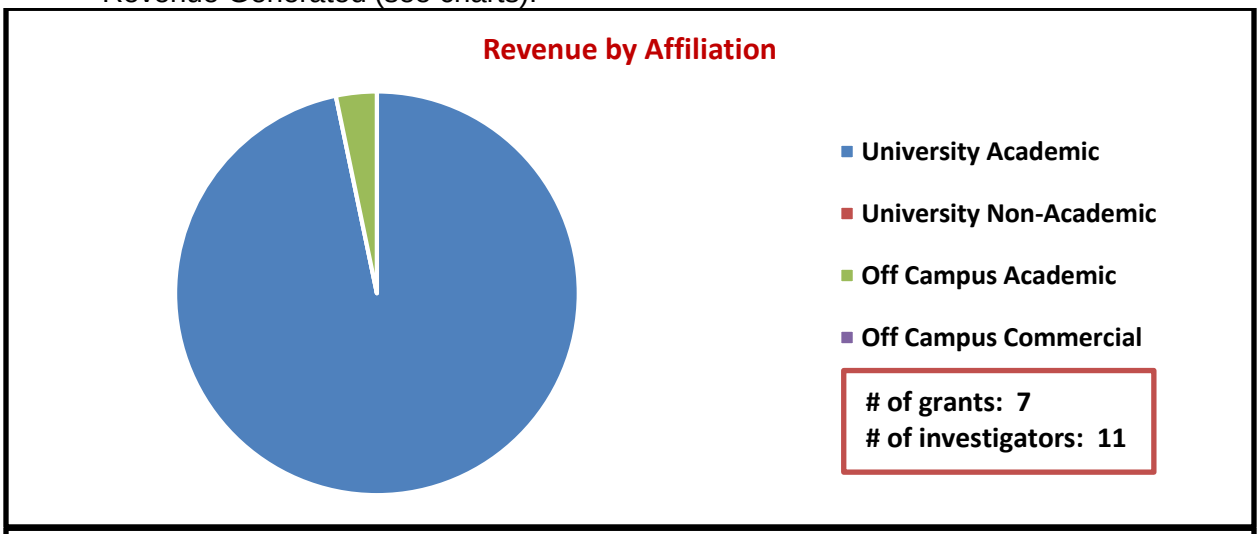
Management Meeting

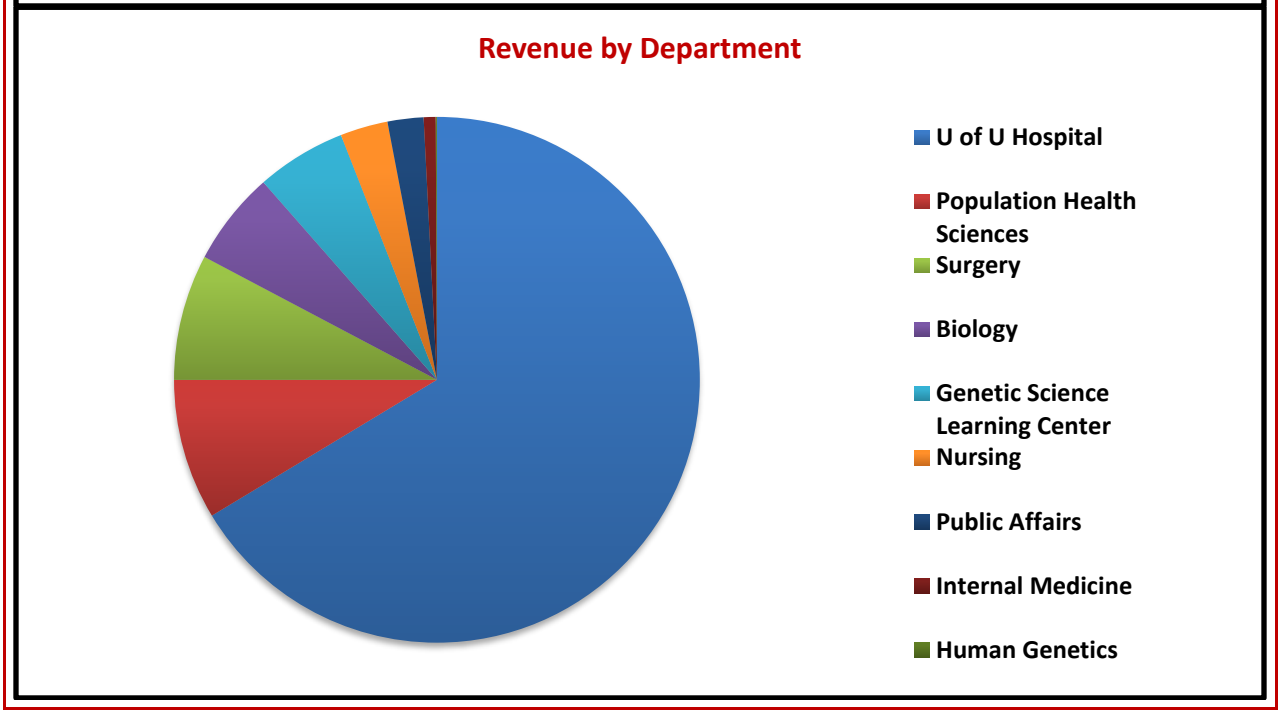
Last meeting date: May 22nd, 2018
Louisa Stark, PhD, GSLC Director
Kevin Pompei, MEd, Administrative Director
John Phillips, PhD, HSC Core Research Facility, Director
Brenda Smith, Associate Director, Accounting and Finance, HSC Core Research Facility Operations
Cynthia Best, MBA, Associate Dean, SOM Finance
Amy Tanner, Director, Research & Science, SVPHS Research Unit
Wendy Kwan, Associate Director, Training & Development SOM Finance
Natalie Johnson, Manager, Administration, Department of Human Genetics

FY18 Scientific Impact

Research Support

Revenue Generated (see charts):





Top Users

1	Patterson, Brittany	Department
2	Fagerlin, Angie	American Heart Association
3	Clark, Richard	NSF
4	Pompei, Kevin	Gift
5	Myers, Jeremy	Department of Defense
6	Salt Lake City School District	Off Campus Educational
7	Rothwell, Erin	NIH
8	Park, Albert	Amendment 2 LLC
9	Kiefer, Julie	Program in Personalized Health
10	Dere, Willard	NIH

Educational Modules Published Online

1. Evolution: DNA and the Unity of Life
   http://teach.genetics.utah.edu/content/evolution/
2. Sensory Systems: The Neuroscience of Our Senses
   http://learn.genetics.utah.edu/content/senses/
   http://teach.genetics.utah.edu/content/senses/
3. Cotton
   http://learn.genetics.utah.edu/content/cotton/
4. Insect Herbivores vs. Plants
   http://learn.genetics.utah.edu/content/herbivores/

Publications

1. Powell B, Malone M, Drits-Esser D, Stark LA. (2018). Introduction to heredity 101: Observable traits. *Science and Children* 55(6):36-41.
2. Powell B, Malone M, Drits-Esser D, Stark LA. (2018). Introduction to heredity 102: Inherited traits. *Science and Children* 55(6):42-48.

Iron & Heme

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Overview

The Iron and Heme Core provides analysis of metals, precursor porphyrins and heme. The core also measures activity of the enzymes responsible for heme biosynthesis. Analysis and quantification of heme and its precursors can be obtained for cell pellets, tissue, whole blood, urine, feces and other complex biological materials. Analysis of enzyme activity can be provided for cell pellets, tissue and blood. An Agilent 7900-ICP mass spectrometer is used to measure iron content (as well as other metals) in biological samples.

Uniqueness

The Iron and Heme Core provides a service, not available at most universities. I am unaware of any other U.S. academic service center that provides experienced UPLC/HPLC analysis of heme and porphyrin content, or assays for activity of enzymes involved in heme biosynthesis. Because of our uniqueness and relevance to the hematology community, we receive requests for service from academic laboratories all over the United States. In the past year, our lab has provided this unique service (paid and unpaid) for investigators from eight other research institutions across the country, in addition to serving the Iron and Heme research community at the University of Utah.

Services

The Iron and Heme Core's primary mission is to facilitate research into the role of heme, heme precursors and transition metals in both normal and disease states. The iron and heme core lab has extensive experience with the separation and identification of tetrapyrroles and with running and developing heme biosynthesis pathway enzyme assays. We specialize in iron (and other lesser metals) analysis by ICP-MS and also test for other metals. We are offering the following services:

- Metal analysis by ICP-MS
- UPLC Analysis of Total Heme and protoporphyrin IX
- Spectral Analysis of Heme
- UPLC analysis of porphyrins
- Assays for the following Heme Biosynthetic Enzymes (ALAS, ALAD/PBGS, PBGD, U3S, UROD, COPOX & FECH)

Equipment

Metal Analysis:

- Agilent 7900-ICP mass spectrometer
- Agilent SPS4 autosampler

Heme and Porphyrin analysis:

- Waters Acquity ultra performance liquid chromatography (UPLC) system, equipped with a reverse phase C18 column, a photodiode array detector and a fluorescence detector for reversed phase analytical work
- Agilent 8453 diode array spectrophotometer
- HPLC Waters 2795 Alliance HT separations module with a Waters 474 Scanning Fluorescence Detector and a Waters 2996 PDA Detector (photodiode array)

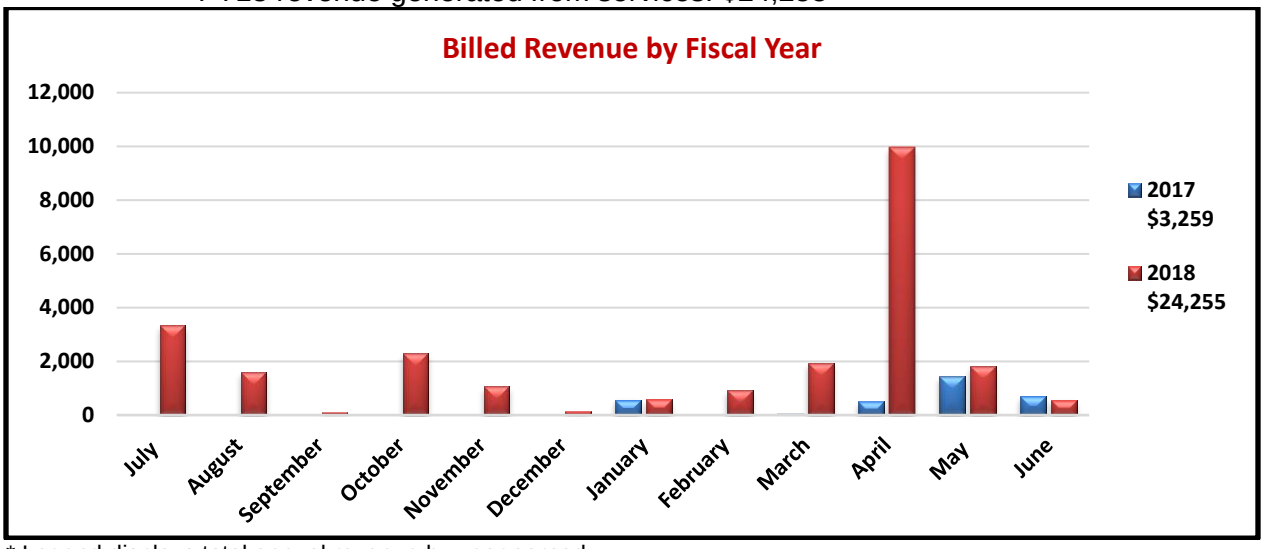
Personnel

Laurie Jackson, Core Director
Hector Bergonia, Lab Specialist Tetrapyrrole Biochemistry

Revenue/Expenses

FY18 Total Expenses: **$12,929**
FY18 Total Revenue: **$24,255**

- VP of Research Support: $0
- FY18 revenue generated from services: $24,255



* Legend displays total annual revenue by year earned.

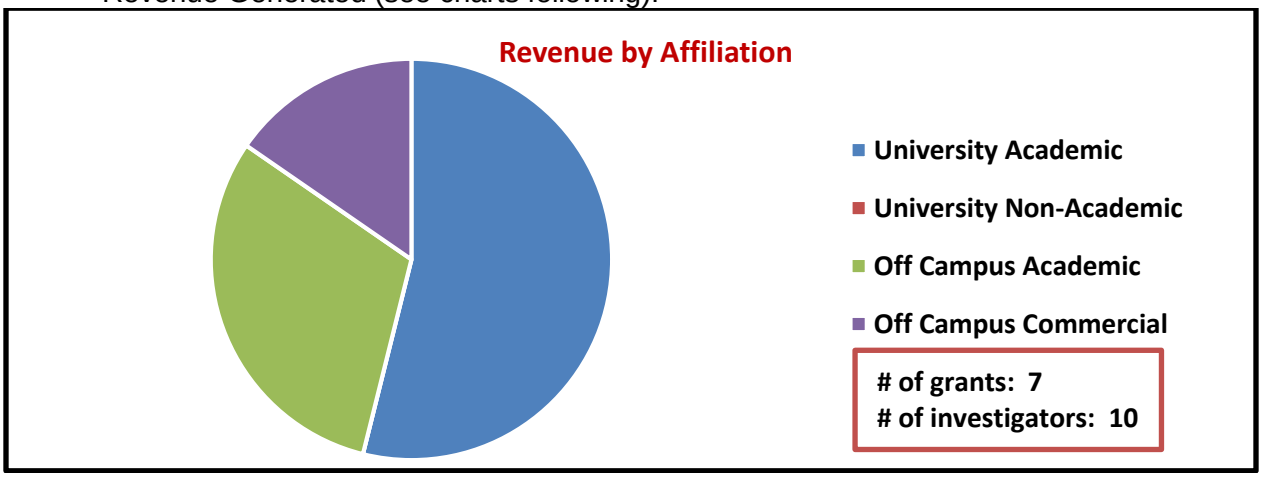
Advisory Board Committee (CIHD Operations Committee)

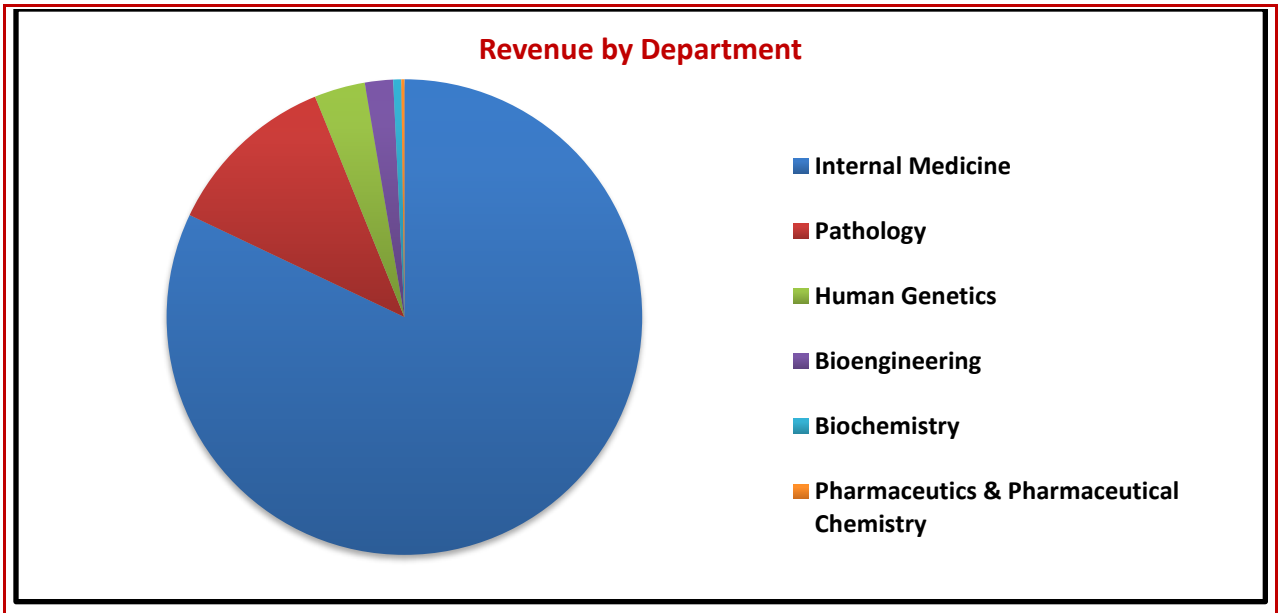
Last meeting date: October 4, 2017
John D. Phillips
James Cox
Diane M Ward
Dennis Winge

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):





Top Users

1	Phillips, John	NIH
2	University of Maryland	Off Campus Academic
3	Massachusetts General Hospital	Commercial
4	Boston Children's Hospital	Commercial
5	Ward, Diane	NIH
6	Leibold, Elizabeth	NIH
7	East Carolina University	Off Campus Academic
8	Rodan, Aylin	Department
9	Stewart, Russell	NIH, Army Research Office
10	Hughes, Adam	Searle Scholars Program

Goals for FY18

- Improve efficiency of workflow
- Increase awareness of our services

Publications

1. J. Chung et al. Erythropoietin signaling regulates heme biosynthesis (2017 May 29) eLIFE 6:e24767.
2. Seguin et al. Reductions in the mitochondrial ABC transporter Abcb10 affect the transcriptional profile of heme biosynthesis genes (2017 August 14) J. Biol. Chem. 292(39):16284.
3. Y. Y. Yien et al, Mtation in human *CLPX* elevates levels of delta-aminolevulinate synthase and protoporphyrin IX to promote erythropoietic protoporphyria (2017, September 5) PNAS E8045-E8052.
4. E. R. Rocha et al. Bacteroides fragilis requires the ferrous-iron transporter FeoAB and the CobN-like proteins BtuS1 and BtuS2 for assimilation of iron released from heme. MicrobiologyOpen. Published online before inclusion in issue as Early View e00669.

Materials Characterization Lab

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Overview

The Materials Characterization Lab (MCL) is a user research facility managed by the Materials Science and Engineering (MSE) Department at the University of Utah. The lab offers clients access to a wide range of analytical instrumentation and services for a variety of biochemical, organic, inorganic, and environmental samples.

The MCL is provides researchers with training on the care and operation of equipment used in materials characterization. In addition to providing training for new users, our staff is available to help users in the design of experiments and the interpretation of results.

The MCL maintains a ~1300 sq. ft. lab facility, including optical and metallographic microscopes, two scanning electron microscopes (SEM), an energy dispersive X-ray spectrometer (EDS), a Fourier transform infrared (FTIR) spectrometer, an ultraviolet-visible-near-infrared (UV-Vis-NIR) spectrophotometer, two X-ray diffractometers (XRD), a differential scanning calorimeter (DSC), a dilatometer, an Instron mechanical testing system, a BET surface area and pore size analyzer, carbon and gold sputter coaters, a compression mounting press, and a grinding and polishing system.

Uniqueness

The MCL has an extensive history of successful collaborations with academia, government, and industry clients ranging from startups to multinational corporations in the aerospace, automotive, coatings, geochemical, medical, semiconductor, and other markets.

MSE faculty and staff serve as resources in the following areas of specialization: biofuel cells, ceramics, composites, computational electronic materials and polymers, electronic materials and assemblies, explosive sensing, nanomaterials, nanotechnology, and more.

The MCL has expertise in:

- Biomedical materials and devices
- Ceramics
- Composites
- Electronic materials
- Metals and metal oxides
- Polymers

The MCL provides the following:

- Cross-sectional analysis
- Materials analysis, comparison, and identification
- Microphotography suitable for advertising and training purposes
- Routine analysis for quality assurance and control
- Workforce training / education

Services

The MCL staff provide consultations and experiment design suggestions based on the needs of the user. The services offered by the MCL include materials characterization with the following techniques:

Microscopy

- Optical microscopy & metallography
- Scanning electron microscopy (SEM) with secondary electron (SE), backscatter electron (BSE), and energy dispersive X-ray spectroscopy (EDS) detectors

Spectroscopy

- Fourier transform infrared (FTIR) spectroscopy
- Ultraviolet-visible-near infrared (UV-Vis-NIR) spectrophotometry

X-Ray Diffraction (XRD)

- Lattice parameters
- Percent crystallinity
- Phase identification
- Phase quantification

Macroscopic & Physical Testing

- Differential scanning calorimetry (DSC)
- Dilatometry
- Instron mechanical testing – tensile, compression, and flexure testing
- Surface area and pore size analysis

Sample Preparation

- Carbon and gold sputtering
- Cross-sectioning / microsectioning
- Grinding and polishing

The MCL also serves as a facility for Materials Science and Engineering undergraduate and graduate level courses that involve materials characterization.

Equipment

Optical Microscopy

- Olympus BH2 Series System Microscope with UC50 5 Megapixel Digital Color Camera
- Olympus Tokyo PME Inverted Stage / Metallographic Microscope
- Olympus VANOX Universal Research Microscope

Scanning Electron Microscopy

- Hitachi S-3000N Scanning Electron Microscope (SEM) with Secondary Electron (SE), Backscatter Electron (BSE), and EDAX HIT S3000N Energy Dispersive X-ray Spectroscopy (EDS) Detectors
- Hitachi TM3030Plus Tabletop Microscope (SEM) with SE and BSE Detectors

Spectroscopy

- Varian 3100 Excalibur Series Fourier Transform Infrared Spectrometer (FTIR) with Attenuated Total Reflectance (ATR) and Transmission Accessories
- Perkin-Elmer LAMBDA 950 UV-Vis-NIR Spectrophotometer with 150 mm Integrating Sphere, 2D Detector Module, and Universal Reflectance Acc.(URA)

X-Ray Diffraction

- Philips PANalytical X'Pert X-Ray Diffractometer (XRD)
- Bruker D2 Phaser X-Ray Diffractometer (XRD)

Macroscopic & Physical Testing

- NETZSCH DSC 3500 Sirius Differential Scanning Calorimeter (DSC)
- Anter Corporation Work Horse IB Dilatometer
- Instron 5969 Dual Column Tabletop Testing System
- Micromeritics Gemini V BET Surface Area and Pore Size Analyzer
- Micromeritics FlowPrep 060 Sample Degas System
- METTLER AE100 Analytical Balance

Sample Preparation

- Cressington 108carbon/A Carbon Coater for Conductive Carbon Coatings
- Cressington 108auto Sputter Coater for Conductive Gold Coatings

Cross-Sectioning / Microsectioning

- Buehler SimpliMet II Mounting Press
- LECO Spectrum System 1000 with Oscillating Polishing Head and Six Sample Holder

Personnel

Taylor Sparks, Ph.D., Director, Assistant Professor, Faculty Advisor
Angela Nelson, Administrative Officer
Kimberly Watts, Lab Manager

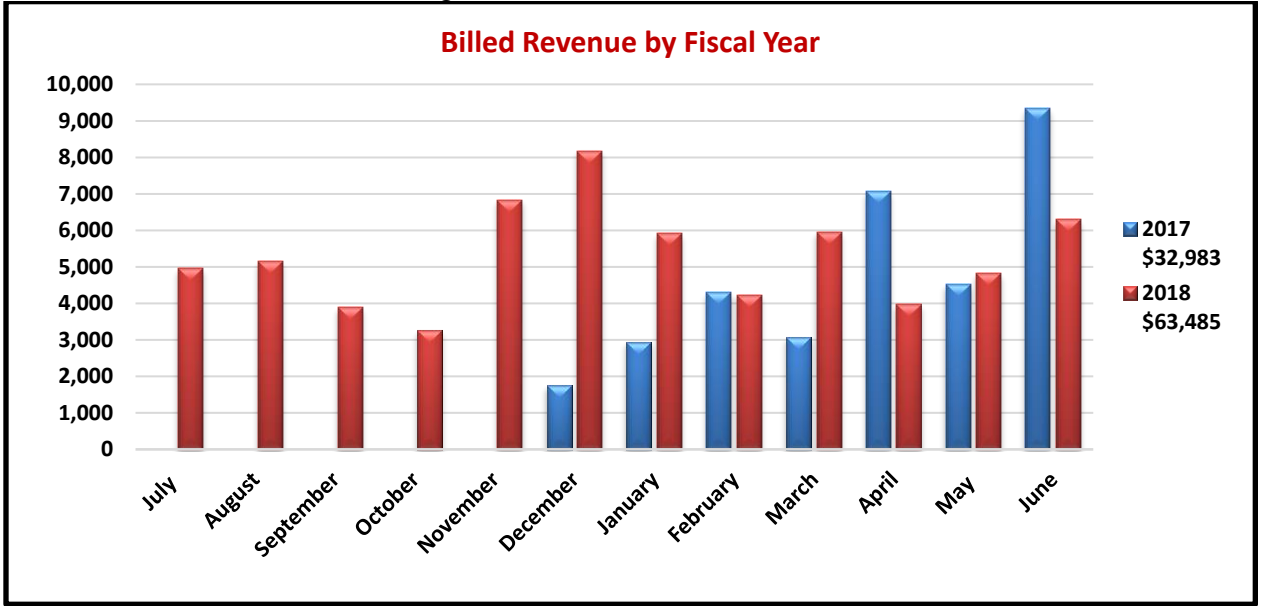
Goals for FY19

- Increase lab usage and revenue
- Create standard training videos and materials for interns and users alike
- Formulate and enact lab organization practices that will decrease turnaround time for lab results

Revenue/Expenses

FY18 Expenses: Total $74,716
FY18 Revenue: Total $63,485

- VP of Research Support: $ 0
- FY18 revenue generated from services: $63,485



* Legend displays total annual revenue by year earned.

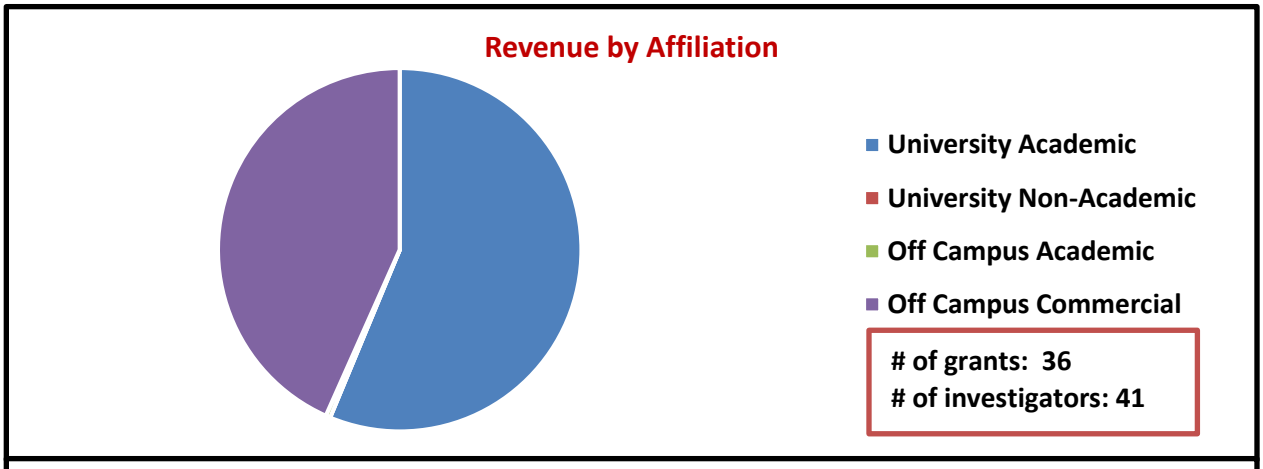
Advisory Board Committee

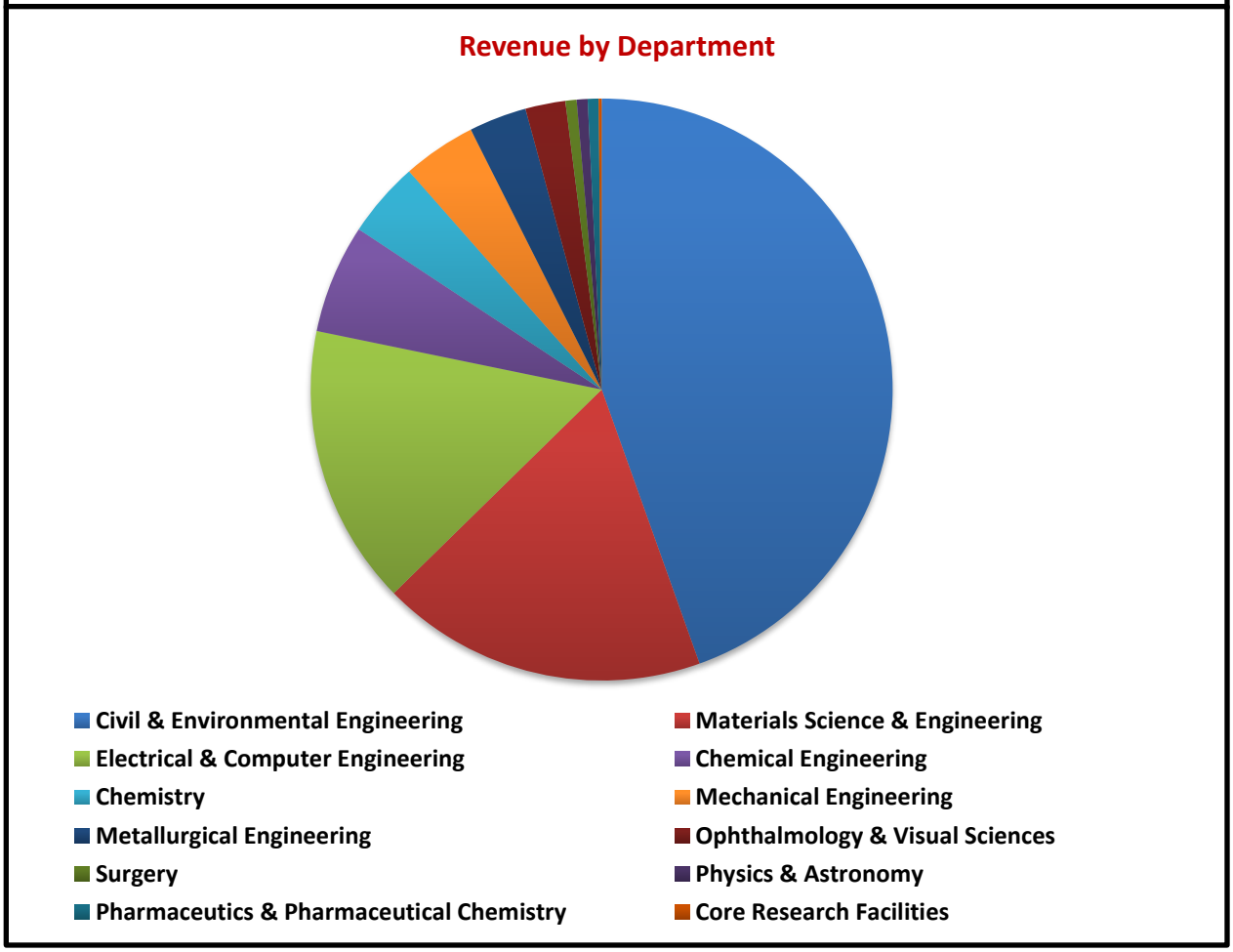
Last meeting date: June 20, 2017
Taylor Sparks, Ph.D., Assistant Professor
Mike Scarpulla, Ph.D., Associate Professor
Dmitry Bedrov, Ph.D., Associate Professor

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):





Top Users

1	McDonald, Luther	DHS
2	Sparks, Taylor	Fisher Company
3	Western Institute for Biomedical Research	Commercial
4	Nahata, Ajay	NSF
5	Jevremovic, Tatjana	Department
6	Utah Materials Research	Commercial
7	Storagenergy Technologies	Commercial
8	Virkar, Anil	NSF, DOE
9	Edwards Lifesciences	Commercial
10	Technology Holding LLC	Commercial

National Center for Veterans Studies

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Overview

The mission of the National Center for Veterans Studies (NCVS) at The University of Utah is to engage in research, education, outreach, and advocacy for improving the lives of military personnel, veterans, and their families. The NCVS conducts research primarily focused on suicide prevention and PTSD among service members and veterans, and provides evidence-based treatments to this community at no cost. NCVS staff also conduct training workshops and educational presentations for healthcare providers and the public.

Services

NCVS offers a range of services including consulting, training, and psychological treatments. Main services that have been developed and used during FY2018 include:

- **Suicide prevention training workshops.** The NCVS provides a range of training workshops to licensed mental healthcare providers, certified peer specialists, and other members of the community. These workshops focus on translating the results of NCVS research into a range of settings in order to better prepare healthcare providers and communities to assist high-risk service members and veterans.
- **Psychological treatments for service members, veterans, and first responders.** The NCVS offers evidence-based treatments for the military, veteran, and first responder communities at no-cost. The NCVS has pioneered innovative treatment delivery methods shown to yield more rapid recovery from posttraumatic stress disorder (PTSD) and suicidal thinking. The primary treatments offered by the NCVS include cognitive processing therapy for PTSD and brief cognitive behavioral therapy for suicide prevention. Service members, veterans, and first responders interested in receiving these therapies can contact the NCVS to schedule an initial consultation at ncvs@utah.edu or 801-587-7978.

Personnel

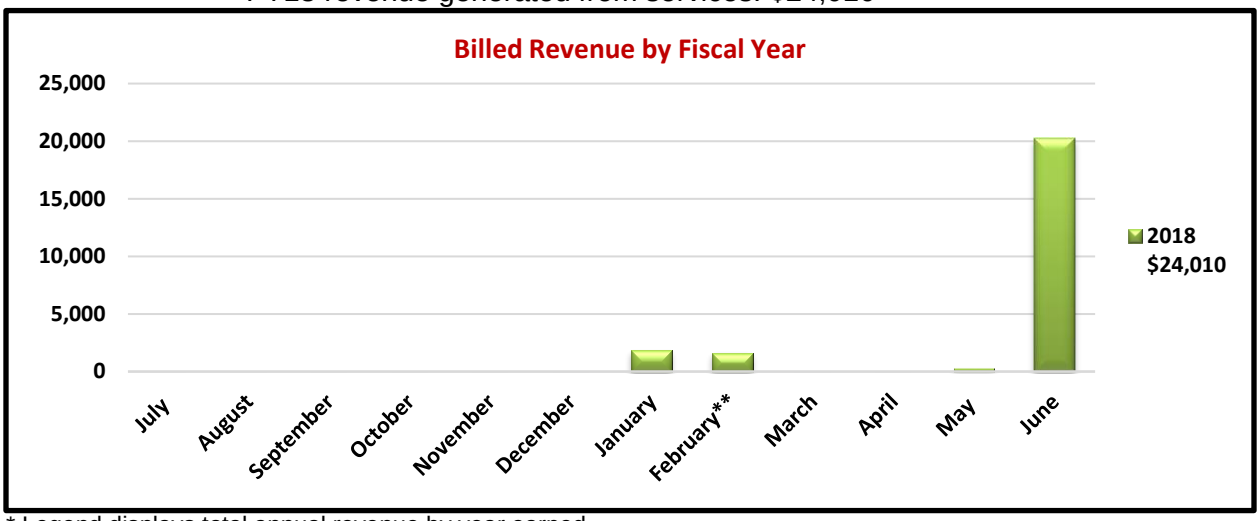
Craig Bryan, PsyD, ABPP, Executive Director
AnnaBelle Bryan, MS, Director of Operations
Feea Leifker, PhD, Director of Clinical Services
David Rozek, PhD, Director of Training

Revenue/Expenses

FY18 Expenses: Total $1,416

FY18 Revenue: Total $24,010

- VP of Research Support: $ 0
- FY18 revenue generated from services: $24,010



* Legend displays total annual revenue by year earned.
** Management by Core Administration 2018.

Grant Support

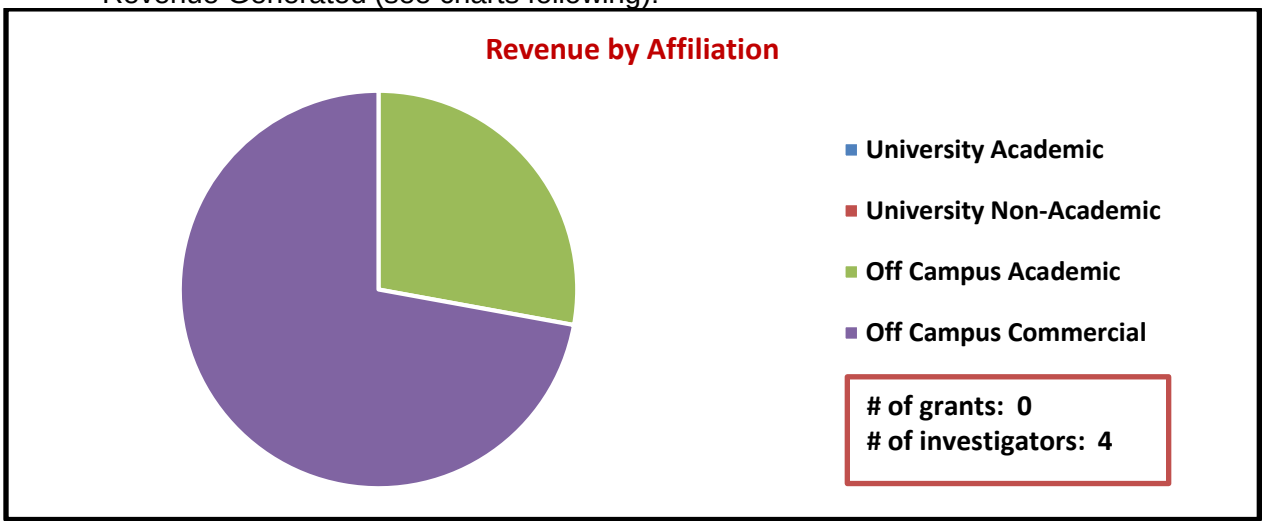
The NCVS has been awarded the following research grants this year:

- Department of Defense – Peer to Peer Programs for Military Suicide Prevention
- The Boeing Company – Suicide & Trauma Reduction Initiative for VEterans (STRIVE)
- Bob Woodruff Foundation – R&R Program
- Department of Defense – Brief Cognitive Behavioral Therapy Replication Trial
- Department of Defense – Project Safe Guard (Prime: University of Southern Mississippi)

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):



Top Users

1	Whiteman AFB	Commercial
2	UT Health San Antonio	Off Campus Academic
3	Davis School District	Off Campus Academic
4	Ted Bonar Consulting	Commercial

Publications

NCVS researchers have published 27 scientific papers thus far in 2018, and published a total of 21 scientific papers in 2017

Nuclear Engineering

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Overview

UNEP provides state-of-the-art laboratories used for alpha, beta, gamma and neutron radiation detection, irradiation of material samples to study various effects of various types of radiation, and neutron activation analysis techniques (nondestructive technique to find a sample elemental composition). UNEP maintains a 7,500 sq ft nuclear engineering and radiochemistry facility, including a fully operable 100 kW TRIGA Mark-1 nuclear reactor, 3 High Purity Germanium (HPGe) gamma detectors, liquid scintillation counting, and alpha spectrometry.

Uniqueness

The Utah Nuclear Engineering Facility is the only nuclear research reactor in the State of Utah, and one of the few in the Intermountain West area. We offer a number of unique, non-destructive testing techniques for analyzing isotopic and chemical composition of a wide variety of samples. UNEP has been at the forefront of establishing a safety culture and practices, already implemented at large scale commercial power plants, in a research reactor environment. UNEP also allows students from the University of Utah, as well as other local universities, to train for and obtain a Reactor Operator (RO) license from the Nuclear Regulatory Commission (NRC).

Services

The types of services offered by UNEP include material characterization by chemical composition analysis and radiation resistance of samples placed in high radiation environments. Example services are as follows:

- Neutron Activation Analysis (NAA)
- Sample Irradiation
- Electronics Hardness Testing
- Radioisotope Generation
- Passive Gamma Spectroscopy
- Alpha Spectroscopy
- Liquid Scintillation Counting
- Fission Track Analysis

Because of the uniqueness and lack of familiarity that often encompasses a research reactor an important aspect of our work is consulting with researchers and PIs at the early stages of their research in order to establish an efficient and cost effective plan with utilizing our TRIGA reactor and wide variety of radiation detectors.

Equipment

Radiation Detectors

- Canberra Alpha Analyst
- Canberra HPGe detectors
  - BEGe 3830
  - REGe 4020
  - GC 4020
- Beckman Liquid Scintillation Counter
- TRIGA Research Reactor

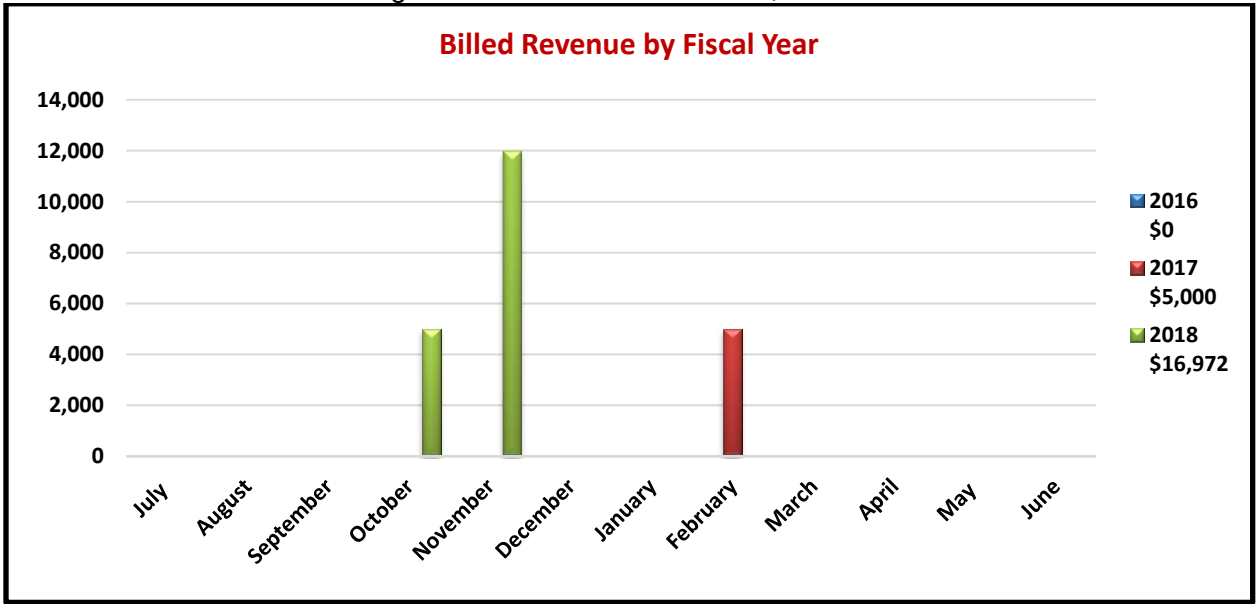
Personnel

Matthew Lund, Reactor Supervisor
Amanda Foley, Reactor Operator
Lucas Albright, Reactor Operator
Steven Pappas, Operator in Training
Alexander Reifsnyder, Operator in Training
Donavan Feist, Lab Analyst

Revenue/Expenses

FY18 expenses: $10,610
FY18 revenue: $16,972

- FY18 revenue generated from services: $16,972



* Legend displays total annual revenue by year earned.

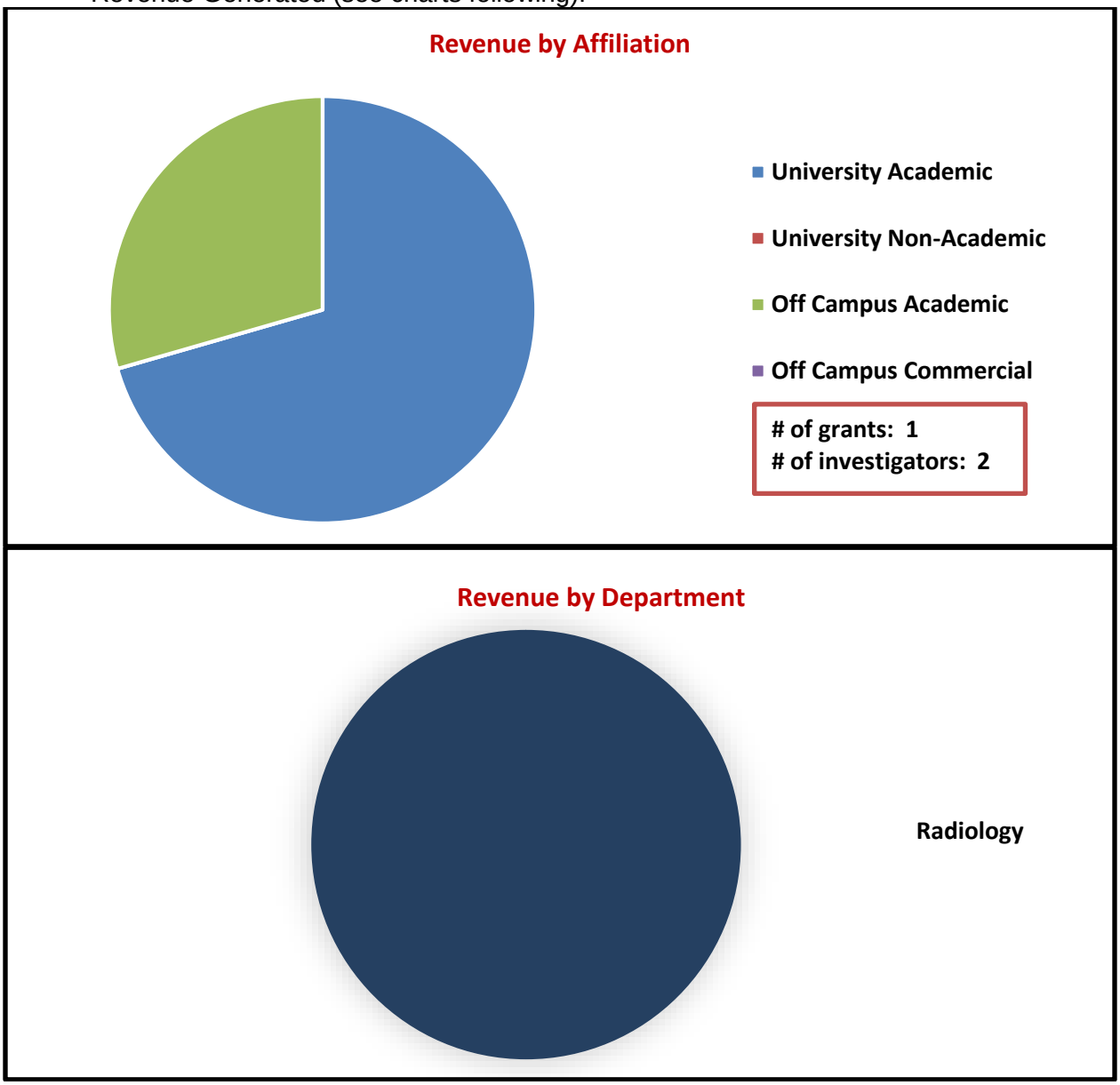
Advisory Board Committee

Last meeting date: March 27, 2017
Jim Byrne, Reactor Safety Committee Chair
Terry Ring, Professor, Chemical Engineering
Greg Moffitt, Former Reactor Supervisor

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):



Top Users

1	Minoshima, Satoshi	U of U Research Foundation, Department
2	Okayama University	Off Campus Academic

Goals for FY18

- Characterize and begin utilizing pneumatic irradiator
- Alpha spectrometry
- More consistent user base
- International 2 Week Training course with Okayama University
- Possible labs/classes with outside entities

Scalable Analytics & Informatics

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Overview

The University of Utah Center for Scalable Analytics and Informatics (USAI) provides support to research and operations groups inside and outside the University of Utah. These services include Annotation and Chart Review, Natural Language Processing, EMR-driven Clinical Trial Recruitment, Analytics and Data Services, and Enterprise Architecture and Application Development.

Uniqueness

Utah Scalable Analytics and Informatics provides multiple services for researchers utilizing electronic medical records. EMR-driven Clinical Trial Recruitment provides the ability to identify patients during an encounter with a healthcare provider that potentially could participate in a clinical trial and could drastically reduce cost and increase recruitment. Annotation products help machines and humans mark-up data for classification. Natural Language Processing (NLP) processes test data to extract structured data to infer concepts that can be understood by machines and humans for further analysis. USAI's annotation product line focuses on easing the burden and increasing consistency of manual chart review and annotation tasks. While annotation and chart review are time consuming and expensive, they are vital to many part of the research process: data exploration, feasibility, defining study variables, identifying information in text notes, classifying information within a document, at the document level, at the encounter or patient level, and validating study results. USAI provides Enterprise Architecture and Application Development and has developed annotation tools to support Natural Language Processing, which improves outcomes in health services research and reduces the costs to the researcher. Education is also important to USAI and therefore USAI has recruited and trained computer science students.

Services

- Annotation and Chart Review
- Natural Language Processing
- EMR-driven Clinical Trial Recruitment
- Analytics and Data Services
- Enterprise Architecture and Application Development

Consultation is provided in order to define a projects scope and budget in the early stages of development to make optimal and efficient use of USAI's services. The staff will also handle regulatory requirements and project management if needed.

Specialized Software

Chart Review

- eHOST
- ChartReview

Natural Language Processing

- Leo
- Chex

Data Exploration and Visualization

- FirstLook

Personnel

Scott L DuVall, PhD, Director
Chris Ledding, Financial Analyst
Olga Patterson, Applied NLP Lead
Brad Adams, Senior Software Designer and Programmer
Patrick Alba, Clinical Data Manager
Corinne Halls, Clinical Research Annotation Manager
Daniel Denhalter, Clinical Research Annotation Manager

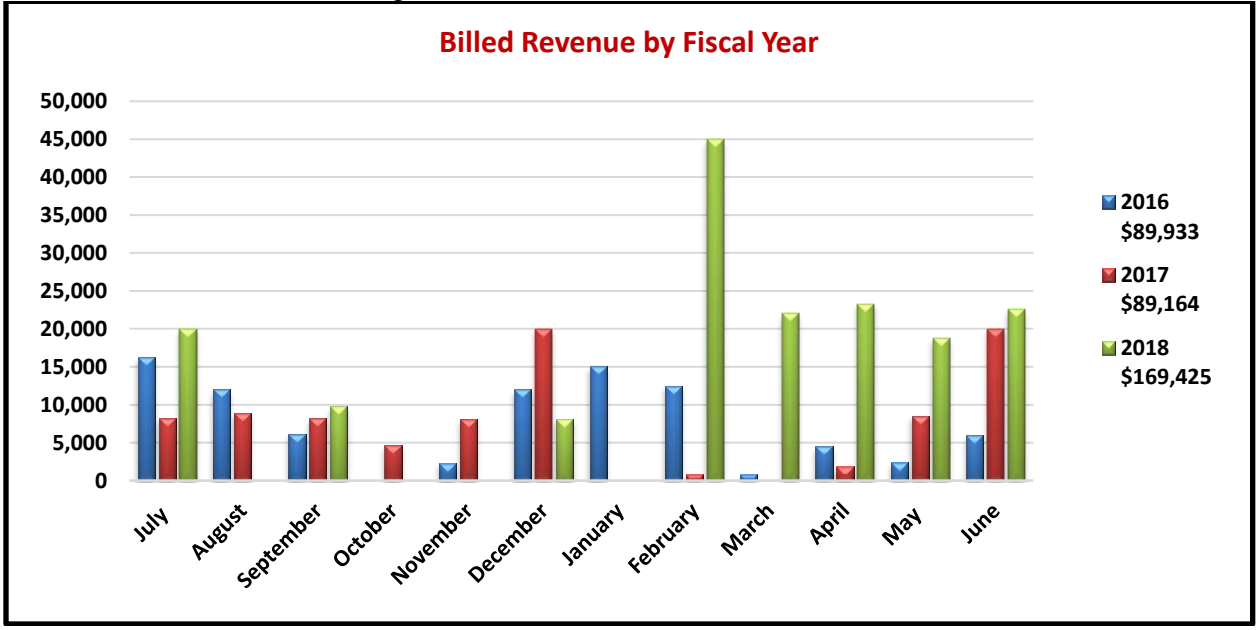
Goals for FY19

USAI will continue to offer and expand its services to University and Industry members in health sciences research by providing EMR-driven patient trial recruitment, annotation and chart review, natural language processing, enterprise architecture and application development and data analysis. To meet increasing demand of USAI's services, the team has brought on board several new staff members to include health science research specialists, computer programmers, data managers and administrative support

Revenue/Expenses

FY18 Expenses: **$77,036**
FY18 Revenue: **$169,425**

- VP of Research Support: $0
- FY18 revenue generated from services: $169,425



* Legend displays total annual revenue by year earned.

Management Meeting

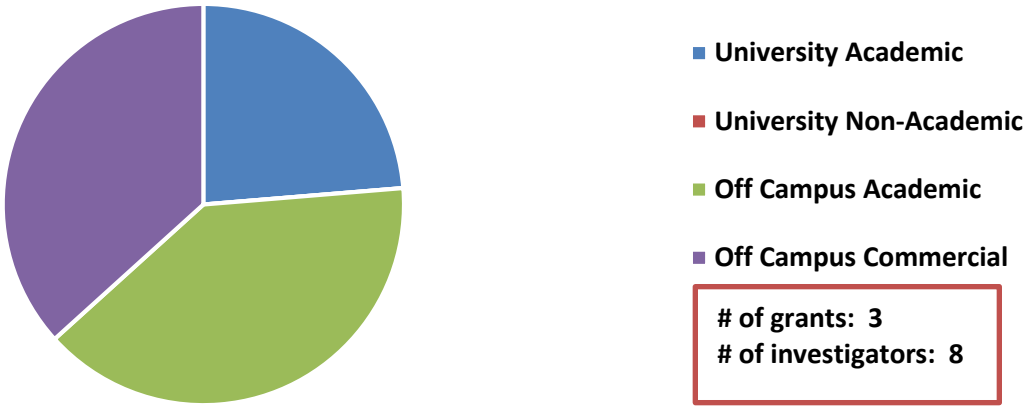
Last meeting date: Aug 10, 2017
Scott L DuVall, PhD, Director
Ryan Heugly, Program Manager
Christopher Ledding, MBA, Financial Analyst

FY18 Scientific Impact

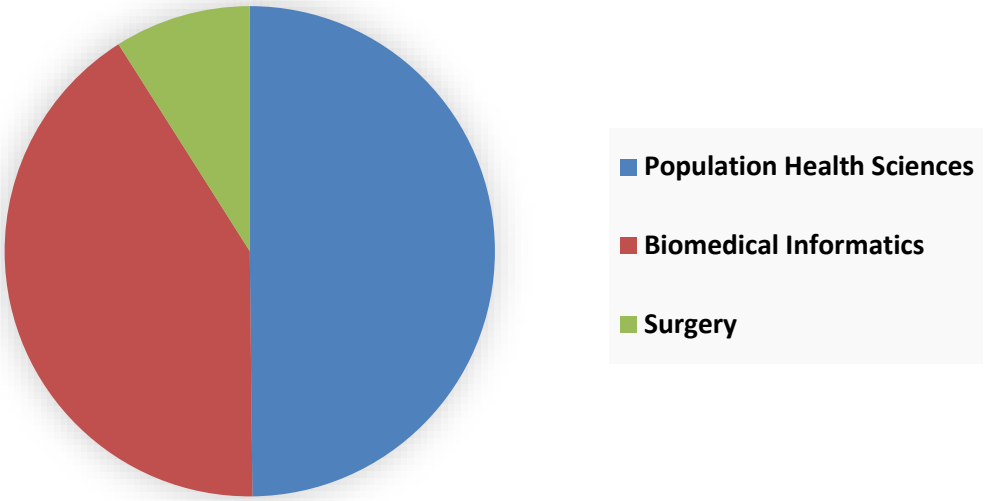
Research Support

Revenue Generated (see charts):

Revenue by Affiliation



Revenue by Department



Top Users

1	Vanderbilt University Medical Ctr.	Off Campus Academic
2	Anolinx	Off Campus Commercial
3	Western Inst. For Biomed. Res.	Off Campus Academic
4	Novartis Pharmaceuticals	Off Campus Commercial
5	University of Michigan	Off Campus Academic
6	Dartmouth College	Off Campus Academic
7	PAREXEL	Off Campus Commercial
8	Bucher, Brian	Department

Publications

1. Johnson SB, Adekkanattu P, Campion TR Jr, Flory J, Pathak J, Patterson OV, DuVall SL, Major V, Aphinyanaphongs Y. From Sour Grapes to Low-Hanging Fruit: A Case Study Demonstrating a Practical Strategy for Natural Language Processing Portability. AMIA Jt Summits Transl Sci Proc. 2018 May 18;2017:104-112. eCollection 2018. PubMed PMID: 29888051; PubMed Central PMCID: PMC5961788.
2. Jones MM, Winthrop KL, Nelson SD, Duvall SL, Patterson OV, Nechodom KE, Findley KE, Radonovich LJ Jr, Samore MH, Fennelly KP. Epidemiology of nontuberculous mycobacterial infections in the U.S. Veterans Health Administration. PLoS One. 2018 Jun 13;13(6):e0197976. doi: 10.1371/journal.pone.0197976. eCollection 2018. PubMed PMID: 29897938; PubMed Central PMCID: PMC5999224.
3. Gupta S, Liu L, Patterson OV, Earles A, Bustamante R, Gawron AJ, Thompson WK, Scuba W, Denhalter D, Martinez ME, Messer K, Fisher DA, Saini SD, DuVall SL, Chapman WW, Whooley MA, Kaltenbach T. A Framework for Leveraging "Big Data" to Advance Epidemiology and Improve Quality: Design of the VA Colonoscopy Collaborative. EGEMS (Wash DC). 2018 Apr 13;6(1):4. doi: 10.5334/egems.198. PubMed PMID: 29881762; PubMed Central PMCID: PMC5983017.
4. Widanagamaachchi W, Livnat Y, Bremer PT, Duvall S, Pascucci V. Interactive Visualization and Exploration of Patient Progression in a Hospital Setting. AMIA Annu Symp Proc. 2018 Apr 16;2017:1773-1782. eCollection 2017. PubMed PMID: 29854248; PubMed Central PMCID: PMC5977592.
5. Stevens VW, Stenehjem DD, Patterson OV, Kamauu AWC, Yim YM, Morlock RJ, DuVall SL. Characterization and survival of patients with metastatic basal cell carcinoma in the Department of Veterans Affairs: a retrospective electronic health record review. Arch Dermatol Res. 2018 Aug;310(6):505-513. doi: 10.1007/s00403-018-1834-8. Epub 2018 May 8. PubMed PMID: 29737404.
6. Lynch KE, Whitcomb BW, DuVall SL. How Confounder Strength Can Affect Allocation of Resources in Electronic Health Records. Perspect Health Inf Manag. 2018 Jan 1;15(Winter):1d. eCollection 2018 Winter. PubMed PMID: 29618960; PubMed Central PMCID: PMC5869441.
7. Maguen S, Madden E, Patterson OV, DuVall SL, Goldstein LA, Burkman K, Shiner B. Measuring Use of Evidence Based Psychotherapy for Posttraumatic Stress Disorder in a Large National Healthcare System. Adm Policy Ment Health. 2018 Jul;45(4):519-529. doi: 10.1007/s10488-018-0850-5. PubMed PMID: 29450781.
8. Hull LE, Lynch JA, Berse BB, DuVall SL, Chun DS, Venne VL, Efimova OV, Icardi MS, Kelley MJ. Clinical Impact of 21-Gene Recurrence Score Test Within the Veterans Health Administration: Utilization and Receipt of Guideline-Concordant Care. Clin Breast Cancer. 2018 Apr;18(2):135-143. doi: 10.1016/j.clbc.2017.11.018. Epub 2017 Nov 29. PubMed PMID: 29306660.
9. Brittain EL, Duncan MS, Chang J, Patterson OV, DuVall SL, Brandt CA, So-Armah KA, Goetz M, Akgun K, Crothers K, Zola C, Kim J, Gibert C, Pisani M, Morris A, Hsue P, Tindle HA, Justice A, Freiberg M. Increased Echocardiographic Pulmonary Pressure in HIV-infected and -uninfected Individuals in the Veterans Aging Cohort Study. Am J Respir Crit Care Med. 2018 Apr 1;197(7):923-932. doi: 10.1164/rccm.201708-1555OC. PubMed PMID: 29131651; PubMed Central PMCID:PMC6020408.
10. Schroeck FR, Patterson OV, Alba PR, Pattison EA, Seigne JD, DuVall SL, Robertson DJ, Sirovich B, Goodney PP. Development of a Natural Language Processing Engine to Generate Bladder Cancer Pathology Data for Health Services Research. Urology. 2017 Dec;110:84-91. doi: 10.1016/j.urology.2017.07.056. Epub 2017 Sep 12. PubMed PMID: 28916254; PubMed Central PMCID: PMC5696035.

Transgenic & Gene Targeting Core

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Overview

The Transgenic & Gene Targeting Core (TGTC) provides world-class service and assistance in the field of mouse transgenesis, gene targeting, and related mouse endeavors to the scientific community. The complex technology, expensive equipment, precise techniques and expertise provided by TGTC continues to be a critical tool in maintaining the University of Utah's position at the cutting edge of scientific research and a leader in the field of mouse genetic modification.

Our main services provide transgenic and gene targeted mice to researchers. CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) technology has allowed researchers, even those not adept at molecular biology, to obtain specific gene targeted mice for their research in a more direct manner than traditional methods. TGTC uses CRISPR technology to generate knockout, knockin, and conditional targeted mice. This method allows for faster, more efficient and less expensive generation of mice with specific genetic mutations.

Other services include conventional gene targeting of ES (embryonic stem) cells followed by injection of targeted cells to produce germline chimeras, and production of traditional transgenic mice where the transgene is randomly inserted into the genome. In addition, TGTC has expertise in mouse-related procedures including embryo and sperm cryopreservation, in vitro fertilization (IVF), intracytoplasmic sperm injection (ICSI), karyotyping of ES cells, rederivation of mice from frozen embryos, and derivation of primary ES cells. Our facility consists of two cell culture hoods and incubators, two microinjection stations for both pronuclear and blastocyst injections, three surgery areas, and a mouse room for housing and breeding the necessary animals. All of the people in the TGTC have several years of vast experience in the transgenic mouse field.

Services

- Mouse generation of targeted mutations using CRISPR/Cas technology to create specific genetic mutations including knockout, knockin, and conditional knockout
  - via microinjection of reagents
  - via ZEN (zygote electroporation of nucleases)
  - via GONAD (genome editing via oviductal nucleic acids delivery)
- In vivo Validation of CRISPR reagents
- Blastocyst injection of targeted ES embryonic stem cells
- Pronuclear injection of DNA to produce transgenic mice
- Gene targeting of ES embryonic stem cells
- Primary ES cell generation
- Sperm cryopreservation
- Embryo cryopreservation
- IVF, in vitro fertilization
- Rederivation of mouse lines via embryo transfer
- Ovary transfer
- Import/export sperm and/or embryos
- Karyotyping of ES embryonic stem cells
- Sperm and embryo long-term storage

Equipment

- Zeiss Axio Observer.Z1 microinjection station
- Nikon Diaphot 300 microinjection station
- Eppendorf Transferman NK2 micromanipulators
- Eppendorf Femtojet microinjector
- Nikon SMZ645 dissection microscopes
- Olympus SZX10 dissection microscopes
- Nikon Eclipse TS100 inverted microscopes
- Sutter P-97 pipette puller
- Narashige MF-900 microforges
- ESCO, Forma, New Brunswick CO2 incubators
- MINC IVF incubator
- Brinkman benchtop autoclave
- ESCO cell culture hood
- Forma cell culture hood
- BioRad Gene Pulser Xcell electroporator
- Thermo Cryomed controlled rate embryo freezer
- Thermo ULT -80 freezer
- Thermo -135 freezer
- Centrifuges, microfuges

Personnel

Susan Tamowski, Director
Wenhua Li, Senior Lab Specialist
Kyle O'Connor, Senior Lab Specialist
He Lan, Senior Lab Specialist
Nick Black, Lab Specialist

2018 Annual Update

New Equipment

- BEX Pulse Generator CUY21 EDITII GONAD machine, on loan from Japan, used for in vivo electroporation of CRISPR reagents into mouse embryos

New Services

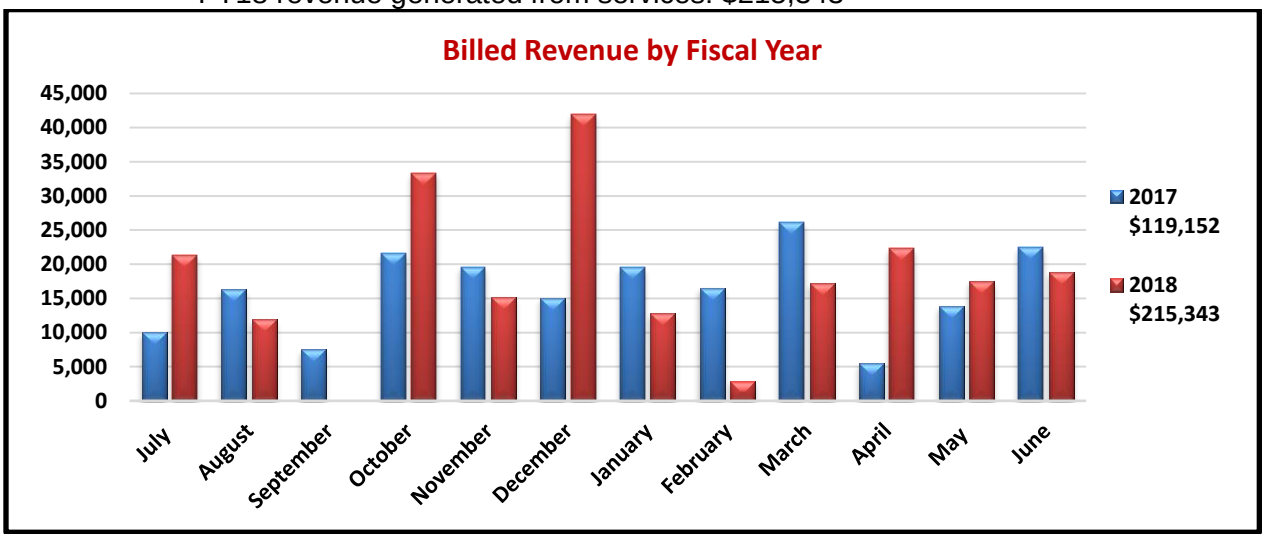
- New technology includes GONAD, a direct in vivo method of generating mutant mice using CRISPR/Cas

Revenue/Expenses

FY18 Expenses: **Total $631,931**

FY18 Revenue: Total $652,982

- VP of Health Sciences Support: $437,369
- FY18 revenue generated from services: $215,343



* Legend displays total annual revenue by year earned.

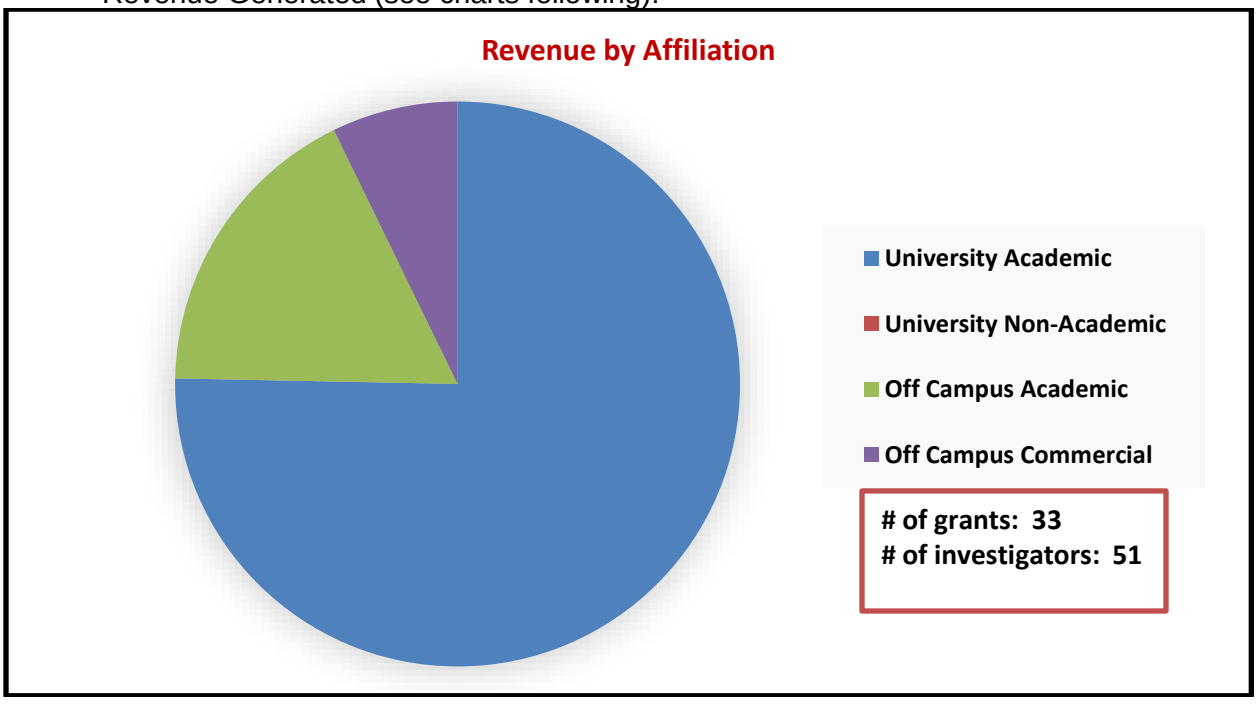
Advisory Board Committee

Charlie Murtaugh, Co-Director, Professor, Human Genetics
Suzi Mansour, Professor, Human Genetics
Dean Tantin, Associate Professor, Pathology

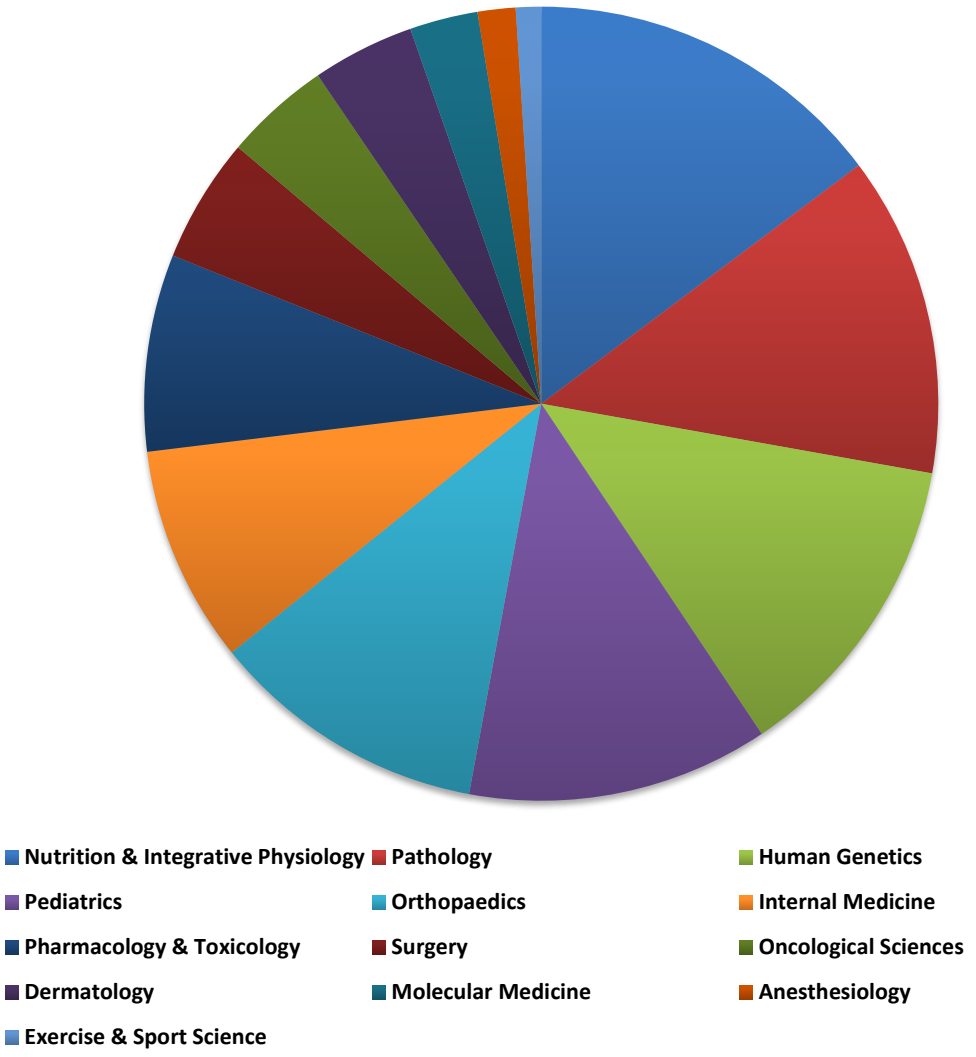
FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



Top Users

1	Summers, Scott	NIH, Department
2	Science Exchange Inc.	Commercial
3	Chou, Hung-Chieh	American Diabetes Assoc., UT Science Tech. Research
4	Baehr, Wolfgang	NIH
5	Lai, Kent	Department, NIH, NEH
6	Park, Sungjin	NIH
7	Yang, Jun	NIH, Department
8	Kardon, Gabrielle	Department
9	Jones, Kevin	NIH
10	Lamb, Tracey	NIH

HEALTH
UNIVERSITY OF UTAH

Letter of Support for grants:

1. Mark Warren's application for an NIH grant that includes the generation of a new mouse to study the importance heart arrhythmia and its relationship to cardiac sodium channels. Obtaining this mouse model is a key component in addressing the origin of RVOT vulnerability in BrS patients.
2. Mary Elizabeth Hartnett's application for an RO1 grant entitled "Mechanisms of Angiogenesis in Retinopathy of Prematurity" to include generating an inducible knockout mouse of EPOR.
3. Corrine Welt's application for an NIH grant to generate conditional mouse to recreate a stop gain mutation identified in a family with dominant inheritance of primary ovarian insufficiency and autoimmune disease.
4. Dean Tantin's application for an NIH grant to study the transcription regulators OCA-B and Oct1 and the establishment of poised gene expression states in memory T cells.
5. Matthew Rondini's application for a 2018 VA Merit Award entitled "*Platelet Reprograming during Inflammation"* that requires the generation of a platelet specific conditional knockout mouse.
6. Christopher Reilly's application for a grant entitled "TRP Channels and Air Pollution" that requires the generation of humanized mice using CRISPR/Cas technology.
7. Janis Weis' application for a grant entitled "Myostatin is a mediator and potential target in Lyme disease" to develop a myostatin deficient mouse to be able to identify quantitative trait loci that regulate the severity of murine Lyme disease.

USTAR CTR Genetic Discovery

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Overview

The UCGD service recharge center helps investigate the genetic basis for human disease by providing whole exome and genome sequence analyses for research and clinical projects. We specialize in variant calling and disease-gene discovery utilizing tools developed by the UCGD research group, including VAAST, pVAAST, PHEVOR, Lumpy, WHAM, IOBIO, RUFUS, and others. Services offered include alignment and variant calling (SNVs, INDELs, and structural variants) for NGS datasets, joint genotyping, disease gene discovery in cohorts and families, and ad hoc research analyses as dictated by the needs of the project. In total, the UCGD has available 2340 CPU cores and 3.25 PB of disc storage, plus access to additional shared resources. Total capacity for variant calling is approximately ~100,000 genomes per year via a combination of in-house and cloud-based processing. The UCGD is able to provide high-bandwidth transfers of data via parallelized transfer methods such as Globus, Aspera, and others.

Services

- Alignment and variant calling for NGS datasets, including whole genome, exome, and panel sequences using a Sentieon (GATK-based) variant calling pipeline
- Structural variant calling, annotation, and prioritization using the Base2 Genomics platform
- Reference-free variant calling and investigation of *de novo* variants using RUFUS
- Joint genotyping of separate data sets with ancestry-matched controls
- Disease gene discovery in cohorts and families using VAAST, pVAAST, PHEVOR, GEMINI, IOBIO, and other tools as needed

Personnel

Mary Anne Karren, Director
Barry Moore, Project Director
Shawn Rynearson, Software Developer
Carson Holt, Software Developer
Bushra Gorsi, Programmer/Analyst
Steven Boyden, Director of Research and Science
Chris Fahim, Project Lead
Ad hoc analysts from Yandell, Quinlan, and Marth laboratories including:
Javier Hernandez, Matt Velinder, Tom Nicholas, Andrew Farrell

2018 Annual Update

Grant Support – UCGD service recharge center provided service quotes and/or letters of support for the following grant submissions in FY18:

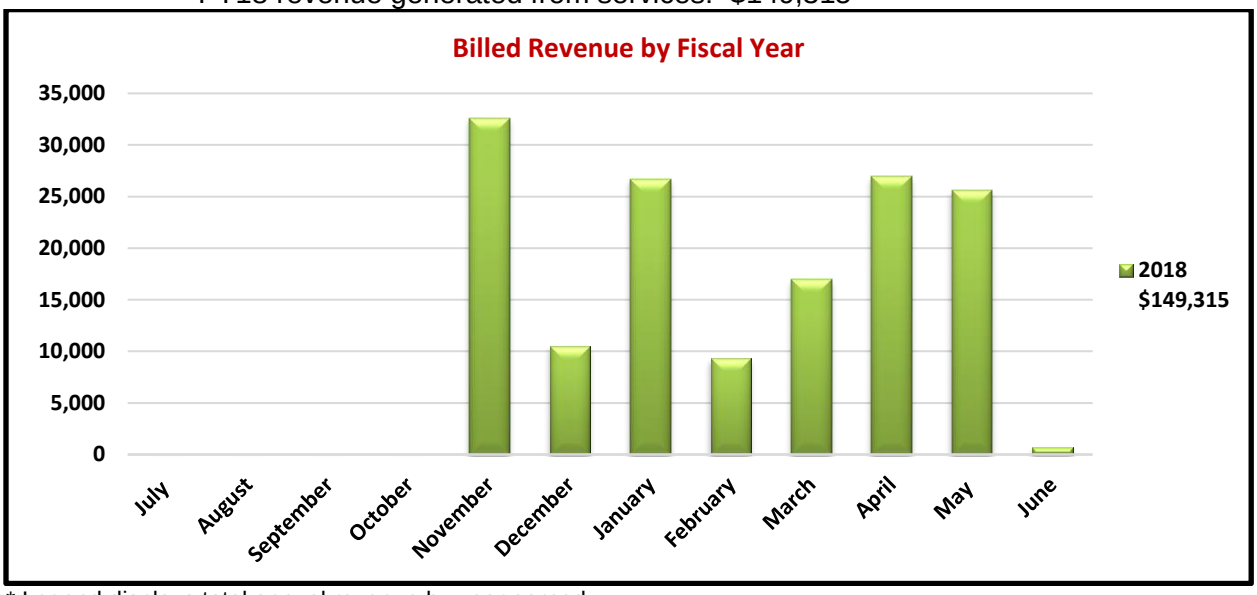
- Center for Fertility, Infertility, and Genomics (P50) Rothwell
- Intermountain West Clinical Site for the Undiagnosed Disease Network (U01) Botto

Revenue/Expenses

FY18 Expenses: **Total $34,647**

FY18 Revenue: **Total $149,315**

- VP of Health Sciences Support: $ 0
- FY18 revenue generated from services: $149,315



* Legend displays total annual revenue by year earned.

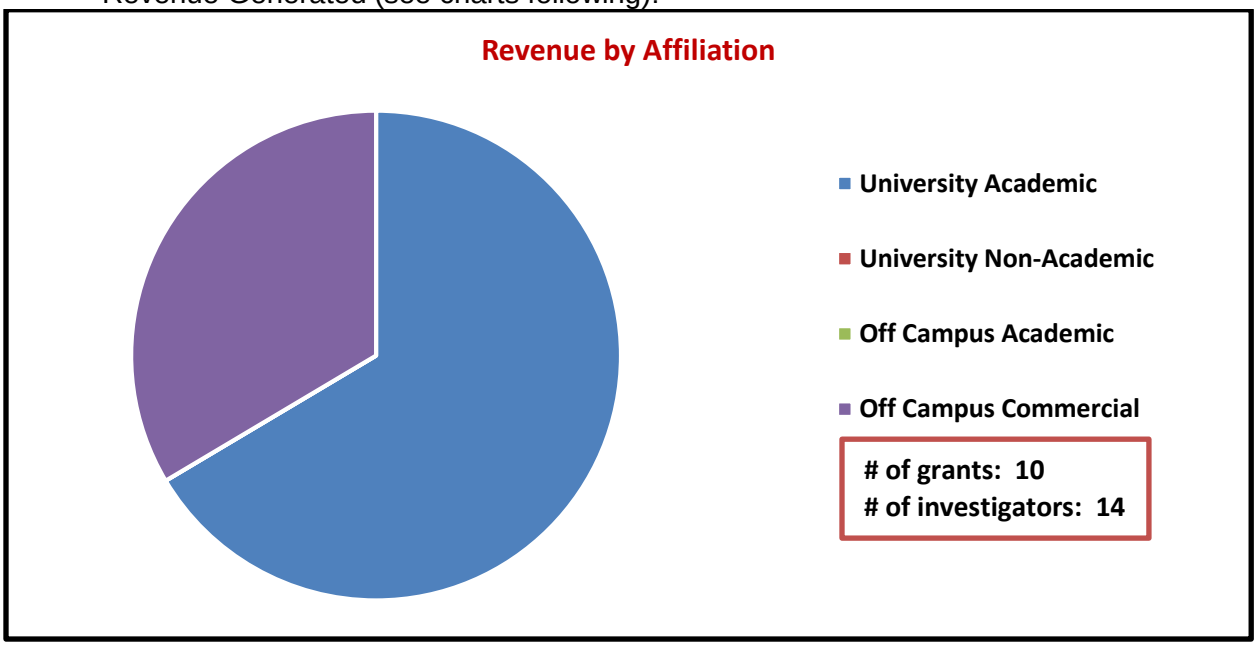
Advisory Board Committee

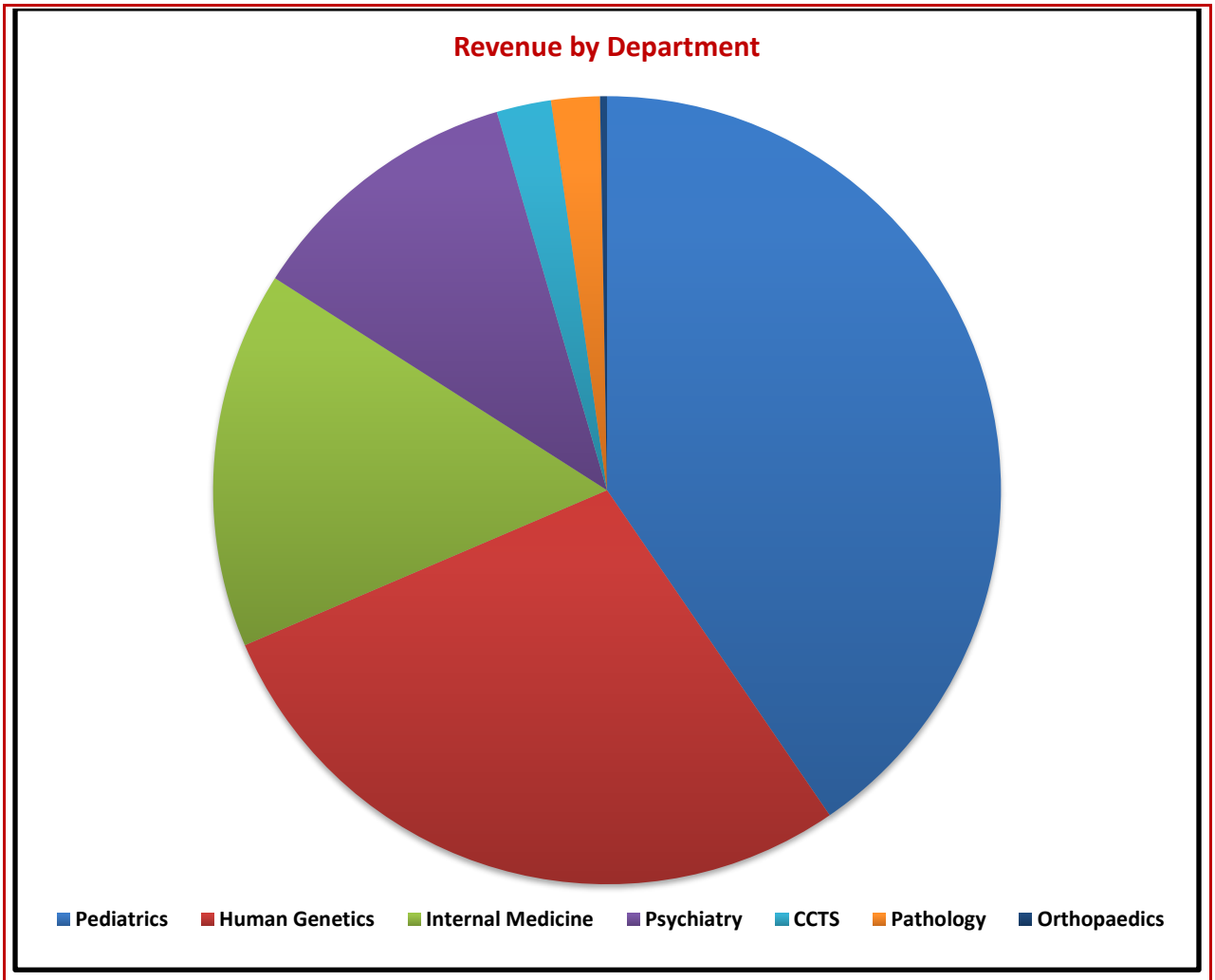
Mark Yandell, PhD, Professor of Human Genetics
Gabor Marth, DSc, Professor of Human Genetics
Aaron Quinlan, PhD, Associate Professor of Human Genetics

FY18 Scientific Impact

Research Support

Revenue Generated (see charts following):





Top Users

1	Fabric Genomics	Commercial
2	Tristani, Martin	NIH
3	Yandell, Mark	NIH, Janssen Research & Development
4	Coon, Hilary	Janssen Research & Development
5	Guthery, Stephen	NIH, Department
6	Welt, Corrine	NIH
7	Dere, Willard	NIH, Department
8	Pezzolesi, Marcus	National Kidney Foundation of Utah
9	Wever-Pinzon, Omar	Department
10	Camp, Nicola	HCI

NOTES