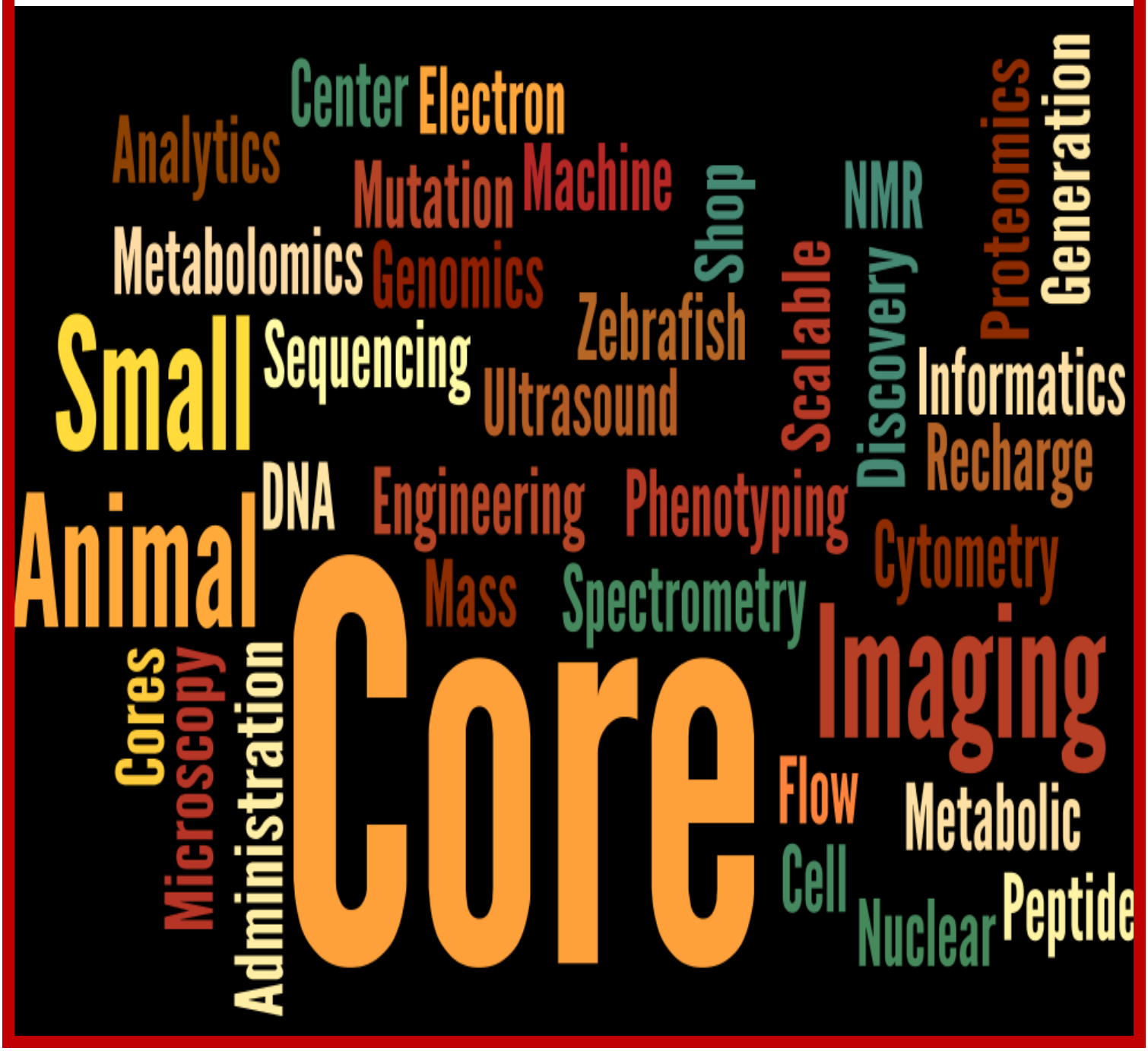
UNIVERSITY OF UTAH
HEALTH SCIENCES

2015 Annual Report

HSC CORES
UNIVERSITY OF UTAH



UNIVERSITY OF UTAH HEALTH SCIENCES

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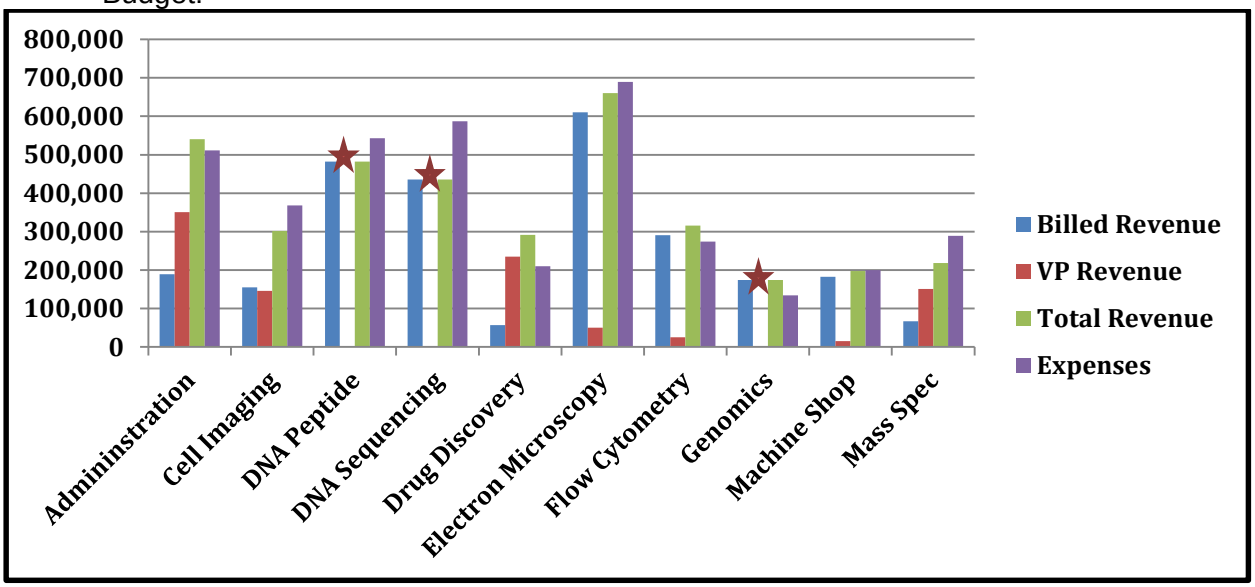
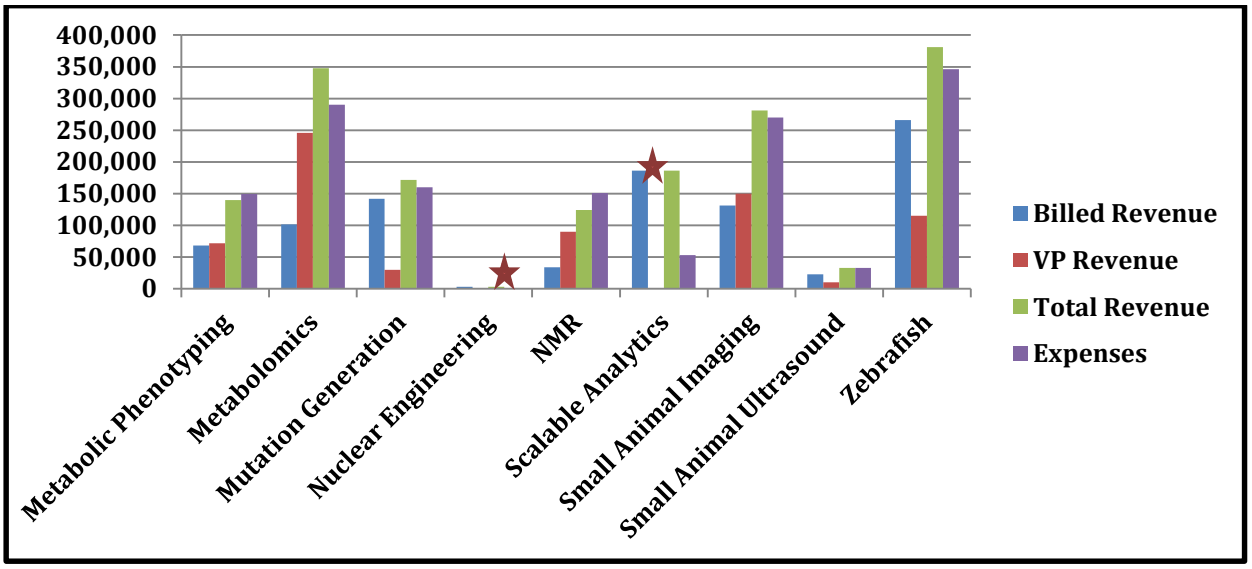
HEALTH SCIENCES

Core Facilities Overall Financial Summary

Revenue & Expenses

- The Core Facilities budget for FY15 was $5.1 million with an expense total of $5.2 million. Approximately $3 million in expenses went to salaries and benefits while $2.2 million was spent on equipment and operating supplies.
- In FY15, $3.4 million in services were billed.
- Budget:





** Positive cash carry forward balance from FY14 was applied to cost of expenses for FY15

★ These facilities received no operating support from the VP.

UNIVERSITY OF UTAH
HEALTH SCIENCES

Cores Administration

Overview

The Health Sciences Center (HSC) Core Facilities operate under central administration headed by Dr. John Phillips, who reports to Dr. Andy Weyrich. The administrative office is managed by Ms. Brenda Smith, with assistance from Ms. Esther Kim, and Mr. Jeff Ware. The Cores Administration office is responsible for the personnel management, budget preparation, financial affairs, ordering of supplies, tracking expenses of the Core Facilities. In addition, the administrative office supports general research infrastructure for the research community, for example maintaining the X-ray film developer in the SOM and the research irradiator logging and access requests. All cores operate on a charge-back basis, although recovery of operating expenses from recharge funds varies. The goal for each HSC Core Facilities is to provide the necessary technology and expertise for successful data generation and analysis for all faculty and students at the University of Utah. The goal of the administrative office is to provide a seamless billing, collections, ordering and personnel service so that technical core staff can focus on delivering the highest quality scientific resource.

Personnel

- John Phillips, Ph.D., Director HSC Core Facilities
- Brenda Smith, Associate Director of Finance
- Esther Kim, Administrative Assistant
- Jeff Ware, Accountant

2015 Annual Update

- The administrative team continues to refine the electronic scheduling and billing services to make as user friendly as possible. In 2015 the system was redesigned to be accessible from mobile devices and streamlined for scheduling events.
- In FY15, the Cores Administration office successfully reduced the amount of time to process billing to 1 business day. The new HSC scheduling/billing system validates chartfields with the University's CIS system which has eliminated billing errors.
- In FY15 the core had a combined billing of 3.4 million, however, what is most impressive was the collection rate for billed services was 100%. The internal tracking system that was created lists each account balance in real time. Each director can access the system by logging in and reviewing their reports. The tracking system currently stores fiscal data from 2 years.
- A new website was created for the HSC Cores. www.cores.utah.edu
- There were two new recharge centers added to the portfolio managed through the administrative office: Nuclear Engineering and Scalable Analytics & Informatics (see new sections for descriptions).
- The second annual retreat was held on September 25th. 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. Discussions regarding requirements for maintaining logs and copies of original data identified that there is no standardized system currently available, this issue will need to be revisited.

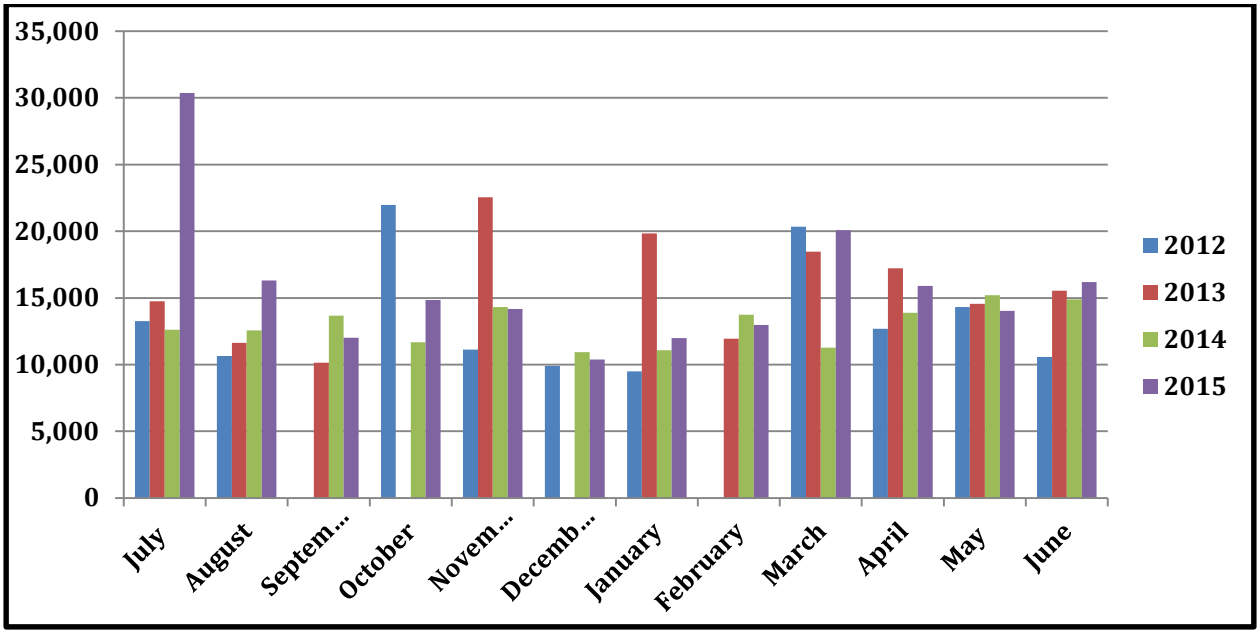
FY2016 Goals

- Develop a Virtual Genomics Website
- Develop an electronic inventory system

Cores Administration Revenue & Expenses

The administrative budget covers the following expenses: Salaries/Benefits: $286,000, Fixed Expenses: (such as IT Support, X-Ray Film Developer, and Irradiator) $180,000 and unanticipated service and repairs: $45,662

- VP of Health Science Support: $350,760
- FY15 revenue: $189,265
- FY15 expenses: $511,662
- FY15 Revenue from services*:



*This represents the income from the 5% administrative fee charged to each core, based on collected revenue from billed services.

Advisory Board Committee

Last meeting date: January 21, 2015

- Andy Weyrich*, Associate Dean for Basic and Translational Sciences
- Joseph Yost, Professor, Neurobiology and Anatomy
- Mark Yandell, Professor, Human Genetics
- John Phillips*, Director, Core Facilities
- Dennis Winge*, Professor, Hematology
- David Stillman, Professor, Pathology
- Wes Sundquist, Professor, Biochemistry
- Stephen Lessnick, Professor, Pediatric Hematology
- Carl Wittwer*, Professor, Pathology
- Eric Schmidt*, Professor, Medicinal Chemistry
  (* - in attendance)

Addendum

- Faculty Oversight Committee Guidelines can be found for all cores at the following link: http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

UNIVERSITY OF UTAH
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Cell Imaging Facility

Overview

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

Services

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

Equipment

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

Personnel

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

2015 Annual Update

New Equipment

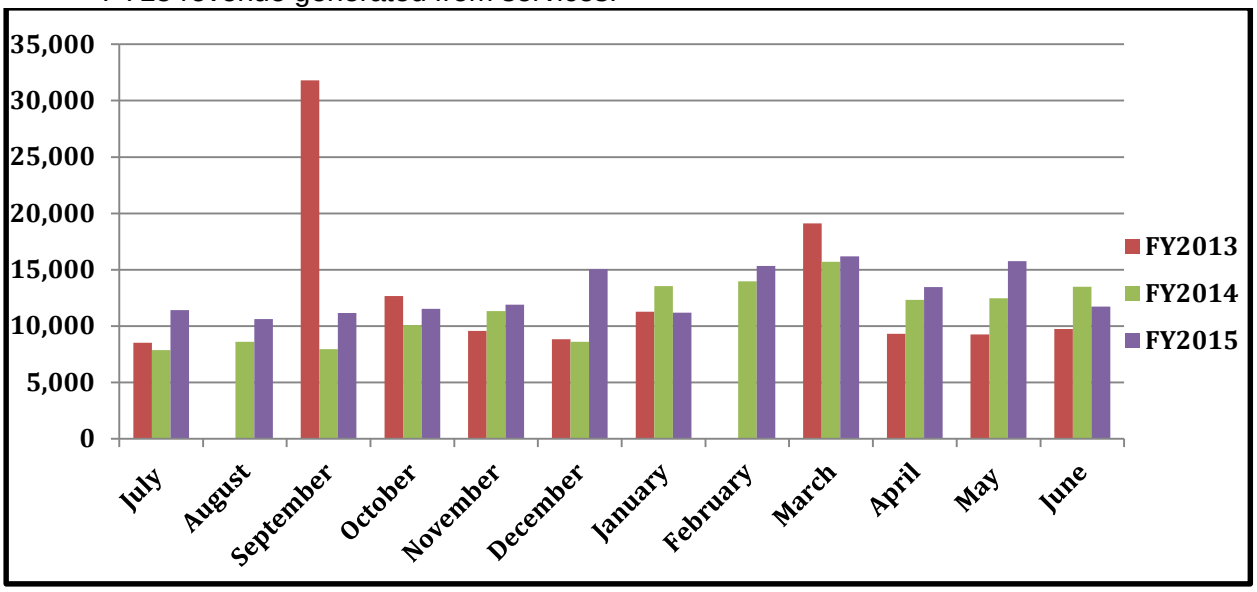
- January 2015 the SPIM light sheet microscope came online in part from funding obtained from HCI

New Services

- Mike Redd can perform zebrafish based imaging experiments for an hourly rate
- Cell based quantification is available on the Imaris workstation
- Branch core locations in Biology ASB230, SMBB and Huntsman Cancer Institute will be phased in starting in July 2015. A variety of confocal, software and other resources will be available at these locations.

Revenue/Expenses

- VP of Health Sciences Support for normal operating expenses: $146,000
- Neurobiology & Anatomy Support for EP add on to 2-photon microscope: $ 38,748
- FY15 revenue: $155,202
- FY15 expenses: $368,462
- FY15 revenue generated from services:



Advisory Board Committee

Last meeting date: June 16th, 2015

- Gabrielle Kardon, Associate Professor, Human Genetics
- Kristen Kwan, Assistant Professor, Human Genetics
- Jody Rosenblatt, Assistant Professor, Oncological Sciences
- Josh Bonkowsky, Associate Professor, Neurobiology and Anatomy
- Adam Douglass, Assistant Professor, Neurobiology and Anatomy
- Jason Shepherd, Assistant Professor, Neurobiology and Anatomy
- Matt Wachowiak, Associate Professor, Neurobiology and Anatomy

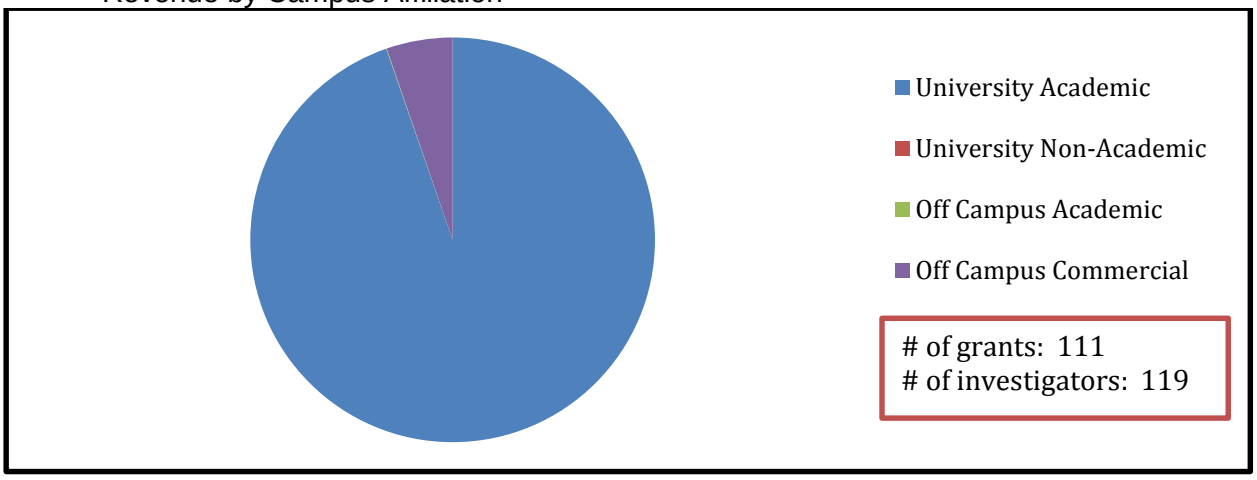
Addendum

- Faculty Oversight Committee Guidelines
  http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

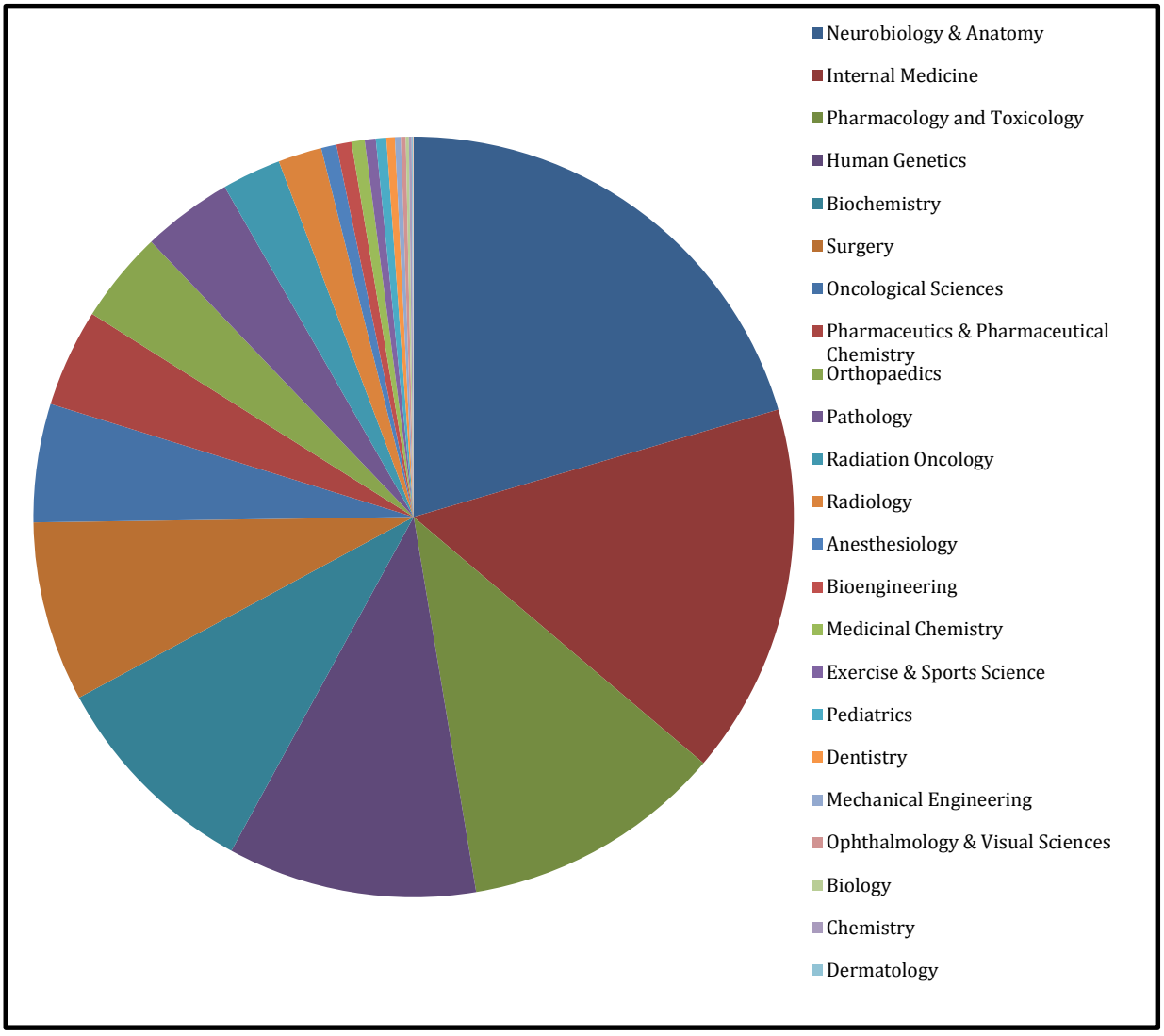
FY15 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

Bonkowsky, Josh	NIH, ALD, Department, March of Dimes, Bluebird Bio Inc.
Li, Dean	NIH, Agency
Sundquist, Wesley I	NIH, DHHS, HCI, University
Wilcox, Karen	NIH, Pharmaceuticals, Department
Wasatch Scientific Services	External
Kardon, Gabrielle	NIH, PEW Trust, Muscular Dystrophy
Rosenblat, Jody	NIH, Department
Dorsky, Richard	NIH, Department, Univ. California
Lane, Thomas	National MS Society, NIH
Letsou, Anthea	Department, HCI, NIH

Publications

1. Gibson, C.C., et al., *Strategy for identifying repurposed drugs for the treatment of cerebral cavernous malformation.* Circulation, 2015. **131**(3): p. 289-99.
2. Hansen, J.M., D.R. Chavez, and G.M. Stanfield, *COMP-1 promotes competitive advantage of nematode sperm.* Elife, 2015. **4**.
3. Johnson, D.P., et al., *HDAC1,2 inhibition impairs EZH2- and BBAP-mediated DNA repair to overcome chemoresistance in EZH2 gain-of-function mutant diffuse large B-cell lymphoma.* Oncotarget, 2015. **6**(7): p. 4863-87.
4. Keefe, A.C., et al., *Muscle stem cells contribute to myofibres in sedentary adult mice.* Nat Commun, 2015. **6**: p. 7087.
5. Mackay, D.R. and K.S. Ullman, *ATR and a Chk1-Aurora B pathway coordinate postmitotic genome surveillance with cytokinetic abscission.* Mol Biol Cell, 2015. **26**(12): p. 2217-26.
6. Mercenne, G., et al., *Angiomotin functions in HIV-1 assembly and budding.* Elife, 2015. **4**.
7. Merrell, A.J., et al., *Muscle connective tissue controls development of the diaphragm and is a source of congenital diaphragmatic hernias.* Nat Genet, 2015. **47**(5): p. 496-504.
8. Nogueira, J.M., et al., *The emergence of Pax7-expressing muscle stem cells during vertebrate head muscle development.* Front Aging Neurosci, 2015. **7**: p. 62.
9. Zhou, Z., et al., *The cerebral cavernous malformation pathway controls cardiac development via regulation of endocardial MEKK3 signaling and KLF expression.* Dev Cell, 2015. **32**(2): p. 168-80.

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Centralized Zebrafish Animal Resource Facility

Overview

The Centralized Zebrafish Animal Resource (CZAR) Facility provides state-of-the-art systems for housing, breeding, and doing experiments with zebrafish, an emerging vertebrate model system. It comprises 5000 fish tanks maintained on 4 independent recirculating water systems, and houses a large number of wildtype and mutant fish strains. The communal laboratory design encourages intellectual and experimental synergism among research groups, facilitating 1) large genetic screens carried out as collaborations between multiple laboratories; 2) collaborative research projects that require shared use of specific genetically marked or mutagenized animals; 3) development and distribution of resources and new technologies that advance the research efforts of all laboratories on campus; 4) a teaching environment in which the newest technologies and resources are disseminated quickly; and 5) training and experimental support for laboratories wishing to try pilot zebrafish experiments. Currently the facility houses approximately 75,000-100,000 fish at any given time. It is used by 12 large laboratories and supports an additional six to ten small-scale user groups.

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

Equipment

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

Personnel

- Maurine Hobbs, Director
- Sharon Johnson, Senior Laboratory Specialist - Zebrafish Husbandry and WT line maintenance
- Talmage Long, Technician - Dedicated Nursery Manager

2015 Annual Update

New Equipment

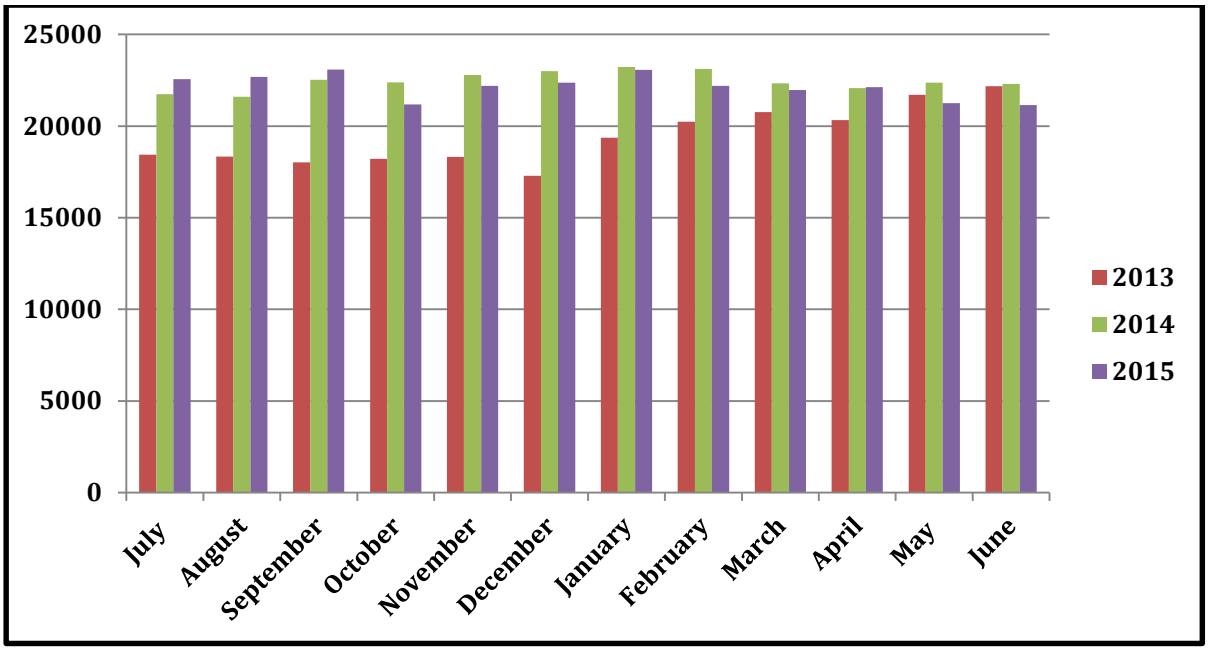
- February 2014, Injection station 1 was fitted with an analog camera and monitor to facilitate teaching microinjection to new users.
- May 2014, temperature sensors were installed throughout the facility to help monitor the quality of temperature control, and record deviations that could affect fish health.
- June 2014, Dr. Grunwald was awarded a $500,000 G20 NIH grant to expand the CZAR by more than 50% in the next year.
- June 2015, Construction began on the $1.13 M expansion of the CZAR. The expansion will increase the capacity by nearly 3,000 additional tanks holding 40,000 - 60,000 more fish. The expansion will include additional experimental procedure space, increased nursery capacity, and an off-cycle room for increased egg production.

New Services

- As of July 2014, Ms. Johnson will maintain WT or transgenic lines for any lab for a nominal fee. This service can now be requested through the Cores web site.
- The CZAR now offers 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.

Revenue/Expenses

- VP of Health Sciences Support: $115,000
- Total FY15 revenue: $265,839*
- Total FY15 expenses: $346,302
- FY15 revenue from services:



*Note: revenue for FY13, FY14 and FY15 is maximal due to facility limitations.

Advisory Board Committee - Last meeting date: 3/18/15

- David Jonah Grunwald, Professor, Human Genetics
- Joshua Bonkowsky, Associate Professor, Neurobiology and Anatomy and Pediatrics
- Richard Dorsky, Associate Professor, Neurobiology and Anatomy
- Kristen Kwan, Assistant Professor, Human Genetics
- Amnon Schlegel, Assistant Professor, Internal Medicine
- Rodney Stewart, Assistant Professor, Oncological Sciences
- Jack Taylor, Director, Office of Comparative Medicine
- H. Joseph Yost, Professor, Neurobiology and Anatomy and Pediatrics

Addendum

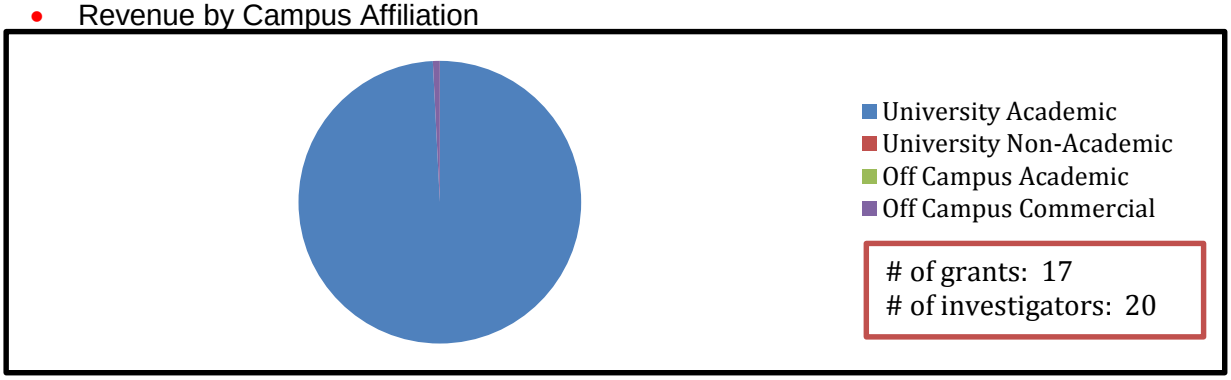
- Faculty Oversight Committee Guidelines

http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

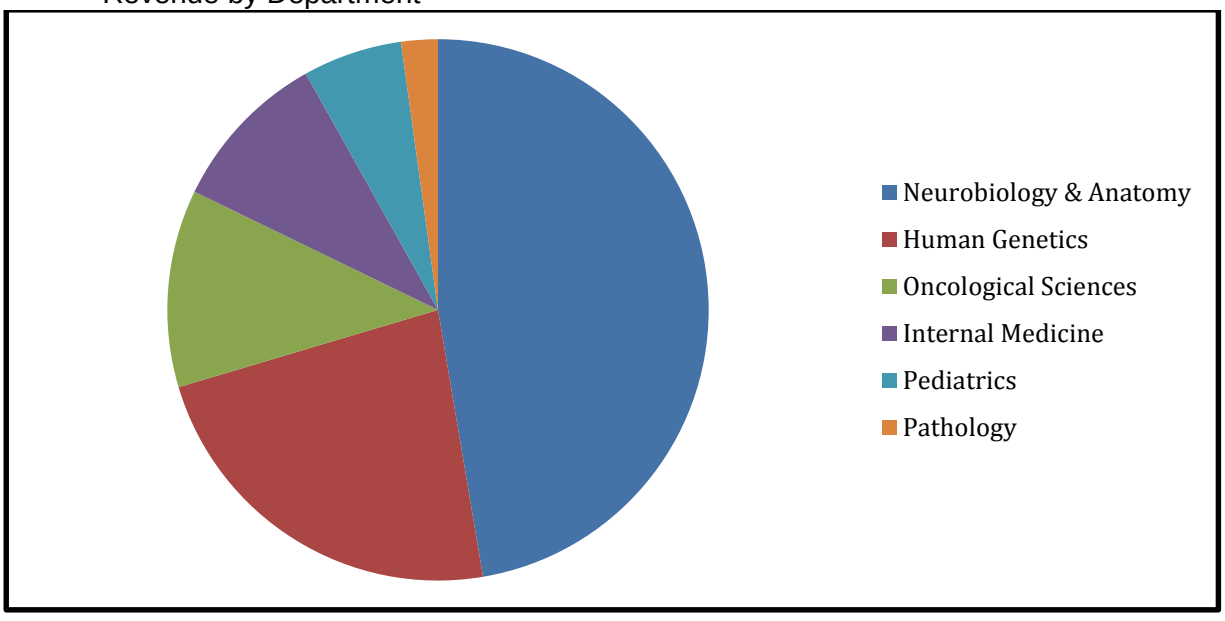
FY15 Scientific Impact

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 facility, as of July 2015, are listed on pages 6-9.
- Revenue by Campus Affiliation



- Revenue by Department



Top Users

1	Yost, Joseph	NIH
2	Grunwald, David	NIH
3	Dorsky, Richard	NIH
4	Schlegel, Amnon	DHHS
5	Bonkowsky, Josh	NIH
6	Kwan, Kristen	NIH, March of Dimes
7	Rosenblatt, Jody	NIH
8	Douglass, Adam	Department
9	Tavtigian, Sean	NIH, HCI
10	Jou, Chuanchau	American Heart Association

Publications 2014-2015

1. Blango, M.G., et al., *Forced resurgence and targeting of intracellular uropathogenic Escherichia coli reservoirs.* PLoS One, 2014. **9**(3): p. e93327.
2. Briona, L.K., et al., *Wnt/ss-catenin signaling is required for radial glial neurogenesis following spinal cord injury.* Dev Biol, 2015. **403**(1): p. 15-21.
3. Cruz-Garcia, L. and A. Schlegel, *Lxr-driven enterocyte lipid droplet formation delays transport of ingested lipids.* J Lipid Res, 2014. **55**(9): p. 1944-58.
4. Fossat, N., et al., *Context-specific function of the LIM homeobox 1 transcription factor in head formation of the mouse embryo.* Development, 2015. **142**(11): p. 2069-79.
5. Gu, Y., et al., *Defective apical extrusion signaling contributes to aggressive tumor hallmarks.* Elife, 2015. **4**: p. e04069.
6. Hill, J.T., et al., *Poly peak parser: Method and software for identification of unknown indels using sanger sequencing of polymerase chain reaction products.* Dev Dyn, 2014. **243**(12): p. 1632-6.
7. Jhuraney, A., et al., *BRCA1 Circos: a visualisation resource for functional analysis of missense variants.* J Med Genet, 2015. **52**(4): p. 224-30.
8. Kwan, K.M., *Coming into focus: the role of extracellular matrix in vertebrate optic cup morphogenesis.* Dev Dyn, 2014. **243**(10): p. 1242-8.
9. Lam, Y.F., et al., *Gastrointestinal Immune Response to the Shrimp Allergen Tropomyosin: Histological and Immunological Analysis in an Animal Model of Shrimp Tropomyosin Hypersensitivity.* Int Arch Allergy Immunol, 2015. **167**(1): p. 29-40.
10. Lopez-Izquierdo, A., et al., *The absence of insulin signaling in the heart induces changes in potassium channel expression and ventricular repolarization.* Am J Physiol Heart Circ Physiol, 2014. **306**(5): p. H747-54.
11. Lyozin, G.T., et al., *Isolation of rare recombinants without using selectable markers for one-step seamless BAC mutagenesis.* Nat Methods, 2014. **11**(9): p. 966-70.
12. May, M., et al., *ZC4H2, an XLID gene, is required for the generation of a specific subset of CNS interneurons.* Hum Mol Genet, 2015. **24**(17): p. 4848-61.
13. Nash, D., et al., *Shared Segment Analysis and Next-Generation Sequencing Implicates the Retinoic Acid Signaling Pathway in Total Anomalous Pulmonary Venous Return (TAPVR).* PLoS One, 2015. **10**(6): p. e0131514.
14. Neugebauer, J.M. and H.J. Yost, *FGF signaling is required for brain left-right asymmetry and brain midline formation.* Dev Biol, 2014. **386**(1): p. 123-34.
15. Otsuna, H., et al., *High-resolution analysis of central nervous system expression patterns in zebrafish Gal4 enhancer-trap lines.* Dev Dyn, 2015. **244**(6): p. 785-96.
16. Percival, S.M., et al., *Variations in dysfunction of sister chromatid cohesion in esco2 mutant zebrafish reflect the phenotypic diversity of Roberts syndrome.* Dis Model Mech, 2015. **8**(8): p. 941-55.

17. Schlegel, A., *Studying lipoprotein trafficking in zebrafish, the case of chylomicron retention disease.* J Mol Med (Berl), 2015. **93**(2): p. 115-8.
18. Schlegel, A. and P. Gut, *Metabolic insights from zebrafish genetics, physiology, and chemical biology.* Cell Mol Life Sci, 2015. **72**(12): p. 2249-60.
19. Slattum, G.M. and J. Rosenblatt, *Tumour cell invasion: an emerging role for basal epithelial cell extrusion.* Nat Rev Cancer, 2014. **14**(7): p. 495-501.
20. Tam, W.Y., L. Jiang, and K.M. Kwan, *Transmembrane 6 superfamily 1 (Tm6sf1) is a novel lysosomal transmembrane protein.* Protoplasma, 2015. **252**(4): p. 977-83.
21. Tong, K.K., T.C. Ma, and K.M. Kwan, *BMP/Smad signaling and embryonic cerebellum development: stem cell specification and heterogeneity of anterior rhombic lip.* Dev Growth Differ, 2015. **57**(2): p. 121-34.
22. Vong, K.I., et al., *Sox9 is critical for suppression of neurogenesis but not initiation of gliogenesis in the cerebellum.* Mol Brain, 2015. **8**: p. 25.
23. Xing, L., et al., *Rapid and efficient zebrafish genotyping using PCR with high-resolution melt analysis.* J Vis Exp, 2014(84): p. e51138.
24. Zhang, Y., et al., *Inhibition of bone morphogenic protein 4 restores endothelial function in db/db diabetic mice.* Arterioscler Thromb Vasc Biol, 2014. **34**(1): p. 152-9.
25. Zou, P., et al., *Bright and fast multicoloured voltage reporters via electrochromic FRET.* Nat Commun, 2014. **5**: p. 4625.

DNA Peptide Facility

Overview

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

Services

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

Equipment

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

Personnel

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

2015 Annual Update

New Equipment

- The DNA Peptide Facility did not obtain any additional equipment in FY15

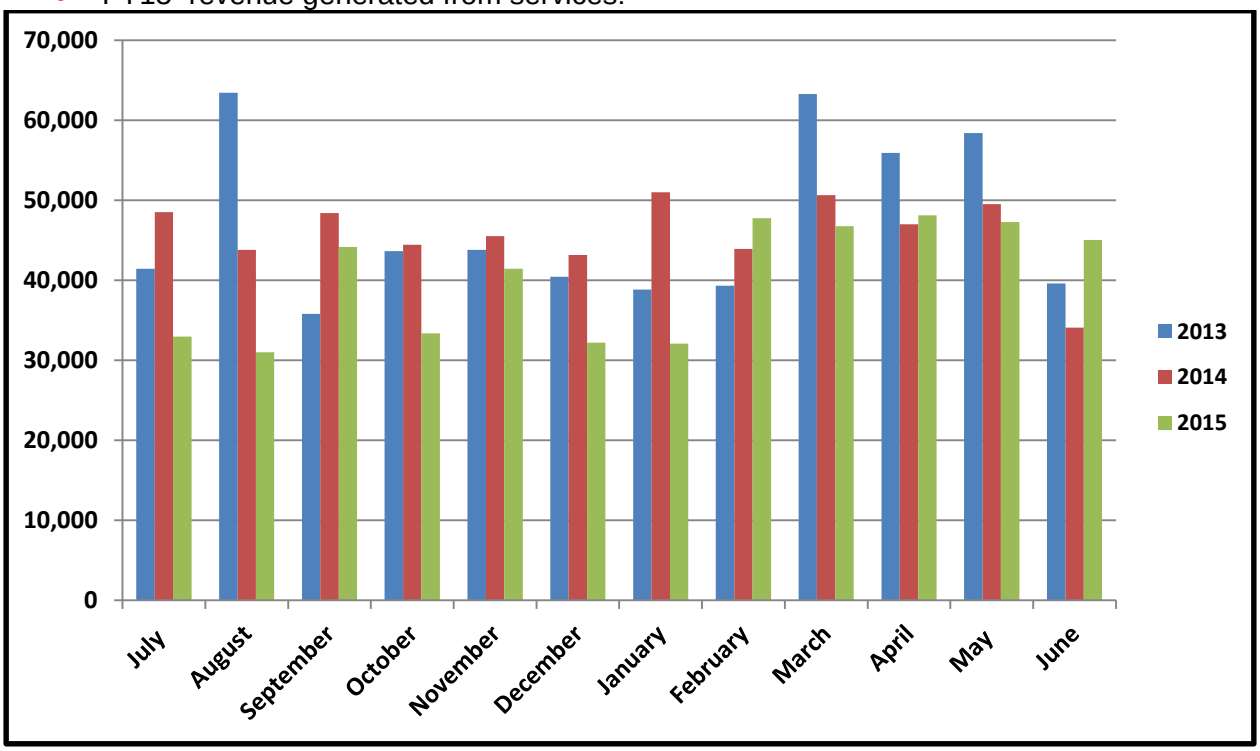
New Services

- The DNA Peptide Facility did not implement any additional services in FY15

Revenue/Expenses

- VP of Health Sciences Support: $0
- FY15 revenue: $500,301
- FY15 expenses: $542,576

- FY15 revenue generated from services:



Advisory Board Committee

Last meeting date: August 2014

- Eric Schmidt, Professor, College of Pharmacy
- Jen Heemstra, Assistant Professor, Chemistry
- John Weis, Professor, Pathology

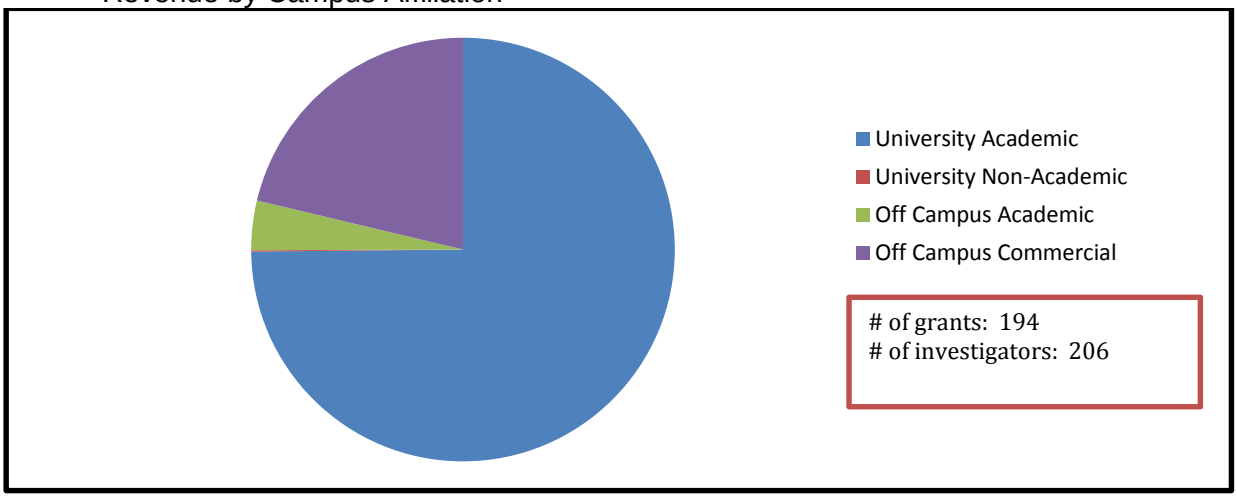
Addendum

- Faculty Oversight Committee Guidelines
  http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

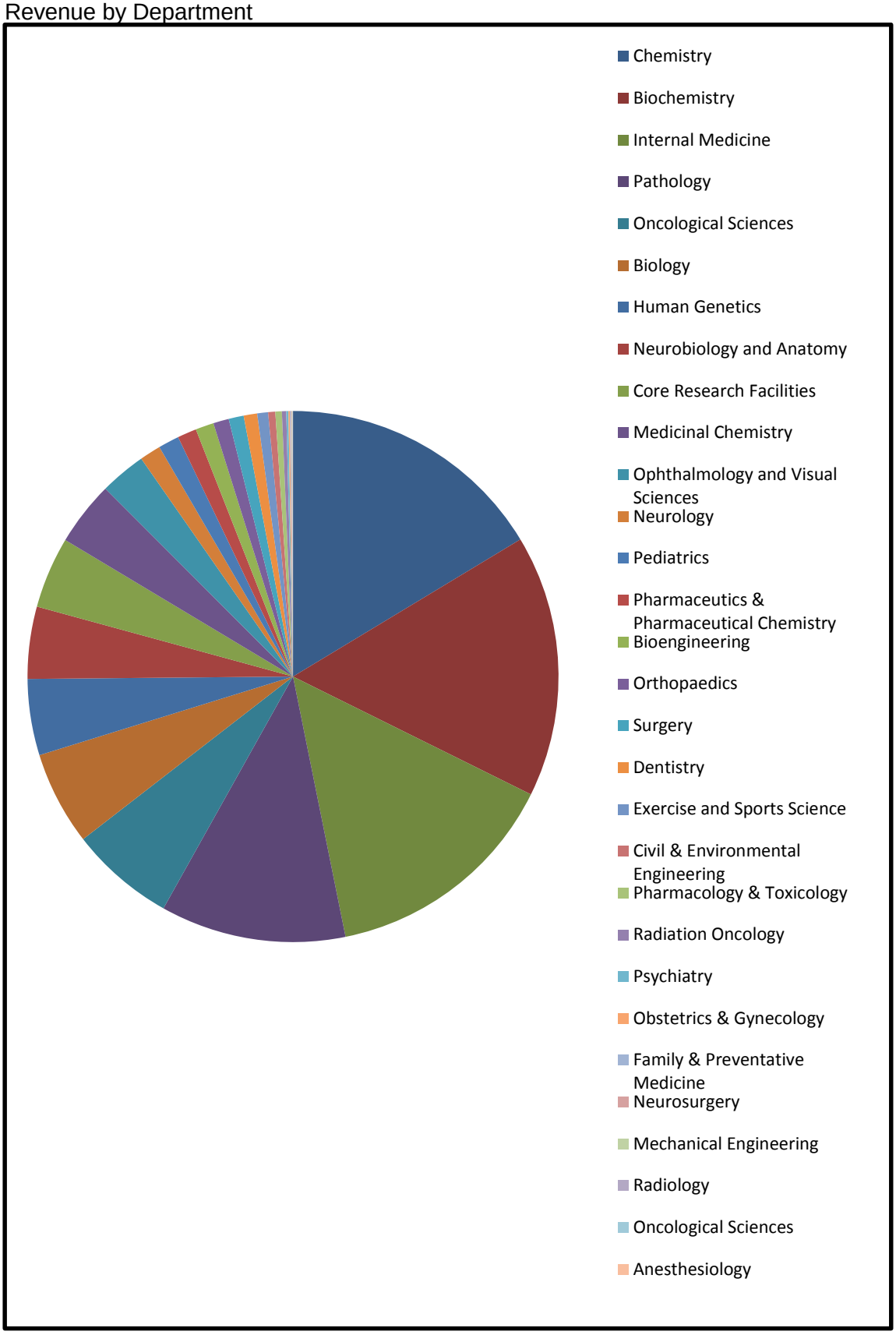
FY15 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

1	BioFire Diagnostics	Off Campus
2	Sundquist, Wesley I	NIH
3	Heemstra, Jennifer	Department, Arizona State University
4	Wittwer, Carl	Department, BioFire Diagnostics
5	Burrows, Cynthia	NIH, NSF, Electronic Bioscience
6	Dahlem, Timothy	HSC Cores
7	Tavtigian, Sean	NIH
8	Rutter, Jared	NIH, Nora E.Treadwell Foundation
9	Schmidt, Eric	NIH, Oregon Health & Science Univ.
10	Weyrich, Andy	NIH

Publications

1. Bruno, B.J. and C.S. Lim, *Inhibition of bcr-abl in human leukemic cells with a coiled-coil protein delivered by a leukemia-specific cell-penetrating Peptide.* Mol Pharm, 2015. **12**(5): p. 1412-21.
2. Ding, Y., et al., *Unfolding Kinetics of the Human Telomere i-Motif Under a 10 pN Force Imposed by the alpha-Hemolysin Nanopore Identify Transient Folded-State Lifetimes at Physiological pH.* J Am Chem Soc, 2015. **137**(28): p. 9053-60.
3. Fleming, A.M., et al., *Rates of chemical cleavage of DNA and RNA oligomers containing guanine oxidation products.* Chem Res Toxicol, 2015. **28**(6): p. 1292-300.
4. Gillespie, D.L., et al., *RNA interference targeting hypoxia-inducible factor 1alpha via a novel multifunctional surfactant attenuates glioma growth in an intracranial mouse model.* J Neurosurg, 2015. **122**(2): p. 331-41.
5. Ma, Y., et al., *Borrelia burgdorferi arthritis-associated locus Bbaa1 regulates Lyme arthritis and K/BxN serum transfer arthritis through intrinsic control of type I IFN production.* J Immunol, 2014. **193**(12): p. 6050-60.
6. Matissek, K.J., et al., *Delivery of a monomeric p53 subdomain with mitochondrial targeting signals from pro-apoptotic Bak or Bax.* Pharm Res, 2014. **31**(9): p. 2503-15.
7. Okal, A., et al., *Re-engineered p53 chimera with enhanced homo-oligomerization that maintains tumor suppressor activity.* Mol Pharm, 2014. **11**(7): p. 2442-52.
8. Sardar, D., et al., *Recognition sequences and substrate evolution in cyanobactin biosynthesis.* ACS Synth Biol, 2015. **4**(2): p. 167-76.
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10. Woessner, D.W., et al., *A coiled-coil mimetic intercepts BCR-ABL1 dimerization in native and kinase-mutant chronic myeloid leukemia.* Leukemia, 2015. **29**(8): p. 1668-75.

DNA Sequencing Facility

Overview

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

Services

DNA Sequencing Services

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

Robotics

- Biomek FX with Span-8 and 96 head

Other Services

- Lab consumables for sample submission
- Life Technologies freezer program

Equipment

Sequencers

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

Liquid Handlers

- 2 Biomek FX's

Personnel

- Derek Warner, Director
- Michael Powers, Senior Laboratory Specialist
- Jinlan Wang, Lab Specialist

2015 Annual Update

New Equipment

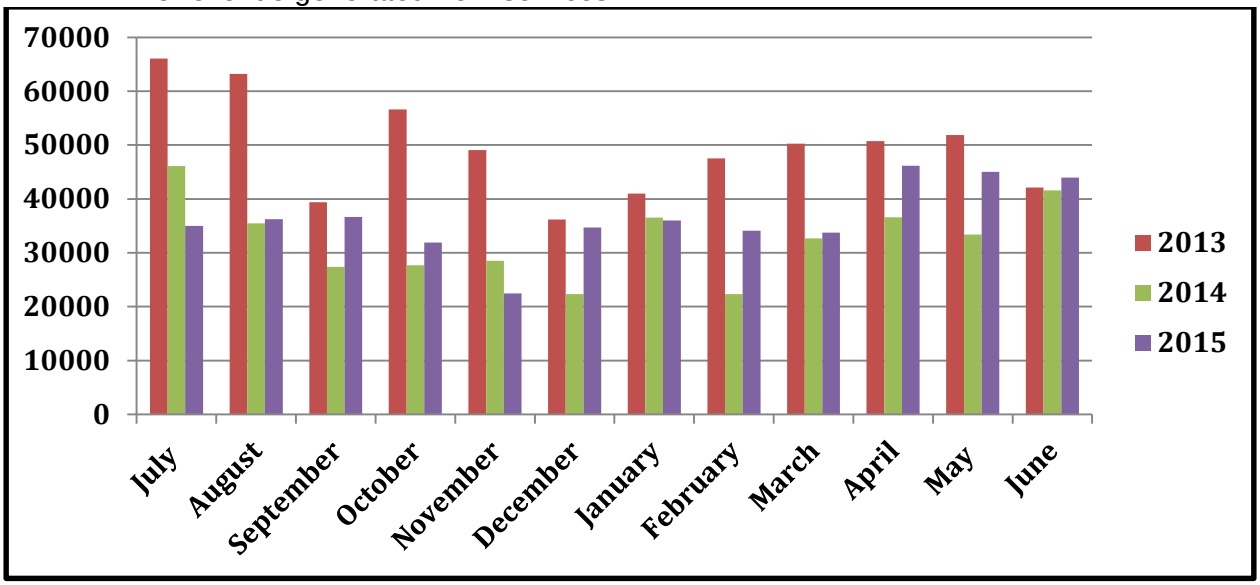
- In June 2015, the DNA Sequencing Facility received an additional BioMek FX to be installed in the post-PCR area. This instrument will allow better separation of Pre and Post PCR areas further minimizing any concern over PCR contamination of samples. It will also expand the ability to support customer projects where robotics support is deemed advantageous.

New Services

- At the end of June 2015, the core in conjunction with the GNomEx staff were able to implement early release of data for customers of Sanger sequencing. This allows the users to receive their data within only hours of the daily runs being started.
- Prices have been updated for sequencing supplies

Revenue/Expenses

- VP of Health Sciences Support: $0
- FY15 revenue: $435,877
- FY15 expenses: $586,666
- FY15 revenue generated from services:



Advisory Board Committee

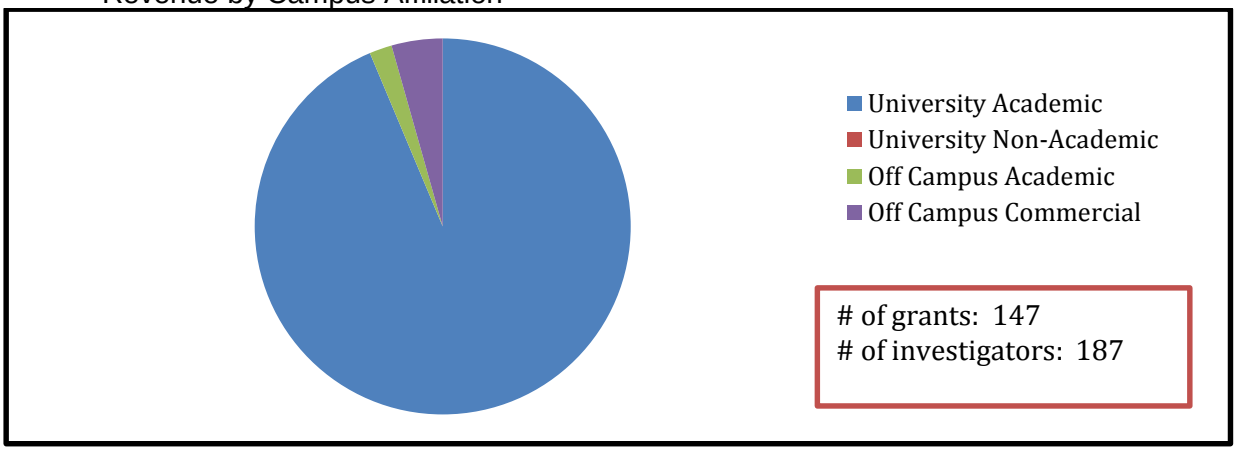
Last meeting date: July 20, 2015

- Monica Vetter, Professor, Neurobiology & Anatomy
- Colin Dale, Associate Professor, Biology
- Robert Weiss, Professor, Human Genetics

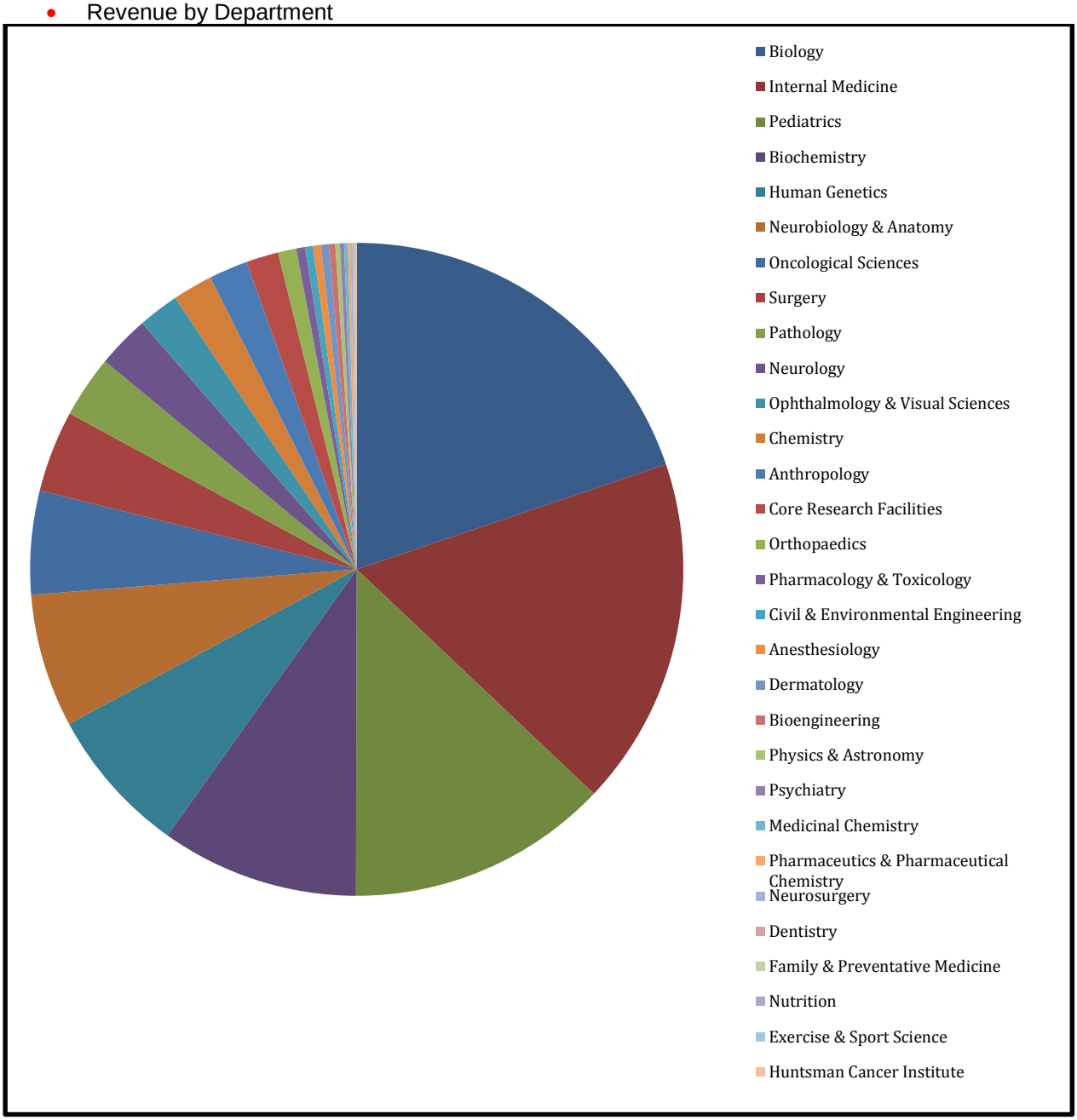
FY15 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

1	Baldomero Olivera	NIH
2	Byington, Carrie	Department
3	Blair, David	NIH
4	Grunwald, David	NIH
5	Parkinson, John	NIH
6	Yost, Joseph	NIH
7	Cannon-Albright, Lisa	NIH, Mayo Clinic Rochester
8	Sanguinetti, Michael	NIH
9	Tavtigian, Sean	NIH
10	Sundquist, Wesley I	NIH, DHHS, HCI

Publications

1. Aldiri, I., et al., *Polycomb repressive complex PRC2 regulates Xenopus retina development downstream of Wnt/beta-catenin signaling.* Development, 2013. **140**(14): p. 2867-78.
2. Allen-Brady, K., et al., *Evidence for pelvic organ prolapse predisposition genes on chromosomes 10 and 17.* Am J Obstet Gynecol, 2015. **212**(6): p. 771 e1-7.
3. Aman, J.W., et al., *Insights into the origins of fish hunting in venomous cone snails from studies of Conus tessulatus.* Proc Natl Acad Sci U S A, 2015. **112**(16): p. 5087-92.
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6. Fung, C.M., et al., *IUGR prevents IGF-1 upregulation in juvenile male mice by perturbing postnatal IGF-1 chromatin remodeling.* Pediatr Res, 2015. **78**(1): p. 14-23.
7. Gupta, M.P., et al., *Clinical Characteristics of Uveal Melanoma in Patients With Germline BAP1 Mutations.* JAMA Ophthalmol, 2015. **133**(8): p. 881-7.
8. Han, H., et al., *Binding of Substrates to the Central Pore of the Vps4 ATPase Is Autoinhibited by the Microtubule Interacting and Trafficking (MIT) Domain and Activated by MIT Interacting Motifs (MIMs).* J Biol Chem, 2015. **290**(21): p. 13490-9.
9. Hsu, H.T., et al., *TRANSCRIPTION. Recruitment of RNA polymerase II by the pioneer transcription factor PHA-4.* Science, 2015. **348**(6241): p. 1372-6.
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14. Kubinak, J.L., et al., *MyD88 signaling in T cells directs IgA-mediated control of the microbiota to promote health.* Cell Host Microbe, 2015. **17**(2): p. 153-63.
15. Lai, R.Z. and J.S. Parkinson, *Functional suppression of HAMP domain signaling defects in the E. coli serine chemoreceptor.* J Mol Biol, 2014. **426**(21): p. 3642-55.
16. Lyozin, G.T., et al., *Isolation of rare recombinants without using selectable markers for one-step seamless BAC mutagenesis.* Nat Methods, 2014. **11**(9): p. 966-70.
17. Nash, D., et al., *Shared Segment Analysis and Next-Generation Sequencing Implicates the Retinoic Acid Signaling Pathway in Total Anomalous Pulmonary Venous Return (TAPVR).* PLoS One, 2015. **10**(6): p. e0131514.
18. Neugebauer, J.M., et al., *The prodomain of BMP4 is necessary and sufficient to generate stable BMP4/7 heterodimers with enhanced bioactivity in vivo.* Proc Natl Acad Sci U S A, 2015. **112**(18): p. E2307-16.
19. Safavi-Hemami, H., et al., *Specialized insulin is used for chemical warfare by fish-hunting cone snails.* Proc Natl Acad Sci U S A, 2015. **112**(6): p. 1743-8.

20. Salipante, S.J., et al., *Performance comparison of Illumina and ion torrent next-generation sequencing platforms for 16S rRNA-based bacterial community profiling.* Appl Environ Microbiol, 2014. **80**(24): p. 7583-91.
21. Shakya, A., et al., *Pluripotency transcription factor Oct4 mediates stepwise nucleosome demethylation and depletion.* Mol Cell Biol, 2015. **35**(6): p. 1014-25.
22. Teerlink, C., et al., *Significant evidence of linkage for a gene predisposing to colorectal cancer and multiple primary cancers on 22q11.* Clin Transl Gastroenterol, 2014. **5**: p. e50.
23. Teerlink, C.C., L.A. Cannon-Albright, and R.Z. Tashjian, *Significant association of full-thickness rotator cuff tears and estrogen-related receptor-beta (ESRRB).* J Shoulder Elbow Surg, 2015. **24**(2): p. e31-5.
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25. Vickrey, A.I., et al., *Convergent Evolution of Head Crests in Two Domesticated Columbids Is Associated with Different Missense Mutations in EphB2.* Mol Biol Evol, 2015.
26. Viollet, L., et al., *Alternating Hemiplegia of Childhood: Retrospective Genetic Study and Genotype-Phenotype Correlations in 187 Subjects from the US AHCF Registry.* PLoS One, 2015. **10**(5): p. e0127045.
27. Wang, Y., et al., *Endogenous Small RNA Mediates Meiotic Silencing of a Novel DNA Transposon.* G3 (Bethesda), 2015.
28. Zabriskie, M.S., et al., *BCR-ABL1 compound mutations combining key kinase domain positions confer clinical resistance to ponatinib in Ph chromosome-positive leukemia.* Cancer Cell, 2014. **26**(3): p. 428-42.
29. Zhang, J., et al., *Ezh2 maintains retinal progenitor proliferation, transcriptional integrity, and the timing of late differentiation.* Dev Biol, 2015. **403**(2): p. 128-38.
30. Zinkhan, E.K., et al., *Combination of intrauterine growth restriction and a high-fat diet impairs cholesterol elimination in rats.* Pediatr Res, 2014. **76**(5): p. 432-40.

Drug Discovery Facility

Overview

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

Uniqueness

The University of Utah possesses the scientific and medical talent, innovation research culture, and state-of-the-art research facilities to contribute substantially to the discovery of small molecule drugs. However, significant challenges still remain in translation of basic scientific discoveries into potential human therapeutics. The uniqueness of the Drug Discovery Facility is that 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's anticipated that the discovery of candidate lead compounds from the facility will stimulate interest in commercial development of technology at the University of Utah through licensing agreements with pharmaceutical industry partners and the production of new start-up biotechnology companies.

Services

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

Equipment/Compound Collection

Automated Liquid Handling Stations:

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

Automated Detection Systems:

- Molecular Devices ImageXpress XLS Automated High-Content System
- Bio-tek Plate Synergy 4 Plate Reader with stacker

CRISPR Libraries:

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

Commercial Compound Libraries:

- Chembridge 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 II

Private/Proprietary Chemical Collections:

- UUPCC – University of Utah Private Chemical Collection
- Dept of Chemistry Library
- Ireland Natural Product Collection

Personnel

- Bai Luo, Ph.D., Director

2015 Annual Update

New Equipment:

- Addition of a transmitted light tower to ImageXpress XLS Automated High-Content System - capable of providing automated cellular imaging in fluorescent, transmitted light, and phase-contrast imaging of fixed- or live-cell assays, tissues and small organisms

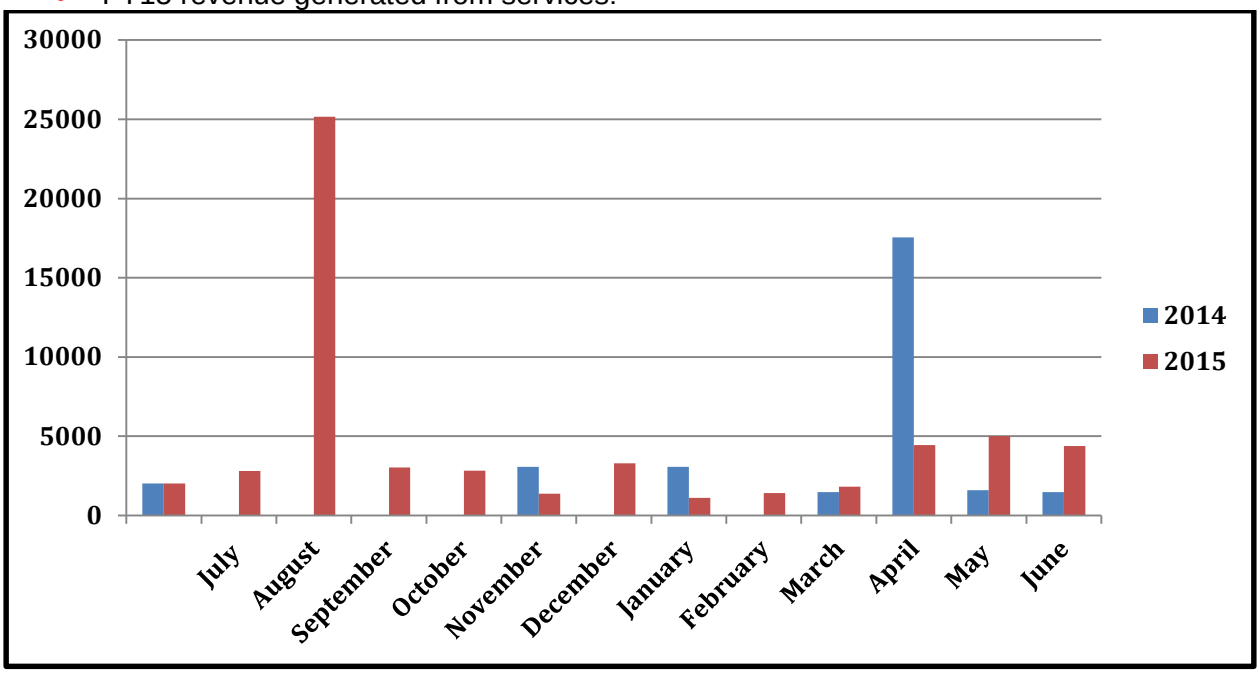
New Compound Collection:

- ChemBridge Diverset CL (50K) – This library is complementary to exist Diverset EXP (50K) so that they can be combined to create a 100,000-compound diversity library. Each library offers a diverse set of 50,000 compounds with extensive pharmacophore coverage for primary screening. Stringent druglike and desirable chemical group filters coupled with a 3D conformer analysis are used in selecting a premium set of 50,000 druglike compounds with maximum pharmacophore coverage and chemical diversity.
  - The 50,000-compound DIVERSet-EXP Library is selected from ChemBridge's EXPRESS-Pick™ Collection stock of more than 505,000 handcrafted compounds.
  - The 50,000-compound DIVERSet-CL Library is selected from ChemBridge's CORE Library stock of more than 520,000 parallel-synthesized compounds based on novel scaffolds designed by ChemBridge.

Revenue/Expenses

- VP of Health Sciences Support: $235,000
- FY15 Revenue: $54,120
- FY15 Expense: $220,726

- FY15 revenue generated from services:



Advisory Board Committee

Last meeting date: December 17, 2014

- Darrell Davis, Professor, College of Pharmacy
- Ryan Looper, Associate Professor, Chemistry Department
- John Phillips, Professor, Internal Medicine
- Jared Rutter, Professor, Department of Biochemistry
- Hari Vankayalapati, Research Assistant Professor, HCI

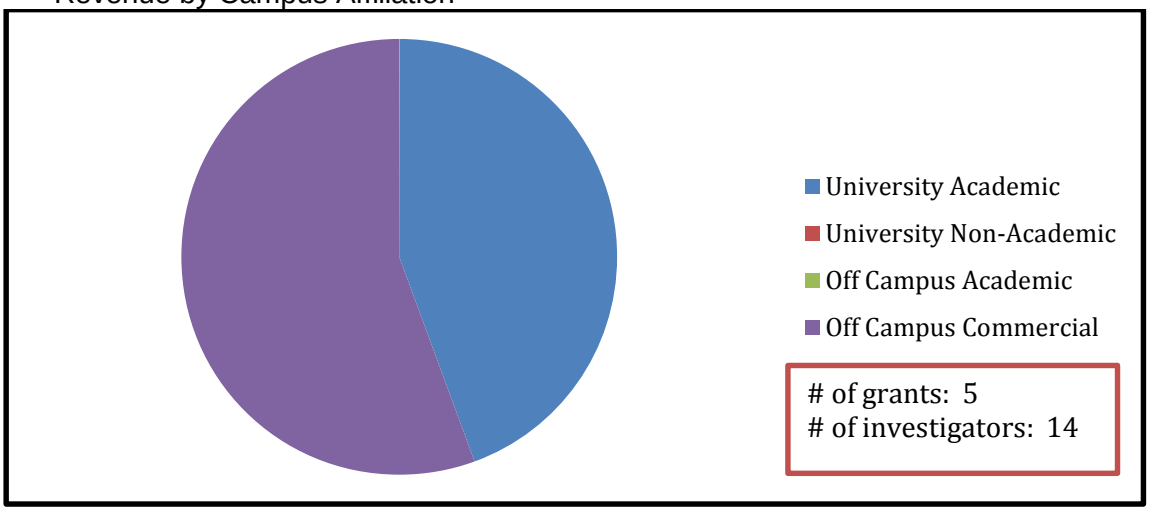
Addendum

- Faculty Oversight Committee Guidelines can be found for all cores at the following link: http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.p

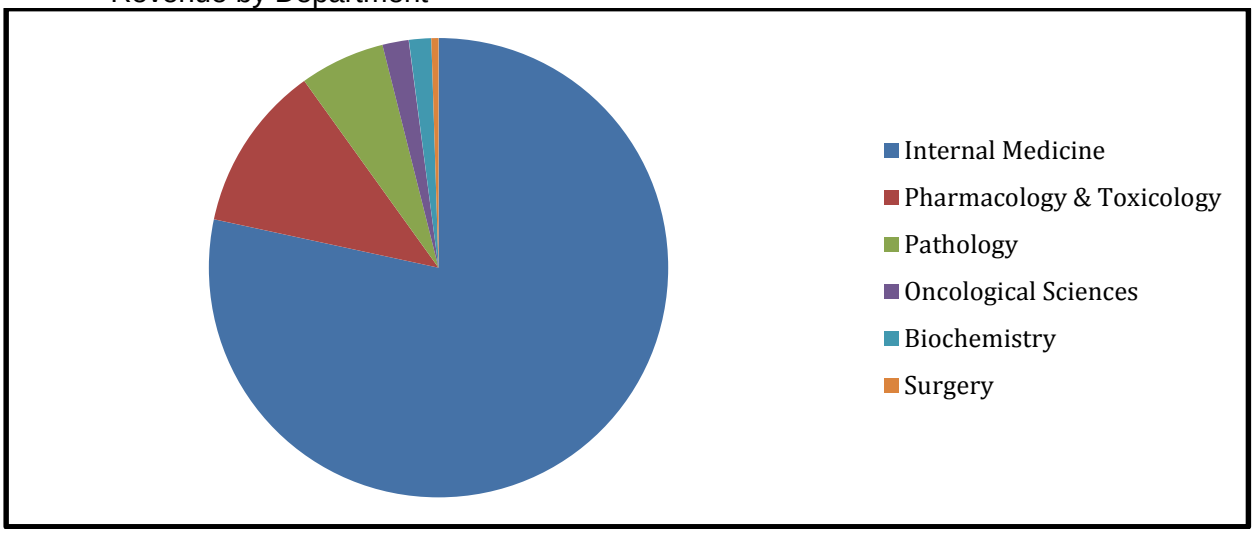
FY15 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

Li, Dean	NIH, Advanced Heart Failure Program
Recursion Pharmaceuticals Inc	Off Campus Commercial
Bild, Andrea	Boston University, HCI
Planelles, Vicente	NIH, University of NC, Aids Research
Bio, Vettore	Off Campus Commercial
Villanueva, Claudio	NSF, NIH
Tavtigian, Sean	NIH
Brown, Jessica	Department
Mulvey, Matthew	NIH
Varley, KT	HCI

Goals for FY16

Integrate new functionalities

- Synthetic and Medicinal Chemistry Facility
- HCI Preclinical Research Resources

Expand capabilities

- Upgrade Bio-teq plate reader (7 year old)
- Enhance Utility of UUPCC Library
- Fragment-based Screening Library

Expand business

- Move to main campus
- Better advertise DDC services to U. research community
- Explore the possibility of institutional seed funding for screening

Publications

1. El-Chaar, N.N., et al., *Genomic classification of the RAS network identifies a personalized treatment strategy for lung cancer.* Mol Oncol, 2014. **8**(7): p. 1339-54.
2. Gibson, C.C., et al., *Strategy for identifying repurposed drugs for the treatment of cerebral cavernous malformation.* Circulation, 2015. **131**(3): p. 289-99.

Electron Microscopy

Overview

The Electron Microscopy (EM) Facility utilizes transmission electron microscopy (TEM) and scanning electron microscopy (SEM) imaging to determine cellular structures, the morphology of biological macromolecules, the three-dimensional structures of biological macromolecules, and the size and structure of nanoparticles. The EM Facility also prepares specimens for the microscope. The EM facility has four spatially distinct locations to best 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, Biology and ASB. SEM experiments are done on microscopes owned by the Surface Analysis Laboratory.

Services

Clinical Services:

- Thin-section electron microscopy of tissue biopsies (technical component 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
- Procedures for observing tissues and cellular specimens including embedding, drying, osmification, and storage
- Procedures for observing particulate and macromolecular samples including staining, metal coating, drying, and cryogenic TEM

Equipment

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

Personnel

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

2015 Annual Update

New Equipment

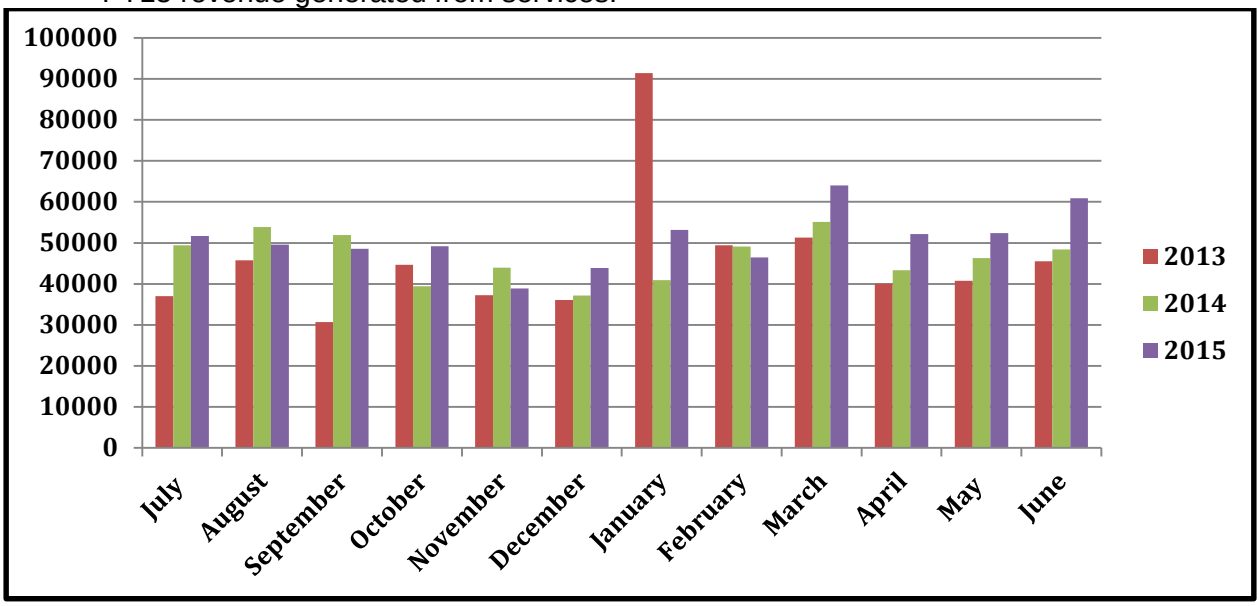
- Gatan K2 Summit, direct electron detector, installed 8/2014
- Upgrade Installation Tecnai Software (RIF Funds) $61,532
- Single Tilt Multiple Specimen Holder (RIF Funds) $ 37,333

New Services

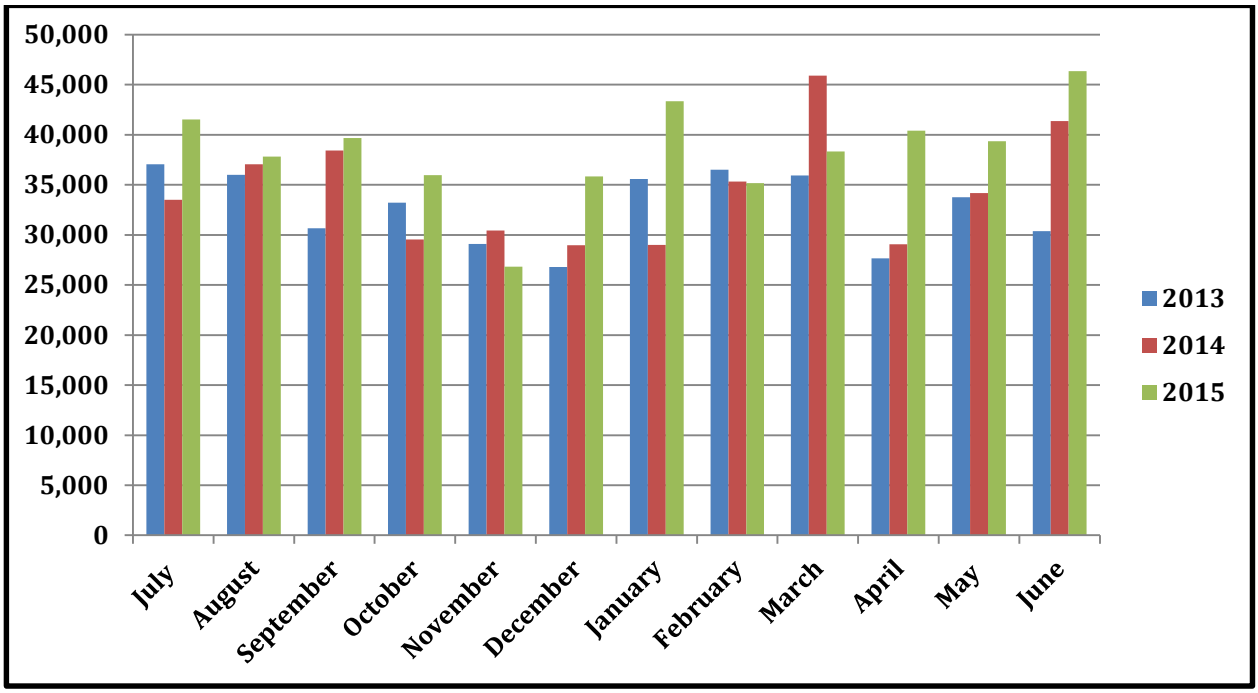
- No new services for FY15

Revenue/Expenses

- VP of Research Support: $50,000
- FY15 revenue: $610,354
- FY15 expenses: $689,648
- FY15 revenue generated from services:



Clinical Revenue



Advisory Board Committee

Last meeting date: October 2, 2013

- Erik Jorgensen, Distinguished Professor, Department of Biology
- Mary Bronner, Professor, Department of Pathology
- Fred Clayton, Associate Professor of Pathology

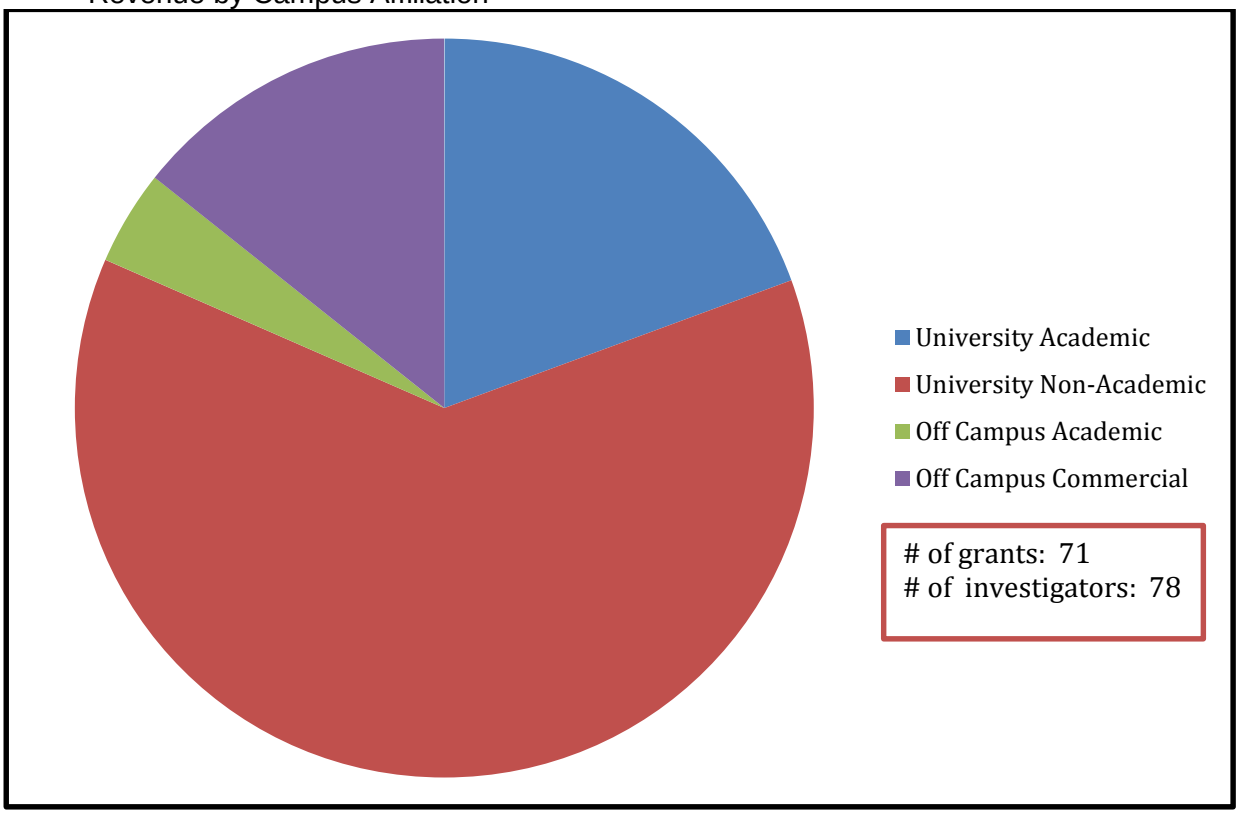
Addendum

- Faculty Oversight Committee Guidelines can be found for all cores at the following link: http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

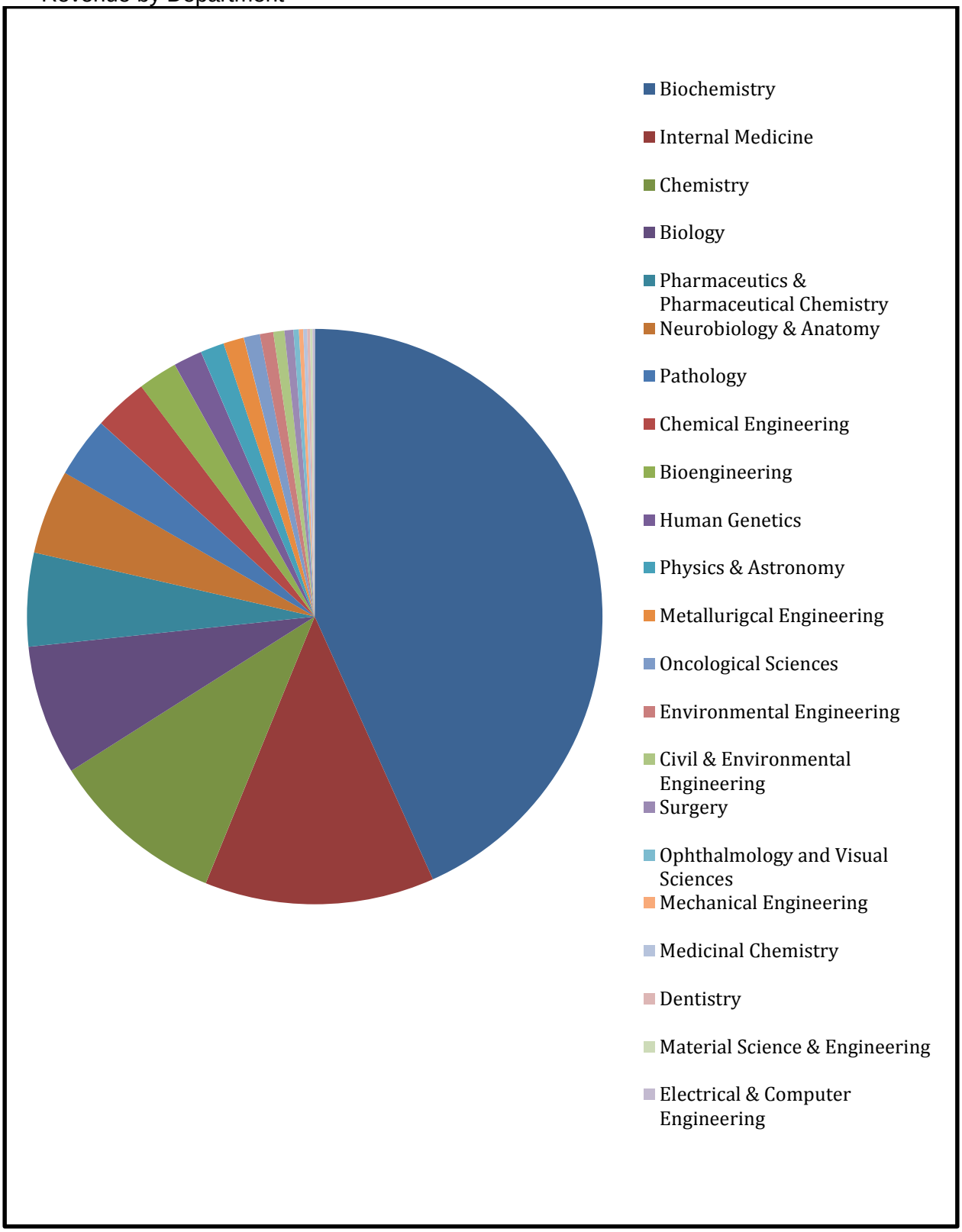
FY2015 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

1	ARUP	Off Campus
2	Tricore	Off Campus
3	Scripps	Off Campus
4	Sundquist, Wesley I	NIH
5	Primary Children's Medical Ctr	Off Campus
6	Utah State University	Off Campus
7	St. Johns	Off Campus
8	Hill, Christopher	NIH
9	Frost, Adam	Searle Scholars Program, UC San Francisco
10	Jorgensen, Erik	HHMI

Goals for FY16

- Obtain high-quality TEM data with FEI Tecnai F20 and Gatan K2 Summit camera
- Maintain high-quality clinical services
- Improve clinical services by establishing remote capability
- Establish tomography as a frequently used method
- Plan for new facility on main campus (Crocker Service Center)
- Increase usage of main-campus microscopes

Publications

1. Kalita, M., et al., *A nanosensor for ultrasensitive detection of oversulfated chondroitin sulfate contaminant in heparin.* J Am Chem Soc, 2014. **136**(2): p. 554-7.
2. Lin, C.Y., et al., *Ultrasound sensitive eLiposomes containing doxorubicin for drug targeting therapy.* Nanomedicine, 2014. **10**(1): p. 67-76.
3. Liu, J., et al., *Surface force measurements at kaolinite edge surfaces using atomic force microscopy.* J Colloid Interface Sci, 2014. **420**: p. 35-40.

Flow Cytometry Facility

Overview

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

Uniqueness

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

Services

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

- DNA content/cell cycle measurement
- Immunofluorescence analyses
- Characterization of cell populations based on scattered light intensity measurements and autofluorescence
- Cell sorting including viable, sterile cell sorting
- Intracellular calcium flux
- A range of apoptosis assays
- Fluorescence Resonance Energy Transfer (FRET)
- Nanoparticle characterization
- Bivariate and univariate chromosome analysis
- Receptor-ligand interactions
- Cell proliferation studies including BrdU incorporation and CFSE tracking
- Viability assays (membrane exclusion and metabolic viability)
- Various function assays including oxidative metabolism, neutrophil function (oxidative burst, phagocytosis) cytoplasmic pH, membrane potential
- Kinetic analyses
- Signal transduction pathway analyses (simultaneous assessment of multiple intracellular phosphorylated epitopes combined in complex multi-color assays)
- Sample preparation and staining

Consultation and training is provided in order to define projects in the early stages of development to make optimal and efficient use of flow cytometry. The staff will prepare samples including staining, data collection, quality control, data analysis/interpretation, and creation of graphics. Alternatively, if the investigator chooses, the facility can provide consultation only on any of the above services so that the research is entirely in the hands of the investigator.

Equipment

Sorters

- BD FACSAria
- Propel Labs Avalon

Analyzers

- BD FACSCanto
- Cytek DxP
- BD FACScan

Personnel

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

FY15 Annual Update

New Equipment

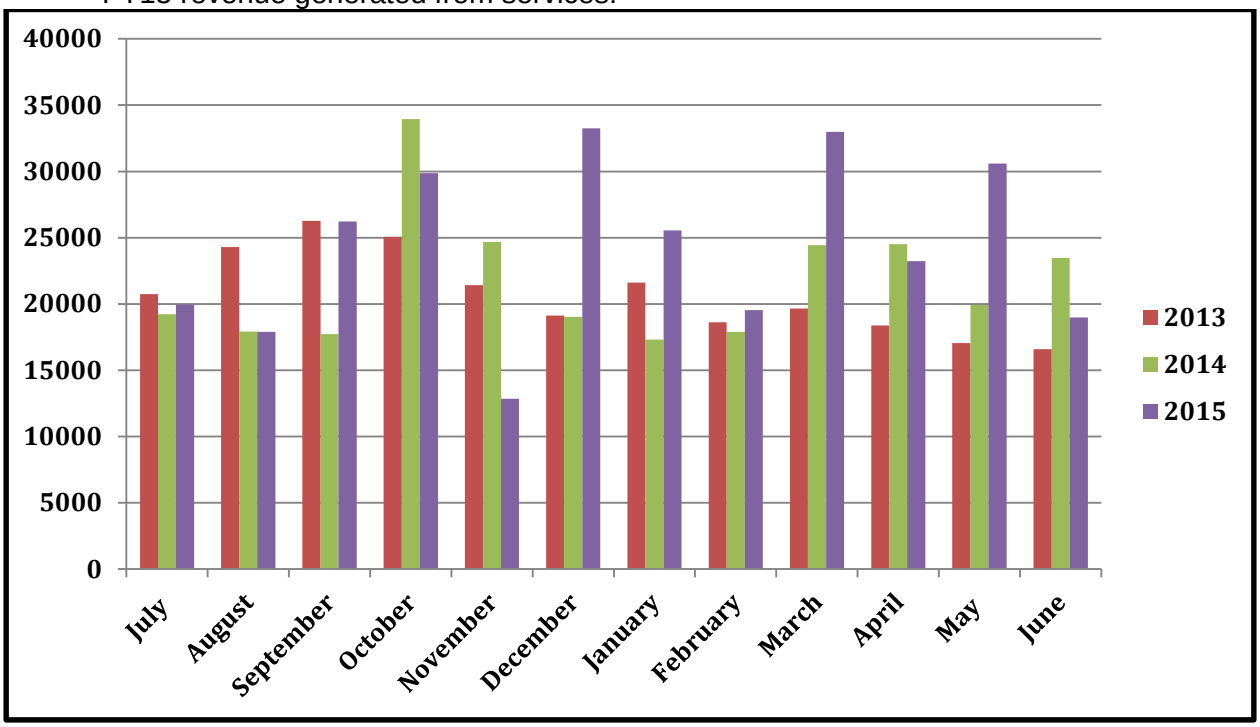
With the addition of a BD X20 flow cytometer in the Department of Pathology a growing userbase is taking advantage of a number of fluorescent dyes that the Flow Core was not able to detect due to limited instrument capabilities. For this reason, funding obtained through the VP for Research Office ($21,925) was used to upgrade the FACSAria cell sorter. This upgrade consisted of adding 4 new detectors, for a total of 17 possible detectors now available on the FACSAria. This should allow the Flow Core to accommodate virtually any panel designed for the foreseeable future.

New Services

Although not particularly a new service, the flow core has seen a significant increase in sample preparation associated revenue. Roughly $80,000 in FY15 was generated through investigators dropping off samples that the core prepped and analyzed. Historically revenue in the core has been driven through providing access to instrumentation. These additional projects could provide a significant jump in yearly revenue if maintained.

Revenue/Expenses

- VP of Health Sciences Support: $25,000
- FY15 revenue: $290,854
- FY15 expenses: $274,111
- FY15 revenue generated from services:



Advisory Board Committee

Last meeting date: July 30, 2015

- Ryan O'Connell, Assistant Professor, Pathology
- Thomas O'Hare, Associate Professor, Hematology
- Gerald Spangrude, Professor, Hematology
- Matthew Williams, Assistant Professor, Pathology
- Charles Goolsby, Professor of Pathology, Northwestern University

Addendum

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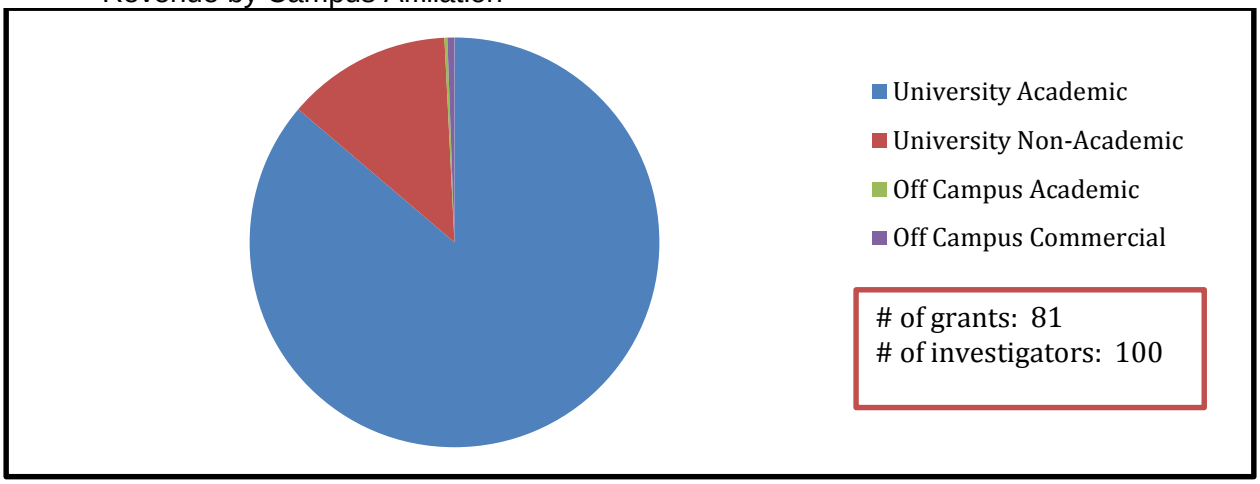
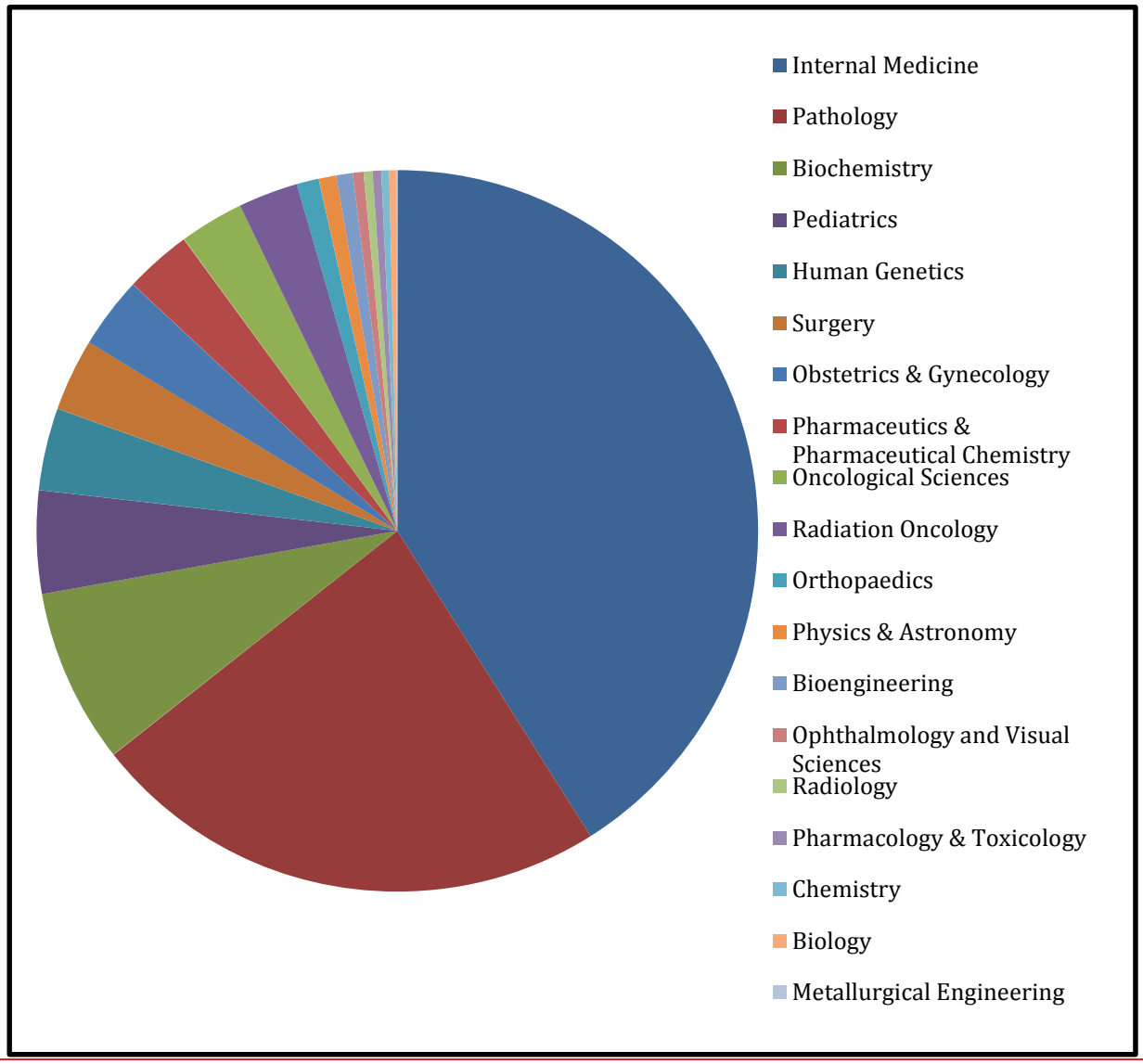
FY15 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

1	ARUP	Off Campus
2	Williams, Matthew	Department
3	Camp, Nicola	NIH
4	Deininger, Michael	NIH, Leukemia & Lymphoma Society
5	Atanackovic, Djordje	Department, HCI
6	Boudina, Sihem	NIH
7	Rutter, Jared	Treadwell Foundation, NIH
8	Capecchi, Mario	HHMI, Akers Private Foundation
9	Planelles, Vicente	NIH, Univ. of NC, American Found. Aids Res.
10	Prchal, Josef	Leukemia & Lymphoma Society, HHMI

Goals for FY16

Due to the increase is multiparameter analytical needs, the flow core will be pursuing the purchase of a 4 laser >10 color instrument. Over the last year the core has had to turn away potential customers or develop suboptimal phenotypic panels because the core lacks the instrumentation to accomplish these assays.

Also, the Avalon cell sorter still represents and area for significant increase in revenue. As the usage on the FACSAria cell sorter remains heavy, we will be shifting some of these projects to the Avalon. This should allow greater throughput of experiments on the Aria as well as free up time for more high parameter sorts.

Publications

1. Blanc, C.A., H. Rosen, and T.E. Lane, *FTY720 (fingolimod) modulates the severity of viral-induced encephalomyelitis and demyelination.* J Neuroinflammation, 2014. **11**: p. 138.
2. Bonczkowski, P., et al., *Replication competent virus as an important source of bias in HIV latency models utilizing single round viral constructs.* Retrovirology, 2014. **11**: p. 70.
3. Bruno, B.J. and C.S. Lim, *Inhibition of bcr-abl in human leukemic cells with a coiled-coil protein delivered by a leukemia-specific cell-penetrating Peptide.* Mol Pharm, 2015. **12**(5): p. 1412-21.
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5. Chamberlain, L.M., et al., *Extended culture of macrophages from different sources and maturation results in a common M2 phenotype.* J Biomed Mater Res A, 2015. **103**(9): p. 2864-74.
6. Cusick, M.F., et al., *DA virus mutant H101 has altered CNS pathogenesis and causes immunosuppression.* J Neuroimmunol, 2014. **277**(1-2): p. 118-26.
7. Cusick, M.F., et al., *Acthar gel treatment suppresses acute exacerbations in a murine model of relapsing-remitting multiple sclerosis.* Autoimmunity, 2015. **48**(4): p. 222-30.
8. DePaula-Silva, A.B., et al., *Determinants for degradation of SAMHD1, Mus81 and induction of G2 arrest in HIV-1 Vpr and SIVagm Vpr.* Virology, 2015. **477**: p. 10-7.
9. Eiring, A.M., et al., *Combined STAT3 and BCR-ABL1 inhibition induces synthetic lethality in therapy-resistant chronic myeloid leukemia.* Leukemia, 2015. **29**(3): p. 586-97.
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12. Khorashad, J.S., et al., *shRNA library screening identifies nucleocytoplasmic transport as a mediator of BCR-ABL1 kinase-independent resistance.* Blood, 2015. **125**(11): p. 1772-81.
13. Kohl, K.D., et al., *Herbivorous rodents (Neotoma spp.) harbour abundant and active foregut microbiota.* Environ Microbiol, 2014. **16**(9): p. 2869-78.
14. Kubinak, J.L., et al., *MyD88 signaling in T cells directs IgA-mediated control of the microbiota to promote health.* Cell Host Microbe, 2015. **17**(2): p. 153-63.
15. Lochhead, R.B., et al., *MicroRNA-146a provides feedback regulation of lyme arthritis but not carditis during infection with Borrelia burgdorferi.* PLoS Pathog, 2014. **10**(6): p. e1004212.
16. Martins, L.J., et al., *Modeling HIV-1 Latency in Primary T Cells Using a Replication-Competent Virus.* AIDS Res Hum Retroviruses, 2015.
17. Murry, J.P., et al., *Sulfonation pathway inhibitors block reactivation of latent HIV-1.* Virology, 2014. **471-473**: p. 1-12.
18. Peng, Z.H. and J. Kopecek, *Synthesis and activity of tumor-homing peptide iRGD and histone deacetylase inhibitor valproic acid conjugate.* Bioorg Med Chem Lett, 2014. **24**(8): p. 1928-33.
19. Pomicter, A.D., et al., *Limited efficacy of BMS-911543 in a murine model of Janus kinase 2 V617F myeloproliferative neoplasm.* Exp Hematol, 2015. **43**(7): p. 537-45 e1-11.
20. Ramirez, P.W., et al., *Downmodulation of CCR7 by HIV-1 Vpu results in impaired migration and chemotactic signaling within CD4(+) T cells.* Cell Rep, 2014. **7**(6): p. 2019-30.
21. Rondina, M.T., et al., *Platelet-monocyte aggregate formation and mortality risk in older patients with severe sepsis and septic shock.* J Gerontol A Biol Sci Med Sci, 2015. **70**(2): p. 225-31.
22. Saayman, S., et al., *An HIV-encoded antisense long noncoding RNA epigenetically regulates viral transcription.* Mol Ther, 2014. **22**(6): p. 1164-75.
23. Schell, J.C., et al., *A role for the mitochondrial pyruvate carrier as a repressor of the Warburg effect and colon cancer cell growth.* Mol Cell, 2014. **56**(3): p. 400-13.
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25. Van Vranken, J.G., et al., *SDHAF4 promotes mitochondrial succinate dehydrogenase activity and prevents neurodegeneration.* Cell Metab, 2014. **20**(2): p. 241-52.
26. Yousef, S., et al., *CD229 is expressed on the surface of plasma cells carrying an aberrant phenotype and chemotherapy-resistant precursor cells in multiple myeloma.* Hum Vaccin Immunother, 2015. **11**(7): p. 1606-11.
27. Yousef, S., et al., *Immunomodulatory molecule PD-L1 is expressed on malignant plasma cells and myeloma-propagating pre-plasma cells in the bone marrow of multiple myeloma patients.* Blood Cancer J, 2015. **5**: p. e285.

Genomics Facility

Overview

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

Services

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

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

DNA Sequencing
- Mutation Detection

Real Time PCR
- Gene Expression

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

Personnel
- Derek Warner, Director
- Michael Klein, Manager

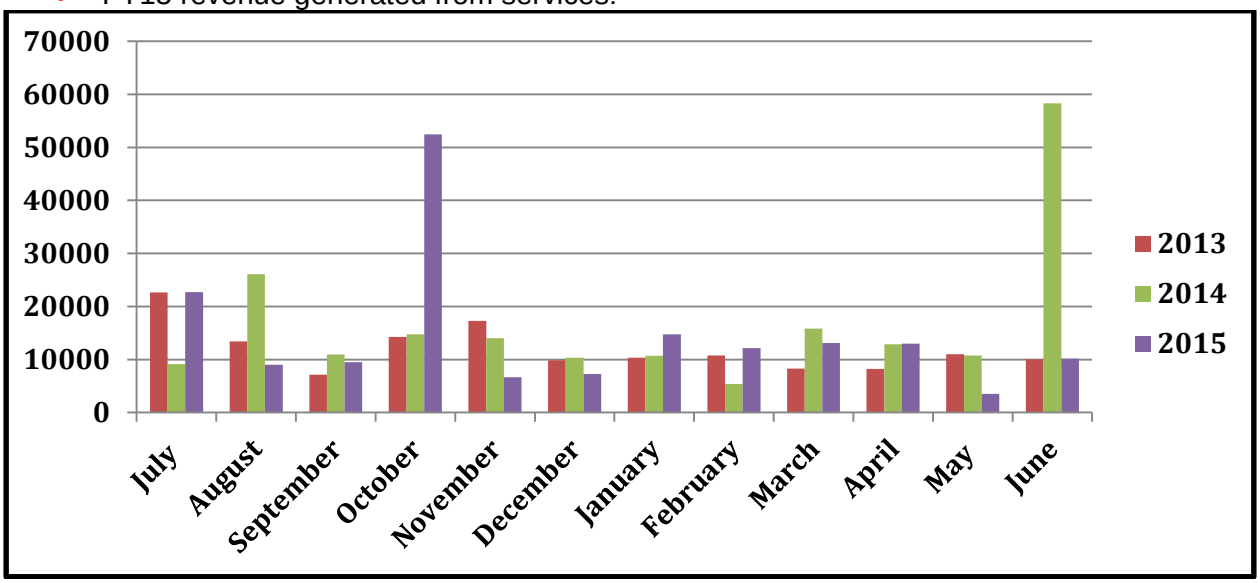
2015 Annual Update

New Equipment
- No new instrumentation for FY15

New Services
- No new services for FY15

Revenue/Expenses
- VP of Health Sciences Support: $0
- FY15 revenue: $174,278
- FY15 expenses: $134,337

- FY15 revenue generated from services:



Advisory Board Committee
Last meeting date: July 20, 2015

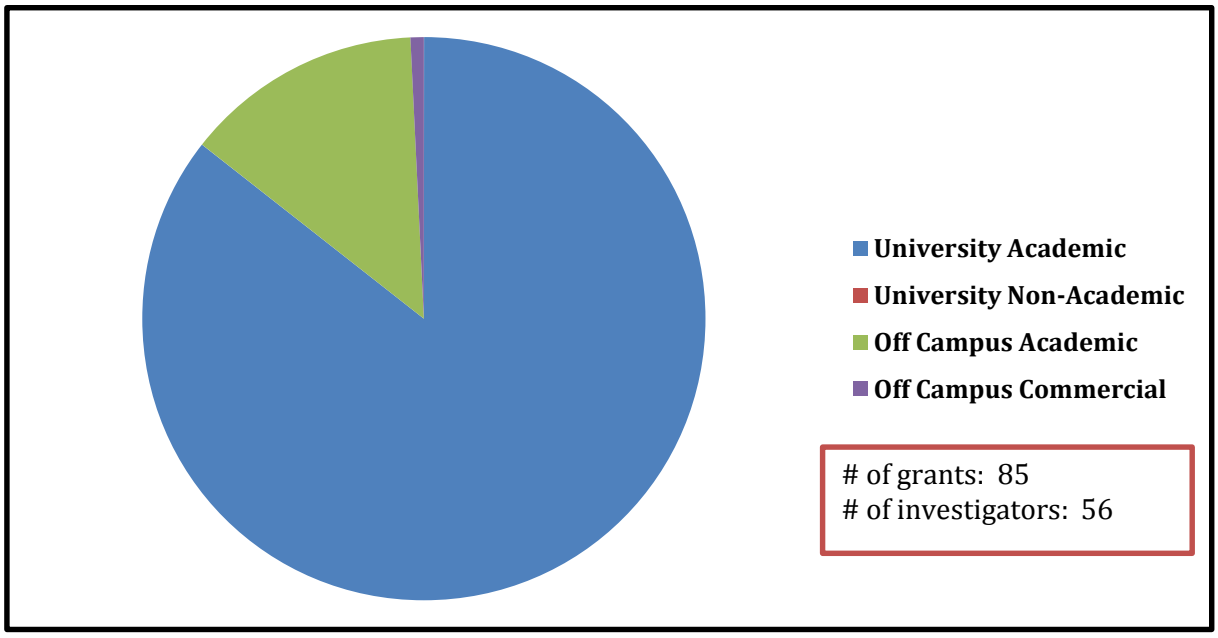
- Gerald Krueger, Professor, Dermatology
- Deborah Neklason, Research Associate Professor, Huntsman Cancer Institute
- Nicola Camp, Professor, Genetic Epidemiology

Addendum

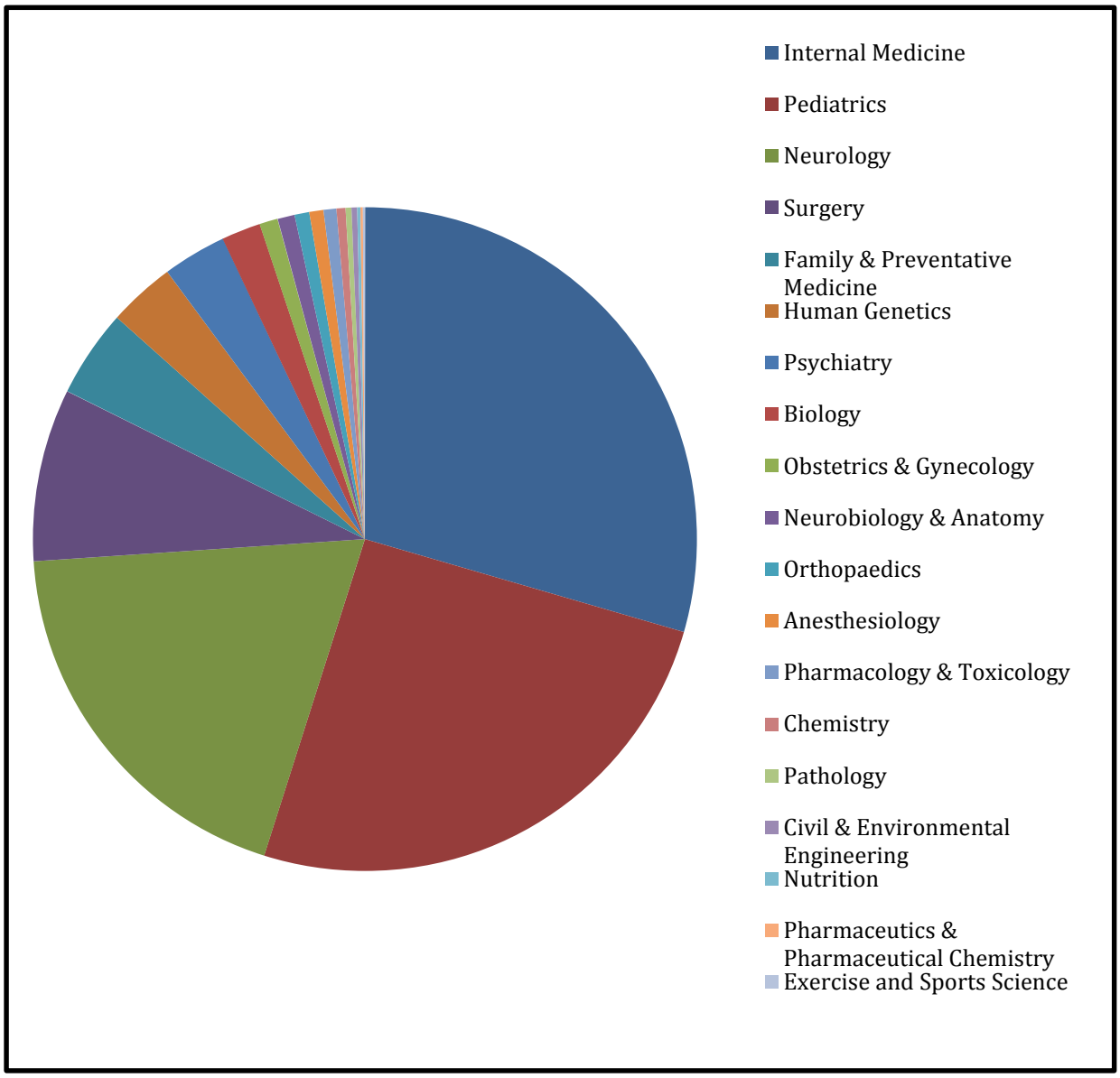
- Faculty Oversight Committee Guidelines can be found for all cores at the following link: http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

FY15 Scientific Impact
Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

1	Korenberg, Julie	NIH
2	Pulst, Stefan	Norda
3	Cannon-Albright, L.	NIH, Mayo Clinic Rochester
4	Camp, Nicola	NIH
5	Carrell, Douglas	Department
6	Tulane University	Off Campus Academic
7	Taylor, Jack	Department
8	Coon, Hilary	NIH
9	Weiss, Robert B.	NIH, HHMI
10	Ohio State University	Off Campus Academic

Publications

1. Allen-Brady, K., et al., *Evidence for pelvic organ prolapse predisposition genes on chromosomes 10 and 17.* Am J Obstet Gynecol, 2015. **212**(6): p. 771 e1-7.
2. Cirulli, E.T., et al., *Exome sequencing in amyotrophic lateral sclerosis identifies risk genes and pathways.* Science, 2015. **347**(6229): p. 1436-41.
3. Dansithong, W., et al., *Ataxin-2 regulates RGS8 translation in a new BAC-SCA2 transgenic mouse model.* PLoS Genet, 2015. **11**(4): p. e1005182.
4. Gallego-Iradi, C., et al., *KCNC3(R420H), a K(+) channel mutation causative in spinocerebellar ataxia 13 displays aberrant intracellular trafficking.* Neurobiol Dis, 2014. **71**: p. 270-9.
5. Gibson, S.B., et al., *Familial clustering of ALS in a population-based resource.* Neurology, 2014. **82**(1): p. 17-22.
6. Iacob, E., et al., *Gene expression factor analysis to differentiate pathways linked to fibromyalgia, chronic fatigue syndrome, and depression in a diverse patient sample.* Arthritis Care Res (Hoboken), 2015.
7. Iacob, E., et al., *Leukocyte Gene Expression in Patients with Medication Refractory Depression before and after Treatment with ECT or Isoflurane Anesthesia: A Pilot Study.* Depress Res Treat, 2014. **2014**: p. 582380.
8. Javan, H., et al., *Cardiomyocyte p65 nuclear factor-kappaB is necessary for compensatory adaptation to pressure overload.* Circ Heart Fail, 2015. **8**(1): p. 109-18.
9. Jenkins, T.G., et al., *Intra-sample heterogeneity of sperm DNA methylation.* Mol Hum Reprod, 2015. **21**(4): p. 313-9.
10. Lo, R.Y., et al., *Coenzyme Q10 and spinocerebellar ataxias.* Mov Disord, 2015. **30**(2): p. 214-20.
11. Moscovich, M., et al., *Clinical evaluation of eye movements in spinocerebellar ataxias: a prospective multicenter study.* J Neuroophthalmol, 2015. **35**(1): p. 16-21.
12. Neuenschwander, A.G., et al., *Amyotrophic lateral sclerosis risk for spinocerebellar ataxia type 2 ATXN2 CAG repeat alleles: a meta-analysis.* JAMA Neurol, 2014. **71**(12): p. 1529-34.
13. Nguyen, T.T., et al., *Loss of Miro1-directed mitochondrial movement results in a novel murine model for neuron disease.* Proc Natl Acad Sci U S A, 2014. **111**(35): p. E3631-40.
14. Scoles, D.R., et al., *Repeat Associated Non-AUG Translation (RAN Translation) Dependent on Sequence Downstream of the ATXN2 CAG Repeat.* PLoS One, 2015. **10**(6): p. e0128769.
15. Snow, A.K., et al., *APC promoter 1B deletion in seven American families with familial adenomatous polyposis.* Clin Genet, 2014.
16. Teerlink, C., et al., *Significant evidence of linkage for a gene predisposing to colorectal cancer and multiple primary cancers on 22q11.* Clin Transl Gastroenterol, 2014. **5**: p. e50.
17. Teerlink, C.C., L.A. Cannon-Albright, and R.Z. Tashjian, *Significant association of full-thickness rotator cuff tears and estrogen-related receptor-beta (ESRRB).* J Shoulder Elbow Surg, 2015. **24**(2): p. e31-5.
18. Zhou, G., et al., *Efficacy of aliskiren, compared with angiotensin II blockade, in slowing the progression of diabetic nephropathy in db/db mice: should the combination therapy be a focus?* Am J Transl Res, 2015. **7**(5): p. 825-40.

Machine Shop

Overview

The Machine Shop Facility is equipped with a full complement of lathes, drills, mills, welders, grinders, and CNC systems, staffed by experienced machinists 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. A portion of the work done by this group directly benefits the U. Hospital groups that need repair, customization, synthesis of "tools" for surgeries with rapid turn around time.

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

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

2015 Annual Update

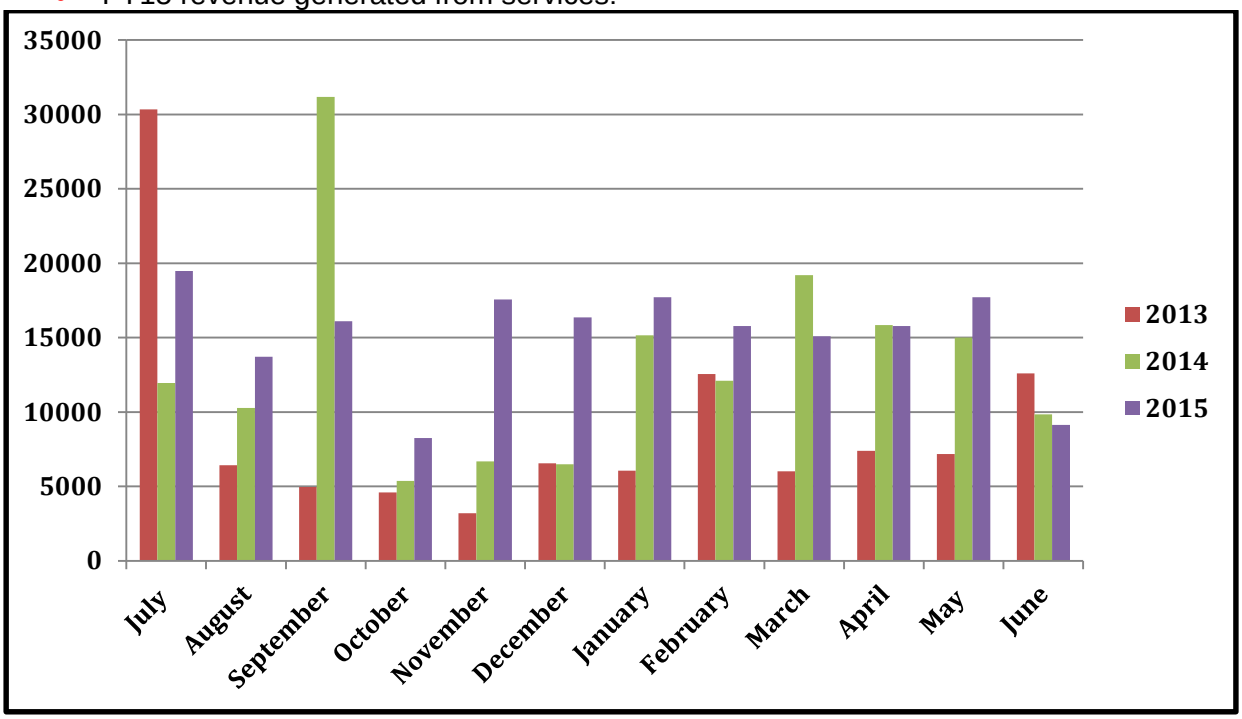
New Equipment

- The Machine Shop Facility received a new state of the art CNC Lathe
- The Machine Shop Facility continues to supply improved plastic fabrication

Revenue/Expenses

- VP of Health Sciences Support: $15,000
- FY15 revenue: $182,693
- FY15 expenses: $199,724

- FY15 revenue generated from services:



Advisory Board Committee

- Perry Renshaw, Professor, Psychiatry
- Stephen Andrues, Materials Management Facilitator, Facilities Engineering
- Steve White, Professor, Add Program

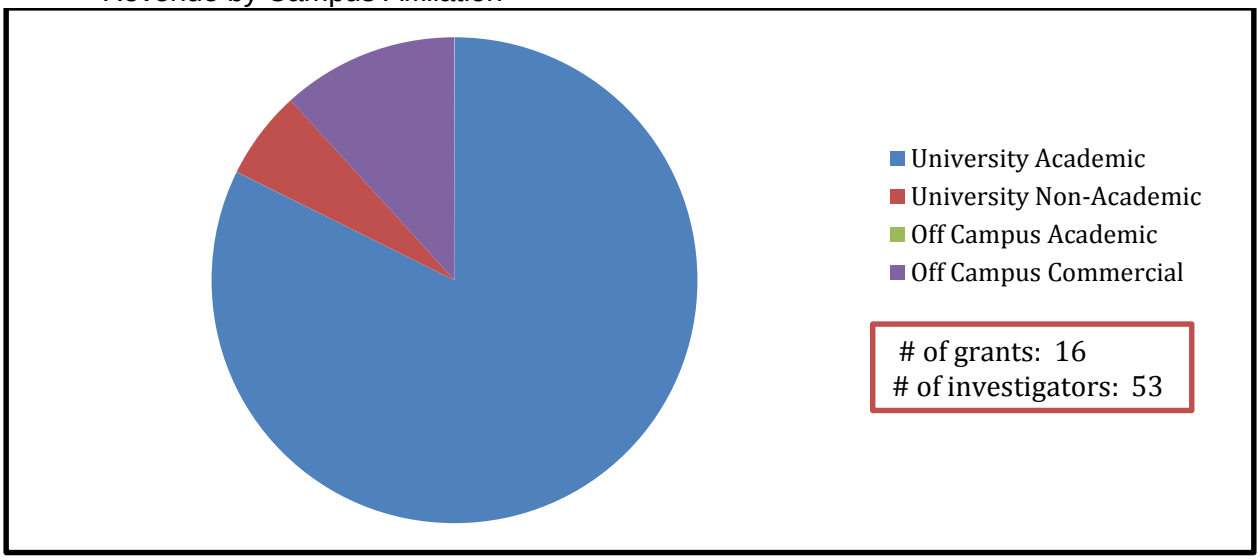
Addendum

- Faculty Oversight Committee Guidelines can be found for all cores at the following link: http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

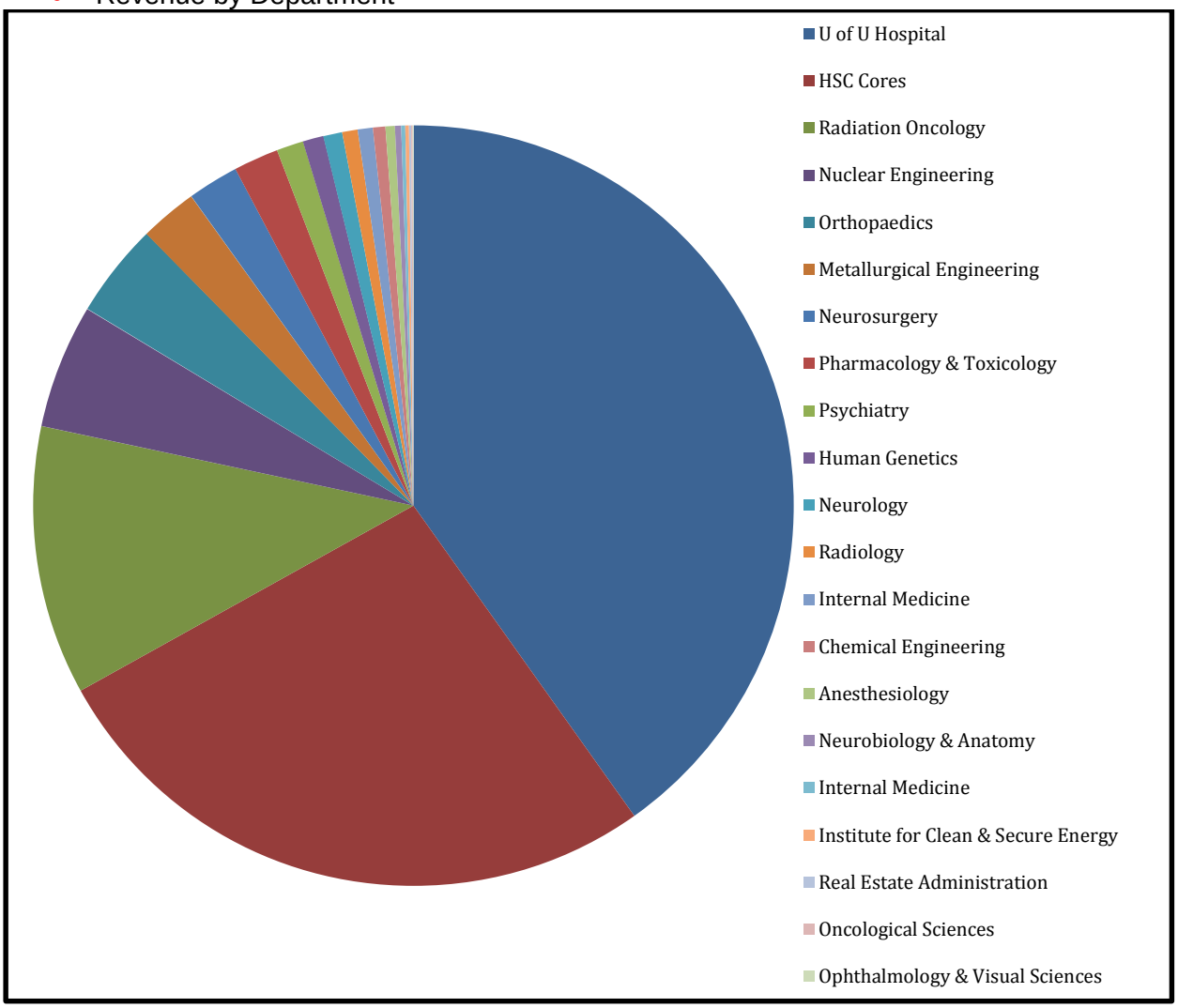
FY15 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

1	Andrues, Steve	University Hospital Surgical Services
2	Rodesch, Chris	HSC Cell Imaging Core
3	Meisner, Steve	Radiation Oncology
4	Myriad Genetics	Off Campus
5	Primary Children's Medical Center	Off Campus
6	Peacock, Darren	University Hospital Operating Room
7	Rajamani, Raj	Metallurgical Engineering
8	Hobbs, Maurine	HSC Zebrafish Core
9	Quinn, David	Orthopaedics
10	Sawyer, Allison	University Hospital Surgical Services

Publications: There were no know publications acknowledging this facility in FY15

Mass Spectrometry & Proteomics

Overview

The Mass Spectrometry & Proteomics Facility is geared toward supporting proteomics research as well as providing basic mass spectrometry (MS) support for a broad range of research and sample types, such as polymers, natural products, small synthetic molecules, peptides, large intact proteins, and nucleic acids. The facility is equipped with several high-performance mass spectrometers, including a state-of-the-art FTMS instrument (LTQ-FT; ThermoElectron) with nano-LC and nano-ESI ionization, and a state-of-the-art Maldi/ToF/ToF instrument (UltrafleXtreme; Bruker Daltonics) with tissue-imaging capabilities. LC/MS/MS instruments in the lab are equipped with nano-LC for ultimate sensitivity and chromatographic performance. The mission of this facility is to provide the highest quality mass spectrometry analyses for protein and other biomolecule investigations. The facility relocated from BPRB to the basement of EEJ. The move shutdown several spectrometers for two months and one for nearly six months. This has had a significant impact on the performance of the facility. Curently all equipment has been restored to the capability prior to moving or better.

Services

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

Proteomics Services:

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

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

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

Equipment

Mass Spectrometers
- Thermo LTQ-FT
- Bruker UltrafleXtreme
- Waters Q-ToF-2
- **NEW!** Bruker Maxis 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
-

Advisory Board Committee
- Darrell Davis, Professor, Medicinal Chemistry
- Jared Rutter, Professor, Biochemistry
- Guy Zimmerman, Professor, Human Genetics
- Michael Kay, Professor, Biochemistry

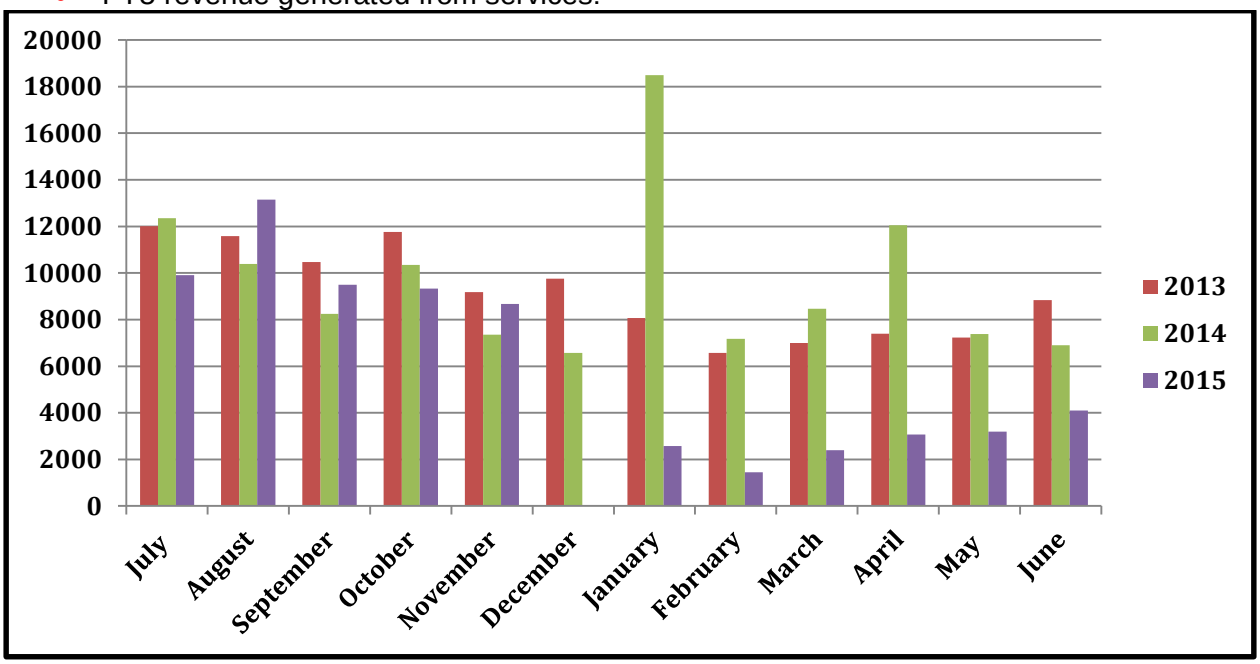
Addendum
- Faculty Oversight Committee Guidelines can be found for all cores at the following link: http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

2015 Annual Update

New Equipment
- In May 2015, the Mass Spectrometry & Proteomics Facility received a NIH S10 award for the purchase of a Bruker Maxis HD with ETD. This instrument will be implanted for the analysis of intact proteins and other proteomics projects.

Revenue/Expenses
- VP of Health Sciences Support: $151,000
- FY15 revenue: $67,335
- FY15 expenses: $ 219,068

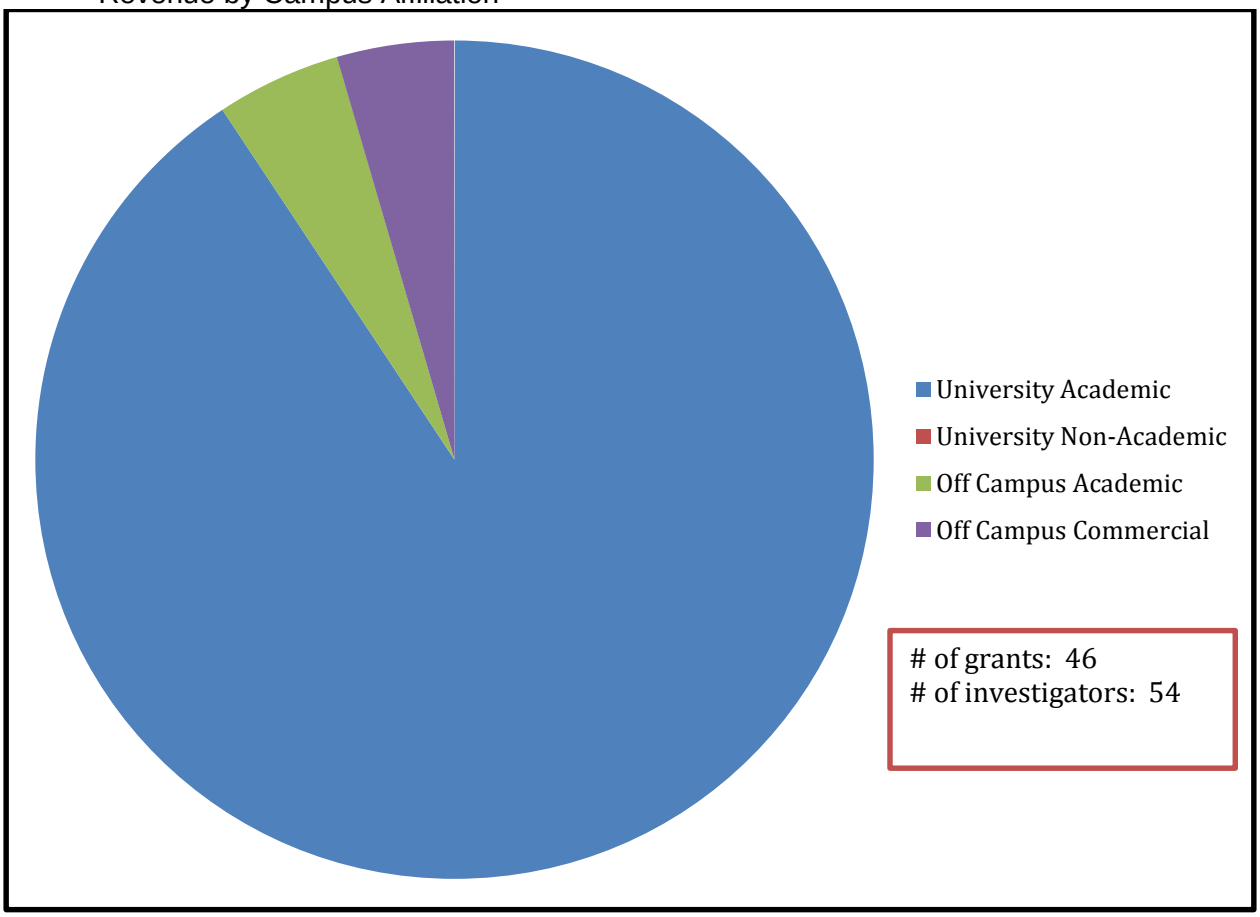
- FY5 revenue generated from services:



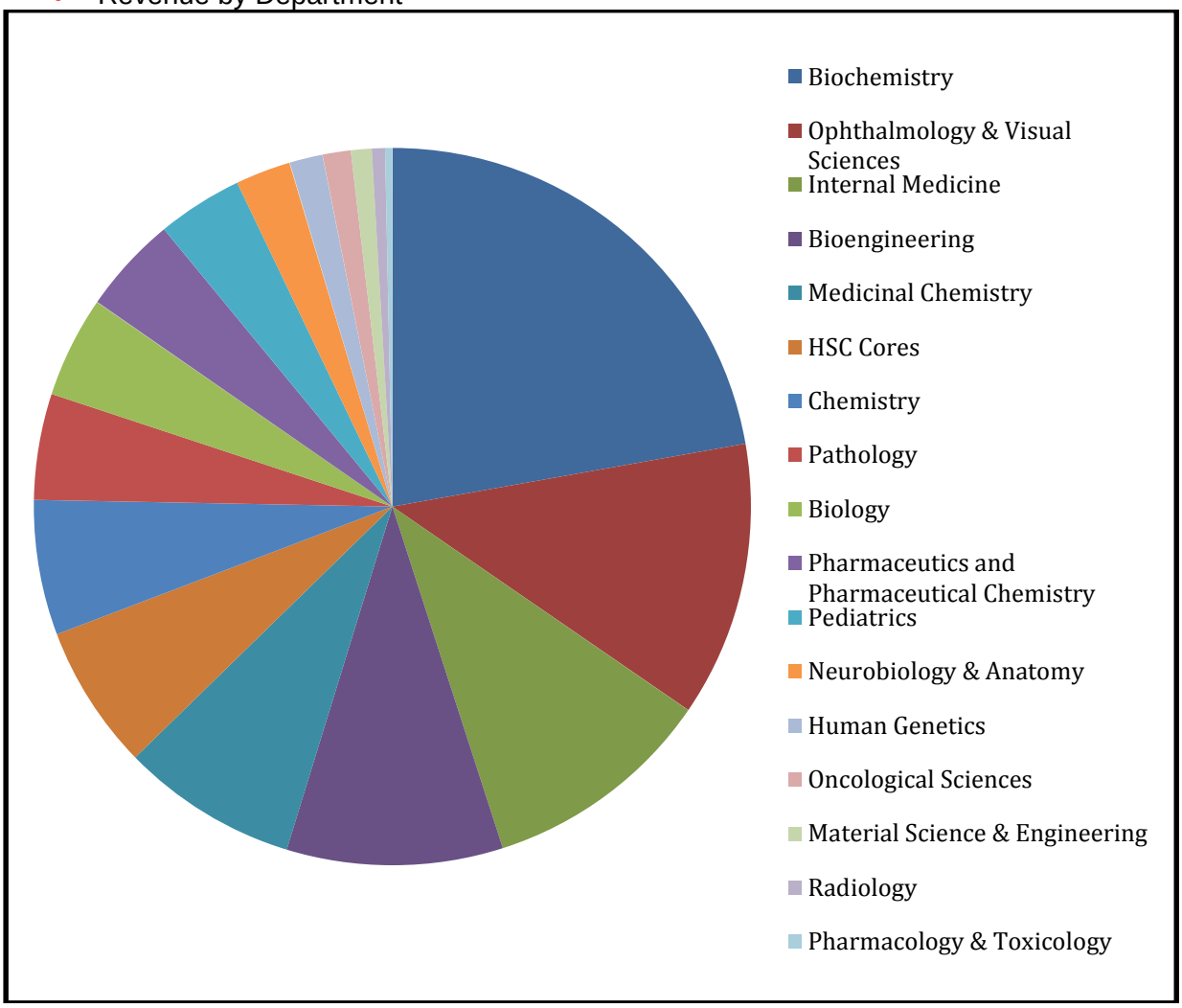
FY15 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users 2015

1	Sundquist, Wesley I	NIH, DHHS, HCI
2	Yu, Michael	NIH
3	Hageman, Gregory	Department
4	Hanson, Miachel	HSC DNA Peptide Core
5	Minteer, Shelley	USDA, Army Research Office
6	Sharma, Sunil	Salarius Pharm., LSK Biopartners
7	Hill, Christopher	NIH
8	Davis, Darrell	Department
9	Yost, Christian	Department
10	Vankayalapati, Hari	Taylor Endowment Cancer Fund

Publications

1. Caballe, A., et al., *ULK3 regulates cytokinetic abscission by phosphorylating ESCRT-III proteins.* Elife, 2015. **4**: p. e06547.
2. Han, H., et al., *Binding of Substrates to the Central Pore of the Vps4 ATPase Is Autoinhibited by the Microtubule Interacting and Trafficking (MIT) Domain and Activated by MIT Interacting Motifs (MIMs).* J Biol Chem, 2015. **290**(21): p. 13490-9.
3. Mercenne, G., et al., *Angiomotin functions in HIV-1 assembly and budding.* Elife, 2015. **4**.
4. Shen, P.S., et al., *Protein synthesis. Rqc2p and 60S ribosomal subunits mediate mRNA-independent elongation of nascent chains.* Science, 2015. **347**(6217): p. 75-8.
5. VanderLinden, R.T., et al., *Structural basis for the activation and inhibition of the UCH37 deubiquitylase.* Mol Cell, 2015. **57**(5): p. 901-11.

Metabolic Phenotyping

Overview

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

Services

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

Equipment

- Seahorse Flux (XF24) Analyzer
- Eight Columbus Instruments metabolic chambers equipped with temperature-controlled enclosure.
- NMR
- Luminex MAGPIX & Luminex 200 System

Personnel

- Sihem Boudina, Ph.D., Interim Director
- Yonhwan Han, Manager

2015 Annual Update

Equipment

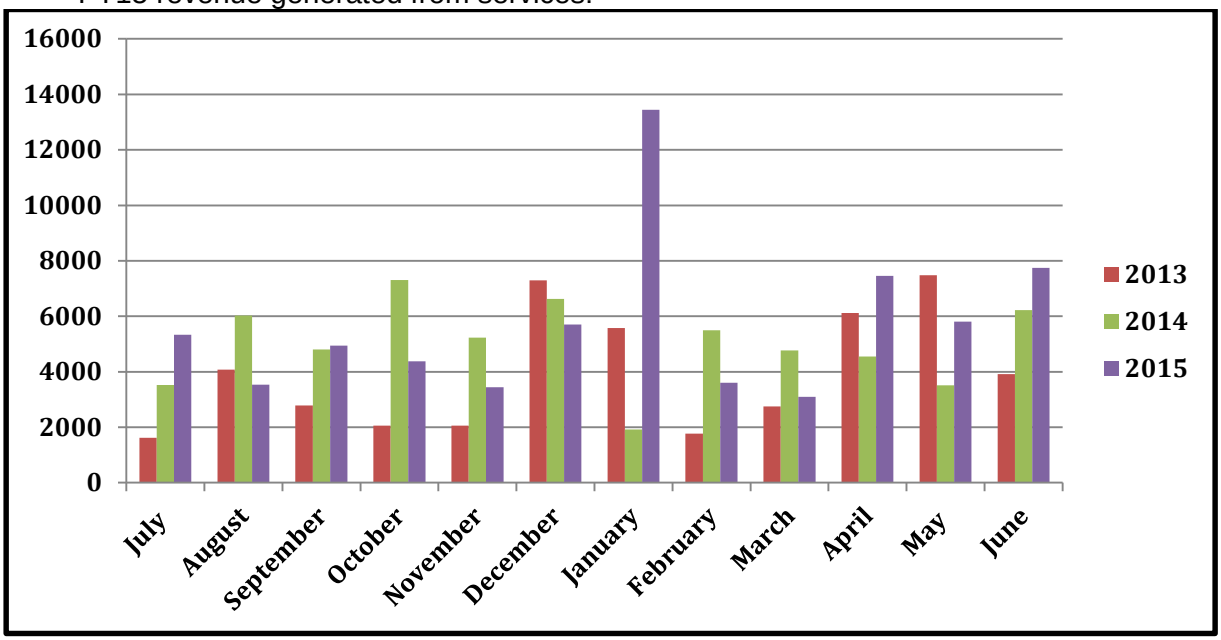
- In March 2015, the Metabolic Phenotyping Facility was awarded $73,112 from VP of Research equipment grant to upgrade the metabolic chambers. Two additional chambers were added, totaling 8 chambers, and an environmental enclosure that allows the control of temperature and light for the study of thermoregulation of metabolism and circadian influences.

New Services

- The Metabolic Phenotyping Facility is now offering glucose and insulin Clamps in mice and rats, a gold standard to measure whole body insulin sensitivity.
- Gene expression analysis using multiplex technology

Revenue/Expenses

- VP of Health Sciences Support: $71,500
- FY15 revenue: $68,239
- FY15 expenses: $149,418
- FY15 revenue generated from services:



Advisory Board Committee

Last meeting date: January, 2014

- Don McClain, Professor, Endocrinology, Metabolism & Diabetes
- Jared Rutter, Professor, Biochemistry
- Carl Thummel, Professor, Human Genetics

Addendum

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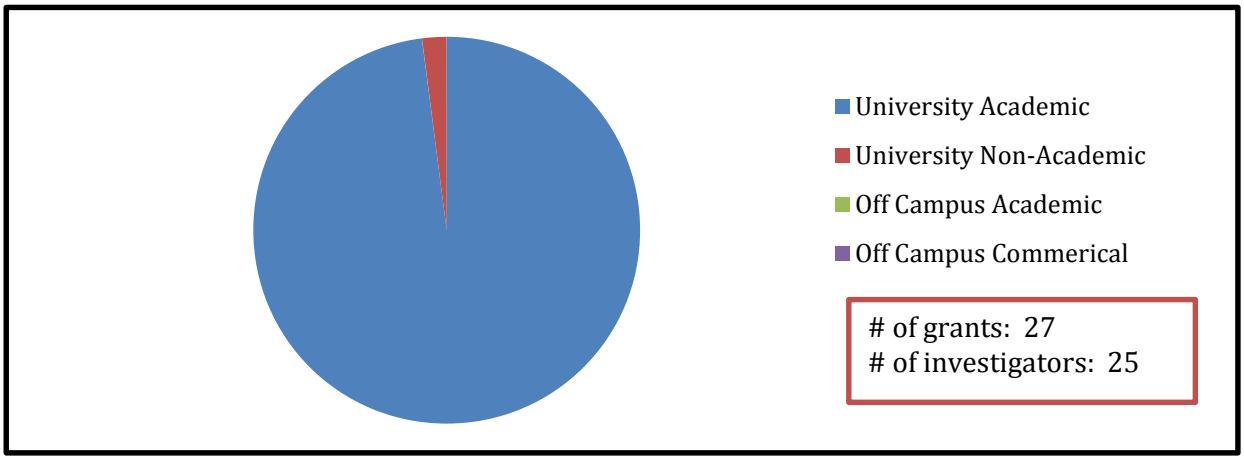
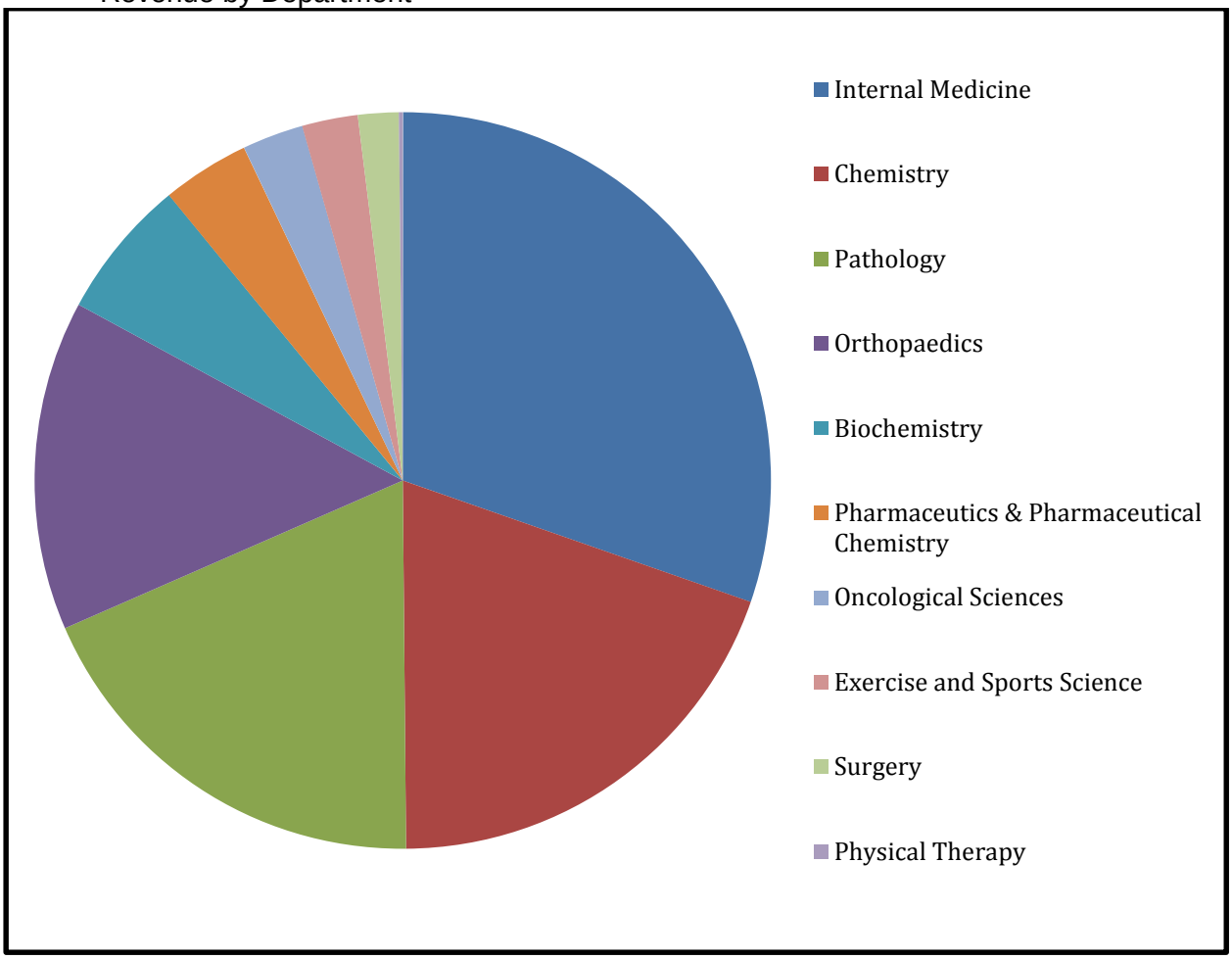
FY15 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

1	Minteer, Shelley	USDA, Army Research Office
2	McClain, Donald	NIH
3	Higgins, Thomas	Peery Discover Program
4	Round, June	NIH, Mallinckrodt Jr. Foundation
5	O'Connell, Ryan	NIH
6	Symons, John	NIH, American Diabetes Association
7	Li, Dean	NIH, Advanced Heart Failure Program
8	Kaplan, Jerry	NIH
9	Bae, You	NIH
10	Villanueva, Claudio	NIH,NSF

Publications

1. Diakos, N.A., et al., *Myocardial atrophy and chronic mechanical unloading of the failing human heart: implications for cardiac assist device-induced myocardial recovery.* J Am Coll Cardiol, 2014. **64**(15): p. 1602-12.
2. Haller, J.M., et al., *Inflammatory cytokine response following acute tibial plateau fracture.* J Bone Joint Surg Am, 2015. **97**(6): p. 478-83.
3. Kwon, O.S., et al., *MyD88 regulates physical inactivity-induced skeletal muscle inflammation, ceramide biosynthesis signaling, and glucose intolerance.* Am J Physiol Endocrinol Metab, 2015. **309**(1): p. E11-21.
4. Nguyen, T.T., et al., *Loss of Miro1-directed mitochondrial movement results in a novel murine model for neuron disease.* Proc Natl Acad Sci U S A, 2014. **111**(35): p. E3631-40.
5. Schell, J.C., et al., *A role for the mitochondrial pyruvate carrier as a repressor of the Warburg effect and colon cancer cell growth.* Mol Cell, 2014. **56**(3): p. 400-13.
6. Shen, L., et al., *Metabolic reprogramming in triple-negative breast cancer through Myc suppression of TXNIP.* Proc Natl Acad Sci U S A, 2015. **112**(17): p. 5425-30.

Metabolomics Facility

Overview

The Metabolomics facility provides analysis of metabolites found within a tissue, biological fluid, whole organism, culture, or other biological source. Currently metabolomics is a comparative science; the facility usually analyzes the differences found between biological samples that have been subjected to a treatment. This can be a genetic mutation, drug treatment, etc. Most analyses are relative, therefore the facility can only make judgments on individual metabolites such as comparing the relative amounts of succinate between a mutant and a wild type but not compare the levels of succinate and fumarate within the same group or between groups. No one method is fully capable of completely profiling the metabolome. To maximize the number of metabolites observed, the facility is equipped with three chemical analysis platforms, GC-MS, LC-MS, and NMR. The facility moved in the past year from BPRB to the basement of EEJ. This move caused a significant amount of downtime. While this is minimally reflected in the monthly revenue (see below) the cost in additional time to staff was significant. It should be noted that Director, James Cox did an outstanding job of organizing this move to be efficient and cost effective for the University.

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:

- Waters GCT Premier gas chromatograph-mass spectrometer (GC-MS)
- Agilent 5973 gas chromatograph-quadrupole mass spectrometer (GC-MS)
- Agilent 6520 Ultrapressure liquid chromatograph-quadrupole time of flight mass-spectrometer (UPLC-QTOF-MS)
- Agilent 6550 Ultrapressure liquid chromatograph-quadrupole time of flight mass-spectrometer (UPLC-QTOF-MS)

- Agilent 6550 QTOF, which is a highly sensitive and state of the art mass spectrometer for polar metabolite analysis
- Varian 500 MHz NMR with data processed by the Chenomx software suite

Personnel

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

2015 Annual Update

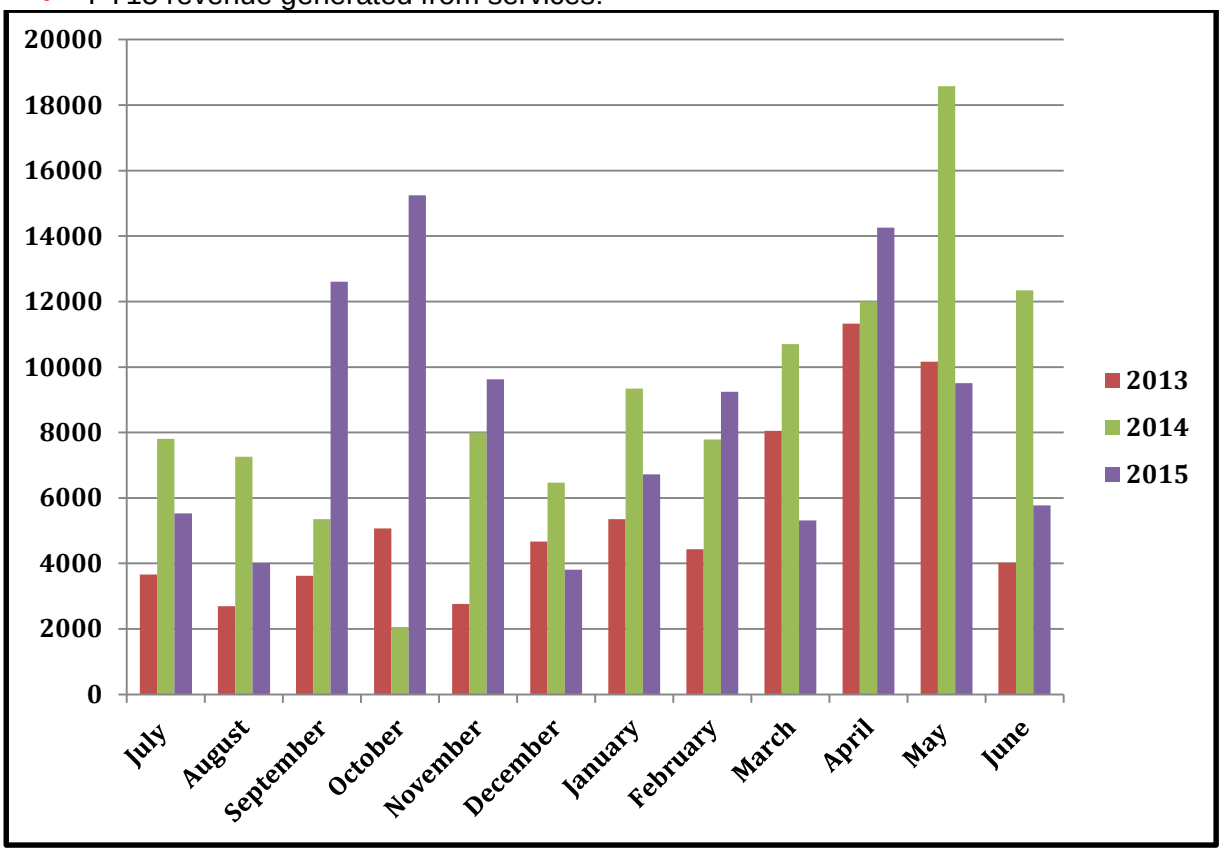
New Equipment

- Agilent 6490 Triple quadrupole LC-MS for the targeted quantification of metabolites, lipids and peptides. (Received $242,369 from VP of Research in March 2015)
- Nitrogen Generator (Received $ 18,000 from VP for Research, 10,000 from Biochemistry, $ 33,000 from Human Genetics and $4,000 from HSC Cores Administration

New Services: None

Revenue/Expenses

- VP of Health Sciences Support : $246,000
- FY15 revenue: $101,633
- FY15 expenses: $289,962
- FY15 revenue generated from services:



Advisory Board Committee

Last meeting date: February 03, 2015

- Dennis Winge, Professor, Hematology
- Carl Thummel, Professor, Department of Human Genetics
- Eric Schmidt, Professor, Medicinal Chemistry

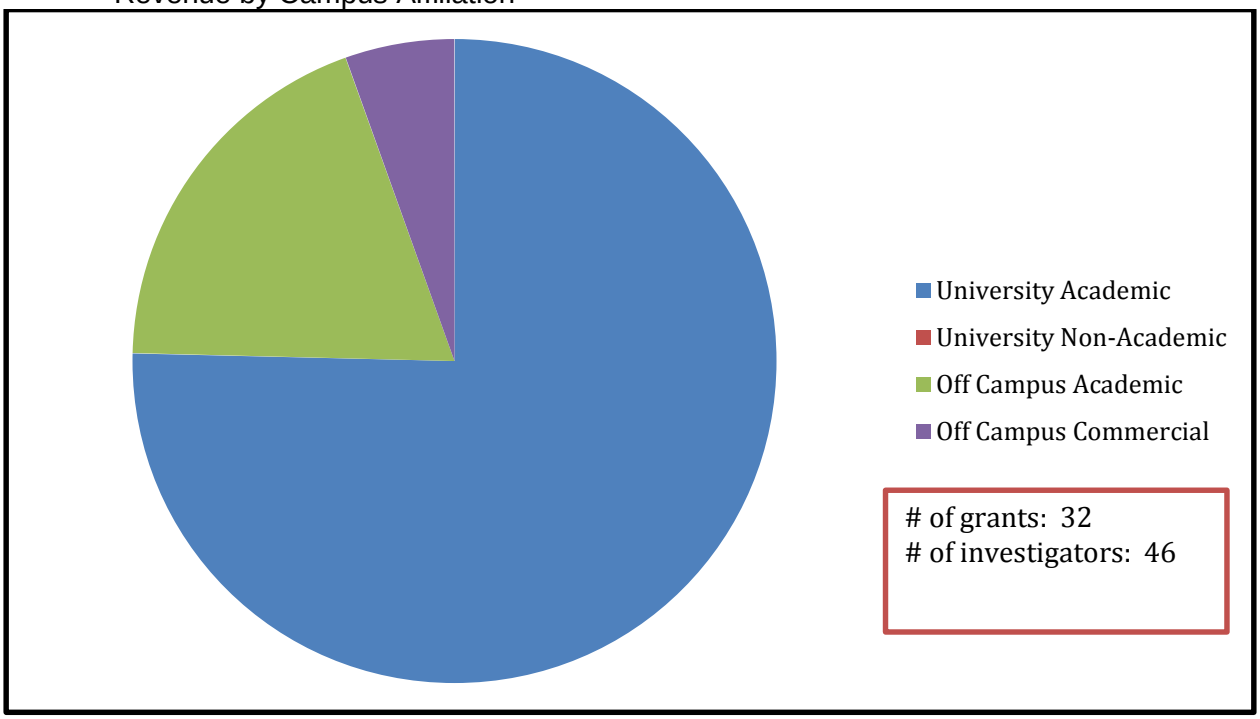
Addendum

- Faculty Oversight Committee Guidelines can be found for all cores at the following link: http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

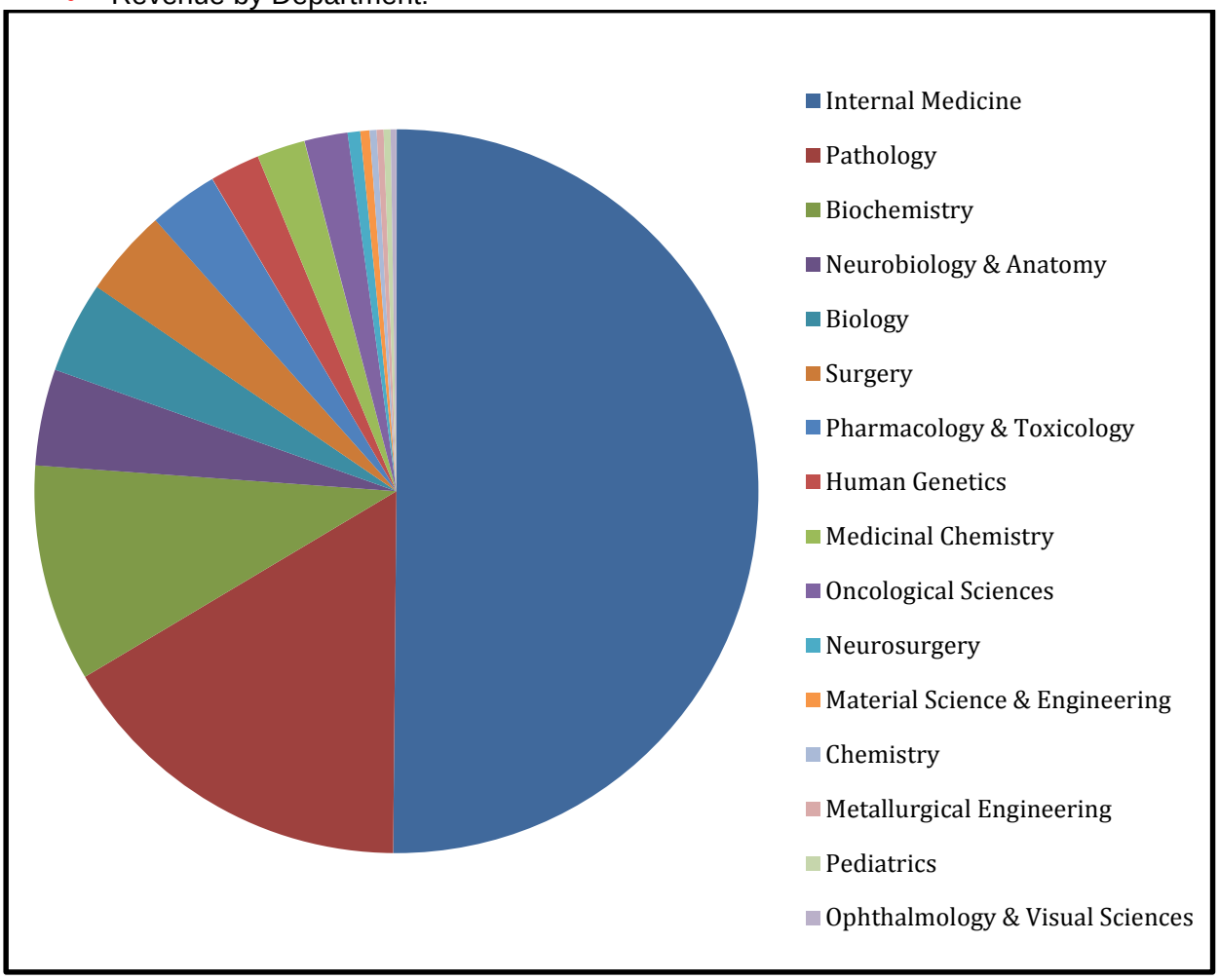
FY15 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department:



Top Users

1	Drakos, Stavros	Doris Duke Foundation
2	Brigham Young University	Off Campus Academic
3	Wasatch Scientific Services	Off Campus Commercial
4	Fujinami, Robert	NIH, Questcor Pharmaceuticals
5	Hughes, Adam	Department
6	Rutter, Jared	NIH, Treadwell Foundation
7	Boudina,Sihem	NIH
8	McClain, Don	NIH
9	Bonkowsky, Josh	NIH
10	Kaplan, Jerry	NIH

Publications

1. Cox, H.D., et al., *Detection and in vitro metabolism of AOD9604.* Drug Test Anal, 2015. **7**(1): p. 31-8.
2. Frech, T.M., et al., *Cardiac metabolomics and autopsy in a patient with early diffuse systemic sclerosis presenting with dyspnea: a case report.* J Med Case Rep, 2015. **9**: p. 136.
3. Kohl, K.D., et al., *Gut microbes of mammalian herbivores facilitate intake of plant toxins.* Ecol Lett, 2014. **17**(10): p. 1238-46.
4. Na, U., et al., *The LYR factors SDHAF1 and SDHAF3 mediate maturation of the iron-sulfur subunit of succinate dehydrogenase.* Cell Metab, 2014. **20**(2): p. 253-66.
5. Philip, M., et al., *Heme exporter FLVCR is required for T cell development and peripheral survival.* J Immunol, 2015. **194**(4): p. 1677-85.
6. Seferovic, M.D., et al., *Heritable IUGR and adult metabolic syndrome are reversible and associated with alterations in the metabolome following dietary supplementation of 1-carbon intermediates.* FASEB J, 2015. **29**(6): p. 2640-52.
7. Shibayama, J., et al., *Metabolic remodeling in moderate synchronous versus dyssynchronous pacing-induced heart failure: integrated metabolomics and proteomics study.* PLoS One, 2015. **10**(3): p. e0118974.
8. Simcox, J.A., et al., *Dietary iron controls circadian hepatic glucose metabolism through heme synthesis.* Diabetes, 2015. **64**(4): p. 1108-19.

UNIVERSITY OF UTAH
HEALTH SCIENCES

Mutation Generation & Detection Facility

Overview

The Mutation Generation & Detection (MGD) Core Facility specializes in providing customized Engineered DNA Nucleases in either the TALEN or CRISPR-Cas9 formats. These DNA Nucleases are cutting edge technology used to perform targeted genomic engineering that modifies a specific genomic region of interest in multiple model systems, including D. rerio, D. melanogaster, C. elegans, P. falciparum, S. cerevisiae, T. castaneum, mammalian cell lines, A. aegypti, and mouse embryos. 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 a partnership with the Mouse Transgenic Facility to create engineered mouse models using CRISPR DNA Nucleases, 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 500 unique TALEN and CRISPR reagents.

Main 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 design and construction
- 2X CRISPR design and construction

High Resolution Melt Analysis

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

Additional Services

- Mouse Transgenic Injection (partnership with Mouse Transgenic Facility)
- Blastocyst Validation of CRISPR reagents (partnership with Mouse Transgenic Facility)
- ssDNA donor design and production
- dsDNA donor design and production
- Custom HRMA genotypng in D. rerio, D. melanogaster, and mouse embryos

Production of transgenic D. rerio using CRISPR reagents

Equipment

BioFire LightScanner
3X Eppendorf Mastercycler ProS
Eppendorf Centrifuge 5430
27" Apple iMac Desktop with QWC Mercury Elite-Al Pro External Hard drive
Illumina Eco
Innova 43 bacterial Shaker
Innova 42 bacterial Shaker
Frigidaire -20°C Freezer
2X Eppendorf 5424 Microcentrifuges

Personnel

Timothy Dahlem, Ph.D., Director

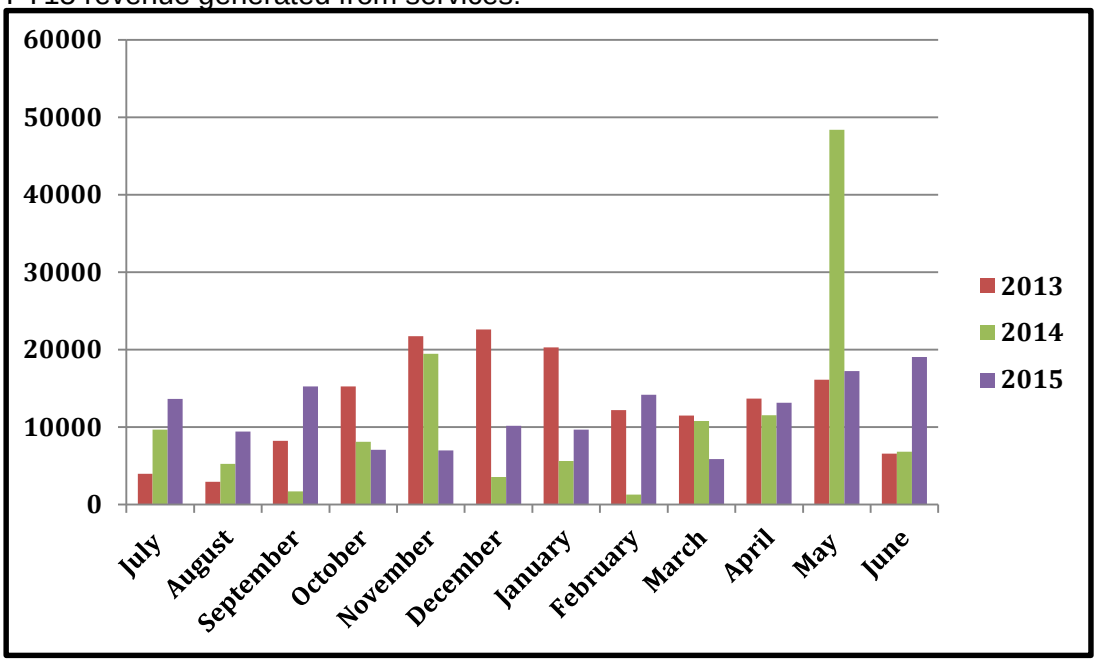
2015 Annual Update

New equipment: None
New Services:

Blastocyst Validation of CRISPR reagents (partnership with Mouse Transgenic Facility)
ssDNA donor design and production
dsDNA donor design and production
Custom HRMA genotypng in D. rerio, D. melanogaster, and mouse embryos
Production of transgenic D. rerio using CRISPR reagents

Revenue/Expenses

- VP of Health Sciences Support: $30,000
- FY15 revenue: $141,713
- FY15 expenses: $159,979
- FY15 revenue generated from services:



Advisory Board Committee
Last meeting date: July 23, 2014

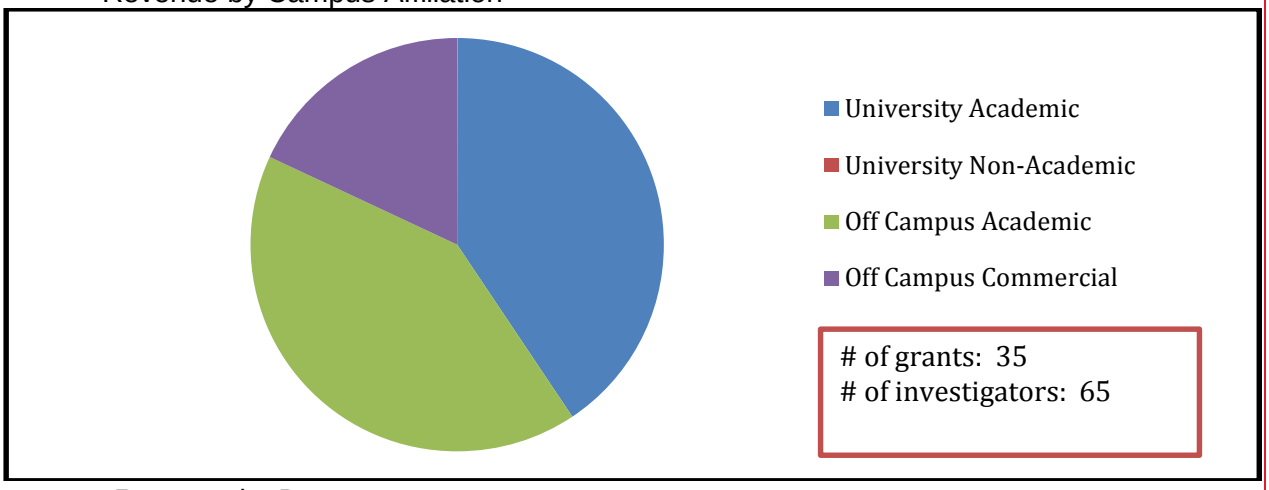
- David Grunwald, Department of Human Genetics (Senior Faculty Advisor)
- Dana Carroll, Department of Biochemistry
- Ryan O'Connell, Department of Pathology
- Lewis Charles Murtaugh, Department of Human Genetics

Addendum

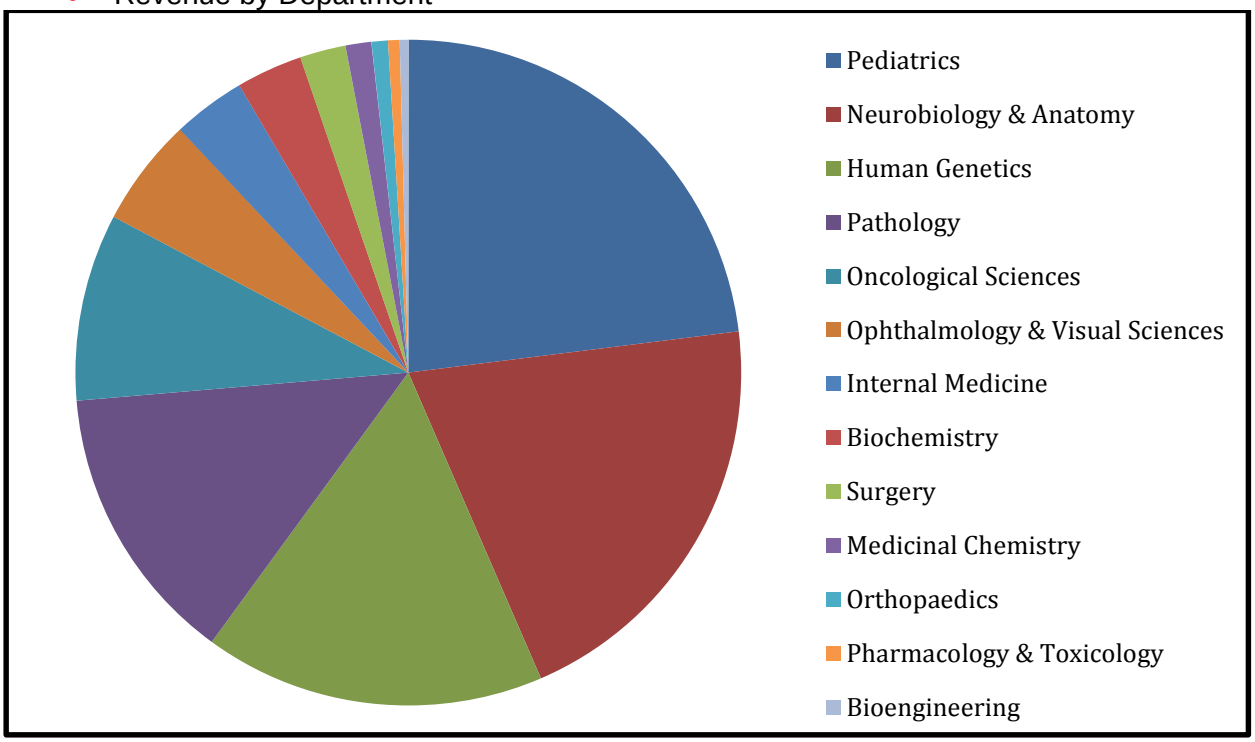
- Faculty Oversight Committee Guidelines can be found for all cores at the following link: http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

FY15 Scientific Impact
Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

1	Weizmann Institute of Science	Off Campus Academic
2	Tristani-Firouzi, Martin	Treadwell Foundation, New England Research Inst.
3	Science Exchange	Off Campus Commercial
4	Kundra Transgenics	Off Campus Commercial
5	Grundwald, David	NIH
6	Yost, Joseph H.	NIH
7	University of Iowa	Off Campus Academic
8	New England Research Institutes	Off Campus Commercial
9	University of Idaho	Off Campus Academic
10	Bonkowsky, Josh	NIH

Collaboration and Support of Other HSC and University Facilities

The MGD Core has partnered directly with Dr. Ryan O'Connell on the production of a custom CRISPR Library for his lab. As part of this collaboration Dr O'Connell has covered 10% of the Cores salary requirements for FY'15

DNA Sequencing Facility: The MGD Core spent $6,671 with the DNA Sequencing Core in FY15.

DNA Peptide Facility: The MGD Core spent ~$14,591 with the DNA/Peptide Synthesis Core in FY15.

The MGD Core's partnership with the Mouse Transgenic Facility to produce transgenic mouse models has directly brought in 29 different projects to the Mouse Transgenic Facility totaling at least $78,901 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 facilities: $100,163

Non-billable Invoice Hours

One of the central purposes of the MGD Facility is to be a resource of education for researchers on the University of Utah campus. The facility achieves this aim in official ways such as seminars given directly to different departments on campus. However, the central avenue of education by the facility is informal one-on-one, in person communication with researchers. In FY15, the facility spent more than ~152 hours teaching University of Utah researchers about Engineered DNA nuclease technology and mutation detection by HRMA. The MGD Core believes that this represents only 60-70% of the time spent directly interacting with researchers, which would put the actual time spent between 217 and 253 hours.

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

1. Grant type: R01 competitive renewal
   PD/PI: Corrine Welt
   Grant Title: The Genetics of Polycystic ovary syndrome
   Funding Source: NICHD
   Grant Award Number: 2 R01 HD065029-06
2. Grant type: RO1
   PD/PI: Jun Yang
   Grant Title: Functions of C8ORF37 in Photoreceptors
   Funding Source: NEI
   Grant Award Number: still under review
   Total Project Period: 5 year
   Total Amount: $ 1,250,000 + 612,500 (Indirect) = 1,862,500
3. Grant type: R01
   PD/PI: Camron Bryant
   Grant Title: BRIDGING GENETIC VARIATION WITH BEHAVIOR: MOLECULAR AND FUNCTIONAL MECHANISMS OF QUANTITATIVE TRAIT GENE REGULATION OF THE STIMULANT AND ADDICTIVE PROPERTIES OF METHAMPHETAMINE IN MICE
   Funding Source: NIDA
   Grant Award Number: 1 R01 DA039168 01A1
   Total Project Period: 07/01/15-06/30/2020
   Annual Amount: $584,493
4. Grant type: VA Merit Review Award
   PD/PI: Francis Miller
   Grant Title: Regulation of the Nox1 NADPH Oxidase in Vascular Smooth Muscle Cells
   Funding Source: Veterans Administration BLR&D
   Grant Award Number: I01 BX001729-05
   Total Project Period: 4/1/2016 – 3/31/2020
   Annual Amount: $ 150,000

Letters of Support written and provided to faculty for grant applications

1. LOS for Dr. Gillian Stanfield for her R01 proposal "Intercellular communication and competition between migrating cells". June‘15
2. LOS for Dr. Ellen Prithem’s goal of using Crispr technology for targeted genome modification in bat cells. Nov’14
3. LOS for Dr. Matt Mulvey’s to use of CRISPR-Cas9 technology to generate gene-specific knock-out lines in zebrafish. Sept‘14
4. LOS for Dr. Russell Butterfield’s use CRISPR for generating a conditional mouse model of the Col6a1 gene as proposed in his K08 application (K08 AR066058-01). Oct‘14
5. LOS for Dr. Robby Bowles’ R21 proposal "Genetically Engineered Cell/Biomaterial Systems Using CRISPR Gene Editing and SELP Recombinant Polymers for Treatment of Intervertebral Disc Pathology" June’15
6. LOS for Dr. Anne Moon’s proposal “Tbx3-regulated alternative RNA processing in cardiac conduction system development” June’15
7. LOS for Dr. Long-Sheng Song’s proposal “Novel functions of E-C Coupling Structural Protein Junctophilin-2 in the hear” Jan‘15

Publications

1. Basu, S., et al., *Silencing of end-joining repair for efficient site-specific gene insertion after TALEN/CRISPR mutagenesis in Aedes aegypti.* Proc Natl Acad Sci U S A, 2015. **112**(13): p. 4038-43.
2. Boer, E.F., et al., *Fascin1-dependent Filopodia are required for directional migration of a subset of neural crest cells.* PLoS Genet, 2015. **11**(1): p. e1004946.

Nuclear Magnetic Resonance (NMR) Facility

Overview

NMR is an analytical tool widely used in biomedical research to determine structures of small molecules, natural products, proteins, carbohydrates, nucleic acids, and their complexes. The NMR facility provides easy access to outstanding instrumentation, three spectrometers (400, 500, and 600 MHz) located at the University of Utah Health Sciences campus and two spectrometers (800 and 900 MHz) located at the University of Colorado-Boulder and -Denver campuses. The facility staff will provide training for those researchers who will record their own data (preferred) or we will record data on a fee-for-service basis. Staff members have a substantial collective expertise in NMR of proteins, nucleic acids, and natural products and they engage in collaborations with many research groups both on and off campus. The NMR Facility has multiple Linux workstations for data processing, analysis, and structure calculation. We provide services for both not-for-profit and for-profit entities.

Services

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

Equipment

- Varian Mercury 400 MHz NMR (University of Utah, SK H)
- 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., Director
- Dennis Edwards, Technician
- Jay Olsen, Technician

2015 Annual Update

New Equipment

- LINUX workstations (3) and NMR software upgrade to VnmrJ4A (3)

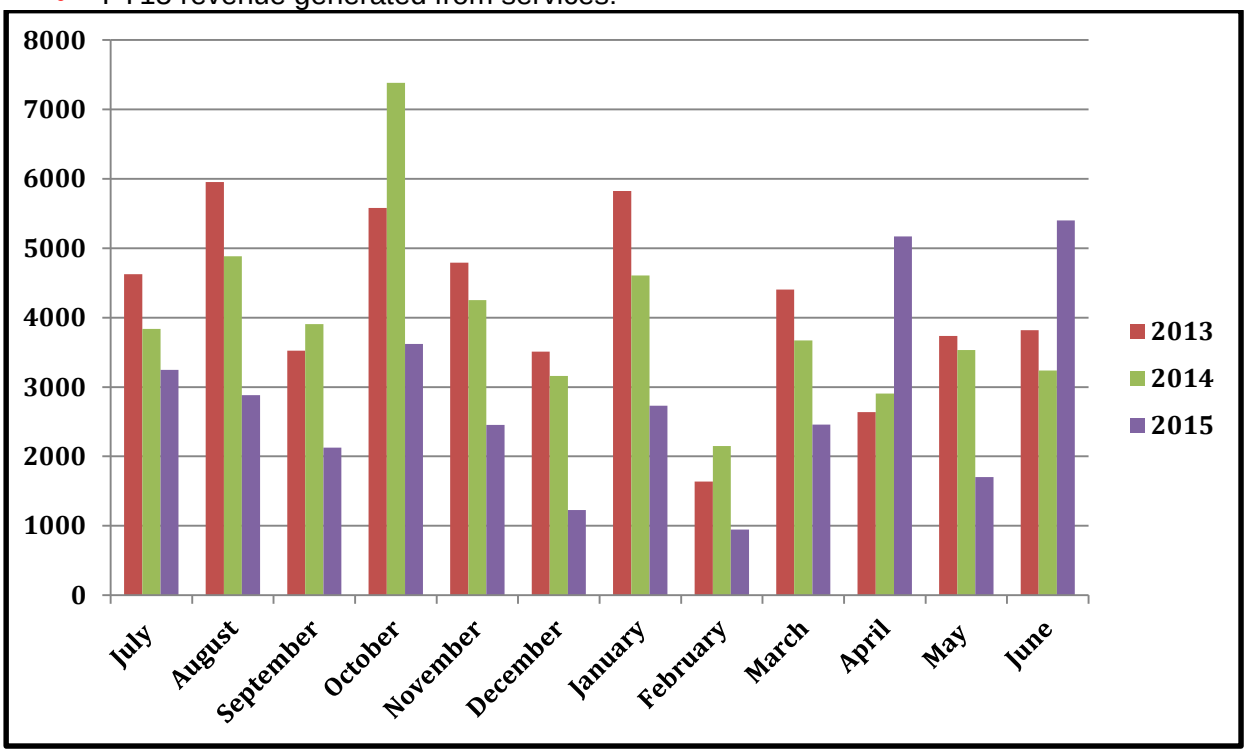
New Services

- The NMR Facility did not implement additional services in FY15

Revenues/Expenses

- VP of Health Sciences Support: $90,000
- FY15 revenue : $33,966
- FY15 expenses: $140,539

- FY15 revenue generated from services:



Advisory Board Committee

Last meeting date: April 2014

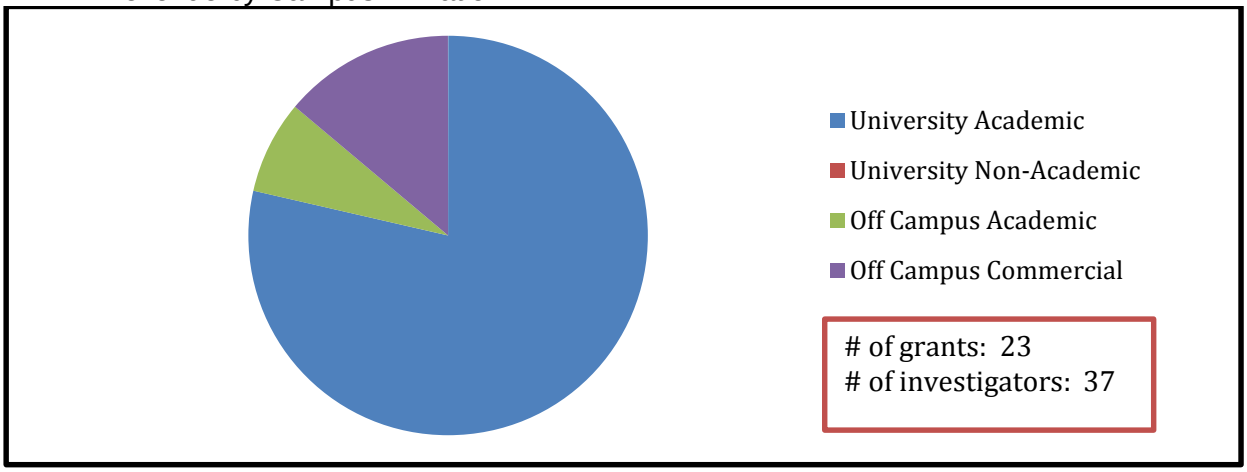
- Darrell Davis, Professor, College of Pharmacy
- Wesley Sundquist, Professor, Department of Biochemistry
- Eric Schmidt, Professor, College of Pharmacy

Addendum

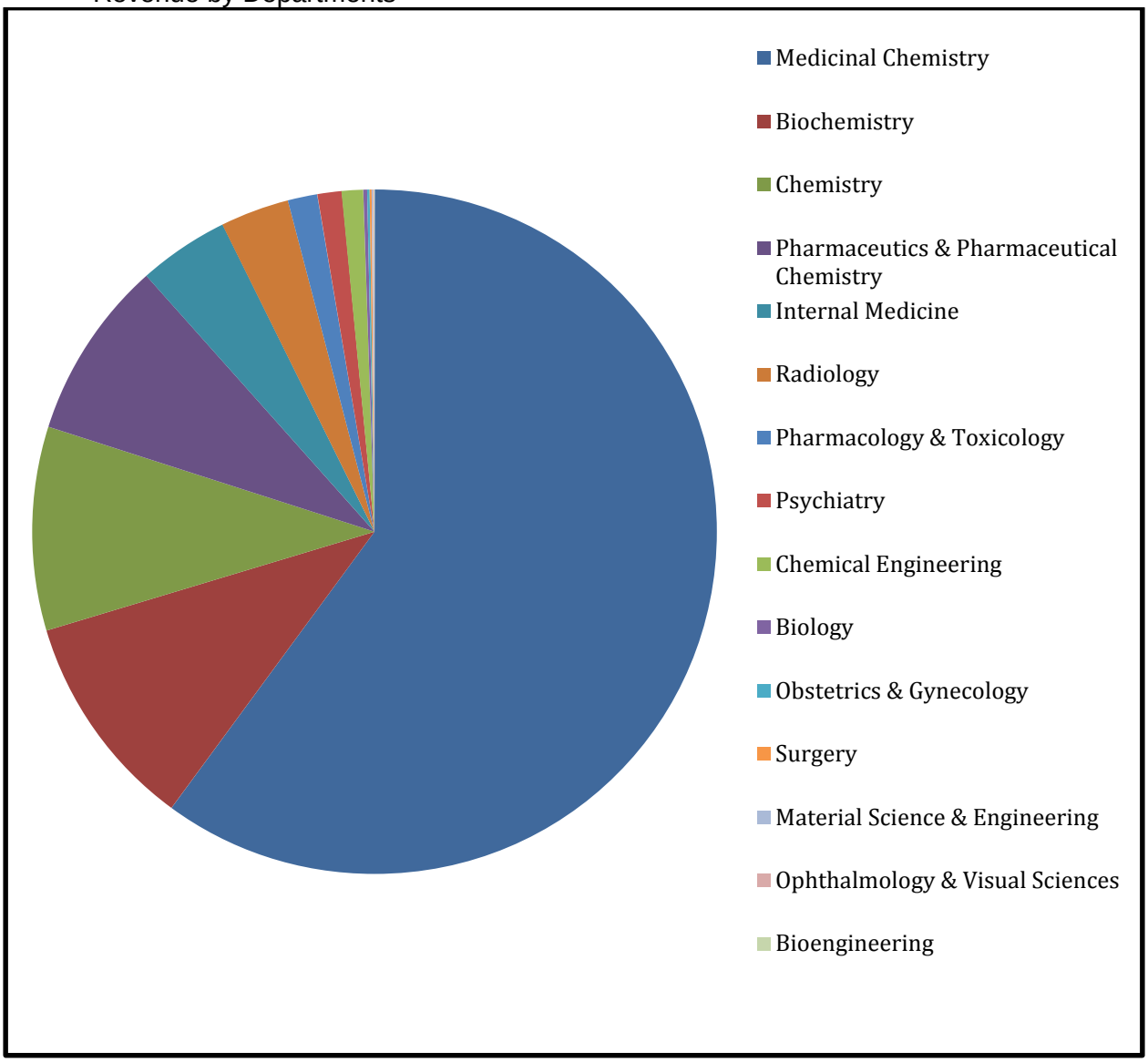
- Faculty Oversight Committee Guidelines can be found for all cores at the following link: http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

FY15 Scientific Impact

- Revenue by Campus Affiliation



- Revenue by Departments



Top Users

1	Davis, Darrell	Department
2	Schmidt, Eric	NIH, Oregon Health &Science University
3	VioGen Biosciences	Off Campus Commercial
4	Poulter, C. Dale	NIH, DHHS
5	University of Phillippines	Off Campus Academic
6	Sundquist, Wesley	NIH, DHHS, HCI
7	Prestwich, Glenn	Glycomira LLC, Department
8	Mitra Biotech Inc.	Off Campus Commercial
9	Stewart, Russell	Office Navy Research, Army Reseach,NIH
10	Balagurunathan, Kuberan	Virginia Commonwealth University

Publications

1. Elia, R., et al., *Silk-hyaluronan-based composite hydrogels: a novel, securable vehicle for drug delivery.* J Biomater Appl, 2013. **27**(6): p. 749-62.
2. Gormley, A.J., et al., *Plasmonic photothermal therapy increases the tumor mass penetration of HPMA copolymers.* J Control Release, 2013. **166**(2): p. 130-8.
3. Henriksen, N.M., et al., *Structural and energetic analysis of 2-aminobenzimidazole inhibitors in complex with the hepatitis C virus IRES RNA using molecular dynamics simulations.* J Chem Inf Model, 2014. **54**(6): p. 1758-72.
4. Hu, J., et al., *pH-responsive and charge shielded cationic micelle of poly(L-histidine)-block-short branched PEI for acidic cancer treatment.* J Control Release, 2013. **172**(1): p. 69-76.
5. Hwang, H.S., H.C. Kang, and Y.H. Bae, *Bioreducible polymers as a determining factor for polyplex decomplexation rate and transfection.* Biomacromolecules, 2013. **14**(2): p. 548-56.
6. Jadulco, R.C., et al., *4-Quinolone alkaloids from Melochia odorata.* J Nat Prod, 2014. **77**(1): p. 183-7.
7. Jia, H.Z., et al., *A boronate-linked linear-hyperbranched polymeric nanovehicle for pH-dependent tumor-targeted drug delivery.* Biomaterials, 2014. **35**(19): p. 5240-9.
8. Jiang, G., et al., *Phosphorothioate analogs of sn-2 radyl lysophosphatidic acid (LPA): metabolically stabilized LPA receptor agonists.* Bioorg Med Chem Lett, 2013. **23**(6): p. 1865-9.
9. Kakule, T.B., et al., *Two related pyrrolidinedione synthetase loci in Fusarium heterosporum ATCC 74349 produce divergent metabolites.* ACS Chem Biol, 2013. **8**(7): p. 1549-57.
10. Kalita, M., et al., *A nanosensor for ultrasensitive detection of oversulfated chondroitin sulfate contaminant in heparin.* J Am Chem Soc, 2014. **136**(2): p. 554-7.
11. Khatun, Z., et al., *Oral absorption mechanism and anti-angiogenesis effect of taurocholic acid-linked heparin-docetaxel conjugates.* J Control Release, 2014. **177**: p. 64-73.
12. Kim, H.A., K. Nam, and S.W. Kim, *Tumor targeting RGD conjugated bio-reducible polymer for VEGF siRNA expressing plasmid delivery.* Biomaterials, 2014. **35**(26): p. 7543-52.
13. Kim, J., et al., *Therapeutic efficacy of a systemically delivered oncolytic adenovirus - biodegradable polymer complex.* Biomaterials, 2013. **34**(19): p. 4622-31.
14. Kim, J., et al., *Efficient lung orthotopic tumor-growth suppression of oncolytic adenovirus complexed with RGD-targeted bioreducible polymer.* Gene Ther, 2014. **21**(5): p. 476-83.
15. Lee, C.H., et al., *Enhanced therapeutic efficacy of an adenovirus-PEI-bile-acid complex in tumors with low coxsackie and adenovirus receptor expression.* Biomaterials, 2014. **35**(21): p. 5505-16.
16. Lee, W.Y., et al., *Prevention of anti-microbial peptide LL-37-induced apoptosis and ATP release in the urinary bladder by a modified glycosaminoglycan.* PLoS One, 2013. **8**(10): p. e77854.
17. Lin, Z., et al., *Structure and activity of lobophorins from a turrid mollusk-associated Streptomyces sp.* J Antibiot (Tokyo), 2014. **67**(1): p. 121-6.
18. Lin, Z., et al., *Neuroactive diol and acyloin metabolites from cone snail-associated bacteria.* Bioorg Med Chem Lett, 2013. **23**(17): p. 4867-9.
19. Lin, Z., et al., *A bacterial source for mollusk pyrone polyketides.* Chem Biol, 2013. **20**(1): p. 73-81.
20. Lin, Z., et al., *Griseorhodins D-F, neuroactive intermediates and end products of post-PKS tailoring modification in Griseorhodin biosynthesis.* J Nat Prod, 2014. **77**(5): p. 1224-30.

21. Lu, Z., et al., *Plakinamine M, a steroidal alkaloid from the marine sponge Corticium sp.* J Nat Prod, 2013. **76**(11): p. 2150-2.
22. Lu, Z., et al., *Myristicyclins A and B: antimalarial procyanidins from Horsfieldia spicata from Papua New Guinea.* Org Lett, 2014. **16**(2): p. 346-9.
23. Madan, D., et al., *Non-invasive imaging of tumors by monitoring autotaxin activity using an enzyme-activated near-infrared fluorogenic substrate.* PLoS One, 2013. **8**(11): p. e79065.
24. McIntosh, J.A., et al., *Aestuaramides, a natural library of cyanobactin cyclic peptides resulting from isoprene-derived Claisen rearrangements.* ACS Chem Biol, 2013. **8**(5): p. 877-83.
25. Mishra, D., et al., *Dexamethasone-loaded reconstitutable charged polymeric (PLGA)n - b-bPEI micelles for enhanced nuclear delivery of gene therapeutics.* Macromol Biosci, 2014. **14**(6): p. 831-41.
26. Moon, H.H., et al., *MSC-based VEGF gene therapy in rat myocardial infarction model using facial amphipathic bile acid-conjugated polyethyleneimine.* Biomaterials, 2014. **35**(5): p. 1744-54.
27. Pan, H., et al., *Efficiency of high molecular weight backbone degradable HPMA copolymer-prostaglandin E1 conjugate in promotion of bone formation in ovariectomized rats.* Biomaterials, 2013. **34**(27): p. 6528-38.
28. Pan, H., et al., *Synthesis of long-circulating, backbone degradable HPMA copolymer-doxorubicin conjugates and evaluation of molecular-weight-dependent antitumor efficacy.* Macromol Biosci, 2013. **13**(2): p. 155-60.
29. Platt, R.J., et al., *From molecular phylogeny towards differentiating pharmacology for NMDA receptor subtypes.* Toxicon, 2014. **81**: p. 67-79.
30. Raman, K., S. Arungundram, and B. Kuberan, *Chemogenesis of an antiangiogenic glycosaminoglycan.* ACS Med Chem Lett, 2014. **5**(6): p. 644-6.
31. Rudolf, J.D., H. Wang, and C.D. Poulter, *Multisite prenylation of 4-substituted tryptophans by dimethylallyltryptophan synthase.* J Am Chem Soc, 2013. **135**(5): p. 1895-902.
32. Sadekar, S., et al., *Poly(amido amine) dendrimers as absorption enhancers for oral delivery of camptothecin.* Int J Pharm, 2013. **456**(1): p. 175-85.
33. Sorna, V., et al., *High-throughput virtual screening identifies novel N'-(1-phenylethylidene)-benzohydrazides as potent, specific, and reversible LSD1 inhibitors.* J Med Chem, 2013. **56**(23): p. 9496-508.
34. Swarup, V.P., et al., *Exploiting differential surface display of chondroitin sulfate variants for directing neuronal outgrowth.* J Am Chem Soc, 2013. **135**(36): p. 13488-94.
35. Tian, L., H.C. Kang, and Y.H. Bae, *Endosomolytic reducible polymeric electrolytes for cytosolic protein delivery.* Biomacromolecules, 2013. **14**(8): p. 2570-81.
36. Tran, V.M. and B. Kuberan, *Synthesis of fluorophore-tagged xylosides that prime glycosaminoglycan chains.* Bioconjug Chem, 2014. **25**(2): p. 262-8.
37. Tran, V.M., et al., *Synthesis and assessment of glycosaminoglycan priming activity of cluster-xylosides for potential use as proteoglycan mimetics.* ACS Chem Biol, 2013. **8**(5): p. 949-57.
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41. Yin, H., et al., *Effects of cholesterol incorporation on the physicochemical, colloidal, and biological characteristics of pH-sensitive AB(2) miktoarm polymer-based polymersomes.* Colloids Surf B Biointerfaces, 2014. **116**: p. 128-37.
42. Zhang, R., et al., *Synthesis and evaluation of a backbone biodegradable multiblock HPMA copolymer nanocarrier for the systemic delivery of paclitaxel.* J Control Release, 2013. **166**(1): p. 66-74.

Small Animal Imaging Facility

Overview

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

Services

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

7 Tesla small animal MRI 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 scanners

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

FMT mouse system

- 4 channel excitation with near-infrared laser diodes at 635, 670, 745, and 785 nm, maximizing tissue penetration depth and permitting multiplexed analysis of biological pathways
- System can configured as an ultra-high resolution preclinical CT scanner; a high-resolution, high-sensitivity preclinical SPECT scanner; or as a dual modality preclinical SPECT/CT scanner

- The Small Animal Imaging Facility also includes an Instrument Development Lab which primarily provides infrastructure for the construction of custom RF coils. These are often necessary to optimize the data quality for a given MRI application. The facility also houses basic machining tools (including a Milling machine) for making experimental apparatus's such as scanning platforms and stereo taxes.

Equipment

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

Personnel

- Edward Hsu, Ph.D., Director
- Osama Abdullah, M.S., Imaging Specialist
- Samer Merchant, M.S., Imaging Specialist
- Adam Schmidt, Research Student
- Boston Terry, Research Student
- Keven Wang, Research Student

2015 Annual Update

New Equipment

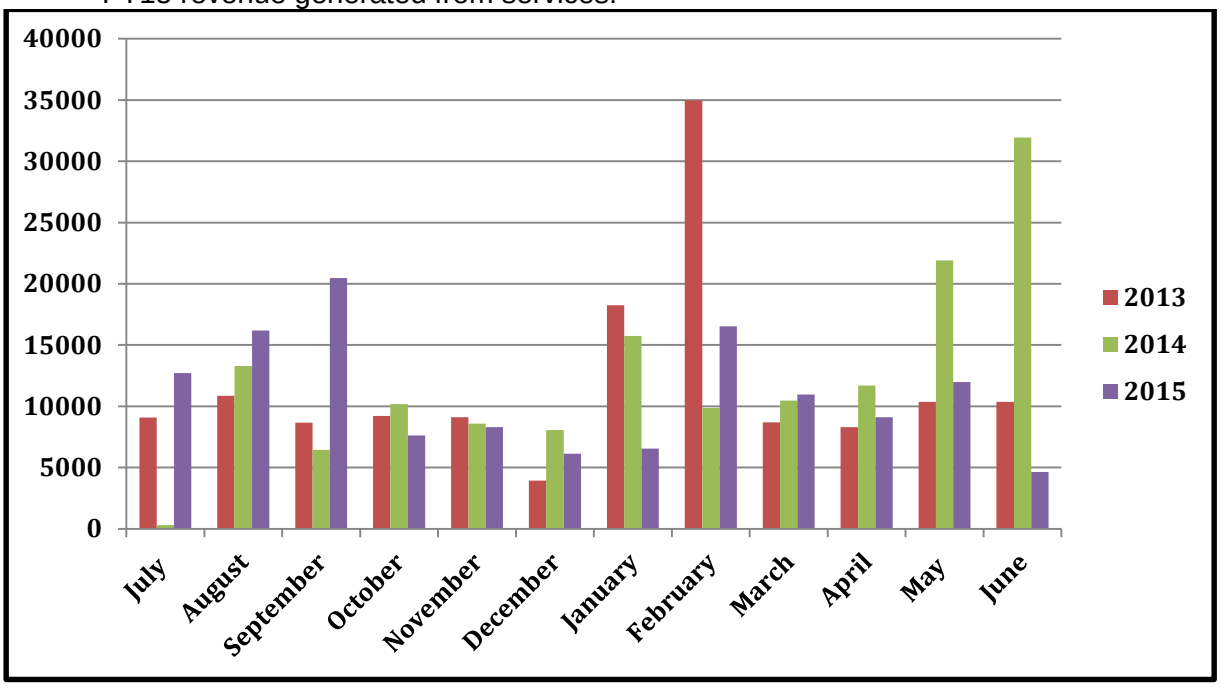
- Received 50,753 from VP for Research for software updates and workplace

New Services

- No major new service was added in FY15.

Revenue/Expenses

- VP of Health Sciences Support: $50,000
- VP of Research Support: $100,000
- FY15 revenue: $131,139
- FY15 expenses: $269,875
- FY15 revenue generated from services:



Advisory Board Committee

Last meeting date: March 29, 2013

- John Hoffman, Professor, HCI
- John Phillips, Research Associate Professor, Hematology
- Jack Taylor, Director, Office of Comparative Medicine
- Rob MacLeod, Professor, SCI
- Dennis Parker, Professor, Radiology Research

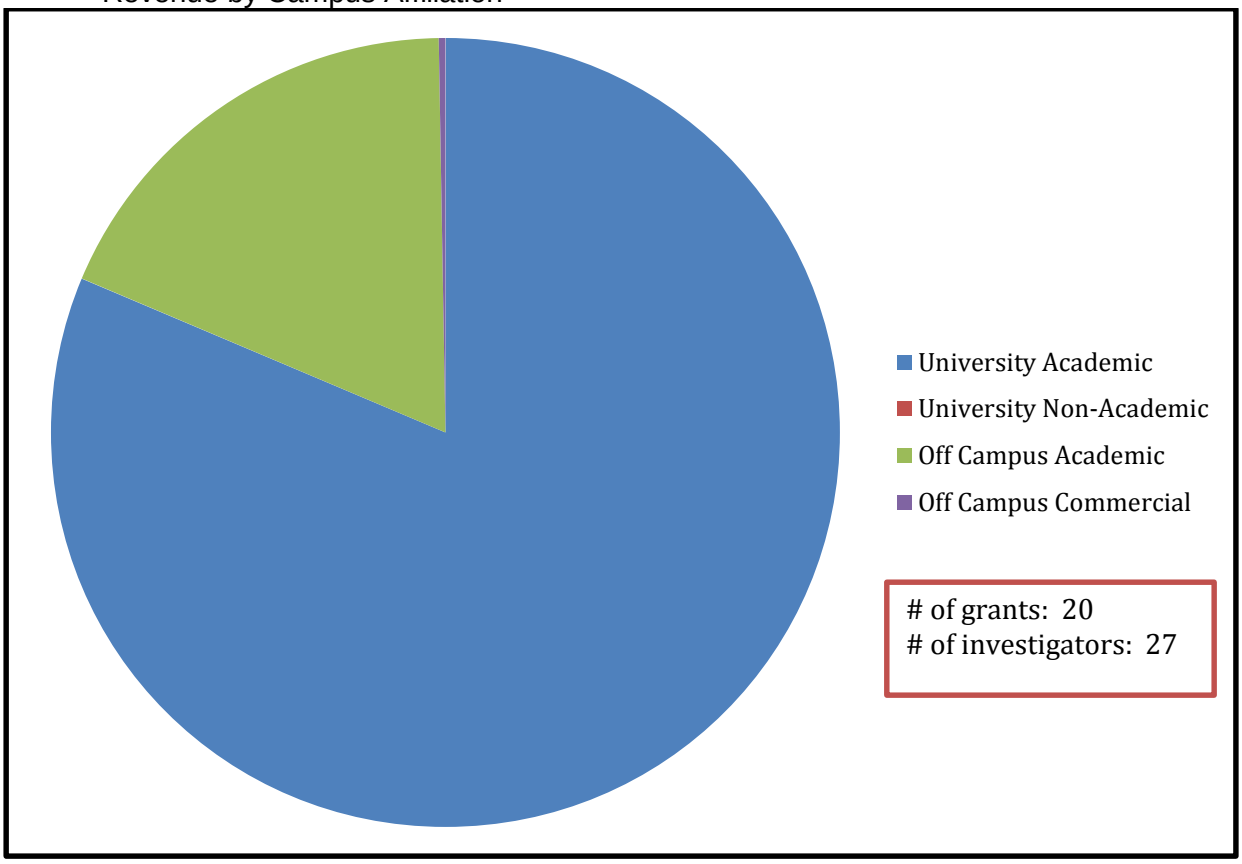
Addendum

- Faculty Oversight Committee Guidelines can be found for all cores at the following link: http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

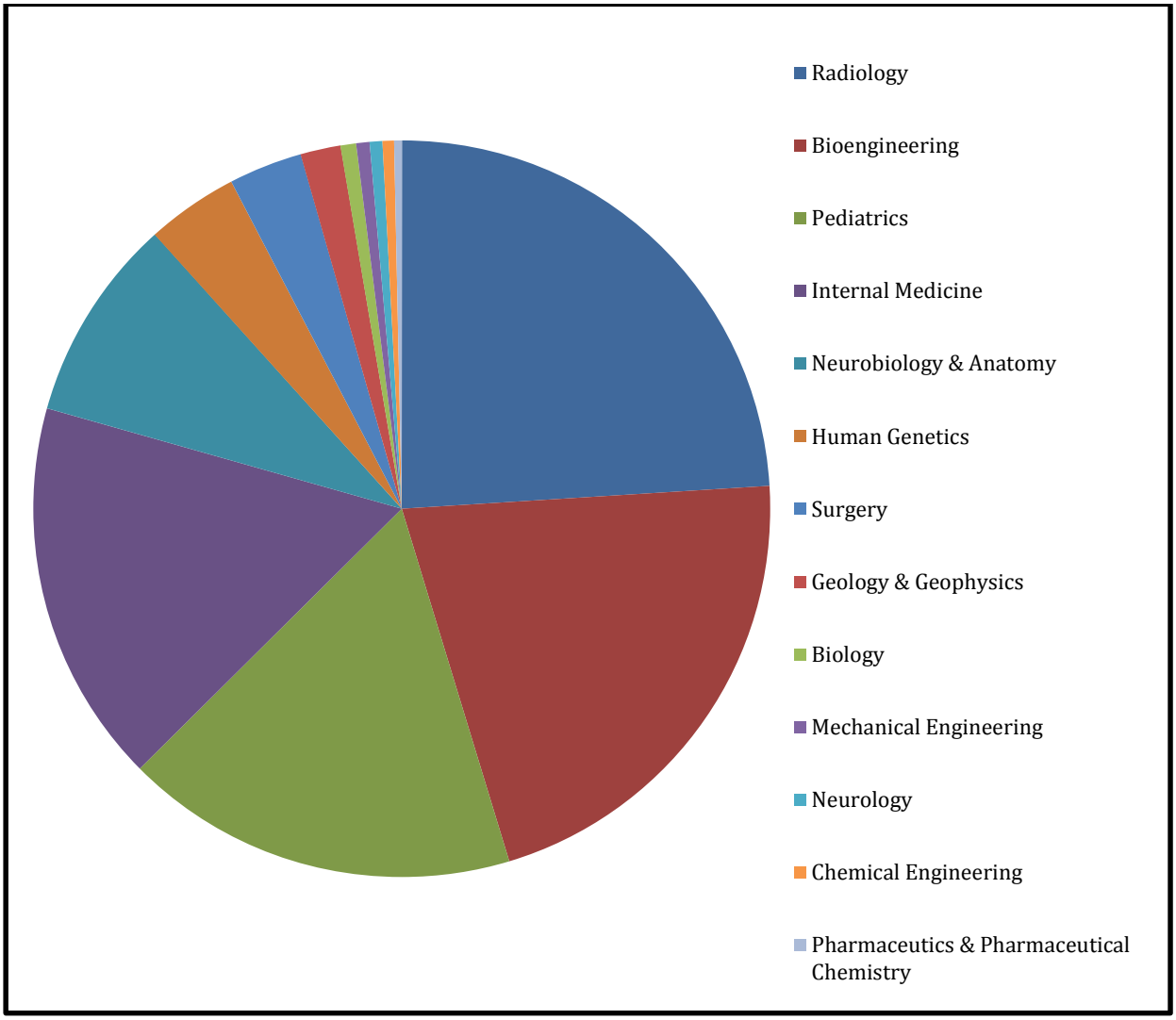
FY15 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

1	Yap, Jeffrey	DHHS
2	Hsu, Ed	U of U Research, Department
3	Utah State University	Off Campus Academic
4	Korenberg, Julie	NIH
5	Li, Dean	NIH, Advanced Heart Failure Program
6	Williams, Megan	Whitehall Foundation, Mallinckrodt Foundation
7	Colorado State University	Off Campus Academic
8	Capecchi, Mario	Akers Private Foundation, Colby Health Chair
9	Whitehead, Kevin	NIH
10	Park, Albert H.	Triological Society, Department

Publications

1. Abdullah, O.M., et al., *Characterization of diffuse fibrosis in the failing human heart via diffusion tensor imaging and quantitative histological validation.* NMR Biomed, 2014. **27**(11): p. 1378-86.
2. de Souza, P.C., et al., *OKN-007 decreases tumor necrosis and tumor cell proliferation and increases apoptosis in a preclinical F98 rat glioma model.* J Magn Reson Imaging, 2015.
3. Eskandari, R., et al., *Differential vulnerability of white matter structures to experimental infantile hydrocephalus detected by diffusion tensor imaging.* Childs Nerv Syst, 2014. **30**(10): p. 1651-61.
4. Gomez, A.D., et al., *Characterization of regional deformation and material properties of the intact explanted vein by microCT and computational analysis.* Cardiovasc Eng Technol, 2014. **5**(4): p. 359-370.
5. McKellar, S.H., et al., *Animal model of reversible, right ventricular failure.* J Surg Res, 2015. **194**(2): p. 327-33.
6. Schober, M.E., et al., *Dietary Docosahexaenoic Acid Improves Cognitive Function, Tissue Sparing, and Magnetic Resonance Imaging Indices of Edema and White Matter Injury in the Immature Rat after Traumatic Brain Injury.* J Neurotrauma, 2015.
7. Welsh, C.L., E.V. DiBella, and E.W. Hsu, *Higher-Order Motion-Compensation for In Vivo Cardiac Diffusion Tensor Imaging in Rats.* IEEE Trans Med Imaging, 2015. **34**(9): p. 1843-53.

Small Animal Ultrasound Facility

Overview

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

Services

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

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

Equipment

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

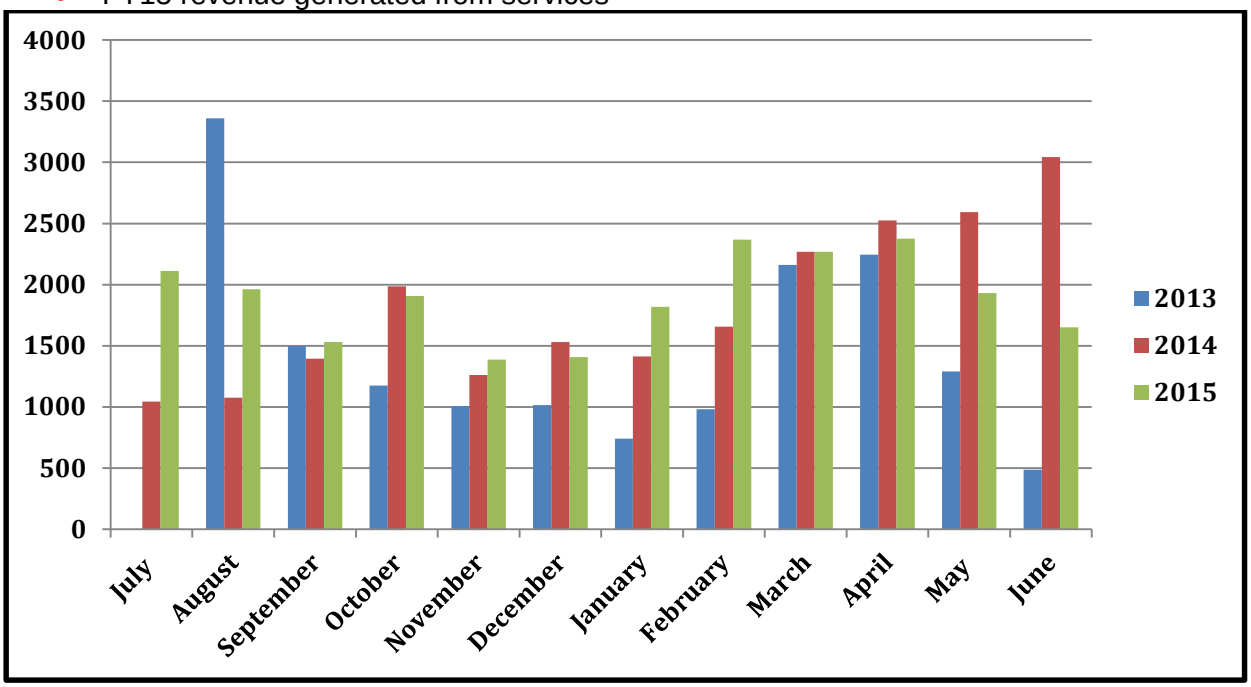
Personnel

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

Revenue/Expenses

- VP of Health Sciences Support: $10,000
- Total FY15 revenue: $22,721
- Total FY15 expenses: $32,828

- FY15 revenue generated from services



Advisory Board Committee:
Last meeting date: April 15, 2013

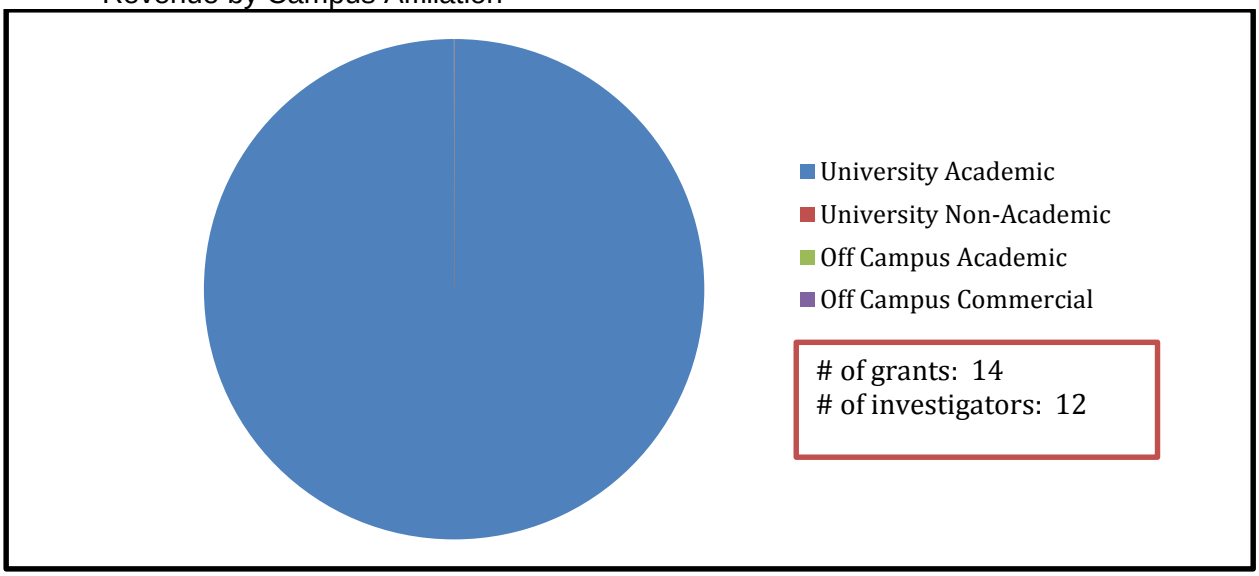
- Andy Weyrich, Associate Dean for Basic and Translational Sciences
- Craig Selzman, Associate Professor, Cardiothoracic Surgery
- Brent Wilson, Assistant Professor, Cardiology

Addendum

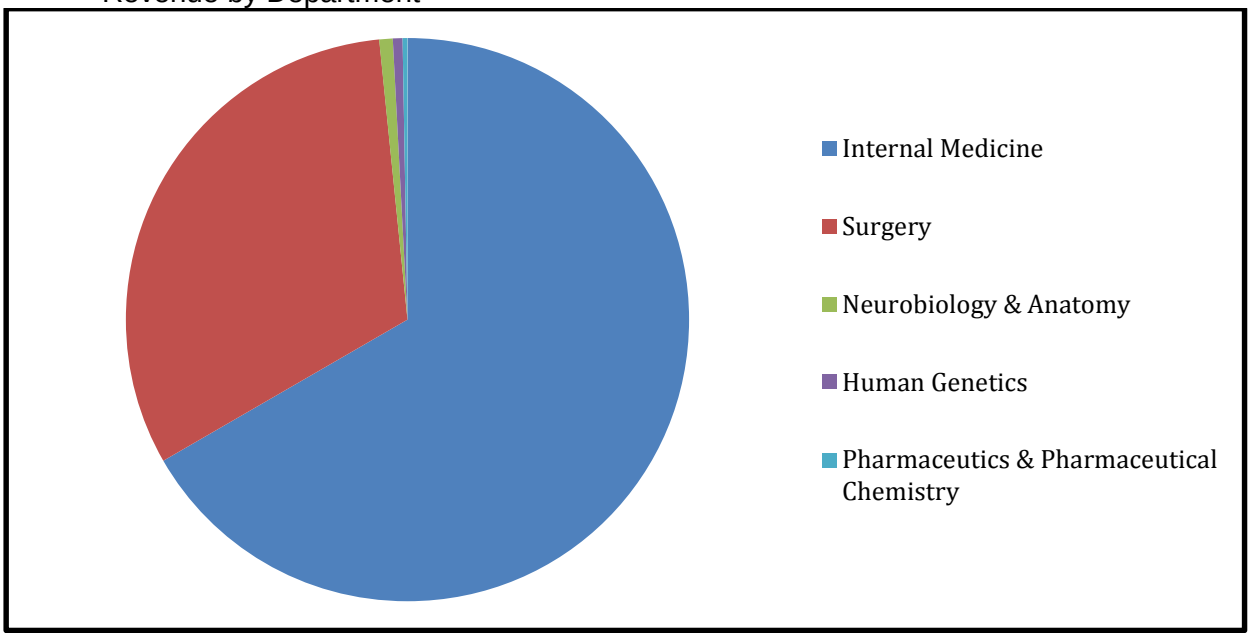
- Faculty Oversight Committee Guidelines can be found for all cores at the following link: http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

FY15 Scientific Impact
Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

1	Selzman, Craig	Department
2	Franklin, Sarah	NIH, Treadwell Foundation, Harrison Research Funds
3	Donato, Anthony	NIH
4	Li, Dean	NIH, Agency
5	Sachse, Frank	Nora Eccles Treadwell Foundation
6	Shui, Yan-Ting	NIH
7	Weyrich, Andy	NIH
8	Kardon, Gabrielle	NIH, PEW Trust, Muscular Dystrophy
9	Kopecek, Jondrich	DHHS, NIH, Army Medical Research
10	Kim, Sung Wan	NIH, Pharmicell CO, LTD

Publications

1. McKellar, S.H., et al., *Animal model of reversible, right ventricular failure.* J Surg Res, 2015. **194**(2): p. 327-33.

Service Recharge Centers

Overview

The HSC Administration Office also manages Service/Recharge Centers. These Centers are not cores but do 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 balance is. 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 become a Core, then all guidelines must be followed.

Service/ Recharge Centers are creating primarily to provide services to the University Community but can also provide services to external customers. The administration of each these facilities is performed by the home department. Only recharge activity for these groups is managed by the Administrative Office, this is in part due to the efficient billing system that has been developed in collaboration with our IT support group managed by Mr. Rick Haycock.

Nuclear Engineering

Overview

UNEF provides state-of-the-art laboratories used for alpha, beta, gamma and neutron radiation detection, irradiation of material samples to study various effect
ts of various types of radiation, and neutron activation analysis techniques (nondestructive technique to find a sample elemental composition). UNEF 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 chemical composition of a wide variety of samples. UNEF has been at the forefront of establishing safety culture and practices, already implemented at large scale commercial power plants, in a research reactor environment. UNEF 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 UNEF 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)
- TCA cycle intermediates
- Passive gamma spectroscopy
- Alpha spectroscopy
- Nucleotides
- Liquid scintillation counting

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

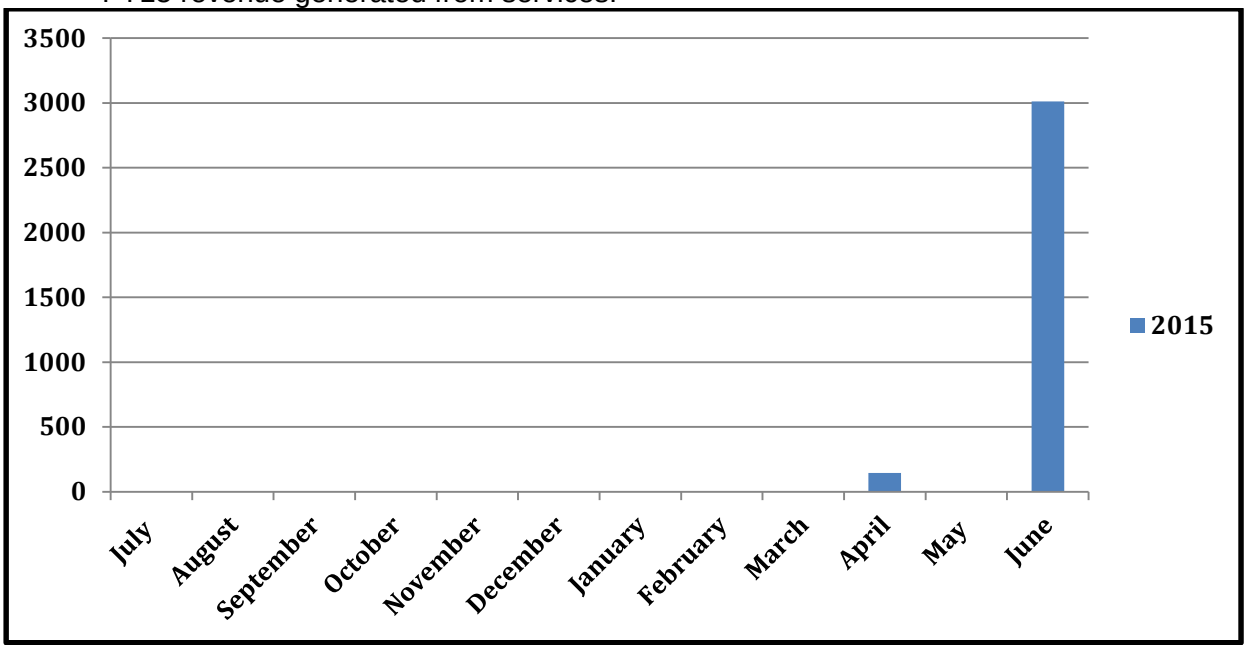
Personnel

- Tatjana Jevremovic, Director
- Ryan Schow, Reactor Supervisor
- Steve Burnham, Senior Reactor Operator

2015 Annual Update

Revenue/Expenses

- VP of Research Support : 0
- FY15 revenue: $3,157
- FY15 expenses: $159
- FY15 revenue generated from services:



Advisory Board Committee

Last meeting date: July 29, 2015

- Jim Byrne, Reactor Safety Committee Chair
- Terry Ring, Professor, Chemical Engineering
- Greg Moffitt, Former Reactor Supervisor

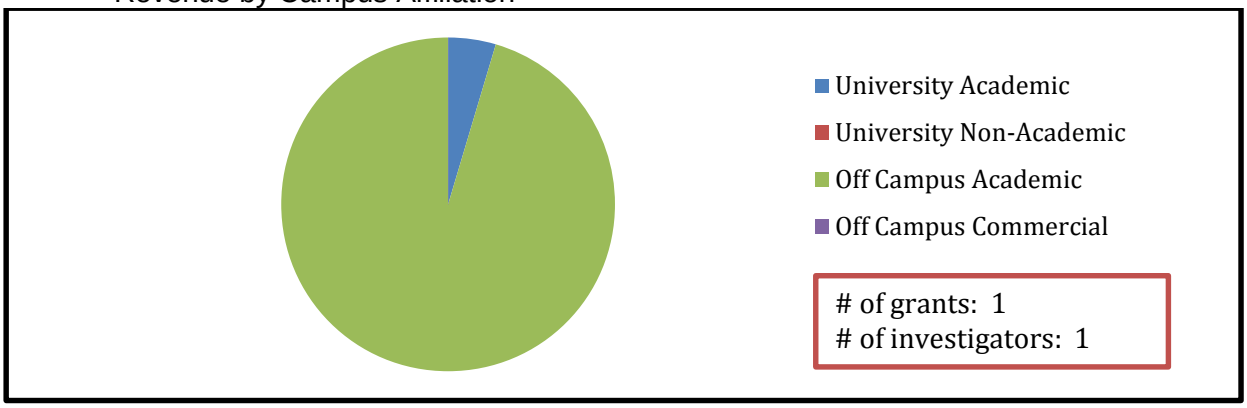
Addendum

- Faculty Oversight Committee Guidelines can be found for all cores at the following link: http://cores.utah.edu/wp-content/uploads/2015/09/Faculty-Advisory-Committee-Responsibilities-2.pdf

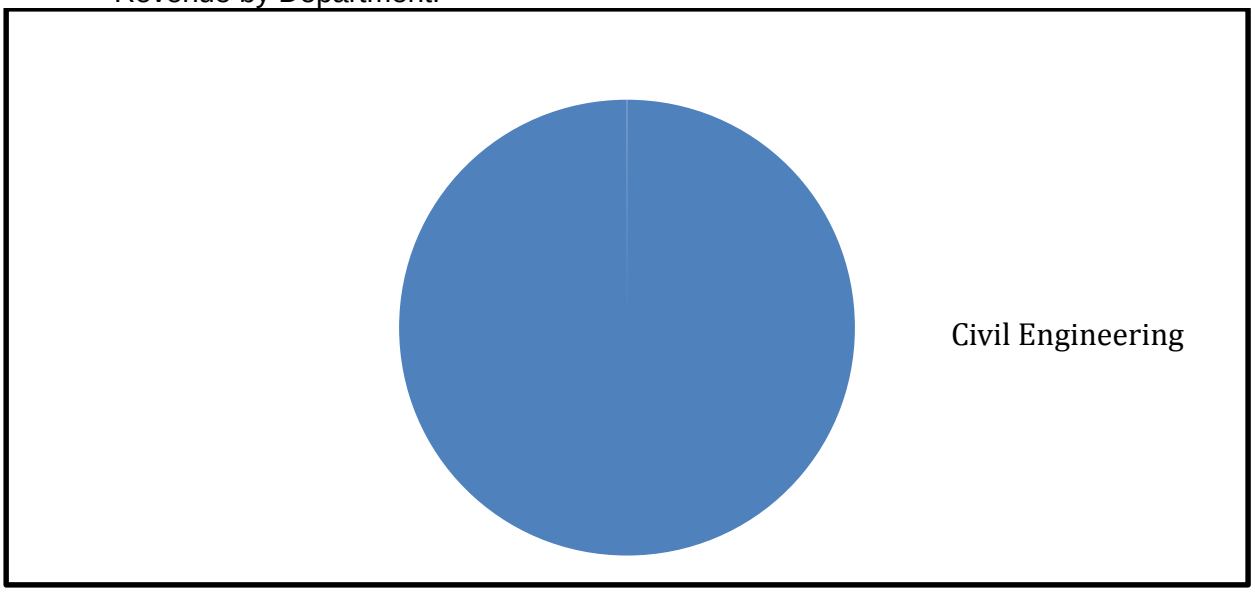
FY15 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department:



Top Users

1	Brigham Young University	Off Campus Academic
2	Romero, Pedro	Department

Goals for FY16

- Characterize and begin utilizing pneumatic irradiator
- Alpha spectrometry
- More consistent user base
- Reactor Operator training classes for UU and BYU students
- Possible labs/classes with outside entities

Scalable Analytics & Informatics

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

The following services are offered by USAI:

- 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
- Pat Nechodom, Executive Manager
- Ryan Heugly, Program Manager
- Olga Patterson, Applied NLP Lead
- Ryan Cornia, Architecture and Systems Developer
- Brad Adams, Senior Software Designer and Programmer
- Patrick Alba, Clinical Data Manager
- Thomas Ginter, NLP Programming Lead
- Corinne Halls, Clinical Research Annotation Manager
- Daniel Denhalter, Clinical Research Annotation Manager

FY15 Annual Update

New Equipment

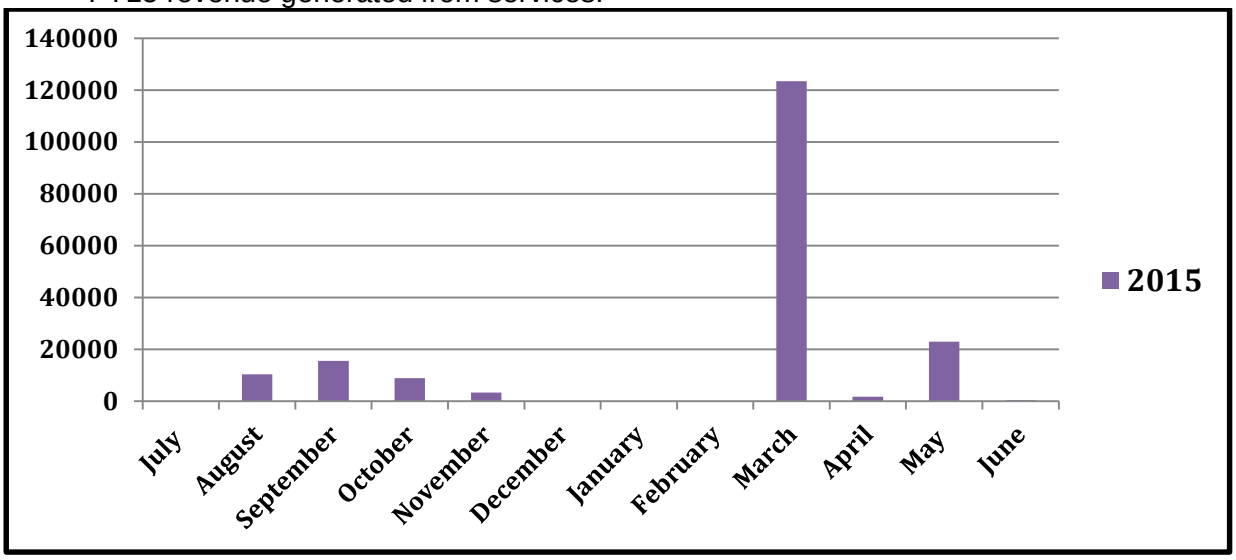
Computers

New Services

USAI is a new Service/Recharge Center for this Fiscal Year

Revenue/Expenses

- VP of Research Support: 0
- FY15 revenue: $186,423
- FY15 expenses: $ 53,144
- FY15 revenue generated from services:



Management Meeting

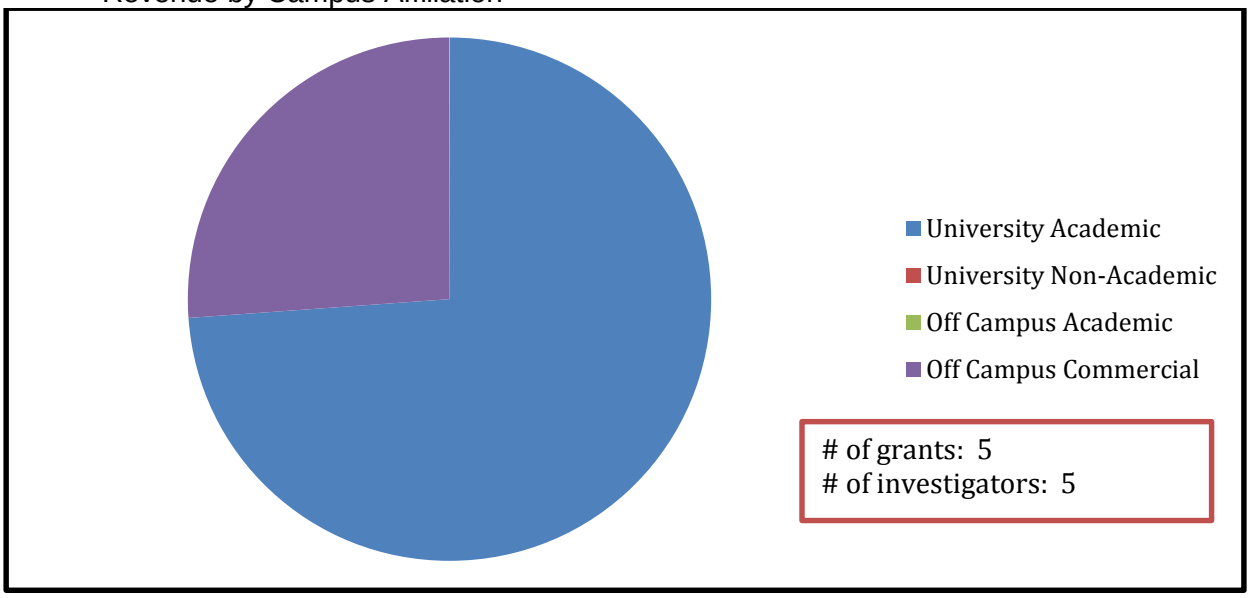
Last meeting date: July 14, 2015

- Scott L DuVall, PhD, Director
- Pat Nechodom, Executive Manager
- Ryan Heugly, Program Manager
- Kevin Malohi, VINCI Deputy Director
- Christopher Ledding, MBA, Budget Analyst

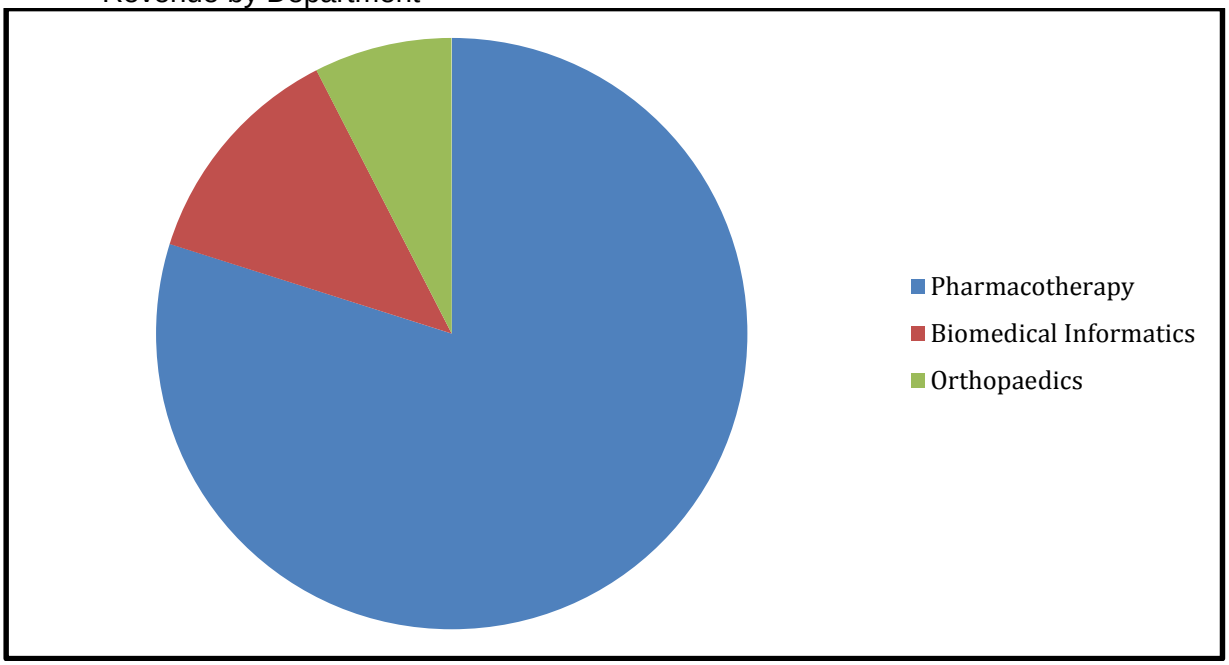
FY15 Scientific Impact

Research Support

- Revenue by Campus Affiliation



- Revenue by Department



Top Users

1	Lafleur, Joanne	Pharmacotherapy Outcome Research
2	IHC Health Services	Off Campus Commercial
3	Chapman, Wendy	NIH, DHHS, Northern California Institute
4	Pelt, Christopher	U of U Research
5	Anolinx	Off Campus Commercial

Publications

1. Bellows, B.K., et al., *Healthcare costs and resource utilization of patients with binge-eating disorder and eating disorder not otherwise specified in the Department of Veterans Affairs.* Int J Eat Disord, 2015.
2. Cannon, G.W., et al., *Persistence and dose escalation of tumor necrosis factor inhibitors in US veterans with rheumatoid arthritis.* J Rheumatol, 2014. **41**(10): p. 1935-43.
3. Divita, G., et al., *Sophia: A Expedient UMLS Concept Extraction Annotator.* AMIA Annu Symp Proc, 2014. **2014**: p. 467-76.
4. Kerr, G.S., et al., *Measuring physician adherence with gout quality indicators: a role for natural language processing.* Arthritis Care Res (Hoboken), 2015. **67**(2): p. 273-9.
5. LaFleur, J., et al., *Analysis of osteoporosis treatment patterns with bisphosphonates and outcomes among postmenopausal veterans.* Bone, 2015. **78**: p. 174-85.
6. Navarro-Millan, I., et al., *Association of hyperlipidaemia, inflammation and serological status and coronary heart disease among patients with rheumatoid arthritis: data from the National Veterans Health Administration.* Ann Rheum Dis, 2015.
7. Nelson, R.E., et al., *Using multiple sources of data for surveillance of postoperative venous thromboembolism among surgical patients treated in Department of Veterans Affairs hospitals, 2005-2010.* Thromb Res, 2015. **135**(4): p. 636-42.
8. Ohno-Machado, L., et al., *pSCANNER: patient-centered Scalable National Network for Effectiveness Research.* J Am Med Inform Assoc, 2014. **21**(4): p. 621-6.