

HSC Cores Research Facilities

**ANNUAL
REPORT
2024**



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HSC Cores Facilities

Overall Financial Summary

Revenue & Expenses

- HSC Core Facilities budgeted \$12 million for FY24, with expenses totaling \$11.3 million. Approximately \$6.5 million in expenses went to salaries and benefits while \$4.8 million was spent on equipment and operating supplies.
- In FY24, \$10.7 million in services were billed, and collected from all units combined. An overhead fee of 5% (\$563,195) was used for administrative support.

Core Research Facilities

FY24 Cores	Total Expenses	Equipment Expenses	Total Revenue	SVPHS	VPR	RIF/Match
Administration	1,170,282		1,269,195	705,000		
ADD	97,321		295,553	0		
BHIDC	56,767		40,636	0		
BIDAC	79,886		88,545	0		
Cell Imaging	871,500	310,469	835,450	225,000		214,692
Data Science Services	1,347,052		1,413,946	785,000		
DNA Peptide	310,531		310,949	60,000		
DNA Sequencing	706,208	277,783	605,990	50,000		133,500
Drug Discovery	193,863		228,271	75,000		
EM	1,009,565		1,002,872	250,000	15,000	
Flow Cytometry	577,926		736,479	40,000		
Genomics	286,098		300,076	0		
Iron & Heme	30,180		62,410	0		
Machine Shop	313,671		284,047	60,000		
Mass Spectrometry	509,054		675,308	225,000		202,000
Metabolic Phenotyping	431,907	251,690	449,964	85,000		194,690
Metabolomics	731,122		691,954	240,000		
Mutation Generation	131,388		156,281	70,000		
NMR	119,244		109,845	70,000		
Nuclear Engineering	0		0	0		
Powder	91,514		37,590	0		
PreClinical Imaging	226,362		213,326	120,000	35,000	
Scalable Analytics	96,332		184,435	0		
Small Animal Ultrasound	91,323		54,811	20,000		
Software Development	316,689		555,628	100,000		
Transgenic Mouse	532,770		605,681	334,603		
USTAR Genetics	929,225		720,412	236,000		

Service Recharge Centers

FY24 Service Recharge Centers	Total Expenses	Equipment Expenses	Total Revenue	SVPHS	VPR	RIF/Match
BioMedical Microfluids	42,999		46,941			
BioPhysical Interactions	135		2,702			
Center Human Toxicology	95,672		167,571			
Crus	2,687		16,284			
Genetic Science Learning CTR	2,118,512		2,081,403			
MCL Meldrum	133,310		149,340			
Metabolic Kitchen	5,648		15,723			
Metal 3D Printing	2,432		7,190			
Midas	0		0			
Nanofab Administration	1,411,591		1,344,704		176,386	85,680
Nanofab Cleanroom	1,077,301		1,062,041		50,000	
Nanofab Surface Analysis	880,425		745,713		50,000	
Nuclear Engineering	0		0			

Cores Administration

Overview

The Health Sciences Center (HSC) Core Facilities administratively reports to the Assistant Vice President for Cores Infrastructure Dr. James Cox, who reports to Dr. Rachel Hess, SVPHS Associate Vice President for Research. The administrative office is managed by Ms. Brenda Smith, with assistance from Ms. Iryna Wiley, Ms. Terra Curley, and Mr. Derek Schlotfeldt. Responsibilities of the Core Administration office include - personnel management, budget preparation, financial affairs, ordering of supplies, and tracking expenses for all 41 Core Facilities/Service Recharge Centers. In addition, the Administrative Core supports general research infrastructure for the community, e.g. maintaining the X-ray film developer in the SOM and the research irradiator logging and access requests. All cores and recharge centers operate on a charge-back basis, with the Administration Core recovering 5% of the revenue collected for billing and collection services.

Personnel

- James E. Cox, Ph.D., Assistant Vice President for Cores Infrastructure
- Brenda Smith, Administrative Director
- Derek Schlotfeldt, Manager Administrative
- Terra Curley, Senior Accountant
- Iryna Wiley, Financial Mgt Analyst
- Elliot Francis, Principal Software Engineer
- Megan Bowler, Principal Software Engineer

Advisory Board Committee

Last meeting date: February 7th, 2024

- James Cox Ph.D., Assistant Vice President for Cores Infrastructure
- Rachel Hess M.D. M.S., Associate Vice President for Research, SVPHS
- Chris Hill D.Phil., Vice Dean of Research, SOM
- Kevin Whitty Ph.D., Associate Dean for Research, College of Engineering
- Scott Summers Ph.D., Professor and Chair, Nutrition & Integrative Physiology
- Erin Rothwell Ph.D. VP for Research
- Mark Yandell Ph.D., Professor, Human Genetics
- Matthew Rondina M.D., Associate Professor, Internal Medicine
- Sarah Franklin Ph.D., Associate Professor, Internal Medicine
- Martin McMahon Ph.D., Professor, Dermatology
- Dean Tantin Ph.D., Professor, Pathology
- Eric Schmidt Ph.D., Professor, Medicinal Chemistry
- Wes Sundquist Ph.D., Professor, Biochemistry
- Alana Welm Ph.D., Professor, Oncological Sciences

FY24 Annual Update

- In FY24 the core billed \$10.7M; however, what is most impressive the collection rate for billed services remains at **100%**. We have developed an account management system to allow each Director to view revenue and expenses in real time. The tracking system stores fiscal data so that historical comparisons between revenue and expenses can be performed as well as validation of expenses, and operational analysis.
- Five new Service/Recharge Centers; Metabolic Kitchen, Metal 3D Printing, MIDAS, Software Development, and Biomedical Interactions are now managed through the administrative office to increase accountability and reduce expenses associated with billing and collections.
- The annual retreat was held in person in September 2023.
- Admin Core created an updated ordering system to replace an existing FileMaker Pro deployment. This update included a move to a UIT managed server, a new web-based User Interface and a transfer of all historical data. The new ordering system brings the ordering system fully under Cores control as a mission critical operation support application. This system is anticipated to expand access and ease of ordering for all participating facilities.
- HSC had a full main website rebuild.
- HSC assumed control of all cores related websites.
- Cores interactive Map
- The electronic inventory system remains in active use by many organizations across campus. Minor updates include expanded support for the new university provided RFID inventory tags in addition to the HS Cores printed tags. This system is scheduled for a feature review and major update in October 2024.
- Critical IT infrastructure has been expanded in response to new needs and decentralized to allow quicker disaster recovery and more robust fail-over for all active services.
- Upgraded infrastructure to reduce downtimes and increase recovery/robustness.

FY25 Goals

- Unify Management of U24/U54 CIHD/CCEH Websites
- Deploy rebuilt inventory system with custom reporting support and GPS coordinate tracking
- Begin development of multi-facility project coordination/user defined research project management tools in Resource System
- Develop project proposal for Cores-wide freezer contents tracking program/initiative
- Develop service contract tracking system

Cores Administration Revenue & Expenses

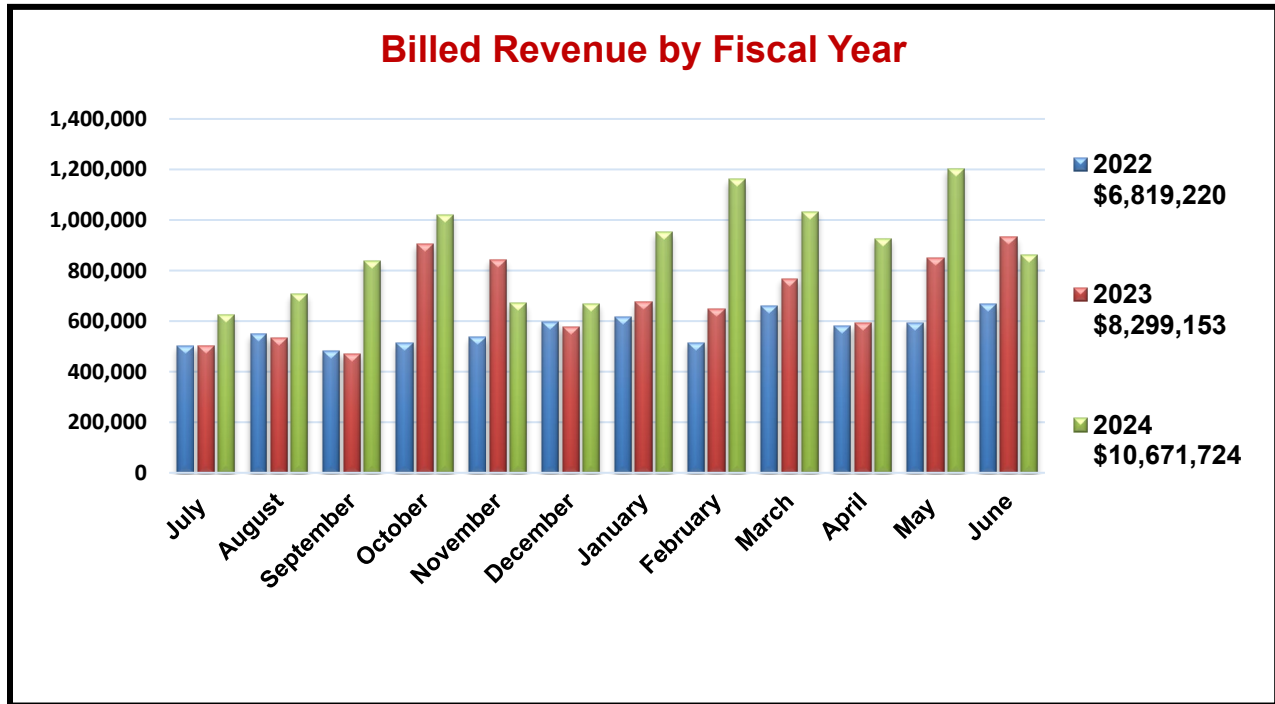
FY24 Expenses: Total \$1,170,282

The Cores Administration Budget covers the following expenses:

- Salaries/Benefits: \$958,537
- Fixed Expenses (IT Support for 62 staff, developer, x-ray, software Expenses): \$147,663.
- Unanticipated equipment repairs and replacement: \$64,082

FY24 Revenues: Total \$1,268,195

- SVP of Health Sciences Support: \$705,000
- FY24 Revenue Generated from Services: \$563,195



Addendum

The administrative core ensures that all cores maintain a regular faculty advisory committee meeting that conforms to the following guidelines:

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

Anticonvulsant Drug Development (ADD) Program

Overview

The Anticonvulsant Drug Development (ADD) Program is an established laboratory experienced in the preclinical identification and evaluation of investigational compounds for the treatment of epilepsy.

Uniqueness

Current investigators at the program have held multiple contracts with biopharmaceutical and government partners for testing of novel compounds in seizure models. The program has considerable experience in performing efficacy and tolerability assessments of novel and established antiseizure drugs (ASDs) using multiple routes of administration [intraperitoneal (i.p.), intravenous (i.v.), oral (per os, p.o.), subcutaneous (s.c.), intramuscular (i.m.), and intracerebroventricular (i.c.v.)] in models for epilepsy.

Services

The models we offer include maximal electroshock (MES)-induced seizure, 6 Hz seizure (varying stimulus intensities), corneal kindled seizure test, lamotrigine-resistant amygdala kindled model, genetic model of Dravet Syndrome (monotherapy and polytherapy testing), viral-induced epilepsy model (Theiler's murine encephalomyelitis virus [TMEV] model), spontaneous bursting model (*in vitro* slice electrophysiology assay), intra-amygdala kainate microinjection model of temporal lobe epilepsy, and post kainate, status epilepticus (SE)-induced chronically seizing rat and mouse models. In parallel, our staff routinely evaluates the effect of investigational compounds on motor impairment in the rotarod test, the open field locomotor assay, the minimal motor impairment (MMI) assay, and the modified Functional Observation Battery (FOB, or Irwin test). Our facilities include state-of-the-art multi-channel monitoring units to allow for continuous video-electroencephalographic (v-EEG) monitoring of spontaneous seizures. We also offer chronic administration of any compound to rats or mice using a drug-in-food model. Using our automated feeder system, drugs can be delivered on a fixed schedule, 24/7 for any requested length of time. Food pellets containing compounds are formulated either by outsourcing or can be custom made in-house. Prices will be determined based on the requirements of the planned study.

FY25 Goals

- Continue Established Operations
- Reaching out to new users

Personnel

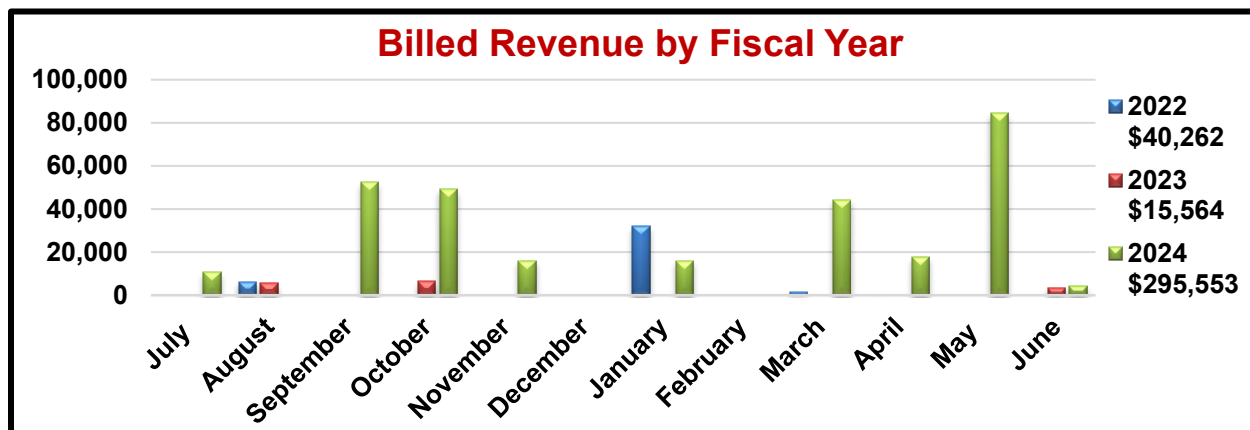
- Karen S. Wilcox Ph.D., Director
- Cameron Metcalf Ph.D., Associate Director
- Vanja Panic Ph.D., Assistant Director (Operations)
- Peter West Ph.D., Research Associate Professor
- Misty Smith Ph.D., Research Assistant Professor
- Kristina Johnson, Laboratory Manager
- Carolina Moncion Ph.D., Sr. Research Analyst
- Christine Wnukowski Ph.D., Sr. Research Analyst
- Elisa Koehler, Project Administrator

Revenue/Expenses

FY24 expenses: \$97,321

FY24 revenue: \$295,553

- Revenue generated from services: \$295,553

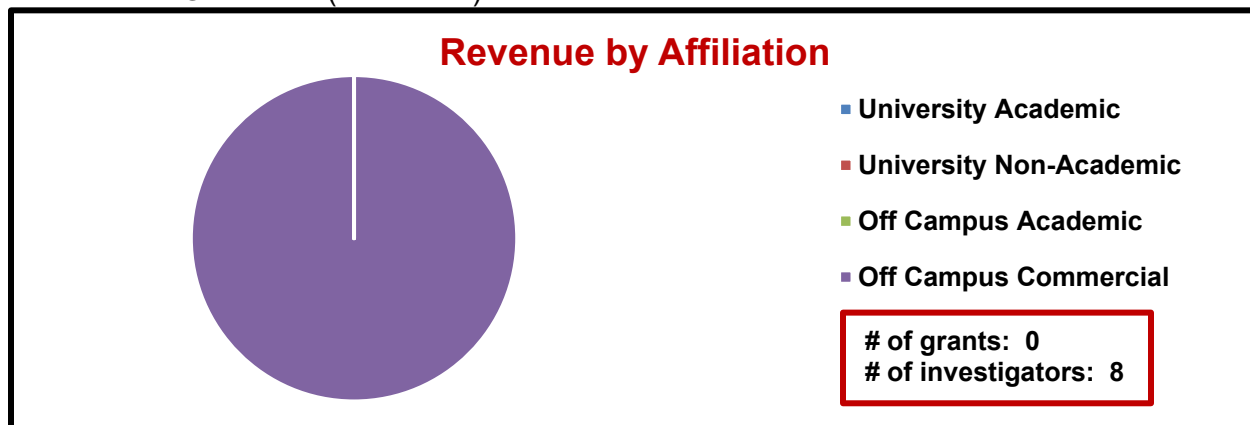


* Legend displays total annual revenue by fiscal year earned.

FY24 Scientific Impact

Research Support

Revenue Generated (see charts):



Top Users

1	Sensorium Therapeutics	Off Campus Commercial
2	Rapport Therapeutics	Off Campus Commercial
3	Autobahn Therapeutics, Inc.	Off Campus Commercial
4	MapLight Therapeutics	Off Campus Commercial
5	London Pharmaceuticals and Research Corp.	Off Campus Commercial
6	Ventus Therapeutics	Off Campus Commercial
7	AMO Pharma Limited	Off Campus Commercial
8	BioSymetrics	Off Campus Commercial

Publications

1. Jakubiec, M., et al (2024). Novel Alaninamide Derivatives with Drug-like Potential for Development as Antiseizure and Antinociceptive Therapies horizontal line In Vitro and In Vivo Characterization. ACS Chem Neurosci **15**(11): 2198-2222.10.1021/acscchemneuro.4c00013

Behavioral Health Innovation and Dissemination Center

Overview

The mission of the Behavioral Health Innovation and Dissemination Center (BHIDC) at The University of Utah (U of U) is to develop, test, and implement behavioral health interventions as well as to train U of U students to deliver them and make these and other state of the art interventions available to the public. The BHIDC conducts research primarily focused on cognitive-behavioral interventions for adults and couples, and provides low cost, evidence-based treatments to Utah residents. BHIDC staff also began conducting training workshops and educational presentations for healthcare providers and the public in FY2022.

Services

BHIDC offered a range of services including consulting, training, and psychological treatments beginning in FY22.

Personnel

- Brian Baucom, PhD, Co-Director
- Feea Leifker, MPH, PhD, Co-Director
- Abigail Boggins, B.A., Research Associate
- Mona Yaptangco, PhD, Research Assistant Professor
- Liz Greene, DNP, APRN, PMHNP-BC, Assistant Professor, Clinical
- Sara Valerious, CSW, Research Assistant
- Andy Godfrey, PhD, Postdoctoral Fellow

Advisory Board Committee

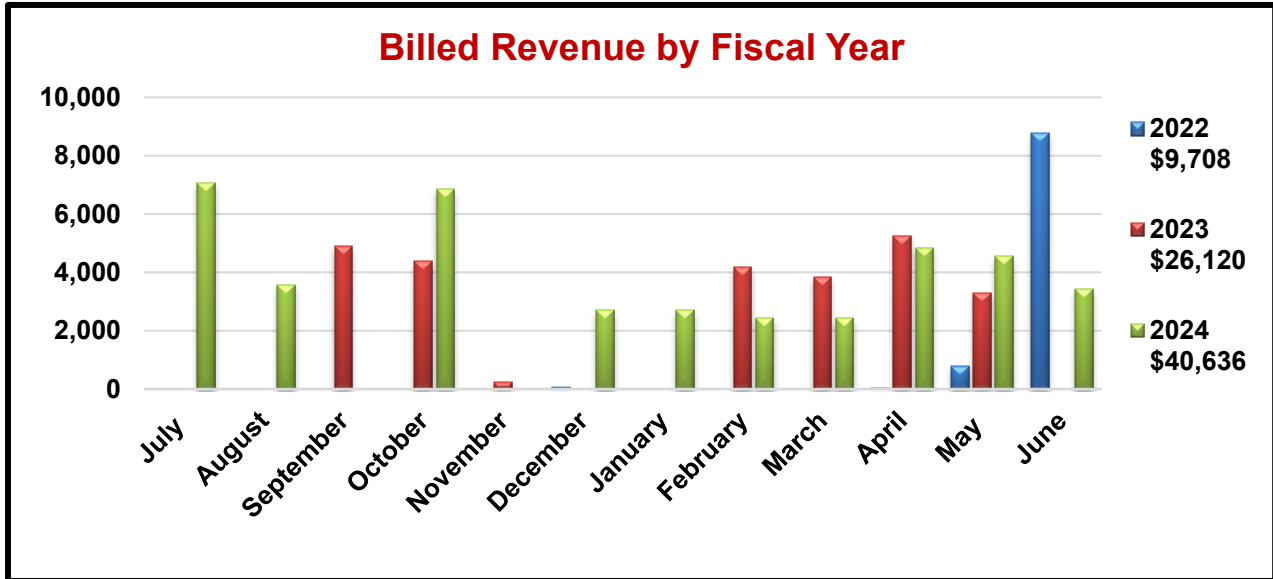
- Cynthia Berg Ph.D., Distinguished Professor of Psychology
- Lee Ellington Ph.D., Professor, College of Nursing
- Rebecca Utz Ph.D., Professor, Department of Sociology
- Lori Kowaleski-Jones Ph.D., Associate Professor, Department of Family & Consumer Studies

Revenue/Expenses

FY24 Expenses: Total \$56,767

FY24 Revenue: Total \$40,636

- FY24 Revenue generated from services: \$40,636

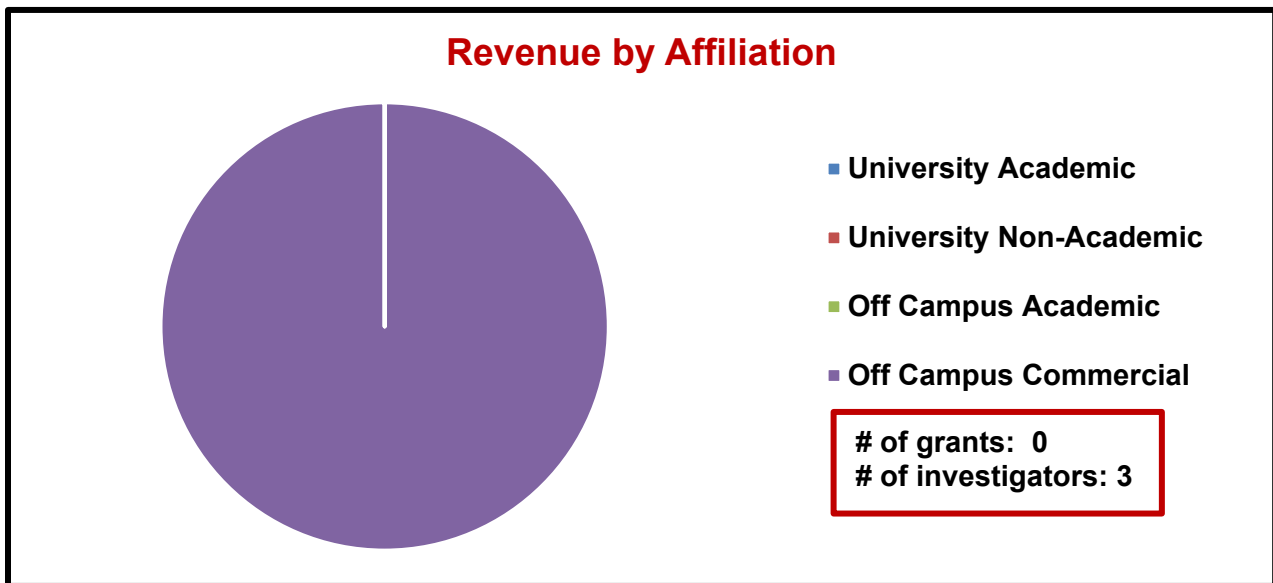


* Legend displays total annual revenue by year earned.

FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Top Users

1	Tim Hortons Foundation Camps	Off Campus Commercial
2	LiveMore ScreenLess	Off Campus Commercial
3	Terra Bueno	Off Campus Commercial

Publications

1. Bar-Sella, A., A. Nof, B. R. Baucom, P. Goldstein, S. Romanov, I. Shpakouskaya, D. Kaplun and S. Zilcha-Mano (2023). The prognostic role of emotion regulation dynamics in the treatment of major depressive disorder. *J Consult Clin Psychol* 91(12): 744-749.10.1037/ccp0000835
2. Baucom, K. J. W., B. R. W. Baucom and F. R. Leifker (2023). Supervising Work with Couples. *Handbook of Training and Supervision in Cognitive Behavioral Therapy*. M. D. Terjesen and T. Del Vecchio. Cham, Springer International Publishing: 109-119.10.1007/978-3-031-33735-2_6
3. Fischer, M. S., D. H. Baucom, D. M. Weber, D. J. Bauer, A. K. Munion, L. S. Porter, A. Christensen, C. M. Bulik, M. A. Whisman, J. S. Abramowitz, J. S. Kirby, C. D. Runfola, B. Ditzen and B. R. W. Baucom (2024). Interpersonal dynamics of vocal fundamental frequency in couples: Depressive symptoms, anxiety symptoms, and relationship distress. *Behav Res Ther* 180: 104571.10.1016/j.brat.2024.104571
4. Kilshaw, R. E., A. Boggins, O. Everett, E. Butner, F. R. Leifker and B. R. W. Baucom (2024). Benchmarking Mental Health Status Using Passive Sensor Data: Protocol for a Prospective Observational Study. *JMIR Res Protoc* 13: e53857.10.2196/53857
5. Leo, K., S. L. Langer, L. S. Porter, K. Ramos, J. M. Romano, D. H. Baucom and B. R. W. Baucom (2024). Couples communication and cancer: Sequences and trajectories of behavioral affective processes in relation to intimacy. *J Fam Psychol* 38(2): 246-259.10.1037/fam0001178
6. Sakaluk, J. K., C. De Santis, R. Kilshaw, M.-M. Pittelkow, C. M. Brandes, C. L. Boness, Y. Botanov, A. J. Williams, D. C. Wendt, L. Lorenzo-Luaces, J. Schleider and D. van Ravenzwaaij (2023). Reconsidering what makes syntheses of psychological intervention studies useful. *Nature Reviews Psychology*.10.1038/s44159-023-00213-9
7. Weber, D. M., B. R. W. Baucom, D. H. Baucom, M. S. Fischer, K. Ramos, J. M. Romano, L. S. Porter and S. L. Langer (2023). Concurrent and Prospective Associations Between Communicated Emotional Arousal and Adjustment Among Couples Coping With Cancer. *Ann Behav Med* 57(9): 753-764.10.1093/abm/kaad017

Biomedical Imaging Data Science & AI Core

Overview

The Biomedical Imaging, Data Science and AI Core (BIDAC) facility provides innovative consulting services in artificial intelligence, computer vision and image analysis to academic research groups and startups across healthcare and health sciences. By leveraging novel technologies, the development and deployment of end-to-end AI-driven data science solutions help partners turn data into insights. Areas of expertise include deep learning applied to healthcare imaging, machine learning for clinical research, HIPAA-compliant data management for clinical studies and computer vision for various domains. These application-oriented services utilize the expertise, computational resources and software development infrastructure of the Scientific Computing and Imaging (SCI) Institute. BIDAC aims to further the scientific mission of the University of Utah by enhancing the capabilities and competitiveness of HSC research partners.

Services

BIDAC offers a range of services including consulting, development of AI, computer vision or image analysis solutions, training, data visualization, software prototyping and algorithm development.

Examples of services that have been developed and/or used include:

- **AI solutions for healthcare imaging.** We developed expertise in building and delivering end-to-end data science solutions using deep learning techniques. Customized workflows leveraged convolutional neural networks (CNNs) and state-of-the-art transformer-based models. Applications included the detection and 3D segmentation of cerebral aneurysms, and 3D multi-organ segmentation for cancer imaging.
- **Machine learning analysis for clinical studies and clinical trials.** BIDAC provided consulting services, comprehensively evaluating machine learning models used in clinical trials for cardiovascular medicine, helping predict ischemia.
- **Vision AI services.** BIDAC developed domain specific computer vision services, by designing and building custom neural network-based solutions. Applications included multi-system thermal stereovision for autonomous navigation, and classification tasks on multi-magnification electron microscopy data.
- **GPU accelerated data science.** BIDAC offered advanced software engineering services to modernize multiple open-source software products, by implementing GPU acceleration, and by focusing on continuous integration and continuous delivery (CI/CD). One application example enhanced retinal connectomics within ophthalmology research.
- **Design and management of a HIPAA-compliant big data engineering pipeline to support clinical research.** In partnership with researchers from Radiology, the Enterprise Data Warehouse (EDW) and the Center for High Performance Computing (CHPC), BIDAC enabled secured data transfer, data management, data analytics and data analysis of 140,000+ radiological images. Clinical studies included AI analysis for COPD and COVID-19 research, image analysis for Deep Brain Stimulation.

Personnel

- Clement Vachet, Director

Advisory Board Committee

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

FY24 Annual Update

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

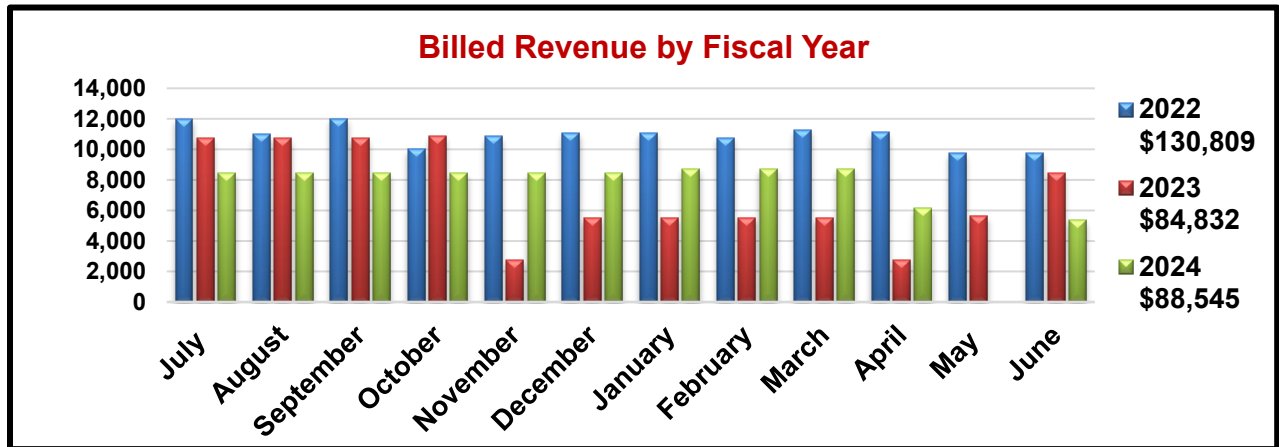
- NSF SBIR Phase II – Rudy Wilcox, RefloDx LLC.

Revenue/Expenses

FY24 Expenses: Total \$79,886

FY24 Revenue: Total \$88,545

- VP of Health Sciences Support: \$ 0
- FY24 Revenue generated from services: \$88,545

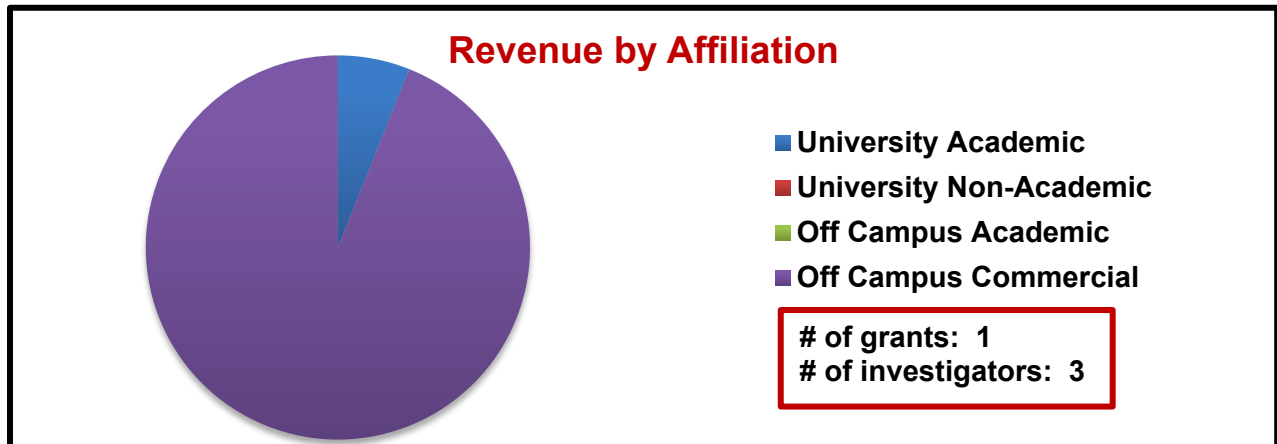


* Legend displays total annual revenue by year earned.

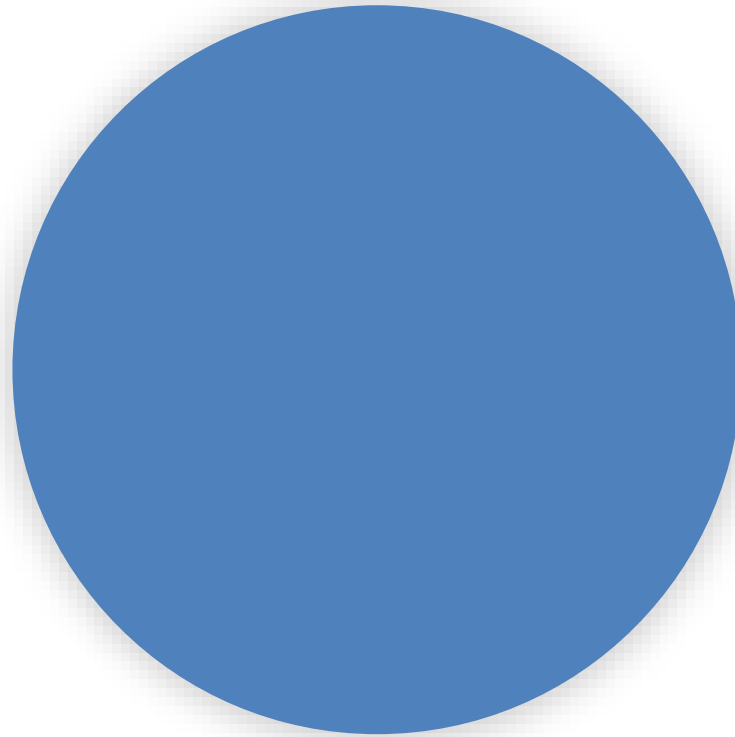
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



■ Radiology & Imaging Sciences

Top Users

1	Bryan Jones	NIH
2	Genetesis, Inc.	Off Campus Commercial
3	Satoshi Minoshima	Department

Publications

No known publications acknowledged this facility in FY24.

Cell Imaging Facility

Overview

The Cell Imaging Facility provides training and consultation on the use of confocal, automated widefield, TIRF, and two-photon microscopy, as well as the software tools for quantitative analysis of image data. The facility has a Zeiss 880 Airyscan confocal, a Leica SP8 White light laser confocal, a Leica SP8 405/488/561/633 confocal, one Olympus FV1000 Spectral confocal, one Nikon A1R confocal, one Zeiss 700 confocal, and two multi-photon microscopes from Prairie/Bruker. In addition, one Nikon Ti automated widefield microscope, one DeltaVision Ultra widefield microscope and a spinning disk confocal (CSUW1) are available for live cell imaging. STEDYCON, a super-resolution microscope from Abberior-instruments that is integrated for resolving 40nm resolution is now available. Two slide scanners, Zeiss Axio Scan.Z1 and AxioScan 7 are available for automated archiving of histology and fluorescence data. A Nikon Spinning Disk Confocal with dual cameras combined with additional TIRF and photoactivation functions is available. CosMx™ Spatial Molecular Imager (SMI) from NanoString provides high-plex in-situ analysis at cellular and subcellular resolution in FFPE and fresh frozen tissue. Automated microscopes with one of four different stage incubators are available (CO₂, temperature, humidity, hypoxia) for live cell imaging. Imaris, Nikon Elements AI, FluoRender, and ImageJ software are available for 2D and 3D analysis of image data.

Services

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

FY25 Goals

Optimizing acknowledgement of the core in published manuscripts with data generated from the core is very important in developing a strategy to acquire additional equipment.

Equipment Location

HSC Location

- Zeiss 700 Confocal Microscope
- Nikon A1R Confocal Microscope
- 2x Prairie Multi-Photon Microscope
- Zeiss Axioscan.Z1 automated slide scanner with a 100 slide loader
- EVOS M5000 FL Widefield Microscope
- Nanostring CosMx Spatial Molecular Imager (SMI)
- Imaris/Nikon Elements AI Workstation

HCI Location

- Leica SP8 confocal with a white light laser
- Leica SP8 confocal with 405, 488, 561, 633nm lasers
- Nikon Ti Automated Microscope
- Zeiss AxioScan 7 slide scanner
- Ibidi stage incubator with CO₂, temperature and hypoxia control
- Imaris Workstation

Biology ASB/Crocker Location

- Olympus FV1000 Confocal Microscope
- Zeiss 880 Airyscan Confocal
- Vutara super resolution
- STEDYCON super resolution
- Leica Cryostat

EEJMRB Location

- Spinning Disk Confocal Microscope
- DeltaVision Ultra Widefield Microscope
- Nikon Spinning Disk Confocal, TIRF and Photoactivation Microscope

Personnel

- Xiang Wang, Ph.D., Director
- Anton Classen, Ph.D., Research Associate
- Satoshi Kumatsu Ph.D., Research Associate
- Katherine Siebeneck, Lab Specialist

Advisory Board Committee

Last meeting date: March 18th, 2024

- Marcus Babst, Professor, Biology
- Sophie Caron, Associate Professor, Biological Sciences
- James Cox, HSC Cores Director
- Bruce Edgar, Professor, Oncological Sciences
- Gabrielle Kardon, Professor, Human Genetics
- Michelle Mendoza, Associate Professor, Oncological Sciences
- Minna Roh-Johnson, Associate Professor, Biochemistry
- Alex Shcheglovitov, Associate Professor, Neurobiology and Anatomy

FY24 Annual Update**New Services**

- Consultation is available at four locations: Building 5 CSC, 555 HCI, 565 EEJMRB and 585 HSC

New Equipment

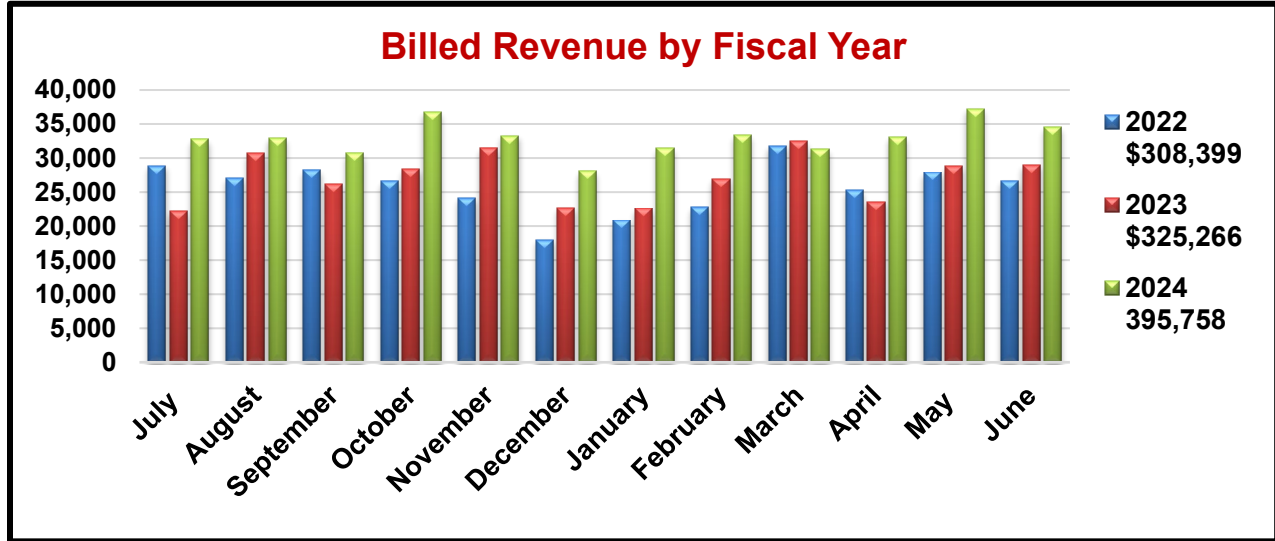
- Zeiss AxioScan 7 slide scanner
- NanoString CosMx Spatial Molecular Imager (SMI)

Revenue/Expenses

FY24 Expenses: Total \$871,500

FY24 Revenue: Total \$835,450

- VP of Health Sciences Support: \$225,000
- Equipment Support: \$214,692
- FY24 Revenue generated from services: \$395,758

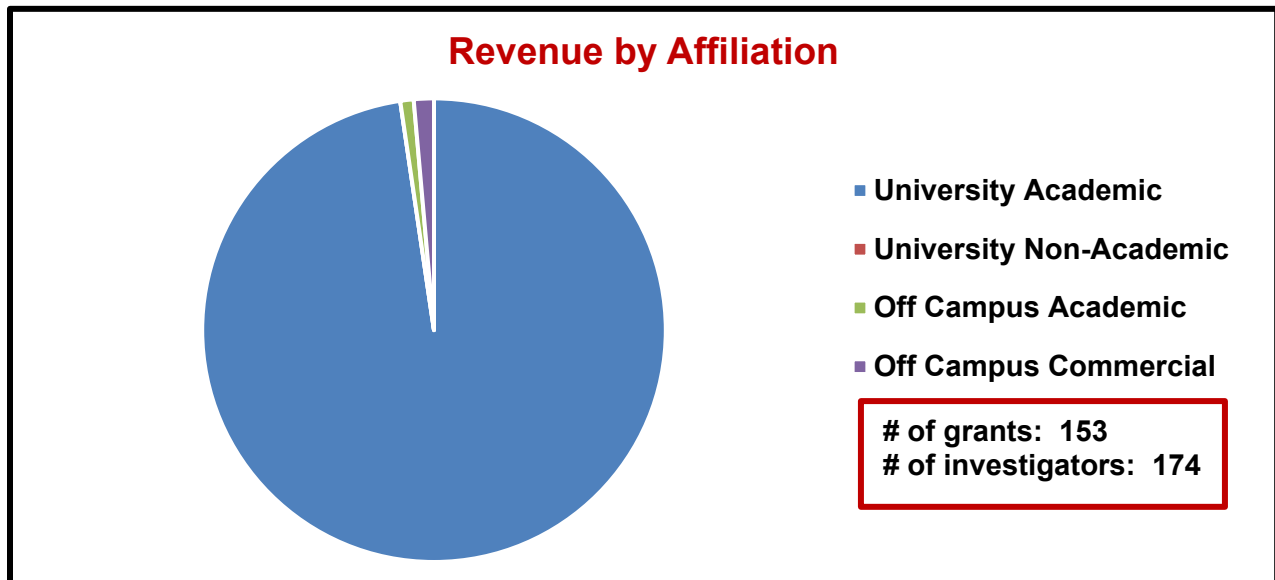


* Legend displays total annual revenue by year earned.

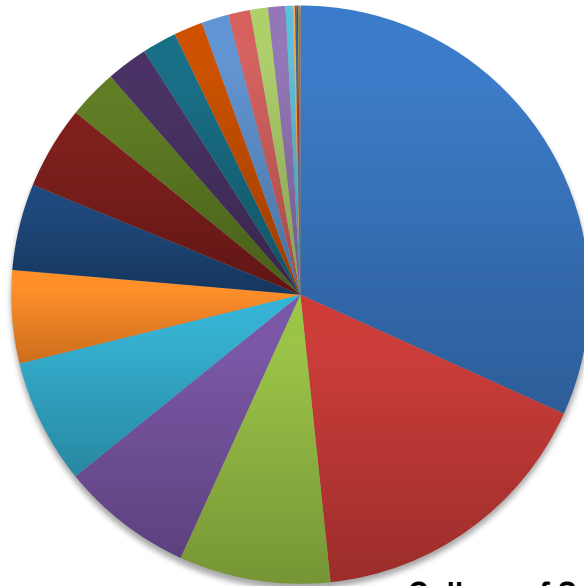
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following)



Revenue by Department



- HCI
- Neurobiology
- College of Pharmacy
- Molecular Medicine
- Orthopaedics
- Radiology & Imaging Sciences
- Pathology
- CVRTI
- Neurology
- Ophthalmology & Visual Sciences
- Psychiatry
- Infectious Disease
- College of Science
- Biochemistry
- Pediatrics
- College of Health
- Surgery
- College of Engineering
- Internal Medicine
- Human Genetics
- Neurosurgery
- CTSI
- Dermatology
- HSC Cores

Top Users

1	Chris Fillmore	Department
2	Sophie Caron	NIH, NSF
3	Erik Jorgensen	Department
4	Michelle Mendoza	Concern Foundation, NIH
5	Josh Bonkowsky	Department
6	Katharine Ullman	NIH, Paul G. Allen Family Foundation
7	Karen Wilcox	NIH
8	Oleksandr Shcheglovitov	NIH
9	Bruce Edgar	Department, NIH
10	Minna Roh-Johnson	Department, NIH, University of Utah Research Foundation

Publications

1. Anderson, B., D. Blair, K. Huff, J. Wisniewski, K. S. Warner and K. Kauser (2023). Photochemical Modification of the Extracellular Matrix to Alter the Vascular Remodeling Process. *J Funct Biomater* **14**(12).10.3390/jfb14120566
2. Carey, C. M., H. L. Hollins, A. V. Schmid and J. A. Gagnon (2024). Distinct features of the regenerating heart uncovered through comparative single-cell profiling. *Biol Open* **13**(4).10.1242/bio.060156
3. Carney, K. R., A. M. Khan, S. Stam, S. C. Samson, N. Mittal, S. J. Han, T. C. Bidone and M. C. Mendoza (2023). Nascent adhesions shorten the period of lamellipodium protrusion through the Brownian ratchet mechanism. *Mol Biol Cell* **34**(12): ar115.10.1091/mbc.E23-08-0314
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7. de Hart, N., J. J. Petrocelli, R. J. Nicholson, E. M. Yee, L. van Onselen, M. J. Lang, P. E. Bourrant, P. J. Ferrara, E. D. Bastian, L. S. Ward, B. L. Petersen and M. J. Drummond (2024). Dietary delivery of glycomacropeptide within the whey protein matrix is not effective in mitigating tissue ceramide deposition and obesity in mice fed a high-fat diet. *J Dairy Sci* **107**(2): 669-682.10.3168/jds.2023-23914
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Data Science Services

Overview

Data science is the discipline of extracting knowledge from data and medical informatics is the science of using data, information, and knowledge to improve human health and healthcare delivery. Data Science Services (DSS) is a research analytics team that provides data science and informatics expertise to the clinical and translational research community. DSS serves as the research data concierge for the UHealth Enterprise Data Warehouse (EDW), Epic electronic health record (3+ million UHealth patients), and Epic Cosmos (270+ million patients from 200+ healthcare organizations) data. DSS provides analytic, technical, and consultative support, education, and training to clinicians and researchers on healthcare data, self-service tools, and the effective use of all available resources to answer complex, data-intensive research questions.



Services

Datasets: we provide raw data, analytic datasets, controlled medical vocabularies, metadata, and other types of supporting documentation during the post-award through publication stages.

for
various



Analytics: we provide broad healthcare analytics development and support research including techniques like machine learning, data visualization, and business intelligence approaches, including analyses using Epic [Cosmos](#).



Feasibility: we support research from the early design stage onwards through consultations, feasibility estimates, preliminary analyses, pre-award support, pre-IRB submission [cohort size estimations](#), etc.



Tools and applications: we provide access and ongoing support for various [EDW research tools](#) like Epic SlicerDicer, Business Objects Enterprise (BOE) Clinical Universe, Human Subjects Recruitment Tool, Warthog, DWCell, etc.



Clinical trials: we enhance clinical trials recruitment through Epic [MyChart](#), Human Subject Recruitment Tool ([HSRT](#)), automated BOE and Tableau reports to meet accrual goals and reduce cost.



Natural Language Processing (NLP): we provide clinical NLP support for retrospective and prospective studies using commercial products like [CliniThink](#), text-searches using EDW tools like Oracle Text and [Warthog](#).



Data management: we host research datasets within the EDW and other UHealth repositories and provide comprehensive support for datasets, recurring reports, automatically refreshed datasets, etc.



Collaborations and training: we support multi-center studies through Cosmos [Teleport](#), other research networks, research registries, etc., and conduct seminars, workshops, and hands-on training for departments and divisions on healthcare data.

Personnel

- Vikrant G. Deshmukh, PhD, JD, MS, MSc – Director of Data Science Services and Adj. Asst. Professor, Population Health Sciences, Biomedical Informatics, and Nursing.
- Mingyuan Zhang, MS – Senior Data Scientist, DSS.
- Reid Holbrook, MD, MPH, MBA – Senior Medical Informaticist, DSS.
- Vasee Sivaloganathan, MS – Medical Informaticist, DSS.
- Mihai Virtosu, MS – Medical Informaticist, DSS.
- Lama Albarqawi, MS – Medical Informaticist, DSS.

Academic Oversight Committee

- **Chair:** Yves Lussier, MD, FACMI (Professor and Chair, Biomedical Informatics Biomedical Informatics).
- **Vice-Chair:** Carl V. Asche, PhD, MSc, MBA (Research Professor, Dept. of Pharmacotherapy).
- Vivek K. Reddy, MD, MMM (Assoc. Professor (clinical), Vascular Neurology; Chief Medical Information Officer, University of Utah Hospital).
- Andrea S. Wallace, PhD, RN, FAAN (Assoc. Professor and Assoc. Dean of Research, College of Nursing).
- Julie Fritz, PhD, PT, ATC (Distinguished Professor and Assoc. Dean for Research, College of Health).
- Srinivasan Beddhu, MD (Professor and Clinical Research Medical Director, Internal Medicine).
- Carole Stipelman, MD, MPH, FAAP (Clinical Professor, Pediatrics; Medical Director, UHealth Pediatric Clinic and Sugarhouse Pediatrics).
- Jacob Kean, PhD, MA, MEd (Assoc. Professor, Population Health Sciences).
- Julio Facelli, PhD, FACMI (Professor and Vice-Chair, Biomedical Informatics).

Contact

- Pulse site: <https://pulse.utah.edu/site/DSS>
- Team email: datascience@hsc.utah.edu

FY24 Annual Update

Team updates – The DSS team continues our mission of excellence in research analytics in serving the University’s research community. The Epic Cosmos initiative, co-led by DSS and Epic Cogito teams continues to place the University of Utah among the top 10 institutions in the country in Cosmos usage among hundreds of participating healthcare organizations.

Grant support – DSS provided letters of support for the following grant/contract submissions in FY’24:

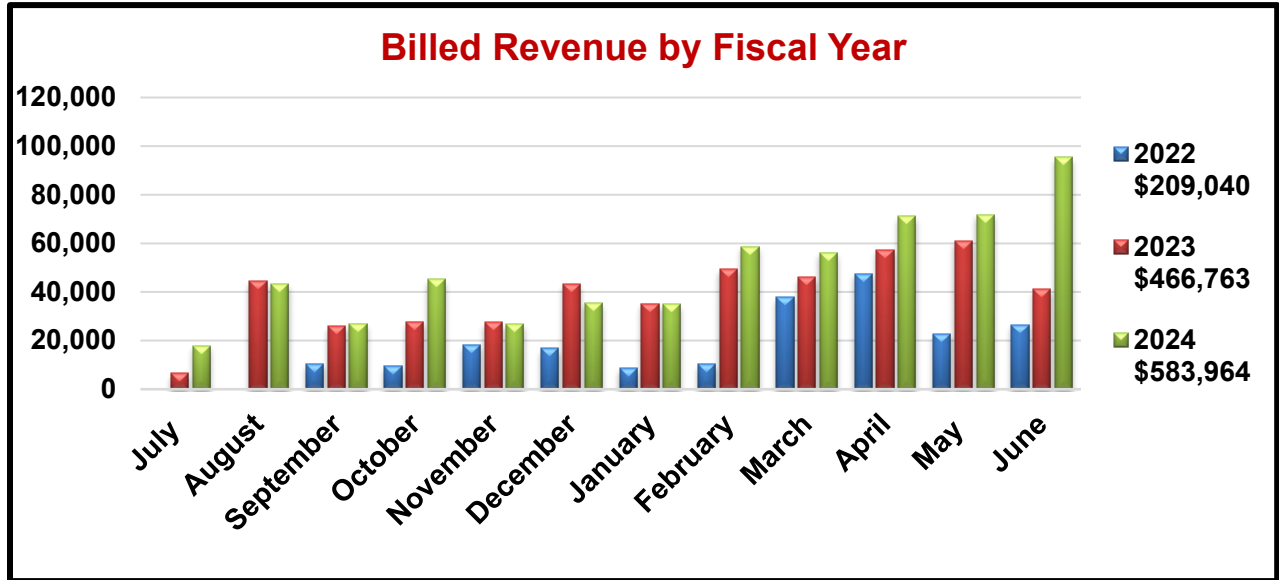
- NIH – Tanya M. Halliday, PhD, RD and Christopher M Depner (College of Health).
- NIH – Shinduk Lee DrPH, MSPH (College of Nursing)
- NIH - Fiemu E. Nwariaku, MD, FACS, MBA and Thomas K. Varghese Jr., MD, MS, MBA, FACS (School of Medicine).
- CDC – Matthew Reeder, PhD, MPH and Lorenzo Botto, MD (School of Medicine)
- CDC – Lorenzo Botto, MD (School of Medicine)
- PCORI – Torri Metz, MD, MS (School of Medicine)
- CDC – Russell Butterfield, MD, PhD (School of Medicine)
- NIH – Elissa M. Ozanne, PhD and Tracey Onega, PhD (School of Medicine).

Revenue/Expenses

FY24 Expenses: Total \$1,347,052

FY24 Revenue: Total \$1,413,946

- VP of Health Sciences Support: \$785,000
- Other: \$44,982
- FY24 Revenue generated from services: \$583,964

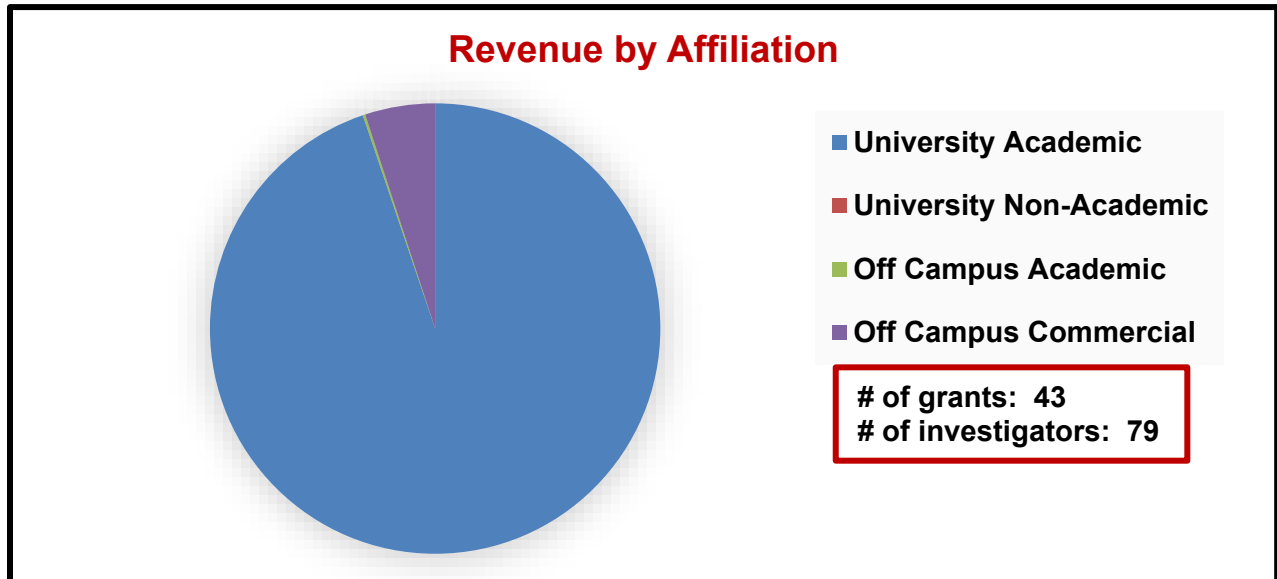


* Legend displays total annual revenue by year earned.

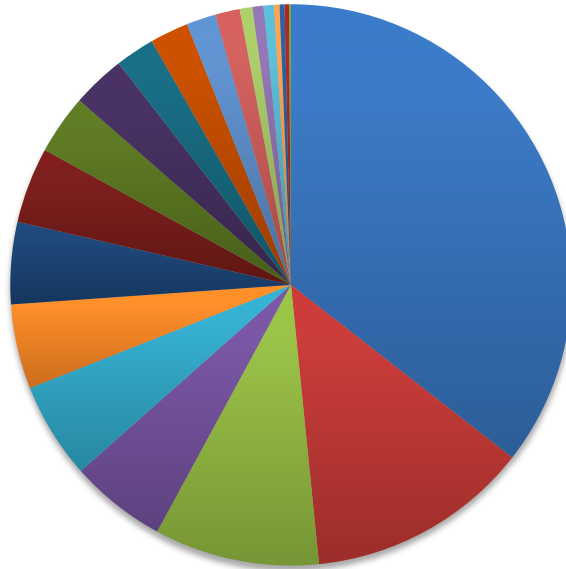
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



- Internal Medicine
- College of Health
- Surgery
- College Of Pharmacy
- Pediatrics
- Obstetrics & Gynecology
- Population Health Sciences
- Family & Preventive Medicine
- CTSI
- Ophthalmology & Visual Sciences
- College of Nursing
- HCI
- Dermatology
- Psychiatry
- Emergency Medicine
- College of Social Work
- Orthopaedics
- University Business Services
- Human Genetics
- Radiology & Imaging Sciences
- Molecular Medicine

Top Users

1	Margaret French	Department
2	Critical Path Institute	Off Campus Commercial
3	Russell Butterfield	Parent Project Muscular Dystrophy
4	Megan Puckett	AGS
5	Brandon Creswell	Department
6	Benjamin Steinberg	Department, Mayo Clinic, NIH
7	Casey Tak	Bayer Pharmaceuticals, Department, University of Colorado at Denver
8	Jincheng Shen	Department
9	Rachel Hess	New York University
10	Heather Hayes	Department

Publications

1. Abedin, Z., M. Herner, M. Torre, Y. Zhang, C. Orton, A. Lyons, T. J. Bunch and B. A. Steinberg (2024). Patient-reported symptomatic events do not adequately reflect atrial arrhythmia. Heart Rhythm. 10.1016/j.hrthm.2024.05.041
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9. Cohan, J. N., J. J. Horns, J. M. Ramsay, L. C. Huang and K. Allen-Brady (2023). Diverticulitis Familiality: A Statewide Case-Control Study. J Am Coll Surg **237**(5): 689-696. 10.1097/XCS.0000000000000799
10. Coon, H. (2024). Using Unique Utah Data to Discover Genetic Factors Leading to Increased Risk of Suicide Death. Biological Psychiatry **95**(10): S25-S26. 10.1016/j.biopsych.2024.02.067
11. Coon, H., A. Shabalin, E. DiBlasi, E. T. Monson, S. Han, E. A. Kaufman, D. Chen, B. Kious, N. Molina, Z. Yu, M. Staley, D. K. Crockett, S. M. Colbert, N. Mullins, A. V. Bakian, A. R. Docherty and B. Keeshin (2024). Absence of nonfatal suicidal behavior preceding suicide death reveals differences in clinical risks. medRxiv. 10.1101/2024.06.05.24308493
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21. Han, S., E. DiBlasi, E. T. Monson, A. Shabalin, E. Ferris, D. Chen, A. Fraser, Z. Yu, M. Staley, W. B. Callor, E. D. Christensen, D. K. Crockett, Q. S. Li, V. Willour, A. V. Bakian, B. Keeshin, A. R. Docherty, K. Eilbeck and H. Coon (2023). Whole-genome sequencing analysis of suicide deaths integrating brain-regulatory eQTLs data to identify risk loci and genes. *Mol Psychiatry* **28**(9): 3909-3919.10.1038/s41380-023-02282-x
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30. Hu, S., C. P. Chang, J. Snyder, V. Deshmukh, M. Newman, A. Date, C. Galvao, B. Haaland, C. A. Porucznik, L. H. Gren, A. Sanchez, S. Lloyd, B. O'Neil and M. Hashibe (2024). Mental health outcomes in a population-based cohort of patients with prostate cancer. *J Natl Cancer Inst* **116**(3): 445-454.10.1093/jnci/djad175
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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 click compatible modifications. The goal of the facility is to provide quality service with rapid turnaround times.

Services

- Routine and custom DNA synthesis
- Routine and custom RNA synthesis
- Routine and custom peptide synthesis
- Peptide purification

Equipment

- Dr. Oligo 192 DNA Synthesizer
- ABI 3900 DNA Synthesizer
- K&A H-8 Synthesizer (2)
- ABI 394 DNA Synthesizer (1)
- 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
- Andrea Koehler, Lab Technician
- Meredith Ford, Lab Technician

Advisory Board Committee

Last meeting date: June 14, 2024

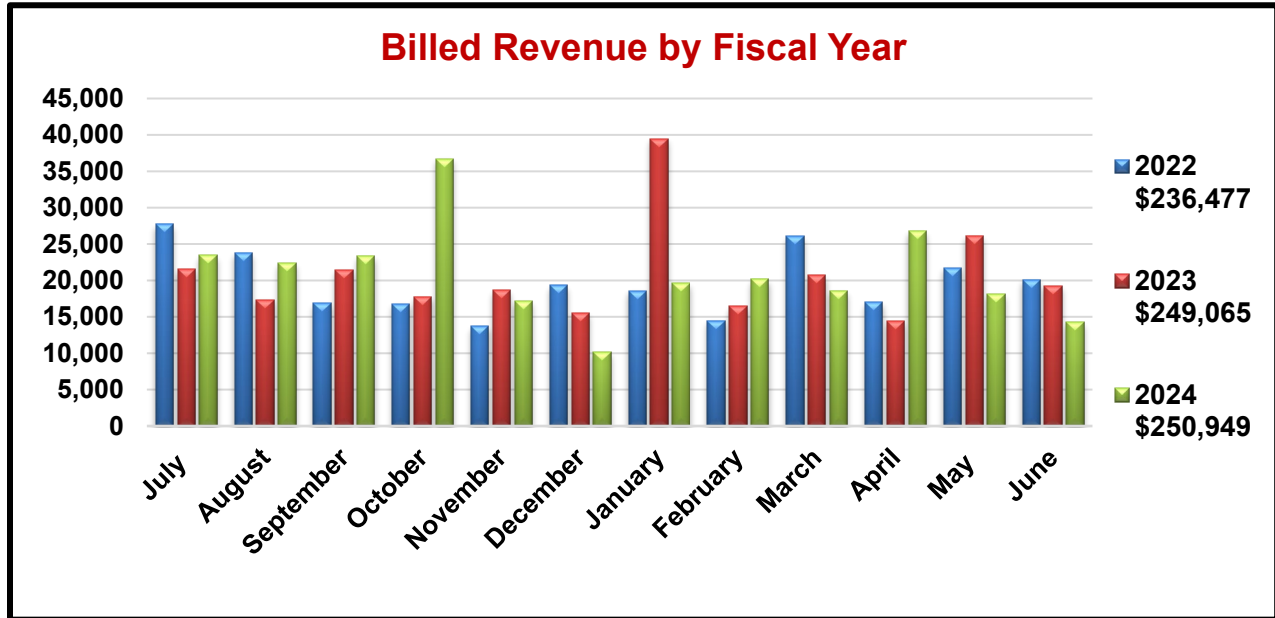
- Raphael Franzini, Professor, College of Pharmacy
- Ming Hammond, Professor, Chemistry Department
- Mahesh Chandrasekharan, Professor, Radiation Oncology

Revenue/Expenses

FY24 Expenses: Total \$310,531

FY24 Revenue: Total \$310,949

- VP of Health Sciences Support: \$60,000
- FY24 Revenue Generated from Services: \$250,949

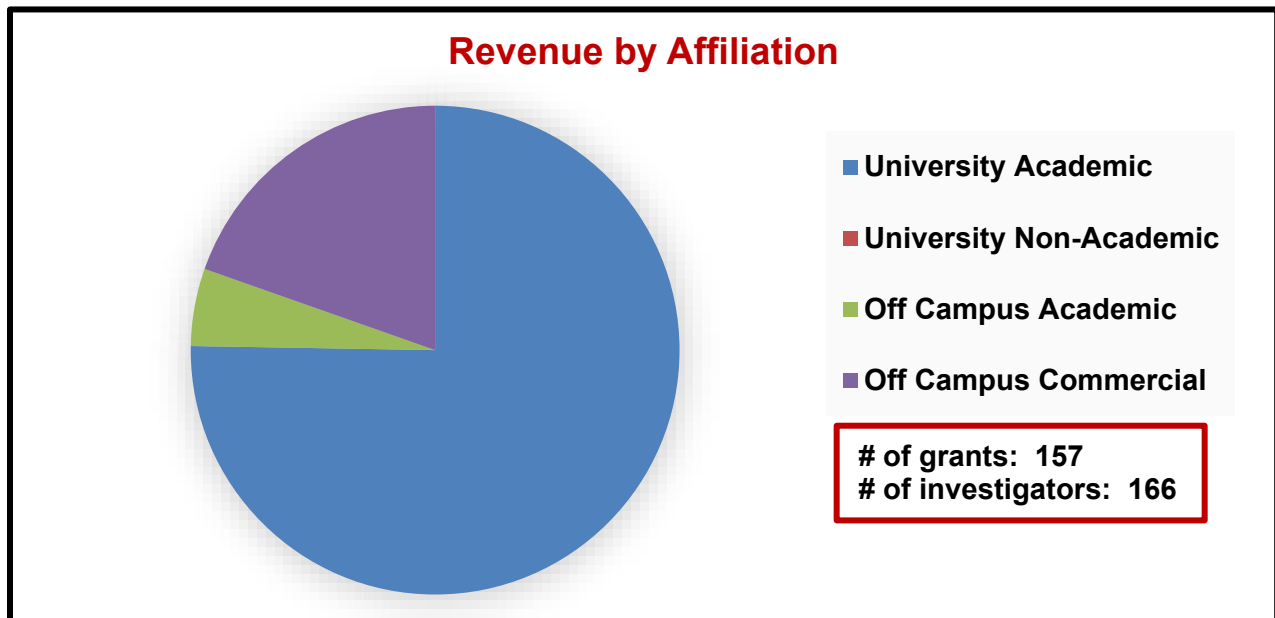


* Legend displays total annual revenue by year earned.

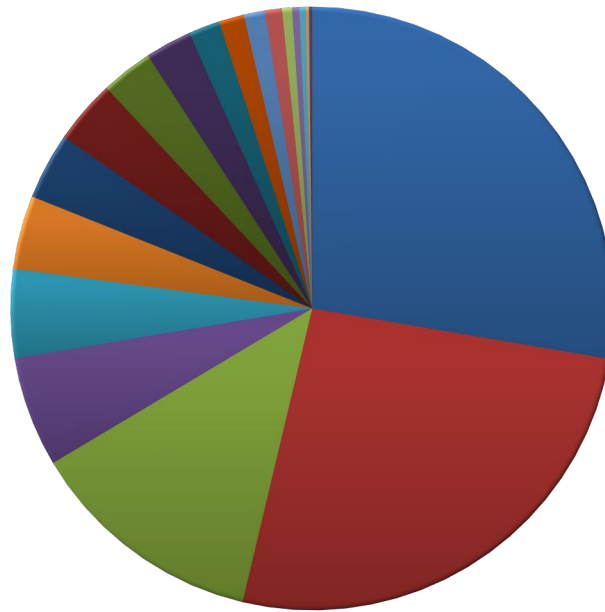
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



- Biochemistry
- College Of Science
- HCI
- College of Pharmacy
- Molecular Medicine
- Internal Medicine
- Pathology
- Neurobiology
- CVRTI
- HSC Cores
- Pediatrics
- College of Health
- Human Genetics
- College of Engineering
- Orthopaedics
- Ophthalmology & Visual Sciences
- Neurology
- Psychiatry
- CTSI
- Neurosurgery

Top Users

1	BioFire Diagnostics	Off Campus Commercial
2	SeekLabs	Off Campus Commercial
3	Wesley Sundquist	Cleveland CF, Department, Gilead Sciences, NIH
4	Cynthia Burrows	NIH
5	Jared Rutter	Brigham & Women's Hospital, Department, Nora Eccles Treadwell Foundation
6	Ming Hammond	NIH, NSF, Office of Naval Research
7	Covant Therapeutics	Off Campus Commercial
8	Eric Schmidt	NIH, NSF
9	Yang Liu	NIH
10	Raphael Franzini	NIH

Publications

1. Aoyagi, K. L., B. Mathew and M. A. Fisher (2023). Enterobacterial common antigen biosynthesis in *Yersinia pestis* is tied to antimicrobial peptide resistance. *bioRxiv*.10.1101/2023.08.26.554945
2. Argueta-Gonzalez, H., C. S. Swenson, K. J. Skowron and J. M. Heemstra (2023). Elucidating Sequence-Assembly Relationships for Bilingual PNA Biopolymers. *ACS Omega* 8(40): 37442-37450.10.1021/acsomega.3c05528
3. Batistatou, N. and J. A. Kritzer (2024). Comparing Cell Penetration of Biotherapeutics across Human Cell Lines. *ACS Chem Biol* 19(6): 1351-1365.10.1021/acscchembio.4c00211
4. Blackwell, A. M., Y. Jami-Alahmadi, A. S. Nasamu, S. Kudo, A. Senoo, C. Slam, K. Tsumoto, J. A. Wohlschlegel, J. M. M. Caaveiro, D. E. Goldberg and P. A. Sigala (2024). Malaria parasites require a divergent heme oxygenase for apicoplast gene expression and biogenesis. *bioRxiv*.10.1101/2024.05.30.596652
5. Consalvo, C. D., A. M. Aderounmu, H. M. Donelick, P. J. Aruscavage, D. M. Eckert, P. S. Shen and B. L. Bass (2024). *Caenorhabditis elegans* Dicer acts with the RIG-I-like helicase DRH-1 and RDE-4 to cleave dsRNA. *Elife* 13.10.7554/eLife.93979
6. Fleming, A. M., C. A. Omega and C. J. Burrows (2023). NEIL3 promoter G-quadruplex with oxidatively modified bases shows magnesium-dependent folding that stalls polymerase bypass. *Biochimie* 214(Pt A): 156-166.10.1016/j.biochi.2023.07.001
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8. Hansen, D. T., N. J. Rueb, N. D. Levinzon, T. E. Cheatham, 3rd, R. Gaston, Jr., K. Tanvir Ahmed, S. Osburn-Staker, J. E. Cox, G. B. Dudley and A. M. Barrios (2024). The mechanism of covalent inhibition of LAR phosphatase by illudalic acid. *Bioorg Med Chem Lett* 104: 129740.10.1016/j.bmcl.2024.129740
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10. Loveridge, K. M. and P. A. Sigala (2024). Identification of a divalent metal transporter required for cellular iron metabolism in malaria parasites. *bioRxiv*.10.1101/2024.05.10.587216
11. Myres, G. J., J. P. Kitt and J. M. Harris (2023). Raman Scattering Reveals Ion-Dependent G-Quadruplex Formation in the 15-mer Thrombin-Binding Aptamer upon Association with alpha-Thrombin. *Anal Chem* 95(44): 16160-16168.10.1021/acs.analchem.3c02751
12. Myres, G. J., J. P. Kitt and J. M. Harris (2024). Surface-Area Enhanced Raman Spectroscopy of DNA in Porous Silica: A Quantitative and Reproducible Alternative to Plasmonic-Based SERS. *Anal Chem* 96(19): 7679-7686.10.1021/acs.analchem.4c00600
13. Ouyang, Y., M. Y. Jeong, C. N. Cunningham, J. A. Berg, A. G. Toshniwal, C. E. Hughes, K. Seiler, J. G. Van Vranken, A. A. Cluntun, G. Lam, J. M. Winter, E. Akdogan, K. K. Dove, S. M. Nowinski, M. West, G. Odorizzi, S. P. Gygi, C. D. Dunn, D. R. Winge and J. Rutter (2024). Phosphate starvation signaling increases mitochondrial membrane potential through respiration-independent mechanisms. *Elife* 13.10.7554/eLife.84282
14. Paine, E. L., J. J. Skalicky, F. G. Whitby, D. R. Mackay, K. S. Ullman, C. P. Hill and W. I. Sundquist (2023). The Calpain-7 protease functions together with the ESCRT-III protein IST1 within the midbody to regulate the timing and completion of abscission. *Elife* 12.10.7554/eLife.84515
15. Scott, T. M., L. M. Arnold, J. A. Powers, D. A. McCann, D. E. Christensen, M. J. Pereira, W. Zhou, R. M. Torrez, J. H. Iwasa, P. J. Kranzusch, W. I. Sundquist and J. S. Johnson (2024). Cell-free assays reveal the HIV-1 capsid protects reverse transcripts from cGAS. *bioRxiv*.10.1101/2024.04.22.590513
16. Smith, J. J., T. R. Valentino, A. H. Ablicki, R. Banerjee, A. R. Colligan, D. M. Eckert, G. A. Desjardins and K. L. Diehl (2024). A genetically-encoded fluorescent biosensor for visualization of acetyl-CoA in live cells. *bioRxiv*.10.1101/2023.12.31.573774

DNA Sequencing Facility

Overview

The DNA Sequencing Facility provides DNA sequencing services and employs the latest technologies to generate high quality data with the goal of rapid sample turnaround at competitive prices. DNA sequencing is accomplished with the use of DNA sequencers and lab robotics such as the Element Biosciences AVITI sequencer (sequencing by avidity), Oxford Nanopore P2Solo (long read sequencer), 10x Genomics and the Biomek FXp for liquid handling needs. For Illumina sequencing we also have the capability of sending samples out for sequencing with approximately 3-week turnaround time run on both the Illumina NovaSeq and the MiSeq instruments. In addition, we have a Minlon from Oxford Nanopore that we can work with you on completing runs of long read sequencing for your projects. Data from standard DNA sequencing services are typically reported to customers the same day as they are run. Sample information can be submitted online and sequencing data files are available for download using a simple and secure interface.

Services

DNA Sequencing

- Element Biosciences AVITI Sequencing (Sequencing by avidity)
- Standard Sanger DNA sequencing
- Primer walking on clones
- Mutation detection and resequencing custom projects
- Pyrosequencing
- 10x Genomics libraries for single cell sequencing
- Illumina Sequencing with 3-week turnaround
- Oxford Nanopore Sequencing
- Full Plasmid Sequencing

Cell Line Authentication

- Human cell line authentication by STR

Robotics

- Biomek FXp with Span-8 and 96 head

Fragment Analysis

- Fragment sizing and concentrations

10x Genomics Chromium Controller

- Single Cell RNA Seq
- ATAC Seq
- Immune cell profiling

Other Services

- Lab consumables for sample submission
- Life Technologies freezer program

Equipment

Sequencers

- Qiagen Q24 Pyrosequencer
- Applied Biosystems 3730xl
- Element Biosciences AVITI
- Oxford Nanopore P2Solo Long Read Sequencer
- Oxford Nanopore Minlon Long Read Sequencer

Liquid Handlers

- 1 Biomek FXp programmable liquid sample dispenser

Fragment Analysis

- AATI Fragment Analyzer

Personnel

- Derek Warner, Director
- Michael Powers, Senior Laboratory Specialist

Advisory Board Committee

Last meeting date: March 28, 2024

- Lynn Jorde Ph.D., Professor, Human Genetics
- Robert Weiss Ph.D., Professor, Human Genetics
- Aaron Quinlan Ph.D., Professor, Human Genetics
- Deb Neklason Ph.D., Research Associate Professor, Huntsman Cancer Institute
- Nicola Camp Ph.D., Professor, Hematology

FY24 Annual Update

New Equipment

- The DNA Sequencing Facility did not acquire new equipment in FY24

New Services

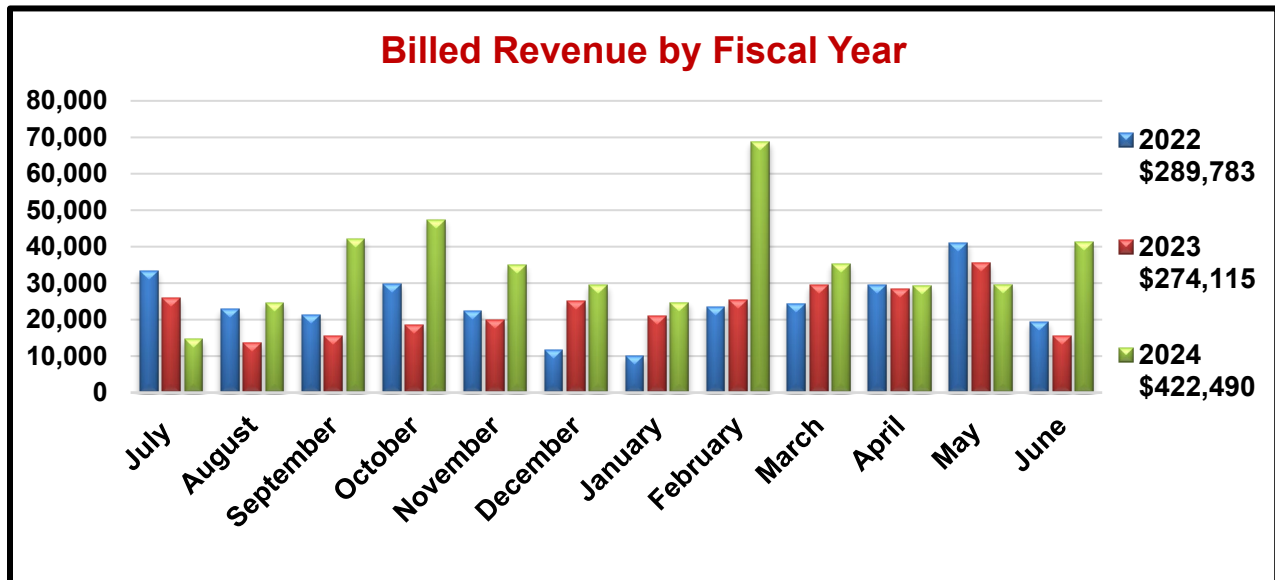
- Full Plasmid Sequencing for University of Utah customers

Revenue/Expenses

FY24 Expenses: Total \$706,208

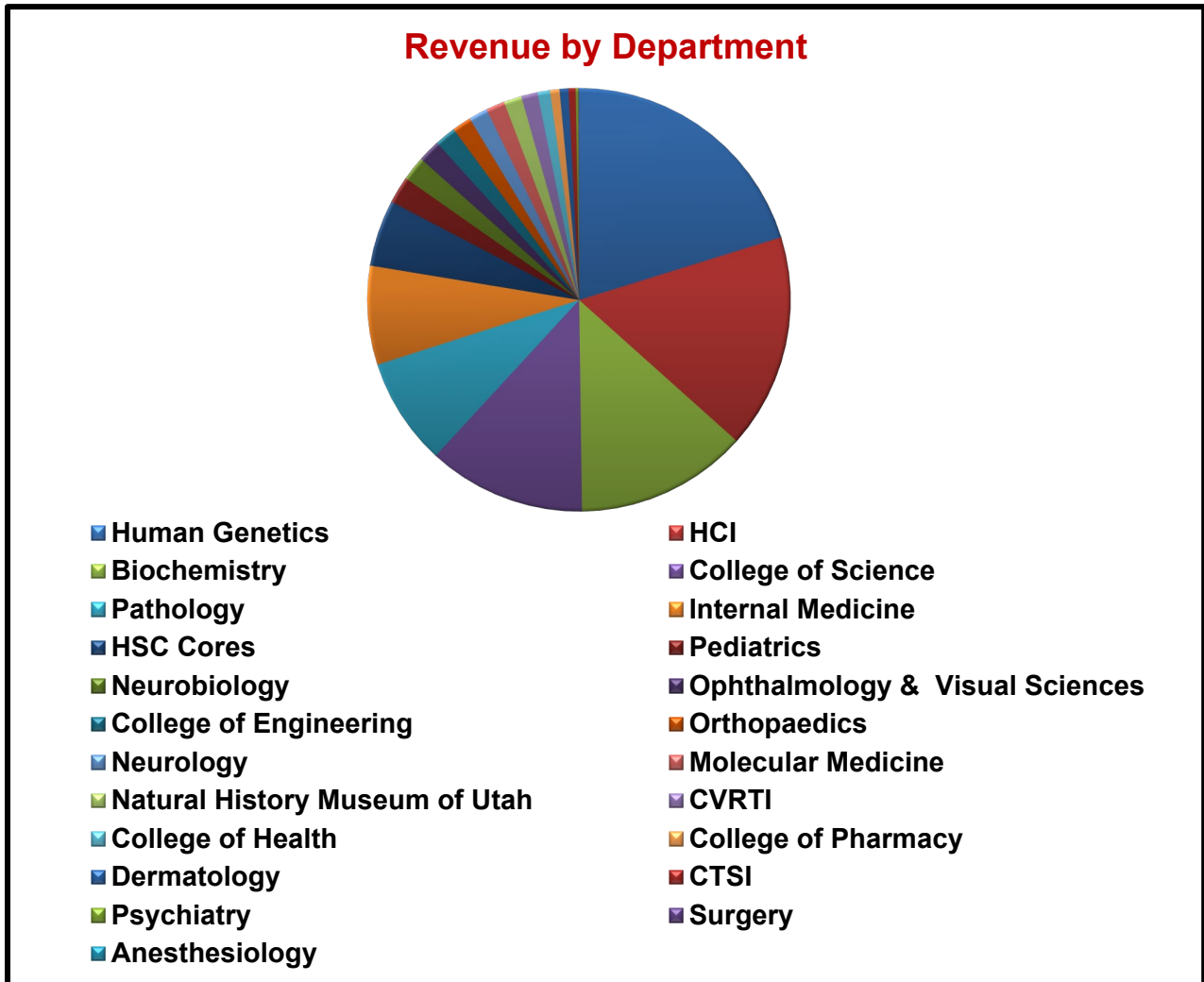
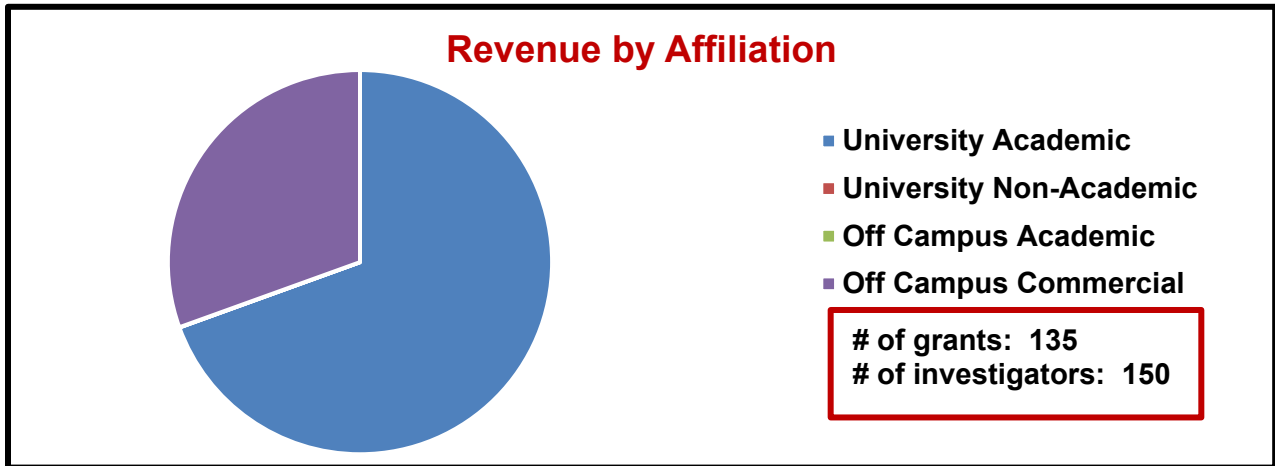
FY24 Revenue: Total \$605,990

- VP of Health Sciences Support: \$50,000
- Equipment Funds: \$133,500
- FY24 Revenue generated from services: \$422,490



* Legend displays total annual revenue by year earned.

FY24 Scientific Impact
Research Support
 Revenue Generated (see charts following):



Top Users

1	Leash Laboratories	Off Campus Commercial
2	Aaron Quinlan	Department, NIH
3	Adrienne Dorrance	Department
4	Wesley Sundquist	Department, Gilead Sciences, NIH
5	Crystal Davey Hicks	Department
6	John Parkinson	NIH
7	Katherine Varley	American Cancer Society, Inc., DOD
8	Maria Bettini	NIH
9	Sean Tavtigan	Department
10	Lezlee Miller	Department

Leash Bio 2024 Competition

1. Andrew Blevins, Ian K Quigley, Brayden J Halverson, Nate Wilkinson, Rebecca S Levin, Agastya Pulapaka, Walter Reade, Addison Howard. (2024). NeurIPS 2024 - Predict New Medicines with BELKA. Kaggle. <https://kaggle.com/competitions/leash-BELKA>

Publications

1. Balit, J., A. Erlangsen, A. Docherty, G. Turecki and M. Orri (2024). Association of chronic pain with suicide attempt and death by suicide: a two-sample Mendelian randomization. *Mol Psychiatry*.10.1038/s41380-024-02465-0
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Drug Discovery Facility

Overview

The Drug Discovery Facility provides small molecule compound collections for screening in biologic assays. The facility delivers low-cost and efficient access to chemical libraries/CRISPR libraries for screening, a diverse array of equipment for automation, and synthetic chemistry support for the characterization and validation of compounds to be further developed as therapeutics, diagnostics and biological sensors or tools.

Uniqueness

The University of Utah possesses the scientific and medical talent, an innovative research culture, and state-of-the-art research facilities to contribute substantially to the discovery of small molecule drugs. However, significant challenges still remain in translation of basic scientific discoveries into potential human therapeutics. The uniqueness of the Drug Discovery Facility is it coordinates the cooperative efforts of individual research groups in a wide variety of different drug discovery studies, ultimately leading to discovery of 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/screening
- Assay development
- Consultation on target identification/validation, hit to lead optimization, PK/PD/Efficacy
- Chemical support for drug discovery

CRISPR Knockout/Knockin Cell Line Production

In collaboration with the Mutation Generation and Detection Core, we started to offer a full cell line generation service from sgRNA design/construction to final cell line generation/verification.

Viral Packaging Service

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

Equipment/Compound Collection

Automated Liquid Handling Stations:

- Tecan EVO100/MCA96 Liquid Handler with sterile bio-hoods
- Tecan EVO100/MCA384 Liquid Handler with sterile bio-hoods
- HP D300 Digital Dispenser
- Axygen Platemax semi-automatic plate sealer
- KingFisher Duo Prime System – Automated DNA/RNA Extraction and Protein/Cell Purification

Automated Detection Systems:

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

CRISPR Libraries:

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

Commercial Compound Libraries:

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

Private/Proprietary Chemical Collections:

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

Personnel

- Bai Luo, Ph.D., Director

Advisory Board Committee

- Darrell Davis, PhD., Professor, College of Medicinal Chemistry
- Ryan Looper, PhD., Professor, Department of Chemistry
- James Cox, PhD., Associate Professor, Department of Biochemistry
- Jared Rutter, PhD., Professor, Department of Biochemistry
- Bryan Welm, PhD., Associate Professor, HCI

FY25 Goals

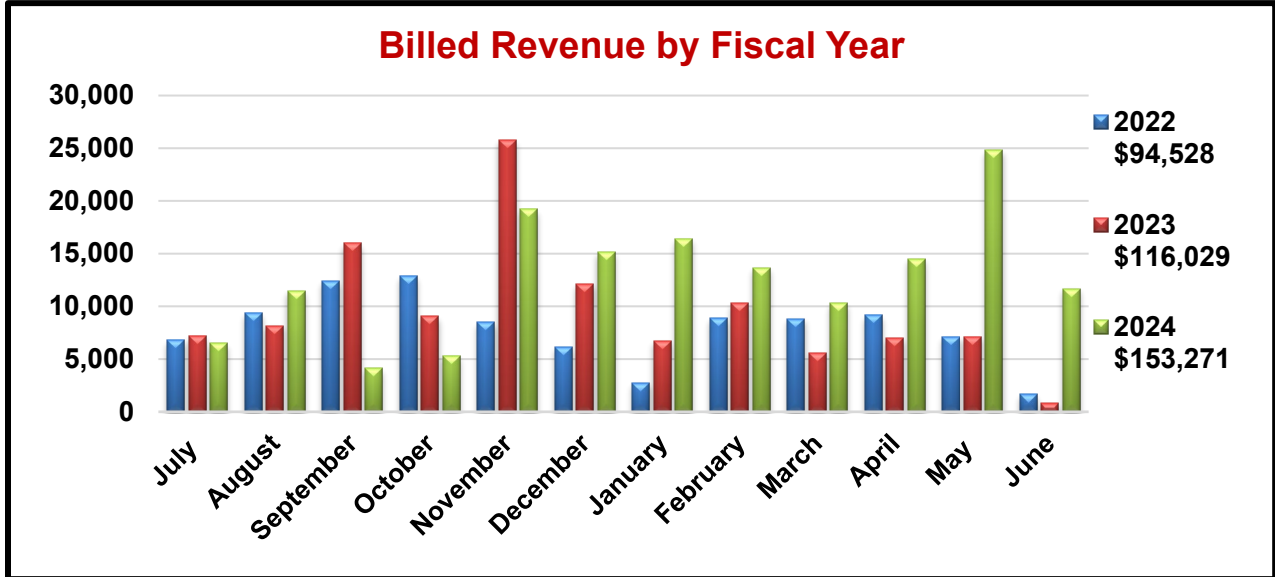
- Expand CRISPR Screening Service
- Increase user base/revenue
- Present services in various department seminar series

Revenue/Expenses

FY24 Expenses: Total \$193,863

FY24 Revenue: Total \$228,271

- VP of Health Sciences Support: \$ 75,000
- FY24 Revenue Generated from Services: \$153,271

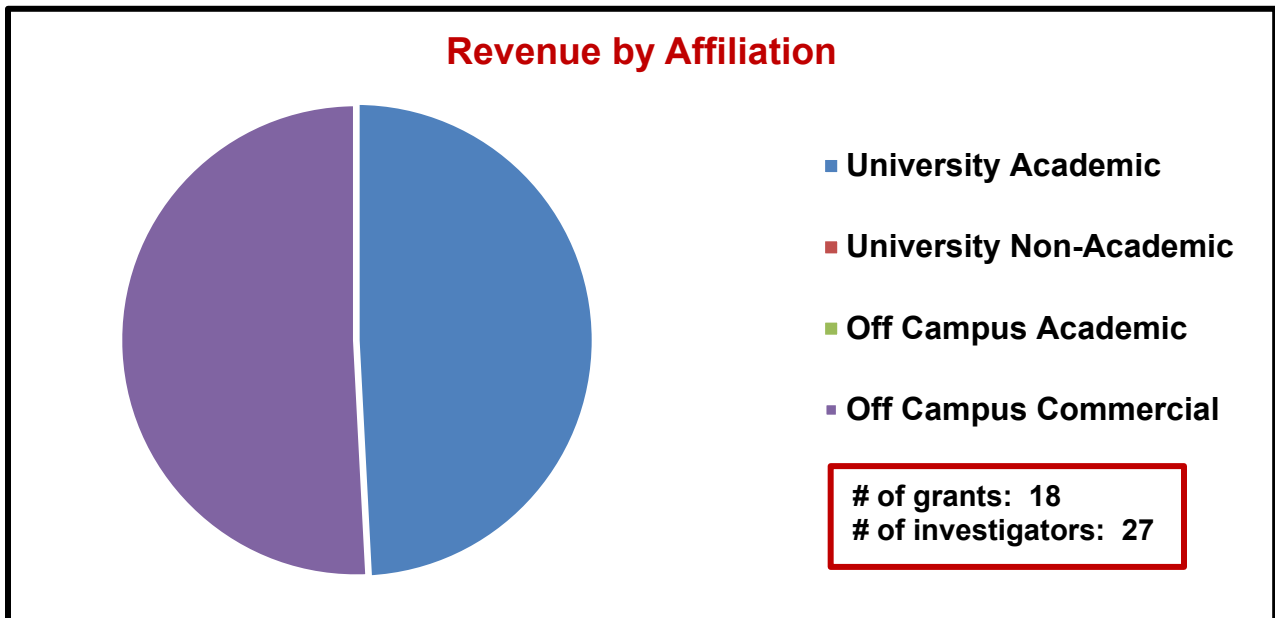


*Legend displays total annual revenue by year earned.

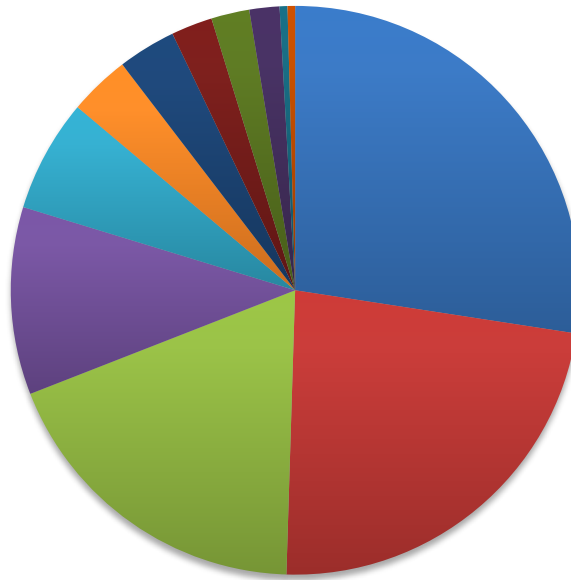
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



- Internal Medicine
- Pediatrics
- Neurobiology
- College of Pharmacy
- Pathology
- HSC Cores
- College of Science
- Biochemistry
- HCI
- CVRTI
- Neurosurgery
- PIVOT

Top Users

1	Reina Bio	Off Campus Commercial
2	Tianxin Yang	NIH
3	Jonathan Constance	NIH
4	Moriel Zelikowsky	Department, NIH
5	Mei Yee Koh	NIH, VHL Alliance
6	Megan Williams	Department, NIH
7	Ladder Therapeutics Inc	Off Campus Commercial
8	Hans Haeckler	NIH
9	Bijina Balakrishnan	Mayo Clinic Rochester
10	Crystal Davey Hicks	Department

Publications

No known publications acknowledged this facility in FY24.

Electron Microscopy

Overview

The Electron Microscopy (EM) Core Laboratory utilizes transmission electron microscopy and scanning electron microscopy to determine cellular structures, the morphology of biological macromolecules, the three-dimensional structures of biological macromolecules and cells, and the size and structure of nanoparticles and other small particles. The EM facility also prepares specimens for the microscope. The EM facility has two spatially distinct locations to serve research groups. The main facility is in SMBB, and one transmission electron microscope (TEM) and one scanning electron microscope are located there. Two TEMs and one scanning electron microscope (SEM) are located in CSC.

Services

Research Services:

- Training on the TEMs, SEM, microtomes, sample preparation, and 2D and 3D image processing
- Sections cut on microtome or ultramicrotome ("thick" and "thin", respectively)
- Prepare tissue and cellular specimens via embedding, drying, osmification, thin-sectioning, and cryogenic methods.
- Prepare particulate and macromolecular samples by staining, metal coating, and cryogenic methods
- Record SEM images
- Record TEM images of dry specimens or of cryogenic, hydrated specimens
- Image specimens via three-dimensional electron microscopy, including tomography
- High-resolution imaging (in many cases distances $< 3 \text{ \AA}$ can be resolved)
- Remote access to TEMs and SEM

FY25 Goals

- Continue obtaining high-quality TEM data from Titan Krios microscope
- Increase our capabilities on Aquilos 2
- Increase research usage
- Increase usage of underutilized microscopes
- Improve efficiency of lab to serve all who wish to use our services
- Develop more image processing capabilities
- Become more proficient at tomography and start doing micro electron diffraction

Equipment:

- JEOL JEM-1400 Plus, transmission electron microscope
- ThermoFisher Titan Krios, transmission electron microscope, with Ceta camera, Gatan energy filter, Volta phase plate, and Gatan K3 direct electron detector
- ThermoFisher Aquilos 2, scanning electron microscope with focused-ion-beam milling (designed for cryogenic specimens)
- Zeiss GeminiSEM 300 scanning electron microscope
- ThermoFisher Tecnai F20, transmission electron microscope, with Gatan K2 Summit direct electron detector
- Leica UC7 ultramicrotome, with cryogenic attachments

- Two Leica UC6 ultramicrotomes
- Leica UCT ultramicrotome
- Reichert Ultracut E ultramicrotome
- Leica JUNG RM2055, microtome
- ThermoFisher Vitrobot, vitrification robot
- Pelco laboratory microwave oven
- Glow discharger
- Access to high-pressure freezer and freeze-substitution machine
- Access to sputter coater
- Critical-point dryer
- High-performance computing nodes (maintained by CHPC)

Personnel

- David Belnap, Ph.D., Director
- Nancy Chandler, Senior Laboratory Specialist
- Willisa Liou, Ph.D., Senior Laboratory Specialist
- Linda Nikolova, Senior Laboratory Specialist
- Barbie Pornillos, Ph.D., Director of Cryo-EM

Advisory Board Committee

Last in-person meeting date: March 2, 2017. Email contact since.

- Erik Jorgensen Ph.D., Distinguished Professor, Department of Biology
- Patricia Revelo M.D. Ph.D., Professor, Department of Pathology
- Erhu Cao Ph.D., Assistant Professor, Department of Biochemistry
- Richard Rabbitt Ph.D., Professor, Department of Bioengineering

Cryo-EM Implementation Committee

Last meeting date: August 15, 2024.

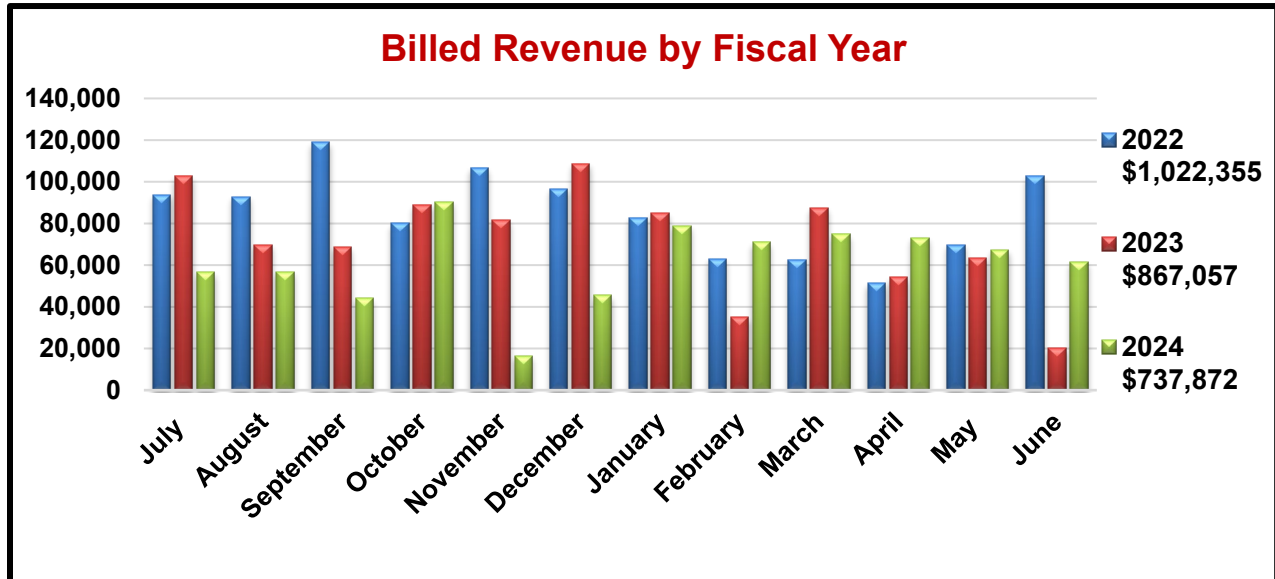
- Brenda Bass, Ph.D., Distinguished Professor, Department of Biochemistry
- Julia Brasch Ph.D., Assistant Professor, Department of Biochemistry
- Erhu Cao Ph.D., Associate Professor, Department of Biochemistry
- Christopher Hill D.Phil., Distinguished Professor, Department of Biochemistry
- Owen Pornillos, Ph.D., Professor, Department of Biochemistry
- Wesley Sundquist Ph.D., Distinguished Professor & Chair, Department of Biochemistry
- Peter Shen Ph.D., Associate Professor, Department of Biochemistry
- Heidi Schubert Ph.D., Research Professor, Department of Biochemistry

Revenue/Expenses

FY24 Expenses: Total \$1,009,565

FY24 Revenue: Total \$1,002,872

- VP of Health Sciences: \$250,000
- VP of Research Support : \$15,000
- FY24 Revenue generated from services: \$737,872

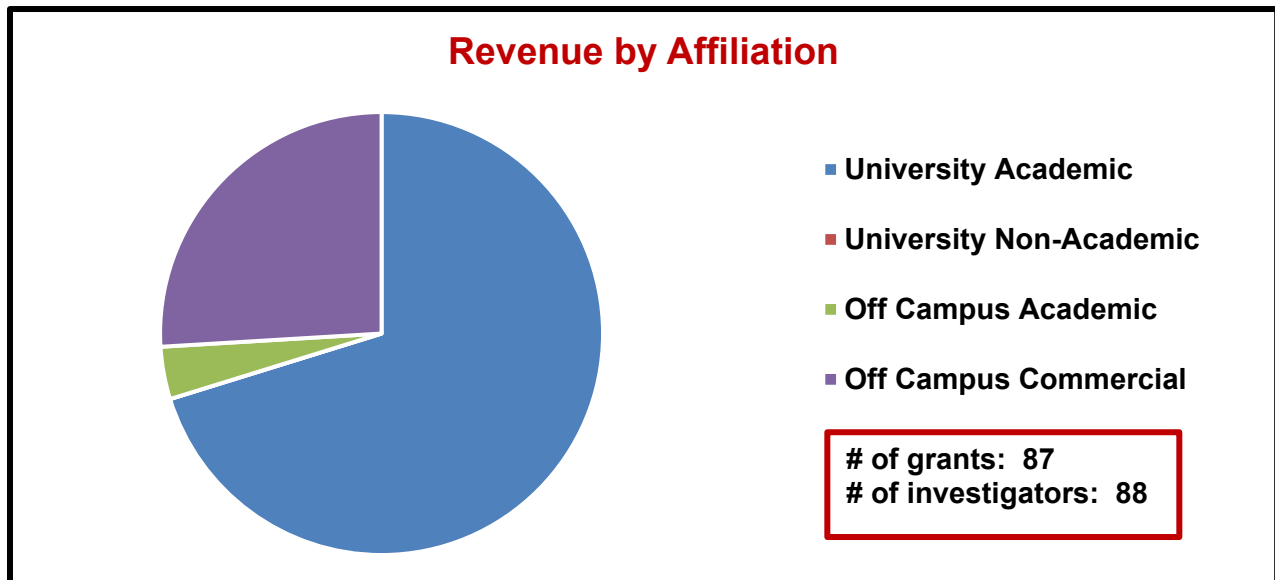


*Legend displays total annual revenue by year earned.

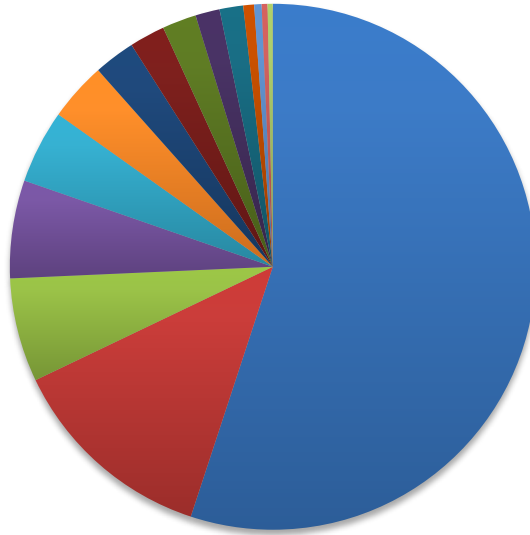
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



- Biochemistry
- CVRTI
- College of Pharmacy
- Neurobiology
- College of Engineering
- Molecular Medicine
- Pathology
- HSC Cores
- HCI
- College of Science
- College of Health
- PIVOT Center
- Ophthalmology & Visual Sciences
- Surgery
- Radiology & Imaging Sciences
- School of Dentistry

Top Users

1	Science Exchange Inc.	Off Campus Commercial
2	Wesley Sundquist	NIH, Cleveland CF, Department, Gilead Sciences, University of Utah Research Foundation
3	Peter Shen	NIH, Department, Northwestern University
4	Erik Jorgensen	Department
5	Brenda Bass	NIH
6	Lyterian Therapeutics	Commercial
7	Saveez Saffarian	NIH
8	Owen Pornillos	NIH
9	Erhu Cao	NIH
10	Robin Shaw	TikkunLev Therapeutics, Department, NIH

Publications

1. AlAbdi, L., H. E. Shamseldin, E. Khouj, R. Helaby, B. Aljamal, M. Alqahtani, A. Almulhim, H. Hamid, M. O. Hashem, F. Abdulwahab, O. Abouyousef, A. Jaafar, T. Alshidi, M. Al-Owain, A. Alhashem, S. Al Tala, A. O. Khan, E. Mardawi, H. Alkuraya, E. Faqeih, M. Afqi, S. Alkhalifi, Z. Rahbeeni, S. T. Hagos, W. Al-Ahmadi, S. Nadeef, S. Maddirevula, K. S. A. Khabar, A. Putra, A. Angelov, C. Park, A. M. Reyes-Ramos, H. Umer, I. Ullah, P. Driguez, Y. Fukasawa, M. S. Cheung, I. E. Gallouzi and F. S. Alkuraya (2023). Beyond the exome: utility of long-read whole genome sequencing in exome-negative autosomal recessive diseases. *Genome Med* 15(1): 114.10.1186/s13073-023-01270-8
2. Backman, T., S. M. Latorre, E. Symeonidi, A. Muszynski, E. Bleak, L. Eads, P. I. Martinez-Koury, S. Som, A. Hawks, A. D. Gloss, D. M. Belnap, A. M. Manuel, A. M. Deutschbauer, J. Bergelson, P. Azadi, H. A. Burbano and T. L. Karasov (2024). A phage tail-like bacteriocin suppresses competitors in metapopulations of pathogenic bacteria. *Science* 384(6701): eado0713.10.1126/science.ado0713
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4. Consalvo, C. D., A. M. Aderounmu, H. M. Donelick, P. J. Aruscavage, D. M. Eckert, P. S. Shen and B. L. Bass (2024). *Caenorhabditis elegans* Dicer acts with the RIG-I-like helicase DRH-1 and RDE-4 to cleave dsRNA. *Elife* 13.10.7554/eLife.93979
5. Gordon, S. G. and O. Rog (2023). Building the synaptonemal complex: Molecular interactions between the axis and the central region. *PLoS Genet* 19(7): e1010822.10.1371/journal.pgen.1010822
6. Kim, J., C. Herrera, W. Y. Aung, G. P. Gonzales Boyles, C. Chavez, M. Cibulka, E. Foley, J. Guerra, D. B. M. Kumar, W. Levrant, L. Lim, J. Llanes, Z. K. O'Brien, A. Pagaduan, J. A. Richardson, K. Rosales, J. Schrecengost, T. Shin, G. Strong-Lundquist, W. Tat, F. Vanderford, I. Vrinceanu, V. Wang, S. Yang, C. Strong, P. K. Tsourkas and K. Regner (2024). Complete genome sequences of cluster F1 and cluster B1 *Mycobacterium smegmatis* phages Karhdo and Basato. *Microbiol Resour Announc* 13(1): e0093823.10.1128/mra.00938-23
7. Lempp, F. A., T. Volz, E. Camerini, F. Benigni, J. Zhou, L. E. Rosen, J. Noack, F. Zatta, H. Kaiser, S. Bianchi, G. Lombardo, S. Jaconi, L. Vincenzetti, H. Imam, L. B. Soriaga, N. Passini, D. M. Belnap, A. Schulze, M. Lutgehetmann, A. Telenti, A. L. Cathcart, G. Snell, L. A. Purcell, C. M. Hebner, S. Urban, M. Dandri, D. Corti and M. A. Schmid (2023). Potent broadly neutralizing antibody VIR-3434 controls hepatitis B and D virus infection and reduces HBsAg in humanized mice. *J Hepatol* 79(5): 1129-1138.10.1016/j.jhep.2023.07.003
8. Momont, C., H. V. Dang, F. Zatta, K. Hauser, C. Wang, J. di Iulio, A. Minola, N. Czudnochowski, A. De Marco, K. Branch, D. Donermeyer, S. Vyas, A. Chen, E. Ferri, B. Guarino, A. E. Powell, R. Spreafico, T. I. Croll, D. M. Belnap, M. A. Schmid, W. Timothy Schaiff, J. L. Miller, E. Camerini, A. Telenti, H. W. Virgin, L. E. Rosen, L. A. Purcell, A. Lanzavecchia, G. Snell, D. Corti and M. S. Pizzuto (2023). How a Potent Anti-neuraminidase Monoclonal Antibody Navigates Recent Immune-evasive Influenza Strains: A Structural Study by Single-particle CryoEM. *Microsc Microanal* 29(29 Suppl 1): 927.10.1093/micmic/ozad067.459
9. Pozner, A., L. Li, S. P. Verma, S. Wang, J. J. Barrott, M. L. Nelson, J. S. E. Yu, G. L. Negri, S. Colborne, C. S. Hughes, J. F. Zhu, S. L. Lambert, L. S. Carroll, K. Smith-Fry, M. G. Stewart, S. Kannan, B. Jensen, C. M. John, S. Sikdar, H. Liu, N. H. Dang, J. Bourdage, J. Li, J. M. Vahrenkamp, K. L. Mortenson, J. S. Groundland, R. Wustrack, D. L. Senger, F. J. Zemp, D. J. Mahoney, J. Gertz, X. Zhang, A. J. Lazar, M. Hirst, G. B. Morin, T. O. Nielsen, P. S. Shen and K. B. Jones (2024). ASPSCR1-TFE3 reprograms transcription by organizing enhancer loops around hexameric VCP/p97. *Nat Commun* 15(1): 1165.10.1038/s41467-024-45280-5
10. Sass, M. I., S. Wang, D. Mack, S. L. Cottam, P. S. Shen and B. M. Willardson (2024). Protocol to study CCT-mediated folding of Gbeta(5) by single-particle cryo-EM. *STAR Protoc* 5(2): 103116.10.1016/j.xpro.2024.103116
11. Wang, S., M. I. Sass, Y. Kwon, W. G. Ludlam, T. M. Smith, E. J. Carter, N. E. Gladden, M. Riggi, J. H. Iwasa, B. M. Willardson and P. S. Shen (2023). Visualizing the chaperone-mediated folding trajectory of the G protein beta5 beta-propeller. *Mol Cell* 83(21): 3852-3868 e3856.10.1016/j.molcel.2023.09.032

Flow Cytometry Facility

Overview

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

Uniqueness

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

Services

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

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

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

Equipment

Sorters

- BD FACSAria-5 laser
- Propel Labs Avalon-2 laser
- BD FACSAria-4 laser
- Cyttek Aurora Cell Sorter

Analyzers

- BD FACSCanto
- BD LSRFortessa
- Beckman Coulter Cytoflex LX
- Beckman Coulter Cytoflex LX
- Beckman Coulter Cytoflex S
- Beckman Coulter Cytoflex
- BD Celesta
- Cyttek Aurora
- Amnis Imagestream

Personnel

- James Marvin, Director
- Madison Smith, Research Associate
- Eduardo Salustiano Jesus dos Santos, Research Associate
- Rebecca Marvin, Senior Lab Specialist
- Sreeja Govindarajan, Lab Specialist

Advisory Board Committee

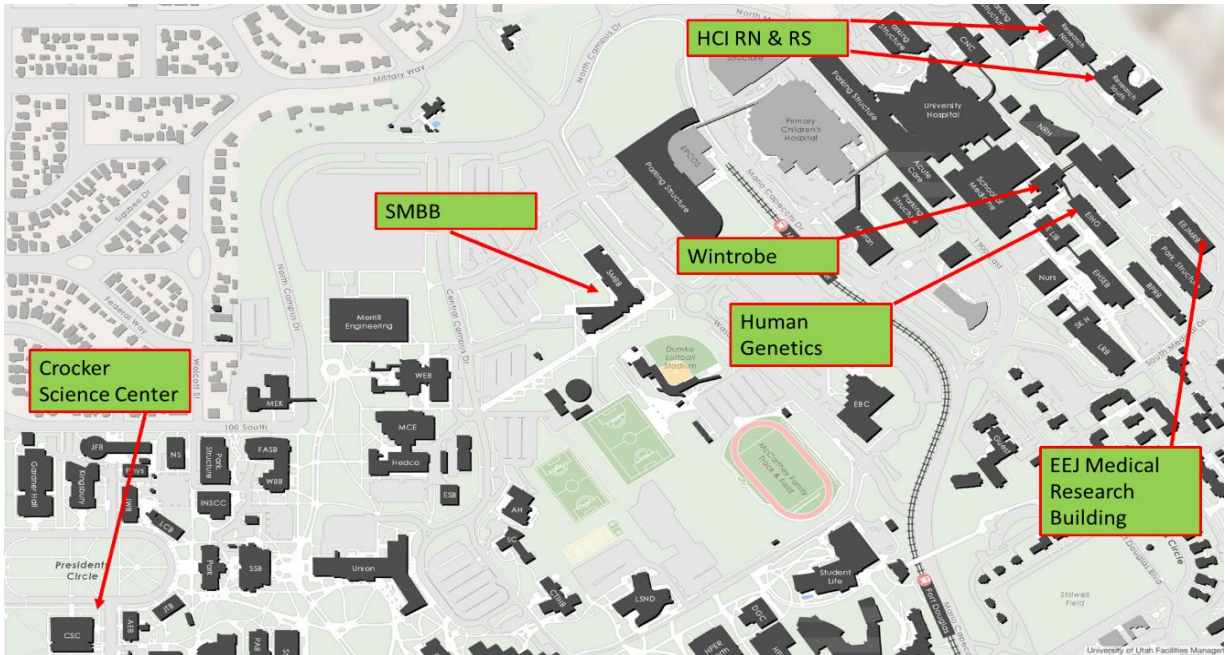
Last meeting date: 12-20-23

- Matthew Williams Ph.D., Professor, Pathology Advisory Board Chair
- Ryan O'Connell Ph.D., Professor, Pathology
- Anna Beaudin Ph.D., Associate Professor, Hematology
- Daniel Leung M.D., Associate Professor, Internal Medicine
- Alessandro Venosa Ph.D., Assistant Professor, Pharm and Toxicology
- Matthew VanBrocklin Ph.D., Associate Professor, Dept of Surgery HCl

FY24 Annual Update

New Equipment

The Flow Core added another conventional analyzer in FY24. ARUP had previously completed a demo of a Beckman Coulter Cytoflex LX. This instrument was made available to the HSC Flow Core at a significant discount. This instrument is fully equipped with 6 lasers and 22 colors as well as a plate loader which can accommodate standard and deep well plates. This instrument fills an important niche for the core in that the main Wintrobe hub of instruments had nothing above 8 colors on a conventional instrument prior to its acquisition.



Staffing

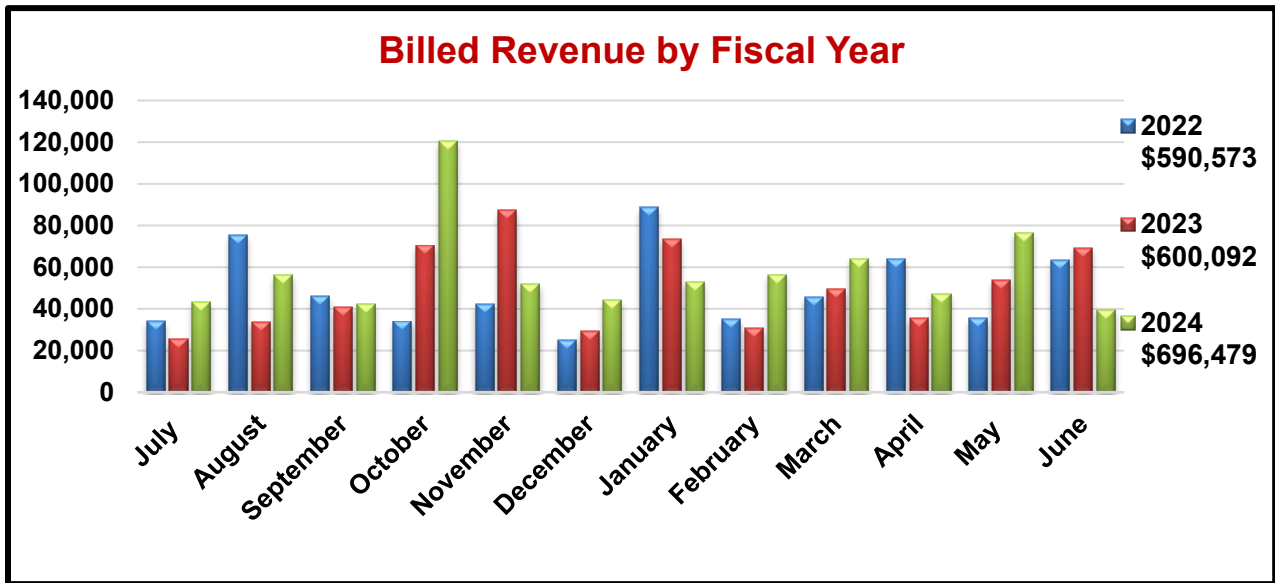
In FY24 we added another PhD to the staff in Madison Smith.

Revenue/Expenses

FY24 Expenses: Total \$577,926

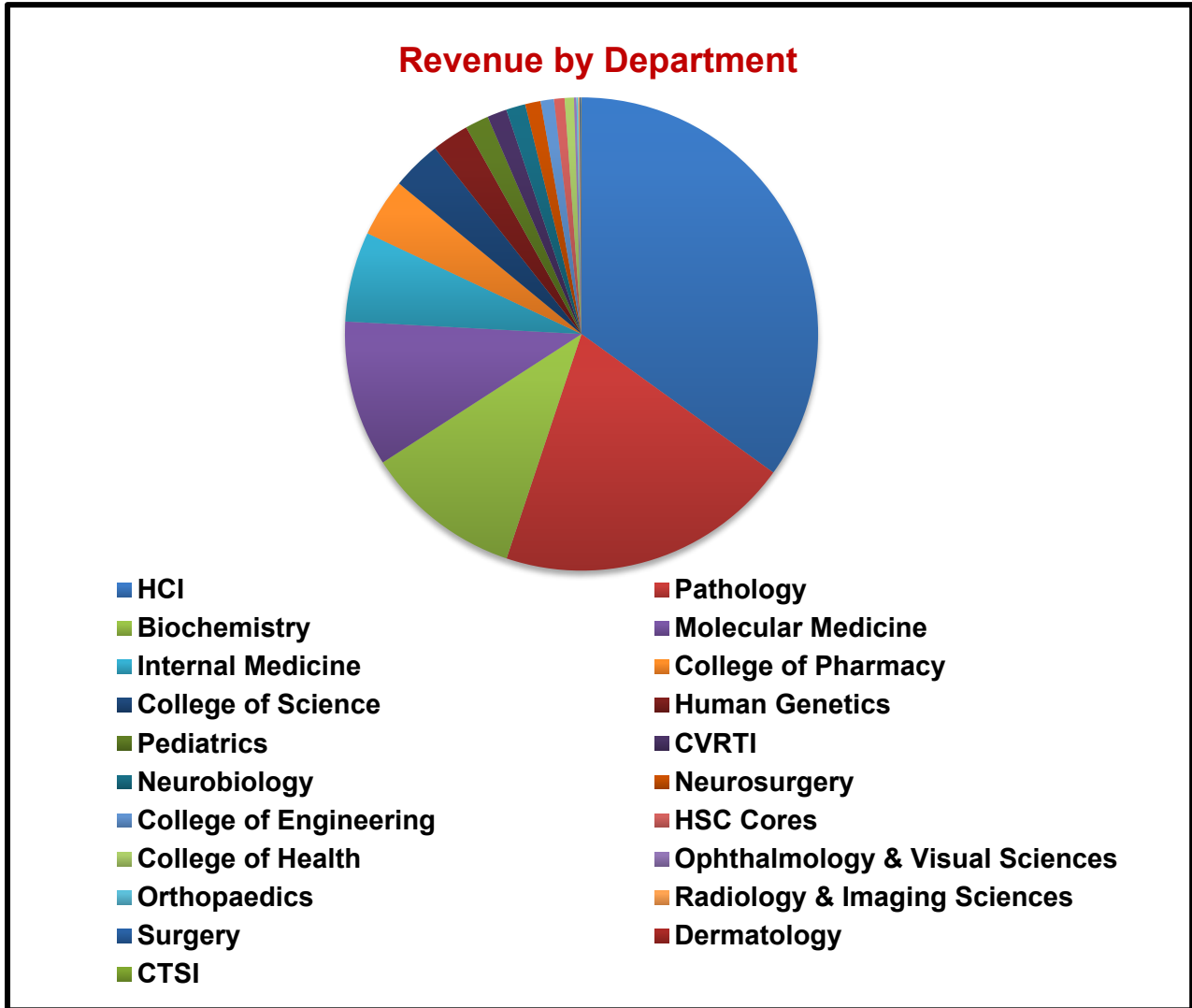
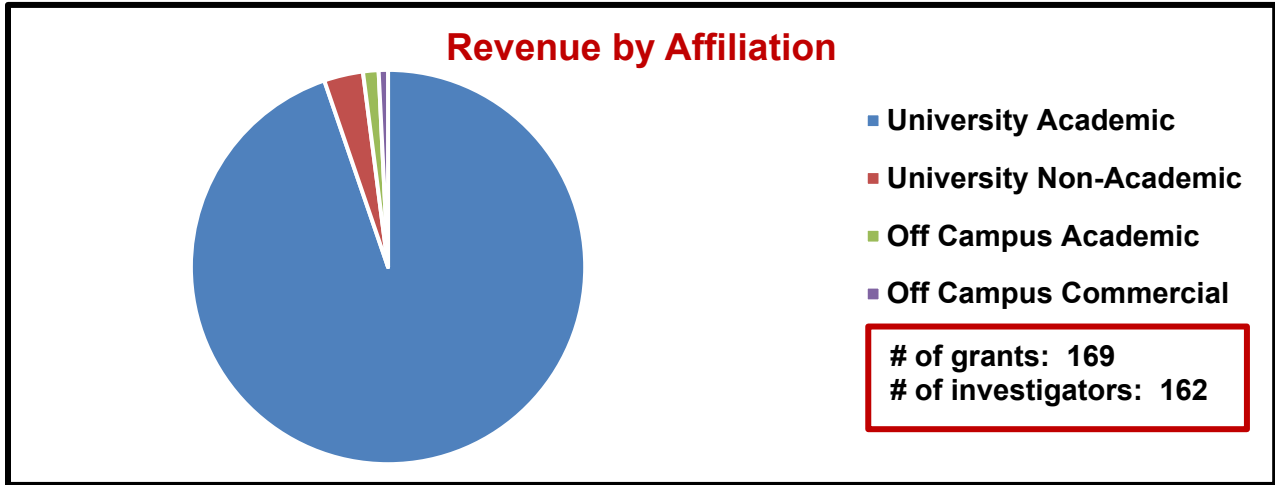
FY24 Revenue: Total \$736,479

- FY24 Revenue generated from services: \$696,479
- VP Support: \$40,000



*Legend displays total annual revenue by year earned.

**FY24 Scientific Impact
Research Support
Revenue Generated (see charts following):**



Top Users

1	Matthew Williams	Department, DOD, NIH
2	Anna Beaudin	NIH, Department, Molecular Medicine, PEW Charitable Trusts
3	ARUP	University Non-Academic
4	Shannon Buckley	NIH
5	Eric Snyder	NIH, Cincinnati Children's Hospital, American Cancer Society, Department, LCRF
6	Brian Evavold	Department, NIH
7	Doug Sborov	Department
8	Adrienne Dorrance	Department
9	Tyler Starr	University of Washington, Vir Biotechnology, NIH, University of Pennsylvania, Department, Aerium Therapeutics
10	Sumati Gupta	Department, Veteran Affairs

Publications

- Blackwell, A. M., Y. Jami-Alahmadi, A. S. Nasamu, S. Kudo, A. Senoo, C. Slam, K. Tsumoto, J. A. Wohlschlegel, J. M. M. Caaveiro, D. E. Goldberg and P. A. Sigala (2024). Malaria parasites require a divergent heme oxygenase for apicoplast gene expression and biogenesis. *bioRxiv: The Preprint Server for Biology*: 2024.2005.2030.596652.10.1101/2024.05.30.596652
- Cheng, O. J., E. J. Lebish, O. Jensen, D. Jancenik, S. Trivedi, J. G. Cacioppo, J. Aubé, E. J. Beswick and D. T. Leung (2024). Mucosal-associated invariant T cells modulate innate immune cells and inhibit colon cancer growth. *Scandinavian Journal of Immunology*: e13391.10.1111/sji.13391
- Denorme, F., N. D. Armstrong, M. L. Stoller, I. Portier, E. A. Tugolukova, R. M. Tanner, E. Montenont, S. Bhatlekar, M. Cody, J. L. Rustad, A. Ajanel, N. D. Tolley, D. C. Murray, J. L. Boyle, M. T. Nieman, S. E. McKenzie, C. C. Yost, L. A. Lange, M. Cushman, M. R. Irvin, P. F. Bray and R. A. Campbell (2023). The predominant PAR4 variant in individuals of African ancestry worsens murine and human stroke outcomes. *The Journal of Clinical Investigation*: e169608.10.1172/JCI169608
- García-Guerrero, A. E., R. G. Marvin, A. M. Blackwell and P. A. Sigala (2024). Biogenesis of cytochromes c and c 1 in the electron transport chain of malaria parasites. *bioRxiv: The Preprint Server for Biology*: 2024.2002.2001.575742.10.1101/2024.02.01.575742
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- Guo, L., S. Jacob, B. K. Manne, E. M. Kolawole, S. Guo, X. Wang, D. Murray, E. A. Tugolukova, I. Portier, Y. Kosaka, C. Barba, M. T. Rondina, B. Evavold, C. Morley, S. Bhatlekar and P. F. Bray (2023). Actin-bundling protein L-plastin promotes megakaryocyte rigidity and dampens proplatelet formation. *Haematologica*.10.3324/haematol.2023.283016
- Hughes, E. P., A. R. Syage, E. M. Mehrabad, T. E. Lane, B. T. Spike and D. Tantin (2024). OCA-B promotes autoimmune demyelination through control of stem-like CD4 + T cells. *bioRxiv: The Preprint Server for Biology*: 2023.2011.2029.569210.10.1101/2023.11.29.569210
- Lee, J., S. K. Zepeda, Y.-J. Park, A. L. Taylor, J. Quispe, C. Stewart, E. M. Leaf, C. Treichel, D. Corti, N. P. King, T. N. Starr and D. Veisler (2023). Broad receptor tropism and immunogenicity of a clade 3 sarbecovirus. *Cell Host & Microbe* 31(12): 1961-1973.e1911.10.1016/j.chom.2023.10.018
- López, D. A., A. Griffin, L. M. Aguilar, C. Deering-Rice, E. J. Myers, K. J. Warren, R. S. Welner and A. E. Beaudin (2024). Prenatal inflammation remodels lung immunity and function by programming ILC2 hyperactivation. *Cell Reports* 43(7): 114365.10.1016/j.celrep.2024.114365
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- Merrill, C. B., I. Titos, M. A. Pabon, A. B. Montgomery, A. R. Rodan and A. Rothenfluh (2024). Iterative assay for transposase-accessible chromatin by sequencing to isolate functionally relevant neuronal subtypes. *Science Advances* 10(13): eadi4393.10.1126/sciadv.adi4393

12. Parkman, G. L., T. Turapov, D. A. Kircher, W. J. Burnett, C. M. Stehn, K. O'Toole, K. M. Culver, A. T. Chadwick, R. C. Elmer, R. Flaherty, K. A. Stanley, M. Foth, D. H. Lum, R. L. Judson-Torres, J. E. Friend, M. W. VanBrocklin, M. McMahon and S. L. Holmen (2024). Genetic Silencing of AKT Induces Melanoma Cell Death via mTOR Suppression. *Molecular Cancer Therapeutics* 23(3): 301-315.10.1158/1535-7163.MCT-23-0474
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14. Ruiz, F., W. Foreman, M. Lilly, V. A. Baharani, D. M. Depierreux, V. Chohan, A. L. Taylor, J. Guenthoer, D. Ralph, F. A. Matsen, H. Y. Chu, P. D. Bieniasz, M. Côté, T. N. Starr and J. Overbaugh (2024). Delineating the functional activity of antibodies with cross-reactivity to SARS-CoV-2, SARS-CoV-1 and related sarbecoviruses.10.1101/2024.04.24.590836
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16. Scherer, S. D., L. Zhao, A. J. Butterfield, C.-H. Yang, E. Cortes-Sanchez, K. P. Guillen, B. E. Welm and A. L. Welm (2023). Breast cancer PDxO cultures for drug discovery and functional precision oncology. *STAR protocols* 4(3): 102402.10.1016/j.xpro.2023.102402
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18. Sun, W., E. P. Hughes, H. Kim, J. Perovanovic, K. R. Charley, B. Perkins, J. Du, A. Ibarra, A. R. Syage, J. S. Hale, M. A. Williams and D. Tantin (2024). OCA-B/Pou2af1 is sufficient to promote CD4+ T cell memory and prospectively identifies memory precursors. *Proceedings of the National Academy of Sciences of the United States of America* 121(9): e2309153121.10.1073/pnas.2309153121
19. Taylor, A. L. and T. N. Starr (2023). Deep mutational scans of XBB.1.5 and BQ.1.1 reveal ongoing epistatic drift during SARS-CoV-2 evolution. *PLOS Pathogens* 19(12): e1011901.10.1371/journal.ppat.1011901
20. Walker, M. F., J. Zhang, W. Steiner, P.-I. Ku, J.-F. Zhu, Z. Michaelson, Y.-C. Yen, A. B. Long, M. J. Casey, A. Poddar, I. B. Nelson, C. D. Arveseth, F. Nagel, R. Clough, S. LaPotin, K. M. Kwan, S. Schulz, R. A. Stewart, J. J. G. Tesmer, T. Caspary, R. Subramanian, X. Ge and B. R. Myers (2023). GRK2 Kinases in the Primary Cilium Initiate SMOOTHENED-PKA Signaling in the Hedgehog Cascade. *bioRxiv: The Preprint Server for Biology*: 2023.2005.2010.540226.10.1101/2023.05.10.540226
21. Zhang, P., S. M. Pronovost, M. Marchetti, C. Zhang, X. Kang, T. Kandelouei, C. Li and B. A. Edgar (2024). Inter-cell type interactions that control JNK signaling in the *Drosophila* intestine. *Nature Communications* 15(1): 5493.10.1038/s41467-024-49786-w

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 fluorescent 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 whole-genome genotyping and copy number variation analysis
- Methylation analysis
- Open array genotyping

Real Time PCR

- Gene expression
- Digital PCR

Equipment

- Illumina iScan
- Two Quantstudio 12k Flex real-time PCR System
- Applied Biosystems QuantStudio Absolute Q digital PCR system

Personnel

- Derek Warner, Director
- Michael Klein, Manager

Advisory Board Committee

Last meeting date: March 28, 2024

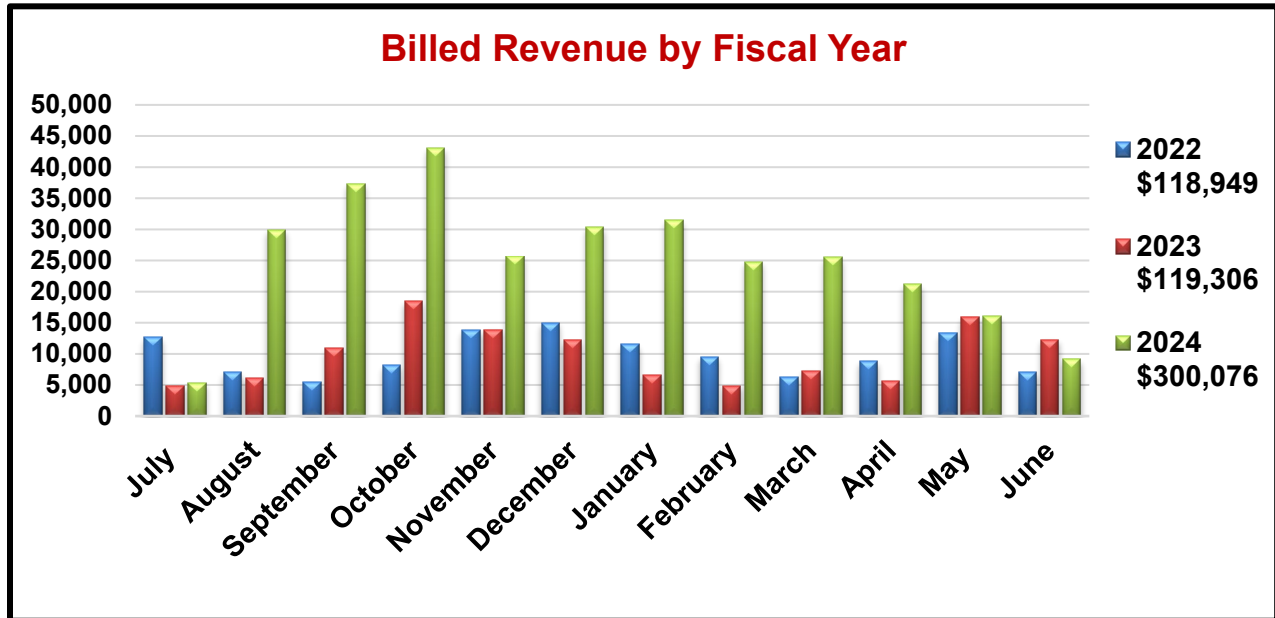
- Deborah Neklason Ph.D., Research Associate Professor, Huntsman Cancer Institute
- Nicola Camp Ph.D., Professor, Department of Pathology
- Lynn Jorde Ph.D., Professor, Human Genetics
- Robert Weiss Ph.D., Professor, Human Genetics
- Aaron Quinlan Ph.D., Professor, Human Genetics

Revenue/Expenses

FY24 Expenses: Total \$286,098

FY24 Revenue: Total \$300,076

- VP of Health Sciences Support: \$0
- FY24 Revenue generated from services: \$300,076

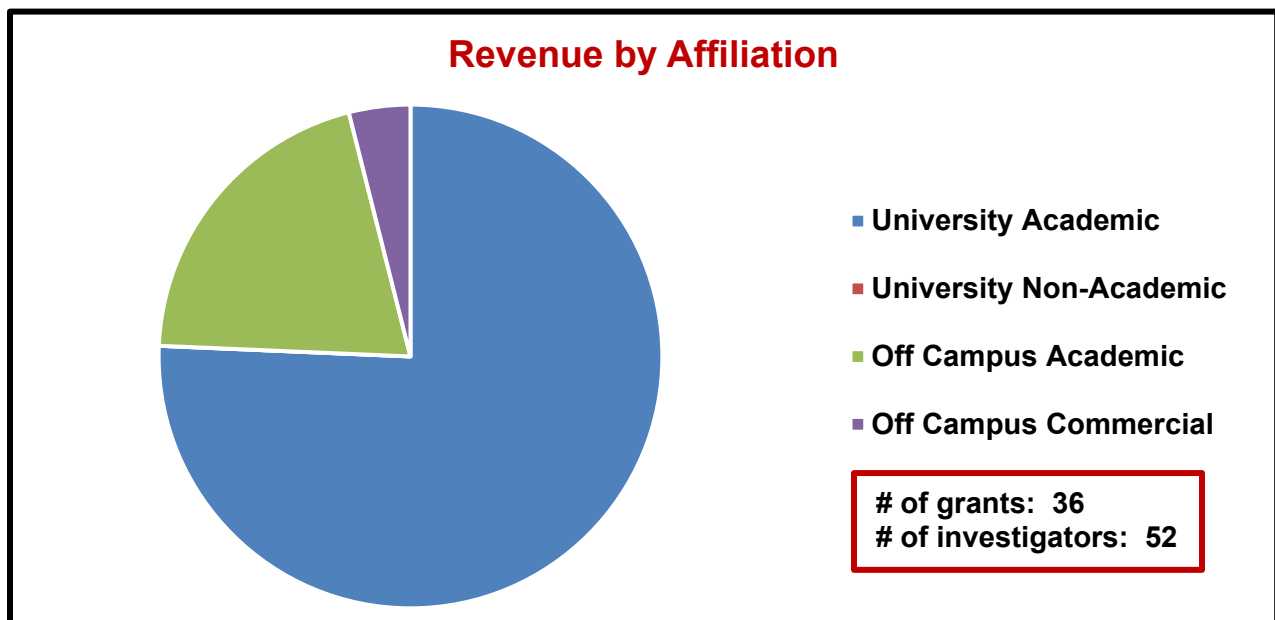


* Legend displays total annual billed revenue by year.

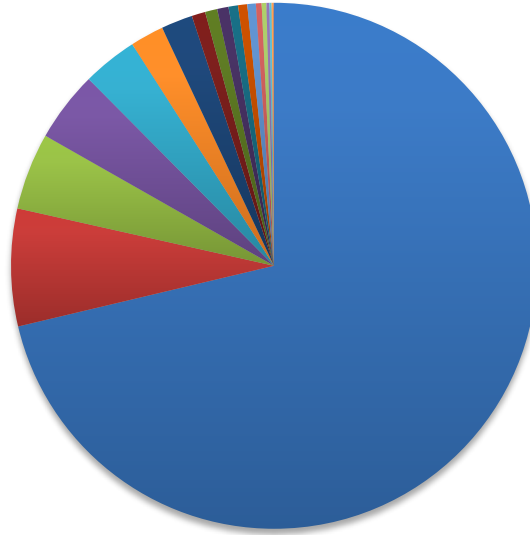
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



- Psychiatry
- Neurology
- College of Health
- HCI
- Pediatrics
- CTSI
- Human Genetics
- Neurobiology
- College of Pharmacy
- HSC Cores
- Molecular Medicine
- Surgery
- CVRTI
- College of Engineering
- Pathology
- College of Science
- Internal Medicine
- Ophthalmology & Visual Sciences
- Biochemistry

Top Users

1	Anna Docherty	NIH
2	Hilary Coon	NIH
3	University of Arizona	Off Campus Academic
4	University of Texas at San Antonio	Off Campus Academic
5	Stefan Pulst	Department
6	Salimetrics LLC	Off Campus Commercial
7	University of Montana	Off Campus Academic
8	University of Nevada, Las Vegas	Off Campus Academic
9	Willard Dere	Department
10	Alana Welm	NIH, Department

Publications

1. Balit, J., A. Erlangsen, A. Docherty, G. Turecki and M. Orri (2024). Association of chronic pain with suicide attempt and death by suicide: a two-sample Mendelian randomization. *Mol Psychiatry*.10.1038/s41380-024-02465-0
2. Cabrera-Mendoza, B., N. Aydin, G. R. Fries, A. R. Docherty, C. Walss-Bass and R. Polimanti (2024). Estimating the direct effects of the genetic liabilities to bipolar disorder, schizophrenia, and behavioral traits on suicide attempt using a multivariable Mendelian randomization approach. *Neuropsychopharmacology* 49(9): 1383-1391.10.1038/s41386-024-01833-2
3. Cannon-Albright, L. A., J. Stevens, C. C. Teerlink, J. C. Facelli, K. Allen-Brady and A. L. Welm (2023). A Rare Variant in MDH2 (rs111879470) Is Associated with Predisposition to Recurrent Breast Cancer in an Extended High-Risk Pedigree. *Cancers (Basel)* 15(24).10.3390/cancers15245851
4. Docherty, A. R., N. Mullins, A. E. Ashley-Koch, et al (2023). GWAS Meta-Analysis of Suicide Attempt: Identification of 12 Genome-Wide Significant Loci and Implication of Genetic Risks for Specific Health Factors. *Am J Psychiatry* 180(10): 723-738.10.1176/appi.ajp.21121266
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9. Herstine, J. A., P. K. Chang, S. Chorny, T. J. Stevenson, A. C. Sunshine, K. Nokhrina, J. Rediger, J. Wentz, T. A. Vetter, E. Scholl, C. Holaway, N. K. Pyne, A. Bratasz, S. Yeoh, K. M. Flanigan, J. L. Bonkowsky and A. M. Bradbury (2024). Evaluation of safety and early efficacy of AAV gene therapy in mouse models of vanishing white matter disease. *Mol Ther* 32(6): 1701-1720.10.1016/j.ymthe.2024.03.034
10. Jacob, S., Y. Kosaka, S. Bhatlekar, F. Denorme, H. Benzon, A. Moody, V. Moody, E. A. Tugolukova, G. Hull, N. Kishimoto, B. K. Manne, L. Guo, R. Souvenir, B. J. Seliger, A. S. Eustes, K. Hoerger, N. D. Tolley, A. N. Fatahian, S. Boudina, D. C. Christiani, Y. Wei, C. Ju, R. A. Campbell, M. T. Rondina, E. D. Abel, P. F. Bray, A. S. Weyrich and J. W. Rowley (2024). Mitofusin-2 Regulates Platelet Mitochondria and Function. *Circ Res* 134(2): 143-161.10.1161/CIRCRESAHA.123.322914
11. Jung, J., T. Loschko, S. Reich, M. Rassoul-Agha and M. S. Werner (2024). Newly identified nematodes from the Great Salt Lake are associated with microbialites and specially adapted to hypersaline conditions. *Proc Biol Sci* 291(2018): 20232653.10.1098/rspb.2023.2653
12. Merrill, C. B., I. Titos, M. A. Pabon, A. B. Montgomery, A. R. Rodan and A. Rothenfluh (2024). Iterative assay for transposase-accessible chromatin by sequencing to isolate functionally relevant neuronal subtypes. *Sci Adv* 10(13): eadi4393.10.1126/sciadv.adi4393
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15. Pozner, A., S. P. Verma, L. Li, S. Wang, J. J. Barrott, M. L. Nelson, J. S. E. Yu, G. L. Negri, S. Colborne, C. S. Hughes, J. F. Zhu, S. L. Lambert, L. S. Carroll, K. Smith-Fry, M. G. Stewart, S. Kannan, B. Jensen, K. L. Mortenson, C. John, S. Sikdar, H. Liu, N. H. Dang, J. Bourdage, J. Li, J. M. Vahrenkamp, J. S. Groundland, R. Wustrack, D. L. Senger, F. J. Zemp, D. J. Mahoney, J. Gertz, X. Zhang, A. J. Lazar, M. Hirst, G. B. Morin, T. O. Nielsen, P. S. Shen and K. B. Jones (2023). ASPSCR1-TFE3 reprograms transcription by organizing enhancer loops around hexameric VCP/p97. *bioRxiv*.10.1101/2023.09.29.560242
16. Raas, Q., A. Wood, T. J. Stevenson, S. Swartwood, S. Liu, R. M. Kannan, S. Kannan and J. L. Bonkowsky (2024). Generation and characterization of a zebrafish gain-of-function ACOX1 Mitchell disease model. *Front Pediatr* 12: 1326886.10.3389/fped.2024.1326886

17. Utzman, P. H., V. P. Mays, B. C. Miller, M. C. Fairbanks, W. J. Brazelton and M. P. Horvath (2024). Metagenome mining and functional analysis reveal oxidized guanine DNA repair at the Lost City Hydrothermal Field. *PLoS One* 19(5): e0284642. [10.1371/journal.pone.0284642](https://doi.org/10.1371/journal.pone.0284642)
18. Visker, J. R., A. A. Cluntun, J. N. Velasco-Silva, D. R. Eberhardt, T. S. Shankar, R. Hamouche, J. Ling, H. Kwak, Y. Hillas, I. Aist, E. Tseliou, S. Navankasattusas, D. Chaudhuri, G. S. Ducker, S. G. Drakos and J. Rutter (2024). Enhancing mitochondrial pyruvate metabolism ameliorates myocardial ischemic reperfusion injury. *bioRxiv*. [10.1101/2024.02.01.577463](https://doi.org/10.1101/2024.02.01.577463)
19. Visker, J. R., B. J. Brintz, C. P. Kyriakopoulos, Y. Hillas, I. Taleb, R. Badolia, T. S. Shankar, J. M. Amrute, J. Ling, R. Hamouche, E. Tseliou, S. Navankasattusas, O. Wever-Pinzon, G. S. Ducker, W. L. Holland, S. A. Summers, S. C. Koenig, T. C. Hanff, K. J. Lavine, S. Murali, S. Bailey, R. Alharethi, C. H. Selzman, P. Shah, M. S. Slaughter, M. K. Kanwar and S. G. Drakos (2024). Integrating molecular and clinical variables to predict myocardial recovery. *bioRxiv*. [10.1101/2024.04.16.589326](https://doi.org/10.1101/2024.04.16.589326)
20. Walker, M. F., J. Zhang, W. Steiner, P. I. Ku, J. F. Zhu, Z. Michaelson, Y. C. Yen, A. Lee, A. B. Long, M. J. Casey, A. Poddar, I. B. Nelson, C. D. Arveseth, F. Nagel, R. Clough, S. LaPotin, K. M. Kwan, S. Schulz, R. A. Stewart, J. J. G. Tesmer, T. Caspary, R. Subramanian, X. Ge and B. R. Myers (2024). GRK2 Kinases in the Primary Cilium Initiate SMOOTHENED-PKA Signaling in the Hedgehog Cascade. *bioRxiv*. [10.1101/2023.05.10.540226](https://doi.org/10.1101/2023.05.10.540226)
21. Xiao, S., A. M. Fleming and C. J. Burrows (2023). Sequencing for oxidative DNA damage at single-nucleotide resolution with click-code-seq v2.0. *Chem Commun (Camb)* 59(58): 8997-9000. [10.1039/d3cc02699j](https://doi.org/10.1039/d3cc02699j)

Iron & Heme

Overview

The Iron and Heme Core Facility provides analyses of the compounds involved in the heme biosynthesis pathway, together with the activities of the enzymes involved in this essential process. The core also provides analyses of biologically important metals. Quantification of heme and its precursors can be performed on cell pellets, tissue, whole blood and other complex biological materials. Analysis of enzyme activity can be performed on cell pellets, tissue and blood. An Agilent 7900-ICP mass spectrometer is used to measure iron content (as well as other metals) in biological samples.

Uniqueness

The Iron and Heme Core provides service not available at most universities. We perform UPLC/HPLC analyses of heme, porphyrins and tetrapyrrole precursors (ALA and PBG). We assay for activities of enzymes involved in heme biosynthesis. We receive and process samples and provide service for academic laboratories all over the United States. We are able to measure activity for each of the eight heme biosynthetic enzymes from tissue and cell sources. We specialize in small, biological samples (cells, tissue, blood). We homogenize and measure protein content for sample normalization, unusual for metal analysis centers and important for biological research.

Services

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

- UPLC analysis of total heme and protoporphyrin IX
- UPLC analysis of tetrapyrrole precursors (ALA and PBG), intermediate porphyrins in heme biosynthesis
- Assays for the following heme biosynthetic enzymes (ALAS, ALAD/PBGS, PBGD, U3S, UROD, COPOX, PPOX & FECH)
- Metal analysis by ICP-MS
- Spectral analysis of hemes
- Sample homogenization (cells & tissues) with protein quantification
- UPLC analysis of related biological compounds like related tetrapyrroles and bilins; and enzyme activities such as reverse ferrochelatase.

FY25 Goals

- Increase awareness of our services
- Increase core efficiency and reduce turnaround time.

Major Equipment

Heme and Porphyrin analysis:

- Two Waters Corporation ultra-performance liquid chromatography (UPLC) systems, ACQUITY UPLC classic and ACQUITY UPLC H-class PLUS (each including a sample manager, a solvent manager, a photodiode array detector, a fluorescence detector, a column heater and a reverse phase C18 column)
- Agilent 8453 diode array spectrophotometer

Metal Analysis:

- Agilent 7900-ICP mass spectrometer system

Personnel

- Hector A. Bergonia, MS, Research Associate, Core Director, Tetrapyrrole Biochemist
- Nina Claunch, Lab Specialist

Advisory Board Committee (CIHD Operations Committee)

Last meeting date: 08-18-2023

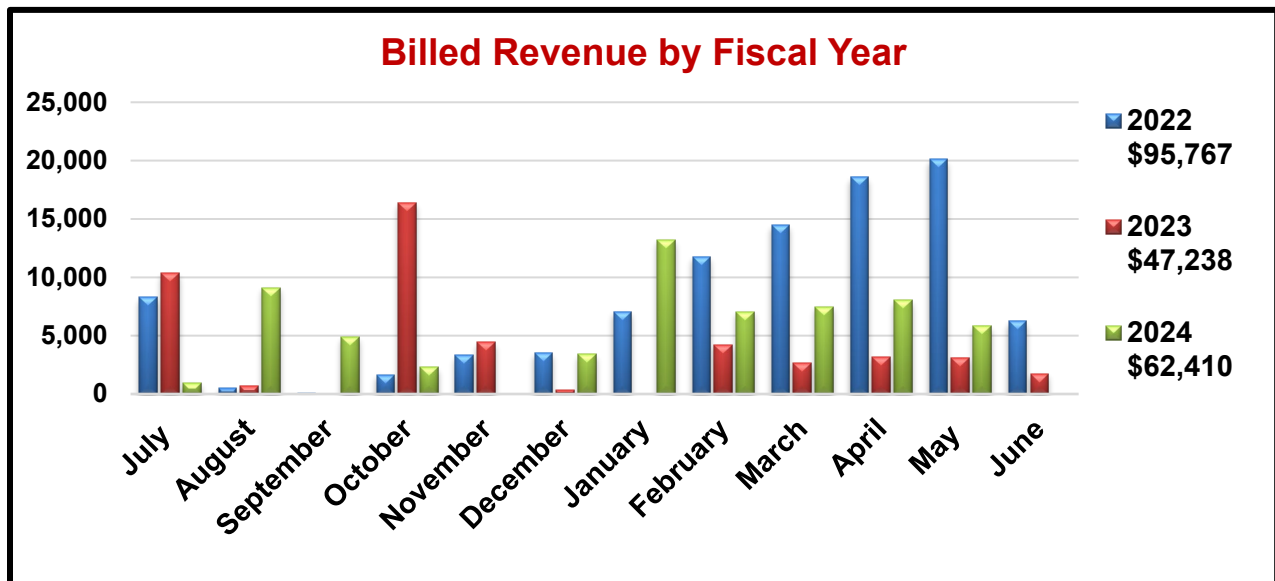
- John D. Phillips, PhD, Hematology
- James Cox, PhD, Biochemistry
- Diane M Ward, PhD, Pathology

Revenue/Expenses

FY24 Total Expenses: \$30,180

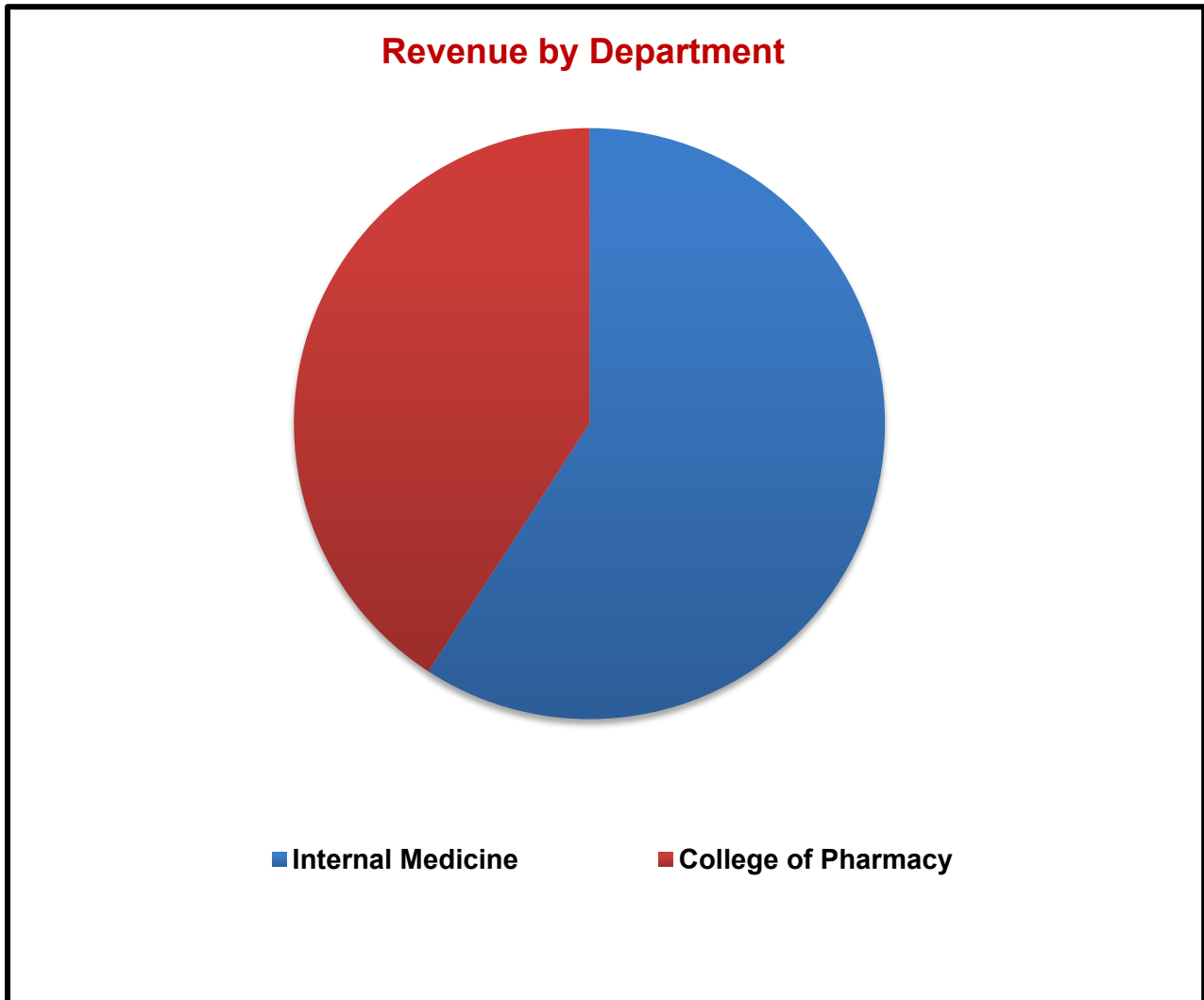
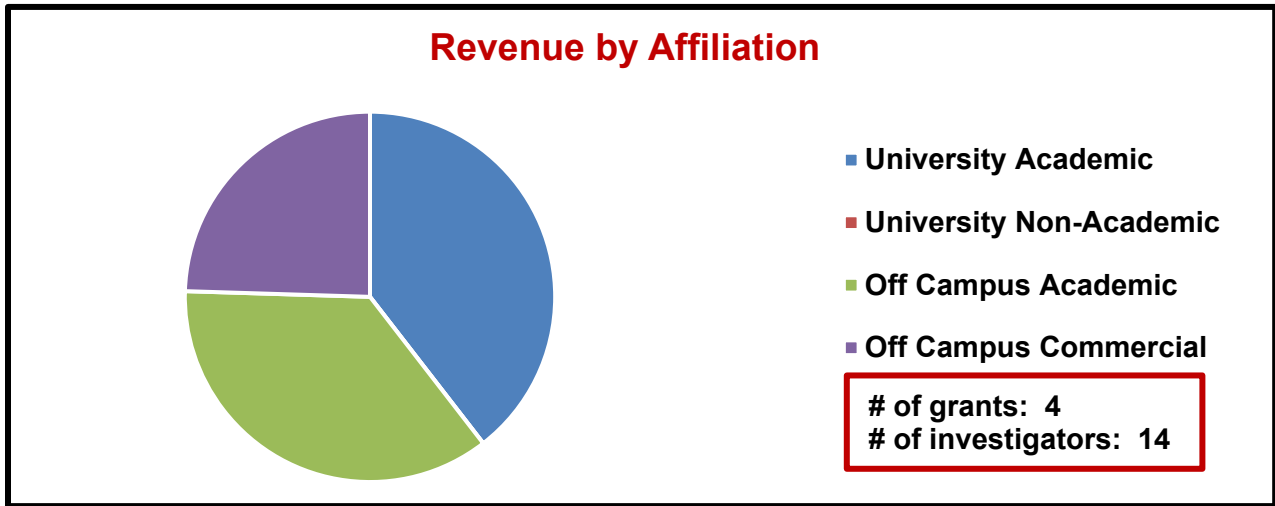
FY24 Total Revenue: \$62,410

- VP of Research Support: \$0
- FY24 Revenue generated from services: \$62,410



* Legend displays total annual revenue by year earned.

**FY24 Scientific Impact
Research Support**
Revenue Generated (see charts following):



Top Users

1	John Phillips	NIH
2	CRISPR Therapeutics	Commercial
3	Hamid Ghandehari	IVEENA LLC
4	University of Pittsburgh	Off Campus Academic
5	The University of Texas El Paso	Off Campus Academic
6	Colorado Biolabs, Inc.	Commercial
7	Howard Hughes Medical Institute	Off Campus Academic
8	University of Alabama at Birmingham	Off Campus Academic
9	Weill Cornell Medicine	Off Campus Academic
10	Christopher Reilly	NIH

Publications

1. Jackson, L. K., T. A. Dailey, B. Anderle, M. J. Warren, H. A. Bergonia, H. A. Dailey and J. D. Phillips (2023). Exploiting Differences in Heme Biosynthesis between Bacterial Species to Screen for Novel Antimicrobials. *Biomolecules* **13**(10).10.3390/biom13101485
2. Yasuda, M., S. Lee, L. Gan, H. A. Bergonia, R. J. Desnick and J. D. Phillips (2023). Cimetidine Does Not Inhibit 5-Aminolevulinic Acid Synthase or Heme Oxygenase Activity: Implications for Treatment of Acute Intermittent Porphyria and Erythropoietic Protoporphyrin. *Biomolecules* **14**(1).10.3390/biom14010027
3. Yien, Y. Y., S. Gillis, M. Perfetto and H. Bergonia (2023). The Clpx G298D Mutation in Clpx-EPP Reveals That Clpx Regulates the Mitochondria Enzymes in Erythroid Heme Synthesis Via Distinct Mechanisms. *Blood* **142**(Supplement 1): 2469-2469.10.1182/blood-2023-187918

Machine Shop

Overview

The Machine Shop Facility is equipped with a full complement of lathes, drills, mills, welders, grinders, and CNC lathe and milling systems, staffed by experienced CNC machinists and engineers capable of turning an idea into reality. The shop staff provides consultation to assist with the design process for products ranging from precise surgical instruments to large-scale testing equipment. The shop can 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. The shop provides microscope parts, stages and assemblies, surgical tool modification, replications, alterations, and reverse engineering.

Services

- Device design/engineering from basic concept to finished product
- Manufacturability consulting
- CNC and manual 3 axis milling machines 2D and 3D machining
- CNC Tormach lathe and manual lathes
- CNC routing services and sign making capabilities
- Laser cutting and engraving services, 3D printing
- Silver soldering and brazing
- MIG, TIG, welding of steel, aluminum, and other types of fabrication
- Anodizing, powder coating and laser cutting project assistance.
- Repair and maintenance of specialty surgical equipment
- Fast surgery tool replication/modifications
- Onsite assessments, pickup, delivery of equipment and repairs

Equipment

- Two CNC mills
- One Shapeoko HD CNC router (aluminum capable)
- One Shapeoko XL CNC Router
- One Matter Hackers Pulse XE 3D printer
- One EPAX E10 4K resolution resin 3D printer
- Two traditional mills
- Four manual lathes
- Two laser cutter/engraving machines.
- Grinders
- MIG, TIG, gas, arc, and spot welders
- Wood working equipment shop
- Band & table saws

Personnel

- Shawn Colby, Machinist, Director
- Joshua Tenny, Machinist, Surgery Tool Repair Specialist

Advisory Board Committee

- Perry Renshaw M.D. Ph.D., Professor, Psychiatry
- Michelle Ford, Materials Management Facilitator, Facilities Engineering
- Kyle Thomson Ph.D., Researcher, Pharm/Tox

FY24 Annual Update

New Equipment

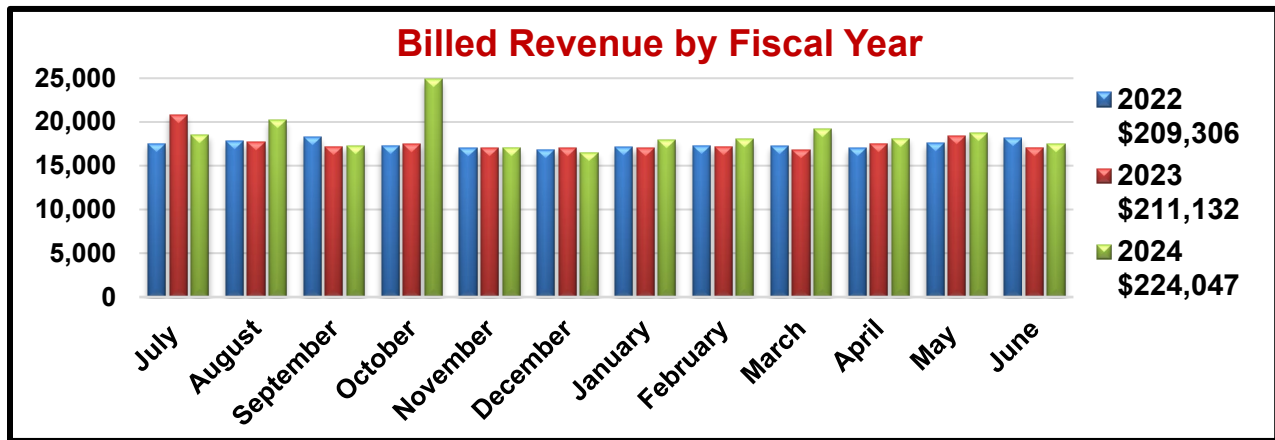
- One Epax E10 4K resolution resin 3D printer
- One Shapeoko XL CNC router
- Two Bambu labs X1 Carbon 3D printer for high speed and high-resolution prints
- Omtech 130-watt laser acrylic cutter 3x5 ft bed

Revenue/Expenses

FY24 Expenses: Total \$313,671

FY24 Revenue: Total \$284,047

- VP of Health Sciences Support: \$60,000
- FY24 Revenue generated from services: \$224,047

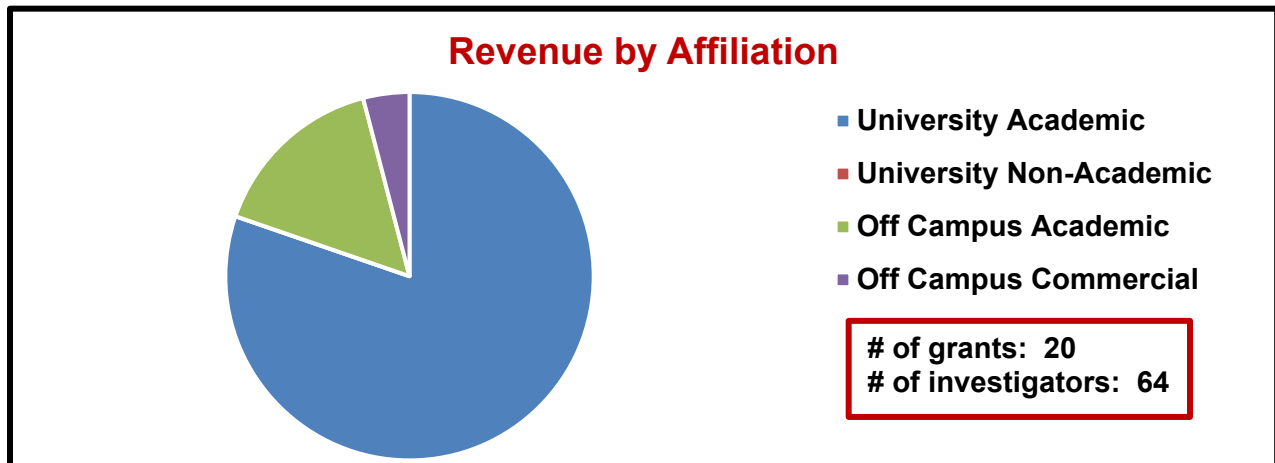


* Legend displays total annual revenue generated by year.

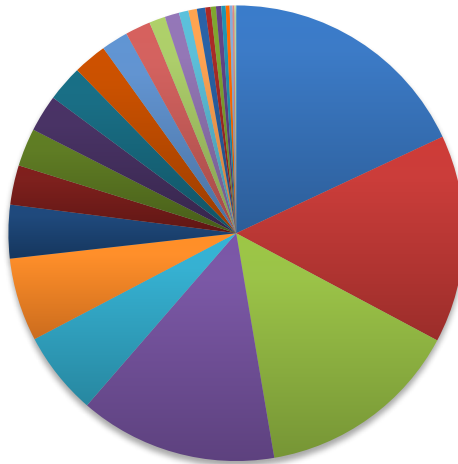
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



- | | |
|--------------------------------------|---------------------------------------|
| ■ Hospital Operating Room | ■ HCI |
| ■ College of Engineering | ■ Orthopaedics |
| ■ ACC Surgery Processing | ■ Neurobiology |
| ■ Ophthalmology | ■ Anesthesiology |
| ■ Internal Medicine | ■ Surgery |
| ■ Physical Medicine & Rehabilitation | ■ ACC Operating Room |
| ■ College of Pharmacy | ■ Radiation Oncology |
| ■ Hospital Sterile Processing | ■ HSC Cores |
| ■ Hospital Rehab Trails Program | ■ Hospital Respiratory Therapy |
| ■ College of Health | ■ Hospital Surgery Services |
| ■ Hospital Engineering | ■ College of Science |
| ■ Neurology | ■ College of Mines and Earth Sciences |
| ■ SVPHS | ■ Pediatrics |
| ■ CNC Operating Room | ■ Biochemistry |

Top Users

1	Department of Veteran Affairs	Off Campus Academic
2	Catherine Hiatt	Department
3	Russ Maag	Department
4	Brent Klev	Department
5	Michael Barber	Department
6	Michele Ebright Breitenbeker	Department
7	Darren Peacock	Department
8	Xuan Zhu	Oregon State University, North Dakota State University, Utah Transit Authority
9	Riley Hamilton	UUOC Diagnostic Radiology
10	Jeffrey Yap	Department

Publications

No known publications acknowledged this facility in FY24.

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. These include natural products, small synthetic molecules, peptides and large intact proteins. The facility is equipped with several high-performance mass spectrometers, including a new Thermo Exploris480, a Bruker Maxis 2 with ETD and a Bruker timsTOF Pro 2. All are equipped with nano-LC/MS/MS 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. In July of 2024, Allison Manuel Ph.D. was promoted to associate core director and a new proteomics laboratory technician was hired, to add bandwidth to the Core.

Services

A range of proteomics and general mass spectrometry services are available. The following services are provided to investigators:

Proteomics Services:

- Protein ID from gel electrophoresis
- 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 LC-MS/MS and accurate mass *de novo* sequencing
- “Top-Down” and “Bottom-Up” proteomics
- Protein quantification analysis using TMT, SILAC, and label free strategies.
- Custom database searching
- Accurate protein mass measurement

General MS Services

- ESI-MS
- ESI-MS/MS
- LC/MS
- LC-MS/MS
- Special project/method development

Equipment

Mass Spectrometers

- Thermo Exploris480 for proteomics
- Bruker Maxis II HD for high mass accuracy intact protein and small molecule analysis.
- Bruker timsTOF Pro 2 for shotgun proteomics

HPLC Systems

- Agilent 1260 Preparative HPLC for MudPIT peptide preparation

Personnel

- James Cox Ph.D., Director
- Allison Manuel Ph.D., Associate Director
- Sandra Osburn-Staker Ph.D., Research Associate
- Eun-Seo Kim, laboratory technician

Advisory Board Committee

Last meeting date: September 20, 2023

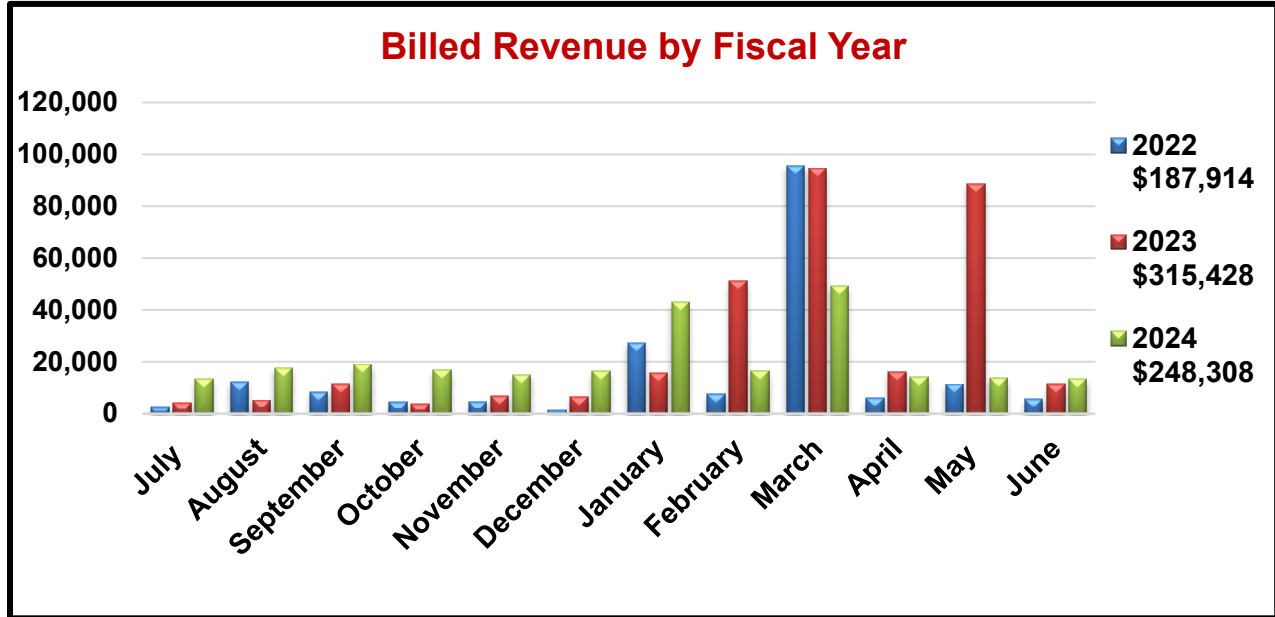
- Chris Hill, DPhil. Professor, Biochemistry
- Hans Haecker, M.D., Ph.D., Professor, Pathology
- Sarah Franklin, Ph.D., Associate Professor, Internal Medicine
- Helena Safavi-Hemami, Ph.D., Assistant Professor, Biochemistry
- Martin Golkowski, Ph.D. Assistant Professor, Pharmacology and Toxicology

Revenue/Expenses

FY24 Expenses: Total \$509,054

FY24 Revenue: Total \$675,308

- VP of Health Sciences Support: \$225,000
- Equipment Support: \$202,000
- FY24 revenue generated from services: \$248,308

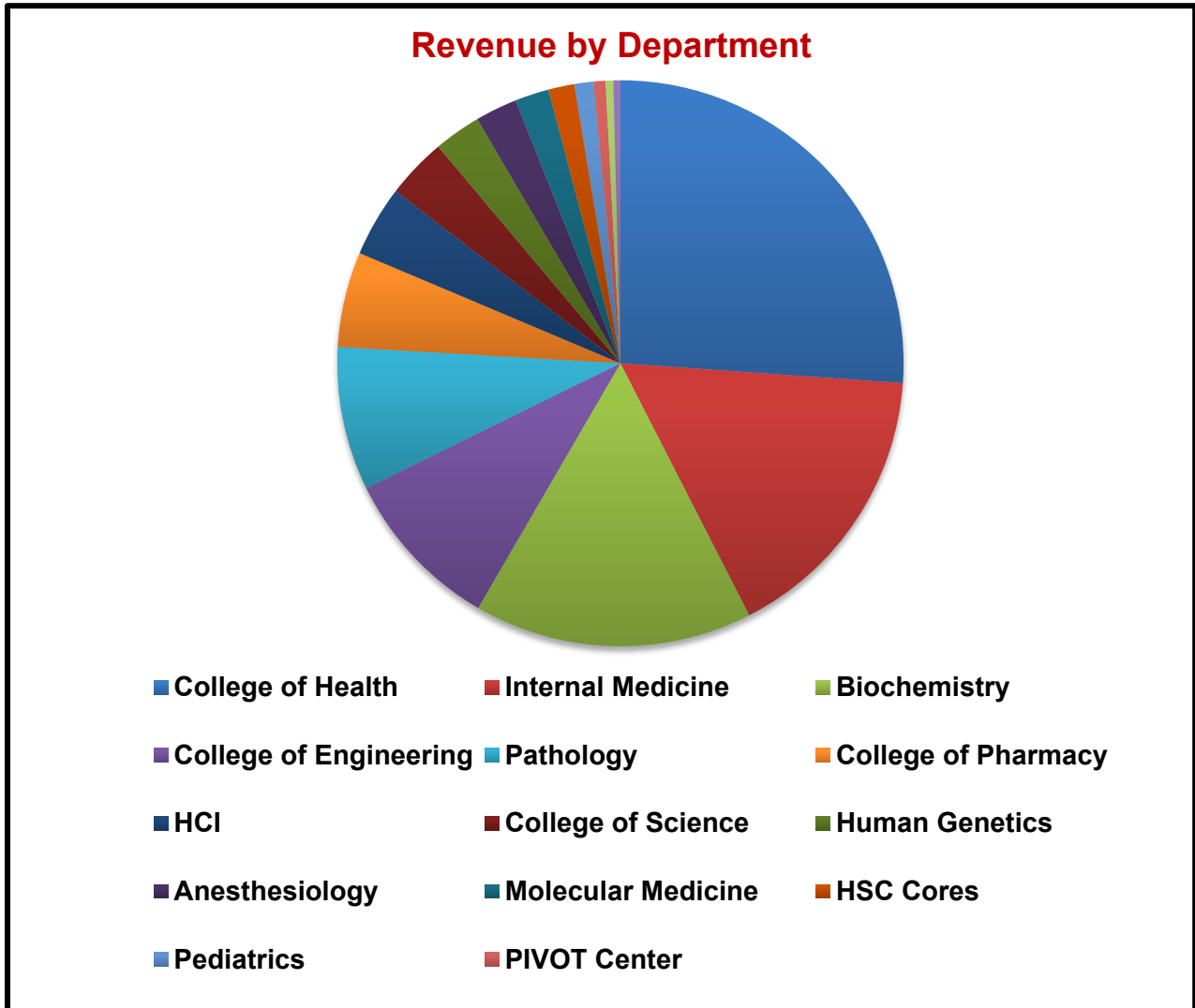
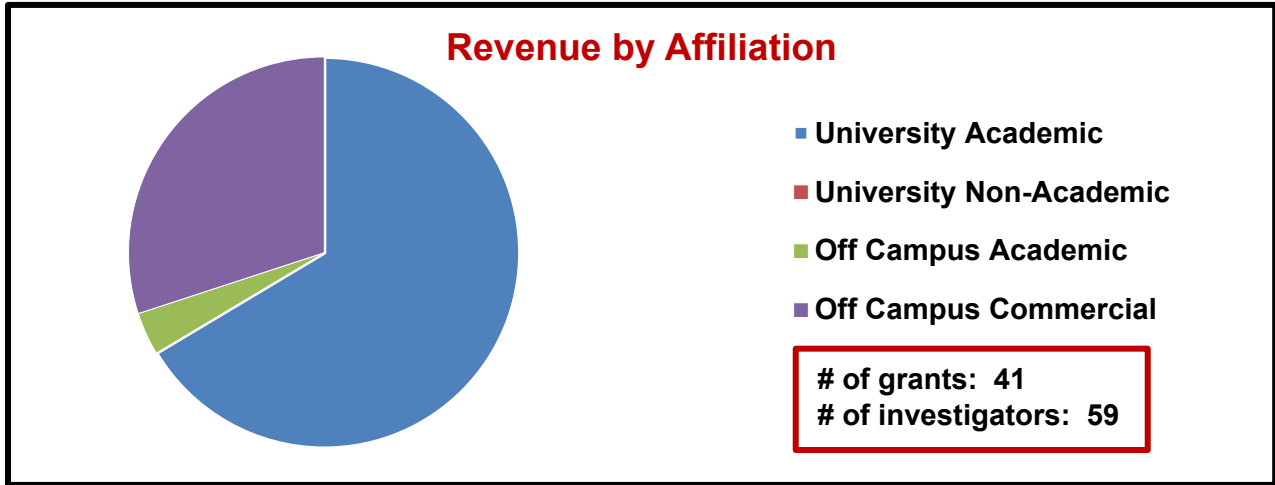


* Legend displays total annual revenue by year earned.

FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Top Users

1	Avrock Biosciences	Off Campus Commercial
2	Recursion Pharmaceuticals	Off Campus Commercial
3	Scott Summers	NIH
4	3Helix	Off Campus Commercial
5	Katsuhiko Funai	NIH
6	Hans Haeckler	NIH
7	Wesley Sundquist	NIH, Department
8	William Holland	NIH
9	Sankar Swaminathan	Department
10	Michael Yu	AOSSM, Department, 3Helix

Publications

1. Backman, T., S. M. Latorre, E. Symeonidi, A. Muszynski, E. Bleak, L. Eads, P. I. Martinez-Koury, S. Som, A. Hawks, A. D. Gloss, D. M. Belnap, A. M. Manuel, A. M. Deutschbauer, J. Bergelson, P. Azadi, H. A. Burbano and T. L. Karasov (2024). A phage tail-like bacteriocin suppresses competitors in metapopulations of pathogenic bacteria. *Science* 384(6701): eado0713.10.1126/science.ado0713

Metabolic Phenotyping

Overview

The Metabolic Phenotyping Core (MPC) is a vital University-sponsored resource offering standardized and high-quality metabolic and physiological tests for the phenotypic characterization of various organism models developed by UofU investigators. This invaluable resource supports research on human diseases such as diabetes, cardiovascular disorders, kidney diseases, neurological diseases, and cancer. The phenotyping tests include determining whole-body glucose metabolism and insulin sensitivity in animals through glucose and insulin tolerance tests and glucose clamps, assessing whole animal energy expenditure using the Columbus Instrument's CLAMS/Oxymax system, determining body composition with the Bruker Minispec NMR, and measuring circulating hormones, growth factors, and cytokine concentrations using the Luminex xMAP multiplex systems (MAGPIX). The MPC also measures analyte concentrations (metabolites, ions, gases, enzymes) in body fluids such as serum, plasma, urine, and cerebrospinal fluid using the Vitros 350 chemistry analyzer. Additionally, the MPC maps the metabolic phenotype of different cell types and tissues using Agilent-Seahorse XF analyzers. The MPC assists scientists in designing and optimizing phenotyping tests, aiming to expedite biomedical research by providing academic and non-academic researchers access to advanced metabolic phenotyping tests at a reasonable price.

Services

- Mitochondrial bioenergetics using an Agilent-Seahorse XF Pro and XFe 96 extracellular flux analyzers
- Assessment of energy balance in mice using CLAMS metabolic chambers
- Body composition (lean mass, fat mass, and fluid content) using Bruker Minispec NMR
- Multiplexed protein analyte (hormone, growth factors, cytokines, adipokines, myokines, and signaling molecules) quantification using high throughput biomarker screening and quantification using Luminex technology, Magpix
- Multiplexed high throughput quantification of metabolites in body fluids such as serum, plasma, urine, and cerebrospinal fluid using Vitros 350 chemistry analyzer
- Determination of the calorific value of a solid/liquid sample using CAL3K-F bomb calorimeter from DDS Calorimeters
- Whole-body glucose metabolism and insulin sensitivity- glucose and insulin tolerance tests
- Quantification of free radicals using an electron spin resonance (ESR) spectrometer, ESR 5000, manufactured by Bruker
- Non-invasively measuring glomerular filtration rate (GFR) in real-time using the transdermal Mini GFR monitor from MediBeacon

Equipment

- Seahorse Flux Analyzer XF pro & XFe96
- Eight Columbus Instruments metabolic chambers equipped with temperature-controlled enclosure.
- Eight Columbus Instruments CLAMS metabolic chambers equipped with running wheels and with the capability to measure core body temperature and heart rate.
- Bruker Minispec NMR
- Luminex MAGPIX
- CAL3K-F Bomb Calorimeter

- Ortho Clinical Vitros 350 chemistry analyzer
- Powers Scientific rodent incubators
- Bruker ESR 5000
- Transdermal Mini GFR Monitor (two sets)

Personnel

- Ying Li MD, PhD, Director
- Xue Yin, Laboratory Technician

Advisory Board Committee

Last meeting date: August 2022

- Scott Summers Ph.D., Professor, Nutrition and Integrative Physiology
- Jared Rutter Ph.D., Professor, Biochemistry
- William Holland Ph.D., Associate Professor, Nutrition, and Integrative Physiology
- Katsuhiko Funai Ph.D., Associate Professor, Nutrition, and Integrative Physiology
- Amandine Chaix Ph.D., Assistant Professor, Nutrition and Integrative Physiology,
- James Cox Ph.D., Director HSC Cores

FY24 Annual Update

The Director, Dr. Li, received a NIH S10 grant for a new Promethion Metabolic Phenotyping System.

A RIF grant for a new Seahorse XF Pro was funded and is now in service.

A CAL3K-F bomb calorimeter for determining caloric value was purchased, and is now in service.

Two Transdermal Mini GFR monitors were added to the core.

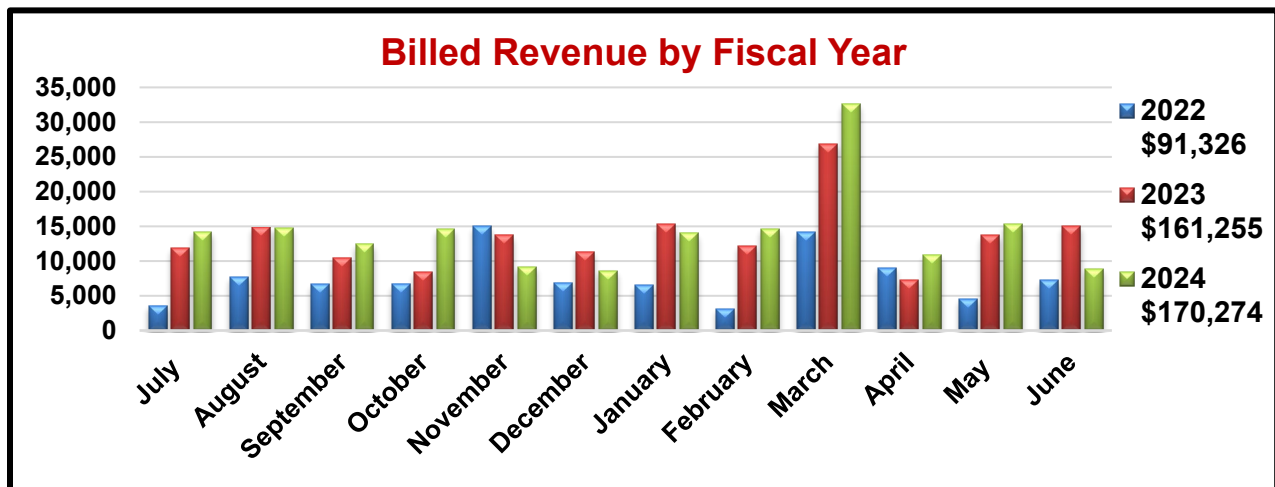
Room 162 is being renovated into three smaller labs: one for housing three rodent incubators, one for a small animal ultrasound, and one for the CLAMS system.

Revenue/Expenses

FY24 Expenses: Total \$431,907

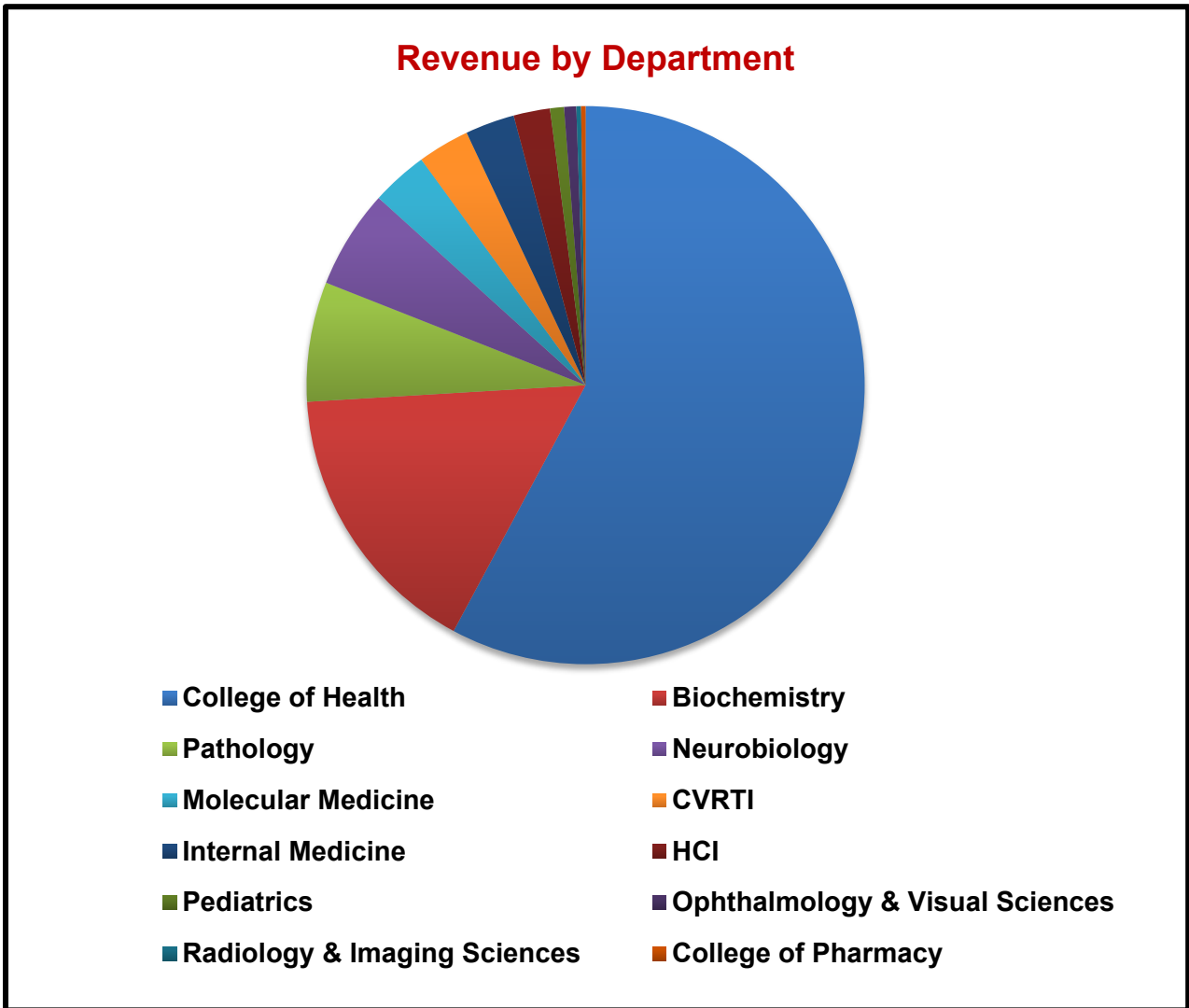
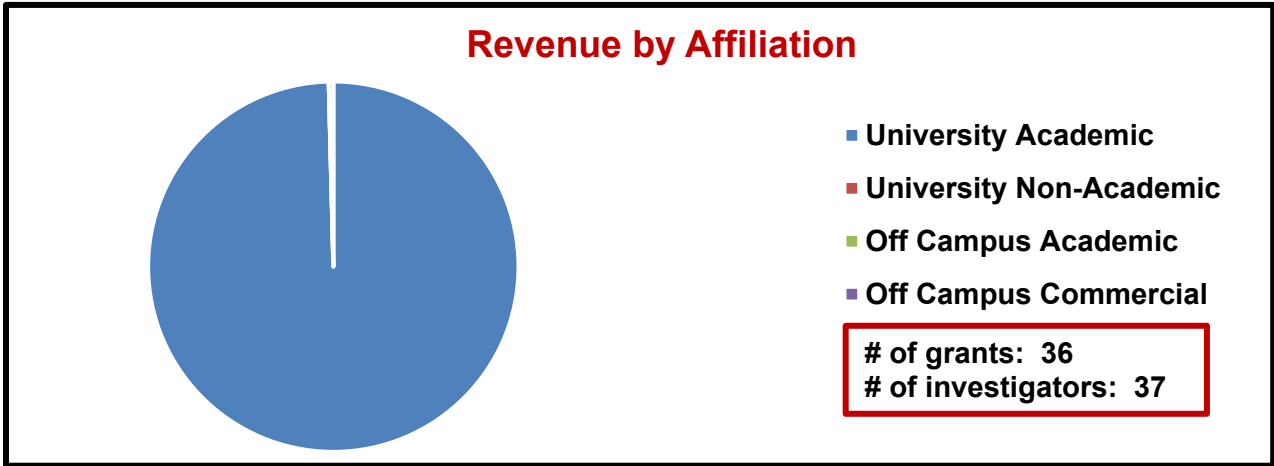
FY24 Revenue: Total \$449,964

- VP of Health Sciences Support: \$ 85,000
- Equipment Support: \$194,690
- FY24 revenue generated from services: \$170,274



*Legend displays total annual revenue by year earned.

**FY24 Scientific Impact
Research Support
Revenue Generated (see charts following):**



Top Users

1	Katsuhiko Funai	NIH
2	Jared Rutter	Department, Brigham & Women's Hospital
3	Amandine Chaix	NIH, Department
4	Micah Drummond	Department, NIH
5	Christopher Gregg	NIH
6	Scott Summers	NIH
7	Keke Fairfax	NIH
8	William Holland	NIH
9	Sihem Boudina	NIH, Department
10	Tianxin Yang	NIH

Publications

1. Clark, A. M., D. Yu, G. Neiswanger, D. Zhu, J. Zou, J. A. Maschek, T. Burgoyne and J. Yang (2024). Disruption of CFAP418 interaction with lipids causes widespread abnormal membrane-associated cellular processes in retinal degenerations. *JCI Insight* 9(1).10.1172/jci.insight.162621
2. Eshima, H., J. M. Johnson and K. Funai (2023). Lipid peroxidation does not mediate muscle atrophy induced by PSD deficiency. *bioRxiv*.10.1101/2023.12.22.573082
3. Fennel, Z. J., P. E. Bourrant, A. S. Kurian, J. J. Petrocelli, N. de Hart, E. M. Yee, S. Boudina, H. S. Keirstead, G. Nistor, S. A. Greilach, N. C. Berchtold, T. E. Lane and M. J. Drummond (2024). Stem cell secretome treatment improves whole-body metabolism, reduces adiposity, and promotes skeletal muscle function in aged mice. *Aging Cell* 23(6): e14144.10.1111/ace1.14144
4. Gallop, M. R., R. F. L. Vieira, E. T. Matsuzaki, P. D. Mower, W. Liou, F. E. Smart, S. Roberts, K. J. Evason, W. L. Holland and A. Chaix (2024). Long-term ketogenic diet causes hyperlipidemia, liver dysfunction, and glucose intolerance from impaired insulin trafficking and secretion in mice. *bioRxiv*.10.1101/2024.06.14.599117
5. Klag, K. A., R. Bell, X. Jia, A. Seguin, J. A. Maschek, M. Bronner, J. E. Cox, J. L. Round and D. M. Ward (2024). Low-Iron Diet-Induced Fatty Liver Development Is Microbiota Dependent and Exacerbated by Loss of the Mitochondrial Iron Importer Mitoferrin2. *Nutrients* 16(12).10.3390/nu16121804
6. Shahtout, J. L., H. Eshima, P. J. Ferrara, J. A. Maschek, J. E. Cox, M. J. Drummond and K. Funai (2024). Inhibition of the skeletal muscle Lands cycle ameliorates weakness induced by physical inactivity. *J Cachexia Sarcopenia Muscle* 15(1): 319-330.10.1002/jcsm.13406
7. Siripoksup, P., G. Cao, A. A. Cluntun, J. A. Maschek, Q. Pearce, M. J. Brothwell, M. Y. Jeong, H. Eshima, P. J. Ferrara, P. C. Oporum, Z. S. Mahmassani, A. D. Peterlin, S. Watanabe, M. A. Walsh, E. B. Taylor, J. E. Cox, M. J. Drummond, J. Rutter and K. Funai (2024). Sedentary behavior in mice induces metabolic inflexibility by suppressing skeletal muscle pyruvate metabolism. *J Clin Invest* 134(11).10.1172/JCI167371

Metabolomics Facility

Overview

The Metabolomics Core at the University of Utah is a recognized leader in the field of metabolomics, lipidomics and metabolic tracer analysis. It was established 18 years ago with a mission to perform comprehensive global metabolomics and lipidomics analyses. Over the years the Metabolomics Core has developed methods to analyze the metabolome and lipidome of a variety of biological systems and samples. The core is highly equipped with state-of-the-art instrumentation and expert staff. It provides both non-targeted analysis for biomarker discovery as well as targeted quantitation of metabolites for discovery validation. New, highly capable instrumentation has been acquired over the past several years to enhance our capabilities to perform these studies. No single method is fully capable of completely profiling the metabolome, to maximize the number of metabolites observed, the facility is equipped with two chemical analysis platforms, GC-MS and LC-MS.

Services

The primary mission of the facility is the metabolomics/lipidomics 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 samples 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

- Two Agilent 5977B gas chromatograph-quadrupole mass spectrometers (GC-MS) for metabolic tracer analysis.
- Agilent 5973 gas chromatograph-quadrupole mass spectrometer (GC-MS) for fatty acid analysis.
- Agilent 7200 gas chromatograph-quadrupole time of flight mass spectrometer (GC-QTOF-MS) for discovery metabolomics.
- Agilent 6545A Ultra Pressure Liquid Chromatograph-Quadrupole Time of Flight Mass-Spectrometer (UPLC-QToF-MS) for discovery lipidomics.

- Agilent 6545B Ultra Pressure Liquid Chromatograph-Quadrupole Time of Flight Mass-Spectrometer (UPLC-QTOF-MS) for discovery metabolomics.
- Agilent 6490 Triple quadrupole UPLC-MS for the targeted quantification of metabolites, lipids and peptides
- Sciex 6500 QTRAP Triple quadrupole UPLC-MS for the targeted quantification of metabolites, lipids and peptides
- Thermo QExactive Plus UPLC-MS for isotope tracer analysis.
- Sciex 7600 UPLC-QToF for metabolomics and lipidomics
- Sciex 7500+ UPLC-QQQ for targeted metabolomics and lipidomics quantification

Personnel

- James Cox, PhD, Director
- Alan Maschek, PhD, Associate Director
- Leon Catrow, PhD, Research Associate
- Quentinn Pierce, BS, Research Associate
- Jordan Reelitz, BS, Research Specialist
- Trevor Lonergan, BS, Research Specialist

Advisory Board Committee

Last meeting date: September 15, 2023

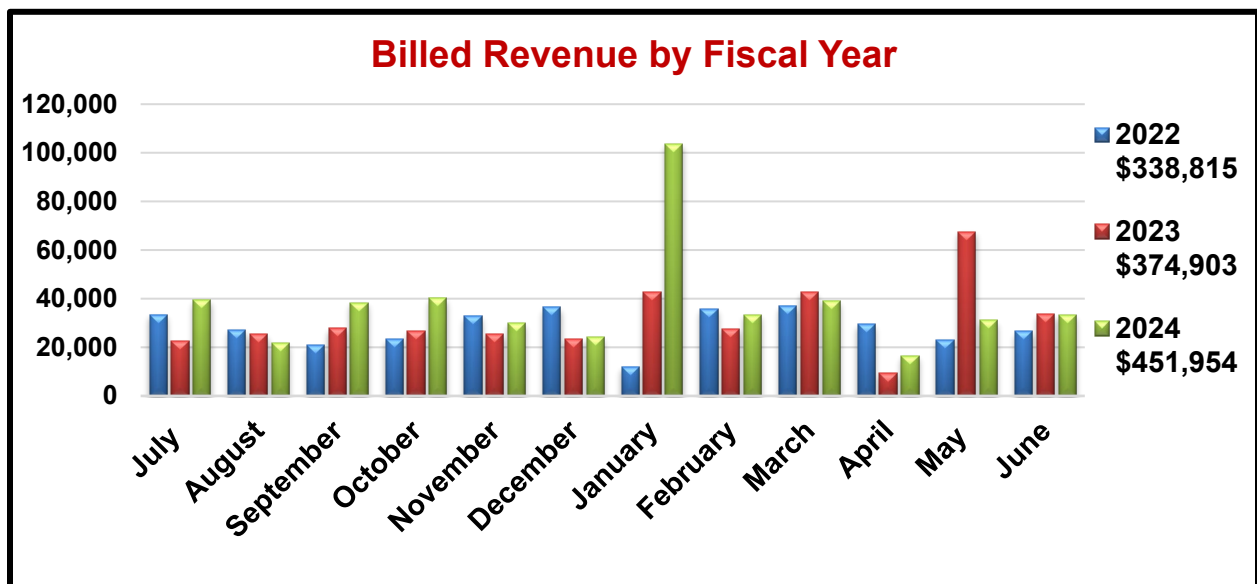
- Greg Ducker, PhD, Assistant Professor, Department of Biochemistry
- Keke Fairfax, PhD, Associate Professor, Department of Pathology
- William Holland, PhD, Associate Professor, Nutrition & Integrative Physiology
- Katsu Funai, PhD, Associate Professor, Nutrition & Integrative Physiology
- Jared Rutter, PhD, Professor, Department of Biochemistry

Revenue/Expenses

FY24 Expenses: Total \$731,122

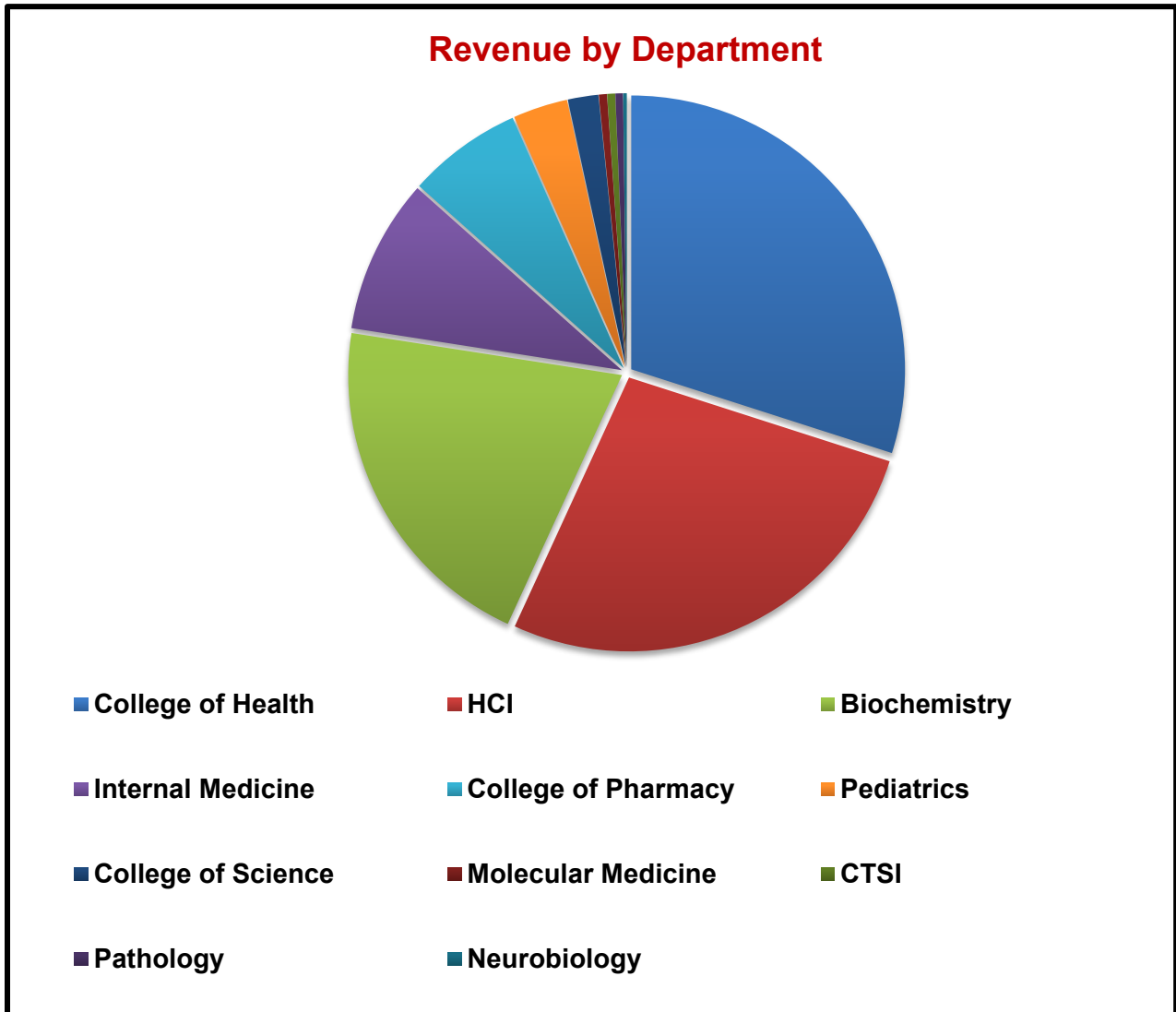
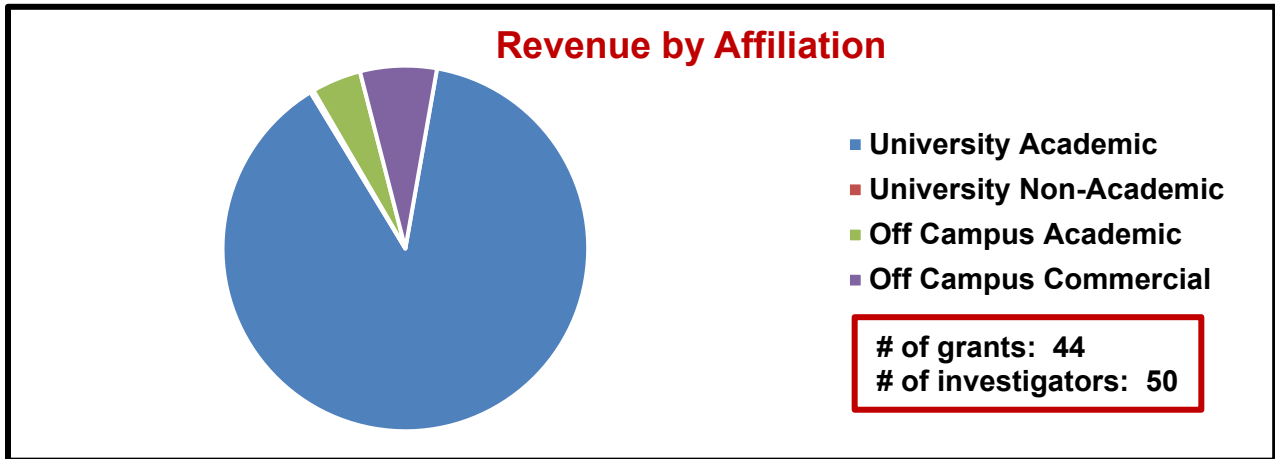
FY24 Revenue: Total \$691,954

- VP of Health Sciences Support: \$240,000
- FY24 Revenue generated from services: \$451,954



* Legend displays total annual revenue by year earned.

**FY24 Scientific Impact
Research Support
Revenue Generated (see charts following):**



Top Users

1	Mary Playdon	Cedars- Sinai Medical Center, NIH
2	William Holland	NIH, Department
3	Jared Rutter	Brigham & Women's Hospital, Department, Nora Eccles Treadwell Foundation
4	Quotient Therapeutics	Off Campus Commercial
5	Katsuhiko Funai	NIH
6	John Phillips	NIH, Department
7	Karen Wilcox	Citizens United in Research for Epilepsy, NIAID
8	Adam Hughes	NIH
9	Micah Drummond	NIH
10	James Fang	Department

Publications

- Clark, A. M., D. Yu, G. Neiswanger, D. Zhu, J. Zou, J. A. Maschek, T. Burgoyne and J. Yang (2024). Disruption of CFAP418 interaction with lipids causes widespread abnormal membrane-associated cellular processes in retinal degenerations. *JCI Insight* 9(1).10.1172/jci.insight.162621
- Freeman, S. M., J. L. Catrow, J. E. Cox, A. Turano, M. A. Rich, H. P. Ihrig, N. Poudyal, C. T. Chang, E. M. Gese, J. K. Young and A. L. Olsen (2024). Binding Affinity, Selectivity, and Pharmacokinetics of the Oxytocin Receptor Antagonist L-368,899 in the Coyote (*Canis latrans*). *Comp Med* 74(1): 3-11.10.30802/AALAS-CM-23-000044
- Karasawa, T., R. Hee Choi, C. A. Meza, J. A. Maschek, J. E. Cox and K. Funai (2024). Skeletal muscle PGC-1alpha remodels mitochondrial phospholipidome but does not alter energy efficiency for ATP synthesis. *bioRxiv*.10.1101/2024.05.22.595374
- Klag, K. A., R. Bell, X. Jia, A. Seguin, J. A. Maschek, M. Bronner, J. E. Cox, J. L. Round and D. M. Ward (2024). Low-Iron Diet-Induced Fatty Liver Development Is Microbiota Dependent and Exacerbated by Loss of the Mitochondrial Iron Importer Mitoferrin2. *Nutrients* 16(12).10.3390/nu16121804
- Li, F., Z. Lin, P. J. Krug, J. L. Catrow, J. E. Cox and E. W. Schmidt (2023). Animal FAS-like polyketide synthases produce diverse polypropionates. *Proc Natl Acad Sci U S A* 120(38): e2305575120.10.1073/pnas.2305575120
- Li, Y., B. Chaurasia, M. M. Rahman, V. Kaddai, J. A. Maschek, J. A. Berg, J. L. Wilkerson, Z. S. Mahmassani, J. Cox, P. Wei, P. J. Meikle, D. Atkinson, L. Wang, A. M. Poss, M. C. Playdon, T. S. Tippetts, E. M. Mousa, K. Nittayaboon, P. V. Anandh Babu, M. J. Drummond, H. Clevers, J. A. Shayman, Y. Hirabayashi, W. L. Holland, J. Rutter, B. A. Edgar and S. A. Summers (2023). Ceramides Increase Fatty Acid Utilization in Intestinal Progenitors to Enhance Stemness and Increase Tumor Risk. *Gastroenterology* 165(5): 1136-1150.10.1053/j.gastro.2023.07.017
- Nicholson, R., L. Cedeno-Rosario, Y. Li, J. A. Maschek, N. Ramkumar, W. Holland and S. Summers (2024). Ceramides as Mediators of Mitochondrial Dysfunction Driving Kidney Injury. *Physiology* 39(S1): 424.10.1152/physiol.2024.39.S1.424
- Norris, M., M. Gillingham, J. Vockley, N. Longo, C. Lam, T. Tippetts, J. Taloa, R. Hoobler, J. Mahlow, J. Meeusen, J. Maschek, W. Holland and S. Summers (2024). Ceramide – the unmasked driver of heart failure in very long-chain acyl-CoA dehydrogenase deficiency (VLCADD). *Molecular Genetics and Metabolism* 141: 108167.10.1016/j.ymgme.2024.108167
- Norris, M. K., T. S. Tippetts, J. L. Wilkerson, R. J. Nicholson, J. A. Maschek, T. Levade, J. A. Medin, S. A. Summers and W. L. Holland (2024). Adiponectin overexpression improves metabolic abnormalities caused by acid ceramidase deficiency but does not prolong lifespan in a mouse model of Farber Disease. *Mol Genet Metab Rep* 39: 101077.10.1016/j.ymgmr.2024.101077
- Nwagbo, U., S. Parvez, J. A. Maschek and P. S. Bernstein (2024). Elov14b knockout zebrafish as a model for ocular very-long-chain PUFA deficiency. *J Lipid Res* 65(3): 100518.10.1016/j.jlr.2024.100518
- Pilarte, K. A., E. C. Reichert, Y. S. Green, L. M. Halberg, S. A. McFarland, P. N. Mimche, M. Golkowski, S. D. Kamdem, K. M. Maguire, S. A. Summers, J. A. Maschek, J. W. Reelitz, J. E. Cox, K. J. Evason and M. Y. Koh (2024). HAF Prevents Hepatocyte Apoptosis and Hepatocellular Carcinoma through Transcriptional Regulation of the NF-kappaB pathway. *bioRxiv*.10.1101/2024.01.09.574894

12. Shahtout, J. L., H. Eshima, P. J. Ferrara, J. A. Maschek, J. E. Cox, M. J. Drummond and K. Funai (2024). Inhibition of the skeletal muscle Lands cycle ameliorates weakness induced by physical inactivity. *J Cachexia Sarcopenia Muscle* 15(1): 319-330.10.1002/jcsm.13406
13. Siripoksup, P., G. Cao, A. A. Cluntun, J. A. Maschek, Q. Pearce, M. J. Brothwell, M. Y. Jeong, H. Eshima, P. J. Ferrara, P. C. Oporum, Z. S. Mahmassani, A. D. Peterlin, S. Watanabe, M. A. Walsh, E. B. Taylor, J. E. Cox, M. J. Drummond, J. Rutter and K. Funai (2024). Sedentary behavior in mice induces metabolic inflexibility by suppressing skeletal muscle pyruvate metabolism. *J Clin Invest* 134(11).10.1172/JCI167371
14. Xiao, T., A. M. English, Z. N. Wilson, J. A. Maschek, J. E. Cox and A. L. Hughes (2024). The phospholipids cardiolipin and phosphatidylethanolamine differentially regulate MDC biogenesis. *J Cell Biol* 223(5).10.1083/jcb.202302069
15. Zhang, S., K. J. Williams, A. Verlande-Ferrero, A. P. Chan, G. B. Su, E. E. Kershaw, J. E. Cox, J. A. Maschek, S. N. Shapira, H. R. Christofk, T. Q. de Aguiar Vallim, S. Masri and C. J. Villanueva (2024). Acute activation of adipocyte lipolysis reveals dynamic lipid remodeling of the hepatic lipidome. *J Lipid Res* 65(2): 100434.10.1016/j.jlr.2023.100434
16. Zhao, J., C. Ballard, A. J. Cohen, B. Ringham, B. Zhao, H. Wang, K. Zuspan, A. Rebentisch, B. A. Locklear, M. Dahl, J. A. Maschek, J. E. Cox and L. A. Joss-Moore (2023). Postnatal growth restriction impairs rat lung structure and function. *Anat Rec (Hoboken)*.10.1002/ar.25297

Mutation Generation & Detection Facility

Overview

The Mutation Generation & Detection (MGD) Core Facility supports researchers by securing, developing, and optimizing the latest DNA nuclease technologies, reagents, and protocols for targeted genome modification. Currently, the MGD Core specializes in providing customized CRISPR reagents for gene editing in multiple model systems, including but not limited to *M. musculus*, *D. rerio*, *D. melanogaster*, *C. elegans*, *S. cerevisiae* and mammalian cell lines. Beyond reagent production, the MGD Core has established partnerships with the Transgenic & Gene Targeting (TG) Mouse Core Facility, the Drug Discovery Core, and the Cellular Translational Research Core to create engineered mouse models, immortalized cell lines and human stem cell lines respectively. The MGD Core also provides custom genotyping services including High Resolution Melt Analysis (HRMA), CRISPR validation services, homology directed repair donor template synthesis, custom cloning services and targeted sequencing 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 reagents.

Main Services

CRISPR Services

- CRISPR sgRNA
- High fidelity Cas9 protein
- Custom CRISPR plasmid design and construction
 - CRISPRa, CRISPRi, AAV, Cas12a and other CRISPR based technologies

High Resolution Melt Analysis

- HRMA PCR plates (10 pack)
- HRMA PCR sealing film (10 pack)
- MeltDoctor™ HRM Master Mix 100 rxns
- MeltDoctor™ HRM Master Mix 500 rxns
- Mineral Oil (500ml bottle)
- HRMA Training
- Help with optimization and analysis of HRMA assays
- Custom Mutation Detection upon request

Genotyping Services

- Custom RFLP genotyping of mutant and transgenic mice
- Detection of transgene insertion
- Custom HRMA genotyping
- Sequence verification of genome edits

Other Services

- Custom cloning of mammalian and bacterial expression vectors
- Custom cloning of homology directed repair vectors
- Plasmid purification services
- Short ssDNA homology directed repair donor design and production
- Long ssDNA homology directed repair design and production
- Production of CRISPR constructs for generating transgenic *D. melanogaster*
- Mouse model generation (partnership with TG Mouse Core Facility)
- Blastocyst validation of CRISPR reagents (partnership with TG Mouse Core Facility)
- Generation of modified cell lines (partnership with Drug Discovery Core)
- Generation of modified human stem cell lines (partnership with Cellular Translational Research Core)

Equipment

- BioFire LightScanner
- 3X Eppendorf Mastercycler ProS
- Eppendorf centrifuge 5430
- 2X Eppendorf 5424 microcentrifuges
- Innova 43 bacterial shaker
- Innova 42 bacterial shaker
- Frigidaire -20°C freezer
- Lonza 4D Nucleofector system:
 - 4D-Nucleofector Core Unit
 - 4D-Nucleofector X Unit
 - 4D-Nucleofector Y Unit
 - 4D-Nucleofector 96-well Shuttle
- CCI biological safety cabinet
- NapCo Model 6300 CO₂ incubator
- ThermoFisher TSX600 -80 °C freezer
- Sorvall RT 6300 centrifuge

Personnel

- Crystal Davey, Ph.D., Director
- Lilian Hayes, B.S., Lab Technician

Advisory Board Committee

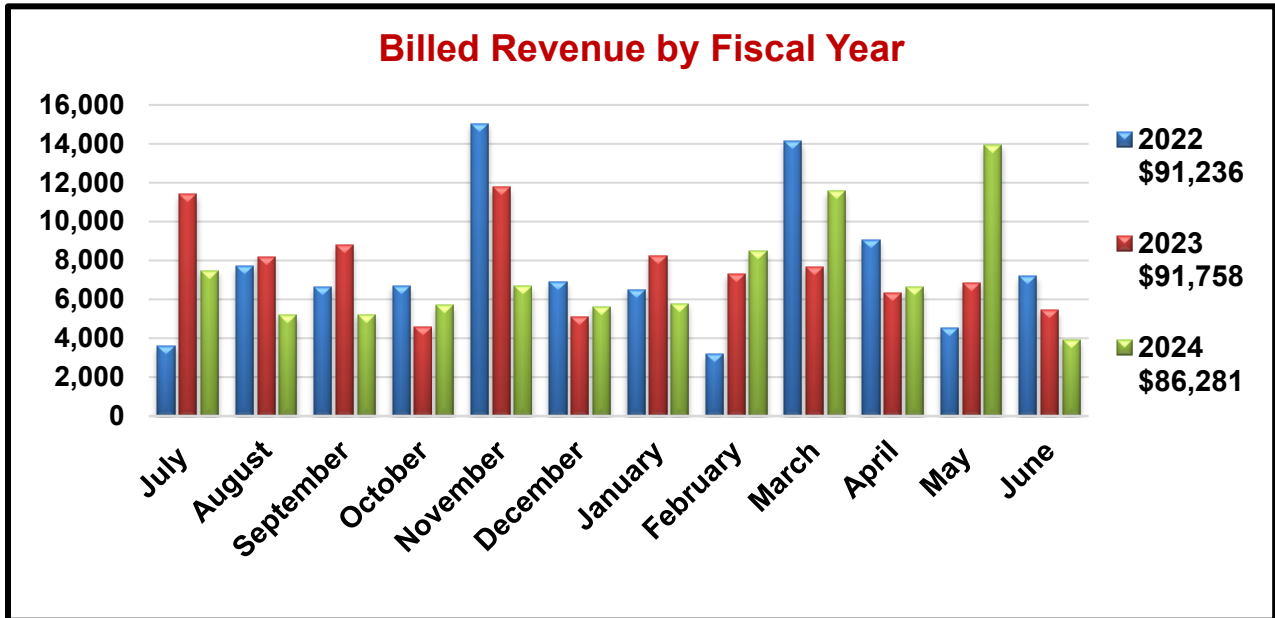
- David Grunwald, Ph.D., Professor, Department of Human Genetics (Senior Faculty Advisor)
- Christopher Gregg, Ph.D., Professor, Department of Neurobiology & Anatomy
- Lewis Charles Murtaugh, Ph.D., Associate Professor, Department of Human Genetics
- Yang Liu, Ph.D., Assistant Professor, Department of Biochemistry

Revenue/Expenses

FY24 Expenses: Total \$131,388

FY24 Revenue: Total \$156,281

- VP of Health Sciences Support: \$70,000
- FY24 Revenue generated from services: \$86,281

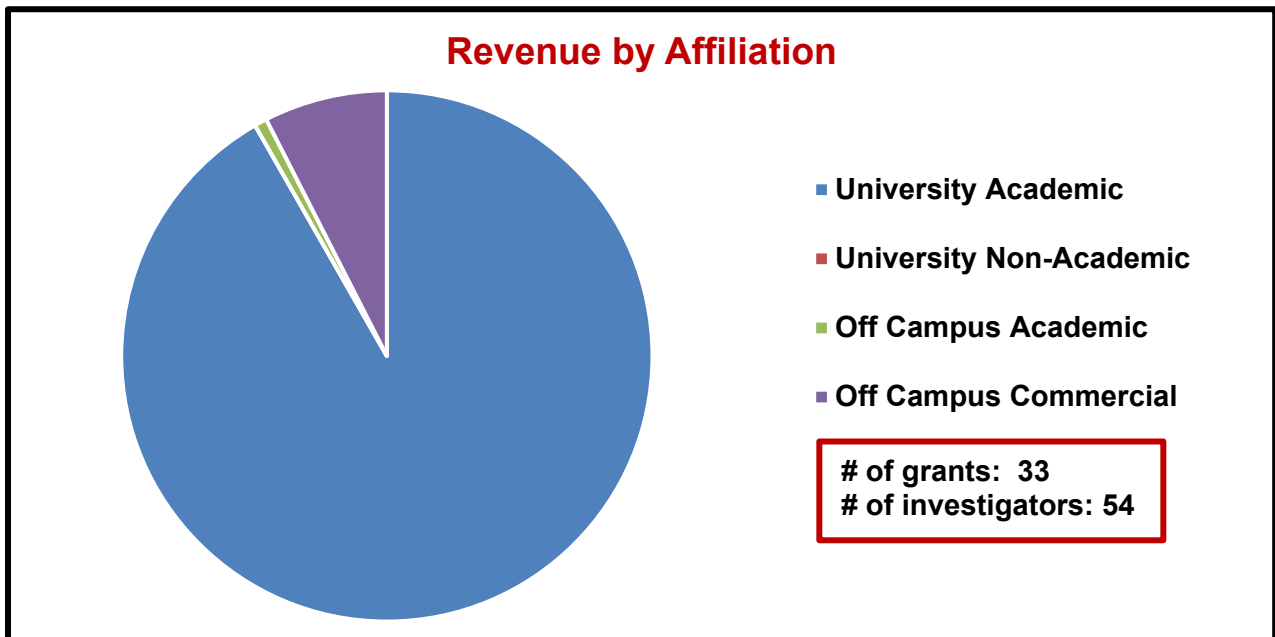


* Legend displays total annual revenue by year earned.

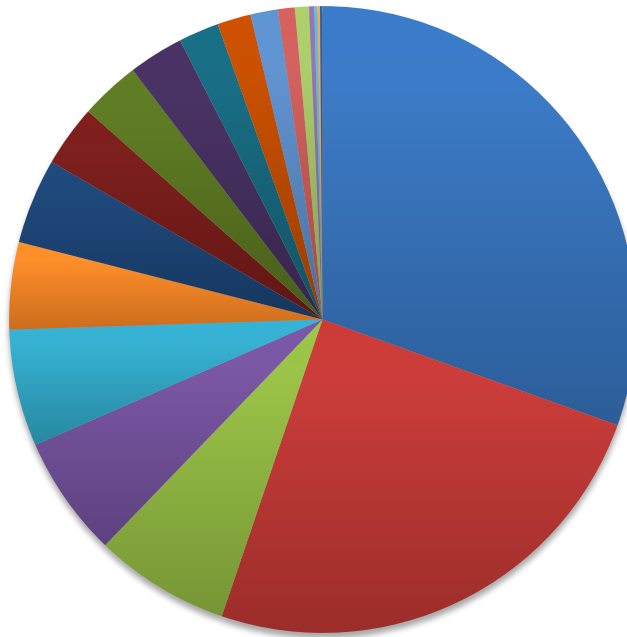
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



- Neurobiology
- HCI
- College of Health
- Pediatrics
- Surgery
- HSC Cores
- Pathology
- Ophthalmology & Visual Sciences
- Internal Medicine
- Biochemistry
- CVRTI
- Human Genetics
- Molecular Medicine
- Orthopaedics
- College of Pharmacy
- CTSI
- College of Engineering
- College of Science
- School of Dentistry

Top Users

1	Christopher Gregg	NIH
2	Shannon Buckley	NIH
3	Reina Bio	Off Campus Commercial
4	Alana Welm	Department, NIH
5	Michael Deans	Department
6	John Phillips	NIH
7	Bai Luo	Department
8	Josh Bonkowsky	Department
9	Adrienne Dorrance	Department
10	Wesley Sundquist	NIH

Collaboration and Support of Other HSC and University Facilities:

DNA Sequencing Facility

The MGD Core spent \$11,527 with the DNA Sequencing Core in FY24.

DNA Peptide Facility

The MGD Core spent \$4,238 with the DNA/Peptide Synthesis Core in FY24.

Drug Discovery Facility

During FY24 the MGD Core's partnership with the Drug Discovery Facility to produce genetically modified cell lines and to package viral vectors brought in 6 different projects totaling \$22,224 in chargebacks for that facility.

Mouse Transgenic Facility

During FY24 the MGD Core's partnership with the Mouse Transgenic Facility to produce custom mouse models brought in 22 different projects to the Mouse Transgenic Facility totaling \$82,909 in chargebacks for that facility.

Total FY24 chargeback impact of the MGD Core on other University Core Research facilities is \$120,898.

Non-billable Invoice Hours

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

Letters of Support

Written and provided to faculty and trainees for support of grant applications:

1. LOS for Dr. Yufeng Huang's grant: "EphB2 signaling in kidney fibrosis.", August 2023
2. LOS for Dr. Alex Shcheglovitov's proposal to establish the Utah Center for Comparative Neurogenomics genetically modified human stem cell lines., January 2024
3. LOS for Dr. Ben Christensen's grant: "Erectile Dysfunction Genetics and The Environment (EDGE): A Systems Biology Approach to ED.", February 2024
4. LOS for Dr. Adrienne Dorrance's RO1 application: "Unraveling the impact of mutated HSCs on the BM and immune microenvironment.", February 2024
5. LOS for Dr. Corrine Welt's R21 application: "The Genetics of Polycystic Ovary Syndrome (PCOS).", February 2024
6. LOS for Dr. Alejandro Sanchez's KCA Trailblazer award application: "Adaptation to fatty-acid excess in obesity leads to clear cell renal cell carcinoma initiation.", April 2024
7. LOS for Dr. Martin Golkowski's R01 application: "Multi-Level Control of Hepatocellular Carcinoma Plasticity by an Endocytic Kinase and Adapter Protein.", April 2024
8. LOS for Omid Tavakoli-Rouzbehani's F31 titled: "Deciphering PRDM16-Mediated Cardiac Metabolism by Targeting PERM1 for Therapeutic Intervention.", April 2024
9. LOS for Dr. My Helm's R21 application, June 2024
10. LOS for Dr. Dean Tantin's proposal: "Role of Oct4 redox regulation in reprogramming and development." June 2024

Publications

1. Goodrich, E. J. and M. R. Deans (2024). Emx2 lineage tracing reveals antecedent patterns of planar polarity in the mouse inner ear. *Development* 151(10).10.1242/dev.202425
2. Herstine, J. A et al (2024). Evaluation of safety and early efficacy of AAV gene therapy in mouse models of vanishing white matter disease. *Mol Ther* 32(6): 1701-1720.10.1016/j.ymthe.2024.03.034
3. Zimmerman, E., et al (2024). Aryl Hydrocarbon Receptor Activation in Pulmonary Alveolar Epithelial Cells Limits Inflammation and Preserves Lung Epithelial Cell Integrity. *J Immunol* 213(5): 600-611.10.4049/jimmunol.2300325

Nuclear Magnetic Resonance

Overview

Nuclear Magnetic Resonance (NMR) is a versatile and widely used research tool in medicine, chemistry, pharmacology, biochemistry, biology and many other fields. The NMR core supports research in synthetic chemistry, natural product characterization, drug discovery, and structural biology at the University of Utah. This support includes the departments of Medicinal Chemistry, Molecular Pharmaceutics, Pharmacology and Toxicology, Biochemistry, Bioengineering, and the Huntsman Cancer Institute. FY23 NMR publications are listed below. The NMR space at Room 50 BPRB and Room 2 Skaggs Hall is excellent. Major instrumentation includes three high-field NMR spectrometers (400, 500, and 600 MHz) and an HCN cryogenic probe. The hardware is driven with three dedicated Rocky Linux workstations loaded with software for data collection (VnmrJ), data processing and analysis (VnmrJ, Mnova, nmrPipe, and NMRFAM-SPARKY), structure calculation (XPLOR, ROSETTA, and CYANA), and visualization (PYMOL). We also provide NMR resources to regional universities and colleges, and not-for-profit and for-profit companies. During FY23 ~30% of chargeback revenue came from this group. The University of Utah is a full member of the Rocky Mountain NMR Consortium and we have access to the Colorado 900 MHz at Anschutz Medical Campus in Denver, Colorado. Jack Skalicky, HSC NMR Core Director and Associate Research Professor of Biochemistry, has many years of experience in protein biochemistry, structural biology, protein/small-molecule NMR spectroscopy, and management of the NMR core. Advanced NMR training and formal NMR courses are available.

Varian INOVA 600 MHz NMR spectrometer. This instrument is our work horse for NMR of proteins, peptides, natural products, and “small amount” samples. NMR training and advance reservation is required. Varian INOVA console with three full radio frequency (RF) channels, a dedicated ^2H decoupling accessory, and Z-axis PFG capability. Four probes, **1)** Varian Mark-2 5 mm triple resonance (^1H , ^{13}C , ^{15}N) cryogenic probe, Proton S/N is 4800/1, **2)** Nalorac 5 mm triple resonance (^1H , ^{13}C , ^{15}N) room temperature (RT) probe, **3)** Nalorac 8 mm triple resonance (^1H , ^{13}C , ^{15}N) RT probe, **4)** Nalorac 5 mm quad resonance (^1H , ^{13}C , ^{15}N , ^{31}P) RT probe.

Varian INOVA 500 MHz spectrometer. This instrument is used for NMR of chemistry, peptides, natural products, x-detection. NMR training and advance reservation is required. Varian INOVA console has three full radio frequency (RF) channels and dedicated ^2H decoupling accessory. Three probes with Z-axis PFG capability, **1)** 5 mm Nalorac triple resonance HCN (^1H , ^{13}C , ^{15}N) RT probe, **2)** 5 mm Nalorac triple resonance HXC ($^1\text{HX}=50\text{-}203\text{ MHz}$, ^{13}C), **3)** and a 3 mm Nalorac MDBG500 Dual Broadband ($^1\text{H}/^{19}\text{F}$, X=50-203 MHz).

Varian MERCURY 400 MHz spectrometer. Console with three full RF channels. Equipped with 4NG400-5+ 5 mm four nuclei (^1H , ^{19}F , ^{31}P , ^{13}C) RT probe with PFG capability and direct detection of ^1H , ^{13}C , ^{19}F , and ^{31}P . NMR training and advance reservation is required.

Rocky Mountain NMR Consortium Varian 900 MHz NMR spectrometer. We are full members of the Rocky Mountain NMR consortium and have access to a Varian DirectDrive 900 housed at University of Colorado Anschutz Medical Campus in Denver. This instrument is “fully loaded” and includes four complete RF channels, XYZ-axis Pulsed Field Gradient, and salt-tolerant and carbon-enhanced triple resonance cryogenic probe. Remote data collection is through a secure network portal. The instrument is used primarily for NOESY and TROSY based experiments for protein structure determination. Proton signal/noise is 7500/1. Advance reservation is required. Director will coordinate with Colorado and lead the data collection.

Services

- NMR consultation
- NMR data collection and analysis
- NMR training for individuals and groups
- Full collaboration of NMR based projects
- Formal course in NMR spectroscopy

Equipment

- Varian Mercury 400 MHz NMR (University of Utah)
- Varian Inova 500 MHz NMR (University of Utah)
- Varian Inova 600 MHz NMR with HCN cryogenic probe (University of Utah)
- Varian DD2 900 MHz NMR with HCN cryogenic probe (University of Colorado Anschutz Medical Campus)

Personnel

- Jack Skalicky, Ph.D., NMR Core Director, Research Associate Professor of Biochemistry
- Derek Schlotfeldt, NMR technician

Advisory Board Committee

Last updates: July 2024.

- Darrell Davis Ph.D., Department of Medicinal Chemistry
- Eric Schmidt Ph.D. Department of Medicinal Chemistry
- Jaclyn Winter Ph.D., Department of Pharmacology and Toxicology
- Wesley Sundquist Ph.D., Department of Biochemistry
- Jessica Kramer Ph.D., Department of Bioengineering

FY24 Annual Update

New Equipment

- Rebuild of cryogenic CCC, purchase of rebuilt Helium Compressor and Cold Head
- Installation of openVnmrJ software on NMR spectrometers.

New Services

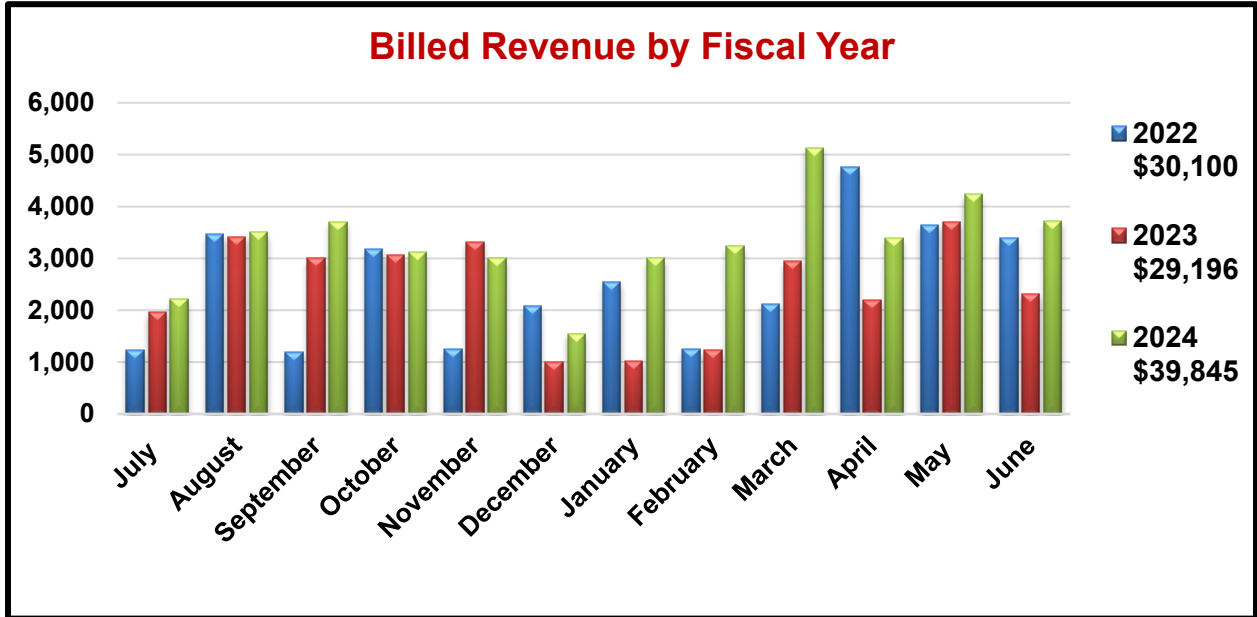
- The NMR Facility did not implement additional services in FY24

Revenues/Expenses

FY24 Expenses: Total \$119,244

FY24 Revenue: Total \$109,845

- VP of Health Sciences Support: \$70,000
- FY24 Revenue generated from services: \$39,845

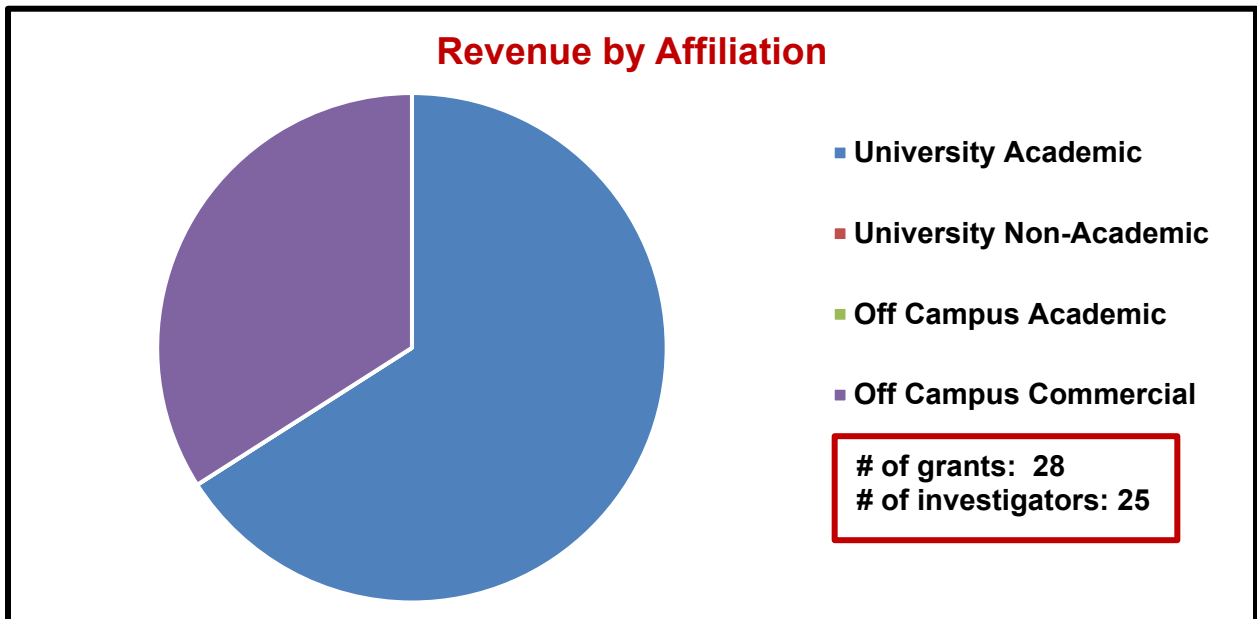


* Legend displays total annual revenue by year earned.

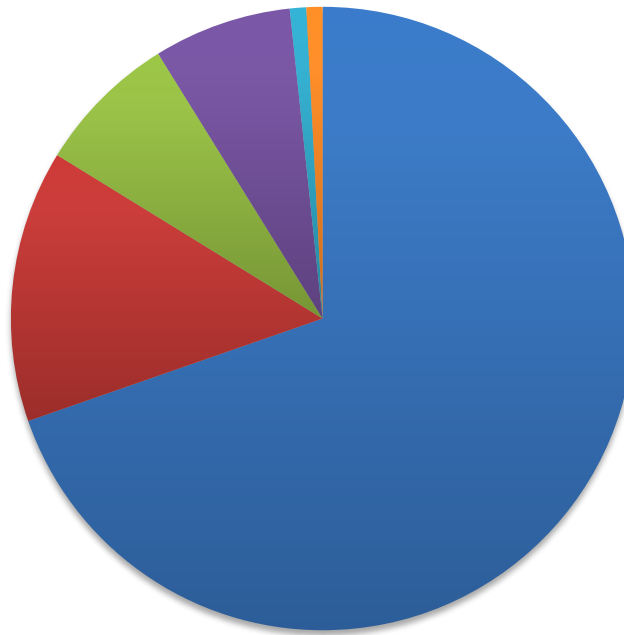
FY24 Scientific Impact

Research Support

Revenue Generated: (see charts following)



Revenue by Department



- College of Pharmacy
- HCI
- Biochemistry
- College of Engineering
- Radiology & Imaging Sciences
- PIVOT Center

Top Users

1	Eric Schmidt	NIH, NSF
2	Echelon Biosciences, Inc.	Off Campus Commercial
3	Raphael Franzini	NIH, Department
4	Jaclyn Winter	NIH
5	Gentex Corporation	Commercial
6	Merit Medical Systems	Commercial
7	Biolexis Therapeutics, Inc.	Commercial
8	Darrell Davis	Department
9	Wesley Sundquist	Department, NIH
10	Amy Barrios	NIH, NSF

Publications

1. Cui, G., L. Zhou, H. Liu, X. Qian, P. Yang, L. Cui, P. Wang, D. Li, J. M. Winter and G. Wu (2024). The Discovery of Acremochlorins O-R from an Acremonium sp. through Integrated Genomic and Molecular Networking. *J Fungi (Basel)* **10**(5).10.3390/jof10050365
2. Deleray, A. C., S. S. Saini, A. C. Wallberg and J. R. Kramer (2024). Synthetic Antifreeze Glycoproteins with Potent Ice-Binding Activity. *Chem Mater* **36**(7): 3424-3434.10.1021/acs.chemmater.4c00266
3. Hansen, D. T., N. J. Rueb, N. D. Levinzon, T. E. Cheatham, 3rd, R. Gaston, Jr., K. Tanvir Ahmed, S. Osburn-Staker, J. E. Cox, G. B. Dudley and A. M. Barrios (2024). The mechanism of covalent inhibition of LAR phosphatase by illudalic acid. *Bioorg Med Chem Lett* **104**: 129740.10.1016/j.bmcl.2024.129740
4. Heard, S. C., K. L. Diehl and J. M. Winter (2023). Biosynthesis of the fungal nonribosomal peptide penilumamide A and biochemical characterization of a pterin-specific adenylation domain. *RSC Chem Biol* **4**(10): 748-753.10.1039/d3cb00088e
5. Horvath, E. R. B., M. G. Stein, M. A. Mulvey, E. J. Hernandez and J. M. Winter (2024). Resistance Gene Association and Inference Network (ReGAIN): A Bioinformatics Pipeline for Assessing Probabilistic Co-Occurrence Between Resistance Genes in Bacterial Pathogens. *bioRxiv*.10.1101/2024.02.26.582197
6. Khurana, N., K. Watkins, D. Ghatak, J. Staples, O. Hubbard, V. Yellepeddi, K. Watt and H. Ghandehari (2024). Reducing hydrophobic drug adsorption in an in-vitro extracorporeal membrane oxygenation model. *Eur J Pharm Biopharm* **198**: 114261.10.1016/j.ejpb.2024.114261
7. Kohout, V. R., Wardzala, C. L., and Kramer, J. R. (2023) Mirror Image Mucins and Thio Mucins with Tunable Biodegradation. *J Am Chem Soc*
8. Lacerna, N., 2nd, Y. Cong and E. W. Schmidt (2024). An Autocatalytic Peptide Cyclase Improves Fidelity and Yield of Circular Peptides In Vivo and In Vitro. *ACS Synth Biol* **13**(1): 394-401.10.1021/acssynbio.3c00645
9. Li, F., Z. Lin, P. J. Krug, J. L. Catrow, J. E. Cox and E. W. Schmidt (2023). Animal FAS-like polyketide synthases produce diverse polypropionates. *Proc Natl Acad Sci U S A* **120**(38): e2305575120.10.1073/pnas.2305575120
10. Lim, A. L., B. W. Miller, Z. Lin, M. A. Fisher, L. R. Barrows, M. G. Haygood and E. W. Schmidt (2023). Resistance mechanisms for Gram-negative bacteria-specific lipopeptides, turnercyclamycins, differ from that of colistin. *Microbiol Spectr* **11**(6): e0230623.10.1128/spectrum.02306-23
11. Lin, Z., F. Li, P. J. Krug and E. W. Schmidt (2024). The polyketide to fatty acid transition in the evolution of animal lipid metabolism. *Nat Commun* **15**(1): 236.10.1038/s41467-023-44497-0
12. Lin, Z., V. Agarwal, Y. Cong, S. A. Pomponi and E. W. Schmidt (2024). Short macrocyclic peptides in sponge genomes. *Proc Natl Acad Sci U S A* **121**(11): e2314383121.10.1073/pnas.2314383121
13. Major, M., C. S. Nervig, A. Gerland and S. C. Owen (2024). Surface-Available HER2 Levels Alone Are Not Indicative of Cell Response to HER2-Targeted Antibody-Drug Conjugate Therapies. *Pharmaceutics* **16**(6).10.3390/pharmaceutics16060752
14. Marsh, M. C. and S. C. Owen (2023). Therapeutic Fusion Proteins. *AAPS J* **26**(1): 3.10.1208/s12248-023-00873-8
15. McPartlon, T. J., C. T. Osborne and J. R. Kramer (2024). Glycosylated Polyhydroxyproline Is a Potent Antifreeze Molecule. *Biomacromolecules* **25**(6): 3325-3334.10.1021/acs.biomac.3c01462
16. Nguyen, J. and S. C. Owen (2024). Emerging Voices in Drug Delivery - Breaking Barriers (Issue 1). *Adv Drug Deliv Rev* **208**: 115273.10.1016/j.addr.2024.115273
17. Scesa, P. D. and E. W. Schmidt (2023). Biomimetic Approach to Diverse Coral Diterpenes from a Biosynthetic Scaffold. *Angew Chem Int Ed Engl* **62**(39): e202311406.10.1002/anie.202311406
18. Scesa, P. D. and E. W. Schmidt (2024). Brewing coral terpenes-A yeast based approach to soft coral terpene cyclases. *Methods Enzymol* **699**: 373-394.10.1016/bs.mie.2024.03.023
19. Svatunek, D., K. Chojnacki, T. Deb, H. Eckvahl, K. N. Houk and R. M. Franzini (2023). Orthogonal Inverse-Electron-Demand Cycloaddition Reactions Controlled by Frontier Molecular Orbital Interactions. *Org Lett* **25**(34): 6340-6345.10.1021/acs.orglett.3c02265
20. Weigel, W. K., 3rd, A. L. Montoya and R. M. Franzini (2023). Evaluation of the Topology Space of DNA-Encoded Libraries. *J Chem Inf Model* **63**(15): 4641-4653.10.1021/acs.jcim.3c01008
21. You, W., A. L. Montoya, S. Dana, R. M. Franzini and C. Steegborn (2024). Elucidating the Unconventional Binding Mode of a DNA-Encoded Library Hit Provides a Blueprint for Sirtuin 6 Inhibitor Development. *ChemMedChem*: e202400273.10.1002/cmdc.202400273

POWDER

Overview

POWDER is an end-to-end platform for conducting research on mobile wireless networks. With equipment distributed across the University of Utah campus, POWDER provides radios that are programmable down to the waveform, attached to a network that can be configured by the user, connected to a wide variety of compute, storage, and cloud resources. Each wireless base station in POWDER includes a number of SDRs, an RF front end and antennas, a complement of control hardware for managing and accessing the devices, and a fiber connection to a near-edge compute cluster. Specialized massive multi-input multi-output (mMIMO) base stations consist of SDRs and antennas in a dedicated configuration to support mMIMO research. In addition to base stations, POWDER provides both fixed-location and mobile (shuttle-based) wireless endpoints with SDR, RF, and control resources similar to that found at the base stations. While most of POWDER's wireless sites are outdoors, POWDER includes an indoor lab for performing more controlled and smaller-scale wireless experiments. Researchers can use the POWDER platform to build their own wireless networks, using existing protocols or technologies (such as 4G, 5G, and MIMO), up-and-coming ones (such as massive MIMO), or new ones that they invent and build from the ground up. In this environment, they can experiment with novel networks, devices, and applications.

Services

POWDER provides researchers with remote, over-the-Internet access to equipment, software, configurations, and data for carrying out experiments. A user begins an experiment by visiting POWDER's web portal and provisioning a "slice" of the facility. The researcher interacts with the resources in that slice via standard Internet tools and protocols to orchestrate and conduct experiments. POWDER staff provide training and assistance to users of the facility: e.g., design expertise, on-site equipment management, and problem diagnosis and resolution.

Equipment

- 8 rooftop base stations
- 6 "dense deployment" (lamppost) base stations
- 3 massive MIMO rooftop base stations and 4 clients
- 10 fixed-location wireless endpoints
- 17 mobile wireless endpoints
- 2 portable wireless endpoints
- front-haul fiber network and near-edge compute: CWDM + 19 compute servers + GPU
- metro cloud (Emulab/CloudLab): 100s of compute servers
- indoor over-the-air laboratory: 4 base station-class radios + 4 endpoint-class radios
- indoor controlled RF environment: 8 radios + programmable wired RF switching fabric
- RF bench: 2 directly wired radio pairs

Personnel

- Jacobus Van der Merwe, PhD, PI and Director
- Eric Eide, PhD, Co-PI
- Neal Patwari, PhD, Co-PI
- Robert Ricci, PhD, Co-PI
- Kirk Webb, MS, Associate Director
- Jonathon Duerig, BS, Research Associate
- Mike Hibler, MS, Systems Programmer
- David M. Johnson, MS, Research Associate
- Dustin Maas, PhD, Research Associate
- Alex Orange, BS, Research Associate
- Leigh Stoller, MS, Systems Programmer
- Gary Wong, MS, Research Associate
- Sam Zachary, BS, Technician

Advisory Board Committee

Last meeting date: March 10, 2022.

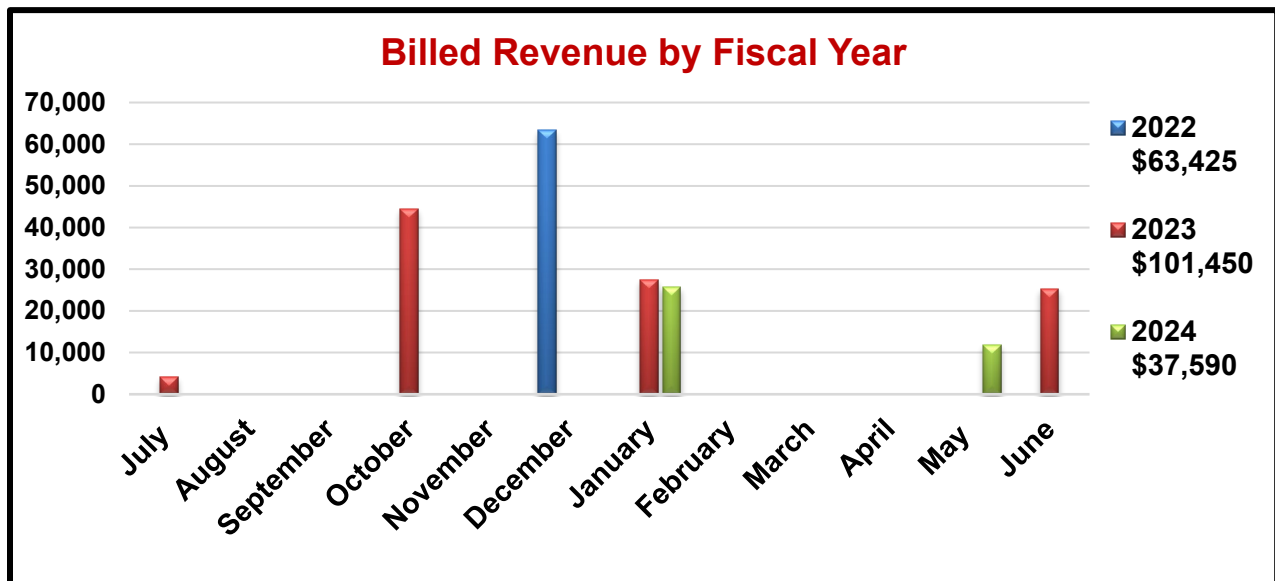
- Suman Banerjee, PhD, Professor, University of Wisconsin-Madison
- Arup Bhuyan, PhD, Technical Director, Idaho National Laboratory
- David DeTienne, PhD, Principal Engineer, Raytheon Technologies
- Monisha Ghosh, PhD, Professor, University of Notre Dame
- Raymond Knopp, PhD, Professor, EURECOM
- Zhi-Li Zhang, PhD, Professor, University of Minnesota
- Lin Zhong, PhD, Professor, Yale University

Revenue/Expenses

FY24 Expenses: Total \$91,514

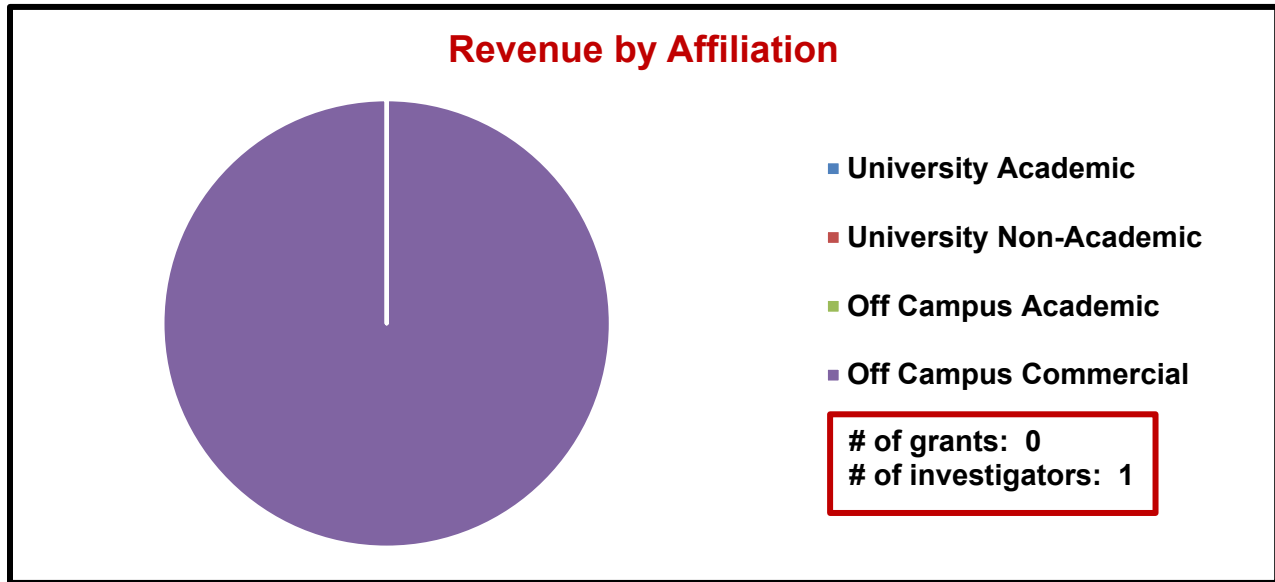
FY24 Revenue: Total \$37,590

- VP of Health Sciences Support: \$ 0
- FY24 revenue generated from services: \$37,590



* Legend displays total annual revenue by year earned.

**FY24 Scientific Impact
Research Support**
Revenue Generated (see charts following):



Top Users

1	O-Ran Alliance	Off Campus Commercial
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Publications

1. Chuprov, S., Zatsarenko, R., Korobeinikov, D., Reznik, L. (2024, May). Robust training on the edge: Federated vs. transfer learning for computer vision in intelligent transportation systems. In *2024 IEEE World AI IoT Congress (AlloT)* (pp. 172–178). 10.1109/AlloT61789.2024.10578970
2. Jeng, C. (2023). *WATCH: A distributed clock time offset estimation tool on the Platform for Open Wireless Data-Driven Experimental Research* (Master’s thesis, Washington University in St. Louis, St. Louis, MO). 10.7936/2czs-1e96
3. Johnson, D., D. Maas, S. Tadik, A. Orange, L. Stoller, K. Webb, M. Awan, J. Bills, M. Gomez, A. Sarbhai, G. Durgin, S. Kasera, N. Patwari, D. Schurig and J. Merwe (2024). PowDER-RDZ: Prototyping a Radio Dynamic Zone using the POWDER platform.10.1109/DySPAN60163.2024.10632848
4. Mitchell, F. B., Wang, J., Kasera, S. K., Bhaskara, A. (2024, May). Utilizing confidence in localization predictions for improved spectrum management. In *IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN)*.
5. Sarbhai, A., Mitchell, F. B., Kasera, S. K., Bhaskara, A., Van der Merwe, J. E., Patwari, N. (2024, May). Reactive spectrum sharing with radio dynamic zones. In *IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN)*.
6. Tadik, S., K. M. Graves, M. A. Varner, C. R. Anderson, D. M. Johnson, S. K. Kasera, N. Patwari, J. V. d. Merwe and G. D. Durgin (2024). Digital Spectrum Twins for Enhanced Spectrum Sharing and Other Radio Applications. *IEEE Journal of Radio Frequency Identification* 8: 376-391.10.1109/JRFID.2023.3327212
7. Tyler, J. H., M. K. M. Fadul and D. R. Reising (2023). Considerations, Advances, and Challenges Associated with the Use of Specific Emitter Identification in the Security of Internet of Things Deployments: A Survey. *Information* 14(9): 479
8. West, R. W. and J. V. d. Merwe (2023). dNextG: A Zero-Trust Decentralized Mobile Network User Plane. *Proceedings of the 19th ACM International Symposium on QoS and Security for Wireless and Mobile Networks*. Montreal, Quebec, Canada, Association for Computing Machinery: 15–24.10.1145/3616391.3623427

Preclinical Imaging Facility

Overview

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

Services

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

7.1 T Preclinical MRI system

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

CT/PET/SPECT Scanners

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

MSOT Scanner

- In-vivo molecular imaging
- Uses fluorescent excitation of molecular tracers or endogenous hemoglobin with ultrasound signal transduction to create real-time images and video of blood flow, perfusion, and oxygenation

Equipment

- 7 Tesla Bruker BioSpec MRI Scanner
- Siemens Inveon CT/PET/SPECT
- iThera MSOT Multispectral Opto-Acoustic Tomography

Personnel

- Edward Hsu, Ph.D., Director
- Sixiang Shi, Ph.D., Associate Director, Radioimaging
- E.K. Jeong, Ph.D., Associate Director, MRI
- Stewart Yeoh, Ph.D., Manager
- Tyler Slater, Research Assistant

Advisory Board Committee

Last meeting date: July 9, 2024

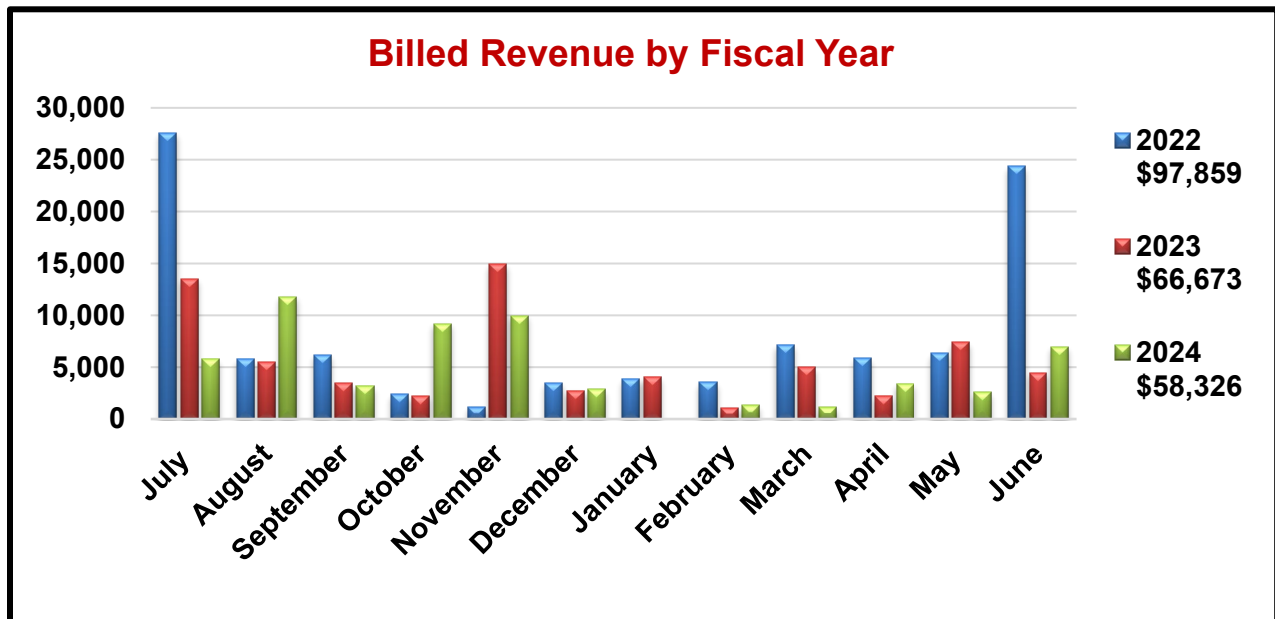
- Rob MacLeod Ph.D., Professor, Bioengineering/SCI/CVRTI
- Satoshi Minoshima, M.D., Ph.D., Professor, Chair, Radiology
- James E. Cox, Ph.D., Research Associate Professor, Biochemistry
- Donna Cross Ph.D., Associate Professor, Radiology

Revenue/Expenses

FY24 Expenses: Total \$226,362

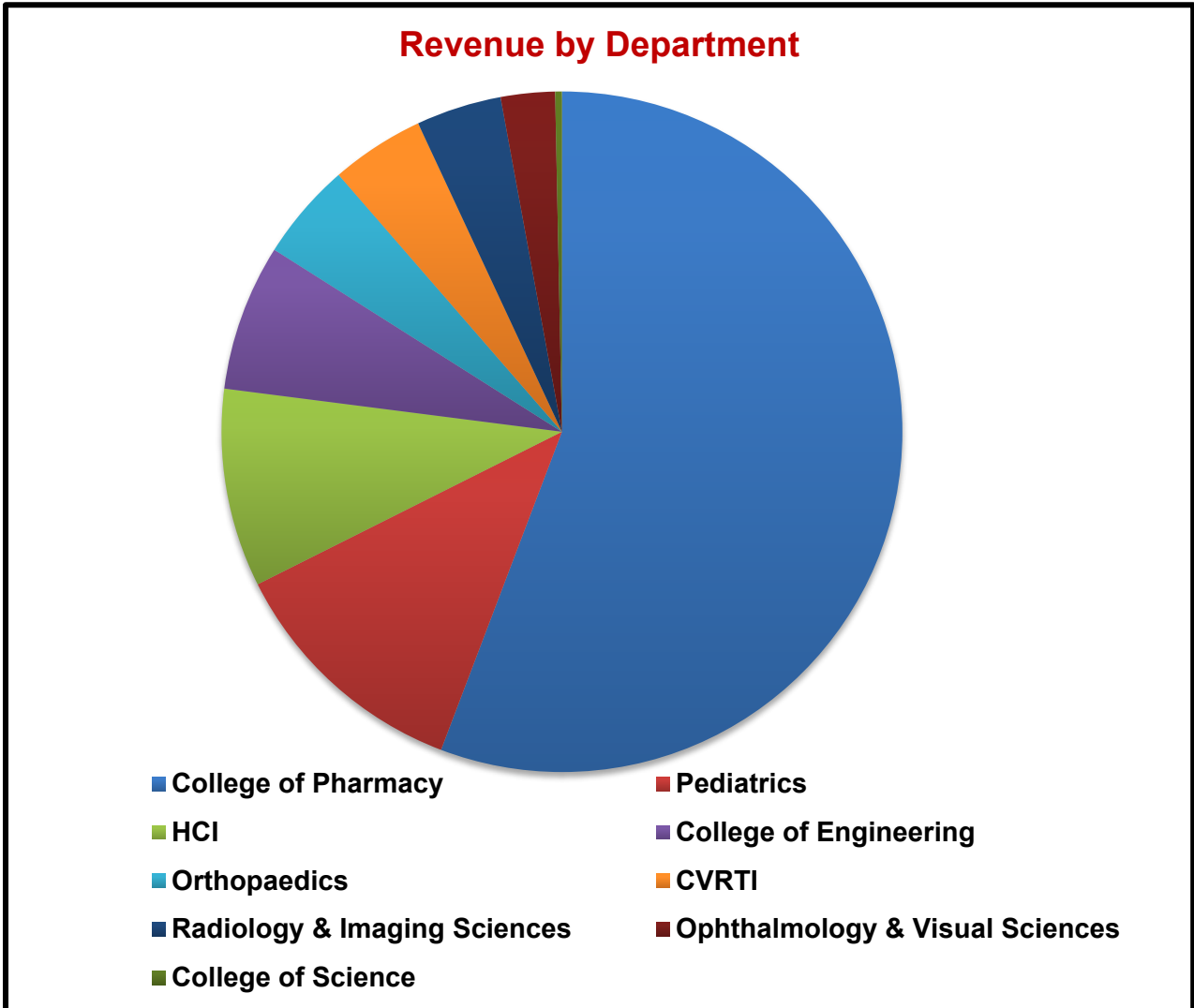
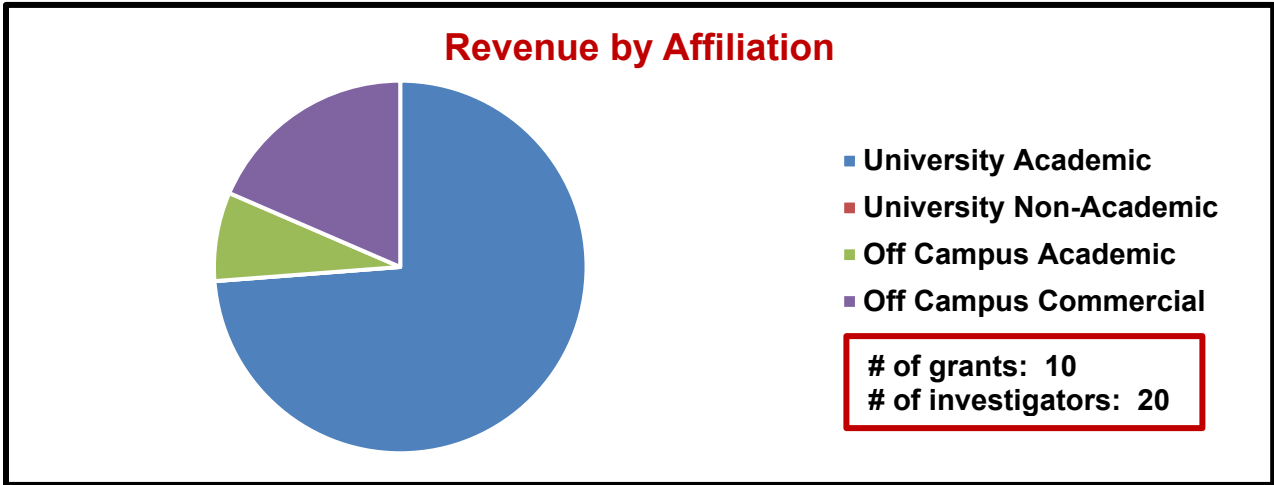
FY24 Revenue: Total \$213,326

- VP of Health Sciences Support: \$120,000
- VP of Research Support: \$35,000
- FY24 Revenue generated from services: \$58,326



* Legend displays total annual revenue by year earned.

**FY24 Scientific Impact
Research Support
Revenue Generated (see charts following)**



Top Users

1	Rock Microscopy LLC	Commercial
2	Micah Drummond	Department
3	Katsuhiko Funai	NIH
4	Hamid Ghandehari	University of Utah Research Foundation
5	Michelle Schober	NIH
6	Kevin Jones	Department
7	Michele Ebright Breitenbeker	Department
8	Ravi Ranjan	Nora Eccles Treadwell Foundation
9	Utah State University	Off Campus Educational
10	Sixiang Shi	University of Utah Research Foundation, Department

Publications

1. Cornelssen, C., A. Payne, D. L. Parker, M. Alexander, R. Merrill, S. Senthilkumar, J. Christensen, K. S. Wilcox, H. Odeen and J. D. Rolston (2024). Development of an MR-Guided Focused Ultrasound (MRgFUS) Lesioning Approach for the Fornix in the Rat Brain. *Ultrasound Med Biol* **50**(6): 920-926.10.1016/j.ultrasmedbio.2024.02.018
2. Herstine, J. A., P. K. Chang, S. Chorny, T. J. Stevenson, A. C. Sunshine, K. Nokhrina, J. Rediger, J. Wentz, T. A. Vetter, E. Scholl, C. Holaway, N. K. Pyne, A. Bratasz, S. Yeoh, K. M. Flanigan, J. L. Bonkowsky and A. M. Bradbury (2024). Evaluation of safety and early efficacy of AAV gene therapy in mouse models of vanishing white matter disease. *Mol Ther* **32**(6): 1701-1720.10.1016/j.ymthe.2024.03.034
3. Thomas, W. M., S. A. Zuniga, I. Sondh, M. Leber, F. Solzbacher, T. Lenarz, H. H. Lim, D. J. Warren, L. Rieth and M. E. Adams (2024). Development of a feline model for preclinical research of a new translabyrinthine auditory nerve implant. *Front Neurosci* **18**: 1308663.10.3389/fnins.2024.1308663

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 (USAI) 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 and chart review products help machines and subject matter experts mark-up and abstract data for classification. Natural Language Processing (NLP) processes text data to extract structured data to infer concepts that can be understood by machines and humans for further analysis. USAI's annotation and chart review 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 parts 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. Natural language processing algorithms can help automate the identification of relevant clinical data from the medical record. Data science and machine learning are new areas that expand the capability from traditional statistical modeling. USAI provides Enterprise Architecture and Application Development and has developed tools to improve efficiency and outcomes in health services research, reduces the costs to researchers. 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
- Data Science and Machine Learning
- Enterprise Architecture and Application Development

Consultation is provided 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.

FY25 Goals

USAI has lost some key members of our natural language processing, data and analytics, and data science and machine learning service lines to companies in the technology and healthcare industries. We have been working on recruitment. In addition, we have made great advances in designing the next generation chart review tool, called Abstract, and new methods for probabilistic phenotyping that are ongoing. We have also implemented transformer models into our Natural Language Processing team and are planning how to incorporate Large Language Models in FY24.

Specialized Software

Chart Review

- eHOST
- ChartReview
- Abstract

Natural Language Processing

- Leo
- Chex
- MedSpaCy

Clinical Trial Management

- ProjectFlow

Data Exploration and Visualization

- OHDSI Atlas

Personnel

- Patrick Alba, NLP Analyst
- Siamack Ayandeh, Research Associate
- Lacy Castleton, Clinical Annotator
- Amy Cox, Clinical Annotator
- Scott L DuVall, PhD, Director
- Jeffrey Ferraro, Data Science Lead
- Qiwei Gan, NLP Analyst
- Brent Hill, Annotation Manager
- Mengke Hu, NLP Analyst
- Cassandra Jacobson, Clinical Annotator
- David Kotter, Clinical Annotator
- Chris Ledding, Financial Analyst
- Qingzhu Liu, Software Designer and Programmer
- Julie A Lynch, PhD, Adjunct Professor
- Tiffany Quilter, Clinical Annotator
- Della Richter, Operations Manager
- Hamid Saoudian, Enterprise Architect
- Ramana Seerapu, IT Project Manager
- Jianlin Shi, Research Assistant Professor
- Johnathan Stanley, NLP Analyst
- Denise Stone, Clinical Annotator
- Shaoyu Su, Software Designer and Programmer
- Alexis Tabish, Clinical Annotator
- Craig Teerlink, Research Assistant Professor
- Bin Yu, Software Designer and Programmer

Management Meeting

Last meeting date: We meet weekly on Wednesday afternoons.

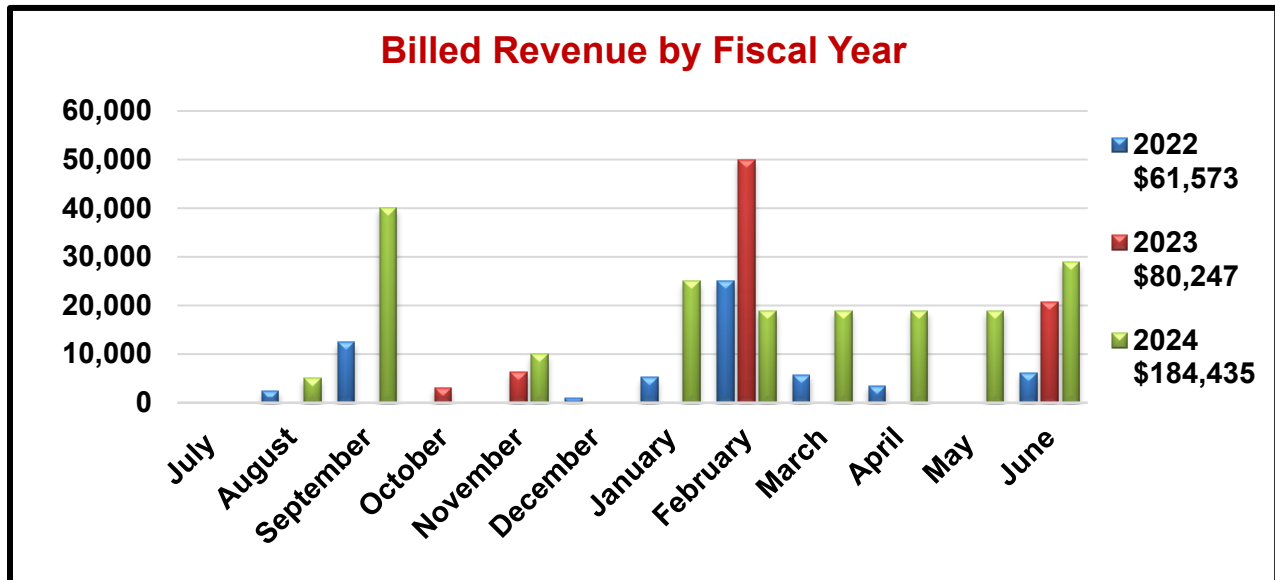
- Scott L DuVall, PhD, Director
- Christopher Ledding, MBA, Financial Analyst

Revenue/Expenses

FY24 Expenses: **\$96,332**

FY24 Revenue: **\$184,435**

- VP of Research Support: \$0
- Revenue generated from services: \$184,435

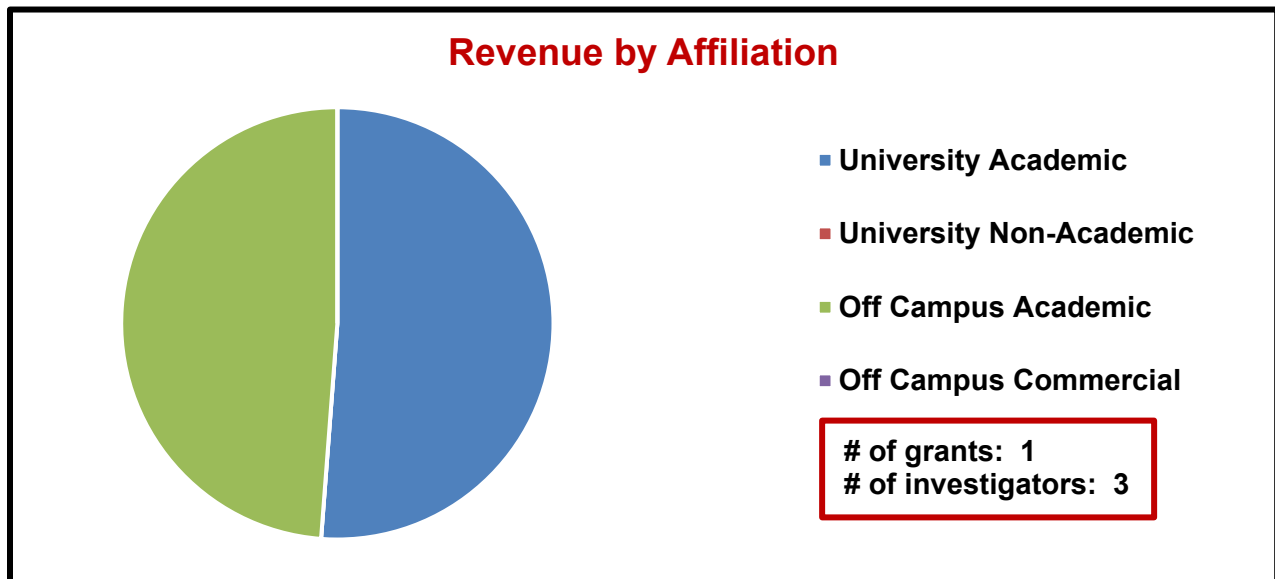


* Legend displays total annual revenue earned (not collected) by fiscal year.

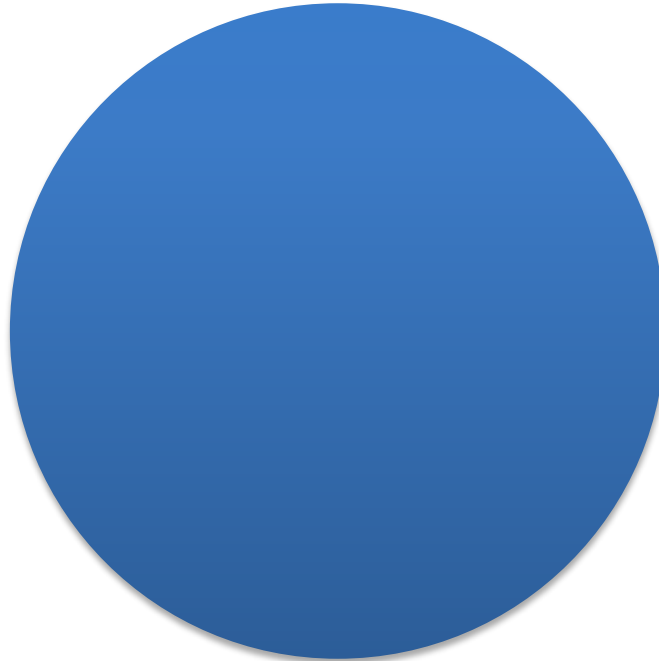
FY24 Scientific Impact

Research Support

Revenue Generated (see charts):



Revenue by Department



■ Internal Medicine

Top Users

1	Scott DuVall	Parexcel
2	University of Pennsylvania	Off Campus Academic
3	Univ California San Francisco	Off Campus Academic

Publications

- Adkar, S., J. Lynch, S. Bamezai, S. Sorondo, R. Choi, M. Levin, S. M. Damrauer, S. Pyarajan, P. S. Tsao, S. Skirboll, N. J. Leeper and D. Klarin (2023). Abstract 250: Genome-wide Association Study Of Intracranial Aneurysms Reveals Shared Heritability With Aortic Aneurysms And Atherosclerosis. Arteriosclerosis, Thrombosis, and Vascular Biology **43**(Suppl_1): A250-A250.10.1161/atvb.43.suppl_1.250
- Adkar, S., j. lynch, S. Bamezai, S. Sorondo, R. Choi, J. Cabot, M. Levin, S. M. Damrauer, S. Pyarajan, P. S. Tsao, S. Skirboll, N. J. Leeper and D. Klarin (2023). Abstract 15566: Dissecting the Genetic Architecture of Intracranial Aneurysms. Circulation **148**(Suppl_1): A15566-A15566.10.1161/circ.148.suppl_1.15566
- Alba, P. R., Q. Gan, M. Hu, S. H. Zhu, S. E. Sherman, S. L. DuVall and M. Conway (2024). Development of a Natural Language Processing System to Identify Clinical Documentation of Electronic Cigarette Use. Stud Health Technol Inform **310**: 659-663.10.3233/SHTI231047
- Bowles, A., C. Perez, A. Vachani, J. Steltz, B. Rose, A. K. Bryant, H. Eyre, S. L. DuVall, J. A. Lynch and P. R. Alba (2024). An NLP Framework for the Extraction of Concept Measurements from Radiology and Pathology Notes. Stud Health Technol Inform **310**: 1446-1447.10.3233/SHTI231237

5. Cai, C. X., A. Nishimura, M. G. Bowring, E. Westlund, D. Tran, J. H. Ng, P. Nagy, M. Cook, J. A. McLeggon, S. L. DuVall, M. E. Matheny, A. Golozar, A. Ostropelets, E. Minty, P. Desai, F. Bu, B. Toy, M. Hribar, T. Falconer, L. Zhang, L. Lawrence-Archer, M. V. Boland, K. Goetz, N. Hall, A. Shoaibi, J. Reys, A. G. Sena, C. Blacketer, J. Swerdel, K. D. Jhaveri, E. Lee, Z. Gilbert, S. L. Zeger, D. C. Crews, M. A. Suchard, G. Hripcsak and P. B. Ryan (2024). Similar Risk of Kidney Failure among Patients with Blinding Diseases Who Receive Ranibizumab, Aflibercept, and Bevacizumab: An Observational Health Data Sciences and Informatics Network Study. *Ophthalmol Retina* **8**(8): 733-743.10.1016/j.oret.2024.03.014
6. Candelieri-Surette, D., A. Hung, J. A. Lynch, K. M. Pridgen, F. Y. Agiri, W. Li, H. Aggarwal, T. Anglin-Foote, K. M. Lee, C. Perez, S. Reed, S. L. DuVall, Y. N. Wong and P. R. Alba (2023). Development and Validation of a Tool to Identify Patients Diagnosed With Castration-Resistant Prostate Cancer. *JCO Clin Cancer Inform* **7**: e2300085.10.1200/CCI.23.00085
7. Chanfreau-Coffinier, C., K. A. Friede, M. E. Plomondon, K. M. Lee, Z. Lu, J. A. Lynch, S. L. DuVall, J. L. Vassy, S. W. Waldo, J. H. Cleator, T. M. Maddox, D. J. Rader, T. L. Assimes, S. M. Damrauer, P. S. Tsao, K. M. Chang, D. Voora, J. Giri and S. Tuteja (2023). CYP2C19 Polymorphisms and Clinical Outcomes Following Percutaneous Coronary Intervention (PCI) in the Million Veterans Program. *medRxiv*.10.1101/2023.10.25.23297578
8. Chang, N. N., C. Chanfreau-Coffinier, J. Bates, S. Tuteja, T. R. Anglin, V. R. Moore, J. Hou, A. Waljee, K. M. Pridgen, D. W. Oslin, D. Voora, S. L. DuVall, F. E. Cunningham and J. A. Lynch (2023). Pharmacogenetic testing and monitoring of complete blood counts among Veterans newly prescribed thiopurine treatments: a retrospective cohort study. *J Pharm Policy Pract* **16**(1): 166.10.1186/s40545-023-00657-7
9. Cogill, S., S. Nallamshetty, N. Fullenkamp, K. Heberer, J. Lynch, K. M. Lee, M. Aslan, M. C. Shih and J. S. Lee (2024). Predicting clinical outcomes of SARS-CoV-2 infection during the Omicron wave using machine learning. *PLoS One* **19**(4): e0290221.10.1371/journal.pone.0290221
10. Davis, S., A. Liu, D. Lapato, C. Teerlink, A. Gentry, E. Lancaster, M. Singh, G. Genovese, B. Gorman, T. Bigdeli, J. Lynch, J. Ross, A. Ganna, R. Hauger and R. Peterson (2023). 47. UNVEILING THE HIDDEN HEALTH RISKS: PHENOME-WIDE ASSOCIATIONS IN SEX CHROMOSOME TRISOMIES FROM THREE INTERNATIONAL COHORTS. *European Neuropsychopharmacology* **75**: S80-S81.<https://doi.org/10.1016/j.euroneuro.2023.08.153>
11. Davis, S. M., C. Teerlink, J. A. Lynch, B. R. Gorman, M. Pagadala, A. Liu, M. S. Panizzon, V. C. Merritt, G. Genovese, S. Pyarajan, J. L. Ross and R. L. Hauger (2023). Prevalence, Morbidity, and Mortality of 1,609 Men with Sex Chromosome Aneuploidy: Results from the Diverse Million Veteran Program Cohort. *medRxiv*.10.1101/2023.07.15.23292710
12. Davis, S. M., C. C. Teerlink, J. A. Lynch, N. Klamut, B. R. Gorman, M. S. Pagadala, M. S. Panizzon, V. C. Merritt, G. Genovese, J. L. Ross and R. L. Hauger (2024). An extra X chromosome among adult women in the Million Veteran Program: A more benign perspective of trisomy X. *Am J Med Genet C Semin Med Genet*: e32083.10.1002/ajmg.c.32083
13. Davis, S. M., C. Teerlink, J. A. Lynch, B. R. Gorman, M. Pagadala, A. Liu, M. S. Panizzon, V. C. Merritt, G. Genovese, J. L. Ross and R. L. Hauger (2024). Prevalence, Morbidity, and Mortality of Men With Sex Chromosome Aneuploidy in the Million Veteran Program Cohort. *JAMA Netw Open* **7**(3): e244113.10.1001/jamanetworkopen.2024.4113
14. Dornisch, A., R. Karunamuni, K. Maxwell, J. Lynch, I. Garraway, A. Kibel, C. Brunette, M. Danowski, K. M. Lee, S. DuVall, J. Gaziano, B. Rose, R. Hauger, J. Vassy and T. Seibert (2024). Abstract 4801: Clinical polygenic model to stratify risk of any, metastatic, and fatal prostate cancer in a randomized controlled trial of precision screening. *Cancer Research* **84**: 4801-4801.10.1158/1538-7445.AM2024-4801
15. DuVall, S. L., C. G. Parker, A. R. Shields, P. R. Alba, J. A. Lynch, M. E. Matheny and A. W. C. Kamauu (2024). Toward Real-World Reproducibility: Verifying Value Sets for Clinical Research. *Stud Health Technol Inform* **310**: 164-168.10.3233/SHTI230948
16. DuVall, S. L., J. A. Lynch, P. R. Alba, M. E. Matheny, M. A. Suchard, A. R. Shields, A. W. C. Kamauu, L. Glasser, C. Ferreira, S. Venkatesan, C. Talarico and S. Taylor (2023). 2292. Measuring Effectiveness against a Shifting Variant Landscape: COVID-19 Example in the Department of Veterans Affairs. *Open Forum Infectious Diseases* **10**(Supplement_2).10.1093/ofid/ofad500.1914
17. Eyre, H., P. R. Alba, C. J. Gibson, E. Gatsby, K. E. Lynch, O. V. Patterson and S. L. DuVall (2024). Bridging information gaps in menopause status classification through natural language processing. *JAMIA Open* **7**(1): o0ae013.10.1093/jamiaopen/o0ae013
18. Ghouse, J., et al(2024). Integrative common and rare variant analyses provide insights into the genetic architecture of liver cirrhosis. *Nat Genet* **56**(5): 827-837.10.1038/s41588-024-01720-y
19. Gulanski, B. I., J. L. Goulet, K. Radhakrishnan, J. Ko, Y. Li, N. Rajeevan, K. M. Lee, K. Heberer, J. A. Lynch, E. Streja, P. Mutalik, K. H. Cheung, J. Concato, M. C. Shih, J. S. Lee and M. Aslan (2024). Metformin prescription for U.S. veterans with prediabetes, 2010-2019. *J Investig Med* **72**(1): 139-150.10.1177/10815589231201141
20. Gupta, S., Chang, N. C. N., Stempniewicz, N., Tirupati, C. B. K., Coronado, G., Lynch, J. A., Hoge, C., Mulvihill, E., Gagner, J., & DuVall, S. L. (2023). 911. Burden of Herpes Zoster among Employed Adults in the Department of Veterans Affairs Health System. *Open Forum Infectious Diseases*, *10*(Suppl 2), ofad500.956. <https://doi.org/10.1093/ofid/ofad500.956>

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26. Lee, K. M., A. K. Bryant, J. A. Lynch, B. Robison, P. R. Alba, F. Y. Agiri, K. M. Pridgen, S. L. DuVall, K. Yamoah, I. P. Garraway and B. S. Rose (2024). Association between prediagnostic prostate-specific antigen and prostate cancer probability in Black and non-Hispanic White men. *Cancer* **130**(2): 224-231.10.1002/cncr.34979
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Small Animal Ultrasound Facility

Overview

The Small Animal Ultrasound Facility has VisualSonics Vevo 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 instruments 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 resolving the rapid heart rates of mice, 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 an 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 offline image analysis station is also available for later review and analysis of studies.

- Ultrasound imaging access
- Training in the 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

- Ying Li, MD, PhD, Director
- Xue Yin, Laboratory Technician

Advisory Board Committee

Last meeting date: April 15, 2013.

- Tingting Hong, MD, PhD, Associate Professor, College of Pharmacy
- Sihem Boudina, PhD, Associate Professor, Department of Nutrition and Integrative Physiology
- Joe Palatinus, MD, PhD, Assistant Professor, Internal Medicine

FY24 Annual Update

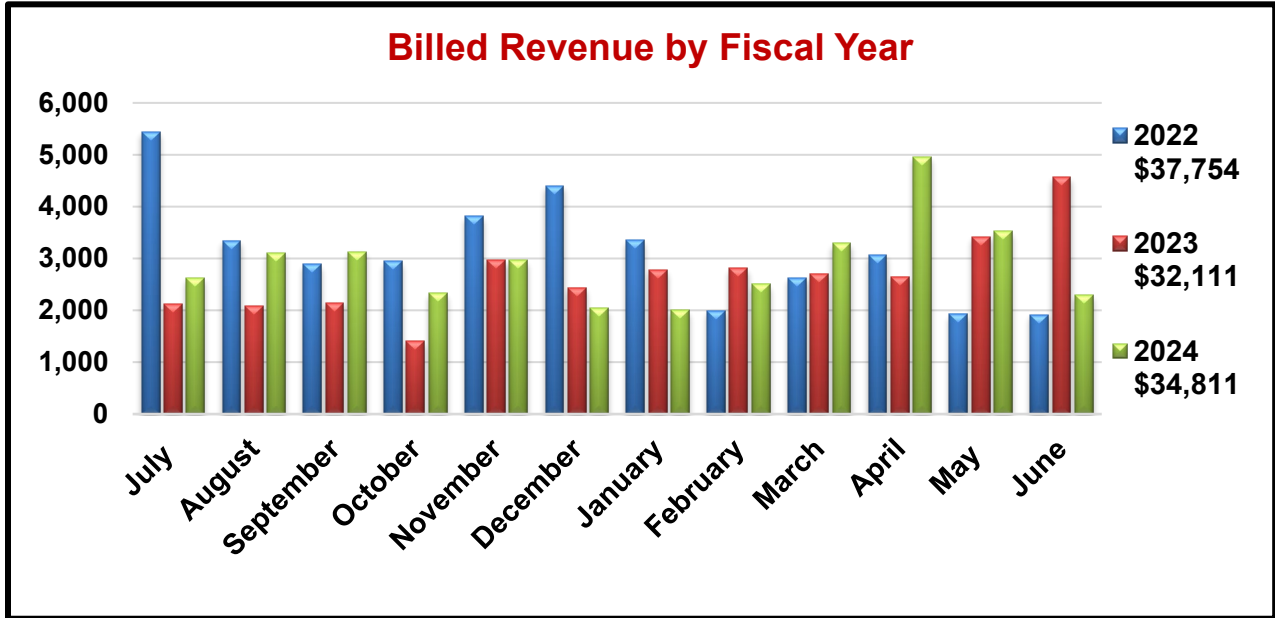
VisualSonics phased out the Vevo 2100 at the end of 2023. We are in the process of obtaining a Vevo F2 to replace it.

Revenue/Expenses

FY24 Expenses: Total \$91,323

FY24 Revenue: Total \$54,811

- VP of Health Sciences Support: \$20,000
- FY24 Revenue generated from services: \$34,811

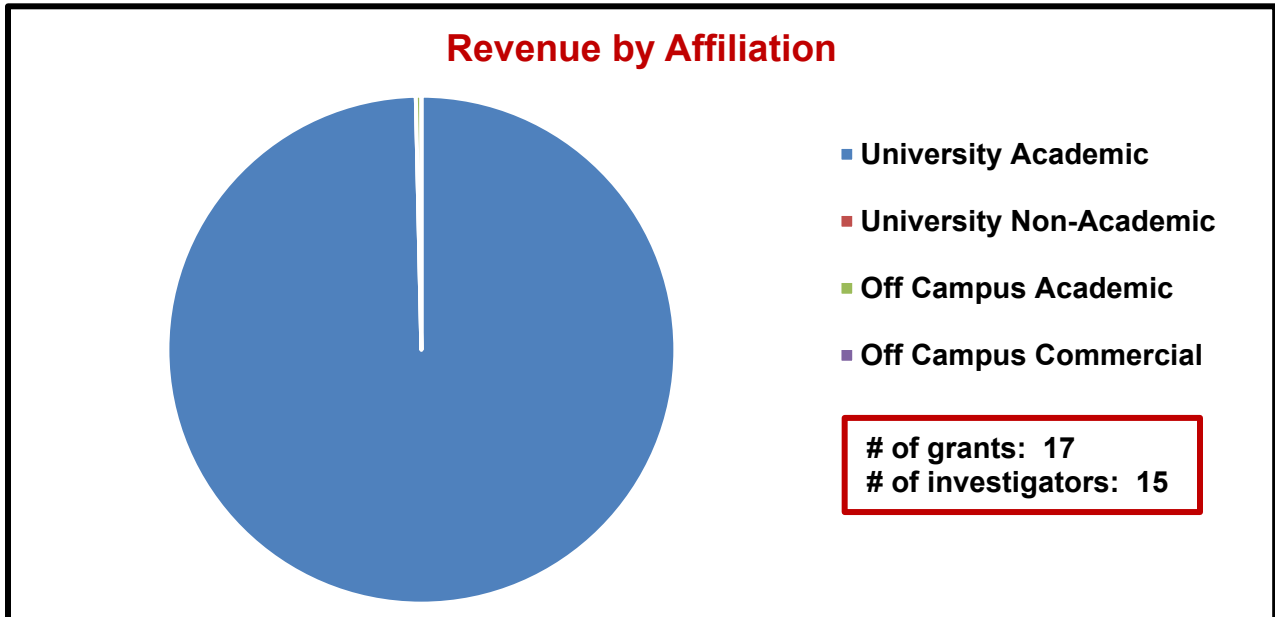


* Legend displays total annual revenue by year earned.

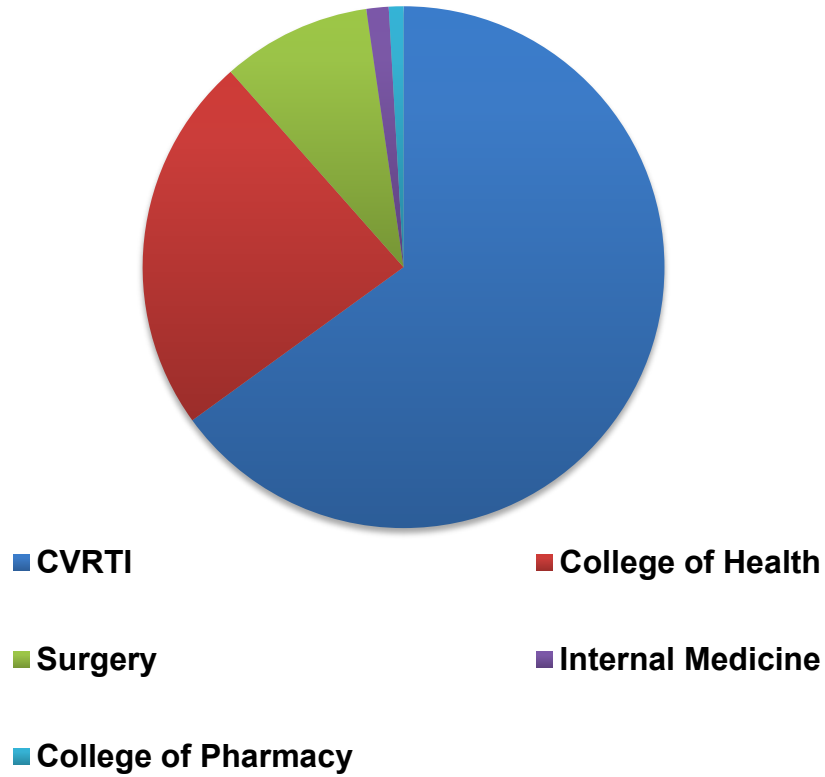
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



Top Users

1	Stavros Drakos	NIH, Nora Eccles Treadwell Foundation, VA
2	Robin Shaw	TikkunLev Therapeutics Inc., Department
3	Sihem Boudina	NIH, Department
4	Craig Selzman	Department
5	Scott Summers	NIH
6	Ademuyiwa Aromolaran	Nora Eccles Treadwell Foundation, NIH
7	William Holland	NIH
8	Joseph Palatinus	Department
9	Anthony Donato	NIH
10	Dipayan Chaudhuri	NIH

Publications

- Ghosh, R., et al (2024). Sequestosome 1 (p62) mitigates hypoxia-induced cardiac dysfunction by stabilizing hypoxia-inducible factor 1alpha and nuclear factor erythroid 2-related factor 2. *Cardiovasc Res* **120**(5): 531-547. [10.1093/cvr/cvae023](https://doi.org/10.1093/cvr/cvae023)
- Visker, J. R., et al (2024). Enhancing mitochondrial pyruvate metabolism ameliorates myocardial ischemic reperfusion injury. [bioRxiv.10.1101/2024.02.01.577463](https://doi.org/10.1101/2024.02.01.577463)

Software Development & Systems Design Core (SD2C)

Overview

The Software Development and Systems Design Core (SD2C) provides custom software and hardware development services to the greater University of Utah community. Formed from the Digital Health Initiative, the core specializes in design, development and deployment of early-stage, non-enterprise software services (digital games, applications, and tools) across the academic and industry spheres. The SD2C also works with prototyped hardware to design tailored software for data collection and analysis. The SD2C utilizes state-of-the-art technology and Agile processes across the entire software development lifecycle (see [SD2C Resources](#) for more information).

Uniqueness

The Software Development and System Design Core offers a valuable service often missing on research university campuses. Software design, development, and deployment is highly variable in scope and is typically initiated through one of four means in academia: 1) hiring project-specific software engineers, 2) working with intra/inter-institutional collaborators, 3) working with outside vendors, or 4) soliciting work from campus IT services. Each of these have several downsides; where they can be either expensive with little cost-benefit, lack in expertise, and/or drive vendor lock-in; risking IP rights to those outside the University ecosystem. The SD2C is uniquely positioned to solve these problems; by allowing for collaborative digital innovation with an expert team at competitive rates and ensuring a smooth transition for projects seeking commercialization or further development outside of the core.

Services

The mission of the SD2C is to provide technological excellence for the advancement of scientific research performed across campus. The SD2C has extensive expertise with the software development lifecycle with developers who have worked across both academic and industry environments. We specialize in early-stage, software/hardware integration across design, development, and deployment stages. We offer the following services:

- Custom database creation and deployment
- Tailored data analysis pipelines
- Automated data collection solutions
- VR/AR/XR game development
- Mobile app development
- Software & hardware integration
- Dynamic web development

FY24 Goals

- Increase awareness of our services
- Increase core efficiency and reduce turnaround time.

Major Tools

Software Design Tools:

- Kanboard, Notion, Adobe XD, Figma

Software Development Software

- Unity, MATLAB, JetBrains IDE (Python, C#, Javascript, CSS/HTML), Articy

Software Development Hardware

- Synology NAS1823xs+ server with upgraded Components
- Meta Quest 2, 3, Pro VR headsets
- Microsoft HoloLens headset
- Laptops with upgraded components for game development
- Mac Studio with upgraded components
- Android and Apple mobile devices and tablets

Software Cloud Deployment Access

- Google Cloud Platform
- Amazon Web Services
- Center for High Performance Computing (CHPC)

Personnel

- Andrew K. Moran, PhD (Director)
- Jared Slawski, MBA (Software Developer)
- Jonah Brooks, MA (Software Design Engineer)
- Jashpranav Shah, MS (Assoc. Software Design Engineer)
- You (Oscar) Zuo, MS (Assoc. Software Design Engineer)
- Junkai (Alex) Chen, MS (Assoc. Software Design Engineer)

Advisory Board Committee

Last meeting date: TBD

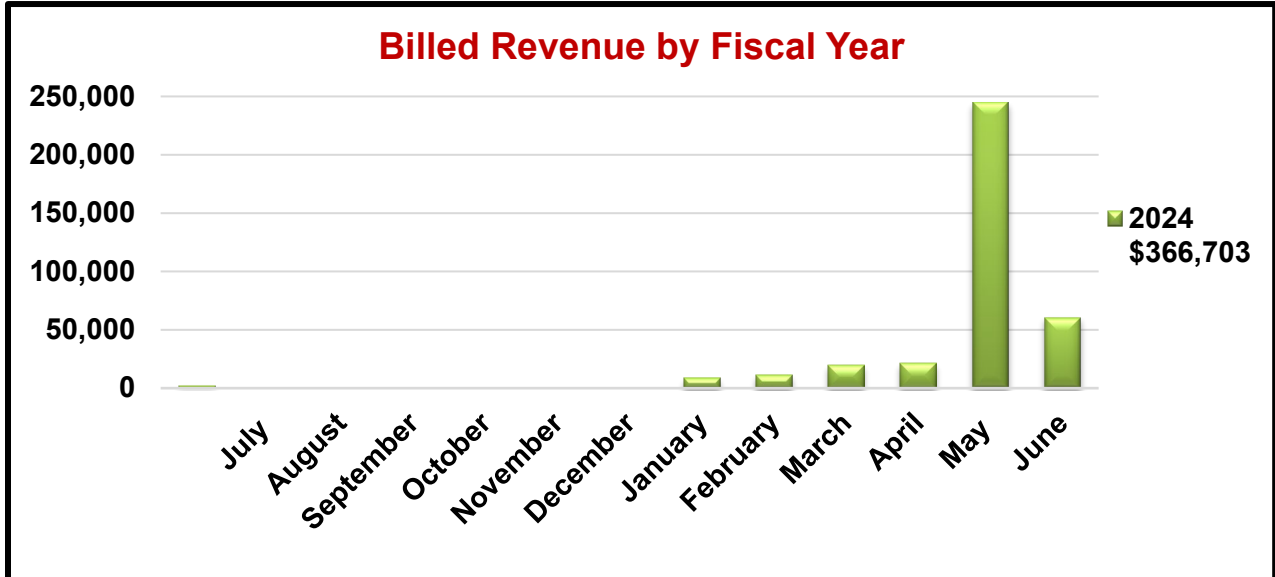
- Andrew K. Moran, PhD, HSC Cores
- Roger Altizer, PhD, Population Health Sciences
- Victoria Tiase, RN, PhD, Biomedical Informatics
- Angie Fagerlin, PhD, Population Health Sciences
- Greg Clark, PhD, Bioengineering

Revenue/Expenses

FY24 Total Expenses: \$316,689

FY24 Total Revenue: \$555,628

- SVPHS of Health Sciences: \$100,000
- Seed grant funding: \$88,925
- FY23 Revenue generated from services: \$366,703

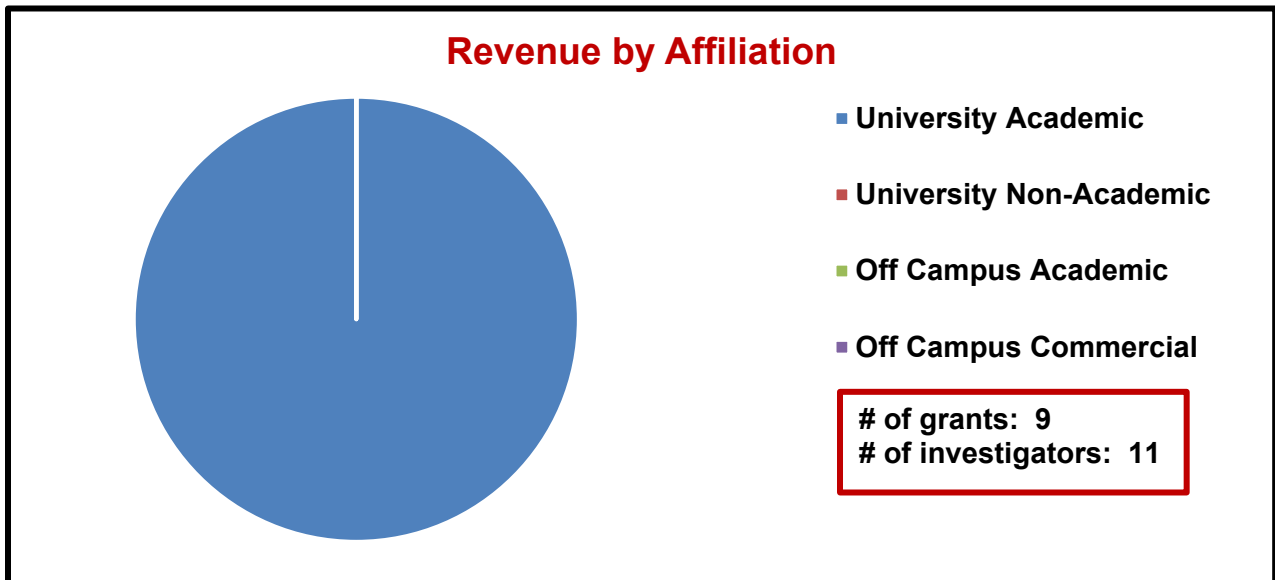


* Legend displays total annual revenue by year earned.

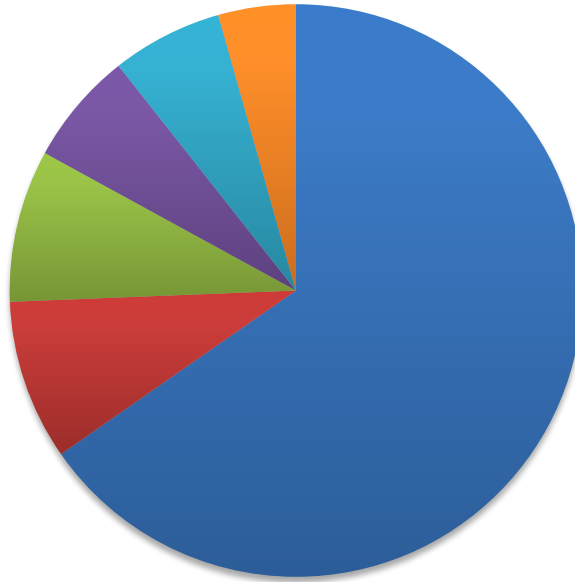
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



- College of Social Work
- College of Health
- SVPHS
- HSC Cores
- Population Health Sciences
- College of Nursing

Top Users

1	Chad McDonald	Department, Utah Department of Health, UCLA
2	Julie Fritz	Department
3	Rebecca Delaney	Health System Innovation and Research
4	Andrew Moran	Department
5	Jordan King	NIH
6	Andrea Wallace	Department
7	Shizuko Morimoto	Department, NIH
8	Lauri Linder	National Cancer Institute, Intramural
9	Alexandra Terrill	Craig H Neilsen Foundation, NIH
10	Rhonda Nelson	Department

Publications

No known publications acknowledged this facility in FY24.

Transgenic & Gene Targeting

Overview

The goal of the Transgenic & Gene Targeting (TG) Mouse Core Facility is to provide state of the art service and assistance in the field of mouse transgenesis and gene targeting. The TG Mouse Core develops gene targeting technology, possesses state of the art equipment, provides project consultation and assists in the execution of research to maintain a position as a leader in the field of mouse genetic modification.

Our main service is to generate transgenic and gene targeted mouse models for researchers. The TG Mouse Core uses CRISPR technology to generate knockout, knockin, and conditionally targeted alleles in mice. This method allows for the efficient and relatively inexpensive generation of mice with specific genetic mutations. Other services include conventional gene targeting of mouse ESCs (embryonic stem cells) followed by injection of targeted cells to produce germline chimeras, and production of traditional transgenic mice where the transgene is randomly inserted into the genome. In addition, the TG Mouse Core has expertise in mouse research procedures including embryo and sperm cryopreservation, *in vitro* fertilization (IVF), karyotyping of ESCs, rederivation of mice from frozen embryos and derivation of primary ESCs. Our facility consists of a cell culture hood, incubators, three microinjection stations for both pronuclear and blastocyst injections, a surgery area, and a mouse room for housing and breeding. The TG Mouse Core staff has a vast array of experience in the gene targeting and transgenic mouse field. Our lab works closely with University of Utah regulatory groups and is in compliance with strict IACUC and USDA guidelines.

Services

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

Equipment

- Nikon Eclipse Ti2 microinjection station, with fluorescence, CO₂, heating/cooling stage
- Leica Dmi8 microinjection stations (2)
- Eppendorf Transferrman NK2 micromanipulators
- Eppendorf Femtojet microinjectors
- Eppendorf Peizo drills
- Leica S9i stereomicroscopes (2)
- Olympus SZX16 dissection microscopes (2), one with fluorescence option
- Nikon Eclipse TS100 inverted microscopes
- Zeiss Stemi508 stereomicroscope
- Sutter P-97 pipette puller
- Narashige MF-900 microforges
- TMC vibration isolation tables (3)
- ESCO, Forma, New Brunswick CO₂ incubators
- MINC IVF incubator
- Brinkman benchtop autoclave
- Forma cell culture hood
- BioRad Gene Pulser Xcell electroporator
- NepaGene21 Electroporator system, with concave electrodes for in vivo GONAD, and with glass slide electrode for ZEN
- Neon NxT Electroporation System
- KingFisher Duo Prime
- 96-well VeritiPro PCR thermal cycler (2)
- ProFlex 3 x 32-well PCR system
- Thermo Cryomed controlled rate embryo freezer
- Thermo TSX Series -80°C freezer
- 340L Thermo Scientific CryoPlus liquid nitrogen storage system (2)
- Centrifuges, microfuges

Personnel

- Crystal Davey, Ph.D., Director
- He Lan, Ph.D., Research Associate
- Nicholas Black, Lab Specialist
- Lilian Hayes, B.S., Lab Technician

Advisory Board Committee

Last meeting date: July 14, 2023

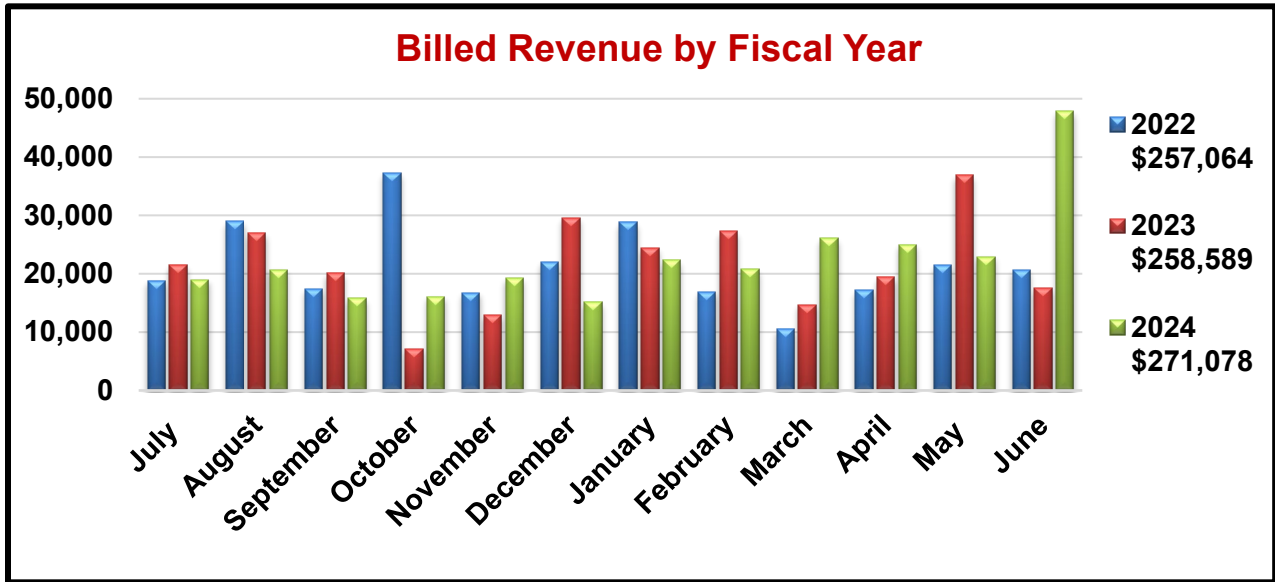
- Lewis Charles Murtaugh, Ph.D., Associate Professor, Department of Human Genetics (Sr. Faculty Advisor)
- Christopher Gregg, Ph.D., Associate Professor, Department of Neurobiology & Anatomy
- Kevin B. Jones, MD, Professor, Huntsman Cancer Institute
- Dean Tantin, Ph.D., Professor, Department of Pathology

Revenue/Expenses

FY24 Expenses: Total \$532,770

FY24 Revenue: Total \$605,681

- VP of Health Sciences Support: \$334,603
- FY24 Revenue generated from services: \$271,078

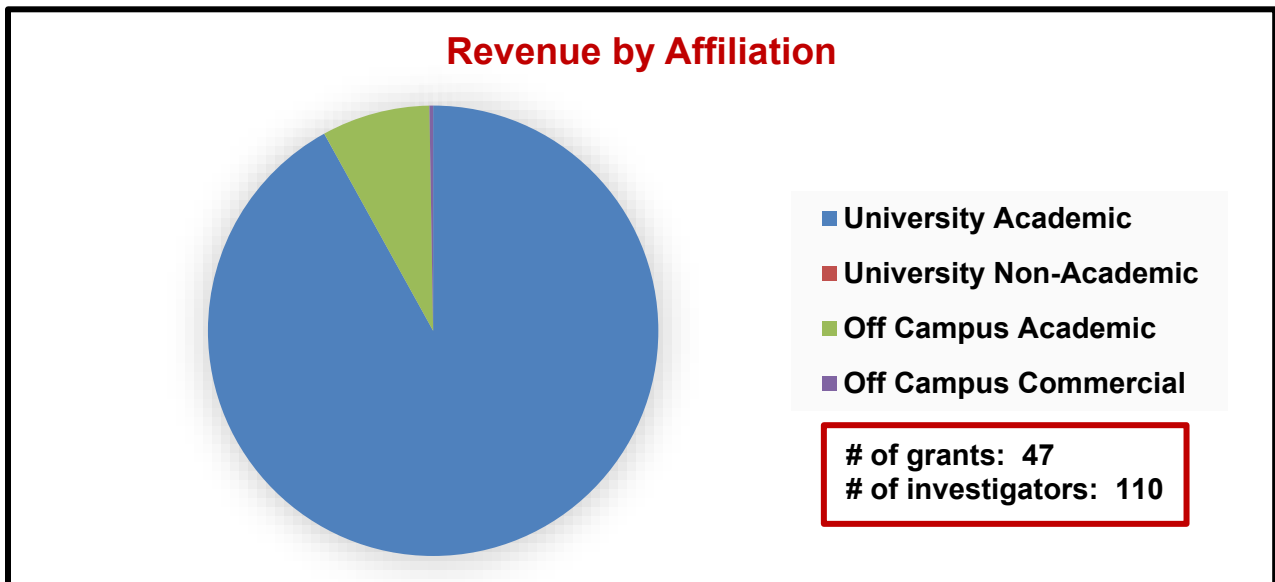


* Legend displays total annual revenue by year earned.

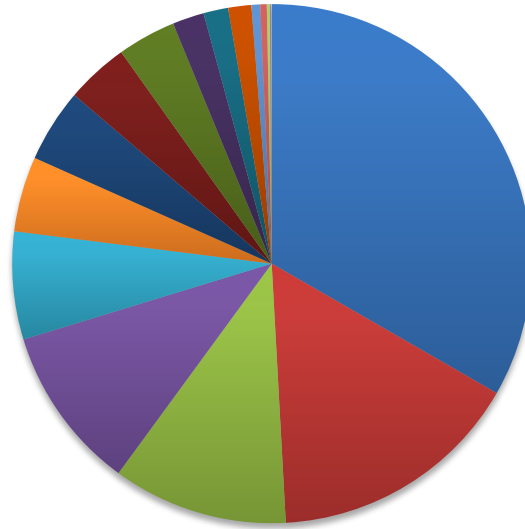
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



- HCI
- Neurobiology
- College of Pharmacy
- Pathology
- Internal Medicine
- Molecular Medicine
- Orthopaedics
- Surgery
- Ophthalmology & Visual Sciences
- CVRTI
- Human Genetics
- Pediatrics
- Psychiatry
- Neurology
- Biochemistry
- Neurosurgery
- Oncological Sciences
- Anesthesiology

Top Users

1	Alana Welm	Breast Cancer Research Foundation, Department, NIH
2	Shannon Buckley	NIH
3	Michael Deans	Department, NIDCD, NIH
4	Alisha Schlichter	Department
5	Darrel Brodke	Skaggs Foundation for Research
6	Katsuhiko Funai	National Kidney Foundation, NIH
7	Weiquan Zhu	Department
8	Zemin Zhou	Department
9	Christopher Gregg	NIH
10	John Phillips	NIH

Letters of Support

Written and provided to faculty for support of grant applications:

1. LOS for Dr. Yufeng Huang's grant: "EphB2 signaling in kidney fibrosis.", August 2023
2. LOS for Dr. Ben Christensen's grant: "Erectile Dysfunction Genetics and The Environment (EDGE): A Systems Biology Approach to ED.", February 2024
3. LOS for Dr. Adrienne Dorrance's RO1 application: "Unraveling the impact of mutated HSCs on the BM and immune microenvironment.", February 2024
4. LOS for Dr. Alejandro Sanchez's KCA Trailblazer award application: "Adaptation to fatty-acid excess in obesity leads to clear cell renal cell carcinoma initiation.", April 2024
5. LOS for Dr. My Helm's R21 application, June 2024

Publications

1. Goodrich, E. J. and M. R. Deans (2024). Emx2 lineage tracing reveals antecedent patterns of planar polarity in the mouse inner ear. *Development* 151(10).10.1242/dev.202425
2. Herstine, J. A., P. K. Chang, S. Chorny, T. J. Stevenson, A. C. Sunshine, K. Nokhrina, J. Rediger, J. Wentz, T. A. Vetter, E. Scholl, C. Holaway, N. K. Pyne, A. Bratasz, S. Yeoh, K. M. Flanigan, J. L. Bonkowsky and A. M. Bradbury (2024). Evaluation of safety and early efficacy of AAV gene therapy in mouse models of vanishing white matter disease. *Mol Ther* 32(6): 1701-1720.10.1016/j.ymthe.2024.03.034

Utah Center for Genetic Discovery

Overview

The UCGD Core supports bioinformatic analysis at the University of Utah with expertise in massively scalable data processing, and it maintains shared computational infrastructure as well as web-based data portals for data access and collaborative analysis. We help investigate the genetic basis for human disease by providing whole exome and genome sequence analyses for research and clinical projects. We also provide analysis of RNA-seq, metagenomic, lipidomic, and other related datasets to support the Immunology, Inflammation, and Infectious Disease (3i) Initiative as well as other research projects. Our shared genomics infrastructure consists of 3280 CPU cores, over 9.6 PB of disk storage, and an expansive library of computational software tools and workflows.

Services

- Sequence alignment and variant calling in NGS datasets to identify small nucleotide variants (SNVs), small insertions/deletions (INDELs), and structural variants (SVs).
- Prioritization and interpretation of variants using filtering and/or statistical methods.
- Disease gene discovery in cohorts and families.
- Project and data management using our HIPAA compliant Mosaic data sharing portal.
- Bulk and single cell RNA-seq processing and analysis.
- Microbial Isolate Genome Assembly and Annotation.
- Metagenomics and metatranscriptomics analysis.
- Marker Gene Sequencing Analysis (16S, ITS or other single gene amplicon analysis with preferred taxonomic reference).
- Custom computational workflow development.

Personnel

- Carson Holt Ph.D., UCGD Core Director
- Barry Moore, Director of Research and Science
- Shawn Rynearson, Senior Software Developer
- Steven Boyden Ph.D., Director of Research and Science
- Joselin Hernandez Ph.D., Research Associate
- Marco Marchetti Ph.D., Research Associate

Advisory Board Committee

- Mark Yandell, PhD, Professor of Human Genetics
- Gabor Marth, DSc, Professor of Human Genetics
- Aaron Quinlan, PhD, Professor of Human Genetics
- Joseph Yost, PhD, Professor and Vice Chairman for Basic Science Research, Department of Pediatrics
- Daniel Leung, MD/MSc, Associate Professor of Internal Medicine

FY24 Annual Update

Grant Support – UCGD Core supported the following grant submissions in FY24:

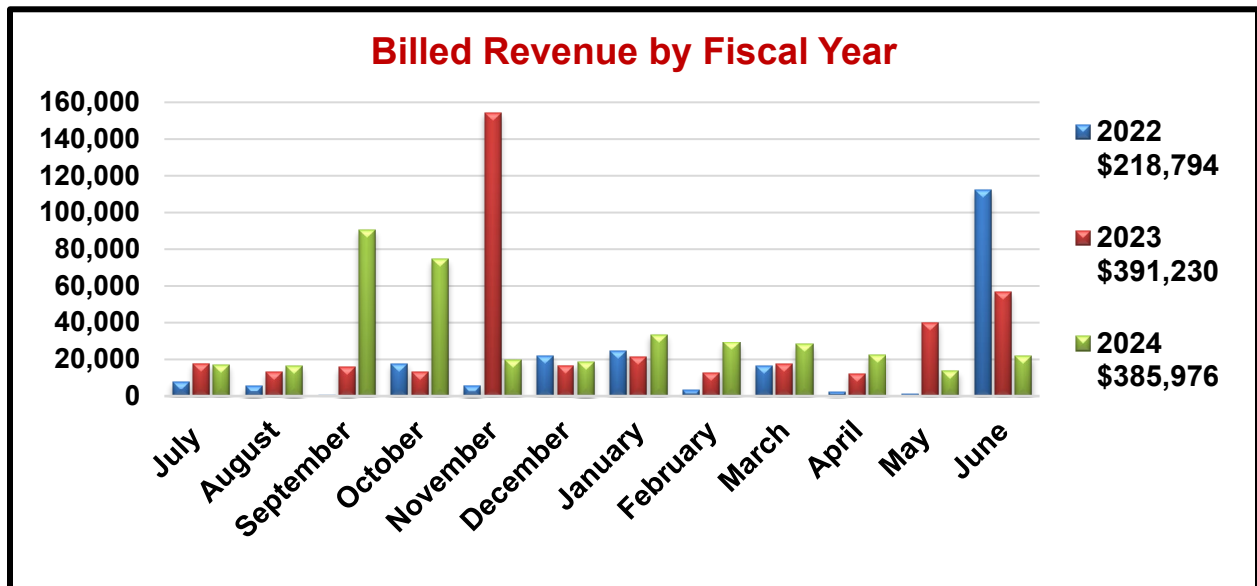
- *Advancing Equitable Precision Medicine: An Explainable AI Platform for Ancestry-Aware Risk Stratification (R01)*. PI: Edgar Javier Hernandez
- *Diagnostic Centers of Excellence for the Undiagnosed Disease Network (U01)*. PI: Lorenzo Botto
- *Erectile Dysfunction Genetics and the Environment (EDGE): A Systems Biology Approach to ED (R01)*. PI: James Hotaling
- *The role of inhibitory Fc receptor in regulating long-lasting humoral immunity (R01)*. PI: Koushik Roy
- *Primary Ovarian Insufficiency: Etiology and Comorbid Disease (R01)*. PI: Corrine Welt
- *Immune Cell reprogramming by pathogens in early life (R01)*. PI: Keke Fairfax
- *Lustre data storage (S10 - Awarded)*. PI: Carson Holt
- *A state-of-the-art web platform for collaborative, longitudinal genome diagnostics (R44/SBIR - Awarded)*. PI: Alistair Ward w/ Frameshift Genomics
- *Inherited and de novo genetic variants relevant to familial, recurrent and sporadic stillbirth (R01 - Awarded)*. PI: Tsegaselassie Workalemahu
- *Utah Center for Pediatric Personalized Medicine (Warren Alpert Foundation - Awarded)*. PI: Joshua Bonkowsky
- *Intermountain West Clinical Center for a Childhood Liver Disease Research Network (U01 - Awarded)*. PI: Stephen Guthery
- *Epigenetic Variation and Aging (W. M. Keck Foundation - Awarded)*. PI: Deborah Neklason

Revenue/Expenses

FY24 Expenses: Total \$929,225

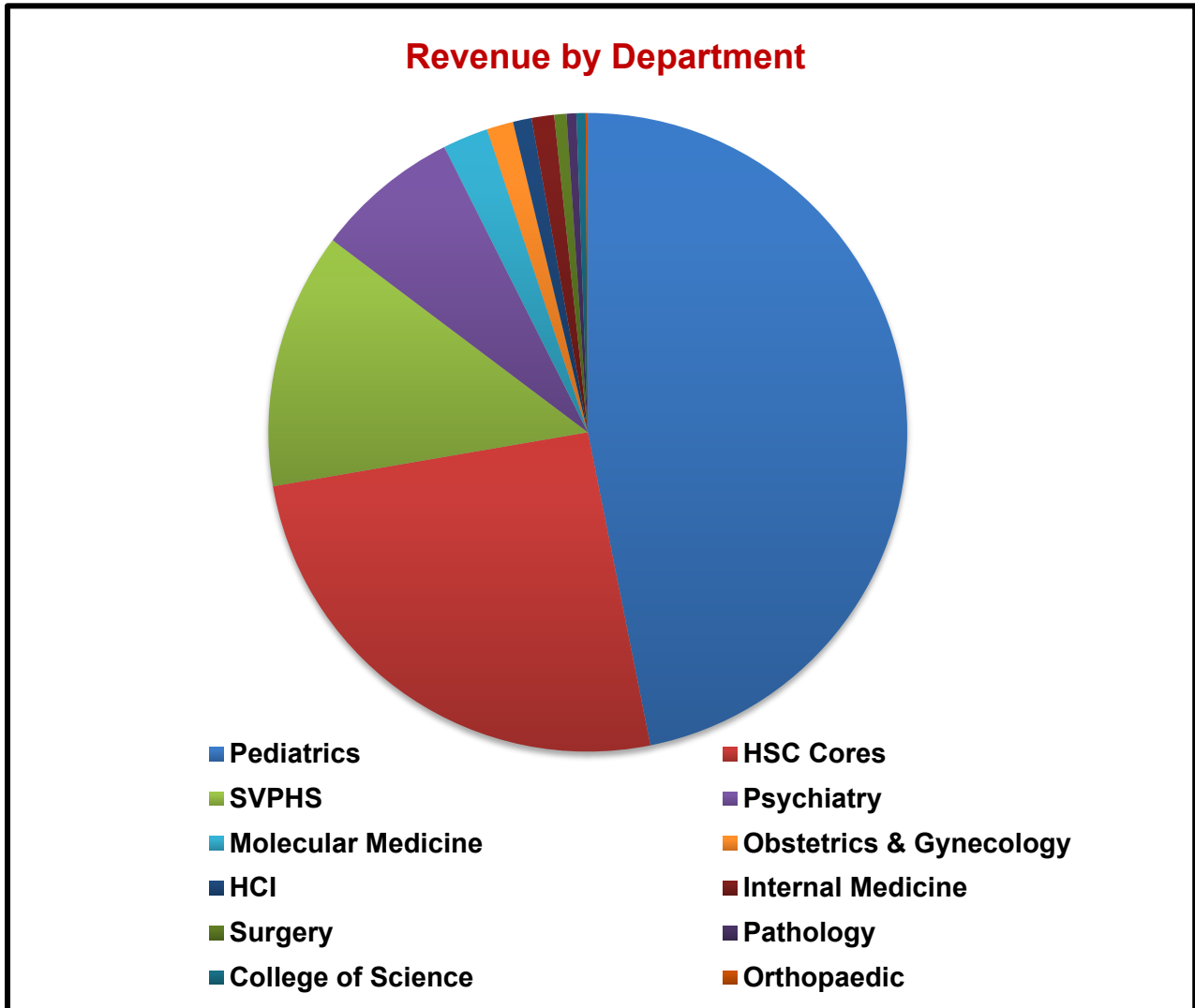
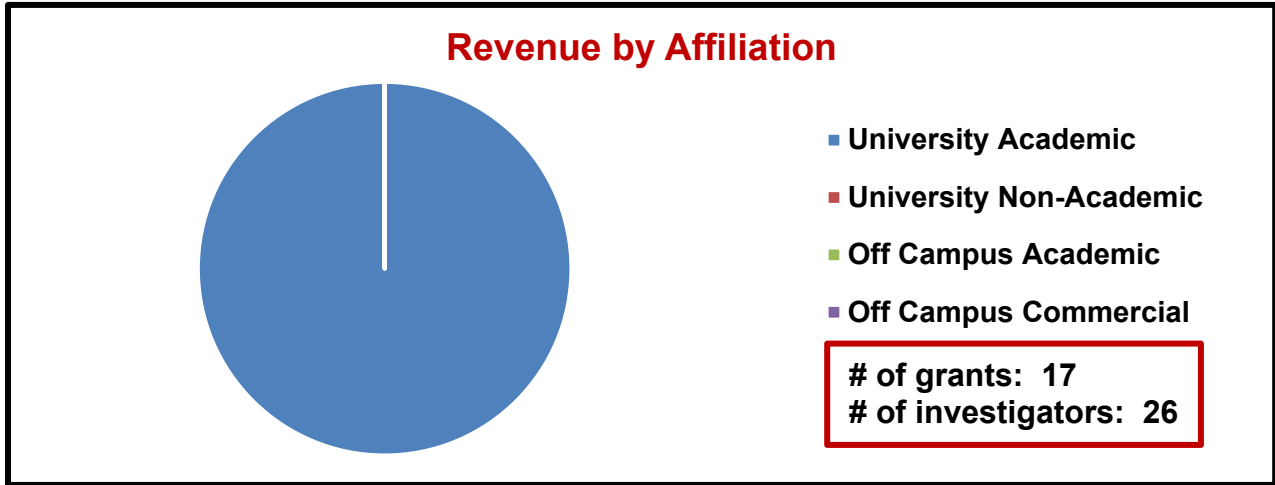
FY24 Revenue: Total \$720,412

- VP of Health Sciences Support UCGD: \$236,000
- Equipment Support: \$98,436
- FY24 Revenue generated from services: \$385,976



* Legend displays total annual revenue by year earned.

**FY24 Scientific Impact
Research Support
Revenue Generated (see charts following):**



Top Users

1	Sabrina Malone-Jenkins	Department
2	Carson Holt	Department
3	Lorenzo Botto	NIH, Department
4	Chelsie Smith	Department
5	Hilary Coon	Department
6	Nicholas Carr	Department
7	Corrine Welt	NIH
8	Nathan Blue	Department
9	Katharine Walter	University of Utah Research Foundation, NIH
10	Kenneth Aston	Oregon Health & Science University

Publications

- Avery, C. N., N. D. Russell, C. J. Steely, A. O. Hersh, J. F. Bohnsack, S. Prahalad and L. B. Jorde (2024). Shared genomic segments analysis identifies MHC class I and class III molecules as genetic risk factors for juvenile idiopathic arthritis. *HGG Adv* 5(2): 100277.10.1016/j.xhgg.2024.100277
- Han, S., E. DiBlasi, E. T. Monson, A. Shabalin, E. Ferris, D. Chen, A. Fraser, Z. Yu, M. Staley, W. B. Callor, E. D. Christensen, D. K. Crockett, Q. S. Li, V. Willour, A. V. Bakian, B. Keeshin, A. R. Docherty, K. Eilbeck and H. Coon (2023). Whole-genome sequencing analysis of suicide deaths integrating brain-regulatory eQTLs data to identify risk loci and genes. *Mol Psychiatry* 28(9): 3909-3919.10.1038/s41380-023-02282-x
- Juchnewitsch, A. G., K. Pomm, A. Dutta, E. Tamp, A. Valkna, K. Lillepea, E. Mahyari, S. Tjagur, G. Belova, V. Kubarsepp, H. Castillo-Madeen, A. Riera-Escamilla, L. Polluaas, L. Nagirnaja, O. Poolamets, V. Vihljajev, M. Sutt, N. Versbraegen, S. Papadimitriou, R. I. McLachlan, K. A. Jarvi, P. N. Schlegel, S. Tennisberg, P. Korrovits, K. Vigh-Conrad, M. K. O'Bryan, K. I. Aston, T. Lenaerts, D. F. Conrad, L. Kasak, M. Punab and M. Laan (2024). Undiagnosed RASopathies in infertile men. *Front Endocrinol (Lausanne)* 15: 1312357.10.3389/fendo.2024.1312357
- Miller, T. A., E. J. Hernandez, J. W. Gaynor, M. W. Russell, J. W. Newburger, W. Chung, E. Goldmuntz, J. F. Cnota, S. C. Zybowski, W. T. Mahle, V. Zak, C. Ravishankar, J. R. Kaltman, B. W. McCrindle, S. Clarke, J. K. Votava-Smith, E. M. Graham, M. Seed, N. Rudd, D. Bernstein, T. M. Lee, M. Yandell and M. Tristani-Firouzi (2023). Genetic and clinical variables act synergistically to impact neurodevelopmental outcomes in children with single ventricle heart disease. *Commun Med (Lond)* 3(1): 127.10.1038/s43856-023-00361-2
- Palmquist, R., Moore, B., Boyden, S., Nicholas, T., Bayrak-Toydemir, P., Mao, R., Farrel, A., Holt, C., Rynearson, S., Solorzano, C., Ward, Alistair., Best, D., Al-Sweel, N., Bentley, D., Brunelli, L., Chow, C., Close, D., Cormier, M., Deshotel, M., . . . Bonkowsky, J. (submitted). The Utah NeoSeq Project: A collaborative multidisciplinary program to facilitate genomic diagnostics in the Neonatal Intensive Care Unit. *Npj Genomic Medicine*
- Watkins, W. S., E. J. Hernandez, T. A. Miller, N. R. Blue, R. Zimmerman, E. R. Griffiths, E. Frise, D. Bernstein, M. T. Boskovski, M. Brueckner, W. K. Chung, J. W. Gaynor, B. D. Gelb, E. Goldmuntz, P. J. Gruber, J. W. Newburger, A. E. Roberts, S. U. Morton, J. E. Mayer, C. E. Seidman, J. G. Seidman, Y. Shen, M. Wagner, H. J. Yost, M. Yandell and M. Tristani-Firouzi (2024). Genome Sequencing is Critical for Forecasting Outcomes following Congenital Cardiac Surgery. *medRxiv*.10.1101/2024.05.03.24306784
- Zhao, J., N. Longo, R. G. Lewis, T. J. Nicholas, S. E. Boyden, A. Andrews, A. Larson, N. Undiagnosed Diseases, P. Bayrak-Toydemir, L. D. Botto and R. Mao (2024). Novel molecular mechanism in Malan syndrome uncovered through genome sequencing reanalysis, exon-level Array, and RNA sequencing. *Am J Med Genet A* 194(5): e63516.10.1002/ajmg.a.63516

Service Recharge Centers

Overview

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

BioMedical Microfluids Lab

Overview

The Biomedical Microfluidics Core (BMC) is a user research facility managed by the State of Utah Center of Excellence for Biomedical Microfluidics managed by Bruce Gale and the Department of Mechanical Engineering. The lab offers clients design, engineering, and prototyping services for a wide variety of biomedical assays, medical devices, and high-throughput automation instruments. These devices can be custom designed and focused on answering specific research questions or optimized for commercial manufacturing.

The BMC has significant experience with a wide range of microfluidic devices and manufacturing methods. The BMC can prototype devices using a wide range of polymers, glass, and semiconductors (such as Si). Devices can be manufactured using photolithography tools (in conjunction with the Nanofab), soft lithography, laminates, 3D printing, or molding processes. The BMC has significant experience in including a variety of pumps, valves, sensors, separation components, analytical elements, input/output components, and flow control devices, which combined allow for rapid development of custom devices. Past applications include: bacteria and virus detection, cell sorting, high speed PCR devices, chemical analysis, complex reaction engineering, multiplexed cell culture and analysis, drug delivery, nanoparticle generation and analysis, and miniature medical devices for blood vessel and peripheral nervous system repair. The BMC is especially adept at working with companies developing new products.

Uniqueness

The BMC has an extensive history of successful collaborations with academia, government, and industry clients ranging from startups to multinational corporations in the medical, chemical, drug development, drug delivery, analytical, and other markets.

The BMC staff can help with custom design of microfluidic devices to fit your research and analytical needs. The BMC staff can also help with the design of custom microfluidic devices that have key characteristics for commercialization, including low-cost manufacturing, high repeatability, and simplification of complex operations.

The BMC has expertise in:

- Biomedical materials and devices
- Packaging and interfaces
- Automated sample preparation
- Sensor integration
- High throughput analysis
- General biomedical miniaturization

Services & Equipment

The BMC provides the following services:

- Custom microfluidic device design
- Microfluidic device prototyping
- Device engineering
- Device testing
- Low volume manufacturing
- Consulting services for commercialization of microfluidic devices

FY25 Goals

- Expand the range of services offered.

Personnel

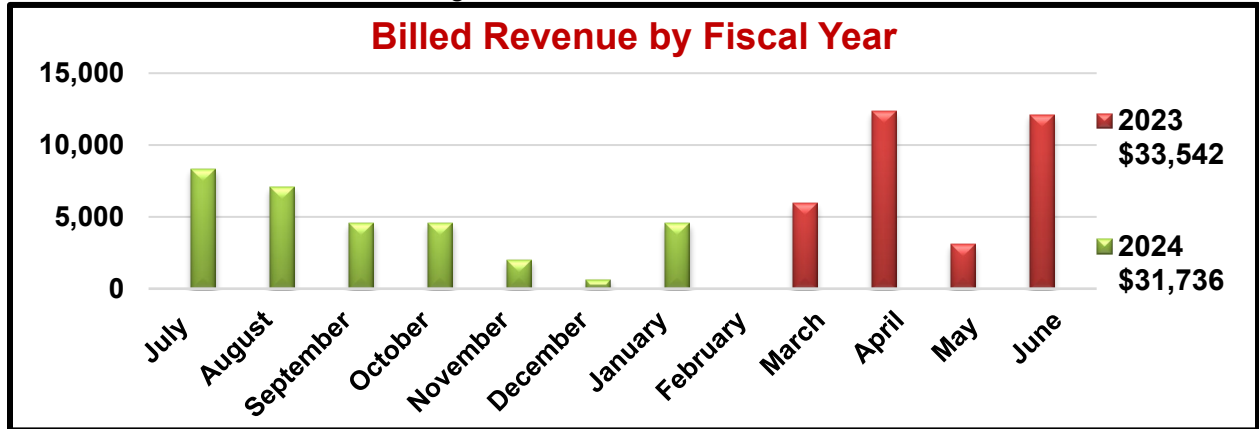
- Bruce Gale, Director

Revenue/Expenses

FY24 Expenses: Total \$42,999

FY24 Revenue: Total \$46,941

- VP of Research Support: \$ 0
- FY24 Revenue generated from services: \$31,736

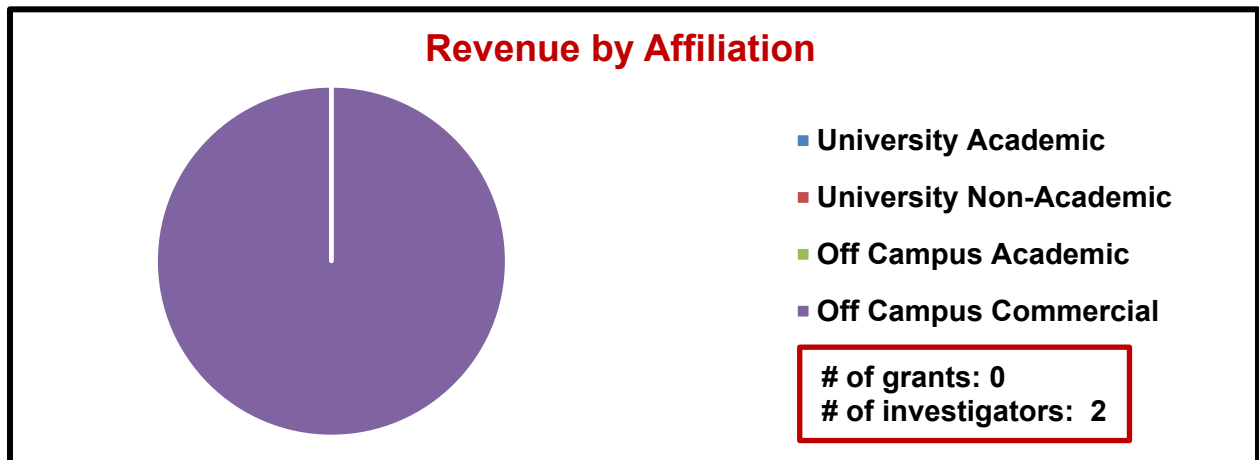


* Legend displays total annual revenue by year earned.

FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Top Users

1	Paterna Biosciences	Off Campus Commercial
2	NanoSpot, Inc.	Off Campus Commercial

Publications

No known publications acknowledged this facility in FY24.

Biophysical Interactions

Overview

The Biophysical Interactions Core characterizes macromolecular biophysics and interaction energetics using a wide variety of state-of-the-art instrumentation including: an SPR-24 Pro real-time, label-free surface plasmon resonance biosensor; an analytical ultracentrifuge with UV-Vis and Rayleigh interference optics; an iTC200 Microcalorimeter for isothermal titration calorimetry; and an Aviv 410 circular dichroism spectrometer. With these techniques researchers can analyze association and kinetic binding constants, enthalpies and entropies of binding, secondary structure, shape, molecular weight, stoichiometry, stability, and homogeneity.

Uniqueness

The Biophysical Interactions Core provides unique services with specialized equipment not commonly available. Our ITC and SPR instruments can be applied to a wide variety of biological systems to quantify different parameters of interactions, such as association and dissociation kinetics and enthalpy/entropy of binding events. Additionally, our structural instruments (CD and AUC) provide a detailed look at many aspects of the physical shape and stability of the molecules being analyzed. We work with numerous academic labs to design experiments, train users, and deliver publication quality data in a timely manner. Although we traditionally focus on protein-protein and protein-ligand interactions, these techniques can be applied to many different systems.

Services

The Biophysical Interactions Core's mission is to help researchers investigate several biomolecular characteristics in different contexts. We specialize in binding event analysis through SPR and ITC, and structural analysis via CD and AUC and are pleased to offer the following services:

- ITC analysis of chemical dynamics of binding interactions
- High-throughput SPR analysis of binding events
- CD analysis of secondary structure and stability
- AUC analysis of shape, molecular weight, and stability of biomolecules

FY25 Goals

- Increase awareness of our services and generate more users

Major Equipment

Binding Event Analysis:

- Bruker Sierra SPR-24 Pro surface plasmon resonance instrument with eight individual channels and three spots per channel, and Bruker SPR analysis 4 software.
- Malvern Panalytical Microcal iTC200 instrument and MicroCal ITC Origin 7 analysis software

Structural Analysis:

- Aviv 410 circular dichroism spectrometer with a RTE-100 Neslab refrigerated bath circulator, and 1 and 10 mm quartz cuvettes
- Beckman Coulter XLI Optima AUC, rotors, and the corresponding analysis software

Personnel

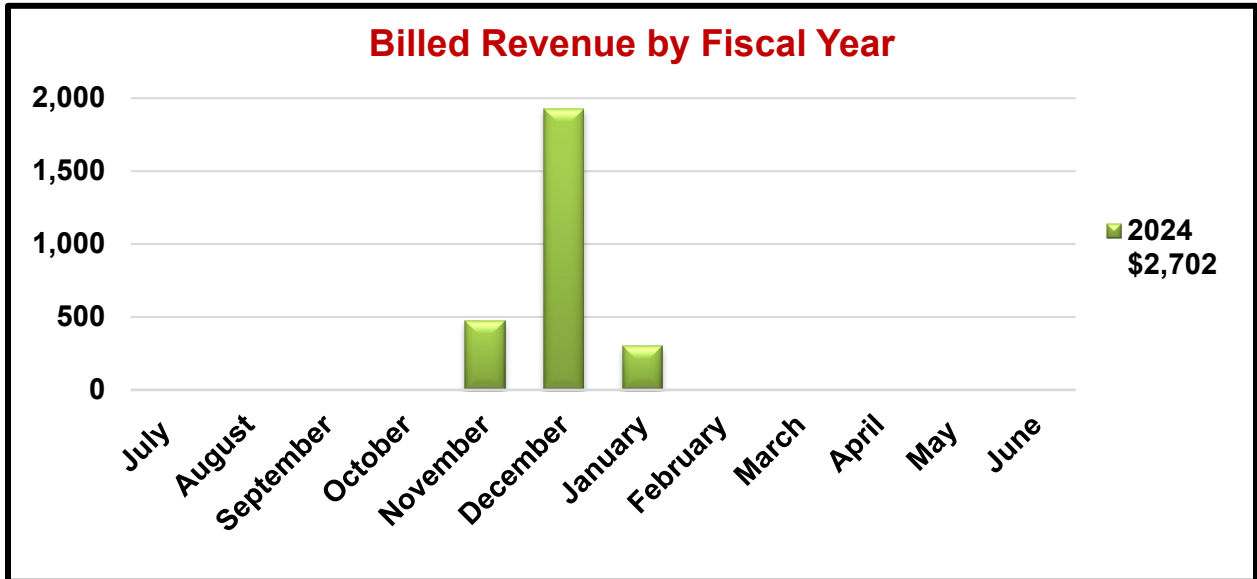
- Riley J. Giesler, PhD, Core Director

Revenue/Expenses

FY24 Total Expenses: \$135

FY24 Total Revenue: \$2,702

- FY24 Revenue generated from services: \$2,702

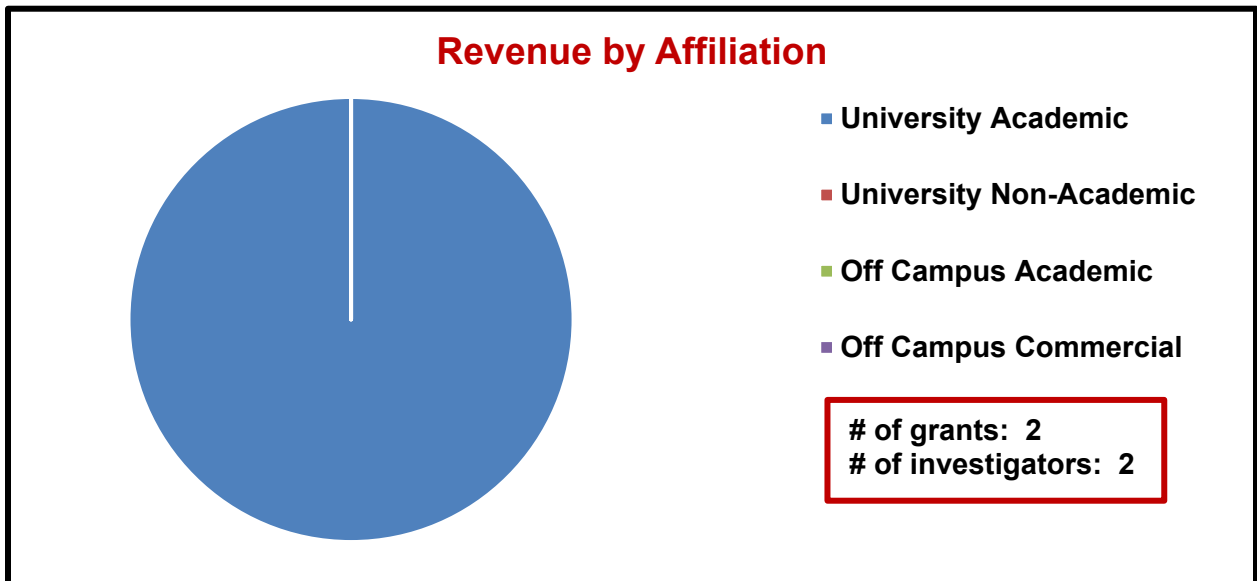


* Legend displays total annual revenue by year earned.

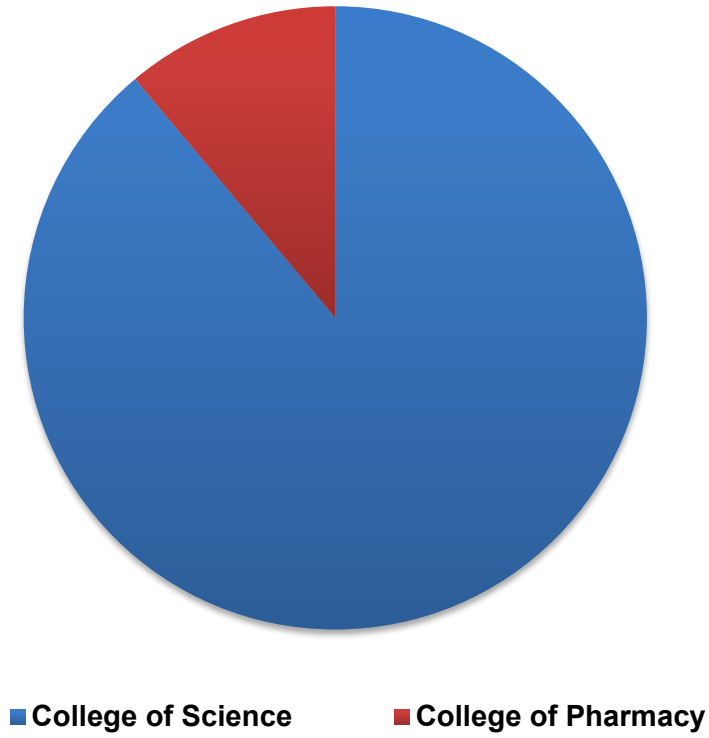
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



Top Users

1	Martin Horvath	NSF
2	Katharine Diehl	NIH

Publications

No known publications acknowledged this facility in FY24.

Center for Human Toxicology

Overview

The Center for Human Toxicology (CHT) provides targeted, quantitative bioanalysis that supports studies throughout the drug development pipeline. The Center offers customized assay development and sample analysis to generate data for a vast array of therapeutically active compounds.

Uniqueness

The CHT's ability to develop customized quantitative assays for targeted novel therapeutic compounds and adapt previously published assays for use within the Center is a unique service within the University of Utah. The capability to provide these services have been honed over 30+ years of serving as the contract bioanalytical laboratory for NIDA, in addition to the directorship leading cutting-edge forensic toxicology and clinical pharmacology research throughout the storied history of the Center.

The CHT is home to several liquid chromatography-tandem mass spectrometry (LC-MS/MS) systems that are maintained and operated by experienced staff members. LC-MS/MS instrumentation requires infrastructure and costs that are prohibitive for many laboratories. By providing these resources to investigators on- and off-campus, the Center facilitates critical drug studies by academic researchers in both basic and clinical sciences.

In contrast to external Clinical Research Organizations (CROs) offering similar services, the CHT provides transparent, high quality analyses at affordable prices, which is of particular benefit to academic investigators seeking preliminary data that will support a grant application. Furthermore, the CHT can help investigators design sample collection schemes within a study and conduct advanced pharmacokinetics analyses after data collection to support the broader utility of data generated within the Center.

Services

- Schedule 1 DEA License
- Custom Assay Development by LC-MS/MS
- Sample Analysis by LC-MS/MS
- Sample Analysis by ELISA
- Optimal Sampling Design
- Non-Compartmental Pharmacokinetic Analysis
- Pharmacometric Modeling

Equipment

LC-MS/MS

- ThermoScientific Vanquish Flex LC and Velos Pro MS
- ThermoScientific Vanquish Flex LC and TSQ Quantis Plus MS/MS
- **Waters Acquity UPLC and ThermoScientific TSQ Vantage MS/MS**
- **Waters Acquity UPLC and Xevo TQD MS/MS**
- **Waters Acquity UPLC and Micromass Quattro Premier XE MS/MS**

Developed Assays

Compounds (Matrix)

- Cannabis and metabolites (plasma, urine, hair)
- Buprenorphine and metabolites (plasma)
- Ganciclovir (plasma, dried blood spots, tissue)
- Methamphetamine/Amphetamine (plasma, oral fluid)
- Mirtazapine (plasma)
- Amiloride (plasma)
- Atropine (plasma)
- Cefazolin (plasma, cerebrospinal fluid)
- Opioids [morphine, oxycodone, fentanyl, fentalogues and metabolites] (plasma, urine)
- Anti-Seizure Medications [clobazam, valproate, carbamazepine, stiripentol, levetiracetam] and their metabolites (plasma, brain tissue)

Personnel

- Christopher Reilly, Ph.D., ATS, Director
- Joseph Rower, Ph.D., DABCP, Associate Director
- Cassandra Deering-Rice, Ph.D. Assistant Director
- David Anderson, MS, Laboratory Manager
- Tia Freeman, BS
- Logan Hoggard, MS

FY25 Goals

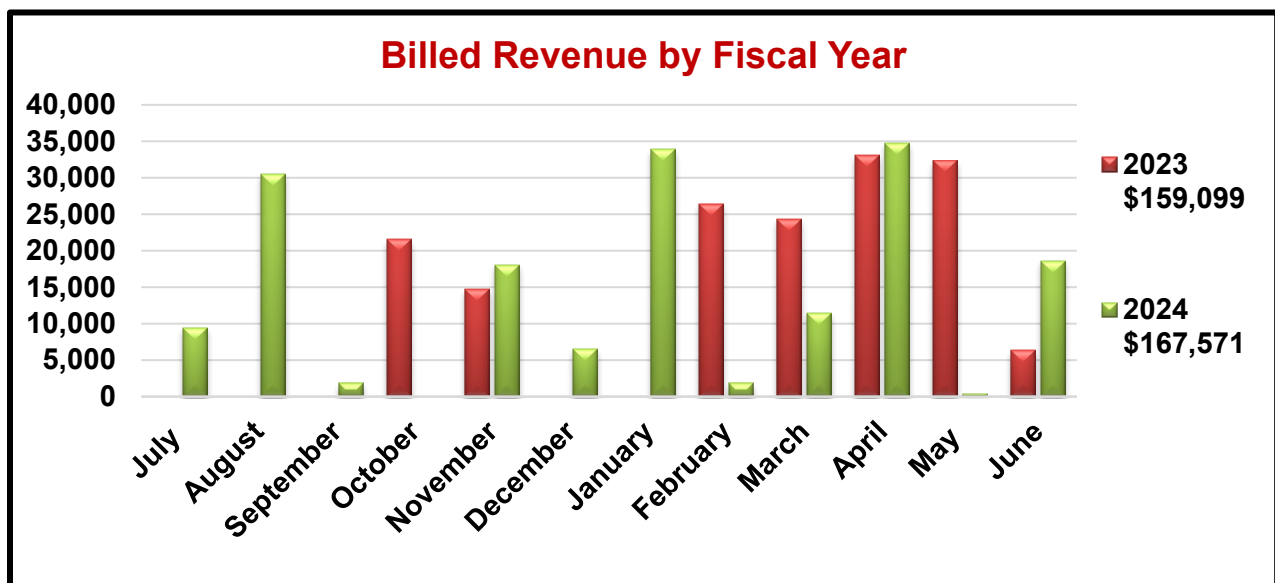
- Continue to streamline assay development and sample analysis procedures.
- Expand knowledge of our services across and beyond campus.
- Build CHT infrastructure to enable more efficient support of client projects.

Revenue/Expenses

FY24 Expenses: Total \$95,672

FY24 Revenue: Total \$167,571

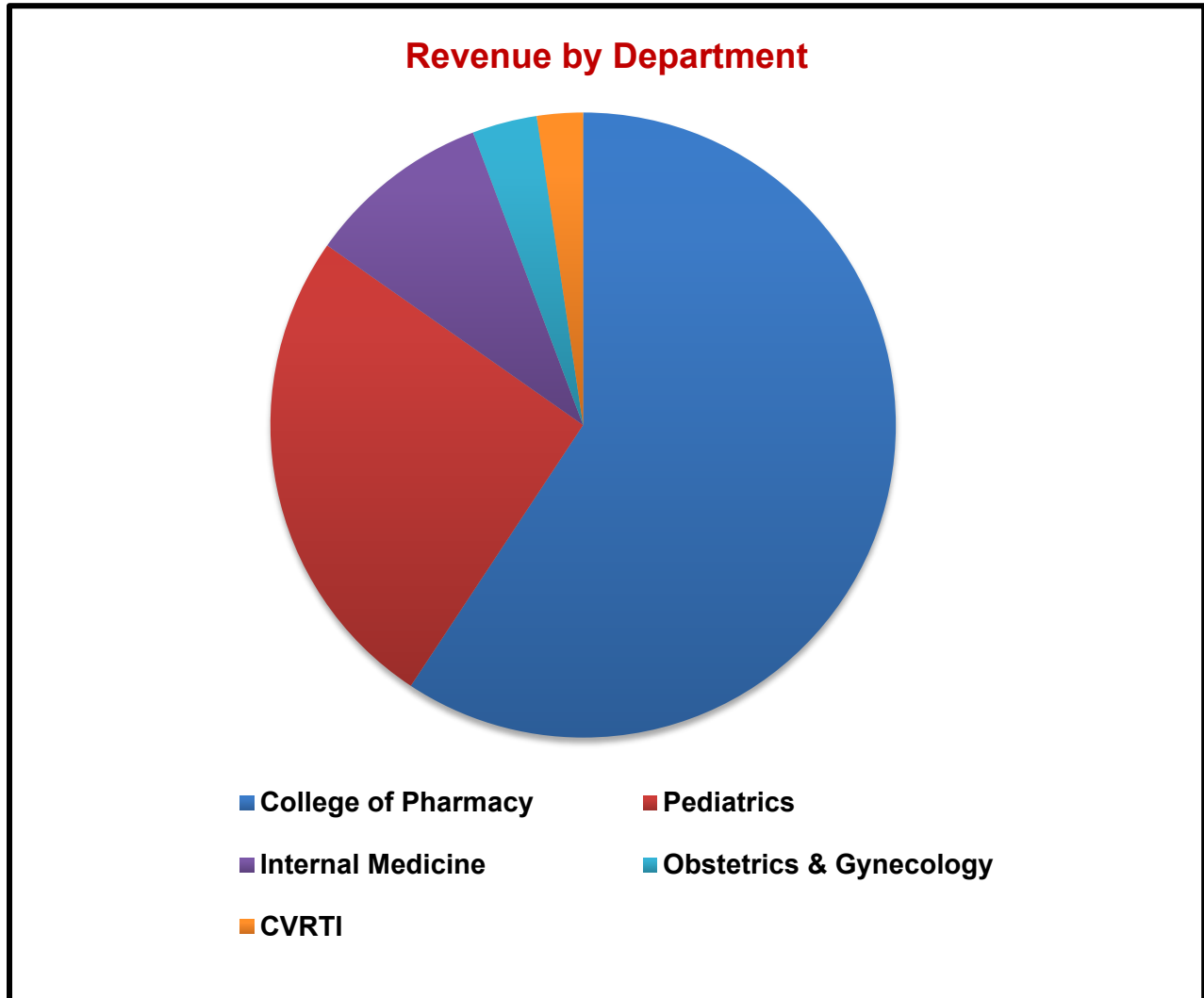
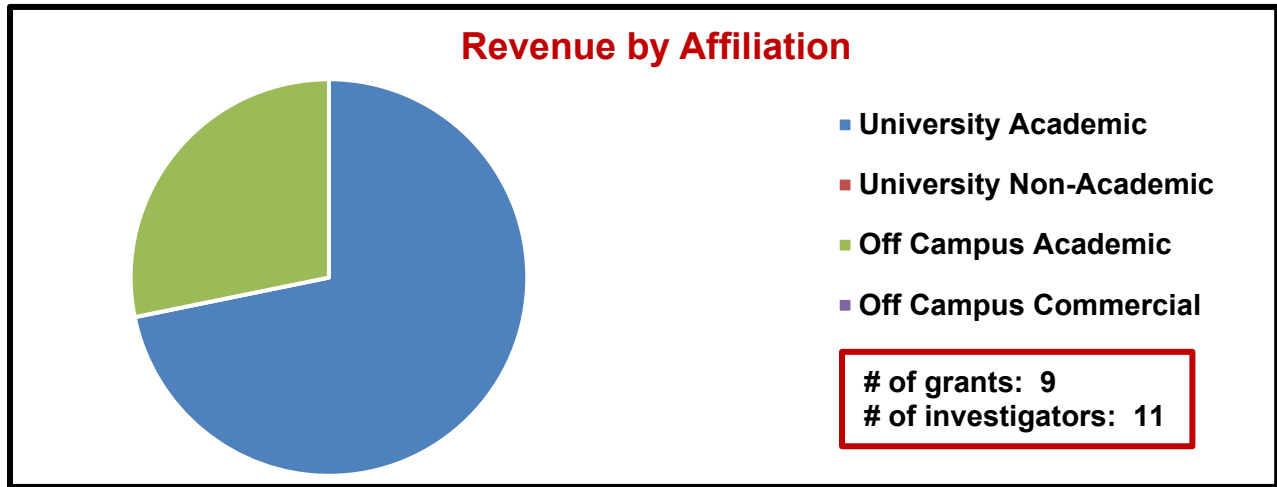
- FY24 Revenue generated from services: \$167,571



* Legend displays total annual revenue by year earned.

**FY24 Scientific Impact
Research Support**

Revenue Generated (see charts following):



Top Users

1	Christopher Reilly	Heluna Health
2	Massachusetts General Hospital	Off Campus Academic
3	Joseph Rower	University of Chicago, Cures within Reach, New England Research Institutes
4	Jonathan Constance	Department, NIH
5	Monique Cho	NIH
6	University of Minnesota	Off Campus Academic
7	Elena Enioutina	Department
8	University of Georgia	Off Campus Academic
9	Kevin Watt	NIH, American Foundation for Pharmaceutical Education
10	Marcela Smid	NIH

Publications

- Callahan, S. J., E. Beck, D. Blagev, D. Harris, M. Lanspa, S. Brown, C. A. Reilly, R. Paine, 3rd and K. J. Warren (2024). Vitamin E Acetate Is Associated with Select Proinflammatory Cytokines: An Analysis of a 2020-2022 Cohort of EVALI Patients. *Am J Respir Crit Care Med* 209(11): 1404-1407. [10.1164/rccm.202311-2155LE](https://doi.org/10.1164/rccm.202311-2155LE)
- Dubinsky, S. D. J., K. M. Watt, C. E. Imburgia, A. M. McKnite, J. P. Hunt, C. Rice, J. E. Rower and A. N. Edginton (2023). Anakinra Removal by Continuous Renal Replacement Therapy: An Ex Vivo Analysis. *Crit Care Explor* 5(12): e1010. [10.1097/CCE.0000000000001010](https://doi.org/10.1097/CCE.0000000000001010)
- Fabian, N. J., A. J. Mannion, M. Jamiel, D. J. Anderson, J. E. Rower, C. A. Reilly, W. Menegas, S. Muthupalani, C. Ta, J. G. Fox, R. Kramer and J. L. Haupt (2023). Evaluation and comparison of pharmacokinetic profiles and safety of two extended-release buprenorphine formulations in common marmosets (*Callithrix jacchus*). *Sci Rep* 13(1): 11864. [10.1038/s41598-023-38973-2](https://doi.org/10.1038/s41598-023-38973-2)
- Hillam, K., D. Suarez, C. Nielson, A. Traxler, E. Sommer, A. Winslow, A. Holley, E. Huang, M. Hughes, M. A. Firpo, J. Rower and A. H. Park (2023). Hearing Following Prolonged and Delayed Ganciclovir Treatment in a Murine Cytomegalovirus Model. *Laryngoscope*. [10.1002/lary.30860](https://doi.org/10.1002/lary.30860)
- Niederauer, S., M. Beeman, A. Cleveland, S. Wojtalewicz, S. Erickson, C. A. Reilly, J. E. Rower, C. Garrett, C. Floyd, J. Shea, J. Agarwal, C. Lade and B. Davis (2024). A ropivacaine-eluting poly(lactide-co-caprolactone) wound dressing provided enhanced analgesia in partial-thickness porcine injuries. *Plast Reconstr Surg*. [10.1097/PRS.00000000000011485](https://doi.org/10.1097/PRS.00000000000011485)
- Nkoy, F. L., B. L. Stone, C. E. Deering-Rice, A. Zhu, J. G. Lamb, J. E. Rower and C. A. Reilly (2024). Impact of CYP3A5 Polymorphisms on Pediatric Asthma Outcomes. *Int J Mol Sci* 25(12). [10.3390/ijms25126548](https://doi.org/10.3390/ijms25126548)
- Parrot, M., B. Yathavan, O. Averin, L. Hoggard, J. E. Rower, M. Voight, D. Greene, A. Tarrell, A. Whelan, H. Ghandehari, N. Murphy and V. Yellepeddi (2024). Clinical pharmacokinetics of atropine oral gel formulation in healthy volunteers. *Clin Transl Sci* 17(3): e13753. [10.1111/cts.13753](https://doi.org/10.1111/cts.13753)

Crus Center

Overview

The Crus Center is a user research facility managed by the Materials Science and Engineering (MSE) Department at the University of Utah. The lab offers clients access to analytical instrumentation and services for a variety of samples.

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

The Crus Center also supports the undergraduate Crus Scholar program which allows students to get paid for certain research projects, generously supported by Dawn and Roger Crus.

Uniqueness

The Crus Center is an open space dedicated to research both within the MSE department, as well as across the University of Utah campus.

Services & Equipment

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

Staff also provide consultations and experiment design suggestions based on the needs of the user. The services offered by the Crus Center include characterization with the following techniques:

- Hitachi S-4800 FE-SEM
 - Ultra-high resolution down to 1 nm
 - Back Scatter, Secondary, and Energy Dispersive X-Ray Spectroscopy
- Rigaku Miniflex 600 x-ray diffraction
 - Powder diffraction
 - 5-sample auto-sampler
- TA Instruments Q600 SDT – DSC, TGA
 - Room temp to 600 Celsius
 - Argon purge gas
- Anton Paar SurPASS 3 Electrokinetic Analyzer (EKA)
 - Automated isostatic point detection
 - pH-relative zeta potential
- Denton Vacuum Desk V – Thin Film Deposition System
 - Automatic timed gold sputtering
- Thermo Scientific Niton XL3T 500 XRF
 - Elemental analysis

FY25 Goals

- Free up space from broken or unused equipment to make room for more techniques.
- Increase online visibility.

Personnel

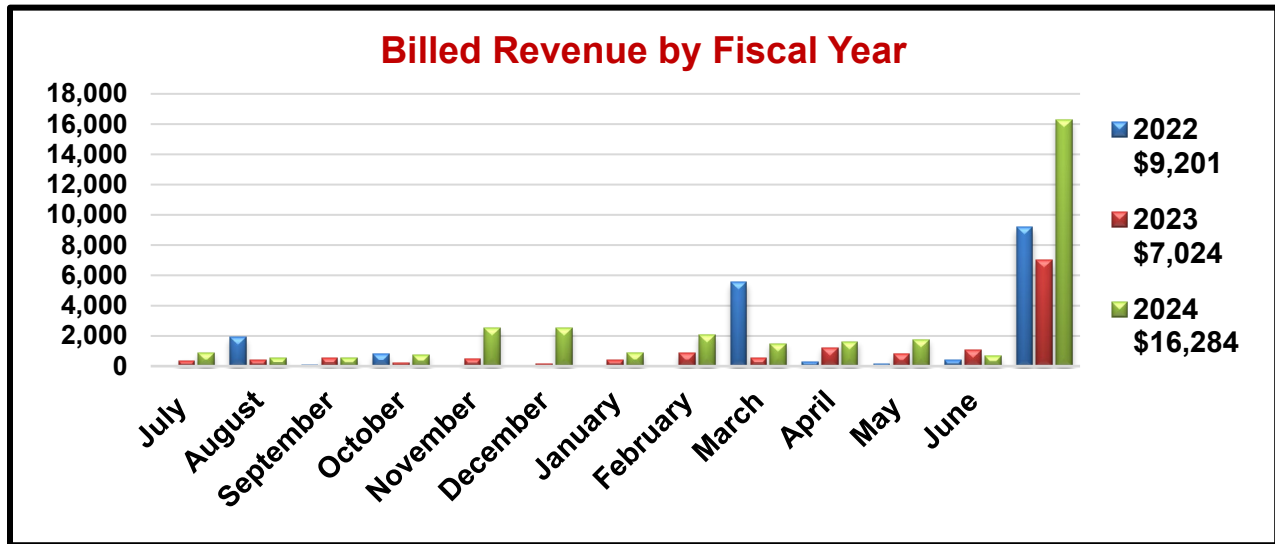
- Bobby Mohanty, Faculty Director
- Kimberly Watts, Lab Manager
- Joy Walker, Executive Secretary
- Christian Norman, Technician

Revenue/Expenses

FY24 Expenses: Total \$2,687

FY24 Revenue: Total \$16,284

- VP of Research Support: \$ 0
- FY24 Revenue generated from services: \$16,284

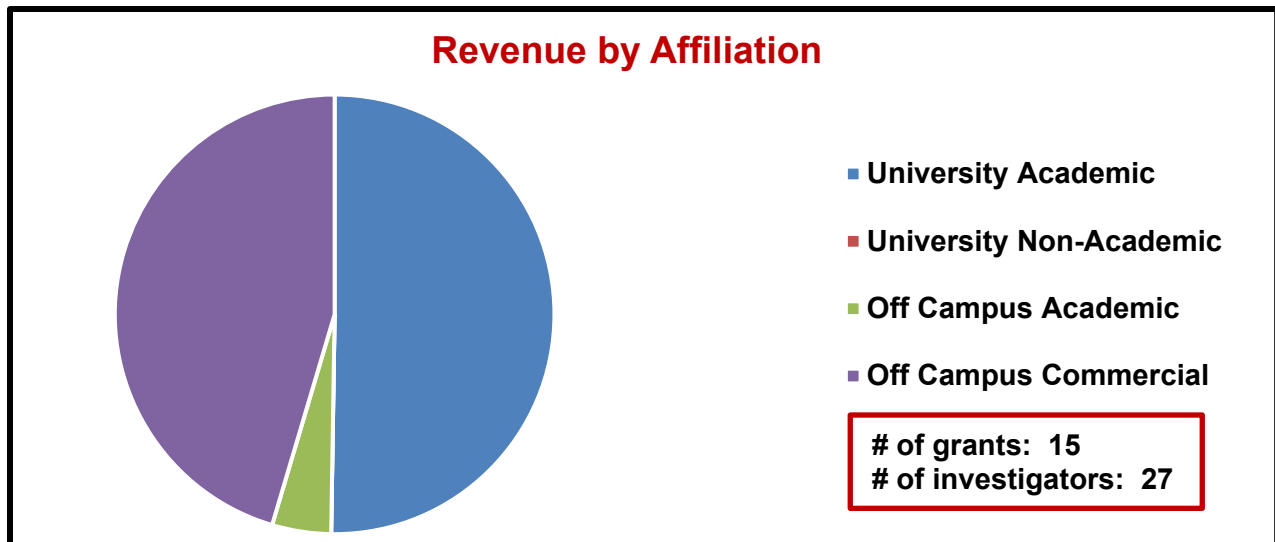


* Legend displays total annual revenue by year earned.

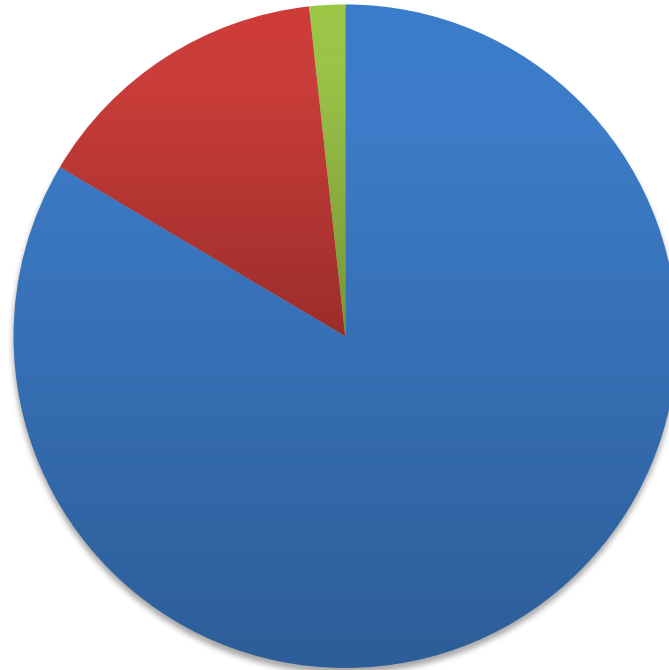
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



■ College of Engineering ■ Chemistry ■ College of Mines & Earth Sciences

Top Users

1	HiFunda, LLC	Commercial
2	Hong Yong Sohn	Department, NASA
3	Zak Fang	Blacksand Technology LLC, IperionX
4	GlycoSurf, Inc.	Commercial
5	Bahamas Marine Ecocentre	Off Campus Academic
6	K.S. Ravi Chandran	DOE
7	Connor Bischak	American Chemical Society, Department
8	Bourns	Commercial
9	Sujee Jeyapalina	VA - Research
10	Xuming Wang	Michigan Tech University, University of Utah Research Foundation

Publications

No known publications acknowledged this facility in FY24.

Genetic Science Learning Center

Overview

The GSLC specializes in making science and health easy for everyone to understand, with a focus on digital interventions, applications, and educational materials. The team collaborates with investigators and research teams to develop all components of digital health interventions from “front end” patient/caregiver/user experience to “back end” and data collection.

Uniqueness

The GSLC brings together in one team synergistic expertise in design and production of digital interventions, applications, and educational materials. Its team is unique among similar groups at US academic institutions in that it includes expertise in multimedia animation and interactivity, graphic design, video production, website and app development, instructional design, science and health writing, community and patient engagement, and research and evaluation; other groups outsource some of these functions.

The GSLC designs and produces digital materials for research studies, clinical trial recruitment, patient education, decision aids for shared decision making, simplified informed consent materials, education and training materials, and Broader Impacts for NSF grants.

Services

The GSLC offers the following services:

Digital Materials Development

Digital design and software development

- Web apps and websites
- Mobile apps and games
- Decision aids
- Interactive multimedia
- Animation (2D and 3D)
- Embedding data collection for interventions via REDCap and other methods

Video production

- Script writing, production and scheduling, videography, editing, and post-production

Music and audio production

- Original music composition and scoring, and audio engineering

Multimedia and visual design

- Animated segments for videos
- Illustration
- Graphic design and layout
- Brochures and infographics

Science and health writing

- Translate complex concepts for patients and other lay audiences
- Video and multimedia scripts
- Website and app content
- Educational and recruitment materials
- Instructional design

Research and Evaluation Services

Evaluation of educational training programs and materials via:

- Quantitative, qualitative and mixed-methods designs
- Developing valid knowledge assessment (test) items
- Developing surveys
- Conducting focus groups and key informant or participant interviews

A project's scope and budget are discussed during an initial consultation(s). For grant proposals, text describing the GSLC and its contributions to the project, a budget and justification are provided. Once a project is agreed to and/or funded, a MOU is prepared, outlining project deliverables, expectations by both parties, a timeline, and budget. A project lead is assigned, who serves as the primary GSLC contact for the project.

FY25 Goals

The GSLC will continue to produce high-quality digital interventions, applications, and materials, as well as conduct evaluations of training programs. We will work to inform researchers and units across the University of Utah campus and elsewhere about our capabilities and our availability to collaborate on projects. In this way, we will seek to increase our visibility and expand our users.

Personnel

- Louisa A. Stark, PhD, Director
- Claudia Morales, BA, Project Manager
- Arthur Veenema, BS, Video Producer/Director
- Kagan Breitenbach, BMu, Audio Engineer/Composer
- Ashe Erickson, BS, Web Systems Manager
- Brooklee Watters, AS, User Experience Developer
- John Maxwell Kelly, BFA, Art Director
- Matt Beecham, BS, Interactive Developer
- Nathan Holland, BA, Graphic Designer
- Moriah Davies, AA, Graphic Designer
- Kristin Fenker, PhD, Science Writing Lead
- Paul Gabrielsen, MS, Science Writer
- Molly Malone, MA, Senior Education Specialist
- Jen Taylor, BS, Education Specialist
- Rebecca Peterson, PhD, Assistant Director of Research and Evaluation
- Harini Krishnan, PhD, Research Associate
- Marissa Morley, BMS, Administrative Assistant

Management Meeting

Last meeting date: August 7, 2024

- Louisa Stark, PhD, GSLC Associate Director
- Claudia Morales, BA, GSLC Project Manager
- James Cox, PhD, HSC Core Research Facility, Director
- Brenda Smith, Director, Accounting and Finance, HSC Core Research Facility Operations

FY24 Annual Update

New Services

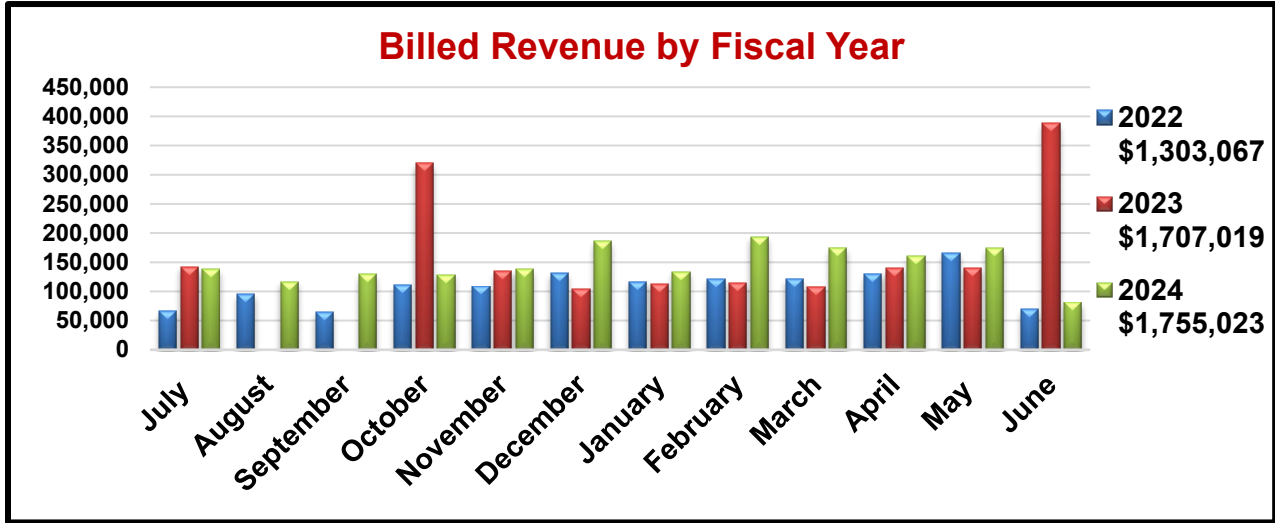
Evaluation of training programs

Revenue/Expenses

FY24 Expenses: \$2,118,512

FY24 Revenue: \$2,081,403

- Other Revenue Sources: \$236,380
- Benning Award: \$90,000
- FY24 revenue generated from services: \$1,755,023

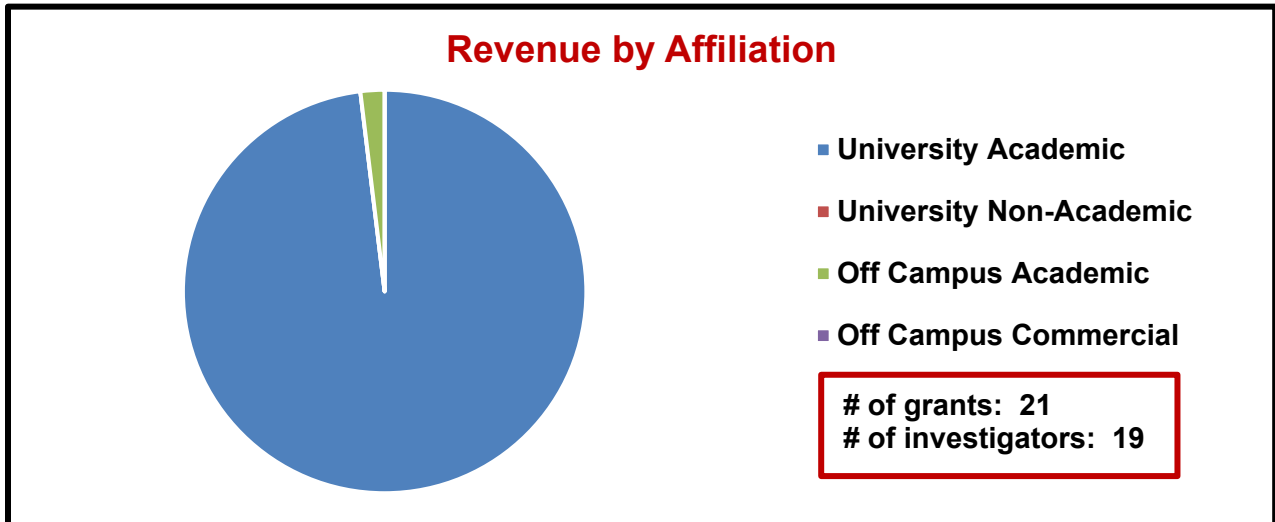


* Legend displays total annual revenue by year earned.

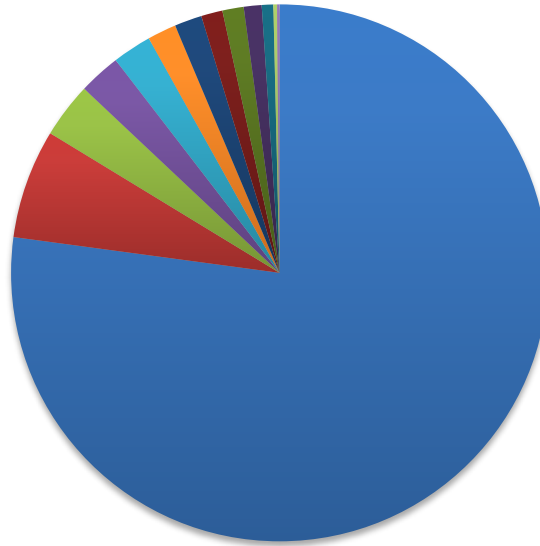
FY24 Scientific Impact

Research Support

Revenue Generated (see charts):



Revenue by Department



- Genetic Science Learning Center
- College of Nursing
- Obstetrics & Gynecology
- SVPHS
- CTSI
- Pediatrics
- HCI
- Neurobiology
- Family & Preventive Medicine
- Population Health Sciences
- Internal Medicine
- HSC Cores
- Human Genetics

Top Users

1	Louisa Stark	NIH, NSF, Utah Department of Health
2	Kara Dassel	NIA, Department of Health
3	Erin Rothwell	NIH
4	Gerald Cochran	Department
5	Kola Okuyemi	NIH
6	Rachel Hess	NIH
7	Brooks Keeshin	SAMHSA
8	University of Georgia	Off Campus Academic
9	University of Colorado Boulder	Off Campus Academic
10	Emily Ahonen	CDC Natl Occupational Safety & Health

Educational Modules Published Online

1. *Symbiosis and Other Relationships* module [Web]. Available <https://teach.genetics.utah.edu/content/symbiosis/> and <https://learn.genetics.utah.edu/content/symbiosis/>; PI: Galen Burke, Department of Entomology, University of Georgia
2. *Odor2Action* mini-module [Web]. Available <https://learn.genetics.utah.edu/content/senses/odor2action/>; PI: John Crimaldi, College of Engineering and Applied Science, University of Colorado
3. Additions to *Model Earth* module [Web]. Available <https://learn.genetics.utah.edu/content/earth/yellowstone/>; <https://learn.genetics.utah.edu/content/earth/wasatchmountains/>; PI: Fan Chi Lin, UU Department of Geology and Geophysics
4. *Genetic Tech Investigations* module [Web] Available <https://teach.genetics.utah.edu/content/gentech/>; and <https://learn.genetics.utah.edu/content/gentech/>

Materials Developed for the NIH *All of Us* Research Program

1. Completed 7 videos in Puerto Rican Spanish
2. Completed 11 hands-on engagements in Latin Spanish and Puerto Rican Spanish
3. Completed 11 micro-workshop videos in English, Latin Spanish, and Puerto Rican Spanish
4. Completed 2 brochures in Latin Spanish and Puerto Rican Spanish
5. Completed 1 poster in Latin Spanish and Puerto Rican Spanish
6. Completed 2 PowerPoints in Latin Spanish and Puerto Rican Spanish
7. Completed 5 Program-in-a-Box sets of materials
8. Completed the *Getting to Know All of Us: VR* experience
9. Developed the *Our Data in Action* app
10. Developed and classroom tested a high school curriculum module titled *Exploring Big Data with the All of Us Data Browser* – [teacher materials](#) and [student materials](#)

Materials Developed for Other UU Faculty and Departments

1. UU Center for Medical Cannabis Research – 3 videos for patient and provider education
2. Michigan Biotrust for Health – animated patient education video. PI: Erin Rothwell, UU Department of Obstetrics and Gynecology
3. Center of Excellence in Total Worker Health: U-Power – developing a 2-hour training module on Total Worker Health. PI: Emily Ahonen, UU Department of Family and Preventive Medicine
4. Age Friendly Care – video development. PI: Timothy Farrel, UU Department of Internal Medicine
5. Materials Characterization Lab (MCL) Core – filmed 3 of 20 videos

Evaluation Studies for Training Programs

1. GURU: Graduate and Undergraduate Researchers of UCEER program. PIs: James Tabery, PhD, UU Department of Philosophy, and Erin Rothwell, PhD, UU Department of Obstetrics and Gynecology.
2. Genomics Summer Research for Minorities: A Pathway to Promote Diversity in Science Research. PI: Joseph Yost, PhD, UU Department of Pediatrics.
3. Huntsman Cancer Institute PathMaker Programs for Cancer Research. PIs: Donald Ayer, Huntsman Cancer Institute, and Kolawole Okuyemi, UU Department of Family and Preventive Medicine.
4. Geriatrics Workforce Enhancement Program – HRSA. PI: Linda Edelman, UU College of Nursing.
5. BRIDGES (RII-BEC: Boosting Retention, Interest, and Diversity through Guided Experiences in STEM. PI: Kankshita Swaminathan, HudsonAlpha Institute for Biotechnology, Huntsville, AL
6. Beginnings: Experiential Learning for Emerging Biotechnology Careers. PI: Kelly East, HudsonAlpha Institute for Biotechnology, Huntsville, AL

Developed Websites

1. Cooperative Centers of Excellence in Hematology – website maintenance [Web]. Available <https://cheh.io/>
2. Building Healthy Families. Jenny Hill, UU Department of Population Health Sciences
3. Life Planning in Early Alzheimers and other Dementias (LEAD), Kara Dassel, UU College of Nursing
4. UU Department of Human Genetics – website maintenance [Web]. Available <https://www.genetics.utah.edu/>

Publications

1. Finley, A. K., L. Andoni, C. A. May, L. A. Stark and K. M. Dent (2023). Exploring the impact of virtual SPIKES training on genetic counselors' confidence to deliver difficult news. *J Genet Couns* **32**(6): 1266-1275.10.1002/jgc4.1794
2. Nava M, Christini K, Kepka D, Kent-Marvick J, Digre KB, Stark LA, Davis FA, Lee D, Mukundente V, Napia E, Sanchez-Birkhead AC, Tavake-Pasi OF, Villalta J, Brown H, Simonsen SE. (2023). Do interventions targeting women impact children's health behaviors? *Utah Women's Health Review*. doi:10.26054/Od-jacn-53wd.
3. Sparks, C., A. Hsu, S. A. Neller, J. Eaton, A. Thompson, B. Wong, E. Iacob, A. L. Terrill, M. Caserta, L. Stark and R. L. Utz (2024). Comparison of recruitment methodologies for clinical trials: Results from the time for living and caring (TLC) intervention study. *Contemp Clin Trials* 140: 107518.10.1016/j.cct.2024.107518
4. Sunada, G. R., K. B. Digre, L. A. Stark, F. Davis, V. Mukundente, E. Napia, A. Sanchez-Birkhead, O. F. Tavake-Pasi, H. Brown, S. C. Alder, K. Giesecker, N. Hu, Y. Wu and S. E. Simonsen (2024). Obesity-Preventive Behaviors and Improvements in Depression among Diverse Utah Women Receiving Coaching from Community Health Workers. *J Health Care Poor Underserved* 35(1): 186-208
5. Taylor-Swanson, L., K. Stoddard, J. Fritz, B. B. Anderson, M. Cortez, L. Conboy, X. Sheng, N. Flake, A. Sanchez-Birkhead, L. A. Stark, L. Farah, S. Farah, D. Lee, H. Merkley, L. Pacheco, F. Tavake-Pasi, W. Sanders, J. Villalta, C. Moreno and P. Gardiner (2024). Midlife Women's Menopausal Transition Symptom Experience and Access to Medical and Integrative Health Care: Informing the Development of MENO GAP. *Glob Adv Integr Med Health* 13: 27536130241268355.10.1177/27536130241268355
6. Utz, R. L., M. Caserta, E. Iacob, C. Sparks, L. Stark, A. Terrill, A. Thompson and B. Wong (2023). Maximizing the Benefit of Respite for Dementia Caregivers: A Study Protocol Describing the Development & Evaluation of the Time for Living & Caring (TLC) Intervention. *OBM Integr Complement Med* **8**(4).10.21926/obm.icm.2304040

Materials Characterization Lab

Overview

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

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

The MCL maintains a ~1300 sq. ft. lab facility, including optical and electron microscopy, x-ray diffraction, thermal analysis, surface analysis, mechanical testing, physical testing, spectrophotometry along with some sample preparation resources.

Uniqueness

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

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

The MCL has expertise in:

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

The MCL provides the following:

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

Services & Equipment

The MCL serves as a facility for Materials Science and Engineering undergraduate and graduate level courses that involve materials characterization. In addition to supporting undergraduate classes, student interns can work for two semesters in the lab to gain experience with machines and professional communication.

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

Optical Microscopy

- Olympus BH2 Series System Microscope
- Olympus Tokyo PME Inverted Stage / Metallographic Microscope
- Olympus VANOX Universal Research Microscope

Scanning Electron Microscopy

- Hitachi TM3030Plus Tabletop Microscope (SEM) with SE, BSE detectors, and Thermo Scientific Pathfinder SDD energy dispersive x-ray spectrometer (EDS).

Spectroscopy

- Nicolet iS50 FT-IR with Diamond ATR attachment
- Perkin-Elmer LAMBDA 950 UV-Vis-NIR Spectrophotometer with 150 mm Integrating Sphere, 2D Detector Module, and Universal Reflectance (URA) Accessories

X-Ray Diffraction

- Philips PANalytical X'Pert X-Ray Diffractometer (XRD) with powder diffraction and thin film detectors.
- Bruker D2 Phaser X-Ray Diffractometer (XRD) with Phi axis rotation abilities.

Thermal Analysis

- Anter Corporation Work Horse IB Dilatometer
- NETZSCH DSC 3500 Sirius Differential Scanning Calorimeter (DSC)
- TA Instruments SDT 650 thermogravimetric analyzer and differential scanning calorimeter (DSC-TGA) with autosampler

Macroscopic & Physical Testing

- TA Instruments DHR 20 Rheometer with Dynamic Mechanical Analysis (DMA) and dielectric testing mode
- Anton Paar MCR viscometry, rheology, and tribology
- Anton Paar Ultrapyc 5000 helium pycnometer
- Instron 5969 Dual Column Tabletop Testing System
- Micromeritics 3Flex physisorption analyzer for BET surface area and pore size
- Micromeritics FlowPrep 060 Sample Degas System
- Beckman Coulter LS230 particle size analyzer (PSA) with polarized light detectors
- Metrohm Karl Fisher Titrator

Sample Preparation

- Mettler AE100 Analytical Balance
- Cressington 108carbon/A Carbon Coater for Conductive Carbon Coatings
- Cressington 108auto Sputter Coater for Conductive Gold and other precious metal Coatings

Cross-Sectioning / Microsectioning

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

FY25 Goals

- Improve sample submission turnaround times.

Personnel

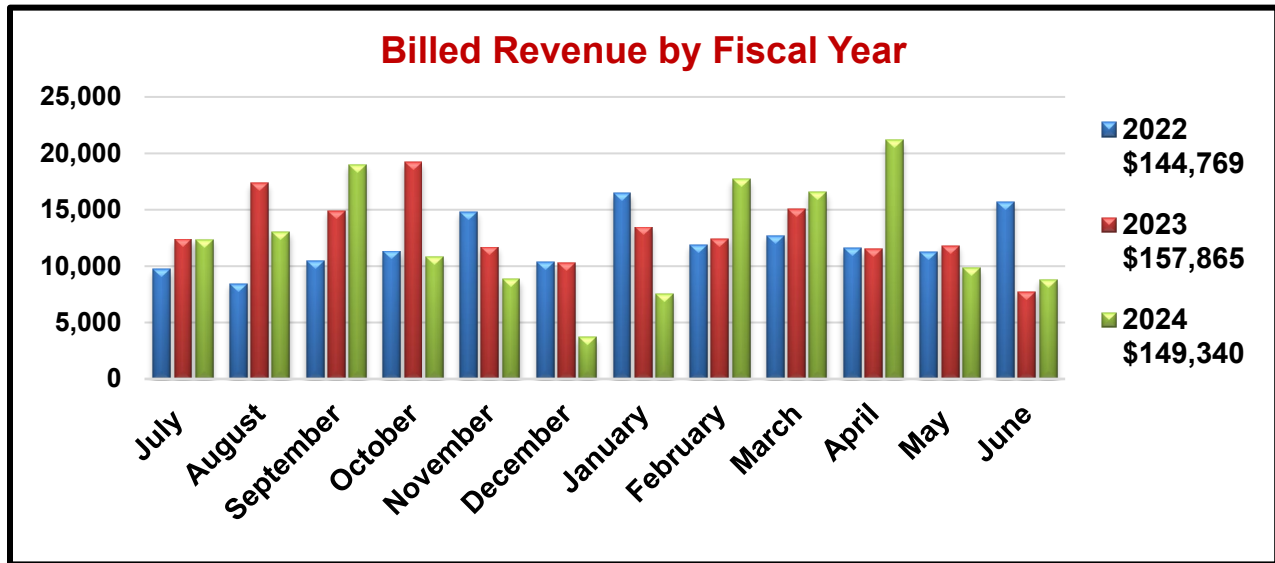
- Angela Nelson, Administrative Officer
- Kimberly Watts, Lab Manager
- Joy Walker, Executive Secretary
- Hannah Braeger, Technician

Revenue/Expenses

FY24 Expenses: Total \$133,310

FY24 Revenue: Total \$149,340

- VP of Research Support: \$ 0
- FY24 Revenue generated from services: \$149,340

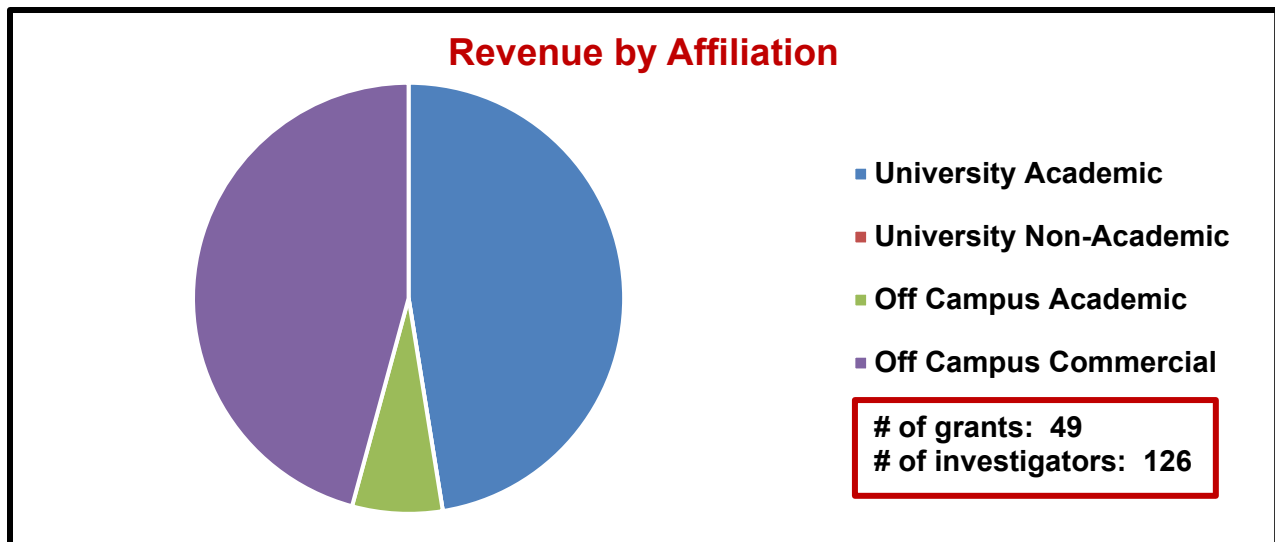


* Legend displays total annual revenue by year earned.

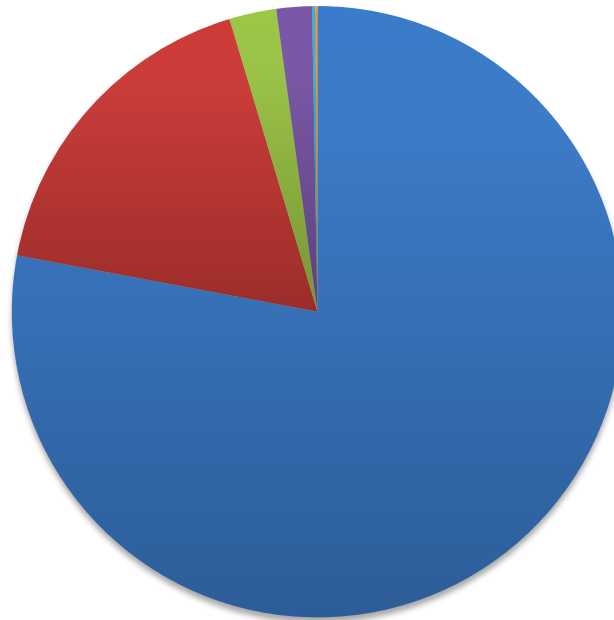
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



- College of Engineering
- College of Science
- College of Pharmacy
- College of Mines Earth and Science
- Architecture & Planning
- HCI

Top Users

1	Purple Innovation LLC	Commercial
2	Michael Gruenwald	W.M. Keck Foundation
3	Chen Wang	Department
4	Lipocine Inc.	Commercial
5	Jeff Bates	Department, University of Utah Research Foundation
6	Co-Diagnostics, Inc.	Commercial
7	Roseanne Warren	NSF, Department, VPR Operating Funds
8	OxEon Energy	Commercial
9	Jiyoung Chang	NSF
10	Kim Watts	Department

Publications

No known publications acknowledged this facility in FY24.

Metabolic Kitchen

Overview

The University of Utah Metabolic Kitchen is an integrated resource between the University of Utah College of Health and the Utah Clinical and Translational Science Institute (CTSI) Clinical Research Unit (CRU) located on the University of Utah campus at 260 1850 E, Salt Lake City, UT 84112. This 770 ft² professional kitchen facility is equipped with industrial cooking appliances, supplies, and research-grade dietary analysis software for precision nutrition services. Its primary mission is to provide researchers with expertise and resources in the fields of nutrition science, disease management, and related academic research pertaining to food and wellbeing.

Uniqueness

Metabolic kitchens are novelty facilities not available to all researchers. They represent a cutting-edge advancement in nutrition research and health sciences by offering precise, customizable dietary solutions for research participants. Their ability to provide controlled meals tailored to specific study protocols, dietary restrictions, and cultural preferences enhances the accuracy and reliability of research findings. These facilities support complex, long-term studies by integrating seamlessly into the research workflow, ensuring consistency and compliance. Moreover, metabolic kitchens facilitate interdisciplinary collaboration among nutritionists, researchers, and healthcare providers, contributing to a deeper understanding of the relationship between diet and health outcomes and fostering the development of innovative dietary interventions and therapies.

Services

The Metabolic Kitchen offers a variety of services, including study consultations led by a registered dietitian, covering topics such as nutrition science, research protocols, interventions, epidemiological tools, and best practices. Additionally, the metabolic kitchen assesses energy and nutritional requirements of research study participants, creates customized menus and recipes, prepares meals to precise standards, conducts diet assessments and analyses, and provides diet counseling, diet record guidance, and review for study subjects.

FY25 Goals

- Increase awareness of services
- Ensure the successful completion of ongoing studies
- Increase efficiency in procedures & protocols
- Recruit student volunteers & interns
- Initiate services for a broader range of research projects

Major Equipment

Oven Range:

- Southbend S60DD-2TL

Dishwasher:

- Hobart AM16VL-BASX

Hood:

- Captivaire DCV-1111

Stainless Steel Work Table:

- Advance Tabco SKG-3012
- Advance Tabco SKG-306 x 3

Clean Dishtable:

- Advance Tabco DTC-S60-36R-X

Stainless Steel Work Table w/Sink:

- Advance Tabco KMS-11B-305L

Refrigerator:

- True Mfg T-23-HC x 2
- True Mfg T-49G-HC-FGD01

Freezer:

- True Mfg T-23F-HC
- True Mfg T-23FG-HC-FGD01

Blast Freezer:

- Irinox Balance XPR4001S

Wire Shelving:

- Olympic J2460C
- Olympic J2442C
- Olympic J1824K
- Olympic J1842K

Three-Compartment Sink:

- Advance Tabco RC-3-1620-18RL-X

Precision Food Scales:

- Mettler Toledo MS1003TS

Personnel

- Rachael Jones, MS, RDN, Metabolic Kitchen Director
- Zachary Hartlyn, Culinary Operations Manager

Advisory Board Committee

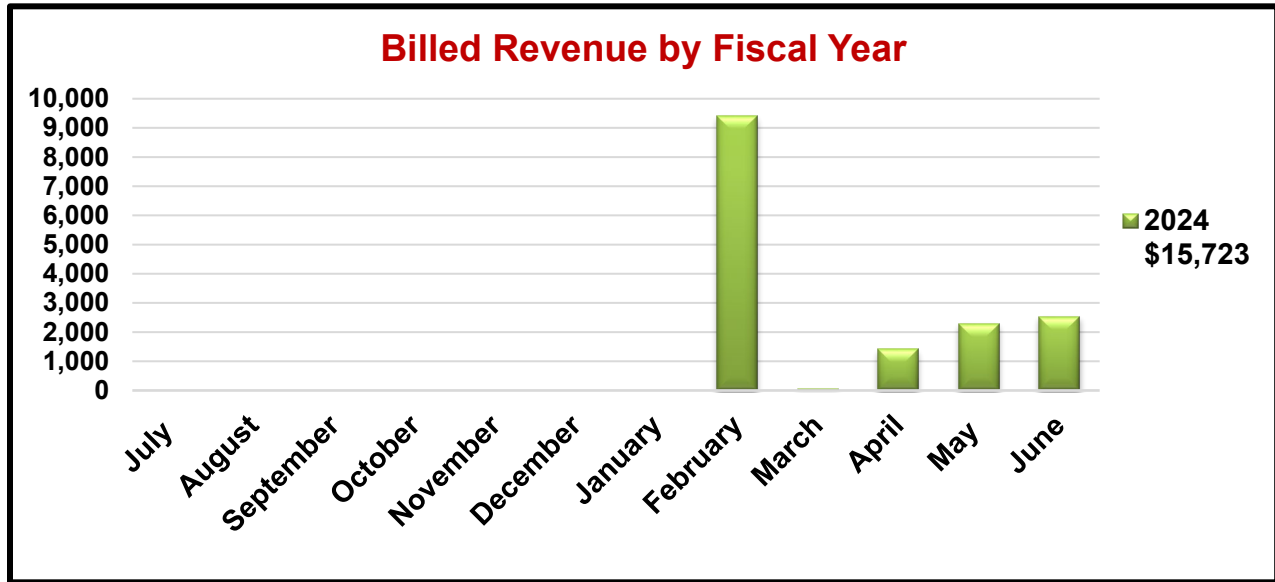
- Scott Summers, Nutrition & Integrative Physiology
- Mary Playdon, Nutrition & Integrative Physiology
- Tanya Halliday, College of Health

Revenue/Expenses

FY24 Total Expenses: \$5,648

FY24 Total Revenue: \$15,723

- VP of Research Support: \$0
- FY24 Revenue generated from services: \$15,723

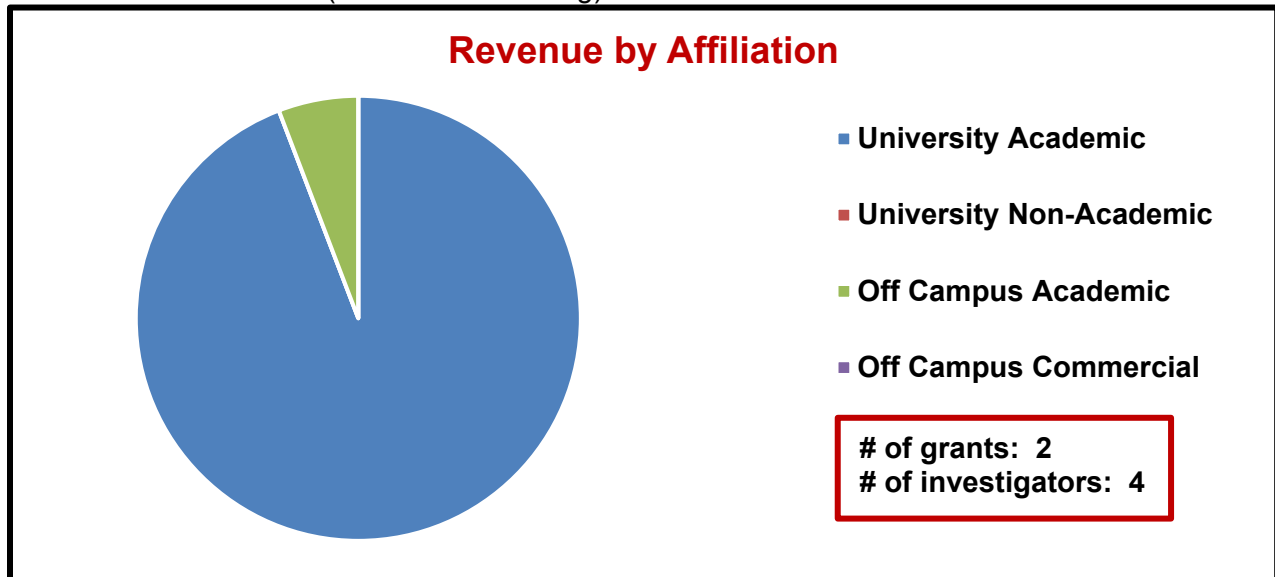


* Legend displays total annual revenue by year earned.

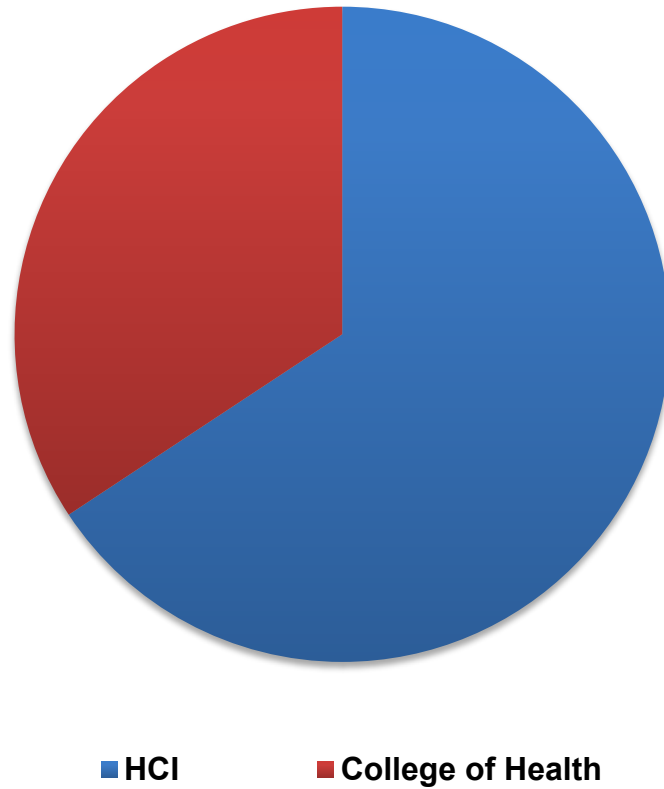
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



Top Users

1	Mary Playdon	Department
2	Christopher Depner	NIH
3	Veteran Affairs Medical Center	Off Campus Educational
4	Tanya Halliday	Department

Publications

No known publications acknowledged this facility in FY24.

Metal 3D Printing

Overview

The Metal 3D Printing Core Facility provides AM (additively manufactured) parts. This manufacturing process includes parts consultation with customers to ensure feasibility. Parts are then modified by the 3D Printing Core Facility as needed so that they are suitable for print. Our modifications include adding support material, adding drain holes, part scaling, or modifying print parameters upon request. Parts can then be heat treated to remove any residual stress leftover by the printing process, providing strong lightweight components with geometries formerly unobtainable.

Uniqueness

The Metal 3D Printing Core provides services not available at most universities. Printing of dangerous metal powder requires specialized equipment and training which are now a luxury to the University of Utah. These printing services are available to anyone, as the service is provided by trained personnel within the core facility. This provides many opportunities to the University of Utah such as performing our own research on AM parts and being able to contribute to national/global research studies.

Services

The Metal 3D Printing Core's primary mission is to provide students, faculty, labs, research organizations, and members of Utah's valley with 3D printed metal parts while maintaining part parameter and part process clarity. We are offering the following services:

- Part feasibility consultation.
- Application of necessary support structure.
- Providing various powder and build plate material types.
- Part printing with parameter/environmental logging as necessary to maintain consistent part quality and advance AM processes.
- Part/support removal and heat treatment if necessary.

FY25 Goals

- Increase awareness of our services
- Increase core efficiency and reduce turnaround time.

Major Equipment

AM Metal Printing:

- Aconity MIDI dual laser AM printer.
- HK Sieve ultrasonic powder filter.
- Aconity (optional) 1200C Inducting heating element.
- Basic machine shop capabilities.

Personnel

- Ashley Spear, Ph.D., Dept. of Mechanical Engineering, Core Account Executive
- Alik Nielsen, B.S., Dept. of Mechanical Engineering, Associate Engineer/Lab Technician

Advisory Board Committee

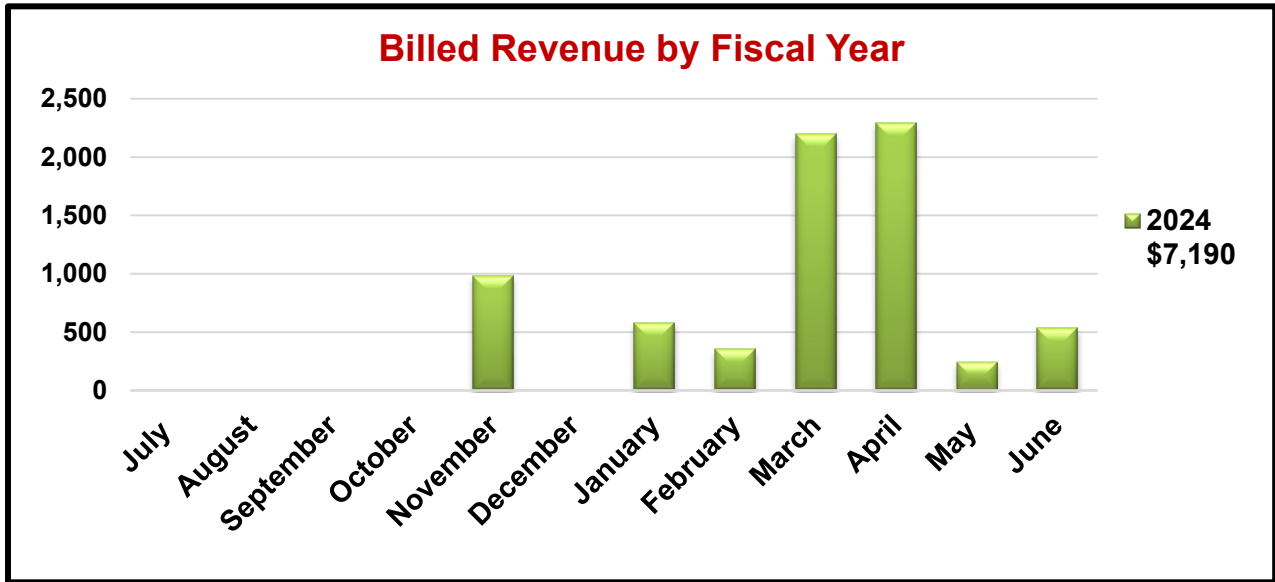
- N/A

Revenue/Expenses

FY24 Total Expenses: \$7,190

FY24 Total Revenue: \$2,432

- VP of Research Support: \$0
- FY24 Revenue generated from services: \$7,190

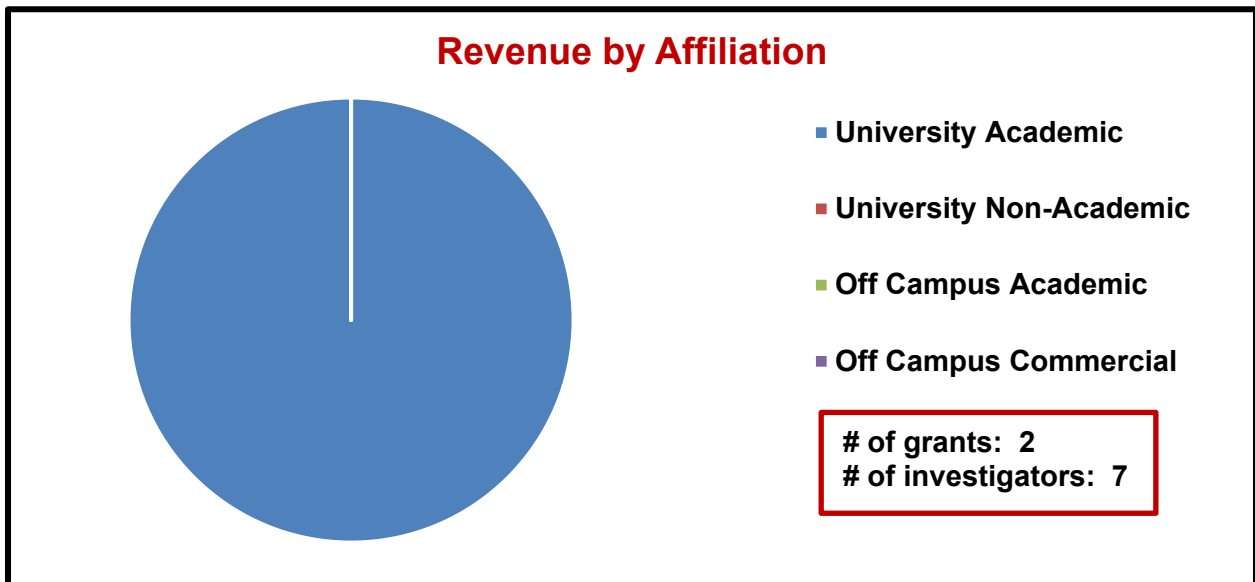


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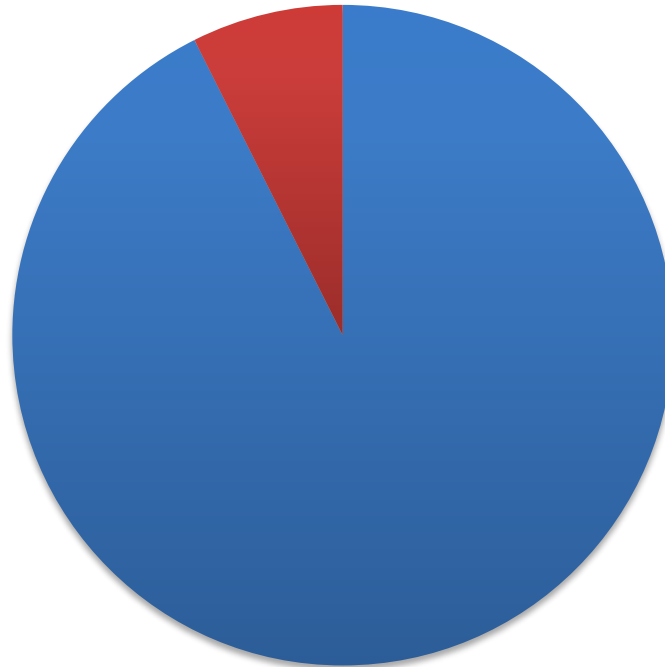
FY24 Scientific Impact

Research Support

Revenue Generated (see charts following):



Revenue by Department



■ College of Engineering

■ HSC Cores

Top Users

1	Kevin Whitty	DOE
2	Sameer Rao	Department
3	Pai Wang	NSF
4	Yongzhi Qu	Department
5	Shuaihang Pan	Department
6	Shawn Colby	Department
7	Robert Hitchcock	Department

Publications

No known publications acknowledged this facility in FY24.

MIDAS

Overview

Direct regulatory interactions between proteins or RNAs and metabolites provides a rapid and adaptive mechanism of metabolic control of cellular processes. Despite their integral importance to cellular function, the protein- and RNA-metabolite interactomes are almost completely undefined. The MIDAS Core provides unique services for targeted protein- or RNA-metabolite ligand interaction discovery.

Uniqueness

Central to MIDAS Core services is the Mass Spectrometry Integrated with Equilibrium Dialysis for the Discovery of Allostery Systematically (MIDAS) platform. MIDAS is a unique and robust interactomics platform developed at the University of Utah by core director Dr. Kevin Hicks in Dr. Jared Rutter's laboratory (DOI: [10.1126/science.abm3452](https://doi.org/10.1126/science.abm3452)). Using a custom compound library of human metabolites, the MIDAS platform provides users with specific protein- or RNA-metabolite interaction information for their target protein or RNA. MIDAS has the unique capacity to simultaneously discovery high and low affinity protein- or RNA-metabolite interactions ($K_d < 5 \text{ mM}$) including substrates, products, cofactors, and orthosteric and allosteric regulators.

Services

The MIDAS Core's primary mission is to facilitate the discovery of interactions between metabolites and proteins or RNAs. We are offering the following services:

- MIDAS analysis of user proteins to identify metabolite ligands.
- MIDAS analysis of user RNAs to identify metabolite ligands.

FY25 Goals

- Increase awareness of our services
- Increase core efficiency and reduce turnaround time.
- Increase core usage.
- Provide new services.

Major Equipment and Reagents

MIDAS platform:

- Two Shimadzu HPLC systems coupled to two SCIEX X500R ESI-QTOF mass spectrometers.
- Biomek NX_p liquid handling robot with SPAN-8 cherry-picker arm and gripper.
- Arrayed MIDAS metabolite library (703 human metabolites)

Personnel

- Kevin G. Hicks, PhD, MIDAS Core Director, MIDAS Core Account Executive, Assistant Professor in the Department of Nutrition and Integrative Physiology
- Casey Hughes, PhD, Research Specialist
- Zihan Monshad, BS, Lab Technician
- Christina Volz, BS, Lab Technician

Utah Nanofab Administration

Overview

The Utah Nanofab is made up of two labs: a cleanroom, and an electron microscopy and materials characterization lab – the EMSAL. This is the largest academic Nanofab Lab in the Northwestern US, with ~23,000 sq. ft of lab space. The cleanroom has the facilities to fabricate small scale devices and has equipment for: lithography, thin film deposition, etching, packaging, micro 3D printing, laser patterning and more. The EMSAL is the leading EM and materials characterization lab on campus, with 4 SEMs, the only analytical TEM/STEM on campus, XRD, and a variety of other techniques to image and measure the chemical, electrical, optical and mechanical properties of materials. The technical expertise of the Nanofab's staff is essential in making sure that students are properly trained in these capabilities.

In FY24, Utah Nanofab (Cleanroom and EMSAL) have \$22M in equipment. There were 106 faculty, 227 students, 19 academic institutions and 82 private companies that used our facilities. The Utah Nanofab is a hub of activity on campus, where our staff guided 32 tours last year for 472 visitors. These include departmental faculty recruitments, graduate student recruitments, undergraduate and graduate level class demos, local industry representatives and state government officials. Having an outstanding set of instrumentation is critical for attracting the best new faculty to the university. We also teach and host 10 university courses, which teach 137 students. The staff and equipment in the Nanofab are integral to these classes. The combined Nanofab, cleanroom and EMSAL, helped to enable \$170M in University research in FY2024. This is the sum of all active research grants, not necessarily awarded in FY24, that utilized the Nanofab.

<https://www.nanofab.utah.edu/>

Personnel

- Hanseup Kim, Director
- Berardi Sensale Rodrigez, Associate Director and Faculty Advocate/Cleanroom
- Luisa Whittaker-Brooks, Associate Director and Faculty Advocate/Electron Microscopy and Surface Analysis Lab
- Amy Lash, Administrative Manager
- Brian Baker, Cleanroom Manager
- Brian Van Devener, EMSAL Manager
- Rachel Henderson, Accountant

Utah Nanofab Administration Revenue & Expenses

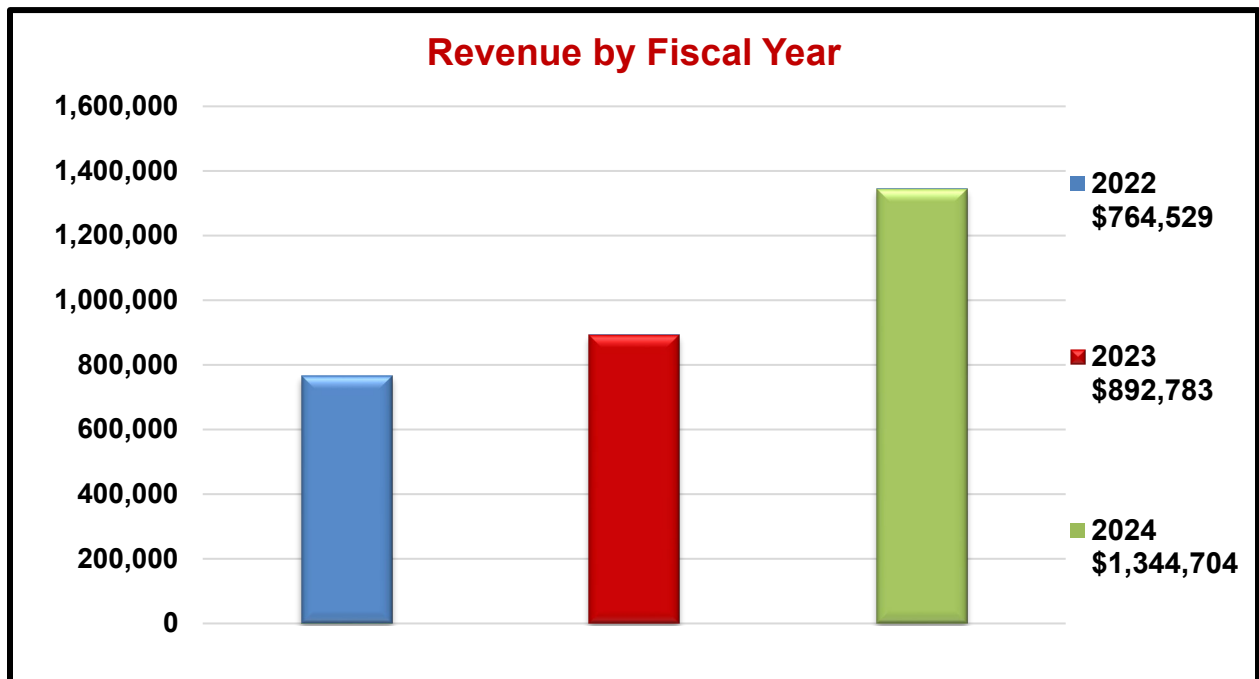
FY24 Expenses: Total \$1,411,591

The Administration Budget covers the following expenses:

- Salaries/Benefits: \$328,267
- Fixed Expenses: \$1,083,324

FY24 Revenues: Total \$1,344,704

- FY24 The John & Marcia Price College of Engineering Revenue: \$762,000
- FY24 VP for Research: \$176,386
- RIF Funds for EMSAL: \$85,680
- Other Sources: \$320,638



Utah Nanofab Cleanroom Facility

Overview

The Utah Nanofab Cleanroom is a state-of-the-art facility that provides access to advanced nanofabrication equipment, expertise, and materials to support research and development across the fields of nanotechnology, microfluidics, nanophotonics, microoptics, microsensors, microelectronics, materials, bio-implantable microdevices, and related areas. Our class 100/1000/10,000 cleanroom provides equipment for nanolithography, thin-film deposition, etching, micro 3D printing, laser patterning, microchip packaging, and more.

Our 4 full-time staff have more than 81 combined years of experience in micro and nanofabrication. The Nanofab Cleanroom has more than \$10.7M in state-of-the-art equipment available for use. There were 92 students, 53 faculty, 37 private companies and 10 academic institutions that used the Nanofab Cleanroom. During the past year, lab members produced 54 peer reviewed publications that made use of cleanroom equipment and resources. This is the sum of all active research grants, not necessarily awarded in FY24, that utilized the Nanofab. This is the sum of all of the research grants that used and relied on the Nanofab.

Services

The Utah Nanofab Cleanroom enables researchers to access facilities, micro/nanofabrication tools, and process design expertise that enable the realization of custom R&D prototype microchips.

- Thin film deposition of insulators, semiconductors, alloys, and precious metals
- Photolithography for patterning micro/nanoscale features on substrates
- Photomask design and fabrication
- Liftoff, wet chemical, and dry plasma etching of thin films on substrates
- Packaging including wafer bonding, wire bonding, and dicing
- 3D printing of micro/nanoscale patterns, devices, and structures
- Microfluidics chip fabrication
- Training and ongoing support to students, researchers, and engineers to enable them to use the equipment and facilities safely, effectively, and efficiently.
- Microchip design and fabrication assistance is available from our professional scientists and engineers. More information at: www.nanofab.utah.edu

FY25 Goals

- Work with industry partners to create a hands-on workforce development cleanroom internship training program to support semiconductor industry technician demand
- Secure funding to purchase and install e-beam nanolithography tool and install in cleanroom space to enable cutting-edge research in nanoscale devices across the university.
- Implement key recommendations from Waymaker review with guidance from the VPR

Equipment (SMBB 2221)

LITHOGRAPHY

- Nanoscribe Professional GT-2 micro/nano 3D printer
- Heidelberg DWL66+ Laser 300nm Pattern Generator
- Heidelberg μ PG 101 Laser Pattern Generator (x2)
- Nanofrazor 30nm-200nm nanolithography tool
- EVG EV-420, Suss MA1006, OAI 800 front & backside mask aligners
- Spinners, ovens, hot plates, fume hoods, SRDs, ultrasonic lift-off.

THIN FILM DEPOSITION

- Sputtering: TMV SS-40C, Denton Discovery 18, Denton 635LL, Precious Metals
- Evaporation: Denton e-beam DV-SJ/20C with four crucible hearths
- PECVD: Oxford PlasmaPro 100 Cobra ICPVD: Si, low-stress Si₃N₄, SiO₂
- CVD: SCS PDS 2010 Parylene-C
- MOCVD: Agnitron Agilis-IH: Gallium Oxide, Germanium Oxide
- ALD: Cambridge Fiji F200 w/ thermal & plasma (Pt, HfO₂, ZnO, Al₂O₃, SiO₂, TiO₂)

FURNACES and DIFFUSION

- LPCVD: Expertech LTO, low-stress Si₃N₄, polysilicon
- ANNEALING: Allwin 610 RTP/RTA with O₂, N₂, Ar, H₂ forming gas, 200-1250 °C
- FURNACES: ProTemp wet/dry thermal silicon oxidation with DCE

ETCH

- RIE and DRIE: Oxford PlasmaPro 100 Cobra 300mm, Oxford Plasmalab 100+ ICP DRIE Bosch & cryo, Plasmalab 80+, Plasmatherm 790 metal RIE (BCl₃, Cl₂)
- ISOTROPIC: Xactix Xetch XeF₂ silicon isotropic dry etch
- WET CHEMICAL: Bold wet benches (acids, bases, organics), Gold wet-etch station

LASER MICROMACHINING

- ULS CO₂ flatbed laser (25W + 75W, 1090nm)
- DPSS Samurai UV laser (355nm, 10um spot size, 3 W)

PACKAGING & ASSEMBLY

- EVG 520IS wafer bonder (anodic, eutectic, polymer, fusion)
- Disco DAD 641 & Disco 3220 dicing saws (std or UV tape)
- MEI wedge wirebonder with Au and Al wire
- LPKF Protomat S104 and Electroplating PCB printed circuit board manufacturing system

CLEAN MICROFLUIDICS

- SU-8 soft lithography
- Vacuum oven and O₂ RIE for PDMS to glass bonding

CLEANROOM METROLOGY

- JEOL JSM-IT200LV Inspection SEM
- Keyence VHX-5000 3D measuring microscope
- n&k NKT 1500 thin film analyzer with wafer mapping
- Nanometrics NanoSpec 3000 film thickness
- Filmetrics F20 & F40 small spot film thickness
- Magnetron Instruments 4-point probe
- Polyvar Met with DIC + many optical microscopes
- Tencor P-10 and P-20 stylus profilometers
- Tencor Flexus 2320 film stress analyzer

ELECTRICAL TESTING

- Keithley 4200A semiconductor parameter analyzer probe station

FY24 Annual Update**New Equipment**

- Oxford PlasmaPro 100 Cobra ICPVD/DRIE system
- Upgraded Agnitron MOCVD epitaxial reactor to deposit Germanium Oxide films
- LPKF Protomat S104 and Electroplating PCB printed circuit board manufacturing system

Personnel

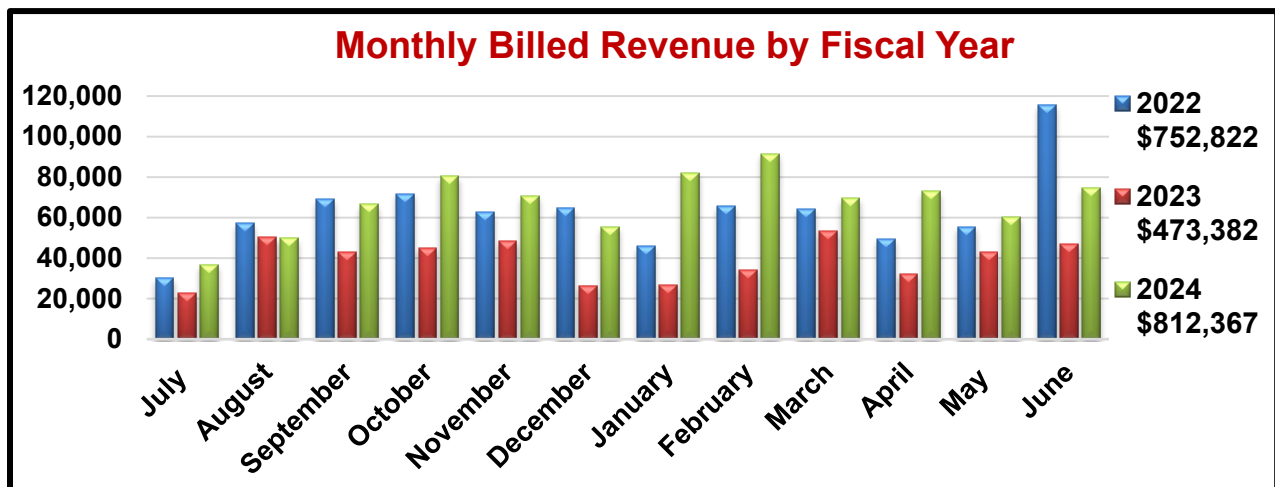
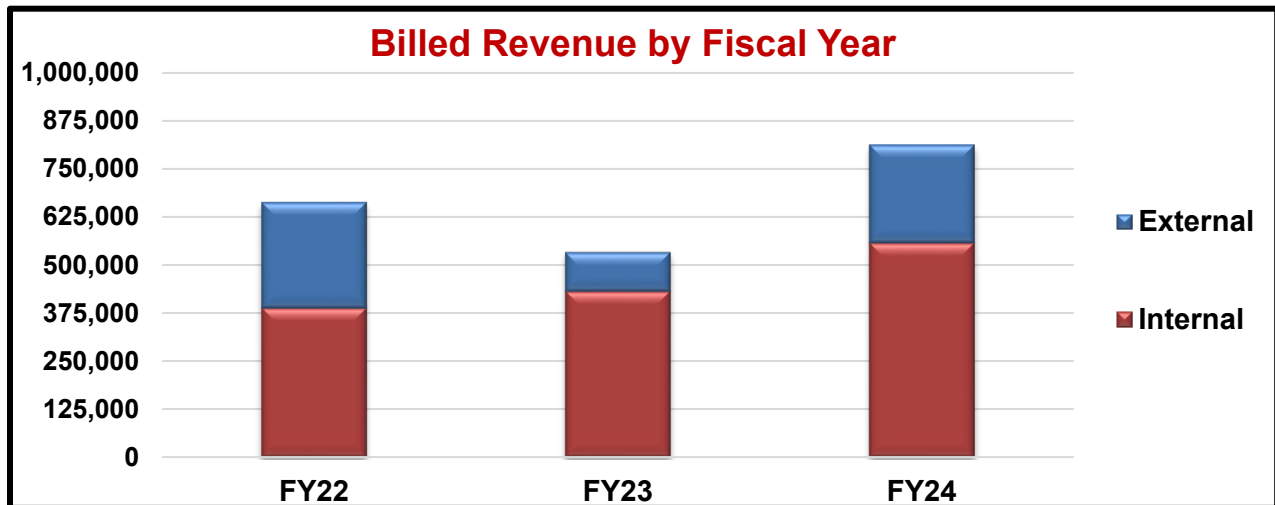
- Hanseup Kim PhD, Director
- Brian Baker, Cleanroom Manager
- Kathy Anderson, Process Engineer, Lab Safety Officer
- Joseph Jacob, Research Device Specialist
- Tony Olsen, Process Engineer
- Jim Pierce, Process Engineer
- Steve Pritchett, Process Engineer

Revenue/Expenses

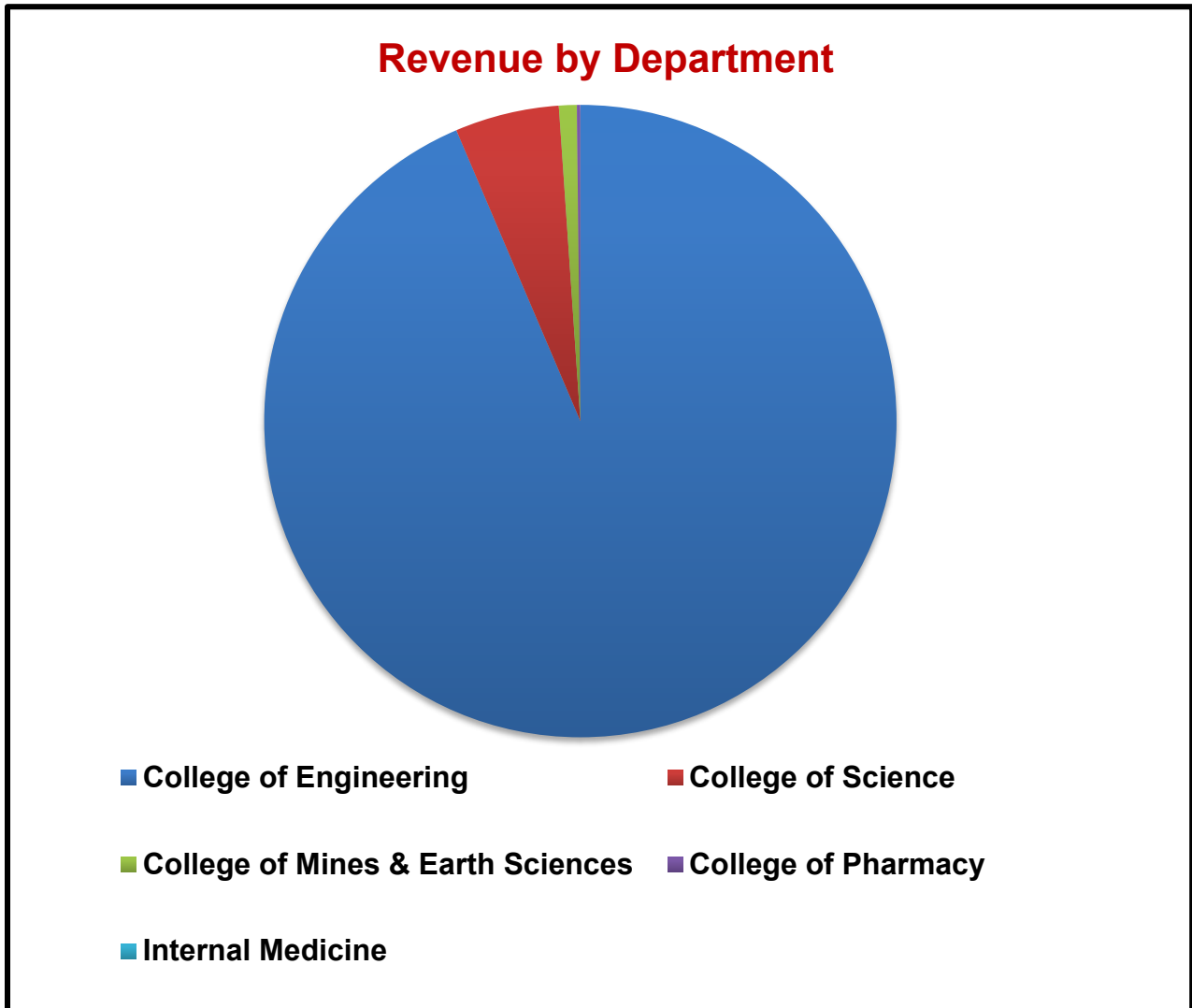
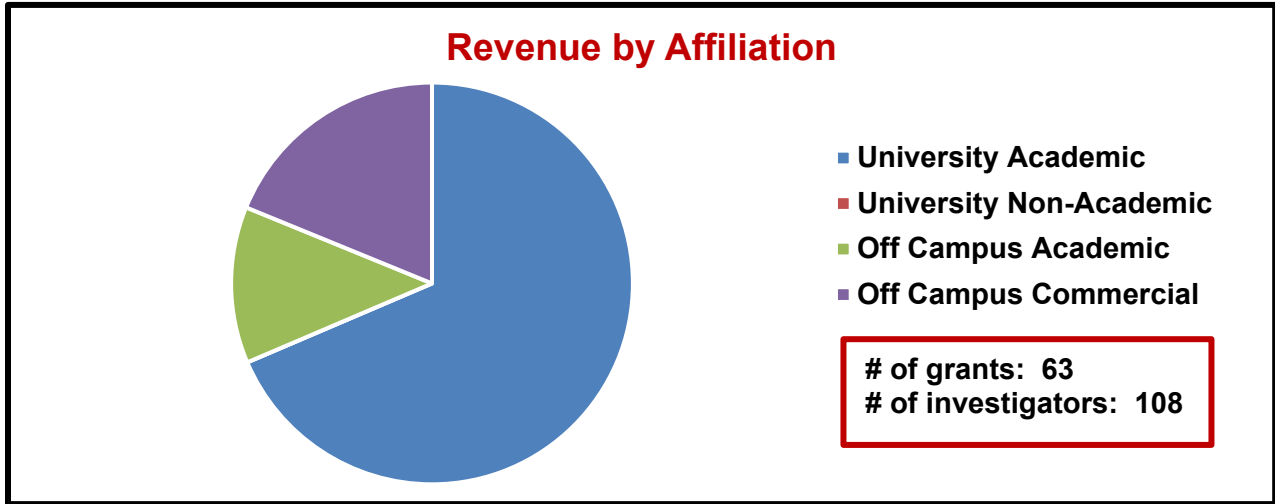
FY24 Expenses: Total \$1,077,301

FY24 Revenue: Total \$1,062,041

- FY24 Revenue billed from services: \$812,367
- VP for Research: \$50,000
- The John & Marcia Price College of Engineering: \$199,674
- The Nanofab Cleanroom has a monthly cap of \$2,500 per total tool use per on-campus lab member, per project. Tool use above the cap is subsidized by the Nanofab Cleanroom. \$231,941 in monthly equipment cap credits were issued to on-campus users.



**FY24 Scientific Impact
Research Support**
Revenue Generated (see charts following):



Top Users

1	Hanseup Kim	DOE, Department
2	Kai Fu	Department, University of Utah Research Foundation
3	Electronic Biosciences	Off Campus Commercial
4	Rajesh Menon	Office of Naval Research, University of Texas Austin
5	Gentex	Off Campus Commercial
6	Yantao Fan	NIH
7	Heayoung Yoon	NSF, DOE. Department
8	University of Montana	Off Campus Academic
9	Florian Solzbacher	Blackrock Microsystems, Department, NYU, Duke University, University of Minnesota
10	Technicolor Precision Biodevices	Off Campus Commercial

Publications

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Utah Nanofab Electron Microscopy and Surface Analysis Lab

Overview

The Nanofab Electron Microscopy and Surface Analysis Lab (EMSAL) provides access, training, and consultation on a wide variety of materials characterization and electron microscopy instruments. We have 4 SEMs, and that capability forms a core part of our services. Three of these are equipped with EDS and EBSD for elemental analysis and crystal orientation mapping, and one is a Focused Ion Beam (dbFIB). We also have the only analytical TEM/STEM on campus, the JEOL 2800. Materials Characterization and Surface Analysis form the next core of our capabilities with: Micro CT, XRD, XPS/AES/ISS/UPS, SAXS/WAXS, XRF, CL, LC MS, nanoindentation, magnetometer, potentiostat, AFM, Ellipsometry, 3D optical profilometry, optical microscopes, and a full suite of sample prep tools for these techniques (coaters, polishers, etc.).

Our 4 full-time staff have more than 50 combined years of experience in electron microscopy and materials characterization. The Nanofab EMSAL has \$11.3M in state-of-the-art equipment available for use. There were 198 students, 92 faculty, 66 private companies and 14 academic institutions that used the Nanofab EMSAL last year. Lab members produced 56 peer reviewed publications in FY2024. The combined Nanofab, cleanroom and EMSAL, helped to enable \$170M in University research in FY2024. This is the sum of all active research grants, not necessarily awarded in FY24, that utilized the Nanofab.

Services

Microscopy and materials analysis: elemental, chemical, crystal structure, mechanical/electrical/magnetic, optical. Training students to be independent users of all equipment in the lab.

- 2D materials
- Alloys/metals
- Additively manufactured materials
- Medical and dental devices
- Battery materials
- Biomaterials
- Catalysts
- Ceramics
- Composites
- Geologic materials
- Microelectronics
- Nanomaterials and nanoparticles
- Orthopedic implants
- Pharmaceuticals
- Polymers
- Semiconductor materials
- Sensors and devices
- Solar cell materials
- Thin films

FY25 Goals

- Secure funding for new XPS instrument
- Implement key new ideas from Waymaker review with guidance from the VPR
- Present a short talk of our capabilities to relevant departments (Chemistry, Physics, Geology and all departments in the John and Marcia Price College of Engineering) at faculty meetings. The goal is to increase faculty awareness of our capabilities and increase utilization of the lab.

Equipment:**Electron Microscopes**

- STEM JEOL 2800. Ultrafast EDS, Liquid & gas in-situ TEM, electrochemistry.
- Focused Ion Beam FEI Helios Nanolab 650i. Hi-res, EDS, EBSD, EBL, Pt, W, C dep; XeF₂, I₂, H₂O enhanced etch.
- SEM FEI Quanta 600 FE-ESEM. EDS, EBSD, Environmental SEM, Bruker PI-89 Picoindenter stage.
- SEM FEI Teneo FE-SEM. EDS, EBSD, Trinity imaging detectors.
- SEM JEOL IT200LV. Cleanroom inspection SEM.

Materials Characterization

- Micro CT Zeiss Xradia Versa 620. 4D, non-destructive imaging, in-situ (heating/cooling/tension/compression), Lab DCT (crystallographic imaging).
- XRD Bruker Discover D8 Hi-res. Thin film/powder/crystalline/polycrystalline samples, XRR, RSM, rocking curves, $\theta/2\theta$ scans, 1100° heating stage.
- Cathodoluminescence (CL) detector (Teneo SEM). Gatan Monarc Pro hyperspectral imaging.
- LC MS Agilent 6470B.
- SAXS/WAXS/GISAXS Anton Paar SAXSPoint 5.0. In-situ heating/cooling/mechanical loading/humidity.
- XRF EDAX Eagle III Microspot. Microprobe and elemental mapping.
- Nanoindenter Hysitron TI Premier. Heating stage.
- Picoindenter stage for SEM. Bruker PI-89.
- Magnetometer Microsense EZ-7 VSM.
- Potentiostat Gamry Reference 600+

Surface Analysis

- XPS/AES/ISS/UPS Kratos AxisUltra DLD.
- AFM Bruker Icon-PT with KPFM, C-AFM, fluid cell, MFM.
- Ellipsometer Woollam V-VASE spectroscopic.

Optical Microscopes and Profilers

- 3D Optical Profiler Olympus OLS5000 LEXT.
- Optical Comparitor Vertex 220 microVu
- Optical Microscope Reichert Polyvar with BF, DF, DIC.

Sample Preparation

- Sample coating for SEM imaging (Au/Pd, C, Cr): Leica ACE600, Gatan PECS1
- Mechanical polishing: suite of tools for SEM/TEM prep
- Sectioning: Techcut 4 saw
- Ion-milling: Fischione 1060 and Gatan PIPS/PECS

FY24 Annual Update
New Equipment

- AFM Bruker Icon-PT: updated and added KPFM and C-AFM
- MTS MicroTestRig: Micro mechanical testing station for SEM and CT (pending)

Personnel

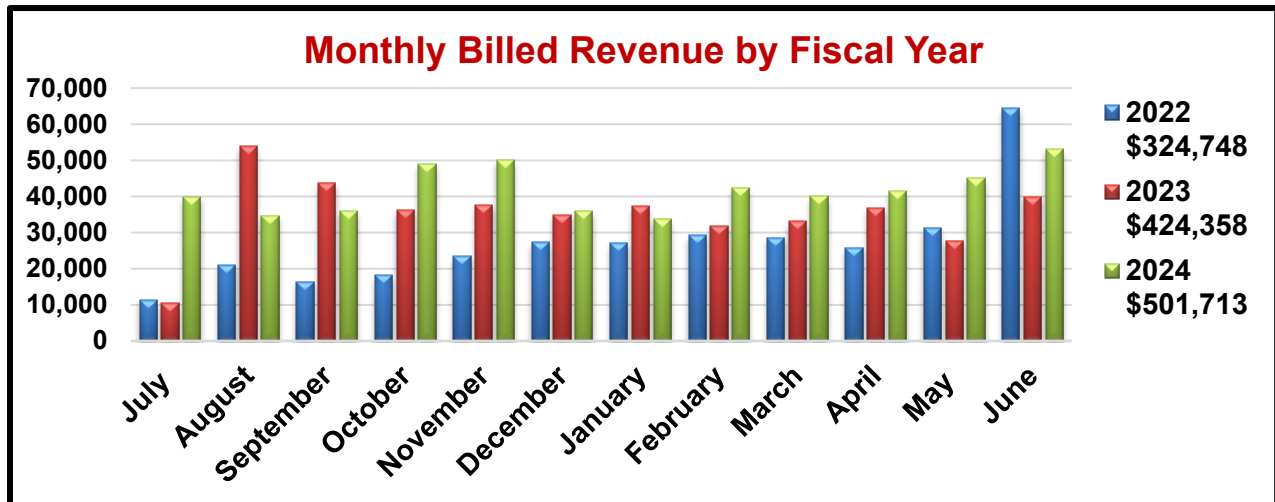
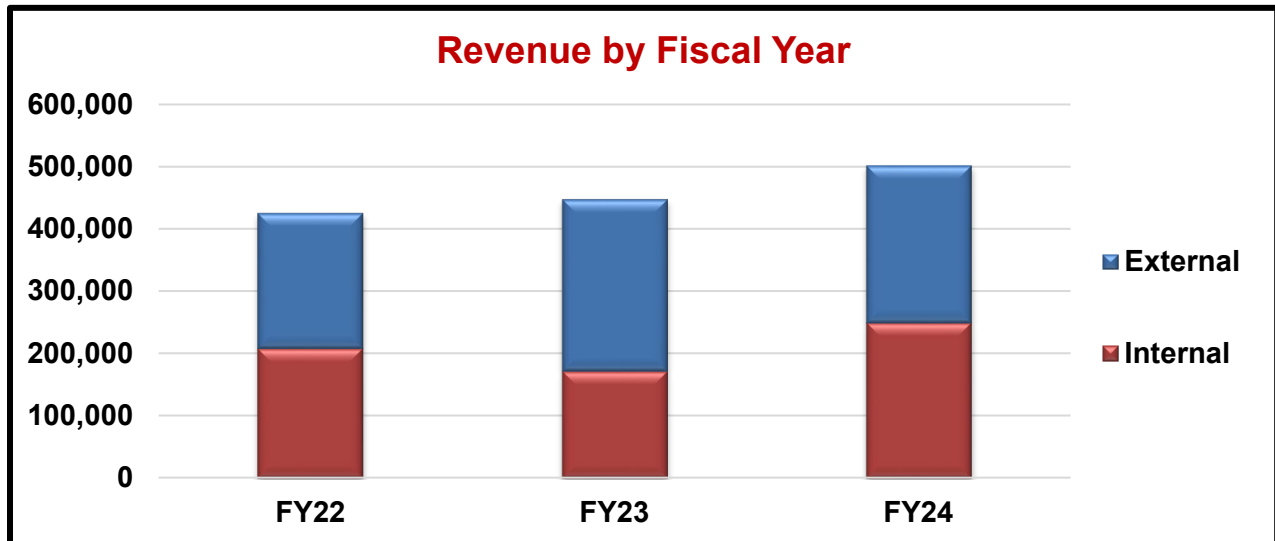
- Hanseup Kim, Ph.D., Director
- Brian Van Devener, Ph.D., Lab Manager
- Paulo Perez, Ph.D., Materials Scientist
- Randal Polson, Ph.D., Research Associate
- Bobby Duersch, Ph.D., Materials Characterization Specialist

Revenue/Expenses

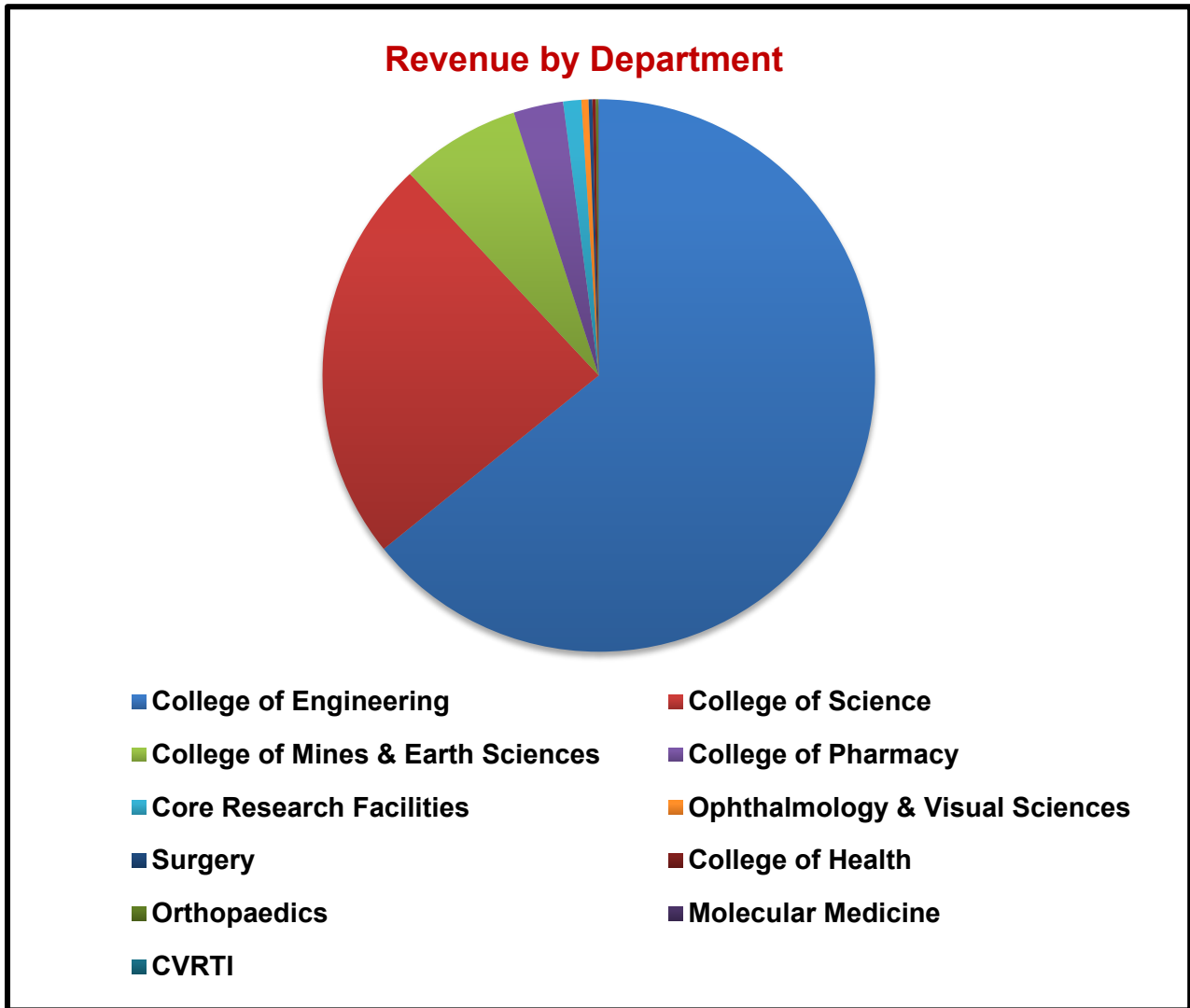
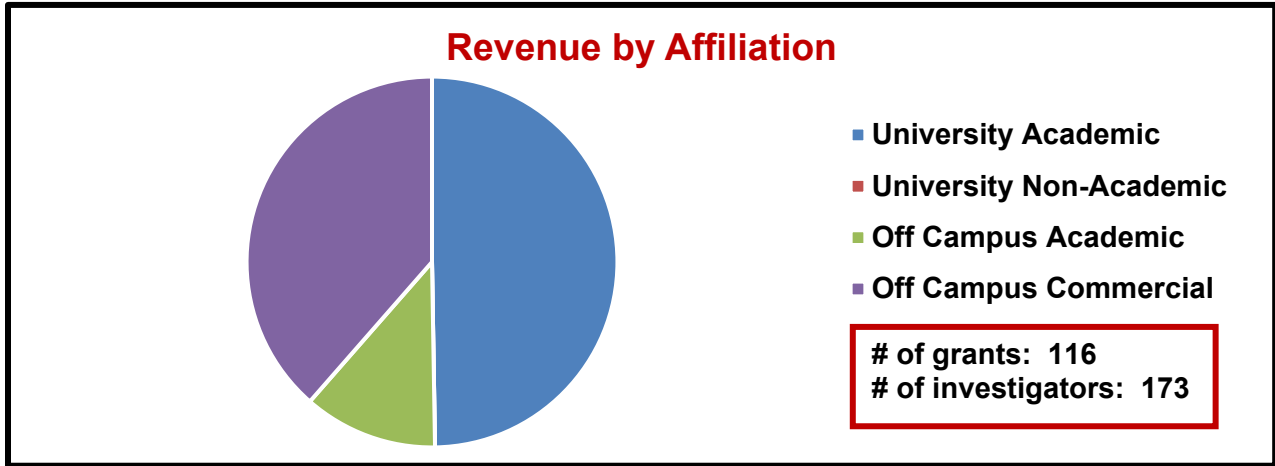
FY24 Expenses: Total \$880,425

FY24 Revenue: Total \$745,713

- FY24 Revenue billed from services: \$501,713
- VP of Research: \$50,000
- The John & Marcia Price College of Engineering: \$194,000



**FY24 Scientific Impact
Research Support
Revenue Generated (see charts following):**



Top Users

1	Gentex Corporation	Off Campus Commercial
2	Forge Nano	Off Campus Commercial
3	Luisa Whittaker-Brooks	Camile & Henry Dreyfus Foundation, DOE, Chemistry, Alfred P Sloan Foundation
4	Luther McDonald	DOE, U.S. Department of Homeland Security
5	Idaho National Laboratory	Off Campus Educational
6	Texas Instruments	Texas Instruments
7	Michael Gruenwald	W. M. Keck Foundation
8	Zak Fang	Blacksand Technology LLC, IperionX
9	Ming Lee Tang	DOE, Chemistry, NSF
10	Roseanne Warren	NSF, Department

Publications

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