

# WHAT'S NEW FOR RU RESOURCE CENTERS – FY18

The Rockefeller University Resource Centers continue to support our scientific community with expert staff, cutting edge equipment and services. The Center staff also conduct applied research to improve techniques and methodologies and fine tune services to meet researchers changing needs.

The University invested significant resources to strengthen and expand on-site instrument design and fabrication capabilities, with relocation and expansion of the **Precision Fabrication Facility (PFF)** – led by **James Petrillo**, Instrumentation Engineer – and creation of the **Instrument Design and Fabrication Facility (IDFF)**, staffed by newly recruited Scientific Machinist **Peer Strogies** and Scientific Engineer **Daniel Gross**. **Peer** has over 12 years' directly relevant experience, including work at Max-Planck Institut for Solar System Research in Katlenburg-Lindau, Baylor College of Medicine in Texas, and the German Primate Center at the Leibniz Institute for primate research in Göttingen. **Dan** has 13 years' design and fabrication experience working at the University of Washington's Applied Physics Laboratory and the Lizzi Center for Biomedical Engineering at Riverside Research. A centerpiece of the new capabilities is the **Hermle C22U 5-axis CNC mill**, a rapid and precise mill that is ideal for prototyping. The Kavli Neural Systems Institute is subsidizing operational costs as a means of facilitating usage for all Laboratories on campus.

**Dan Gross, Jim Petrillo, Peer Strogies (left to right) and the Hermle C22U.**



**Metabolomics Platform:** Together with the Birsoy Laboratory, the **Proteomics Resource Center** implemented a Metabolomics Platform based on a Q-Exacte Plus high resolution/high mass spec combined with HILIC and reversed phase chromatographic separation. The platform offers quantitative profiling of 200 polar metabolites, pulse-chase analysis of selected polar metabolites and selected lipids, discovery type quantitative profiling of lipids based on tandem mass spectrometry, and analysis of selected neurotransmitters and nucleosides. Data generated by this Platform was recently published in *Nature Cell Biology*.

The **Cryo Electron Microscopy Resource Center** was expanded to add a more advanced **Titan Krios G3**. To enable co-location of the new cryo-EM with current instruments, one of the University data centers was moved to the space previously occupied by the PFF. Through effective and tight coordination between Plant Operations, Planning & Construction, IT and the CEMRC, both the data center move and CEMRC enabling work were completed on schedule. Under **Mark Ebrahim's** expert lead, we expect the instrument to be commissioned by early fall. The new Krios has capabilities beyond that of the current Krios, including a newer generation detector and high controllability and reproducibility. The CEMRC added a new GPU and will be adding two more in FY19 to support a dedicated data processing pipeline that includes a user friendly graphical user interface.



*In coordination with IT and Communications & Public Affairs, the Resource Center websites were updated and now conform to new format standards. A number of the Center sites now include videos that showcase staff and services.*

## NEW EQUIPMENT HIGHLIGHTS



The **Cytek Aurora** Spectral Analyzer is a cutting edge instrument that incorporates a unique combination of patent-pending innovative technologies that take flow cytometry to the next level of performance and flexibility. Cytek Aurora was first announced in June 2017 at the CYTO2017 Meeting. While multiple demo units had been widely tested by researchers all over the world, thanks to **Svetlana Mazel's** collaborative research with Cytek scientists, the University obtained the first production unit. Our Cytek Aurora instrument is currently equipped with three lasers (488, 405, and 640 nm) and is capable of detection in 38 fluorescent channels, FSC, and violet laser SSC. With the addition of a 561 nm laser in August 2018, the unique capability of this instrument will be further increased to 50 fluorescent channels, allowing detection of a very wide variety of the Red Fluorescent Proteins.

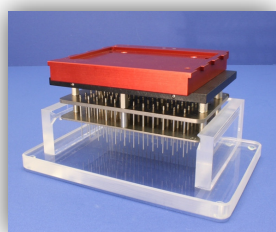
The new **ThermoFisher Attune NxT** analyzer is equipped with two lasers (488 and 561 nm) and seven fluorescence channels. Using the unique acoustic focusing feature, the Autosampler enables Attune to run samples in tubes or plate formats, including 96-well, 384-well, and deep-wells with the high volume intake.



### Added to the Genomics Resource Center:

**10X Genomics Chromium Plus** - This sample preparation instrument supports preparation of both single cell and exome sequencing. For single cell preparation it provides faster and far less expensive service than the Fluidigm system that the GRC already housed. This advance is yet another example of how quickly the technologies supporting deep DNA sequencing advance.

### Available in the High Throughput & Spectroscopy Resource Center:



The TECAN automated liquid handling workstation was enhanced with the addition of **pin-tools** for nanoliter high-throughput dispensing. It is an essential back-up system for the Janus and expands capability for nanoliter dispensing for non-HTS projects.

**NanoTemper MST monolith 115** is a microscale thermophoresis instrument that allows for detection of conformational changes in molecules and is well-suited for measuring equilibrium binding affinities. The technique requires the presence of a fluorophore and can be run with small analyte volumes.



We replaced the 10-year old K-biosystems automated plate sealer with a new **Agilent PlateLoc** instrument, improving consistency and speed.



# MAKING AN IMPACT

Acknowledgement of the Centers ensures that the University meets contractual obligations to funding agencies, strengthens the reputation of the Centers and increases the competitiveness of grant applications that reference use of the Centers. In FY18, 28 **published articles** included Resource Center staff as co-authors and **over 150 articles acknowledged** use of one or more Resource Center.

## Referenced in Grant Applications

The proposed use of one or more Resource Centers was included in 274 of the 304 new sponsored research applications filed with OSPA in FY18.

## Education and Outreach

The heads of all the Centers participated in the **orientation for first year Graduate Students** on September 19, 2017 to introduce them to the support, services, training and consultative services available from the Centers. • The Office of Research Support ran the 14<sup>th</sup> annual **Scientific Resource Center Presentation Series** from October to May. The Resource Center heads each presented an overview of his/her Center's services. These presentations also include reports on results obtained by Center users, information on new trends and technologies and case studies. • The **BIRC, CEMRC,** and **EMRC** sponsored tours for *Science Saturday*, on May 5, 2018. • The **PFF/IDFF** hosted an Open House on February 8, 2018 to showcase the new facility and instruments. • The **PRC** introduced a [web-based tool](#) that allows users to check project status, including when the samples are scheduled and have been run. HOLs can see status for all samples from their labs.

## On and Off Campus Lectures

**BIRC North, A.**, "A Resolution to Avoid an Evil: The Truth about Resolution, Aberrations, and Co-Localization." *The Rockefeller University Monday Lecture Series*, March 26, 2018. • **North A.**, "Cell Biology lecture for Graduate Fellows," January 31, 2018 • **North, A.**, 3D SIM lectures, Superresolution Microscopy Workshop 2017, IMB, Singapore, November 21-24, 2017. • **GRC Zhao, C.**, Invited panelist at the Illumina Single Cell Symposium, June 26, 2018. • **BRC Carroll, T. S.**, "Analysis of ATAC-seq data in R and Bioconductor." *The NYC R/Bioconductor Group (on campus)*.

## Classes and Training

**BIRC** Alison North again taught the annual Optical Microscopy in the Biomedical Sciences course at Woods Hole • **BRC** Thomas Carroll, "Bioinformatics for High Throughput Sequencing in R" • **FCRC** "Beyond the Basics" Flow Cytometry Classes are run every two months • **CBC** Orientation, Investigator Training Workshops, Updated Aseptic Techniques & Tri-Institutional Seminar • **PFF/IDFF** Autonomous and Simple Equipment Training & Heavy Equipment Training • **HPC** Jason Banfelder "Introduction to Statistics" • **HTSRC** Fraser Glickman gave an introduction to drug discovery course to the Tri-I MD/PhD students.

## Key Methodology Publications/Presentations

Alewijnse, Bart; Ashton, Alun W.; Chambers, Melissa G.; **Ebrahim, M.**, et al. (2017). Best practices for managing large CryoEM facilities. *Journal of Structural Biology*. 199 (3): 225-236. • **Mazel, S., Semova, S., Tadesse, S., Han, S.**, Fang, F., Petrina Georgala, P. and Gardner, R. "Size Matters: On the Challenges of Sorting Large Cells with Conventional Droplet Cell Sorters." Presented at CYTO Asia, October 2017. • Jiro Usukura, MD (Prof. Emeritus, Nagoya University), "Live Cell Imaging and Cytoskeleton Analysis at Molecular Resolution Using Atomic Force Microscope." December 7, 2017. • **Chiaravalli J, Glickman JF.** "A High-Content Live-Cell Viability Assay and Its Validation on a Diverse 12K Compound Screen." *SLAS discovery: advancing life sciences R & D*. 2017. PMID: 28783477. • Teng-Leong Chew, PhD (Director of the Advanced Imaging Center at Janelia Research Campus), "Introduction to Image Analysis and FIJI Workshop," April 19-20, 2018. • de Santiago, I. and **Carroll, T.S.**, "Analysis of ChIP-seq Data in R/Bioconductor." *Methods Mol Biol*. 2018; 1689: 195-226.

## Technology and Vendor Presentations

**FCRC:** Maria C. Jaimes, MD (Director, R&D, Applications and Reagents), "Cytex Aurora: Setting the Standard for High Sensitivity Full Spectrum Flow Cytometry." February 1, 2018.

**RU Sponsored Retreats:** Center for Disorders of the Digestive System/Infectious Disease Retreat: Alison North (**BIRC**), Fraser Glickman (**HTSRC**), Deena Oren (**SBRC**) and Kunihiro Uryu (**EMRC**) • Anderson Cancer Center Retreat: Fraser Glickman (**HTSRC**)



Director of the Electron Microscopy Resource Center, **Kunihiro Uryu**, (left) *Science Saturday*, May 5, 2018.



PFF/IDFF Ribbon Cutting and Open House  
**Jim Petrillo**, **Dan Gross** and **Leslie Vosshall** (left to right)  
February 8, 2018

## Promotions

**Carolina Adura** to Manager of Spectroscopy, HTSRC

**Alice Dyer** to Manager of Glasswashing Services

**Christine Lai** to Research Support Specialist, GRC

**Nadine Soplop** to Research Support Specialist, EMRC

**Stanka Semova** to Operations Manager, FCRC

## New Hires

### Bio-Imaging

**Kate Cialowicz**, Research Support Specialist

**Carlos Rico**, Research Support Specialist

### Bioinformatics

**Ji-Dung Luo**, Bioinformatics Analyst

### Glasswashing Services

**Derek Boadi-Ansah**, Research Support Aide

### High Throughput & Spectroscopy

**Mariano Cardenas**, Research Support Specialist

### Instrument Design and Fabrication

**Dan Gross**, Scientific Engineer

**Peer Strogies**, Scientific Machinist

### Proteomics

**Justin Fidelin**, Research Support Specialist

**Soeren Heissel**, Research Support Specialist

**Caitlin Steckler**, Research Support Specialist

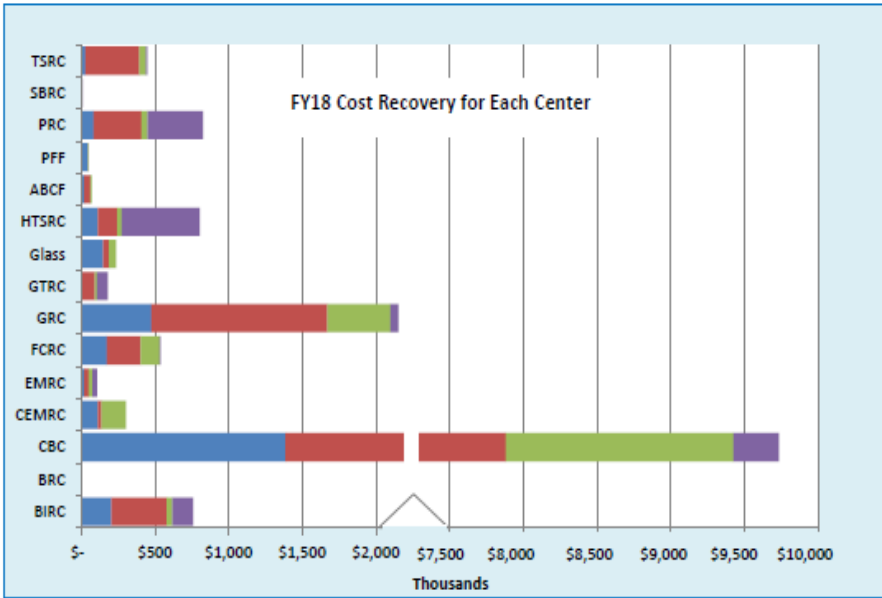
<i>Number of Labs Using the Resource Centers</i>	<b>RU</b>	<b>External</b>
Bioimaging	59	46
Bioinformatics	31	-
CBC	48	1
Cryo EM	12	-
Electron Microscopy	24	13
Flow Cytometry	46	2
Genomics	48	3
Gene Targeting	5	1
Glasswashing	62	-
High Thruput & Spectroscopy	45	28
High Performance Computing	35	1
IDFF	13	1
Antibody & Bioresource	20	150
PFF	29	-
Proteomics	50	40
Structural Biology	13	6
Transgenic Services	15	1

Operating funds for the resource centers are drawn from the University's annual operating budget and are offset, to varying levels, by user fees. User fees for Center services and products are set to recover direct operating costs, e.g., consumables, service contracts, and labor. User fees do not include capital equipment costs.

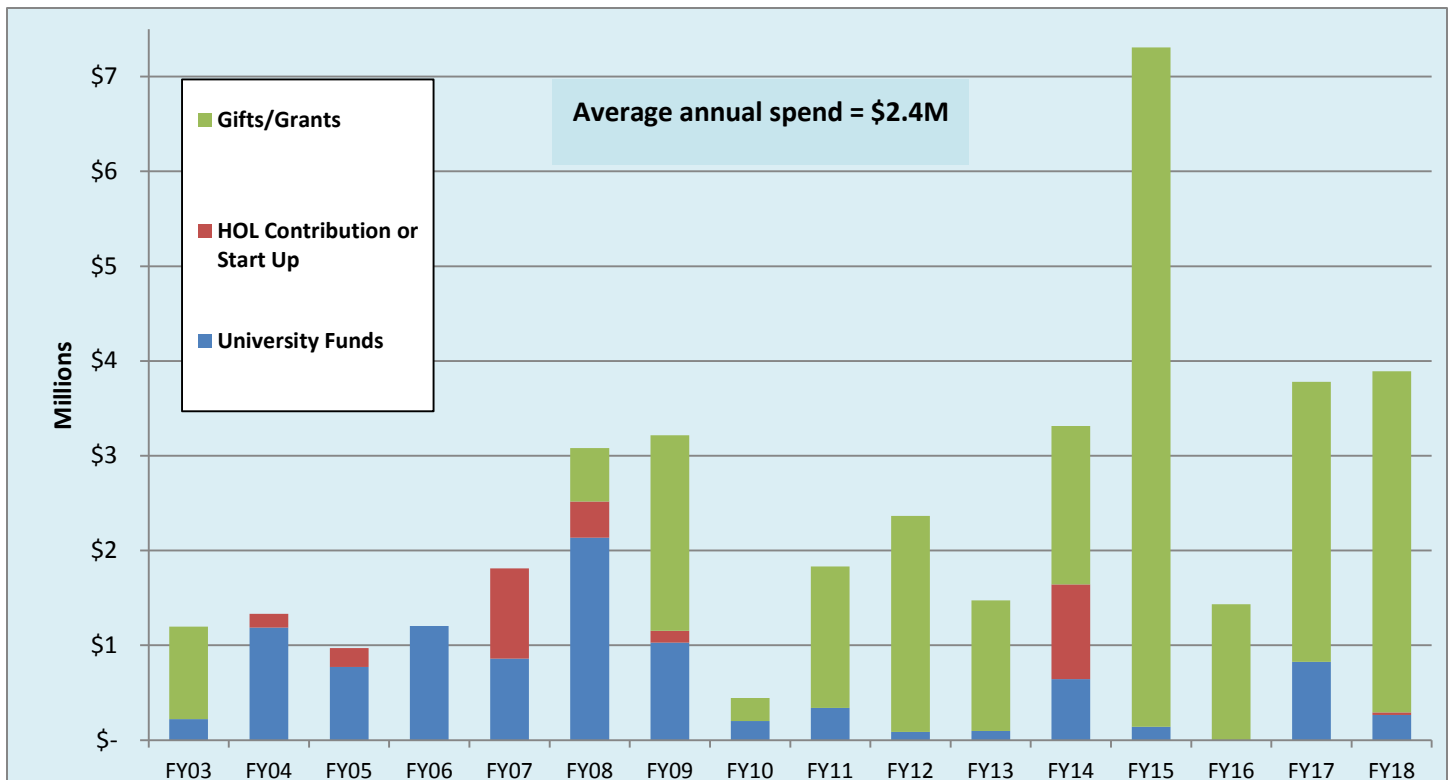
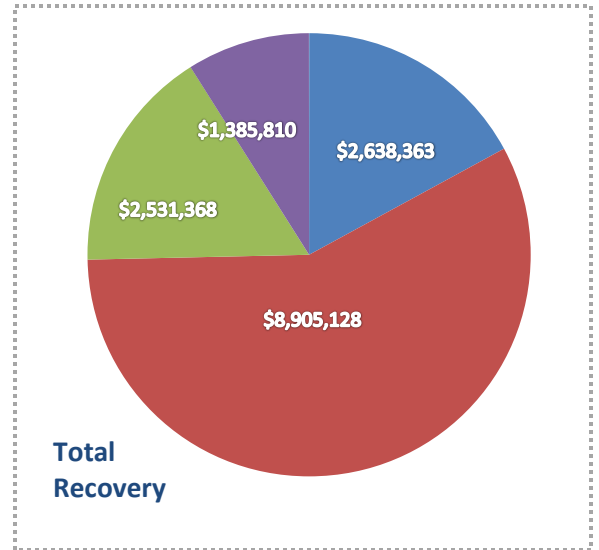
User fees for services and products are established by the University administration with input from the Centers' Scientific Advisory Committees, and with review by University Finance.

Resource Center	FY16		FY17		FY18	
	Operating	Cost Recovery	Operating	Cost Recovery	Operating	Cost Recovery
BIRC	987,177	716,362	997,437	791,505	1,003,285	756,523
CBC	10,183,146	8,481,573	10,693,729	8,413,349	11,337,721	9,271,764
CEMRC	325,914	124,189	442,690	284,556	541,055	302,408
EMRC	634,753	256,652	686,201	276,655	619,463	104,439
FCRC	759,040	415,840	796,497	468,320	940,313	537,565
GRC	1,734,063	1,890,803	2,198,209	1,902,927	2,138,625	2,150,479
GLASS	428,884	219,678	444,843	232,214	459,917	234,725
HTSRC	1,239,371	760,934	1,089,927	705,555	1,358,610	804,408
ABCF	147,929	142,425	144,183	61,734	26,761	70,469
PFF	127,009	21,500	135,720	43,500	174,637	19,675
PRC	1,148,314	642,932	1,139,406	715,247	1,206,845	807,458
SBRC	209,750	6,028	173,927	10,285	194,468	6,958
TSRC	1,090,167	680,807	907,368	574,021	1,014,948	455,094
GTRC	790,877	166,276	898,159	120,162	938,438	172,743
<b>TOTAL</b>	<b>19,806,394</b>	<b>14,525,999</b>	<b>20,748,296</b>	<b>14,600,030</b>	<b>21,016,648</b>	<b>13,371,486</b>
Subsidy	27%		30%		36%	

# BY THE NUMBERS – OPERATIONAL & CAPITAL INVESTMENTS



**Cost Recovery by Funding Source:**  
 RU funds, Grant funds,  
 HHMI, and External Users



**Capital Equipment (>\$70K) Acquisitions FY03 – FY18**