

WHAT'S NEW FOR RU RESOURCE CENTERS – FY20

The Rockefeller University Resource Centers continued to support our scientific community with expert staff, cutting edge equipment and services in fiscal year 2020. The Resource Center staff continued to conduct applied research to improve techniques and methodologies and fine tune services to meet researchers' changing needs.

In the latter half of FY20, the University dealt with an unprecedented set of circumstances due to the COVID-19 Pandemic. Beginning in mid-March, the University, its laboratories, departments, and Resource Centers went into shutdown, with only essential operations and approved COVID-19 related research activities occurring on campus. While the University was able to relatively quickly broaden on-campus activities, we remained in limited operational phase, following NYS and OSHA guidelines, through the end of FY20.

As a result, the Resource Centers were challenged to provide service and support at the fullest level possible while upholding social distancing requirements, reducing services per capacity, and limiting use by external researchers. Through increased remote operations, greater use of videoconferencing, recorded training video sessions, and remote programming of instruments, the Centers found and implemented ways to increase and maintain productivity. Work-from-home activities have increased and include design of experiments and interpretation of experimental results. Development of new and expanded remote and virtual training has helped the Resource Centers to continue to operate and navigate through these unusual times.

NEW METHODS OF TRAINING and CONNECTIVITY

The Structural Biology Resource Center (SBRC), led by Deena Oren, created a Microlearning video to show how to freeze crystals for the synchrotrons, an effort initiated and created by Jeff Henefeld from the IT Creative department to train users virtually. To comply with University social distancing requirements, PPMS was used to limit the number of users per room when scheduling instruments, i.e., for rooms housing more than one system, a reservation on one of the systems blocked access to the other.

The High Throughput & Spectroscopy Resource Center (HTSRC), headed by Fraser Glickman, holds weekly group meeting via Zoom. All members of the HTSRC staff are reading, reviewing, and discussing the scientific literature on the specific COVID projects supported by the HTSRC, training researchers in instrument use remotely, designing experiments, analyzing data and technology horizon scanning. Safe zones were created in the PPMS booking system, to support personal distancing measures and limit room occupancy, and some systems were relocated to DWB 6th floor to allow for appropriate social distancing.

The Bio-Imaging Resource Center (BIRC), headed by Alison North, sent out numerous broadcast e-mails during the shutdown, providing specific guidance on how to safely access the BIRC, announcing Dr. North's confocal review article, describing remote assistance methods, and advertising frequent online seminars and workshops including one given by a BIRC staff member on deep learning methods for image analysis. COVID-suitable training methods on microscopes involved new user guides written by staff, videos to teach the initial operation of the instruments, and remote trainings via zoom.

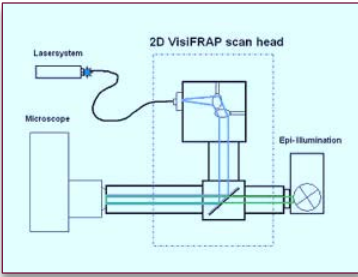
The Flow Cytometry Resource Center (FCRC), headed by Svetlana Mazel, developed SOPs (Standard Operation Procedures) to keep essential operations going while observing social distancing. A new "satellite" analysis room was set up for efficient operation of full spectrum analyzers. For user training on the instruments, an innovative hybrid training approach was developed, allowing FCRC Staff to train users virtually, using an iPad-based Zoom session with a VPN-based Radmin-login session into the instrument's computer.

The Bioinformatics Resource Center (BRC), headed by Thomas Carroll, moved all user meetings to Zoom and operated at full capacity throughout the extent of the shutdown. The BRC held approximately 200 hours of workshops over Zoom for 140 people in virtual attendance with all sessions video recorded and available to those unable to attend. The BRC released two publicly available, peer-reviewed software packages to accelerate the collaborative analysis with users and streamline the installation of software used in training material.

Genomics Resource Center (GRC), headed by Connie Zhao, has restored all services and resumed normal turnaround time. Special freezer space was designated for users to drop off samples any time, 24/7. GRC staff communicated with users by email, phone, and zoom routinely, and held weekly group meetings via zoom. During the Pandemic, GRC introduced new single cell ATAC-Seq and single cell RNA-Seq/ATAC-Seq combined services.

The High Performance Computing Resource Center (HPCRC), headed by Jason Banfelder, operated at full capacity throughout the university shutdown and limited operational phases. Two new software systems were implemented that addressed increased remote and the increased emphasis on computing and data analysis. (1) Open OnDemand: a web-based portal for accessing HPC resources enabled remote visualization and interaction with scientific imaging and other datasets; and (2) Globus: a system for extramural data transfer between academic institutions enabled rapid transfer of COVID genomic data.

EQUIPMENT



BIO-IMAGING

VISIFRAP/PHOTOACTIVATION MODULE FOR THE ISIM - VisiView acquisition software and VisiFRAP module for photo-manipulation of experiments including photobleaching, photoactivation and photoablation.

COMPARATIVE BIOSCIENCE CENTER

RADPRO OMNERA 50 VETERINARY DIGITAL RADIOGRAPHIC SYSTEM-

High Frequency 30kW Single Phase Generator: 125kVp LCD display provides two and three-point operation for individual control of exposure parameters.



ELECTRON MICROSCOPY

WOHLWEND COMPACT HP03 HIGH-PRESSURE FREEZER

for cryofixation of biological samples with superior ultrastructural preservation

GENOMICS

AGILENT TAPE STATION 4200 is an established automated electrophoresis tool for DNA and RNA sample quality control and includes analysis of size, concentration, and integrity. Fully automated sample processing of any sample number between 1 and 96.



HIGH-PERFORMANCE COMPUTING

FOUR COMPUTE NODES WITH TWIN V100 GPUS - added to the HPC cluster to enable rapid analysis of IMAGING DATA and NOVEL AI workflows. **THE DATA PARK SCIENTIFIC DATA ARCHIVE PLATFORM** - added to address growing volumes of scientific data being generated on campus.



FLOW CYTOMETRY:

CYTEK AURORA SPECTRAL ANALYZER - was added and upgraded with the UV-laser to accommodate 64 fluorescent detectors.

SONY MA900 CELL SORTER - 4-laser/12-channel instrument in the Biosafety Cabinet was purchased and installed to increase capacity and meet the demand in cell sorting.

GLASSWASHING: RELIANCE 400XLS - Second replacement unit in two years.

HIGH THROUGHPUT SPECTROSCOPY:

CD SPECTROMETER - An effective tool for measuring protein quality to high throughput screening.

STRUCTURAL BIOLOGY: SEC-MALS - Instrument transferred from the Blobel Laboratory.

PRECISION INSTRUMENTATION TECHNOLOGIES



CLAUSING KALAMAZOO 20" METAL/WOOD VERTICAL BANDSAW

used for woodworking, metalworking or for cutting a variety of other materials, and particularly useful for cutting irregular or curved shapes, while also used to produce straight cuts.

MAKING AN IMPACT

Acknowledgement of the Resource 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 the two-year period, 2019-2020, University Resource Centers were **acknowledged** and/or Resource Center staff were **co-authors** on **278** publications by University scientists.

EDUCATION AND OUTREACH

The heads of all the Centers participated in the orientation for first year Graduate Students on September 14, 2019, to introduce them to the support, services, training, and consultative services available from the Centers.

ON AND OFF CAMPUS LECTURES (Examples)

BIRC • **C. Pyrgaki** presented at a workshop on Light Sheet Microscopy at ABRF annual meeting, Palm Springs, CA., March 2020. **EMRC** • **A. Pasolli**, presented "New methods in ultrastructural analysis applied to cell biology by High Resolution Microscopy", Electron Microscopy Center (CME), National University of Córdoba, Argentina. Theoretical and practical course, December 14-20, 2019. **GRC** • **C. Zhao**, participated in Center for Disorders of the Digestive System and Infectious Disease Biology Retreat and presented poster October 14-15, 2019. **PRC** • **H. Molina**, presented during Tri-I student group visit to the PRC, January 21, 2020. **HTSRC** • **F. Glickman**, "Introduction to Drug Discovery" for Tri-Institutional MD-PhD students, September 24th, 2019.

CLASSES AND TRAINING (Limited listing)

BIRC • hosted a 1-day Imaris image processing workshop, January 15, 2020 • **FCRC** "Beyond the Basics Flow Cytometry Classes" and "Pre-Sort Consultations" regularly scheduled on-demand through request forms placed in FCRC-PPMS, July-June 2020 • **PIT** "User Training" conducted twice weekly, Sept.- Nov. 2019 **BRC** • conducted the "Introduction to High-Throughput Sequencing" open workshop, May-August, 2020, Graduate School training "Introduction to Bioinformatics," June-September, 2020.

KEY METHODOLOGY

PUBLICATIONS/PRESENTATIONS (A few)

BIRC • "Tutorial: guidance for quantitative confocal microscopy" James Jonkman, Claire Brown, Kurt Anderson, Graham D. Wright, Alison North, Nat Protoc. 2020 May; 15(5):1585-1611. • **FCRC** "Spectral Flow and Panel Design Day at the Rockefeller University" February 26, 2020.

SOME RU TECHNOLOGY AND VENDOR PRESENTATIONS

HTSRC • User group meeting on new CRISPR/Cas9 mediated knockout screening and new Hitbit technology for developing endogenous gene reporter assays, December 13th, 2019. **FCRC** • **S. Mazel**, FCS Express Site License - "Lunch and Learn" Flow Cytometry Seminar "The FCS Express Difference – Moving Beyond FlowJo" presented by Sean Burke, MS, Senior Product Manager, De Novo Software, July 10, 2019. **BIRC** • Zeiss Zen Blue imaging workshop October 15, 2019.

RU SPONSORED RETREATS

EMRC, GRC • Center for Basic and Translational Research on Disorders of the Digestive System and Infectious Disease Biology Retreat October 14 –15, 2019.

NEW HIRES

Bioinformatics Resource Center:

- **Doug Barrows**
Bioinformatics Analyst
- **Wei Wang**
Bioinformatics Analyst

High Throughput & Spectroscopy Resource Center:

- **Chloe Larson**
Research Support Assistant

Proteomics Resource Center:

- **Alexandra Pagano**
Research Support Assistant

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 OFFSET ONLY DIRECT OPERATING COSTS, E.G., CONSUMABLES, SERVICE CONTRACTS AND LABOR. USER FEES DO NOT INCLUDE CAPITAL EQUIPMENT COSTS.

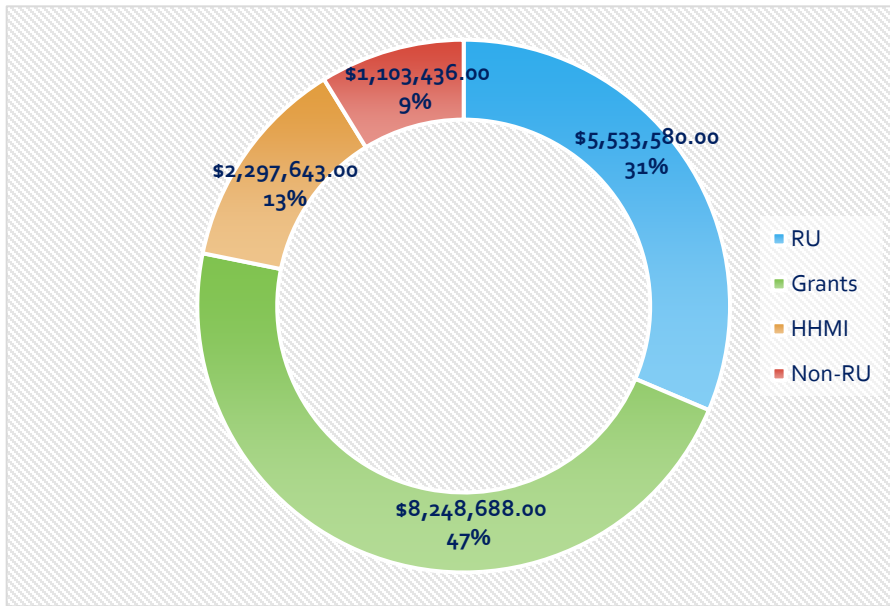
User fees for services and products are established by the University administration with input from the Centers' Scientific Advisory Committees, and with review by University Finance.

Resource Center	FY18		FY19		FY20		FY21 (budgeted)	
	Operating	Cost Recovery	Operating	Cost Recovery	Operating	Cost Recovery	Operating	Cost Recovery
Antibody & Bioresource	26,761	70,469	32,753	32,753	41,000	61,600	50,000	37,000
Bio-Imaging	1,003,285	756,523	1,227,634	756,368	1,251,267	617,960	1,070,239	750,000
Bioinformatics			342,475	80,900	537,491	189,121	697,279	234,208
CBC	11,337,721	9,271,764	11,578,969	9,540,218	12,261,781	9,303,496	11,950,368	9,690,979
CRISPR & Genome Editing	938,438	172,743	968,614	172,460	969,349	155,030	922,393	189,919
Cryo EM	541,055	302,408	604,847	308,274	685,846	412,500	1,024,340	487,500
Electron Microscopy	619,463	104,439	471,714	98,077	530,302	92,608	478,474	135,000
Flow Cytometry	940,313	537,565	1,044,822	487,401	1,073,987	363,831	1,107,201	500,000
Genomics	2,138,625	2,150,479	2,509,800	2,487,546	2,211,047	1,970,000	2,088,065	1,985,000
Glasswashing	459,917	234,725	510,104	269,399	480,249	213,032	498,616	280,000
High Performance Computing	-	-	475,653	176,080	555,186	263,937	723,238	337,864
High Throughput & Spectroscopy	1,358,610	804,408	1,278,697	723,556	1,322,811	862,005	1,175,490	850,000
Precision Instr. Technologies	174,637	19,675	514,750	111,240	561,175	88,343	750,453	162,000
Proteomics	1,206,845	807,458	1,307,846	740,472	1,214,535	787,791	1,228,630	826,200
Reference Genome	716,608	269,427	1,553,506	982,325	1,063,168	811,266	1,132,756	1,130,923
Structural Biology	194,468	6,958	179,467	7,505	187,233	10,153	118,363	26,500
Transgenic & Reproductive Technology	1,014,948	455,094	1,061,884	480,000	1,010,046	437,432	1,151,181	702,042
TOTAL	22,671,694	13,813,656	24,678,288	17,278,494	25,401,287	16,376,168	24,746,569	17,753,063
Subsidy	39%		30%		36%		28%	

RESOURCE CENTER USAGE FY20

NUMBER OF LABS USING THE RESOURCE CENTERS	RU	EXTERNAL
Bio-Imaging	60	30
Bioinformatics	38	0
CBC	48	2
Cryo EM	12	0
Electron Microscopy	27	1
Flow Cytometry	39	1
Genomics	49	2
CRISPR & Genome Editing	14	2
Glasswashing	67	1
High Throughput & Spectroscopy	40	22
High Performance Computing	40	2
Antibody & Bioresource	10	>100
Precision Instrumentation Technologies	32	1
Laboratory of Comparative Pathology	11	—
Proteomics	44	37
Structural Biology	13	1
Transgenic & Reproductive Technologies	18	1

BY THE NUMBERS - OPERATIONAL & CAPITAL INVESTMENTS



FY20 Cost Recovery by Funding Source

FY20 Capital Equipment (>\$70K) FY03-FY20

