RESOURCE CENTER ANNUAL REPORT

FY23

THE ROCKEFELLER UNIVERSITY

WHAT'S NEW FOR THE ROCKEFELLER UNIVERSITY SCIENTIFIC RESOURCE CENTERS

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

While it's not possible to report here on all the contributions the Scientific Resource Centers make to further and support science and the University's mission, we highlight some of these contributions as examples.

A FEW HIGHLIGHTED CONTRIBUTIONS

- The Beckman Advanced Light Sheet Microscopy satellite facility of the Bio-Imaging Resource Center (BIRC) was established.
- The BIRC created a new web section on Data Management and Image Analysis.
- *In-silico* screening workflows were initiated by the Fisher Drug Discovery Resource Center (DDRC) using Schrodinger software.
- The DDRC was essential to the work resulting in two patent applications related to compounds identified against SARS CoV MTase and PL pro filed (63/481,410 entitled "SULFONAMIDE-1H-PYRROLE-2-CARBOXAMIDE INHIBITORS OF SARS-COV-2 NSP14 METHYLTRANSFERASE AND DERIVATIVES THEREOF," filed 1/25/2023; US 63/481,565 patent application entitled "1,3-INDOLE-PROPANAMIDE INHIBITORS OF SARS-COV-2 PLPRO/NSP3 AND DERIVATIVES THEREOF", filed 1/25/2023).
- The Flow Cytometry Resource Center (FCRC) enhanced support of sample preparation by continued R&D, evaluation of reagents, development of SOPs and expanding the range of equipment available in the FCRC to support sample preparation.
- The High-Performance Computing Resource Center (HPCRC) added support for "container-based workloads" by implementing Apptainer on the RU HPC cluster.
- The Structural Biology Resource Center's (SBRC) support in solving structure of anti-afucosylated IgG nanobody was reported (Nat Commun. 2023 May 18;14(1):2853. doi: 10.1038/s41467-023-38453-1).

NEW EQUIPMENT

Bio-Imaging: A TIMEBOW upgrade for fluorescence lifetime imaging was installed on the Abberior STED system; An Axicon custom module for Bessel beam excitation was installed on the Olympus multiphoton; a new Nikon ring-TIRF system with iLAS2 for FRAP replaced the 2009 system; a new workstation for image analysis was added.

CryoEM: The camera on the Krios 1 cryo-EM was upgraded to a K3 system with GIF. Full commissioning of the METEOR System was completed.
Drug Discovery: An Agilent Biotek Synergy NEO2, a multi-function microplate reader (providing fluorescence polarization, time-gated fluorescence, prompt fluorescence, luminescence, and alphascreen) was installed.
Electron Microscopy: A CMOS camera (AMT Nanosprint15-MarkII) was installed on the JEOL1400+ transmission electron microscope.
Flow Cytometry: An Agilent NovoCyte Penteon Flow Cytometer, offering expanded flexibility with 30-fluorescence channel options using five lasers, was installed.
High-Performance Computing: The facility was expanded by 1,280 CPU cores, 8 nVidia L40 GPUs for simulation and AI training workloads, and 20 nVidia A10 GPUs for AI inference workloads.
Laboratory of Comparative Pathology (LCP): Members of the Tri-I can access whole slide scanning service from the LCP. Images are acquired on the new Olympus VS200 Digital Slide Scanner; scanned slides can be viewed and annotated with Aperio's ImageScope software (free download available).
Proteomics: Orbitrap IQ-X Tribrid mass spectrometer equipped with High-field asymmetric-waveform ion-mobility spectrometry (FAIMS) and UVPD (photo-dissociation) was added to support the metabolomics platform. The instrument is capable of measuring at a resolution of 1,000,000. An interesting feature of this new instrument is the *AcquireX Intelligent Data Acquisition Workflow* which allows for greater depth in Data Dependent Acquisition (DDA) experiments. A Thermo Orbitrap Ascend Tribid was acquired to support the proteomics platform. This unit allows the PRC to search data in real-time for improved TMT analysis as well as work with projects that require ETD.

MAKING AN IMPACT

Acknowledgement of the Scientific 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 period 2022-2023**, University Resource Centers were **acknowledged in 127 publications** by University researchers and Resource Center staff **were co-authors on 67 publications** by University and other institutions' scientists.

Education And Outreach (Examples)

- The heads of all the Centers participated in the orientation for ***first year Graduate Students on September 8, 2022***, introducing the new students to the support, services, training, and consultative services available from the Centers.
- The annual ***Resource Center Presentation Series***, running ***from February to June 2023***, included talks by all the University Centers. Some presentations were exclusively in person, some conducted via Zoom, and a few were hybrid.

- The Centers actively participated in the ***Rising Scholars Workshop in May 2023***, organizing on-site activities, and providing presentations, tours, and hands-on experiences for Workshop Scholars, promoting diversity in life and biomedical sciences.
- The High-Performance Computing Resource Center provided computational resources and support to the full cohort of 39 **Summer Science Research Program** students during the summer of 2023.

On &Off Campus Lectures (Examples)

- Fraser Glickman, DDRC director, presented "High Throughput Screening and Early Drug Discovery" to the Tri-Institutional M.D., Ph.D. students as part of their Translational Science Lecture Series, October 5, 2022.

Classes and Training (Limited Listing)

- CBC Training Workshops: The CBC offers a wide range of training events designed to introduce investigators to the facility and to provide them with up-to-date information on technical procedures.
- Resource Center heads and staff served as leads in the *"Introduction to Techniques in Clinical and Translational Science"* certificate course for the University's Certificate in Clinical and Translational Science Program.
- Image Analysis User Group Meetings led by Ved Sharma (Bio-Imaging) for University researchers interested in sharing knowledge and learning from each other were held regularly to discuss the latest image analysis methods, pipelines, software, and new relevant publications, e.g., the user group meeting on 3D segmentation using Deep Learning
- "Beyond the Basics" and "Pre-Sort & Sample Preparation Overview" Flow Cytometry Sessions by Flow Cytometry are offered regularly and are required for new users.
- The Bioinformatics Resource Center led the "Single cell (sc) RNAseq Analysis" bootcamp, a workshop on Reproducible Analysis, and the "Introduction to Bioinformatics" graduate fellows' course.
- The High Performance Computing Resource Center (HPCRC) led a four-day workshop on "Introduction to UNIX."
- The PAIR-UP Advanced microscopy workshop was hosted jointly by Bio-Imaging, the Office of DEI, and a team from the American Society of Cell Biology (ASCB) in November 2022.
- Mark Ebrahim (CEMRC) led a basic electron microscopy and cryo-EM course in the Fall 2022.
- Alison North continues to co-lead the "Optical Microscopy and Imaging in the Biomedical Sciences" course at the Marine Biological Laboratory in Woods Hole, which was held in person August 15 – 25, 2022. The course – designed for research scientists, postdoctoral trainees, core facility directors/staff and graduate students working in the biological sciences – consists of interrelated lectures, laboratory exercises, demonstrations, and discussions that will enable the participants to obtain and interpret high quality microscope data, to

understand and assess potential artifacts, to perform quantitative optical measurements, and to generate digital images for documentation and analysis that accurately present the data.

Methodology Publications/Presentations

Participation at RU retreats

- Connie Zhao attended the RU Metabolism and Infectious Disease retreat (October 28-29, 2022) and the RU Anderson Cancer retreat, (April 18-20, 2023), presenting the poster, "Genomics at Single Cell Level," at both retreats.
- Alison North and Priyam Banerjee attended the Anderson Cancer retreat (April 18-20, 2023).
- Amalia Pasolli, director of the Electron Microscopy Resource Center (EMRC attended the 2022 Pels Family Chemical and Structural Biology Retreat (October 11-12), the 2022 Metabolism, Immunity, and Infectious Diseases Retreat (October 27-28, 2022) and the Stem Cells, Development & Cancer Retreat (May 23-24, 2023), presenting a poster entitled "Electron Microscopy Resource Center: an Overview."

Others:

- Alison North presented a poster on the collaboration on a comparison of super-resolution microscopy techniques for bacterial imaging and segmentation with Dr. Jeanne Salje's group in Cambridge UK at the ELMI meeting (June 6 - 9, 2023).
- Alison North was co-author on *Nature Methods* publication on image analysis repository guidelines. (Rigano, A., Ehmsen, S., Öztürk, S.U. *et al.* Micro-Meta App: an interactive tool for collecting microscopy metadata based on community specifications. *Nat Methods* 18, 1489–1495 (2021). https://doi.org/10.1038/s41592-021-01315-z).
- Christina Pyrgaki (BIRC) gave an invited talk on fluorescence microscopy at the annual NERLSCD meeting, Rochester NY (October 12-14, 2022).
- Amalia Pasolli and Anurag Sharma led a poster presentation entitled, "The Rockefeller University Electron Microscopy Resource Center: An Overview," at the North Atlantic Microscopy Society Meeting at Princeton University (March 15, 2023).
- Jason Banfelder gave a talk, titled "Globus Flows On-Ramp," about automating data transfers from scientific instruments at the Globus World conference at the University of Chicago (April 25-27, 2023).

Some RU Technology and Vendor Presentations

- The EMRC sponsored the seminar: "Three-dimensional Electron Microscopy for Cells, Tissues, and More: Helios 5 Hydra DualBeam, a Plasma FIB-SEM with multiple Ion Species for Cryo and Room Temperature Samples," by Geoff Perumal. Senior Sales Development Representative, Thermofisher Scientific (December 8, 2022).

NIAID "Emergency Awards: Biocontainment Facility Improvements and Building System Upgrades to Support Pandemic Preparedness (G20)" initiative. The proposal, entitled "**Pandemic Preparedness Research and Biocontainment Infrastructure at The Rockefeller University,"** funds $7.2M: (a) to equip existing BSL3 the University's more thoroughly and ABSL3 facilities; and (b) to renovate space in an existing laboratory building to establish much needed additional BSL3 procedure space. PI: **Tim O'Connor**.

Diatome Award for EMRC poster (Amalia Pasolli and Anurag Sharma), Microscopy and Microanalysis 2023 Conference, Microscopy Society of America.

JEOL 2023 Image Contest Award: Anurag Shama's ant larvae image prepared with CryoSEM won the May award. It will be displayed in the 2024 JEOL Calendar and in the JEOL booth in meetings.

NEW HIRES

- Bio-Imaging: Behzad Khajavi, Optical Engineer (Beckman Grant)
- Bioinformatics: Jenelys Ruiz-Ortiz, Bioinformatics Analyst (Kavli)
- Drug Discovery: Shlomi Dagan, Research Support Specialist (MAVDA grant); Loreto Carvallo Torres, Research Support Specialist; Francesca Corelli, Senior Research Support Specialist
- Flow Cytometry: Yong Chen, Research Support Specialist
- Proteomics: Michael Isay-Del Viscio, Research Support Associate

PROMOTIONS

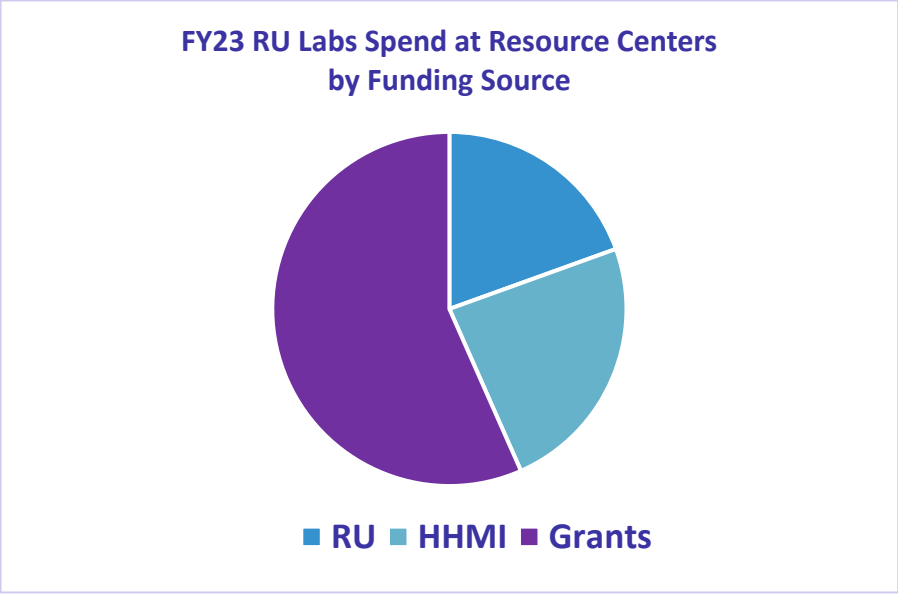
- CBC: Leslie Diaz, Director of Veterinary Services; Bryan Baker, Director of Operations
- DDRC: Chloe Larson, Research Support Associate
- FCRC: Songyan Han, Senior Research Support Specialist
- Glasswashing, Beverly Guthrie-Turenne and Khalil Koiner, Skilled Research Support Aides
- PIT: Peer Strogies, Director of PIT
- PRC: Hanan Alwaseem, Manager of Metabolomics Platform

BY THE NUMBERS

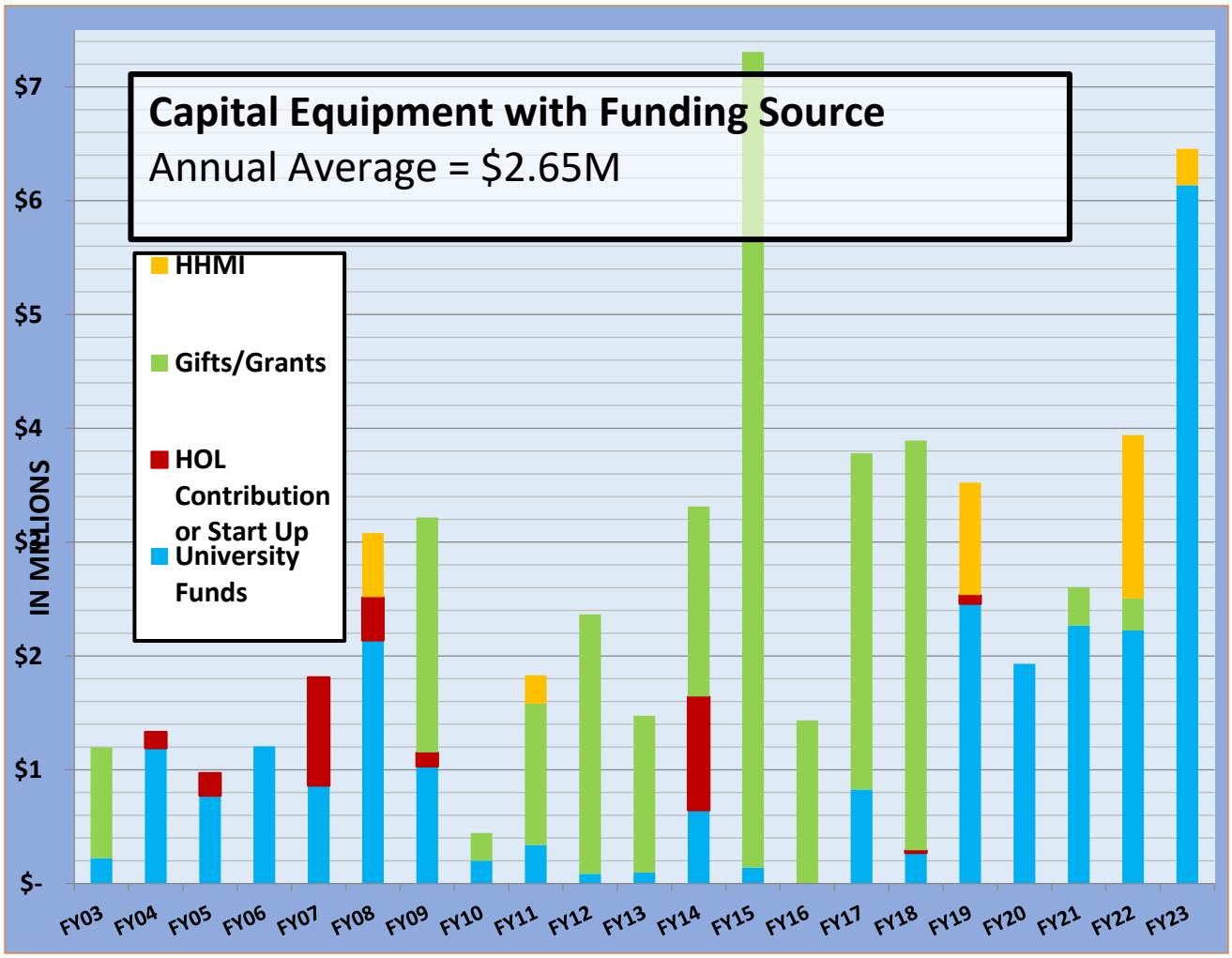
Numbers of Labs Using the Resource Centers

Research Centers	RU Labs	External Labs FY 23
Antibody & Bioresource	6	163
Bio-Imaging	50	10
Bioinformatics	30	1
Comparative Bioscience Center	52	5
Cryo-EM	16	1
Drug Discovery	37	11
Electron Microscopy	28	9
Flow Cytometry	38	1
Genomics	43	2
CRISPR & Genome Editing	8	3
Glasswashing	63	2
High Performance Computing	61	0
Laboratory of Comparative Pathology	18	50+
Precision Instrumentation Technologies	39	2
Proteomics	41	19
Reference Genome	5	33
Structural Biology	12	2
Transgenic & Reproductive Technologies	16	3

FY23 RU Labs Spend at Resource Centers by Funding Source



Resource Center Capital Equipment FY03- FY23



Operating Funds for the Resource Centers

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. They are not used to offset capital equipment costs.

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

Center Operating Budgets and Cost Recovery FY20 to FY23

	FY20		FY21		FY22		FY23	
Resource Center	Operating	Cost Recovery	Operating	Cost Recovery	Operating	Cost Recovery	Operating	Cost Recovery
ABCF	41,000	61,600	86,133	25,380	0	52,698	94,525	75,460
BIRC	1,251,267	617,960	950,096	463,439	954,090	557,937	1,171,641	579,210
BRC	537,491	189,121	692,003	201,331	791,862	244,208	773,347	271,463
CBC	12,261,781	9,303,496	11,791,150	9,257,085	12,094,265	9,490,635	12,813,651	10,088,504
CGERC	969,349	155,030	907,818	174,679	790,840	142,309	773,403	180,382
CEMRC	685,846	412,500	937,812	279,990	844,208	410,001	1,446,124	484,069
Drug Discovery	1,322,811	862,005	1,329,119	740,580	1,120,774	1,045,729	1,192,741	1,046,224
EMRC	530,302	92,608	419,992	100,148	430,391	125,978	570,612	155,528
FCRC	1,073,987	363,831	976,219	424,263	1,029,675	522,043	1,012,163	506,546
GRC	2,211,047	1,970,000	2,502,574	2,143,202	2,581,490	2,640,886	3,135,119	3,102,460
Glasswashing	480,249	213,032	482,471	249,989	463,449	257,067	455,374	235,486
HPCRC	555,186	263,937	564,128	297,895	541,333	348,442	909,959	343,592
PIT	561,175	88,343	634,547	120,603	492,215	89,788	503,062	138,997
PRC	1,214,535	787,791	1,315,609	862,865	1,215,801	920,011	1,158,394	938,928
RGRC	1,063,168	811,266	1,017,990	589,174	1,276,757	939,931	1,269,396	932,898
SBRC	187,233	10,153	127,758	22,912	174,496	35,648	145,257	27,477
TRTRC	1,010,046	437,432	1,010,331	719,646	996,616	612,472	963,653	428,420
TOTAL	25,956,473	16,640,105	25,745,750	16,673,181	25,798,262	18,435,783	27,424,768	19,535,644
Subsidy	36%		35%		29%		29%	

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