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Maximizing Shared Research Resources: Next Steps

Sheenah M. Mische[1]

[1]**NYU Grossman School of Medicine, New York, New York 10016, USA**

Association of Biomolecular Resource Facilities

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ABSTRACT

Shared research resources (SRRs) promote access and training to advanced technologies and applications for a diverse array of trainees, faculty, students, and staff. Institutions and the broader research community benefit from the expertise and reputation of SRRs, their efficient use of research funds, and their positive impact on faculty recruitment and retention. Moreover, as contemporary science has become increasingly multidisciplinary and team based, SRRs are the nexus for basic discovery and the application of new groundbreaking technologies, with data as the key deliverable. However, despite their track record of accomplishments, barriers continue to exist, hindering SRRs essential role in modern research and highlighting the need for a national strategy to ensure their sustainability. The recommendations from the Federation of American Societies for Experimental Biology (FASEB) SRR Task Force publication "Maximizing SRR part III" and subsequent roundtable meetings have spurred efforts for strengthening shared resources, achieving career recognition and parity, and elevating team science to its full potential. This JBT special issue focuses on these efforts, with contributions from members of the Association of Biomolecular Resource Facilities and FASEB Task Force.

ADDRESS CORRESPONDENCE TO: Sheenah M. Mische, NYU Langone Health, 550 First Avenue, New York, New York 10016 (E-mail: sheenah.mische@nyulangone.org; Phone: 212-263-0859).

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For over 40 years, core laboratories, facilities, and shared resource laboratories, collectively referred to here as shared research resources (SRRs), have been highly valued for making efficient use of research funds and broadening access to advanced technologies.[1],[2],[3],[4],[5],[6] SRRs exist at the interface of the administrative, financial, and scientific sectors of a research organization as centralized infrastructure and expertise.[7],[8],[9] Institutions have expanded the number of SRRs across a widening number of scientific disciplines to address the fundamental shift in contemporary research from individually driven science to team-based research.[10],[11],[12] Coupled with the growing complexity of contemporary biomedical research requiring integrated multidisciplinary and specialized expertise, SRRs have emerged as the nexus between basic discovery and the application of new groundbreaking technologies, with data as the key deliverable of SRRs and major contributors to the growth of data-intensive scientific discovery and open science to knowledge acquisition.[13],[14]

The Association of Biomolecular Resource Facilities (ABRF) represents 2300 SRR scientists and administrators, fosters interdisciplinary and multidisciplinary team science, and provides both educational programming in multiple scientific disciplines and core management and networking for its members.[15] As a member society of the Federation of American Societies for Experimental Biology (FASEB), members chaired and contributed to the FASEB Science Policy SRR subcommittee (2016-2019), which convened to identify barriers to effective SRRs. These survey results and recommendations were published in the 2017 report "Maximizing Shared Research Resources Part I and II"[16],[17] and were widely consulted as a primer for developing and improving SRRs, as evidenced by the number of institutions moving to centralized SRRs and administration.

In June 2020, the FASEB SRR Task Force convened to discuss ongoing policy challenges related to SRRs and identify barriers and opportunities for impactful policy changes. Task Force members represented a broad coalition of SRR expertise, with Naomi Charalambakis, director of FASEB Science Policy; co-chairs Nick Ambulos and Sheenah Mische; and members Sara Bowen, Susan Constable, Nancy Fisher, Luellen Fletcher, Naomi Fukagawa, Philip Hockberger, Justine Kigenyi, Susan Meyn, Claudius Mundoma, Kathryn Ramirez-Aguilar, Andrew Vinard, and Mary Winn. The FASEB SRR Task Force final report "Maximizing Shared Research Resources Part III: Challenges and Opportunities"[18] provided a first step in developing a cohesive strategy for strengthening SRRs and its workforce and a resource to increase awareness about the crosscutting value of SRRs to the research community.

Following the release of their report and publication of "Establishing a national strategy for shared research resources in biomedical sciences,"[13] the Task Force hosted several roundtables during 2021 and 2022 with a broad array of stakeholders to continue the conversation about strengthening shared resources, elevating team science to its full potential, and the need for a national strategy to ensure SRR sustainability. In aggregate, the key takeaways from the 3 roundtables included 1) acknowledging the essential role of SRRs in modern research, 2) ensuring broad access within and across institutions and regions, 3) aligning federal agencies on SRR support, 4) expanding career opportunities for SRR scientists, and 5) recognizing the essential role of SRRs in data provenance and management for grants and publications.

This special issue on Maximizing SRRs is a collection of articles contributed by ABRF and FASEB Task Force members regarding ongoing efforts to improve their institutional SRRs as an outcome to the Maximizing SRR publications.[13],[18] Our fearless leader, Naomi Charalambakis, provides an overview of the FASEB SRR Task Force efforts from a science policy perspective, and Task Force member Luellen Fletcher collaborated with Oregon Health Sciences University (OHSU) colleagues Andrew Chitty, Christina Harrington, Aaron Nilsen, and Stefanie Petrie to contribute "Creating a Career Path for Shared Research Resources Personnel," detailing the design and creation of the OHSU SRR skills-based career path, a significant addition to career development for SRR scientists. Task Force members Justine Kigenyi, Sara Bowen, Susan Constable, and Claudius Mundoma partnered to contribute 2 articles; the first, entitled "Strategies for Shared Research

Resources for Enhancing Research Sustainability: Communicating between Stakeholders and Managing Expectations to Maximize Value and Impact," focused on understanding the needs, expectations, and value systems of the various stakeholders in the SRR ecosystem to inform models of communication and best practices; the second, entitled "A Shift in Our Thinking: Reframing Shared Research Resources as Investments in Education and Innovation Not Subsidized Science," presents cogent arguments for using the term institutional investment rather than subsidy to capture the institutional return on investment. Task Force members Susan Meyn and Kathryn Ramirez-Aguilar collaborated with the ABRF Committee on Core Rigor and Reproducibility to contribute "Addressing the Environmental Impact of Science Through a More Rigorous, Reproducible and Sustainable Conduct of Research." The authors posit that SRRs have a role in advancing sustainability and provide several case studies and quality paradigms for adaptation as part of an overall program of sustainability.

Taken together, these wide-ranging articles demonstrate concrete steps toward addressing long-standing challenges and advancing shared resource priorities. But there remains much to do. To that end, the ABRF SRR Task Force will continue and expand the work of the FASEB SRR Task Force, engaging and partnering with stakeholders toward an SRR national strategy.

There remain significant barriers to maximizing SRR, starting with the capacity to share. Institutions need to recognize SRR as infrastructure and reduce institutional silo culture to promote sharing between institutions. Even at NIH, very few of the Institutes support intramural intersectional work, and extramural funding awards remain highly preferential for individual contributors. Changes are needed in funding mechanisms, peer review, and academic culture to accomplish intersectional aims that characterize impactful multidisciplinary modern research. To unlock the full capabilities of SRRs, harmonization across federal agencies is necessary. Investment in SRRs as collaborators and critical infrastructure would benefit more researchers, such as increased opportunities for collaborative grants across federal agencies and between institutions to democratize access to SRRs for small institutions, minority-serving institutions, or NIH Institutional Development Award (IDeA) institutions.[19]

While recognition for SRR is growing, existing policy gaps reveal untapped potential at all levels of governance. Stakeholders must clearly articulate the SRR value statement to institutional, federal agency, and government leadership. The essential value of SRR interdisciplinary teams was clearly evident during the pandemic response to COVID-19, with SRR members providing technical expertise and data, organized coordination, and rapid mobilization of resources for testing and antiviral research efforts.[20],[21],[22] Furthermore, as SRR members are agents of the institution and stewards of the data, they are responsible for the conduct of research performed and data produced in their resource laboratories, supporting data sharing and future reuse of data across disciplines, and would benefit from a standardized policy for crediting SRRs for data contributions to grants and publications.

Lastly, SRRs are well positioned to foster a more diverse, equitable, and inclusive workforce. There is significant demand for scientists in SRRs at all levels of education, requiring skills-based expertise in technology and applications in concert with leadership, project management, teamwork, and communication skills. These skills are also in high demand for industry. However, both undergraduate and graduate training must diversify to reflect the realities of the research workforce job market. The NIH recently announced a new program to support undergraduate and graduate skills–based education,[23] and community college interdisciplinary skills–based degree programs,[24] supported by NSF funding, would benefit from additional funding. Supporting SRRs ultimately expands access for faculty and students at nonresearch universities, democratizing training and research opportunities for underrepresented populations and leveling the playing field for ongoing and future scientific discoveries.

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