

NASA'S SMD BRIDGE PROGRAM: A CO-CREATED PROGRAM THAT FUNDS FACULTY AND STUDENTS AT UNDER-RESOURCED EMERGING RESEARCH INSTITUTIONS

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Introduction: The National Science Foundation (NSF), NASA, and other federal agencies provide financial support to observatories, academic institutions, and national laboratories for research in science, technology, engineering, and mathematics (STEM). Often this funding is the primary support for faculty and their students in the pursuit of advancing research goals. The distribution of federal funding, though, is not proportional to the various types of academic institutions that exist in the United States: in 2018, 90% of federal research and development (R&D) funding went to <22% of the country's research-active institutions [1]. This discrepancy can disadvantage research-active faculty at smaller under-resourced institutions (URIs; e.g., historically Black colleges and universities, HBCUs; community colleges, CCs; primarily undergraduate institutions, PUIs; tribal colleges and universities, TCUs; and other minority-serving institutions, MSIs), who, because of teaching loads, college service requirements, and/or limited external grant support services (among other factors), may have less time, effort, and resources for writing a proposal. Interestingly, these smaller institutions graduate most of the nation's undergraduate STEM majors who are members of historically marginalized communities [2] because, in some cases, the culture and environments of these smaller schools are more conducive to student retention [3]. Supporting faculty (and student) research at these smaller schools is one way to diversify the nation's STEM workforce.

To address the needs of faculty and students at the above-listed under-resourced emerging research institutions (ERIs; [4]), NASA unveiled the new SMD Bridge Program, to create bridges between faculty and students at ERIs and research scientists and engineers at NASA centers and facilities. In Fall 2022, NASA convened a five-day workshop for scientific community members to provide input for the Bridge Program.

The Workshop: A Bridge Program Workshop Organizing Committee (BPWOC) was assembled from >80 applicants at a variety of career stages, institutions, and professional backgrounds. Concurrently, NASA Architects—liaisons between the Bridge Program and their NASA center/facility—were identified. The BPWOC (12, with two co-chairs) met weekly to identify topics for daily discussions and

keynote addresses, to organize the workshop itself by considering key topics (e.g., early-career perspectives, mentoring approaches, needs of each type of ERI, program assessment, NASA's existing programs, etc.), and to create guided instructions for discussion facilitators and note-takers. Over 400 people registered for the workshop; over 100 people attended each day; and dozens of people took notes and facilitated break-out discussion sessions.

The final workshop day featured reports in which the needs and desires of each group were presented. Common themes emerged, which became the basis for the Bridge Program Workshop Report [5].

The Workshop Report: Setting the stage for the co-creation of the SMD Bridge Program, the workshop report [5] compiled experiential observations from hundreds of participants and summarized decades of data that align with the historical data on lower retainment rates among marginalized groups, in a way that allowed the authors to (i) probe reasons for lower retainment rates in the STEM fields among scientists from historically marginalized communities, many of whom were educated at PUIs, HBCUs, and MSIs; and (ii) generate targeted interventions to address this. It further promoted ideas presented in multiple community decadal studies [6,7] that supporting scientists at each stage of their career and increasing diversity in the STEM workforce are of utmost priority. Finally, the workshop report [5] provided ample evidence that ERIs are primed to support STEM faculty and students who have been historically marginalized, if research funding is available to them.

Though each community has its own areas of need, the workshop report [5] identified two major themes for the ideal NASA Bridge Program. It would

- center the needs of students, faculty, and institutions that have been historically and systematically marginalized; and
- assume primary responsibility for building impactful relationships and partnerships with marginalized and underserved communities to diversify its workforce and the STEM community.

Other common themes include the need for rolling proposal submission dates; multi-year (e.g., 3+ years) funding; culturally competent mentoring of students by faculty and NASA researchers; and the recognition

that ERIs are often understaffed [5]. Though some well-established collaborations between NASA centers and ERIs already exist, the need for an “on ramp” was identified, to develop nascent relationships and support institutional research capacity. This “on ramp” is the Bridge Program Seed Funding (BPSF) opportunity, an open solicitation that has concluded two proposal review panels.

BPSF Proposals: Briefly, seed funding offers 1-2 years of funding, with budgets expected to be ~\$300k for 24 months, to develop a new team or support an existing team to submit a full SMD Bridge proposal in the next 1-2 years (or optionally, any other future NASA proposal). To educate the NASA and academic scientific communities in preparation for the first BPSF proposal submissions in June 2023, the Bridge Team spoke to several groups (e.g., community Analysis Group, -AGs; staff members in NASA divisions), hosted a town hall, presented at scientific meetings, and held a series of office hours for prospective principal investigators (PIs) and their grants managers. Fourteen proposals were submitted in June, and 23 were submitted in November. Eleven proposals have been selected for funding thus far.

Dispelling Myths About ERIs: In 2020, the NSF awarded over \$1B to ERIs, in sharp contrast to awards by NASA (Table 1, [8]). The myth that faculty at ERIs do not or cannot conduct quality research is further debunked by recent results of dual-anonymous peer review (DAPR) of NASA proposals. Figure 1 shows a significant increase in selected proposals when identifying information about faculty at PUIs (and other institutions) was removed from proposals.

Next Steps: The Bridge Team will expand engagement with community stakeholders and NASA partners to support new Bridge teams and proposals. The call for BPSF proposals (F.23) is open until the last day of ROSES-2023 (3/29/24). In ROSES-2024 there will be another call for BPSF proposals, as well as the first call for “full Bridge” proposals. Full Bridge Program proposals can request up to 5 years of funding, in Small, Medium, Large and Key Program cost categories.

By the end of 2024, the SMD Bridge Team anticipates supporting vibrant new partnerships in cutting-edge research areas at multiple NASA centers across the country, engaging dozens of new institutions, while propelling the career trajectories of the students, faculty and NASA researchers involved.

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Figure 1. Results of NASA proposal reviews (2023), before and after implementation of DAPR [9].

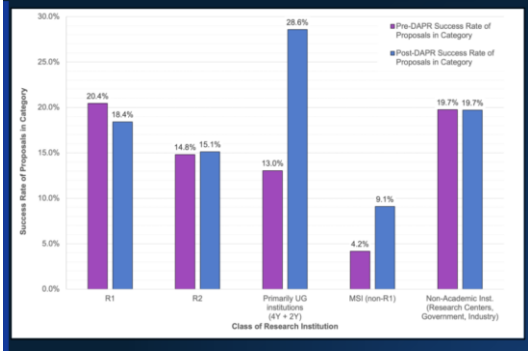


Table 1. Distribution of federal R&D funds (FY20) to ERIs [8]. HHE: High-Hispanic Enrolling; HAIE: High-American Indian Enrolling. # = number of institutions funded.

| | HBCU | HHE | TCU, HAIE | MSI | CC |
|------------|------|-----|-----------|-----|----|
| NSF (\$M) | 111 | 764 | 72 | 319 | 17 |
| # | 54 | 132 | 26 | 151 | 63 |
| NASA (\$M) | 5 | 109 | 15 | 10 | 0 |
| # | 4 | 28 | 1 | 15 | 0 |