

Empowering Diversity Leaders

Proceedings of the 2017
Alliances for Graduate Education and
the Professoriate National Forum





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Foreword

The Council of Graduate Schools (CGS) provides higher education leaders with the knowledge they need to shape our future workforce, improve economies, and enrich societies. CGS is committed to increasing the number of underrepresented minority (URM) students who pursue and successfully earn doctorates and who ultimately enter and remain in the professoriate. Identifying strategies to enhance diversity and inclusion in graduate education is a high priority for CGS and its members. With generous support from the National Science Foundation (NSF #1138812), CGS was very pleased to convene a two-day discussion in Washington, D.C. during the Alliances for Graduate Education and Professoriate (AGEP) National Forum. We were grateful for the active participation of nearly 150 principal investigators and key project leaders from AGEP awardees across the country. Collectively, we shared promising practices for improving the diversity of STEM graduate students who enter the professoriate. The participants formed a community dedicated to applying these transformational strategies across their own colleges and universities. Finally, and most importantly, the Forum provided an opportunity for us to inspire and learn from each other about these practices and strategies for diversifying the STEM professoriate. The proceedings that follow

offer a glimpse of these lively exchanges. Here are a few highlights.

The Pacific Northwest Alliance offered multiple approaches to specialized doctoral mentoring important for the success of American Indian and Alaskan Native students. The California Alliance presented options for reducing attrition after achieving candidacy; a critical period of attrition. Lessons from the Big Ten Academic Alliance included a dual-intervention method that combines better post-doctoral preparation with coaching techniques on diversity hiring for faculty who serve on search committees. The PROMISE, Michigan State University, University of Maryland Baltimore County, and Social Behavioral and Economic Sciences Alliances shared methods for fostering champions of diversity and inclusion that achieve broad cultural change across a campus. Roundtable discussion summaries focused on successful practices for mentoring, elimination of barriers to degree completion, advocacy, effective recruitment, career placement, and leadership development programs. These proceedings also include tips from faculty of diverse backgrounds who successfully navigated the tenure process.

I extend my thanks and appreciation to all those who contributed to the success of this conference.

Suzanne Ortega

*President of the Council of Graduate Schools & Principal Investigator,
Completion and Attrition in AGEP and non-AGEP Institutions (NSF #1138812)*

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The 2017 Alliances for Graduate Education and the Professoriate (AGEP) National Forum convened by the Council of Graduate Schools (CGS) with funding support from the National Science Foundation (NSF grant #1138814). CGS thanks Dr. Mark Leddy and NSF AGEP Program Office staff for their support in planning this event. CGS also extends its appreciation to all speakers and participants of this forum. Finally, CGS also would like to recognize the contributions of the

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Session Summaries

I. Setting the National Contexts

HIRONAO OKAHANA

Assistant Vice President for Research and Policy Analysis, Council of Graduate Schools

CGS AGEP Program

As the only national organization solely committed to research and advocacy for master's and doctoral education in the United States, the Council of Graduate Schools has long been dedicated to diversity and inclusion goals through best practice and benchmarking research efforts. In 2011, CGS was awarded funding from the National Science Foundation (NSF #1138814) to study completion and attrition rates of underrepresented minority (URM) students in science, technology, engineering, and mathematics (STEM) doctoral programs at twenty-one U.S. doctoral degree-granting institutions with large offerings of STEM programs. The study, which captures student-level enrollment records of all URM students who pursued STEM doctorates at these institutions in a twenty-year period, is the largest dataset of its kind. In addition to enrollment records, the dataset includes surveys of current students, focus groups with students and other stakeholders of STEM doctoral programs, and inventories of initiatives designed to facilitate the success of URM students in STEM doctoral programs. The project, which is still ongoing, has generated national research and best practices that inform national efforts to create a more diverse and inclusive STEM graduate student body and professoriate.

Some Signs of Progress

The 2015 CGS report "Doctoral Initiative on Minority Attrition and Completion" (Sowell, Allum, and Okahana, 2015) offers both welcome findings and those that illuminate persisting challenges for our pursuit of more diverse and inclusive STEM graduate programs and professoriate. Specifically, the 2015 report found that the cumulative seven-year completion rates for URM STEM doctoral students increased from 42% to 47% between the earliest and latest cohorts included in the study. Also, the ten-year completion rate of URM STEM doctoral students in this study, 54%, was not far from the 55% ten-year completion rate for U.S. citizens and permanent resident students reported in an earlier CGS doctoral completion study (Sowell, Zhang, Bell, and Redd, 2008).

Another welcoming sign is that URM enrollment in STEM graduate programs has improved in recent years. According to the CGS/GRE Survey of Graduate Enrollment and Degrees (GE&D Survey), on average, Black/African American and Hispanic/Latino first-time enrollment in STEM graduate programs increased by 4.5% and 7.4%, respectively, each year between Fall 2005 and Fall 2015 (Okahana, Feaster, Allum, 2016). Furthermore, the number of earned STEM doctorates by URM

students has more than doubled over the last two decades, increasing from 1,277 in 1995 to 3,057 in 2015, according to NSF's Survey of Earned Doctorates (SED). These robust increases, both in terms of first-time STEM graduate enrollment and earned doctorates by URM students, are encouraging to many of us in the graduate education community. The data suggest, at least in part, that the many diversity and inclusion efforts implemented by colleges and universities, as well as by funding agencies such as NSF, have steered us in the right direction.

Challenges that Remain

Additional work is needed to achieve more just and equitable access to STEM graduate education and, by extension, the professoriate. Despite the robust increases in first-time enrollments in STEM graduate programs, URM students continue to be underrepresented relative to the U.S. population. For example, in fall 2015 URM students collectively accounted for only 19.8% of all U.S. citizens and permanent residents who began pursuing STEM graduate education (Okahana et al., 2016). By different categories of race and ethnicity, Hispanic/Latino (10.2%) had the largest share; followed by Black/African American (8.9%), American Indian/Alaska Native (0.5%), and Native Hawaiian/Other Pacific Islander (0.2%).

Even though the number of earned doctorates in STEM fields doubled over the last two decades for Hispanics/Latinos, Blacks/African Americans, and American Indians/Alaska Natives, these groups collectively accounted for only 12.4% of STEM doctorates in 2015 earned by U.S. citizens and permanent residents, according to SED. Minority representation in the professoriate is even bleaker, with URM degree recipients collectively accounting for 8.3% of all doctoral faculty members in STEM fields in 2013, according to NSF's Survey of Doctoral Recipients (SDR). However, there is one glimpse of hope. Among assistant professors, URM's accounted for 10.4% in 2013. All these data points suggest that while we may be moving in the right direction, the

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Despite the robust increases in first-time enrollments in STEM graduate programs, URM students continue to be underrepresented relative to the U.S. population.
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pace at which we are making progress is not nearly fast enough to facilitate more diverse and inclusive STEM graduate education and the professoriate.

Opportunities

One of the project's key findings was that many graduate schools are engaged in long-standing efforts to promote URM student success. However, these initiatives are often designed as early interventions that focus on recruitment, selection, and first-year transitions of URM doctoral students in STEM fields. In fact, only 36% of the STEM doctoral programs that participated in the project indicated that they offer peer mentoring programs and targeted mentoring for students at the “All But the Dissertation” (ABD) phase (Sowell et al., 2015). The project also demonstrated that one-half of attrition for URM students occurs during the third year of doctoral study and beyond. Considering these findings, support for STEM doctoral students in latter stages seems to be a logical place to improve degree completion rates for URM students.

Indeed, the project results informed us that URM STEM doctoral students seem to grow skeptical about support and interventions offered by graduate programs and faculty members during the latter stages of the doctoral process (Sowell et al., 2015). Further, faculty members are not well resourced or prepared to address the needs of URM STEM doctoral students, as few of the STEM doctoral programs participating in the project offered resources, training, or recognition

for mentorship. These areas point to potential opportunities for STEM doctoral programs and graduate schools to expand these services as a part of a range of strategic approaches to facilitating further diversity and inclusion.

Prior master's education also appears to be a determinant of STEM doctoral degree completion among URM students. The project found that those URM STEM doctoral students with prior master's degrees had a better seven-year completion rate (47%) than those without (42%) (Sowell et al., 2015).

Furthermore, among those URM students without prior master's degrees, there was a statistically significant difference in the probability of earning a STEM doctorate by race/ethnicity. Yet, among those with prior master's degrees, there was no difference by race/ethnicity (Okahana, Klein, Allum, and Sowell, forthcoming). These results suggest that master's education may work as an equalizer in the STEM doctoral education pipeline. The findings support active partnerships between master's and doctoral programs in identifying students with potential for success.

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II. Academic Family: Reconceptualizing Mentoring for American Indian/Alaska Native Graduate Students

SWEENEY WINDCHIEF

Assistant Professor of Adult and Higher Education, Montana State University

Introduction and Self-Location Statement

In alignment with Indigenous Methodologies in Research, the following self-location statement is offered. The presenter grew up with the Nakoda name Tataga Togáhey that was given by his grandfather. He is a member of the Fort Peck Assiniboine Tribe. As an assistant professor at Montana State University, his research falls under the umbrella of Indigenous intellectualism and its interface with higher education is primarily in the maintenance of Indigenous cultural integrity. Thus, he began an academic career being intentional about interweaving Indigenous research with the intentional facilitation of learning and service to the community, in a way that would align with traditional Assiniboine and other Indigenous values.

The purpose of this manuscript is to share the knowledge acquired from the Pacific Northwest Circle of Success: Mentoring Opportunities in STEM (PNW-COSMOS) Alliance. This is an alliance funded in 2014 by a grant from the National Science Foundation's Alliances for Graduate Education and the Professoriate Transformation (AGEP-T) Program. The goal of the alliance is to increase the number of American Indian and Alaskan Native students (AI/AN) who complete STEM graduate programs,

with specific emphasis on doctoral degrees; by developing, implementing and studying a model of culturally congruent STEM graduate education and academic STEM career preparation. The alliance is composed of Washington State University (WSU), University of Idaho (UI), University of Montana (UM) and Montana State University (MSU) with sub-awards to Montana Tech (MTech), Salish Kootenai College (SKC), Heritage University (HU), and Northwest Indian College (NWIC).

Mentoring Program

There are three primary research components to the PNW COSMOS: (1) A Social Sciences Research Team (SSRT) studying the transculturation phenomenon of American Indian/Alaska Native students in graduate STEM fields. (2) The Indigenous Knowledge Field Camps (IKFC) who take faculty/student pairs on a river trip to learn science from an Indigenous perspective. (3) The Indigenous Mentoring Program (IMP). This manuscript will focus on the IMP.

The IMP is developing and implementing a culturally responsive mentoring program that will serve to increase mentoring effectiveness for faculty who are mentoring AI/AN students in STEM

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Although representing 1.2% of the U.S. population, AI/AN students earned just .19% of all doctorates in 2014.
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graduate programs. In order to support the need for such a program, scholars and practitioners are encouraged to evaluate the disparity of AI/AN representation through the use of institutional data at the IMP collaborating institutions. These institutions consist of Washington State University, the University of Idaho, the University of Montana and Montana State University. The average doctoral enrollment in the STEM fields from 2011 to 2013 at these institutions was 0.83%. This can be compared to the national average. According to the 2014 Survey of Earned Doctorates by the National Science Foundation, the data show that, although representing 1.2% of the U.S. population, AI/AN students earned just 0.19% of all doctorates in 2014. The data show that institutions are not typically successful in graduating AI/AN students; presenting a problem that needs to be solved.

In order to address this problem, the IMP research and implementation team asked the Indigenous community to address the question, “How can we improve AI/AN student success through culturally responsive mentoring?” In the program development study, the theoretical framework that was used is informed by the study of higher education. The framework is further informed by historically underrepresented minority student experiences in higher education as these experiences are subsequently couched specifically within an Indigenous context. The methodology of the study is informed by Indigenous and decolonizing methodologies (Smith, 1999; Wilson, 2008) leading to a conversational method (Kovach,

2010) that is useful in maintaining cultural congruity with research participants.

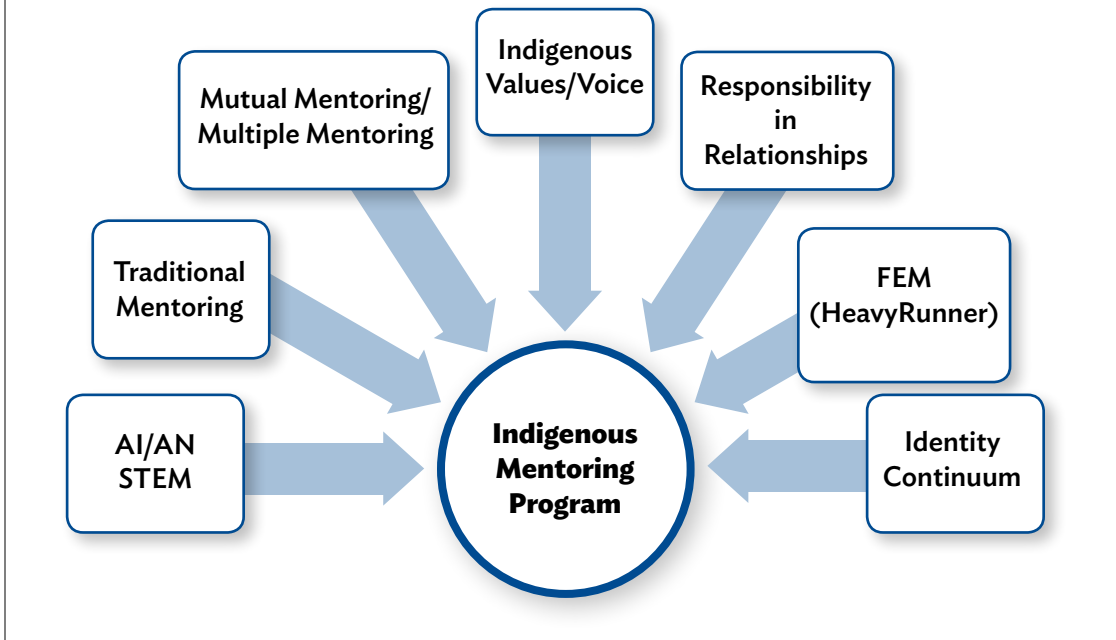
The researchers, two of whom were Indigenous and two non-Indigenous, interviewed 33 respondents consisting of individuals who could best inform the study, AI/AN students, AI/AN student services staff, & STEM faculty who had experience in mentoring AI/AN students. A total of 792 blocks of text were coded resulting in “key themes.” These key themes were used to develop a research-based program to improve academic success. The key themes included the following:

- The Theme of Relationality (69 total): The Theme of Relationality included two distinct concepts. This first included Relationality (31 of 69) defined as the organic development (natural, casual, not forced) of interactions between mentors and students. The second concept included Barriers to this Relationality (38 of 69).
- The Theme of Cultural Humility (60 total): This theme was defined not by a discrete endpoint like cultural competency; rather as a lifelong commitment in practice that mentors engage in with students, communities, collaborators, and internally (Tervalon, & Murray-Garcia, 1998).
- The Theme of Suggestions for Activities (57 total): This theme included informal interactions.
- The Theme of Indigenous Worldviews (46 total): This theme included ways of being, knowing and doing.
- The Theme of Resources and Support (33 total).

Conceptual Framework

To further inform the concept of this program as diagramed in Figure 1, the researchers began by considering the realities of AI/AN in the STEM fields including the aforementioned underrepresentation. This prompted the researchers to investigate how these students are being mentored currently and how other systems of mentorship might be more successful including mutual/multiple mentor

Figure 1. Concept Development for the PNW-COSMOS Indigenous Mentoring Program



processes. Further, the researchers examined how Indigenous values and voice can influence the mentoring process, how the concept of clear, two-way expectations contributes to the mentoring process and how the idea of reimagining mentor relationships in terms of traditional Indigenous kinship structures influences mentoring. Finally, the researchers considered where AI/AN STEM students are on an Indigenous identity continuum as seen in Figure 1.

In order to make this research practical, this concept represented in Figure 1 was transformed into nine learning modules that address the relational, theoretical, methodological and practical aspects of the results. These modules are offered to select faculty who are identified as having past success, and/or a vested interest in mentoring AI/AN students. The nine learning modules provide training in the following areas:

1. Guidelines on how to develop self-location statements & introduction to Indigenous mentoring models

2. A Seminar on Indigenous Research Methodologies (IRMs)
3. A program to development familiarity with AI/AN student services
4. A program that provides faculty with the opportunity to visit the home communities of indigenous students
5. A process for creating an interface between prospective students and mentors
6. Informal gatherings for STEM faculty & AI/AN STEM students
7. A yearly training program on using cultural competency to develop cultural humility
8. Guidance on how to present STEM research to Indigenous community leaders
9. A program that provides access to informative literature on mentoring AI/AN students

Out of respect for STEM faculty mentor's multiple time commitments, these 9 modules were designed to align with the academic calendar and

are offered in 1.5-hour sessions. The first iteration of the IMP program was implemented with 35 STEM faculty mentors or prospective mentors who had a 43% completion rate at the end of the program. To improve upon this completion rate for incoming IMP participants, the team members are considering making the modules 1) more accessible to faculty participants by getting their

input on meeting times, 2) improving student AI/AN support through internal and external partnerships and 3) carefully considering how this program can be tailored to fit different institutions, other historically underrepresented student groups and non-STEM academic fields of study. The current IMP has 68 faculty participants showing 194% growth in participation.

III. Focused Discussion: Pathways to the Professoriate

A Community of Practice to Increase Diversity in the Physical Sciences and Engineering

ROBIN GARRELL

Vice Provost, Graduate Education and Dean, Graduate Division, University of California, Los Angeles

The NSF AGEP California Alliance represents an unprecedented partnership between four outstanding research universities: the University of California—Berkeley, the University of California-Los Angeles, Stanford University and Caltech. These two public and two private universities have allied with a common purpose: to increase the number of underrepresented minority (URM) students and postdoctoral scholars in the physical sciences, computer science and engineering who advance into faculty careers at research universities across the country. The Alliance chose these fields because despite sincere and substantial commitments at many levels in our institutions, progress in diversifying our faculties so that our demographics come close to mirroring those of the State of California has been very slow. The Alliance aims to change the slope.

Towards this end, the institutions within the Alliance identified an intervention gap. Many federally-funded and campus-based initiatives focus on intake into graduate degree programs: for example, aiming to boost applications and yield, or to support success through mentored undergraduate research experiences and bridge programs for inbound graduate students. Further along, many

universities invest great effort in the faculty hiring process: engaging in outreach to build strong candidate pools, training search committees, and providing competitive support packages, and then providing professional development and mentoring to support successful advancement through the professorial ranks. The California Alliance project addresses the attrition that happens between the time when students advance to doctoral candidacy and progress into their careers. The Alliance aims to boost success in hiring URM faculty by substantially increasing the number of advanced graduate students and postdocs who are prepared for and choose to apply for tenure-track faculty positions.

A central goal of the California Alliance is to create a sustainable, multi-disciplinary and multi-institutional community of practice whose members include advanced graduate students, postdoctoral scholars, early-career and senior faculty. Through this approach, the Alliance strives to:

- counteract the isolation that many URM students and postdocs experience in their departments and on their campuses;
- establish expectations for longitudinal mentoring (those ahead helping those who follow);

- provide resources that can support professional development and career progression;
- expose participants to postdoctoral and faculty opportunities across the Alliance;
- provide visibility and validation to the participants;
- and build professional networks that can provide emerging scientists and engineers visibility and access to those who are in a position to hire them.

Activities

The California Alliance is built around four program elements:

1. an annual retreat for students, postdocs and faculty from the four California Alliance institutions, and also leaders from the allied national laboratories (Lawrence Livermore, Lawrence Berkeley, Sandia and Los Alamos);
2. professional development resources;
3. inter-institutional research exchanges;
4. postdoctoral fellowships.

Each **ANNUAL RETREAT** is held on one of the Alliance campuses and brings together students, postdocs and faculty from all four institutions. Additional participants include inspirational keynote speakers such as Dr. Shirley Malcom from the American Association for the Advancement of Science (AAAS), leaders from the national laboratories, and key university administrators, including chancellors, vice chancellors for research, deans and department chairs. Activities include a networking poster session, mentor panels focused on specific professional skills and informal networking time. Each retreat has been built around a theme. Collectively, the first four retreats mapped onto stages in participants' professional development, with the expectation that over several years, each participant would experience the full arc of topics.

The first retreat was designed to establish the Alliance network, explain its purpose, and motivate and set expectations for sustained engagement. Having established that community and an atmosphere that fosters candid and constructive conversations, the subsequent retreats placed increasing emphasis on strategies and tools for success in advancing into the professoriate. Panel themes have ranged from publication strategies, navigating relationships with advisors, considering and planning the postdoctoral experience, preparing strong applications for faculty jobs, and identifying multiple mentors who can collectively support an individual's career progression, providing guidance on navigating common challenges such as an uncomfortable department climate, skeptical colleagues, work-life balance, and many others.

Resources for **GRADUATE PROFESSIONAL AND CAREER DEVELOPMENT** can be found in many places: on campuses, through professional organizations, blogs and countless websites. Recognizing that seeking and finding information that is relevant, substantial and actionable takes time and effort, we developed a website to provide a curated set of resources (documents, links, contacts) relevant to California Alliance participants. We have leveraged existing resources on our campuses, as well as social media sites (Facebook, LinkedIn, AAAS Trellis) to provide ready access and build community around the shared experiences in doctoral degree completion and advancement into postdoctoral and faculty positions.

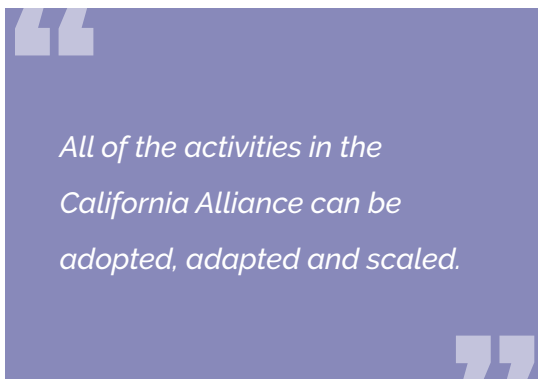
Through the **RESEARCH EXCHANGE**, the California Alliance facilitates and provides funding to Alliance participants who wish to visit another campus in the Alliance. A visit may be arranged to initiate or further a collaboration, to explore opportunities for postdoc or faculty positions, or to develop a mentoring relationship. Typically, the student presents a research talk, an experience that provides visibility for their work and validates their standing as an accomplished emerging scholar. In addition to

advancing the scientific enterprise, the exchanges enable the visitors to experience the host campus as a potential site for employment, while the host campus gets to know the visitor and can begin considering them as future colleagues. We are now adding universities outside of California to the research exchange network, and aspire to grow this into a nationwide program.

The NSF AGEP California Alliance **POSTDOCTORAL FELLOWSHIPS** are unusual in two respects. First, the Alliance recruits through the University of California Presidential Postdoctoral Fellowship Program (PPFP), which targets candidates who have the potential to advance diversity, broadly described. The PPFP candidate pool is outstanding and selection is highly competitive. Second, each campus in the Alliance has engaged campus partners to co-fund the postdoctoral positions, signaling the importance each institution places on diversifying the physical sciences and engineering professoriate. Caltech and Berkeley have been particularly successful in garnering institutional resources and developing activities to support the career advancement of their NSF AGEP postdocs.

Outcomes

The California Alliance is now an established community of practice, enthusiastically embraced by new and continuing graduate student and postdoctoral participants, faculty, and senior administrators on all four campuses. Our research study is designed to assess the impact of specific



Alliance activities. Through observations and feedback that we have solicited on the retreats and research exchanges, we already know that the Alliance has fostered new mentoring relationships, supported candid and far-reaching conversations about the challenges our students and postdocs face and the career options before them, and enabled many participants to successfully advance into postdoctoral and faculty positions. The research exchange and postdoctoral fellowships have served to increase the visibility of underrepresented graduate students and postdocs as prospective future faculty.

All of the activities in the California Alliance can be adopted, adapted and scaled. The research exchange, in particular, is a relatively low-cost activity that has the potential to significantly increase the number of URM graduate students who consider academic careers and succeed in being hired into tenure-track positions at research universities.

The Big Ten Academic Alliance Professorial Advancement Initiative

M.J.T. SMITH

Dean, Graduate School, Purdue University

CHARITY FARBER

Assistant Director of Academic Programs Big Ten Academic Alliance

This paper provides an overview of the *Big Ten Academic Alliance Professorial Advancement Initiative* and the pathway it provides for STEM postdocs and PhD graduates to enter the professoriate. Empowered by a centrally funded staff of 23 academic professionals the Big Ten Academic Alliance has, for more than half a century, shared expertise, leveraged campus resources, and collaborated to generate unique programs for students and faculty. In 2013 the Alliance, formerly known as the Committee on Institutional Cooperation (CIC), consisting of the University of Illinois, Indiana University, the University of Iowa, the University of Michigan, Michigan State University, the University of Minnesota, the University of Nebraska-Lincoln, Northwestern University, the Ohio State University, Pennsylvania State University, Purdue University, and the University of Wisconsin-Madison received funding for the "Professorial Advancement Initiative" (PAI) under the NSF AGEP-Transformation (AGEP-T) program. The goal of the Big Ten PAI is to double the rate at which the Alliance hires underrepresented minority (URM) faculty in the science, technology, engineering, and mathematics (STEM) fields.

Toward that end, the PAI employs a bidirectional approach that involves: a) creating a pool of underrepresented minority (URM) postdocs within the Big Ten who have been well prepared and trained to enter the academy as tenure track

faculty; and b) coaching faculty search committee members to become leaders in diversity hiring—that is, exposing them to the literature about unconscious bias and the compelling benefits of having a diverse faculty.

Preparing Minority Postdocs for Faculty Positions within the Big Ten

There are currently 93 URM STEM postdocs participating in the Big Ten PAI. To properly prepare them for entry into the academy, postdocs are mentored using a multi-campus group model. Using this model, participating postdocs interact with several mentors, ideally consisting of the advisor, a faculty member on the resident campus, and two faculty members at other Big Ten schools who can provide guidance and entrée into faculty positions on their campuses.

To help mentors more effectively coach their postdocs, training materials were created as a resource. Topics addressed include planning for research, understanding publication options, collaborating, developing research presentation skills, preparing for interviews, teaching, understanding future faculty issues, and more. In addition to the mentoring, a webinar series was put in place to allow postdocs across the alliance to hear and participate in special sessions given by faculty experts within the Alliance. Focusing largely on job coaching, networking opportunities, and

grant writing, the cross-institutional webinars have included sessions titled:

- Getting Published in Journals—1st Draft and Responding to Reviews
- Making the Most of Your PAI Mentor Experience
- Writing Your First NSF Grant
- Nuts and Bolts of Writing an NSF Grant
- Networking for Career Success
- Evidence-based Guidance for Team Science
- Academic Job Interviews and Negotiations
- NSF CAREER Grants
- Postdoc Life and Wellness
- Teaching and Classroom Success

Complementing the cross-institutional webinars are campus-specific workshops that typically focus on personal development and campus networking. Examples of these workshops include: Applying for Faculty Jobs; Beyond the Postdoc—Personal and Professional Considerations for Leaders; Effective Research Communication; Interviewing for Faculty Jobs; Preparing for a Successful Application Season; and Tips for Navigating Your Way to an Independent Career.

Originally, the PAI had designated funds to support the mentors for their service in the program. However, we learned that it was more effective to channel this support to the participating postdocs. In fact, many of the faculty members viewed mentoring as part of their job and did not feel comfortable being paid. Consequently, we modified the funding model to allow postdocs to be supported financially from the grant to attend conferences and professional development workshops. Specifically, postdocs can apply for a maximum of two conferences or professional development workshops within the U.S. and can receive funding up to \$1500 for each conference/workshop each funding period. Similarly, they can receive support to visit their Alliance mentors who

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The videos depict a number of situations that can occur during a search committee meeting in which bias, process, and tradition, can negatively disadvantage minority candidates.
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reside on other campuses. Support for travel and lodging expenses is provided for one visit annually with each external mentor.

Coaching Faculty to become Leaders in Diversity Hiring

Many, if not most, faculty members on search committees seek to find the candidate they *judge* to be “best,” not fully recognizing that their *judgments* along the way may not be entirely objective. Research has shown that such judgments are often influenced by assumptions tied to race, ethnicity, and gender, and thus existing hiring practices often contribute to the poor diversity within the faculty ranks. The PAI faculty hiring workshops have built on the materials developed by members within the Big Ten who have ADVANCE programs. The workshop coverage is extensive and includes active recruiting, best practices for evaluating the pool of applicants, research on biases and assumptions, best practices to assure a fair and thorough review of candidates, and implementing an effective interview process. As part of the PAI, a series of video case-studies were developed to facilitate small group table discussions during the workshops. The videos depict a number of situations that can occur during a search committee meeting in which bias, process, and tradition, can negatively disadvantage minority candidates. The purpose of these table discussions is to sharpen awareness among attendees to recognize these patterns, particularly those that are subtle, and

equip them to intervene and level the playing field.

To further assist Big Ten Academic Alliance hiring committees, the PAI has developed a collaborative resource library—a central repository where members can have easy access to diversity materials developed independently across the Alliance. The PAI has also established a postdoc directory with names, credentials, and CVs of postdocs who have been mentored and coached in the PAI. This is an important resource for Big Ten hiring committees seeking to identify prospective URM candidates for STEM faculty positions.

In parallel, the PAI research team is examining a range of critical issues. These include an examination of the influence of mentoring on the self-efficacy and identity of URM postdocs as STEM researchers as well as the influence of having matched-background mentors and the degree of importance URM postdocs place on having a

matched mentor. The team is also studying the influence of mentoring on the successful transition into the professoriate and success in that position along with the influence the mentoring experience has had on unconscious bias. Understanding these issues—postdoc-mentor interactions and faculty perceptions—will help us improve the progression of URM postdocs into the academy.

Progress

The Big Ten PAI is making good progress. Thus far, there are 92 STEM postdocs in the program and more than 600 faculty have been impacted by the PAI hiring workshops. At the start of the program, the Alliance, as a whole, was hiring 24 URM faculty members each year on average. The goal proposed in the grant was to effectively double the Alliance URM hiring rate, the specific numerical target being 50 per year. Currently, the Big Ten Academic Alliance is hiring 67 per year.

Acknowledgments

The success of the Big Ten Academic Alliance PAI is made possible by the active engagement of the campus AGEP-PAI directors and leaders. We wish to acknowledge the hard work of Peter Hitchcock, Aman Yadav, Daniel Wong, Bianca Evans, Michelle Campo, Zana Kwaiser, Antonio Nunez, Belinda Cheung, Richard Lombardo, Jennifer Hobbs, Kristen Mighty, Marcela Hernandez, Pallavi Eswara, Kathy Garza Dixon, Linda Mason, Chris Sahley, and Imogen Hurley in making the program a success.

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IV. On the Road to Tenure—Tips for Success and Management

Connect, Adapt, and Distinguish: Bloom Where You are Planted and Make Your Own Luck

LUIS CIFUENTES

Vice President for Research, Commercialization and Outreach, Texas A&M University, Corpus Christi

More than twenty-eight years in higher education have taught me the value of being positive and taking advantage of all opportunities—change is constant and adaptation is a critical skill. Finding and cultivating a supportive network; knowing how teaching, research, and service were valued and evaluated in my institution; and learning self-awareness of my strengths and weaknesses were keys to my success. These keys not only served me in reaching full professor through tenure and promotion; they have also guided me through a productive career in higher education administration. As General Douglas MacArthur said, “the best luck of all is the luck you make for yourself.”

My personal, educational, and professional life has been one of sharp contrasts. I began my youth in Latin America; living in Ecuador, Paraguay, Chile, and Guatemala. When I was 10 years of age, my family settled in the Washington, D.C., area. I attended a private, east coast liberal arts college; completed graduate study at a public research university; and served in a postdoctoral fellowship at a world-class research institute in my discipline. The sharp contrasts experienced among Latin American cultures and the culture of the United

States taught me the cultural humility required to navigate the different academic cultures I encountered among and within the universities I have served.

Taking stock of my graduate school and postdoctoral fellowship experiences, it was critical that I took advantage of opportunities, some more obvious than others. For example, I began my Master of Science degree with a study of clay particle flocculation along the salinity gradient while at the College of Marine Studies at the University of Delaware. My eventual master's and doctoral theses advisor, Dr. Jonathan Sharp, noted my lack of enthusiasm for that project and offered me the option to address a carbon and nitrogen cycling study that aligned better with my analytical chemistry background and interests, but was not as well-funded. It was difficult for me to disappoint my initial advisor and lose long-term funding. However, moving to an area of study that excited and energized me was a critical early decision in my career.

During the early stages of my PhD studies, I had the opportunity to visit Dr. Thomas Hoering, a distinguished organic geochemist at the

I strongly encourage all who aspire to be faculty at research intensive institutions to intern, take a postdoctoral position or collaborate with the “best” in your field.

Geophysical Laboratory of the Carnegie Institution of Washington. Dr. Kenneth Mopper, a member of my dissertation committee, offered to take me with him and learn more about the exciting high-performance liquid chromatographic techniques Dr. Hoering and his colleague, Dr. Ed Hare, developed to measure amino acids. I came very close to passing on the opportunity, but changed my mind at the last minute. That decision ultimately led to a Predoctoral Fellowship and later a Postdoctoral Fellowship at the Geophysical Laboratory; which, without a doubt, led me down the path to career success. I strongly encourage all who aspire to be faculty at research intensive institutions to intern, take a postdoctoral position, or collaborate with the “best” in your field.

Perusing job advertisements in *Nature* and *Science* magazines and *Eos*, the magazine published by the American Geophysical Union, was a weekly event that I shared with my postdoctoral advisor, Dr. Marilyn Fogel. When the assistant professor position in chemical oceanography opened at Texas A&M University in College Station, Texas, Dr. Fogel asked if I planned to apply. Not having traveled further west than Western Maryland, I impulsively answered, “there is no way that I will move to Texas.” Dr. Fogel, though not much older than me, was much the wiser and responded, “Luis, you will apply to every open position that fits, if the job is offered then you may choose not to move there and decline.”

Fortunately, I listened to her sage advice, and gained a great appreciation for Texas A&M

University, College Station, and Texas. I would not presume to suggest that anyone else respond as I did to the culture “shock” of moving from Washington, DC, to College Station, Texas. I would, however, caution all who look to a career in higher education that the job market, at present, will rarely land one at the geographical region of choice—learn to bloom where you are planted.

I was woefully ignorant of the promotion and tenure (P&T) process when I arrived at Texas A&M University. During the late 1980s and early 1990s, the P&T process was not as well documented, explained, and supervised as it is today. Following the counsel of a senior faculty mentor, I leveraged the network and gravitas of the Geophysical Laboratory to develop an internal and external network of colleagues that enabled me to find research funding for exciting and relevant projects. This network led to peer-reviewed publications, published abstracts and presentations that stood up to the P&T criteria of my department, college and university.

Presently, I serve as the chair of the University Tenure and Promotion Committee at Texas A&M University-Corpus Christi and advise new faculty to be assertive, to ask their department chair and dean to review in detail all relevant P&T documents, and to insist on an annual assessment of progress to tenure and/or promotions.

Reviewing my path to tenure, I recall at least five decisive moments that, had I made a different choice, could likely have resulted in denial of tenure. For example, my first NSF funded project was to use nitrogen isotope ratios as a tracer of bacterial nitrogen sources in estuarine and coastal waters. More than halfway through the project timeline, I spoke with the program manager who remarked that he was disappointed in the results to date from his investment in nitrogen isotope studies. Although he complimented my program, I understood the possibility that support of nitrogen isotopes was in jeopardy and resourced my laboratory to focus more on carbon isotope applications. More and more, higher education careers require changes

in research and scholarly direction, which are uncomfortable but necessary to navigate.

Finally, the tenure and promotion process is not devoid of politics. I have served at Texas A&M University, a globally recognized Tier I university that, at that time, had an enrollment near 50,000 students and at Texas A&M University Corpus Christi, an Hispanic Serving Institution with 12,000

students, significant first generation enrollment, military-friendly school designation, and aspirations to be an emerging research university. These distinct institutions have different shared governance cultures and different tenure and promotion expectations. Distinguish yourself by taking the time to understand the dynamics of your department, college, and university and "make your own luck."

On the Road to Tenure: Tips for Success and Management

CHRISTINE GRANT

Professor and Associate Dean of Faculty Development and Special Initiatives, College of Engineering, North Carolina State University

Is your career roadmap strategically positioning you for promotion and leadership in the academy? While completing graduate school is a necessary step in the quest for a career in academia; the pursuit requires strategic planning. It's critical to *go beyond the how and explore the why*, creating an authentic portfolio for your ideal institution. Learn how to *identify, create, and execute* a personalized process using your academic career goals as a basis for success.

What do you want the legacy of the AGEP program on your university campus to be?

What is the first thing that comes to your mind when you think about what your legacy is going to be? Collectively, we may see themes that thread through your intentional thoughts in this realm. An informal query of AGEP directors indicated their desire to have legacies that include: (1) changes in the culture of graduate student/faculty interactions, (2) collaborations and multi-

institutional communities, (3) more opportunities in STEM, (4) student-centered inclusive environments, (5) empowerment, (6) sustainability, (7) evidence of impact, (8) attitudinal and behavioral changes, and (9) evidence-based practices. I know that these will resonate with the alliances for graduate education and the professoriate (agep) program funders, the National Science Foundation, whose mission states that the organization: "seeks to advance knowledge about models to improve pathways to the professoriate and success for historically underrepresented minority doctoral students, postdoctoral fellows and faculty; particularly African Americans, Hispanic Americans, American Indians, Alaska Natives, Native Hawaiians, and Native Pacific Islanders, in specific STEM disciplines and/or STEM education research fields."

The movie *Hidden Figures* profiles the stories of a group of African American women at the National Aeronautics and Space Administration (NASA) who overcame tremendous obstacles to achieve career success in the STEM arena. When my husband,

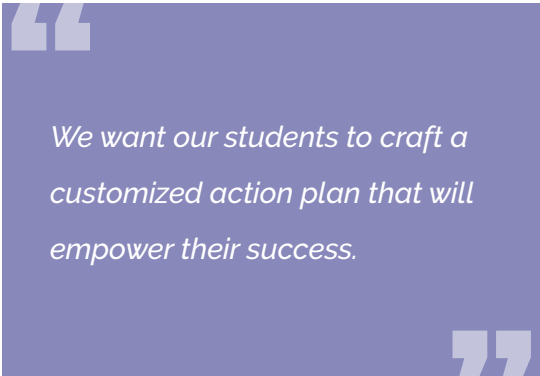
a Massachusetts Institute of Technology (MIT) trained engineer/mathematician, and I (we are an engineering family) saw the movie, I remember sitting there thinking: *Why does this sound so familiar? Why does this feel so familiar?* Then I recalled that when I became a faculty member at North Carolina State University, I was the first African American woman faculty member in the college of engineering and the only one for sixteen years. I actually was on the third floor with the industrial engineering faculty and there was no restroom on that floor for women. Even though there were women staff on that floor; all the women had to go down to the second-floor restroom. I remember pointing this out to somebody in the industrial engineering department. They advocated for my position and the facilities people put a women's room on the third floor. This was my first experience with a group of allies who were not directly affiliated with my departmental unit, but who provided coaching, mentoring, and support in my quest for faculty career success.

So, the question is: Where do the signals come from to promote success and where is the legacy manifested? When I talk to student and faculty groups, I emphasize the concept of academic resilience. From my perspective, true academic resilience occurs when you go beyond the *how to get a faculty position*; to understand the *why you want a faculty position*. There are many faculty development workshops that focus on how to get a faculty position, how to get tenure, and how to *succeed*. We send all of our students to those workshops to learn about *how to successfully pursue a faculty career*. But I want us to ask: What is the *why*? *Why are we seeking a faculty career?* What is the true reason that we are faculty, especially if we are working so incredibly hard? Considering the reasons for pursuing a faculty career has a lot to do with the concept of thinking outside of something I call "the academic career box." To do this, we need to identify the actions and initiatives that we are passionate about and understand the things about faculty life that drive us to greater heights. In this process, it is likely that we, the faculty, have

created a list of fellow faculty members who have developed focused achievable goals outside of the goals associated with the academic career box. Finally, faculty in general must set out to execute a workable roadmap for career success. This is a process we, as faculty, should instill in our students. So, the bottom line is that we want our students to think about the goals or initiatives that they can accomplish in research, teaching and extension *outside of the academic career box*, in addition to the goals and initiatives that they can achieve as faculty members. For a number of our students it is about giving themselves permission, or somebody giving them permission, (the nudge and the resources) to think outside of this academic career box and pursue unconventional career dreams.

My Story

So, who am I? As an assistant professor in chemical engineering at North Carolina State University (NCSU), I received tenure and was promoted to associate professor. At that time, I was the only African American woman to achieve that rank in the college of engineering at the university. I remained the only woman in that program for sixteen years. I received a great deal of mentoring from people who held appointments outside my department, my college, and my university. That is what I had to do in order to find people who looked like me. There were a lot of people; however, who did not look like me, who also did an amazing job mentoring me. What I do, and what you should be doing too, is to encourage your students to find institutions that provide evidence of support (e.g., faculty development and/or advancement programs) when they are considering a faculty position at that institution. You can prepare them and help them realize that they may be the first and the "only lonely" faculty member from an underrepresented group. There is nothing wrong with that. However, if the institution they select is not supporting faculty overall, then you know that our AGEP students are not going to be supported when they go there as faculty members.



As Associate Dean of Faculty Advancement in the NCSU College of Engineering (COE), I am celebrating 10 years in this position that I created with my Dean, Louis Martin-Vega. Dean Martin-Vega is steeped in a tradition of advocacy for diversity issues in STEM. In this role, I develop and facilitate initiatives for all engineering faculty at all ranks (not just the diverse faculty) to advance their careers as academics. My responsibilities include: department head coaching, sponsored agency visits (e.g., National Science Foundation [NSF], Airforce Office of Scientific Research [AFOSRI]), workshops (e.g., NSF Faculty Early Career Development Program [CAREER] and making meaningful sabbaticals) and general strategies for “faculty care.” I also work with the Provost’s Office to develop and implement policies for the College of Engineering. The Faculty Advancement Office also has a new faculty orientation workshop for all COE faculty. The most important contribution I make is leadership for the retention, promotion, tenure (RPT) process at the college level.

Faculty Development: How do you insure success and sustainability?

Faculty development is defined as any endeavor designed to improve the performance of faculty members in all aspects of their professional lives. My responsibility is establishing a faculty advancement framework that integrates a balanced perspective of diverse departmental cultures across the College of Engineering. The success of a faculty development program is dependent

upon the commitment of the university and the college leadership to specific goals and initiatives that inform faculty development programming. It is a partnership between the dean, the department head, and the associate dean of faculty advancement. Because this is an associate dean position (and a permanent executive level position in the college), I interact with the department heads and the other associate deans every other week for the purpose of strategizing faculty development initiatives.

I like this concept of being a coach to the department heads. As a woman of color, I have experienced the academic STEM roadmap progressing from completion of the PhD through promotion to full professor. I really love the fact that I get to work on issues of broadening participation as part of my job. I have been involved with the AGEP Program at NCSU. It was originally called the Minority Graduate Education (MGE) Program and I was on the advisory board. At NCSU, the Building Future Faculty (BFF) Program for graduate students and post docs from around the country actually evolved from the MGE Program. This is one example of a legacy building initiative that was institutionalized by NCSU.

The Letters

A critically important component of the reappointment, promotion, and tenure process is the acquisition of letters that support the proposed faculty promotion action. The following represents a set of phrases that represent the general tone of positive letters that are reviewed by departmental, college level, and university (e.g., Provost) level committees in the promotion process:

- I’m extremely impressed by the creativity of...
- She has carved out a great niche in...
- Professor X has demonstrated significant creativity in a widely adopted...
- Professor Y has a well-funded vibrant program, with high scientific rigor...

- Her record of service to the technical community is very strong.
- I have particularly enjoyed observing this person taking risks in his research approach; I found his innovations in x intriguing

For promotion to full professor, you may see statements that say:

- Her contributions have stimulated the entire field.
- He is one of the top ten researchers of this area nationally.
- I've seen him present at top international conferences.
- She has made a profound impact on the field as an independent and collaborative researcher internationally.
- Her work has a global component as represented by stellar international conference organizing.
- He is viewed as a thought leader; creative and impactful.

Are we training our students to be the faculty that our colleagues can write those positive letters about? That is what we need to think about when we are preparing our graduate students and post docs for academic careers, because those letters hold so much weight when it comes to the tenure process. My take-home message is that it's very important to get our students plugged into this "potential

letter-writing" network. We need to get them in a network early, a network where colleagues will write authentic letters containing the aforementioned phrases and mean it. In order to get tenure, there is more to it than the letters. There are also the teaching, leadership and departmental citizenship achievements. We want our students to craft a customized action plan that will empower their success. We want them to be equipped to identify steps for strategic advancement in their careers. We want them to leverage existing institutional resources to make that happen. If done well, when you send your students out to become professors they can say that they had a solid foundation.

Academic Resilience

So, this is the bottom line: We want our AGEP students to identify their "outside the academic career box goals." These are the goals that promote creativity and passionate contributions to the profession. AGEP students then need to determine who their exemplars are and who they can model their career trajectory after. This connection with exemplars may also assist with the identification of faculty members who can eventually write their tenure letters. As mentors and coaches, we can connect and facilitate the cultivation of these essential relationships. Finally, the pursuit of a workable and executable career roadmap will require the presence of a series of allies and advocates. After all, no one in the academy survives or thrives without a robust community of practice that promotes and celebrates success.

V. Fostering and Empowering Program Champions in STEM Doctoral Education

Champions of AGEP: A Study of Existing Programs

TYKEIA NICOLE ROBINSON

Howard Hughes Medical Institute Policy Fellow, Association of American Colleges and Universities, Consultant, Council of Graduate Schools

This study analyzes focus group data to better understand how existing programs work to support underrepresented minority (URM) doctoral students in science, technology, engineering, and mathematics (STEM) graduate education. Throughout student retention literature, institutions are encouraged to commit to developing and sustaining programs to support URM students of all levels to degree completion (Hurtado, Milem, Clayton-Pedersen, & Allen, 1999; National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, 2011). Various programs have been developed and implemented to enhance the training of URM students and ensure that they are adequately and equitably supported to degree completion.

The body of literature on these programs is burgeoning, but still quite limited in illuminating program processes and the organizational strategies and elements (i.e., leadership) that contribute to program functioning, success and sustainability. This study highlights how persons within and around existing training and retention programs work to fulfill program objectives and support URM doctoral students. The study addresses the following research questions.

1. What are the traits/characteristics of a program champion in STEM graduate education, doctoral training specifically?
2. What are the specific contributions of program champions? How do they support URM students?

Review of Relevant Literature

Previous scholarship highlights several qualities and characteristics of program champions. Studies have found that champions contribute to overall program functioning and program success (Chakrabarti & Hauschildt, 1989; Schon, 1963; Shaw, Howard, West, Crabtree, Nease, Tutt & Nutting, 2012). Similarly, the sustainability of program efforts and the institutionalization of program efforts beyond initial periods of funding have been attributed to the actions of program champions (Goodman & Steckler, 1989; O'Loughlin, Renaud, Richard, Gomez & Paradis, 1998). Studies also show that champions impact and improve the practices used by program participants, program affiliates and colleagues from the environments that surround their programs. Within the context of STEM education, previous research argues that champions organize and energize programs and provide leadership that

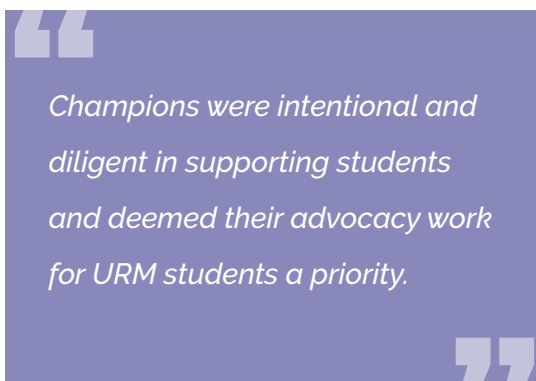
is critical to supporting URM students. Although previous reports describe traits and characteristics that effective program champions should have, the specific ways that champions provide leadership or improve practices at their institutions is not specified.

Methods

The current study is a part of a larger project that explored completion and attrition of URM doctoral students in STEM fields at 21 U.S. colleges and universities. The study utilized focus group data from 16 institutions that was collected as a part of the broader investigation. Focus groups of URM doctoral students and university personnel were conducted during institutional site visits. Student focus groups consisted of URM doctoral students in STEM doctoral degree programs. University faculty and administrative personnel focus groups consisted of admissions/enrollment management personnel, department chairs and graduate program directors, diversity project staff, graduate school personnel, deans and assistant/associate deans. The size of the focus groups varied and each focus group was facilitated by a member of the research team. Analysis of focus group data was completed in several stages. Audio files from focus groups were transcribed, cleaned, and coded by categories that aligned with interview protocols and the theory presented in the conceptual framework. Data was then uploaded into *Dedoose*, a web-based mixed methods software package that facilitated the organization, coding and retrieval of data for analysis.

Findings

Analysis of the data revealed that program champions are self-motivated and often self-appointed members of faculty and university staff or administration. They may or may not be directly affiliated with AGEP programs or other existing recruitment and retention programs and they may not be persons of color or members of groups currently underrepresented in STEM fields. Findings also demonstrated that program



champions serve and support students regardless of their specific job title or campus role. Champions discussed in the data held various positions at their institutions. Examples include senior/executive leaders, department heads, program directors, faculty members, etc. They were known to the participants in the study for their knowledge and expertise and their ability to connect students and faculty to information and resources. The findings also provided several examples of how program champions expressed and demonstrated a deep commitment to the success of all students, but URM students specifically. Students and faculty referred to champions as "one-stop" shops for supporting and aiding URM students. Champions were intentional and diligent in supporting students and deemed their advocacy work for URM students a priority. Champions also provided students with support throughout the length of their doctoral training from the time of recruitment to degree completion. Faculty and student focus group participants reported that program champions took interest in all aspects of students' lives. The academic, professional, and personal realms of students' lives were discussed specifically.

Discussion

Existing scholarship argues that program champions are significant contributors to the effectiveness and success of programs and initiatives (Chakrabarti & Hauschildt, 1989; Schon, 1963; Shaw et al., 2012). Research shows that champions promote changes in practice within

the organizations and programs where they work and that they are savvy and skilled in negotiating environments that surround these areas. Previous research also suggests that champions facilitate and promote the adoption of new policy and innovation in their programs and contribute to the sustainability of program success (Goodman & Steckler, 1989; O'Loughlin, Renaud, Richard, Gomez & Paradis, 1998). Findings from this study tested the recommendations for the traits and characteristics of program champions presented in previous scholarship and provide a basis for expanding our interpretations of the roles and qualities of the program champions.

This study builds on existing research by confirming that program champions engage in the practices outlined in extant literature and by providing examples of 1) how program champions do this work and 2) what conditions best support and sustain the important and valued practices of program champions. Previous research stated that program champions provide leadership. This study illuminates the ways that champions provide leadership on their campuses. The leadership of champions was not limited or confined only to their program. Instead, these champions were recognized throughout and across their campuses as individuals with knowledge and expertise. They were experienced in supporting URM students generally and in their local departments and often provided other faculty members and university administrators with advice and counsel on how to recruit and retain URM students in their STEM programs.

Applying the characteristics of program champions as a conceptual framework (Shaw et al., 2012) allows this study to explore the work of program champions within the programs themselves. It further allows illumination of the ways that program champions influence and improve campus-wide practices and promotion of organizational change on these campuses. The data presents substantial

evidence that students were not the only beneficiaries of the services of program champions. The data verified that program champions provided their faculty and staff colleagues with advice and counsel on how best to attract, support and retain minority student. The data affirmed that program champions often engaged in research projects on student development, retention, and/or the experiences of underrepresented populations in academic spaces. Champions were recognized throughout their campus communities for having expertise on the experiences of URM students. Champions were deemed universal campus resources. They supported faculty, staff, and students in addressing various challenges or provided a referral for assistance if they were unable to assist students themselves.

While highlighting the excellent value of the work and contributions of program champions, the study also illuminated challenges that program champions face and the ways that institutions can better support and sustain their work on their campuses. The data showed the program champions are often self-appointed members of the faculty and administration who serve as champions in addition to the roles and responsibilities of their formal professional positions. Due to these time demands, they work alone or on their own because they typically do not have the time or capacity to train others to support students and programs as champions. This is not ideal for several reasons. Working alone can lead champions to over extend themselves which may lead to burnout. Additionally, the valued knowledge, expertise, and networks of knowledge that program champions possess is time sensitive and limited to the champion's tenure on the campus. When one champion leaves; usually, there is not another person trained or positioned to replace the one who left. The research findings revealed that faculty expressed concerns about the lack of succession training required to replace champions who leave the institution.

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Fostering and Empowering Program Champions in STEM Doctoral Education

ANTONIO A. NUNEZ

Associate Dean for Academic Affairs and Postdoctoral Training, Michigan State University

In many of our institutions, the goals of diversity and inclusion are often endorsed, but rarely internalized. Thus, it is common to see diversity advocates added to search or admissions committees as a practice to broaden participation. However, no such practice is needed to ensure the impact of other fully internalized values such as the importance of granting success, the influence of publications for faculty searches, and the status of grades and academic pedigree for graduate admissions. Internalization of the values of diversity and inclusion is rarely uniform across all domains of the institution. The Graduate School of Michigan State University has made the

promotion of diversity and inclusion in graduate education a core part of the job description of all members of its leadership team. The leadership team members, by design, are all active faculty members who are fully engaged in teaching and research in their own disciplines. A brief description of some of the Graduate School's key initiatives follows.

The Michigan State University Cross-disciplinary Learning Community

From 2005 to 2011, the Graduate School of Michigan State University was part of two grants from the

National Science Foundation via the Alliances for Graduate Education and the Professoriate (AGEP) program. One of the grants focused on the STEM fields and assigned the University of Michigan as the lead institution. The second grant encompassed the Social Behavioral and Economic Sciences (SBES) and assigned the City University of New York (CUNY) as its leader. Locally, the two grants had a common core leadership team in the Graduate School. Having a common leadership core resulted in the genesis of a Cross-disciplinary Learning Community (CLC) of graduate students, postdocs and faculty who continue to meet monthly. The CLC is now an integral, self-sustaining component of the matrix of graduate student support services provided by the Graduate School. Currently over 60% of domestic doctoral students from Michigan State University who identify themselves as African America, Native American or Hispanic/Latino participate in the CLC. The CLC monthly meetings feature short cross-disciplinary presentations that prepare students and postdocs from these underrepresented groups with the best ways to convey the importance and merit of their research to individuals and groups outside of their particular areas of expertise. One core principle of the AGEP-Community is appreciation of the essential role that the SBES must play in facing social problems that range from the future of our planet to the competitiveness of our nation in the global arena. To prepare for that essential role, graduate students in the SBES fields need to develop the skills required to communicate broadly and effectively with the general public and across traditional disciplinary boundaries between the social sciences and the STEM fields. In addition to providing a venue for learning how to communicate across disciplines, the monthly meetings also feature a targeted discussion of how current advances in the STEM fields affect society and the quality of life locally, nationally and globally. Most of these discussions are facilitated by students and the topics are selected by a student steering committee; however, most semesters, visits from scholars from other academic institutions, as well as from government and industry, are also included.

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”

The motivation for integrating STEM and SBE to form a comprehensive and inclusive learning community was twofold. First, as described above, complex social problems demand solutions from interdisciplinary teams comprised of individuals who can communicate across disciplines. Thus, graduate training should include the skills fostered by the CLC. Second, basic research depends upon public support. Therefore, being able to make discussions of rigorous research programs accessible to broad audiences is an essential skill for future investigators. Michigan State University's CLC provides a venue for the development of those communication skills. Attending the monthly meetings of the CLC is a powerful tool for "fostering and empowering program champions." The program provides the energy, commitment, and engagement required by university leaders to promote the values of diversity and inclusion as advanced by the mission of the AGEP national initiative.

The Michigan State University Prospective Doctoral Student Recruitment and Retention Program

The purpose of this new initiative, that is directed by Dr. Judith Stoddart, Interim Dean and Associate Provost for Graduate Education, is to help doctoral programs at Michigan State University recruit, retain and support domestic students from traditionally underrepresented groups. The goal of the program is to contribute to the diversity of the future professoriate. This is a competitive seed-

grant program that provides funding to develop 3-year plans with the broad goal of sustaining active recruitment, professional development, and degree completion success of a diverse doctoral cohort.

Different from the CLC, which is administered directly by the Graduate School in partnership with students and postdocs, this new initiative fosters the emergence of leadership teams within the programs where graduate education takes place. The initial competition in the Fall of 2016 produced five funded projects that include STEM and SBES

fields. One anticipated outcome of this project is the emergence of a collaborative community of program leaders. Together, these leaders and the Graduate School will share successful approaches and effective ways to evaluate the impact of the various recruitment, retention, and support strategies. Future competitions will add to that community and expand the influence of leaders committed to diversity and inclusion. Ultimately, the program will foster and empower program diversity champions in STEM and SBES doctoral education.

Championing PROMISE: A Focused Discussion on Fostering and Empowering Program Champions in STEM Doctoral Education

RENETTA GARRISON TULL

Director of Graduate and Professional Pipeline Development and Special Assistant to the Senior Vice Chancellor for Academic Affairs, University System of Maryland, Associate Vice Provost for Graduate Student Development and Postdoctoral Affairs, University of Maryland, Baltimore County

During the 2017 National Science Foundation AGEP National Forum, hosted by the Council of Graduate Schools, I was asked to discuss my role as a "Champion" for diversity and inclusion, and the steps that my academic institution took to solidify my role. In keeping with the style of the original keynote remarks on February 23, 2017, this summary paper is written in first-person narrative style. The sections of this short summary will describe the history of the PROMISE Alliance for Graduate Education and the Professoriate (AGEP) in Maryland, and the support that the University of Maryland Baltimore County (UMBC), lead institution for the PROMISE AGEP, has provided over the 15-year span of the program. The process of becoming a champion for diversity and inclusion in STEM has

been nurtured by administrators who have provided institutional support, opportunity to expand the program's size and scope to meet the needs of the underrepresented STEM graduate students, and opportunities for career advancement. Faculty and staff colleagues, postdoctoral fellows, and graduate students have offered encouragement for my diversity and professional development-based efforts throughout the years. Such generous actions from colleagues and the stakeholders themselves fill me with renewed energy and vigor which is essential in a business where burnout is common. My role as a program champion continues to advance through support from UMBC's Vice Provost for Graduate Education and Dean of the Graduate School, along with UMBC's Provost and President.

Historical Perspective

On September 11, 2001, Dr. Janet C. Rutledge, Associate Dean of the Graduate School at UMBC, and Dr. Johnetta G. Davis, Associate Dean of Graduate Studies at the University of Maryland College Park, met to discuss development of an alliance between the three public research universities in Maryland: the University of Maryland Baltimore County (UMBC: An Honors University in Maryland), the University of Maryland College Park (UMCP, one of Maryland's land grant universities), and the University of Maryland Baltimore (UMB, home of the University System of Maryland's law school, medical school, and other professional schools.) The plan for the potential NSF project's direction was based upon former Graduate Dean Scott Bass' retreat and discussions on diversifying graduate education in 2000, and a combination of seed money from the University System of Maryland's initiative for minority recruitment and retention in the sciences and matching funds from UMBC to support the effort in 2001. Janet Rutledge who was Associate Dean of the Graduate School at UMBC at the time, worked on a plan to build upon the success of UMBC's successful "underrepresented minorities in STEM-focused" Meyerhoff undergraduate scholars program and Meyerhoff (NIH) Biomedical Fellows graduate program.

Significant change occurred in 2002: 1) UMBC held the first Graduate Horizons program to cultivate new URM graduate students, using Georgia Institute of Technology's FOCUS program as a model; 2) UMBC received an NSF grant to host a mentoring conference on campus to engage Graduate Program Directors (GPDs) in graduate student mentoring discussions; 3) The Graduate School at UMBC partnered with the Office of Institutional Research to analyze enrollment of PhD students by semester, and examine attrition patterns; 4) UMBC won the CGS/Peterson's Award for Innovation in Promoting an Inclusive Graduate Community; and 5) Maryland's proposal for an AGEP was submitted and awarded, with Arthur Johnson (UMBC's Provost during that time period) serving

as Principal Investigator, and Co-PIs Janet Rutledge (UMBC), Johnetta Davis (UMCP), and Jordan Warnick (UMB). The project, initially called "MAGEP: Maryland's Alliance for Graduate Education and the Professoriate," included initiatives to cultivate new underrepresented graduate students in STEM, and events to bring students on campuses together for professional development. The founders wanted this AGEP project to foster community. The original abstract notes that "MAGEP embraces the notion that we must educate the whole person. Our comprehensive approach will foster excellence in education and research while providing emotional support, peer advising, group study, role models and mentoring." In April 2003, UMBC hired me, a former STEM faculty member at the University of Wisconsin-Madison and entrepreneur, to become the first director for Maryland's new AGEP program.

My role as the new director for the tri-campus AGEP began with a copy of the proposal and an empty office. My former positions as a faculty member who had started a Speech Technology Lab, and work with a tech company and relevant advisory boards, prepared me for the challenge of developing a new program, and bringing the concepts from the proposal to fruition. The Co-PIs also provided me with a unique combination of collaboration and latitude. The first charge was to understand the campus cultures and meet the people. MAGEP was re-named "PROMISE," (**P**rofessorial training for **M**athematicians, **I**nformation technologists, **S**cientists, and **E**ngineers), however, students in the social sciences were among the first active participants in the program, and thereafter, Maryland's AGEP became known as PROMISE. Janet Rutledge facilitated my transition to the new role as she worked with committees and councils with the Office of the Provost and the Office of the President at UMBC to give me a place on various meeting agendas to introduce plans for the new tri-campus "PROMISE" program. After 15 years, I still attend the monthly meetings of the Graduate Program Directors. I have also participated on search committees, award committees, and currently serve on the Provost's Executive Committee for

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Our comprehensive approach will foster excellence in education and research while providing emotional support, peer advising, group study, role models and mentoring.
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the Recruitment, Retention and Advancement of Underrepresented Minority Faculty.

Building Upon Successes and Engaging the Campus

PROMISE focused on providing professional development workshops for underrepresented graduate students, and providing opportunities for them to connect with one another. Early programs offered to students included "Understanding Faculty Member's Expectations," and "Navigating Graduate School." Evaluations from the student participants in 2003 revealed their desires to have the events of PROMISE offered to all students, not just those who are underrepresented. They wanted a way to maintain support for URM graduate students, without denying access to other graduate students. Following submission and award of a new PROMISE AGEP grant in 2007 for which I was a Co-PI, I was promoted to Assistant Dean for Graduate Student Development, and UMBC's new Graduate Student Development Unit began to serve all graduate students on campus by offering broad support, and professional development from the first year of graduate school through graduation and into careers. The position of Assistant Dean was institutionalized with a state line, and partial support from a new matriculation fee. Now that professional development was being offered to all students, the senators of the Graduate Student Association agreed that parts of the new matriculation fee could partially support staff for the positions responsible for professional development. Moving my position

from a grant-funded "soft money" position to a state line provided a mechanism for the sustainability of PROMISE, and professional development for graduate students at large.

PROMISE offers more than 50 workshops between campuses each year that focus on academic development such as degree completion, responsible conduct of research, public speaking, and holistic development such as psychological well-being, financial literacy, and health. There are key alliance-wide signature programs that the students identified as being most important to their advancement, some of which include the topics above: 1) The Dissertation House (2-4 days of writing in a cohort with a coach), 2) Summer Success Institute (SSI: Conference in August for new and incoming graduate students), and PROF-it (Professors-in-Training). All of these workshops cultivate the ideals of PROMISE, where "Psychological Sense of Community" and "The Jessica Effect" which promotes inclusion of family, are pivotal to the culture of the program. PROMISE now serves all 12 institutions within the University System of Maryland, and several parts of PROMISE, e.g., Dissertation House, SSI, have been replicated by other schools outside of Maryland.

Nurturing a Champion Through Empowerment

As the spokesperson for PROMISE, and author of several of the resources that have now been presented nationally and internationally, UMBC has provided me with opportunities to share best practices and lessons learned, all while advancing to reach many of my own professional goals. As a current Associate Vice Provost for UMBC, I now work with a variety of strategic initiatives on campus, and I have a detail with the Office of the Vice Chancellor for Academic Affairs for the University System of Maryland. UMBC has nominated me for national and global awards, I have positions on national and international boards, serve as an educational consultant, and enjoy a level of flexibility that allows me to run

programs, contribute to policies, conduct research, and mentor students. The administration's public support for all of these activities, and coverage via UMBC's media channels empowers me to be an even stronger, and more determined champion for STEM doctoral education.

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VI. Understanding Project Evaluation Design, Implementation and Use

National Science Foundation (NSF)

B. JAN MIDDENDORF

Associate Director, Sustainable Intensification Innovation Lab, Kansas State University

Historically, the National Science Foundation (NSF) has been committed to increasing the number of historically underrepresented minorities (URM) engaging in Science, Technology, Engineering, and Mathematics (STEM) through a variety of mechanisms such as research, education, and investment priorities. The Alliance for Graduate Education and the Professoriate (AGEP) is a prominent program that represents this commitment. The AGEP program is housed in the directorate for education and human resources (EHR) under the division of human resource development (HRD).

The AGEP program seeks to advance knowledge about models to improve pathways to the professoriate with the goal of increasing the number of historically URM faculty, in specific STEM disciplines and STEM education research fields. Expected outcomes from AGEP include:

- Increased number of models of STEM graduate education, postdoctoral training and faculty advancement for URMs;
- Improved understanding of levers and barriers affecting participation, transformation, and advancement of URMs, and;

- Institutional advancement in adopting effective models, policies, and practices to support URMs in STEM fields (AGEP program solicitation NSF 16-552)

The AGEP program also has a strong commitment and expectation that projects include a well-articulated rigorous evaluation plan. The plan needs to be based on a logic model or well-defined program of theory with an appropriate evaluation design that includes both formative and summative approaches with an integrated timeline. In the context of NSF, the evaluation must also address *intellectual merits* (process and implementation) and *broader impacts* (diffusion and/or potential transformation). The evaluation must also be conducted by an independent, qualified evaluation professional with sufficient resources based on the project's scope included in the budget.

Multiple Dimensions of Evaluation and Resources for Future Exploration

To meet the AGEP expectations for project evaluation, it is important to understand the multiple dimensions of evaluation as a discipline and/or science. Evaluation, like many fields, has many dimensions and applications. A useful

resource that provides a wider outlook of the various theoretical perspectives, views, and influences of evaluation can be found in Marvin Alkin's book: *Evaluation Roots* (2013). This source includes a valuable illustration of the 'roots' of these influences framed by use, methods, and valuing. The illustration is in the form of an evaluation theory "tree," with each of the main branches representing one of these main dimensions. The dimensions include various scholars and their approaches to evaluation where one considers (a) the issues related to the methodology being used, (b) the way data are to be judged or valued, and (c) the user focus of the evaluation effort. In addition to the foundations of evaluation, it is important to note that high quality evaluation practice adheres to a set of standards found in the Joint Committee on Standards for Educational Evaluation volume, *"The Program Evaluation Standards: A Guide for Evaluators and Evaluation Users,"* (Yarbrough, Shulha, Hopson, & Caruthers, 2011). There are 30 standards overall that are organized into five groups corresponding to five key attributes of evaluation quality: *utility, feasibility, propriety, accuracy, and accountability*. These standards set the context for developing high quality evaluations designed to identify appropriate questions, utilize effective tools, and communicate results for modification and/or improvement. The main point is to demonstrate the contribution and value that quality evaluation can make in implementing projects and/or programs.

Integral Role of Evaluation in Project Modification, Refinement, and Evidence-based Decision-making

Effective evaluation plans are developed at the beginning of the project along with the project team. It is critical for the evaluator to understand the context and scope of the project to develop an effective plan. It is also essential to involve key stakeholders in the identification of relevant questions and indicators to ensure that the methodology and data collected will address the questions of critical interest. As indicated by the AGEP expectations, developing a logic

It is essential to involve key stakeholders in the identification of relevant questions and indicators to ensure that the methodology and data collected will address the questions of critical interest.

model or program of theory is important for the project design. A logic model framework assists the researcher(s) in identifying the theories and assumptions underlying the project, and it links outcomes (short and long-term) with the project activities and processes. Logic models answer questions related to the intended outcomes (What do you expect to happen as result from the project?), project implementation (What do you plan to do and how will the project reach its intended outcomes?), and project performance (What is the impact from the project?).

Other important factors to consider when designing evaluation plans include clearly articulating the project goals, activities and/or strategies that will be implemented to accomplish the goals and identifying the type of evidence or data that will be collected to determine the progress and performance of the project. As outlined in the AGEP solicitation (NSF 16-552), it is important to include both formative and summative approaches in the evaluation design. The purpose of a formative evaluation is to generate information for project improvement. Formative evaluation plans outline methods for documenting progress toward goals and includes a continuous feedback loop to allow for project modification and improvement. The purpose of a summative evaluation is to assess the quality, outcomes, and impact of a fully implemented project by collecting evidence about the related

processes, strategies, and activities that led to results. Summative evaluation also provides data for evidence based decision-making, as well as supporting the broader impacts and dissemination efforts of the project.

Regarding linking evaluation results to broader impacts and dissemination, it is important to recognize the responsibility to communicate what has been learned to relevant audiences. It is also important to consider the various ways of sharing what has been learned through writing, speaking, editing, presenting, and using information technology in ways that are accessible and meaningful to the relevant audiences and stakeholders. Consider who would benefit from what has been learned and make sure that conclusions are based on credible evidence. Additional benefits from quality evaluation include the ability to link the results to future research. Ways to strengthen the evaluation results and link them to research include reading the literature that enables one to see connections, moving from local examples to broader questions, and situating evaluation questions within larger contexts. Frame questions from the point of view of advancing knowledge (research) versus asking questions to inform and assess project development, outcomes, and institutional practice (evaluation). Consider using a conceptual framework to view issues

and questions, which helps to situate what one is studying in a context beyond a single case. Also, highlight key questions, relationships, factors, and key variables while taking note of emerging questions and observations that may lead to broader research.

Challenges to consider when evaluating broadening participation projects include determining the appropriate size and scope necessary to conduct a quality evaluation, identifying the appropriate methodology that complements the research efforts, and ensuring that the evaluation efforts are fully integrated in the project. Understanding the cultural context and individual circumstances are also critical for analysis and interpretation of data and results.

In summary, the main messages to retain from the presentation are: 1) understand the complexity and value of evaluation within your projects; 2) ensure that you engage high quality evaluation professionals; 3) ensure that the evaluator(s) are engaged in the project development stage (at the beginning), the formative stage (during implementation), and at the summative stage (at the end of the project); and lastly, 4) communicate and utilize findings (both positive and/or negative) to inform future AGEP projects and the program overall.

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National Science Foundation and AGEP Evaluation Web Resources:

AAAS Measuring Diversity: An Evaluation Guide for STEM Graduate School Leaders
<http://www.nsfagep.org/files/2011/04/MeasuringDiversity-EvalGuide.pdf>

AGEP Evaluation Tools
<http://www.nsfagep.org/evaluation-resources/>

Common Guidelines for Research and Development

<http://www.nsf.gov/pubs/2013/nsf13126/nsf13126.pdf>

Framework for Evaluating Impacts of Broadening Participation Projects

http://www.nsf.gov/od/broadeningparticipation/framework-evaluating-impacts-broadeningparticipation-projects_1101.pdf

The 2010 User-Friendly Handbook for Project Evaluation

http://www.evaluate.org/wpcontent/uploads/formidable/Doc_2010_NSFHandbook.pdf

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VII. Round Table Discussion: Mentoring, Barriers, Advocacy, Recruitment, Networks, Leadership

ROBERT M. AUGUSTINE

Senior Vice President, Council of Graduate Schools

Discussion Process

During the Discussion Roundtables, 6 topics were discussed based on group table assignments. Two focus questions anchored the discussion for each of the 6 topics. One participant in each group served as a discussion leader and reported to the whole group during the community sharing. One participant in each group served as a note taker and provided the summaries that follow. The discussion groups were guided by the following statements: 1) Identify the practice or practices

that were implemented to improve diversity among STEM graduate students preparing for the professoriate; 2) Identify the data that were collected to show that change was achieved; and 3) Identify the methods that were used to scale up and/or sustain the practice beyond AGEP funded activities to achieve transformational change for the program and/or institution. The summaries are presented by topic and accompanying focus questions.

Topic 1: Mentoring

Focus Questions

- What mentoring practices significantly improved the success of URM STEM doctoral students?
- What was done to encourage adoption of these successful practices as replacements for unsuccessful practices?

Mentoring Circles

The goal of Mentoring Circles is to create a "circle of mentors" for each student in the AGEP Program. The "circle" may include the faculty mentor in the discipline, someone in the graduate arena such as a senior graduate student or a postdoctoral

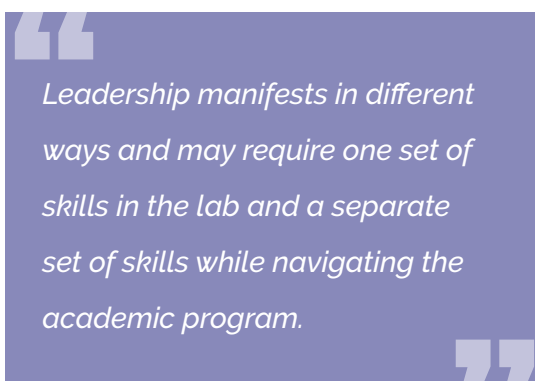
researcher, and faculty members at various stages of their careers, including administrative faculty. In addition to mentees meeting with each mentor individually, the teams of mentors and mentees are brought together in a networking structure once per year.

Multiple Mentors Model

Underrepresented minorities (URMs) often have important mentors who extend mentoring beyond the support provided by their doctoral research mentors. Facilitating those mentoring relationships is just as important as addressing challenges with research mentors. Seeking mentors beyond those in the academy is extremely important to the students and they often find non-academic mentors without an organized structure. In addition, mentors outside the academy are often unknown to the doctoral research mentor/advisor. While mentors outside the academy are indeed necessary; they also may create tension with the research mentor; particularly if this form of mentoring has not been openly adopted and defined by an institution. Without institutional recognition and collaboration processes, research mentors may initially resist and express concerns regarding the role of another mentor. The Texas A&M University System (TAMUS) has addressed this issue by awarding research mini-grants to AGEP students that require at least one mentor/advisor from another AGEP Alliance institution. This approach promotes collaboration between AGEP students and faculty mentors from a range of diverse types of institutions.

The Individual Development Plan (IDP)

The Individual Development Plan is a tool for mentoring that was initially studied at Michigan



Leadership manifests in different ways and may require one set of skills in the lab and a separate set of skills while navigating the academic program.

Tech University. The purpose of the study was to help faculty identify differences between research advising and mentoring. Student feedback was used to identify different types of mentoring needs based on a student's career stage. The program provided evidence that many faculty need training to acquire the broadest range of expertise needed across the continuum of the graduate experience. Incentivizing the faculty to participate in mentoring development programs, such as the one studied at Michigan Tech, was identified as an important strategy to secure participation.

Assessing Institutional Culture

Discussion participants noted that their institutions consistently assess the students. However, their institutions do not routinely assess the culture into which their students enter and matriculate. The participants noted that conflicts that go unresolved have emerged when advisors are insensitive to the cultural challenges of students, such as transitioning from a historically black college and university (HBCU) to a majority institution. Helping faculty understand cultural challenges during periods of transition can help to curtail conflicts to the benefit of both students and faculty mentors.

Topic 2: Barriers

Focus Questions

- What efforts successfully made STEM faculty careers an attractive career path for URM STEM doctoral students?
- What practices successfully removed the barriers to the professoriate, including access to tenure and promotion, and increased the number of diverse URM STEM faculty?

Interpersonal Rapport

The University of California, Berkeley reported that experimental data have shown that interpersonal rapport between mentors and mentees increases the mentee's receptivity to considering faculty careers.

Online Tools

Representatives from Alabama State University noted that the use of online tutoring to foster professional development in skills beyond the STEM discipline; including writing, presenting, and networking, are important for the future success of AGEP students who seek faculty careers. They further noted that the social network AGEP students acquire within the Alliance has been an important asset for career access and success.

Peer Social Networks

The University of Maryland noted that building a social network of peer relationships outside of the laboratory and the academy fosters degree completion and pathways to academic careers. Several successful examples were discussed. The first example focused on a series of retreats provided to AGEP students where peer social networking was practiced. The second example

was from the Center for Inclusive Education. The Center provides an opportunity for AGEP students to build a peer community with other graduate students and postdocs. The peer network connects students to peers who have successfully launched careers in the professoriate. A recurring theme during this discussion was the statement "I'm not sure I would have finished if I didn't have this community." Peer social networks help with degree completion and career trajectory.

Dissertation Retreats

Several institutions discussed the value of "dissertation retreats" that provide structured time to complete the dissertation. These may include designated spaces where food and coaching are available.

Communicating Degree Completion Timetable

Institutions noted that communicating the timeline for degree completion to the research mentor is an essential element for successfully completing the degree and launching the career. They further reported that using the AGEP postdocs to communicate some of the more invisible aspects of completing the degree and launching a career contributes to success.

Community for New URM Faculty

Institutions noted that universities can increase the success of retaining new URM faculty by developing a strong community of scholars who are well integrated into the institutional culture. They further noted that, when an inclusive community is not created, institutions run the risk of isolating

URM faculty. Creating a learning community and a network, even virtually, is important. Such communities require partnerships and mentorships between incoming faculty, seasoned faculty and their doctoral students. The group observed that implementing institutional change to create welcoming structures for new URM faculty contributes to building community and a culture of success. The discussion concluded with a commitment to moving away from a model where students and new faculty must conform to the existing academy and move toward a model where changes in the academy create the communities of scholars who succeed together.

Work-Life Balance

The discussion focused on the more positive perception that current doctoral candidates have regarding career pathways outside the academy. These perceptions include that such positions offer better compensation and work-life balance in contrast to careers in the academy. It was noted that in the academy, URM faculty are often asked to serve on multiple committees to provide diversity.

This practice can be a barrier to achieving research and teaching goals required for promotion and tenure and contribute to unsatisfactory work-life balance. Informing program chairs and graduate directors about this issue and helping these leaders find ways to shield URM students and faculty from this practice can promote career success in the professoriate.

Negotiating Contracts

New faculty typically have not been mentored to understand how to negotiate an offer to achieve satisfactory compensation and work-life balance. Incoming faculty need to understand how to negotiate start-up funds, travel funds, student support, and summer salary. Providing AGEP students with negotiating skills can ensure that these early career professors negotiate an academic contract that will support their success and preserve their work-life balance. Providing a structure for all new faculty to form a cohort so that they can discuss these issues together and find productive solutions can create positive change.

Topic 3: Advocacy

Focus Questions

- What did you do to gain initial buy-in for your proposed practices from a broad range of constituents at your university?
- What did you do to sustain the commitment to the new practices?

Publicity and Awareness Campaigns

The group noted that because the AGEP Alliance is a newer program, advocating for publicity about

the AGEP Program through the Provost's Office, the Graduate Dean's Office, the collegiate dean's offices, and the chairs of departments is critical to its success. An Awareness Campaign requires development of an AGEP website with relevant information. Once the AGEP site is available, other websites must provide a link to the AGEP Program to guide more people to the AGEP website. The Awareness Campaign also requires presentations about the AGEP Program to all the graduate programs. Preparing promotional materials that

introduce students to the AGEP Program and providing outreach to department mentors to recommend students to the program are important to advocacy success. Once potential students are identified, these students can become peer mentors and ambassadors of the AGEP Program. Peer mentors and ambassadors extend the ongoing cycle of awareness. It was further noted that institutions need to maintain the visibility of the AGEP Program with regular outreach to the departments. The outreach may be a simple notation at the bottom of the department's meeting agenda that includes information about upcoming AGEP events that students and faculty may wish to attend. Another approach includes outreach to specific student organizations with messages about the AGEP Program tailored specifically to the students within these groups.

Non-inclusion Issue

Because the AGEP Program specifically focuses on URM students, institutions wanted guidance related to push-back from students who are not eligible for AGEP Program activities. The group noted that promotional materials include a disclaimer that the AGEP Program serves URM students; however, the AGEP Program broadly invites all students and faculty to attend AGEP events. Further, the AGEP Program includes outreach to the graduate student association so that collaborative programming can be developed. It was noted that non-URM students have successfully encouraged URM students to attend these programs.

Outreach Models

The Dean of Diversity at the University of Pittsburgh has implemented a "top-down" awareness program by reaching out to the Provost to secure administrative and financial support for the AGEP Program. The Dean of Diversity then moves to the collegiate deans, who then reach out to department

chairs, who subsequently reach out to the faculty in their programs. This "top-down" approach can be used to create learning communities with the faculty. The learning communities have fostered mentors who then reach out to qualified students. Currently, the AGEP Program has a community of mentors who offer seminars and workshops every two weeks. The Pacific Northwest Circle of Success: Mentoring Opportunities in STEM Model (PNW-COSMOS) used 2 outreach models. One is similar to the "top-down" approach used by the University of Pittsburgh. The other is a "bottom-up" model. Using the "bottom-up" approach, the Graduate Dean and Grant Coordinator at Montana State University reached out to mentors on campus who were already working with the Native American students and informed them of the AGEP Alliances. The Dean and Coordinator also reached out to mentors of the SLOAN Program, another program for financial support of Native American students. SLOAN faculty were already mentoring STEM Native American graduate students. Then, when the Alliance had more information about the activities and data, they implemented "top-down" strategies by reaching out to the Provost and the collegiate deans to ask for their help and support in reaching out to a larger number of faculty, including staff and administrators, to become knowledgeable of the AGEP Program. The combined "bottom-up/top-down" approaches created a network of mentors in several sectors of the University. Additionally, the Coordinator developed a tracking system to monitor STEM faculty awards and accomplishments to provide personal recognition of these achievements and more visibility for the program. It was noted that the COSMOS Alliance studied the previous structure of the BIG 10 Alliance and leveraged advocacy strategies used by this Alliance for their own AGEP Program. Alerting their programs about the previous AGEP Alliances among the Big 10 institutions and highlighting some of the signature programs resulted in attracting more supporters of the program.

Sustaining Strategies

The group noted that using structures that were already in place and highlighting a signature program were essential to sustain interest in the Alliance. In addition, having a support staff that

keeps the program and its agenda advancing is essential. Finally, having a space where personnel can meet regularly to discuss the outreach efforts and resolve issues provides an anchor for sustaining the program.

Topic 4: Recruitment

Focus Questions

- What networking practices increased the number of URM applicants for your STEM programs?
- What recruitment practices, other than networking, also advanced the diverse applicant pool?

Direct Outreach and Cohort Models

Case Western Reserve University reported that one of the institution's most successful practices is direct recruitment through outreach of qualified students. The University engages in strategic coordination with other universities in the Cleveland area to form a cohort at the Annual Biomedical Research Conference for Minority Students (ABRCM). The institution determined that the recruitment of students in cohorts helps to create a community of support and that recruitment strategies can change depending on whether students apply to specific labs or programs. The University uses applicant pool data, including applications that capture ethnicity data, to track its recruitment success.

Student Ambassador Model

Cornell University reported that the institution recruits at conferences by using student

ambassadors from Cornell who endorse their programs to potential students at the conference. This practice is strategically coordinated with its departments. The student ambassadors are formally nominated. The University utilizes the McNair and other URM targeted programs to locate potential candidates. The University provides newly enrolled students with opportunities to consider the range of experiences available to them. This can be accomplished through a lab rotation process. Another practice includes offering application fee waivers to those who apply to graduate school through the AGEP Program. The University gathers student feedback and data available within its customer relations management (CRM) software to inform its practices. The CRM provides a point of contact and an opportunity to convert each application to a degree candidate along a multi-stage continuum.

Faculty Networks

The Tuskegee Institute reported that it uses faculty networks and connections to other institutions to recruit students and offers application fee waivers. The institution tracks students from application through matriculation and at important points of transition.

Partnerships

The Council for Opportunity in Education reported that it partners with the McNair Program to communicate opportunities for advanced study that are supported with application fee waivers. Representatives from the Council noted that universities need to have open channels of communication with graduate programs and with each other to maximize recruitment success.

Virtual Outreach

The Institute for Broadening Participation reported that potential students are significantly more responsive to virtual outreach and webinar efforts that come through the faculty in contrast to general communication via email or text. The Institute collects data through annual surveys and webinar evaluations to guide their decision making.

Networking

The American Physical Society Bridge Program (BRIDGE—APS) created a network to recruit students. Once students are identified within the network, the students are urged to apply to the STEM programs within the network. Holistic review of these applicants was identified as an effective recruitment process along with waiving the application fees.

Implicit Bias

The Northern Ohio Alliance reported that it is working on campus culture by educating the faculty who review applications about implicit bias. The process includes requiring all new faculty and personnel who review files to attend professional development workshops to better understand this issue. In addition, the Graduate School waives standard scores upon request; however, because standard scores are used in institutional rankings, they may only be waived upon request.

Integration of Programs

Michigan State University reported that the University integrates its Minority Recruitment Initiative (MRI) into the Michigan AGEP Alliance for Transformation Program. The University representatives noted that the staff assigned to recruitment duties need to establish a positive working relationship with the faculty.

Data Driven Models

The American Physical Society Bridge Program (BRIDGE—APS) reported that they collect data on the number of students enrolled and their retention rate. Currently, the retention rate stands at 88%. Staff collect data on the number of faculty and staff who have completed the Implicit Bias Workshops and use this data to gauge dissemination of effective practices. Michigan State University reported that the University maintains a database on programs that originally reported an inability to recruit diverse STEM candidates to demonstrate how many of these programs, through their AGEP initiatives, have successfully recruited and enrolled applicants.

Scaling Up Practices Beyond AGEP

Participants reported that universities need to employ holistic review processes to scale up diversity admissions. They further noted that standardized scores appear to be ineffective and uncorrelated with successful recruitment and admission of diverse STEM PhD candidates. Too often standardized scores are used as a filter rather than as part of a broader recruitment/admission process. There was an extensive discussion on the misuse of standardized scores. A participant stated that standardized scores are only correlated with first year GPA. The members of the group urged everyone to review the websites pertinent to misuse of standardized scores and to ensure that if standardized scores are used, all who use them for recruitment and admission understand how they are to be used. The group also discussed the current use of standardized scores in institutional rankings

and the impact this practice has on continued use of the scores. Michigan State University reported that its successes with attracting more minority candidates to PhD study have attracted additional funding for its Minority Recruitment Initiative program. Others noted that successes are being noticed by non-STEM fields and that these programs are asking for the AGEP best practices.

Managing Resistance

The discussion considered the resistance that can occur when diversity workshops are required.

Having the diversity messages and workshops delivered by members of the majority faculty can be an effective strategy for reducing resistance. Another successful practice is to begin diversity training with the President's Council first and then move to other groups. This "top-down" approach can reduce resistance to diversity training on campus. The University of Michigan reported that measurable improvement in diversity recruitment and admissions occurs when one-third of the faculty in a department had completed diversity training.

Topic 5: Networks

Focus Questions

- What networking practices increased placements in professional careers for URM graduates from your STEM programs?
- What practices, other than networking, also increased the success of placing your URM STEM graduates in professorial careers?

Presentations and Networking Models

One placement practice discussed included "Post-Doctoral Chalk Talk." This program provides an opportunity for AGEP students to present their research to an invited group of faculty members (the recommended number is at least 3) who are willing to listen and who then provide feedback. Another practice was the use of a Faculty Search Committee Panel. Using this model, different universities present an overview of their faculty search processes so that AGEP candidates seeking positions learn about both effective and less-

effective practices that may emerge during the interview. Learning about the range of practices is important to understanding and preparing for the experience. Another practice called "Research on Tap" provides candidates with an opportunity to practice presenting their research followed by practice with informal networking.

Professional Development Programs

The Center for the Integration of Research, Teaching, and Learning (CIRTL) Alliance project titled Improved Academic Climate for STEM Dissertators and Postdocs to Increase Interest in Faculty Careers Program reported that it provides information to AGEP participants about distinct types of higher education institutions and what these differences mean for faculty appointments. Students engage in exchange visits that allow them to visit other CIRTL AGEP institutions. During these meetings, they meet with faculty and participate in

research seminars. In addition, the program offers a number of professional development programs. These range from interview practice and review to CV development and construction of a brief focus-statement about their research interests. The program also offers placements in local community colleges to provide the candidates with opportunities to hone teaching expertise and improve competitiveness for placements with teaching-focused institutions.

Career Pathways and Alumni Panels

The group discussed "Career Pathways Panels" as a career pathways tool. Using this model, panelists discuss all of the career pathways that might be considered both in the academy and in industry. This ensures that pathways to academic careers are among the choices being considered. Another approach is to offer an "Alumni Series" for emerging graduates. Seasoned AGEF program alumni in the academy can motivate pathways to academic positions. Institutions with a Mellon Grant discussed the value of paid internships for AGEF candidates. Having a paid experience overcomes the barrier of cost-of-living at the internship site. The candidates also return to their programs more focused and with cross-training that can increase their competitiveness for placements later. Another promising practice was the use of Memorandums of Understanding with other universities that allow for research exchanges and presentations of research. The group also discussed the effectiveness of having a postdoctoral position placement as part of the program.

Professors in Training Program

The "Professors in Training Program" requires that graduate students complete a set number of workshops to become qualified to have a mentored teaching experience and placement at another institution. The mentored experience includes consistent feedback from a faculty mentor regarding the teaching performance. The program provides opportunities for students to teach

classes and gain experience while simultaneously broadening the number of teaching experiences for the students. The teaching opportunity becomes a pipeline for careers in the professoriate within these institutions. The networking within the program connects graduate students to other campuses. The Graduate Dean further supports the program across the Alliance campuses and creates an institutional-level network for students. It was noted that Stony Brook University offers similar opportunities for professional development and for mentored teacher training.

Multiple Advisory Boards Program

The "Multiple Advisory Boards" strategy is another career placement practice. With this approach, a Council of University Deans collaborates with a Council of STEM Deans who work together to create institutional and faculty support and dissemination of AGEF practices across the college community. The united effort helps to foster acceptance of the practices across campuses and departments. This group also discussed the University of Michigan's Individual Development Plans (IDPs) program that promotes careers in the academy through monthly meetings with faculty mentors. The program targets postdoctoral candidates who can create professional development experiences to strengthen career placements.

Data and Tracking

The group discussed the data collected to show how change was being achieved. The Southern Regional Education Board (SREB) AGEF Program collects graduation and employment data to track the career success of students. Stony Brook University reported that while the return on investment of recruitment at conferences is small; the benefit from the personal relationships developed with faculty at these conferences is significant. The recruitment trips allow recruiters to determine best fit for the programs of study. The representatives noted that it can be difficult to compare the costs of recruitment trips in

comparison to the more common practice of simply developing personal contacts with the potential candidates through outreach programs. The group noted that sustainability of practices may be a function of the size of the institution. In addition, it can be challenging to create an institutional memory of the effective practices that created the pathways and outcomes that fostered academic placements. The discussion on tracking placements with data highlighted the conflict that may arise as the demand for diversity in the STEM professoriate confronts that same demand for STEM candidates

in business and industry. The discussion centered on the need for collaboration among the universities and industry. Providing a chart that offers a distribution of careers may be a useful guide. Other challenges included tracking the outcomes of candidates who participate in multiple fellowships and trying to connect "causality" of experiences with the pathways chosen. Many in the discussion group agreed that the totality of the doctoral experience contributes to career pathways; therefore, the final outcomes are difficult to conceptualize and measure.

Topic 6: Leadership

Focus Questions

- What are the effective ways to prevent "burnout" among your program staff members?
- What are the promising practices for nurturing and supporting faculty leaders and administrators who work to facilitate the success of URM STEM students?

Leadership Theory Approach

The Collaborative Research Transformation CIRTLL AGEP Alliance offered its one-year career development program as a promising leadership practice. This program focuses on graduate students and postdocs with demonstrated leadership potential who are personally selected for the experience. Faculty with expertise in leadership theory provide the development and emphasize the leadership skills required for successful careers in the academy.

Leadership Coaching Model

The "Academic Coaching Program" was presented by the Collaborative Research Northern Ohio AGEP Alliance as an effective leadership development model. The program presents an overview of the behavioral, psychological, organizational, and emotional intelligence issues associated with leadership. The program is offered as a cohort program. During the once-per-month cohort meetings, students study team building, conflict resolution, mentoring, and related leadership skills. A faculty member with a background in leadership training guides the discussion by presenting leadership theories as the starting point for the workshop. It was noted that the program is challenged by its scalability. Currently, the program is supported by one academic department and two academic coaches who are serving the needs of all 7 institutions.

Leadership Development Challenges

The discussion identified other challenges with leadership development. For example, leadership manifests in different ways and may require one set of skills in the lab and a separate set of skills while navigating the academic program. Encouraging integration of leadership development with other activities is an important practice and avoids the limitation of its use as a standalone reflective exercise. The group noted that it is important to customize leadership skills to different and unique campus cultures. It was further noted that coaching URM students to put appropriate boundaries around their leadership development programs and to learn to say "no" to leadership opportunities so as not to negatively impact their research must be considered.

Implicit Bias Training Outcomes

The discussion addressed ways in which implicit bias training can have negative consequences. The members of the group noted that currently, research is needed to verify the outcomes of implicit bias training as well as the outcomes for

other existing leadership development programs. One provocative example of a program addressing implicit bias was the "Sexist BS Bingo" program. This program is designed to illustrate how gender bias in faculty recruitment can permeate the process when the same unsubstantiated phrases are uttered by committee members to dismiss a candidate's fit or qualifications for a program. The discussion concluded with perspectives from the SREB-AGEP Doctoral Scholars Program to provide guidance to URM doctoral candidates in training to anticipate how they will position themselves after employment if and/or when race becomes a public issue on the campus at which they will teach.

Collaborations

The overall theme for the discussion was the importance of collaborations and connections among the Alliances to support leadership development and prevent burnout. Alliances discussed having bi-weekly conference calls to share best practices and to increase collaboration across AGEP Alliances.



Alliances for Graduate
Education and the
Professoriate
National Forum
Poster Abstracts

I. AGEPE-BPR Poster Summaries: Broadening Participation In Research In Stem Education

Understanding URM STEM Graduate Students' Identity Integration and Assimilation into a Community of Practice

WESTERN MICHIGAN UNIVERSITY

This research project is based at Western Michigan University, with research activities at Western Michigan University, the University of Michigan, and Michigan State University. It investigates URM STEM graduate students' negotiation of multiple identities as they encounter the disciplinary norms and practices of STEM communities of practice at predominantly white institutions (PWIs). Persistence and success in STEM relies on the ability of graduate students to negotiate and integrate identities as they develop a STEM identity. This research will inform our understanding of the process by which multiple identities are negotiated and integrated when identity conflict emerges during the graduate years for URM graduate students in STEM. Specifically, this research 1) explores identity negotiation as URM graduate students in STEM integrate into a community of practice and 2) documents the social networks URM graduate students in STEM use to support the development of a scientist-identity-centrality. It utilizes a longitudinal and mixed methods design to understand the experiences of students from underrepresented minority groups who are enrolled in STEM Social, Behavioral and Economic Sciences (SBE) PhD programs at three different universities.

Data collection consists of a pre- and post-survey, a series of semi-structured interviews,

and repeated surveys of social networking. The pre- and post-survey measures include identity centrality, identity interference, identity compatibility, and perceived social support. The pre-survey was sent to all URM students enrolled in the first or second year of a doctoral or master's to doctoral STEM/SBE program at participating institutions. It was used to identify and recruit interview participants. There are 6 semi-structured interviews with each participant over 3 years. Each interview has a unique interview protocol, with questions informed by findings from previous interviews and tailored to their position in their program. Interview data is being analyzed with emergent coding methods and the constant comparative method, guided by the theoretical frameworks and research questions. The social networking surveys are personalized to each interview participants' university and doctoral program, allowing us to track changes in their social networks over the course of their graduate program.

Collectively, these data will inform the development of a model for URM STEM graduate student identity integration and identify specific strategies for institutional support needed to promote successful assimilation into a STEM disciplinary community of practice. To-date, we have

developed, validated, and collected data with the identity and social support survey, conducted 4 interviews, and started data analysis. From the preliminary interview coding exercises, several interesting codes emerged related to the guiding theories and literature for this project. This poster presentation will explore two of the codes: *URM Experiences*, which is related to Identity Theory, and *Assimilation*, which is part of Community of Practice Theory. The URM Experiences

Code includes data specifically related to the participants' identities as minorities in their program and university. The Assimilation Code describes participants' sense of belonging or not belonging to their graduate program and whether they feel like they fit the scientist "mold." These codes focus on specific challenges that URM students at predominantly white institutions face with regards to identity and becoming a member of the scientific community.

Interpersonal and Intrapersonal Mechanisms in Improving Mentoring Relationships for URM Students in STEM Fields

UNIVERSITY OF CALIFORNIA, BERKELEY

In academic and professional contexts, people rely on mentors for psychosocial support, career-related support, and role modeling. However, interracial mentoring relationships may face more challenges than same-race mentoring relationships, as underrepresented minority (URM) individuals in predominantly white institutions often worry that they will face discrimination or confirm negative group stereotypes, and White individuals often worry that they will be perceived as prejudiced. Accordingly, our initial goal in this research was to examine whether influencing socio-emotional processes (both at the inter-personal and intra-personal levels) could enhance interracial mentoring interactions. Over the course of this project, we broadened the scope of our goals to investigate interracial dynamics beyond mentorship contexts. Specifically, we sought to gain a deeper understanding of how interracial dynamics at the individual- and community-levels shape attitudes

towards race-based social movements and health disparities.

To better understand interracial relations in mentoring and community contexts, we conducted 11 studies. The objective of studies 1 through 4 was to examine whether increased mutual self-disclosure among White mentors and URM mentees would improve inter-racial mentoring outcomes by reducing negative affect and increasing feelings of rapport. The objective of studies 5 through 6 was to determine whether preparing for interracial mentorship from a self-distanced (i.e., non-first-person), as opposed to a self-immersed (i.e., first-person) perspective, would improve interracial mentoring behavior by reducing neural activity linked to self-referential processes during the provision of criticism. Extending our original aims, the objective of Studies 7 through 8 was to elucidate whether interracial contact would

shape a Black individual's and a White individual's endorsement of the Black Lives Matter movement. Finally, the objective of Studies 9 through 11 was to determine whether community-level racial biases would be related to health outcomes for Black and White participants.

Our lab-based studies revealed that increased self-disclosure between URM mentees and White mentors decreased negative affect and increased rapport, which in turn predicted positive behavioral outcomes for mentees and mentors (Studies 1-4). Additionally, results revealed that White mentors who prepared for interracial mentorship from a self-distanced perspective showed decreased neural activity in regions linked to self-focus (medial prefrontal cortex; mPFC) when conveying

criticism to a Black mentee. This decreased mPFC activity, in turn, predicted more positive and helpful mentorship (Study 5). Self-distancing was also shown to mitigate the link between White mentors' self-focus and poor mentorship (Study 6). Our community-based studies found that increased interracial contact predicted increased endorsement of the Black Lives Matter movement for White participants, but decreased endorsement of this movement for Black participants (Studies 7-8). Finally, Black participants showed poorer health outcomes in communities where White participants (Studies 9-10) or Black participants themselves (Study 11) harbored more racial bias. Together, this research elucidates factors that may disrupt and facilitate interracial relationships in both mentoring and non-mentoring contexts.

A Study of the Cultural Factors Affecting Underrepresented Minority STEM Doctoral Students and Academic Pathway and Transition Programs

AMERICAN INSTITUTES FOR RESEARCH

This is an exploratory, qualitative study of 4 higher education institutional programs that provide pathways or "bridges" to PhD programs for underrepresented minorities pursuing STEM degrees. The purpose of the study is to explore the key features of these types of bridge programs, including the activities and strategies institutions use to support the advancement of URMs through STEM master's programs and their subsequent pursuit of STEM doctoral degrees. The study is guided by the following three research questions:

1. What criteria are STEM PhD pathway programs using to recruit and admit students?

2. What interventions or supports do PhD pathway programs use to promote students' social and academic preparation and integration for success in STEM doctorate programs?
3. What cultural factors of the STEM department and the larger institution affect students' experiences in the PhD pathway programs?

The four bridge sites were selected purposefully to ensure diversity in program maturity, pathway program focus in terms of specific STEM discipline(s), and program structure. The following criteria were considered when selecting the sites:

1) the date when program implementation began

and the maturity of program, 2) the number of student participants in the program, and 3) the type of program (e.g., Louis Stokes Alliances for Minority Participation (LSAMP) Program, AGEP Program, etc.). Ensuring variation in site selection allows this study to learn about different types of components used by bridge programs. One program is housed within a Hispanic serving institution (HSI), two are located within predominantly white institutions (PWIs), and one program is a bridge between a historically black colleges and universities (HBCU) and a PWI. The sites are spread throughout the US, and include sites that have been in existence from 8 years to a site that is relatively new and is currently in its third year. The cohort size varied from 3 to 18.

The multi-day site visits entail interviews and focus groups with bridge program leadership, faculty, and participating students and will occur in the spring of

Study Year 1, the fall and spring of Study Year 2, and the fall and spring of Study Year 3 at each institution. The results of the study will be disseminated through peer-reviewed journal articles at the end of the study. To date, two rounds of data collection have occurred. Formal data analysis will begin when data collection has been completed.

This research is intended to provide information to the STEM community about the cultural factors that most affect underrepresented students' experiences in STEM graduate programs, the role of STEM PhD bridge programs in affecting those experiences, and the institutional/departmental cultural factors that affect implementation of the bridge programs themselves. The research also is intended to explore differences in cultural factors that affect student experiences and program implementation between specific STEM disciplines.

II. AGEP-KAT Poster Summaries: Knowledge Adoption and Translation

The University of Pittsburg Success, Transition, Representation, Innovation, Vision, and Education (PITT STRIVE) Program formerly the Transition to the Doctorate by Adaptable Engagement (TDAE) Program

UNIVERSITY OF PITTSBURGH

Studies reveal that Black/African Americans (5.3%), Hispanic/Latinos (3.5%), and American Indians (1.4%) are significantly underrepresented in the professoriate. The primary goal of PITT STRIVE is to improve the transition of underrepresented minorities, who are US citizens, into doctoral engineering programs at the University of Pittsburgh and to ensure their successful completion by employing evidence-based strategies for student and faculty engagement and fostering an inclusive academic climate for URM doctoral students.

The University of Pittsburgh PITT STRIVE Program is housed and administered under the Swanson School of Engineering (SSOE) Office of Diversity. The PITT STRIVE leadership team aims to develop, coordinate, implement, and assess program activities and outcomes in the following focus areas: 1) improving faculty engagement with URM students, 2) improving faculty awareness of the problems facing URM students, 3) developing a shared vision among vested faculty regarding the success of URM students within our School of Engineering, and 4) fostering an inclusive academic culture climate for the success of URM doctoral students.

The PITT STRIVE Program is now in its second year. The program has successfully recruited 7 scholars and enlisted the participation of the entire underrepresented graduate student population as fellows. Both scholars and fellows benefit from PITT STRIVE's professional development activities, training sessions, and student-focused workshops.

With the goal of adopting/adapting evidence-based strategies for student and faculty engagement, we learned one of the most critical lessons from the first year. The idea of simply adopting/adapting the activities of a successful program (e.g. UMBC Promise, a University of Maryland Baltimore County program) is not the best strategy to employ. Factors such as the university climate and demographics, faculty and student culture, program recognition/maturity, available budget, etc., can cause an activity that is highly successful at one location to fail at another. Thus, a major focus of PITT STRIVE's first year was to acquire data on our climate and culture so the program could more strategically address the specific needs of our scholars and fellows. Cultural and climate focused assessments and one-on-one interviews were performed with our students, faculty, and leadership. During these sessions,

some common themes emerged that pointed to specific focus areas.

One of the most critical focus areas was to unify our underrepresented graduate students who are scattered throughout our 6 departments without much ability to interact. Next, we identified that there were very limited opportunities for these students to engage with our faculty. Several social and professional activities were developed to address these areas, the most successful event

was our first annual summer two-night retreat that was held at Oglebay Resort in West Virginia. Under the direction of professional facilitators of race-based discussions, the event brought together faculty along with our scholars and fellows. Participants worked through sessions discussing emotional topics, personal challenges, and engaged in fun "getting-to-know-you" activities. The result was rated by all who attended as highly valuable and seemed to be the first catalyzing event for PITT STRIVE.

III. AGEP-T Poster Summaries: Transformation

Increasing the Number of Underrepresented Minority Graduate Students and Postdoctoral Scholars in Mathematical, Physical, Computer Sciences and Engineering Fields

THE CALIFORNIA ALLIANCE I

University of California, Berkeley; California Institute of Technology; Stanford University; University of California, Los Angeles

The California Alliance is an unprecedented partnership among UC Berkeley, UCLA, Stanford and Caltech. The goal of the California Alliance is to significantly increase the number of underrepresented minority (URM) graduate students and postdoctoral scholars in the mathematical, physical, computer sciences and engineering (MPCS&E) fields who go on to competitive research and teaching careers at great universities across the nation. Underrepresentation in these fields and at these institutions has been severe and seemingly intractable. The Alliance's approach has been to create a vibrant cross-institutional intellectual community of practice among URM graduate students, postdoctoral fellows, faculty, and key administrators in MPCS&E at the Alliance institutions. Four activities support this approach.

ANNUAL RETREATS: Each year 120-150 faculty, postdocs, and advanced doctoral students attend the California Alliance Annual Retreat. The retreats are designed to generate interactions within and across disciplines, institutions, and cohorts. The retreat focuses on networking, collaboration, professional development, and providing access

to new professional opportunities. Formats include small group consultations, inspirational keynote talks, and primers and panels on topics such as preparing for postdoctoral and faculty jobs, developing a research agenda, academic writing, and publishing. Most advanced eligible graduate students at the Alliance universities participate in the retreat. All attendees have rated it effective.

POSTDOCTORAL FELLOWSHIP PROGRAM: The California Alliance has leveraged AGEP support for 3 postdoctoral fellows with institutional funds controlled both by PIs and administrators to support 18 URM postdoctoral fellows at the California Alliance institutions. The application and selection process is integrated with the prestigious University of California President's Postdoctoral Fellows program.

RESEARCH EXCHANGE: The California Alliance has developed a new model for Cross-Alliance mentoring and advising of URM students and postdoctoral fellows. Alliance and institutional funds support 25+ AGEP participants for inter-campus visits to network, present research, and initiate collaborations. In several cases, the visits

have led to postdoctoral appointments and collaborative publications.

PROFESSIONAL DEVELOPMENT RESOURCES: The California Alliance created a website that serves

as a curated hub, aggregator, and repository for national resources on career pathways and professional development advice for graduate students and postdocs in the mathematical and physical sciences, and engineering.

Advancing Underrepresented Minority Scholars into the Professoriate

THE CALIFORNIA ALLIANCE I

University of California, Berkeley; California Institute of Technology; Stanford University; University of California, Los Angeles

Another focus of the California Alliance is to advance URM scholars into the professoriate. To be successful at winning faculty positions, scholars need to do *more* than complete their PhD programs—they must stand out in terms of their publication record. A candidate's publication record is the most important criterion for potential employment, and an objective predictor of success in the academy, as well as for promotions to tenure and beyond.

In an initial effort to understand publication trends among graduate students in STEM, we turned to a completed data collection effort, the Berkeley Life in the Sciences Study (BLISS), which surveyed all graduate students in the mathematical and physical sciences at Berkeley and which achieved high rates of participation. The survey asked respondents, among other questions, whether they had been an author on a manuscript submitted for publication in the past year, indicating whether the student was involved in research at a sufficient level to warrant authorship. We found an overall pattern such that URM students and women, relative to majority group males, were significantly less likely to be

authors on a manuscript. These findings hold when statistically controlling for other factors that might affect publication (e.g., seniority in the program, teaching responsibilities, research assistantships). However, while the disparities were magnified in mathematical and physical sciences at Berkeley, in Berkeley's separate College of Chemistry, *no disparity emerged*.

Given this unexpected result, we sought to replicate the finding in a larger dataset, and thus turned to Berkeley's long-running PhD Exit Survey, which is required and has a 100% response rate. Two questions from this brief survey serve as proxies for students' participation in the research process—whether they had presented their findings at national conferences, and how much they were encouraged by their advisors to publish. These findings are strikingly similar to those found in the BLISS survey, with the disparities most pronounced in math and physical sciences, but insignificant in the College of Chemistry.

Initial ethnography in Berkeley's College of Chemistry suggests that one of the core principles

that accounts for all graduates' success is the **STRUCTURED PROGRESSION** of students through the program. In a series of interviews, we have learned that chemistry students, from the time they enter the department, are expected to have regular check-ins with mentors to check on their progress. At regular intervals, both students and mentors fill out forms designed to monitor student progress so that nobody "falls through the cracks." Furthermore, respondents all report that there is a uniform and

unwavering expectation for everyone to publish. For example, Chemistry advisors are directly asked, "When would you expect this student to submit a paper for publication?" In short, our initial research suggests that a structured graduate program may blunt the effects of bias that lead to publication disparities, consistent with social science research demonstrating that bias, especially implicit bias, is most likely to be applied under conditions of ambiguity (Dovidio and Gaertner, 2000).

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The California Alliance Model to Increase the Success of Underrepresented Minority Postdoctoral Fellows Becoming Faculty in Mathematics, Engineering and Physical and Computer Sciences

THE CALIFORNIA ALLIANCE II

University of California, Berkeley; California Institute of Technology; Stanford University; University of California, Los Angeles

The University of California-Berkeley is leading a regional network with the University of California-Los Angeles, Stanford University, and the California Institute of Technology to refine, implement, study, sustain, disseminate and begin expanding, reproducing, and replicating the current multi-dimensional California Alliance Model II at the national level.

The California Alliance II is advancing a model to improve the representation of URMs in STEM

faculty positions, eventually providing URM STEM role models to STEM undergraduate and graduate students at postsecondary academic institutions across the Nation. Replicated nationally, this approach could eliminate the more than factor-of-two difference between the current fractions of URM PhD students (~9%) and URM faculty (~4%). The California Alliance II is focused on the least-diverse STEM fields, namely the mathematical, physical, and computer sciences and engineering (MPCS&E) fields.

The California AGEP Alliance II is refining the following components of the model while significantly increasing the dissemination of state-of-the-art knowledge about equitable and inclusive educational and mentoring practices to faculty who work with graduate students and postdoctoral fellows. The key components of the California Alliance II Model include:

1. A new approach to postdoctoral recruitment, professional development, and advancement to the professoriate.
2. A Research Exchange that facilitates cross-institutional mentoring for early identification, professional development, and advancement of URM PhD students. The Research Exchange is designed for nationalization, replication and expansion.
3. An expanded vibrant community of practice, including faculty, administrators, postdocs,

alumni, and doctoral students to support URM advancement. The community of practice is developed and supported at annual retreats and through an online community on AAAS' Trellis.

4. Integrated survey-based and ethnographic research to enhance URM participation in the STEM professoriate.

The California Alliance II's integrated research systematically explores the intersections of identity, structure, and belonging. The Alliance's findings point to an important role for structure in PhD programs, especially in regard to expectations for career advancement into the ranks of the professoriate. Our multi-method research contributes scholarship to social psychology of belonging, identity, and achievement; social anthropology research on learning; and the sociology of professions.

Advancing Interdisciplinary STEM Graduate Education in Energy and Sustainability Disciplines: Increasing the Number of Successful URM STEM Faculty

THE TEXAS A&M UNIVERSITY SYSTEM (TAMUS) ALLIANCE

Texas A&M University; Prairie View A&M University; Texas A&M University–Corpus Christi; Texas A&M University–Kingsville; West Texas A&M University

The long-term goals of the TAMUS Alliance are 1) to increase the number of successful URM STEM faculty by measurably increasing the number of STEM doctoral degrees awarded to URM students each year; and 2) to increase the number of URMs transitioning to STEM faculty positions or to competitive postdocs that lead to faculty positions.

The short-term goal of the project is to develop, implement, and assess a set of transferrable strategies designed to increase the number of successful URM STEM faculty. The strategies focus on 1) increasing the number of URM students who enter participating doctoral programs, 2) increasing the percentage of URM students completing STEM

doctoral degrees, and 3) increasing the number who transition to faculty positions or to competitive postdoctoral positions. The project also focuses on strategies to reduce the time to doctoral degree completion.

To meet the goals and objectives of the project, the TAMUS Alliance developed activities that connected students and faculty across existing programs. Since the start of the project in September 2013, there has been a 50% increase in the number of TAMUS AGEP Alliance participants. There are currently 146 URM STEM graduate students involved in the program. Twenty-nine TAMUS Alliance students have graduated. Of that number 23 have earned master's degrees and 6 have completed doctoral degrees. Six master's students transitioned into a STEM PhD program with 4 earning admission to a TAMUS institution and 2 earning admission to other doctoral-highest institutions. Three PhD students transitioned into the professoriate. Their placements include an adjunct professorship in biology at a Texas community college, an adjunct professorship in nuclear engineering at a New Mexico junior college, and a tenure-track assistant professorship in industrial engineering at a doctoral-highest institution. One current TAMUS Alliance PhD student will transition into a tenure-track assistant professor position in community health at a doctoral-highest institution starting the fall of 2017.

The TAMUS Alliance developed a retention bonus program for students who participated in a number of AGEP and campus-wide professional development activities. Over 100 students received participation bonuses ranging from \$125 to \$2500 per semester. Through 4 annual TAMUS Alliance conferences and social media communications, Alliance was able to create community and support for students at individual institutions and across Alliance institutions. The Alliance-wide Fellowship and Research Funding Application Lab activity prepared students for the fellowship application process, with several TAMUS Alliance students receiving fellowships such as the NSF Graduate Research Fellowship Program (GRFP) and the Ford Foundation Dissertation Fellowship. TAMUS AGEP Alliance students attended the 21st, 22nd, and 23rd Institute on Teaching and Mentoring with the Southern Regional Education Board. The TAMUS AGEP Alliance mini-grant competition awarded 7 AGEP students up to \$7000 each for seed funding to support the development of new collaborative research and/or teaching efforts.

The TAMUS Alliance continues to offer programs, seminars, and workshops that focus on training and professional development as it relates to teaching, research, and networking in academia. The Alliance activities helped to increase the participation, reduce barriers, and promote the success of URM doctoral students preparing for careers in the professoriate.

Advancing Interdisciplinary STEM Graduate Education in Energy and Sustainability Disciplines: Evidence Based Interventions that Can Reduce Perceptions of Exclusion

THE TEXAS A&M UNIVERSITY SYSTEM (TAMUS) ALLIANCE

Texas A&M University; Prairie View A&M University; Texas A&M University–Corpus Christi; Texas A&M University–Kingsville; West Texas A&M University

Inclusive environments provide a feeling of recognition and empowerment for most individuals. While the frequency of social ostracism (being ignored and excluded) is higher for women than for men, this outcome also depends on the salience of ethnicity for the individual. Graduate students of color, who perceive their collegiate experiences to be marginalized, suffer distinct consequences that influence rates of retention and degree completion, compared to general targets of social exclusion (Carter-Sowell, Dickens, Miller, & Zimmerman, 2016). However, with strategic efforts to bolster social support, students of color can thrive, efficiently and effectively, in diverse academic and campus settings (Watkins, Green, Goodson, Guidry & Stanley, 2007). The TAMUS Alliance presents evidence of the impact of chronic ostracism experiences on perceptions of campus climate across the 5 doctoral degree-granting institutions in the Alliance. Further, the Alliance introduces evidence-based interventions that can reduce perceptions of exclusion by marginalized, graduate student populations.

For the research studies in the project, graduate students were recruited to participate in data collection sessions during scheduled time slots at the TAMUS Alliance Annual Conferences. The surveys assessed attendees' self-reports of the stressors and the support systems affecting their individual pursuits of academic, interpersonal, and well-being goals. Analyses of Study 1 data (n=44) indicated that marginalized graduate students reported more chronic experiences of

social ostracism and/or information exclusion, more negative recurring thoughts about their interactions with others on campus, and less overall satisfaction with their collegiate experiences. Analyses of Study 2 data (n=31) showed that the effects of graduate students' social experiences differed across the TAMUS Alliance institutions. Specifically, we found that once a graduate student experienced regular episodes of being ignored and excluded, he/she had more difficulty building a community of belonging in his/her graduate program. Furthermore, we found that graduate students who took less traditional (direct) paths to the professoriate reported more difficulty building a community of belonging in their graduate programs. These differences may be due to the composition of social networks available to them throughout the designated academic programs and campus communities.

Together, these findings extend the existing research on the "chilly" climate in academia that creates an exclusionary environment for diverse populations. For example, interpersonal dynamics affect persistent and recurring thinking. Both positive and negative ruminations may influence well-being and academic outcomes for graduate students at ALL TAMUS Alliance campuses. Implications for engaging contentious topics in order to reduce perceptions of exclusion by marginalized graduate student populations and to better understand issues relating to identity, resilience, and psychological well-being for students are explored and research is ongoing in the TAMUS Alliance program.

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The Commitment to Institutional Cooperation (CIC) Professorial Advancement Initiative (PAI): Increasing the rate at which Underrepresented Minority Faculty are Hired in STEM Fields

THE BIG TEN ALLIANCE

University of Illinois; Indiana University; University of Iowa; University of Michigan; Michigan State University; University of Minnesota; University of Nebraska-Lincoln; Northwestern University; Ohio State University; Pennsylvania State University; Purdue University; University of Wisconsin-Madison

The Big Ten Academic Alliance launched the Commitment to Institutional Cooperation (CIC) Professorial Advancement Initiative (PAI) in 2013. The programmatic goal of PAI is to double the rate at which underrepresented minority (URM) faculty are hired in STEM fields at participating Big Ten Academic Alliance institutions: Illinois, Indiana, Iowa, Michigan, Michigan State, Minnesota, Nebraska, Northwestern, Ohio State, Penn State, Purdue, and Wisconsin. The Alliance used 2010, 2011, 2012 as benchmarking years to set the baseline for measuring improvement. Over this three-year period, the Alliance universities hired an average of 24 URM faculty per year. Using this average as the baseline, the Alliance established the numerical goal of more than doubling this rate. This required hiring 50+ URM faculty each year. Now in its third year of funding, the PAI has exceeded its URM faculty hiring goal by more than 30 percent.

The PAI takes a two-pronged approach to achieve its faculty diversity goal by 1) creating a pool of URM postdoctoral fellows who are well prepared and trained to enter the academy as tenure-track faculty members; and 2) educating mentors, faculty, and faculty search committees about unconscious bias and diversity hiring.

To achieve the first objective, the Alliance matched postdocs with mentors. A set of mentoring modules were developed to help facilitate discussion and guide mentors in coaching their postdocs. The postdoc mentoring experience covers a variety of topics such as:

- Preparation for a faculty role: grant writing, establishing a research program, promotion and tenure process, difficult discussions, collaboration options, and time management; and

- Interview preparation: communication, department interviews, job talks, and CV review.

A professional development series has been initiated that includes monthly webinars for postdocs and campus-based workshops. The PAI research team established the initial topical areas for the webinar series. The webinar series is centrally-driven by the Big Ten Academic Alliance and focuses on job coaching, networking opportunities, and grant writing. The campus-based workshops are campus-driven and focus on personal development and campus networking. PAI postdocs also have the opportunity to participate in regional and national conferences and coaching workshops. Additionally, postdocs are supported to meet face-to-face with cross-institutional mentors.

In support of activities aligned with objective 2, the Alliance developed training materials on unconscious bias, including video case-studies and facilitation guides. These resources are aimed at mitigating negative racial and ethnic biases and perceptions among those involved in the hiring process. The video case studies were developed to challenge the norms in hiring and bring to the forefront the ways in which bias can dominate the faculty selection process. Additionally, the Alliance created a collaborative resource library for Big Ten Academic Alliance members to share and distribute materials for their faculty training workshops. Another tool that the Alliance developed is a searchable directory of URM PAI postdocs that Big Ten Academic Alliance campuses can use for recruitment.

The Commitment to Institutional Cooperation (CIC) Professorial Advancement Initiative (PAI): The Forgotten Scholar: Underrepresented Minority Postdoc Experiences in STEM Fields

THE BIG TEN ALLIANCE

University of Illinois; Indiana University; University of Iowa; University of Michigan; Michigan State University; University of Minnesota; University of Nebraska-Lincoln; Northwestern University; Ohio State University; Pennsylvania State University; Purdue University; University of Wisconsin-Madison

It is estimated that by the year 2050, the present majority population will be in the minority (Bernstein & Edwards, 2008), emphasizing the need to address the current underrepresentation of minority faculty members in the STEM fields. In order to maintain the US STEM workforce, underrepresented minorities must pursue careers in STEM fields. Much of the research to date has focused on STEM education and STEM interest at the K-12 and undergraduate level and we know little about

experiences of URM postdocs in STEM fields. Research on and the development of postdocs is often overlooked as postdocs have reported feeling that they are exploited for low cost labor by institutions (Rohn, 2011). In order to understand the challenges that URM postdocs face and how to support their transition into the professoriate, we conducted qualitative in-depth interviews. Twenty-four underrepresented minority postdocs in STEM fields completed an interview to examine their self-

efficacy, sense of belonging, identity as researchers, and challenges of being a minority.

The rich qualitative data yielded a number of themes related to challenges of being a postdoc, in general, as well as challenges specific to being a minority in STEM. Overall, the themes related to challenges for all postdocs mostly focused on their self-efficacy (such as writing grants, getting published, etc.) and the culture of the work environment. For the challenges for minority postdocs, the themes that emerged focused on

their identity and sense of belonging within the work environment and community, as well as facing stereotypes and biases as a result of being a minority. While a majority of prior work has focused on undergraduate and postgraduate students, the results from the Big Ten Alliance study are the first to point out that a pervasive sense of isolation exists among URM postdocs, who have accomplished the highest level of education. Clearly, it is imperative that mechanisms are developed that allow URM postdocs to have mentors who might understand these challenges.

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PROMISE AGEP Maryland Transformation: Transforming STEM Inclusion and Pipeline Development in Maryland

THE MARYLAND ALLIANCE

The University of Maryland, Baltimore; The University of Maryland, Baltimore County; and The University of Maryland, College Park

PROMISE AGEP Maryland Transformation (PROMISE) has worked to recruit, retain, and train a diverse STEM graduate student body at institutions within the University System of Maryland (USM) for the purpose of preparing a diverse STEM workforce that will include future faculty. PROMISE uses as its conceptual framework, professional development coupled with a psychological sense of community (PSOC) (McMillian & Chavis, 1986), to

serve graduate students and postdocs. PROMISE hosts a suite of activities, based upon 4 goals: 1) Cultivating New Students, 2) PhD Completion and Career Preparation, 3) Programs for Postdoctoral Scholars, and 4) Programs for Faculty. PROMISE has hosted professional development and community building events at the University of Maryland Baltimore County (UMBC), the University of Maryland College Park (UMCP), the University of

Maryland Eastern Shore (UMES), Towson University, Bowie State University and at local hotels. To accomplish the goals, PROMISE hosts "Conferences for Undergraduates" to discuss preparation for graduate school: choosing a program, navigating the application process, developing a statement of purpose, securing letters of recommendation, and navigating the GRE. More than 100 undergraduate students have attended annually, and participation has come from institutions throughout the University of System of Maryland. Each campus also hosts individual efforts that partner with other organizations (e.g., the McNair Partnerships, Summer Horizons) and includes other campuses. In 2015, PROMISE strengthened its connections with the USM Louis Stokes Alliances for Minority Participation (LSAMP) for UMBC, UMCP, and UMES by working with the program directors of those schools to provide graduate school mentoring and preparation sessions. Signature programs such as the PROMISE Dissertation House and the Summer Success Institute, an annual August professional development conference, draw national attention and are heavily sought-after by graduate students within the USM. Workshops and programs include: *How to prepare a TED-style talk*, *Finding a Dissertation Topic*, *PROMISE Research Symposium*, *Writing Accountability Group (WAG)*, *Pathways to Leadership*, *Career Paths for Graduate*

Students, *PROMISE Friends and Family Celebration of Graduates*, *Career-Life Balance*, *Financial Literacy/Credit Scores*, *PROF-it: How to Develop a Teaching Portfolio*, *PROMISE Fall Harvest Dinner*, *How to Deal with Stress*, *Scientific Publishing*, *Faculty Diversity and You*, *Faculty X|Y*, and *IRB Seminars*. The postdoctoral fellows for faculty diversity participated in activities such as developing teaching portfolios, developing a syllabus, understanding and acknowledging strengths as a scientist, developing scientific peer groups, and scientific writing, teaching opportunities, and mentoring graduate students. PROMISE has also produced resources for faculty including a workshop, articles, and a resource website. Advisory board member contributions for faculty include slides for academic interventions, an article published by AAAS online based on the PROMISE event titled, *Talking to Foreign-born STEM Faculty about Diversity*, a video presentation that is used to train faculty mentors, and links to other PROMISE Resources. PROMISE is a stakeholder in annual meetings of the USM graduate deans, is responsible for founding the STEM Deans Council for the USM, and is now part of the Academic Affairs arm of the University System of Maryland. PROMISE has journal articles, books, book chapters, social media presence, and online and printed news stories that are used by schools in the US and abroad to foster and develop diverse future faculty.

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PROMISE AGEP Maryland Transformation: The Third Space, and Contributions to Social Science Research

THE MARYLAND ALLIANCE

The University of Maryland, Baltimore; The University of Maryland, Baltimore County; and The University of Maryland, College Park

The social science studies of PROMISE strive to gain a better understanding of how agency in graduate programs and in career advancement is influenced by these factors: micro-affirmations/micro-aggressions, sense of belonging, membership in professional networks such as AGEP, faculty-student mentoring experiences, being a woman or underrepresented minority (URM) student, and being in a critical mass discipline for women and URM. The three social science research studies include an ethnographic study of high impact practices, a qualitative study of mentoring, and a survey of STEM doctoral students on five PROMISE campuses. The team has completed 16 observations of PROMISE events; 27 interviews about advising, mentoring, and relationships with faculty; and administered a survey completed by 1,525 students from 5 PROMISE campuses.

The mentoring study explored students' definitions of mentoring, their mentoring experiences, and what they were hoping to gain through mentoring. Students' definitions of mentoring emphasized career support and exposure to community practices. Students were hoping to gain a better understanding of their identity as a scientist and to develop skills and be prepared for their careers. Good mentoring increased students' confidence, which was perceived as having career implications. Students' developmental networks were intentionally cultivated and included their advisors or principal investigators, departmental faculty, peers and friends. Advisor relationships and practices that included addressing students' questions, promoting students' development as researchers and helping students network in the

field were particularly important for academic integration. Programmatic initiatives such as PROMISE filled in the missing areas by allowing students to connect with faculty and peers outside of the laboratory. Further, PROMISE programs created spaces where URM students could assess their vulnerabilities and where they could foster social integration and create a sense of community to inform cognitive maps of graduate education and careers.

Similar results were also found in separate surveys that were administered by PROMISE's formative evaluation and assessment. The ethnographic study found that PROMISE events functioned as third spaces for graduate students; spaces that are neither work nor home, where dialogue can take place to build community and sense of belonging. In these third spaces, students were offered a new set of "ruling relations" (or power relations) that differed from what many graduate students experienced in departments that constrained their sense of agency. Specifically, PROMISE events created community, gave students additional affirmation and support, and strove for a sense of egalitarianism among students, faculty and mentors. Our survey study on micro-aggressions found differences in educational experiences and outcomes by sex and racial/ethnic group, for STEM and non-STEM students, and for PROMISE participants and non-participants. One finding included STEM students being more likely to report stronger mentoring relationships with faculty and advisors than non-STEM students, and less likely to experience a sense of belonging in their graduate programs. There have been

presentations on PROMISE research and activities at conferences including the American Educational Research Association (AERA) and American Association for Health Care Engineering (ASHE). More papers are evolving. Additional studies

of the "psychological sense of community" as a conceptual framework for the activities of PROMISE, and studies of STEM identity contribute to the research segments of PROMISE and its publications.

Collaborative Research: Bridging the PhD to Postdoc to Faculty Transitions for Women of Color in STEM

THE VANDERBILT UNIVERSITY, FISK UNIVERSITY, WAKE FOREST UNIVERSITY ALLIANCE

Our nation has been confronted with an ongoing challenge to increase the pool of historically underrepresented minority undergraduate and graduate students at the PhD level in STEM. Some modest gains have been achieved. In parallel, our universities and colleges are now in a better position to recruit, retain and promote URM STEM faculty who serve as role models and academic leaders for URM students to learn from, work with, and emulate. Recent NSF reports indicate that URMs occupy 8% of STEM associate and full professors at all four-year colleges and universities and about 6% of these positions at the nation's most research-intensive institutions. URM women hold even smaller shares of these academic STEM positions; indeed, at many institutions the number of women of color who are STEM faculty is zero. Vanderbilt University, Fisk University, and Wake Forest University Alliance is a collaboration designed to develop, study, and refine a model to recruit, retain, and advance recent URM STEM PhDs, especially women of color, through an innovative postdoctoral fellowship program designed to provide a pathway into tenure-track positions. The postdoc-to-faculty bridge program

includes activities to transition postdoctoral fellows to faculty positions. The program provides junior faculty with mentoring and assistance with developing strong scholarly identities. The integrated research will include cross sectional surveys, three- year longitudinal surveys and small-group interviews to gain a better understanding of the processes facilitating the choices women and URMs make in their STEM careers. Variables to study include differences at the intersections of gender and race, social relationship influences, the academic professional culture, and the institutional context. Vanderbilt and Fisk Universities will institutionalize the key model interventions and stage the model components for implementation. Wake Forest University will disseminate the model to the more than 50 research organizations in the Collaborative to Advance Equity through Research. The National Academy of Science's Ford Foundation Diversity Fellows program will work with the Alliance to identify and recruit promising postdoctoral fellows for project participation. The Anna Julia Cooper Center at Wake Forest will develop the scale-up and dissemination activities for the Alliance. Formative and summative

evaluation work will be performed by an external evaluation team, via a sub-award from Vanderbilt to the Institute for Broadening Participation. In the project's inaugural year, the Alliance identified 12 initial candidates from over 75 applications and recruited via the National Academies Ford Fellows program and other national recruitment activities. The candidates, along with their potential host

laboratories, will be participating in a four-day symposium to develop research projects and determine fit for the program. The launch of this AGEF project has already resulted in significant institutionalization, with Vanderbilt University announcing the creation of the Academic Pathway Fellowship Program, which will sustain the activities piloted during this project.

Improved Academic Climate for STEM Dissertators and Postdocs to Increase Interest in Faculty Careers

THE CENTER FOR THE INTEGRATION OF RESEARCH, TEACHING, AND LEARNING (CIRTL) ALLIANCE

Boston University; Cornell University; Howard University; Iowa State University; Michigan State University; Northwestern University; University of Buffalo; University of Georgia; University of Maryland, College Park; University of Texas at Arlington

The CIRTL Alliance goals are to improve the climate in graduate education and to increase the number of underrepresented graduate students and postdocs interested in and prepared for faculty careers. The nine universities in the Alliance have jointly agreed on project outcomes and the metrics to be used for assessment, while allowing for natural variation in the interventions that each institution will implement locally. The Alliance's Networked Improvement Community will use cycles of improvement to evaluate outcomes against common metrics and adapt what works well at other locations within the partnership. We will also disseminate our outcomes and tested practices across the 43 Center for the Integration of Research, Teaching, and Learning (CIRTL) universities that produce 30% of the nation's STEM PhDs.

The Alliance's interventions are focused on faculty and postdocs who advise STEM graduate students

as well as graduate peers who play a role in building and supporting inclusive communities. Participants in faculty/postdoc workshops will think through their own social identities and work to improve their understanding of underrepresented graduate student experiences and the impact that implicit bias and microaggression behaviors can have on student success within their own research groups. Faculty will also examine metrics of student success and examine the systemic reasons for different outcomes so that they can apply what they learn to impact desired change. We will utilize design thinking workshops so that the faculty have full ownership of the changes implemented in their departments.

For graduate student peers, the workshops will lead students through an understanding of identity, implicit bias, microaggressions, and the underrepresented student experience. Graduate

students will then work through variations of the leadership development workshops. Some universities in the network will hold design thinking workshops that have graduate students develop ongoing communities that support their peers, e.g., at the start of their post-candidacy. Other universities will conduct leadership programs that focus on graduate students developing inclusive teams in their careers. By evaluating outcomes against common metrics, these two options can be compared.

The Alliance will also form learning communities of underrepresented PhD students after their candidacy to enhance the transition towards the professoriate. The learning community will include career and professional development workshops, cohort building and peer mentoring.

The qualitative research component of this project will be centered upon three research questions:

- How do students describe initial and continuing engagement with the department and the discipline?

- What experiences and relationships are most influential in strengthening students' interest in faculty careers?
- How do peers and external supports influence the sense of community?

After each implementation cycle, the research team will conduct 4 to 5 focus groups at two institutions with students (3 focus groups with underrepresented students, 2 with majority students) and 3 to 4 focus groups at the same institutions with administrators, department leaders, and faculty members.

The Alliance will also analyze the data that is integrated within each improvement cycle. We will explore the extent to which a multilevel model can account for the data and which of the proposed drivers has the strongest impact on underrepresented student interest in faculty careers.

A Racially and Ethnically Inclusive Graduate Education Model in Biology, Chemistry and Engineering

THE NORTHERN OHIO ALLIANCE

Bowling Green State University; Case Western Reserve University; Cleveland State University; Kent State University; University of Akron; University of Toledo; Youngstown State University; Central State University; Tuskegee University

The Northern Ohio Alliance is developing, implementing, and studying a model to improve the participation, preparation, and success of underrepresented minority students in the STEM

pipeline. Its programs focus on linking URM STEM students to the professoriate through a multifaceted set of programs that include professional development for students and faculty. The NOA-

AGEP Alliance focuses exclusively on preparing US-citizen URM graduate and undergraduate students in the fields of biological sciences, chemistry, and engineering for the professoriate. Activities of the NOA-AGEP Alliance fall into four categories: Institutional Engagement, AGEP Scholar Professional Development, Social Science Research, and Evaluation.

Institutional Engagement applies campus-wide and Alliance-wide efforts through a series of diversity education workshops for faculty, staff, and students called *Diversity 360*. This five-session faculty development series includes the Mentor-Fellows Program. The Mentor-Fellows Program promotes and recognizes good mentoring practices of URM graduate students. The series also includes the AGEP Scholar Recruitment Program, a best practices approach for URM recruitment pathways. Finally, the series also promotes use of the Diversity Scorecard, a tool and process to examine data to identify equity gaps for URM faculty, staff, and students.

The AGEP Scholar Professional Development Program includes activities designed to cohesively support newly-matriculated URM PhD students (AGEP Scholars). One activity is the Summer Bridge Program, a weekend "bridge experience" for all AGEP Scholars. Academic Coaching is another support service that includes individualized

guidance, support, and empowerment. The Mentor Circles program creates a deep network of mentors spanning an academic career to increase retention and persistence in academia. The NOA-AGEP Research Symposia ensure conference networking and presentation skills training. The Partnerships with HBCUs completes the development potential with opportunities for peer mentoring.

Social Science Research, led by Dr. Diana Bilimoria at Case Western Reserve University, seeks to understand the mechanisms that promote URM students' perceptions of inclusion and the extent to which the proportion of diversity (i.e. majority and minority dynamics) influence URM doctoral students' identity development across both demographic social identity and professional identity. Evaluation, conducted by H&H Strategies, ensures that the processes and tools disseminated will be calibrated to increase the number of URM students prepared to take the next step in their pathway to the professoriate.

By developing, implementing, and studying the recruitment, retention, and graduation of URM PhD students in biology, chemistry, and engineering, the NOA-AGEP Alliance will provide a useful model for other regions in the US with historically low URM enrollment and success.

Collaborative Research to Develop, Implement and Study a STEM Graduate Education Model for American Indians and Native Alaskans

THE PACIFIC NORTHWEST CIRCLE OF SUCCESS: MENTORING OPPORTUNITIES IN STEM ALLIANCE

Washington State University; Montana State University; University of Idaho; University of Montana; Heritage University; Montana Tech; Northwest Indian College; Salish Kootenai College

American Indians and Alaska Natives (AI/AN) are the most underrepresented American demographic group in STEM graduate education and the professoriate and their participation is not growing as rapidly as other underrepresented groups. The Pacific Northwest Alliance Circle of Success: Mentoring Opportunities in STEM (PNW-COSMOS) is an eight-institution Alliance with the goal of increasing the participation of AI/AN students in STEM graduate education through the development, study and implementation of culturally congruent recruitment and mentoring strategies. To coordinate the activities associated with the grant, the Alliance strives to apply the "Four R's:" respect, relevance, reciprocity, and responsibility.¹ Annual summits provide an opportunity to showcase activities, a platform for student and faculty voices, and face-to-face interactions with the external advisory board and external evaluator. Annual assessment reports and informal feedback from the external evaluator provide guidance and developmental evaluation of the assumptions on which the program model is based. Further, consultation with Salish Kootenai College, Northwest Indian College, and Heritage University assists in grounding Alliance activities on the needs of AI/AN students. Alliance news is disseminated by website, newsletter, and social media. Major Alliance activities highlighted in the poster are the Indigenous Mentoring Program and the Indigenous Knowledge Field Camp. The Alliance's Social Science Research is presented separately. The Indigenous Mentoring Program

(IMP) model was developed as a guide for faculty who mentor AI/AN students. The model recognizes that AI/AN students are at different locations along an indigenous identity continuum. That continuum accounts for the cultural differences among indigenous communities. The continuum also accounts for the leadership structure and support service differences for indigenous STEM graduate students at different institutions. Hence, the IMP model was developed with institutional, pedagogical, cultural, and disciplinary flexibility. The model consists of nine modules designed to provide information related to mentoring, student resources, student socialization, cultural humility training, and culturally attuned practices for research conducted by AI/AN students. The IMP was piloted at Montana State University, Montana Tech, University of Montana, and Salish Kootenai College in 2016. The next steps include program refinement and assessment, and rollout to partner institutions in a train-the-trainer model. The Indigenous Knowledge Field Camp (IKFC) developed by the University of Idaho, provides a place-based, cultural-immersion experience for pairs of faculty mentors and student mentees to increase understanding of both Native and Western cultures. Participants collectively and individually reflect on and share their cultural perceptions and beliefs via a place-based, intensive camping and rafting field camp on traditional Nez Perce lands with the assistance of Nez Perce tribal scientists and educators. The underlying concept of the IKFC is that a transcultural understanding of Western

science and Traditional Ecological Knowledge can be achieved through an intense immersion in the culture, knowledge, and resources of Native

populations on Native land. The poster includes a snapshot of reflections by faculty and students who have participated in the IKFC.

Notes

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Collaborative Research to Develop, Implement and Study a STEM Graduate Education Model for American Indians and Native Alaskans: The Social Science Research Project [SSRP]

THE PACIFIC NORTHWEST CIRCLE OF SUCCESS: MENTORING OPPORTUNITIES IN STEM ALLIANCE

Washington State University; Montana State University; University of Idaho; University of Montana; Heritage University; Montana Tech; Northwest Indian College; Salish Kootenai College

The goal of PNW-COSMOS is to increase participation of AI/AN students in STEM graduate education through the development, study and implementation of culturally congruent recruitment and mentoring strategies. The goal of the Social Science Research Project (SSRP) is to advance knowledge about what influences graduate student success in STEM disciplines. SSRP activities examine how culturally congruent approaches facilitate socialization. Cultural congruence is a key construct that recognizes that for learning and mentoring to be successful, these activities must take place in ways that are compatible with students' cultural backgrounds. Traditional approaches to graduate education can clash with student cultural ways of being, leading to potential dissonance and attrition. The SSRP is designed to explore the concepts and practices taking place in the PNW-COSMOS, not as a form of evaluation,

but as a form of co-investigation to determine if and how cultural congruity contributes to effective mentoring, socialization, and student success. SSRP is examining how graduate students from different racial and ethnic groups perceive cultural congruity. Utilizing the Cultural Congruity Scale and the University Environment Scale (Gloria & Kurpius, 1996), an online survey was developed and administered to a sample of STEM graduate students at Alliance-member campuses with graduate programs. The online survey was also administered to a sample of STEM graduate students at peer institutions with a focus on diversity and student retention including Northern Arizona University, Oklahoma State University, University of South Dakota, University of California-Riverside, Kansas State University, and University of Utah. To date, the Alliance has collected 3,193 student responses from all ethnic and cultural

backgrounds. These responses will be used to determine within and between group differences. Analysis is in process. Descriptive statistics will provide aggregate information about characteristics of students in the study. Differences in cultural congruity experiences of AI/AN STEM graduate students compared to other STEM graduate students in other racial and ethnic groups will be estimated using Analysis of Variance models that hold constant differences based on the age and sex of the students. Another question being addressed is how cultural congruity benefits different aspects of student socialization and mentoring. Based on findings from the survey, the Alliance will identify six campuses for case studies to fully

understand cultural congruity, socialization, and mentoring in context. Data collected will include individual and focus group interviews with faculty and students, as well as document analysis and observation. Data will be analyzed using content analysis. Dissemination to the PNW-COSMOS Alliance team takes place throughout all stages of the SSRP. The SSRP outputs include a current literature review related to socialization and cultural congruity for AI/AN students and best practices for mentoring based on the literature; presentations (e.g., Association for the Study of Higher Education, American Educational Research Association); and publications (e.g., *The Department Chair*, book chapter) to national audiences.

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Collaborative Research to Develop, Implement and Study a Virtual Graduate Education Model for Underrepresented Minorities in STEM: The Virtual Model Programs

THE TUSKEGEE ALLIANCE: TO FORGE PATHWAYS TO ACADEMIC CAREERS IN STEM (T-PAC)

Tuskegee University; Alabama State University; Auburn University; Oakland University

This poster describes goals, programmatic interventions and outcomes of a *virtual model* of STEM doctoral education designed for underrepresented minority students (URMs) who seek to prepare for careers in the STEM professoriate as developed by the Tuskegee

Alliance: To Forge Pathways to Academic Careers in STEM (T-PAC). The Alliance consists of two Historically Black Colleges and Universities (HBCUs), Tuskegee University and Alabama State University; and a Traditionally White Institution (TWI), Auburn University. All of the institutions are

located in Alabama. The T-PAC Alliance's virtual interventions provide comprehensive assistance to its 18 participating US Citizen URM STEM doctoral students (scholars) as they progress through the doctoral pipeline. The interventions include: 1) Virtual tutorials on STEM graduate content; 2) Virtual tutorials to assist with the preparation of qualifying exams; 3) An institutionalized virtual graduate course "Literature Search and Technical Writing" to assist the scholars with technical writing needs; 4) An institutionalized virtual graduate course "Proposal Development" to assist the scholars with the writing of competitive proposals; and 5) Virtual teaching experiences. The T-PAC Alliance's virtual concept was suggested by the Alliance's general graduate student body prior to the development of the T-PAC Alliance proposal. Eligible scholars are also mentored to submit National Science Foundation Graduate Research Fellowship Program (NSF GRFP) applications. Webinars on

various topics of interest to the scholars are also given. In addition to virtual efforts, the Alliance poster describes the T-PAC Alliance professional development workshops that are offered to the scholars to provide resources to assist them in dealing with the rigors of graduate school such as management of stress, which is a common theme among the majority of URM graduate students. The workshops are also focused on creating awareness among the scholars of the professoriate, including job responsibilities and their rewards. The poster also highlights the T-PAC Alliance's active dissemination efforts, including spearheading two refereed symposia at the 2015 and 2016 Understanding Interventions Conferences. The T-PAC Alliance outcomes include the progress of the scholars based on their immersion in T-PAC Alliance activities. Another important outcome is success with the institutionalization of the activities.

Collaborative Research to Develop, Implement and Study a Virtual Graduate Education Model for Underrepresented Minorities in STEM: The Virtual Model Findings

THE TUSKEGEE ALLIANCE: TO FORGE PATHWAYS TO ACADEMIC CAREERS IN STEM (T-PAC)

Tuskegee University; Alabama State University; Auburn University; Oakland University

This poster provides an overview of the research findings for the T-PAC Alliance Virtual Model Programs. Quantitative data was collected in multiple phases using online surveys. The research phase includes the academic self-concept scale (Reynolds, 1988) administered via Qualtrics to STEM graduate students across all three institutions. The academic self-concept scale consists of

seven factors: grades and effort, study habits and organizational self-perception, peer evaluation, self-confidence in academics, satisfaction with school, self-doubt regarding ability, and self-evaluation with external factors.

Results indicate that all of the students' self-confidence ratings in academics increased as

they began conducting independent research, but underrepresented minority students (URMs) were lower than non-URM students in both the early and late stages of progress in their graduate studies. Moreover, URM students exhibited less positive self-evaluation based on external factors in the early stage of progress, but this self-evaluation increased in the latter stages. In addition, a second survey identified career choices after graduation, as well as undergraduate and graduate experiences. Choice responses were analyzed with parametric statistics, using the whole sample, and then sub-dividing this sample by institution; Historically Black colleges and Universities (HBCUs) in comparison to Traditionally White Institutions (TWIs), and URM status in comparison to non-URM status.

In general, students were more likely to choose non-academic vs academic careers. Reasons for pursuing academia were also included in the survey questions and regardless of ethnicity, students at the HBCUs were more likely to select academic careers due to a desire to mentor

future generations than students at the TWI. In contrast, students at the TWI were more likely to state a desire to teach and conduct research as a reason to pursue academia than students at the HBCUs. URMs at all institutions had a view of academia more closely aligned with teaching responsibilities than non-URMs, whereas non-URMs had a broader view of academia that included teaching and research responsibilities than non-URMs. Qualitative findings suggest that intrinsic motivation, support systems, advising, and undergraduate research experiences are factors impacting the graduate experience. Findings from this study are consistent with previous studies that identify intrinsic motivation, support systems, advising, relationships and rapport with advisors, and an overall desire to succeed in STEM as instrumental to persistence. This NSF funded project gives voice to STEM URM graduate students that are U.S. citizens in STEM graduate programs providing perspectives on strategies for broadening their participation in STEM degree programs and encouraging their pursuit of STEM careers.

Transformational Programming and Student Outcomes within the Michigan AGEP Alliance

THE MICHIGAN ALLIANCE: MENTORING AND COMMUNITY BUILDING TO ACCELERATE SUCCESSFUL PROGRESSION INTO THE PROFESSORIATE (MAA)

Michigan Technological University; Wayne State University; University of Michigan; Michigan State University; Western Michigan University

The long-term vision and planned outcome of MAA is to increase the success of U.S. citizens who are underrepresented minority (URM) graduate students and postdoctoral scholars in all fields

of STEM through graduate study, postdoctoral training and the professoriate. This vision is actively addressed by adapting to the needs of the five MAA campuses two existing models; one for

fostering multidisciplinary learning communities with diverse students and the other for improving faculty mentoring of URM graduate students and postdoctoral fellows, to the needs of the five MAA campuses. The specific objectives pertinent to the transformational component of the project are: 1) Designing, adapting and implementing evidence-based mentoring initiatives, on all five campuses, and 2) Designing, adapting and implementing evidence-based initiatives to promote interdisciplinary learning communities, on all five campuses.

There are multiple activities offered at each campus to foster the established goals of the project. First, the MAA fosters multidisciplinary learning communities of graduate students and faculty members. Monthly meetings allow AGEP participants to create dialogues across disciplines through informal oral presentations about current research. The learning communities also provide opportunities to share key information regarding graduate school success and to experience a

social network that extends beyond the academic setting. In addition, various alliance institutions have adapted the University of Michigan MORE Model to guide the generation of Individual Development Plans (IDPs) for students and postdocs. In doing so, each campus organizes a series of mentoring activities, including mentoring training opportunities for faculty. Other activities include having MAA participants gather each spring and fall for MAA conferences, hosted by one of the campuses, to build student networks and provide supportive activities, workshops, and other sessions for each stage of career planning and development. These meetings also provide a mechanism to disseminate the two models using a train-the-trainer strategy.

The AGEP Communities represent a high percentage of doctoral students within the MAA who are Black, Hispanic or American Indian U.S. citizens. A high percentage of the graduate student participants complete an advanced degree. Many of our MAA alumni have successfully secured post-doctoral and academic-related positions.

Race-related Contextual Experiences as Influences on Academic Identity and STEM Persistence among Students from the Michigan Alliance for Transformation (MAA)

THE MICHIGAN ALLIANCE: MENTORING AND COMMUNITY BUILDING TO ACCELERATE SUCCESSFUL PROGRESSION INTO THE PROFESSORIATE (MAA)

Michigan Technological University; Wayne State University; University of Michigan; Michigan State University; Western Michigan University

A primary focus of the Michigan Alliance for Transformation (MAA) research component was to learn about contextual experiences that affect underrepresented racial/ethnic minority students'

disciplinary identity and persistence in STEM and to use information learned to support and enhance the Alliance programming around interdisciplinary learning communities and mentoring. To test

questions from our conceptual model, the MAA Team used multiple methods (longitudinal survey, semi-structured interviews) in which we gathered student-reported data on their contextual experiences of climate and mentoring, academic identity, cultural identity and supports, campus/ programmatic resources and supports, and STEM motivation and persistence outcomes over a two-year period. The research sample included URM and non-URM students across Alliance institutions (N=507 and N=589, respectively). This poster presents preliminary findings from multivariate analyses of students' quantitative survey data and thematic content analysis of their qualitative open-ended survey questions.

Analyses indicate URM students experienced less equity and inclusion within their departments/ academic programs, compared to non-URM students in the same departments and programs. URM students reported significantly more micro-aggressions (interpersonal discrimination and incivility), more racial and socioeconomic discrimination, less equitable racial climate, fewer mentors of the same race, and were more likely to have to seek mentors outside of their departments. At the same time, URM students were more likely to report drawing support from their cultural background and from communities on campus outside of their department to help them succeed in their graduate studies, compared to non-URM students. Among URM students, experiences of identity-based stigma (e.g., negative racial climate, interpersonal micro-aggressions, unsupportive mentoring based in low expectations) were negatively associated with their academic identity (e.g., reported disciplinary centrality, self-efficacy,

sense of belonging, intellectual engagement in program) and STEM persistence outcomes (e.g., reported academic challenges, intention to persist in STEM, and interest in faculty/university research careers). Some relationships between students' climate and mentoring variables with academic identity and career interest outcomes differed across pre-candidates and candidates, even when accounting for time/year in a program, suggesting these experiences can have differential impacts on academic identity and career interests for earlier and later stage students.

Analyses also examined factors that promote academic identity and STEM persistence. The findings indicate that URM students' reported contextual support resources (e.g., quality mentoring relationship, inclusive program racial climate, same race mentors) and their individual/ cultural assets (strong racial identity, culturally-based supports) can (a) enhance their academic identity and STEM persistence outcomes and (b) mitigate negative impacts of identity-based stigma experiences on academic identity and STEM persistence outcomes. Further, those research/ survey participants reporting participation in AGEP campus programming also highlighted ways that AGEP supported their sense of community and professional skills and development. Taken together, these findings and our further exploration of variation in student experiences – including the ways that students draw support from individual and cultural assets as well as campus and programmatic resources to mitigate challenges in their department/program contexts can help inform programming to enhance STEM success, degree completion, and faculty/research pipelines.

Interdisciplinary Consortium for Research and Educational Access in Science and Engineering (INCREASE) & Brookhaven Science Associates (Stony Brook University; Columbia University; Cornell University; Harvard University; Massachusetts Institute of Technology; Princeton University; Yale University)

THE STONY BROOK-BROOKHAVEN ALLIANCE: FRONTIERS OF RESEARCH AND ACADEMIC MODELS OF EXCELLENCE

Stony Brook University; Brookhaven National Laboratory

The National Science Foundation's AGEP program's success in growing the recruitment, enrollment and degree production for underrepresented minority (URM) students in science, technology, engineering and math (STEM) fields did not translate into comparable growth in the representation of URM STEM PhD's in research faculty and senior leadership positions in higher education. URM STEM scholars continue to face significant barriers to their advancement into such roles, including reduced access to resources and fewer mentoring opportunities critical for such success. To address these issues, the Stony Brook-Brookhaven Alliance developed the Frontiers of Research and Academic Models of Excellence or FRAME. FRAME's programmatic efforts support URM-STEM dissertating graduate student and postdoctoral trainee participation in high impact research to improve research productivity, enhance professional

preparation, and prepare trainees for careers in the professoriate at the highest levels of research and teaching. The FRAME Model leveraged the existing research partnership between Stony Brook University (SBU) and Brookhaven National Laboratory (BNL) to build a first of its kind, diversity partnership connecting the URM-STEM scholar communities across institutions to develop essential skills in seven key competency areas: 1) discipline-specific conceptual knowledge; 2) research development; 3) communication; 4) professionalism; 5) leadership and management, 6) responsible conduct of research; and 7) teaching. The outcomes of the Stony Brook Brookhaven Alliance project include significant growth in the number of URM STEM postdoctoral trainees at both partner institutions, as well as strong career placement outcomes in research and tenure track positions for dissertating graduate student participants.

The Social Science Research Project

THE STONY BROOK-BROOKHAVEN ALLIANCE

*Frontiers of Research and Academic Models of Excellence Stony Brook University;
Brookhaven National Laboratory*

The Stony Brook-Brookhaven Alliance's FRAME social science research project examined two key psychosocial factors and their impact on STEM engagement and success of graduate students and postdocs. These included 1) the level and stability of STEM self-efficacy and 2) STEM identity. Specifically, this research explored the factors that contribute to how historically underrepresented minority (URM) graduate students (on the basis of race and gender) and postdocs develop and maintain high and stable levels of STEM self-efficacy (i.e., confidence in their ability to be successful in STEM) and STEM identity (i.e., investment and belonging in STEM). The research project utilized a mixed-methods, longitudinal design (repeated measure surveys over multiple time points) to assess stability and change in psychosocial constructs. The research findings confirm hypotheses that URM graduate students report lower STEM career identity than their non-URM peers. However, also as hypothesized, participation in FRAME programmatic activities predicted increased STEM efficacy among URM graduate students compared to their non-URM peers. Further, the findings demonstrate that increases in STEM efficacy predict positive changes

in STEM career identity and sense of belonging in STEM among URM participants. The research project also investigated the role of graduate student *perceptions of environmental entity theory* (PEET), i.e., the perception that their professors, peers, advisors in their STEM department believe that STEM success is achieved through natural ability and genius. The findings indicate that higher *perceptions of environmental entity theory* (PEET) among graduate students predicted higher perceptions of a sexist atmosphere within the department, feelings representative of imposter syndrome (particularly among female graduate students), and lower STEM efficacy and sense of belonging. Further, lower levels of domain specific self-efficacy and sense of belonging in STEM fields predicted a higher probability of considering dropping out of one's graduate program. Together, the findings from the social science research project demonstrate the importance of STEM identity, efficacy, advisor supportiveness and perceptions of a department culture that values inclusion for the academic and social belonging needs of underrepresented STEM scholars.

IV. AGEP Association Projects

Completion and Attrition in AGEP and non-AGEP Institutions

COUNCIL OF GRADUATE SCHOOLS

The original Council of Graduate School's project included two goals. The first was to estimate completion rates, attrition rates, median time-to-degree, and median time-to-attrition for underrepresented minority (URM) students, particularly those who are Black/African American, American Indian/Alaska Native, or Hispanic/Latino, in doctoral programs in science, technology, engineering, and mathematics (STEM) fields. The second was to elucidate factors that may contribute to the successful completion of the degree among URM STEM doctoral students. The project has also received supplementary support to convene a forum to examine promising practices and advance the national discourse on facilitating transformative changes that result in a more diverse and inclusive professoriate and doctoral education enterprise in STEM fields.

In partnership and active participation with twenty-one institutions, the overarching objective of this project was to examine patterns of completion and attrition among underrepresented minorities (URMs) in STEM doctoral programs across a diverse set of AGEP and non-AGEP institutions. Understanding the factors that promote successful completion and the policies and practices that hold promise in this regard were

equally important to the study. Also, the project convened principal investigators and key project personnel of active AGEP grants in order to facilitate a forum to examine promising practices and advance the national discourse on facilitating transformative changes that results in a more diverse and inclusive professoriate and doctoral education enterprise in STEM fields. Developing a network among the AGEP grantees and NSF representatives in order to share insights and lessons learned from their respective alliance activities, and for fostering a sense of community, were also a focus of the AGEP Forum.

All twenty-one partnering institutions were responsible for collecting student-level enrollment data; assembling an inventory of policies, practices, and interventions; and implementing a student survey. CGS researchers also conducted focus group interviews with students and university personnel during site visits to sixteen of the twenty-one institutions to gather additional information in context. The resulting dataset has been analyzed and studied by CGS researchers. The results have been broadly shared in the graduate education community. In addition, the CGS project team will convene a meeting of principal investigators and key project personnel of active AGEP grants.

The project has resulted in the largest dataset of its kind that captures completion and attrition of URM students in STEM doctoral programs, and has calculated seven-year completion and attrition rates, ten-year completion and attrition rates, median time-to-degree, and median time-to-attrition. The study found that 44% of URM doctoral students who entered their STEM programs at the participating institutions between May 1992 and April 2005 earned their doctorates within seven years, while 36% of them withdrew from

their doctoral programs, and 20% remained in the program. The findings have been disseminated widely in the graduate education community via a CGS publication, webinar, and other means, and CGS researchers continue to advance research studies using the project's data with the goal of publishing several education research articles. Also, the project will result in a successful convening of principal investigators and other key project personnel of all active AGEPE grantees.

Physics Bridge Program

THE AMERICAN PHYSICAL SOCIETY

The American Physical Society Bridge Program (APS-BP) is an effort to increase the number of physics PhDs awarded to underrepresented minority (URM) students; focusing on African-American, Hispanic American, and Native-American students. APS-BP is creating sustainable transition programs and a national network of doctoral granting institutions to mentor students to successfully complete PhD programs. The objectives of the project are 1) to increase, within a decade, the fraction of physics PhDs awarded to underrepresented minority students to match the fraction of physics bachelor's degrees granted to these groups, 2) to develop, evaluate, and document a sustainable model of bridging experiences that improve access to and a culture of graduate education for all students, with emphasis on those underrepresented in doctoral programs in physics, and 3) to promote and disseminate successful program components to the physics community.

Key activities associated with American Physical Society Bridge Program include the following: URM student recruitment and placement at Bridge, partnership and member Institutions; Bridge student progress tracking; designation of new partnership and member Institutions; offering the partnership institution a \$10,000 mini-grant; research and project self-assessment; and organizing annual conferences for the Bridge and physics education community.

The APS-BP currently funds six *Bridge Program* sites. These include The Ohio State University, Indiana University, California State University-Long Beach, Florida State University, University of Central Florida, and University of South Florida. APS-BP has also designated 27 physics departments as *Bridge Partnership Institutions*, because they have demonstrated their commitment to improving diversity in physics through a rigorous vetting process. Finally, APS-BP is developing a coalition

of academic institutions that share a commitment to increasing educational opportunities for underrepresented minority physics students. These institutions are termed *Bridge Member Institutions*. This growing network of ABS-BP Partnership and Member Institutions allows for more applicants to be placed at supportive programs, while also establishing lasting relationships with faculty and administrators at these institutions.

Over the duration of the funding period, APS-BP student application numbers have increased, as have the numbers of students who are placed at Bridge affiliated institutions. For the 2016 cohort, 90 applications were submitted to the APS-BP Program. Of this pool, 40 students were accepted

into Bridge affiliated programs that include Bridge, Partnership, and Member Institutions. Twenty-four students were placed at one of our 6 Bridge Program sites, 10 were placed at our Bridge Partnership sites, and 6 accepted offers from Bridge Membership sites. This number of placements has allowed ABS-BP to not only meet, but also exceed our program goal of erasing the national achievement gap. In physics, the addition of only about 30 doctoral degrees each year will bring the fraction of URM students receiving the highest degree up to the same fraction of these student who receive bachelor's degrees in the discipline. By placing an additional 40 students in the 4th year, APS-BP has now contributed a total of 106 students into the physics PhD pipeline.

Doctoral Scholars Program

SOUTHERN REGIONAL EDUCATION BOARD (SREB)

National Science Foundation (NSF) funding through the Alliances for Graduate Education and the Professoriate Program's (AGEP) Southern Regional Education Board (SREB) supports the attendance of members of the Doctoral Scholars Program (DSP) at the Annual Compact for Faculty Diversity Institute on Teaching and Mentoring (Institute). With over 1,100 attending, the Institute is the largest gathering of historically underrepresented minority PhD scholars who are pursuing a career in academia. The Institute provides scholars with the knowledge, skills and support needed to increase their likelihood of success in graduate school and to enhance their preparation for a career as a college or university faculty member. The Institute offers over 60 different workshops and plenary sessions on enhancing teaching skills, developing mentoring

skills, building a network of scholars and providing recruiting opportunities. DSP participants compose three-quarters of the attendees with more than 50% of the attending scholars representing STEM fields, 16% representing social and behavioral sciences fields and 4% representing the health professions. More than 80% of the scholars attending the Institute are historically underrepresented minority PhD students who represent more than 260 higher education institutions, 48 states, Puerto Rico and the District of Columbia.

The intellectual merit of the Doctoral Scholars Program is demonstrated by inclusion of the AGEP community in the Institute where AGEP scholars may access professional development, recruitment opportunities and related skills that

are not typically provided in most PhD programs of study. The participation of AGEP scholars at the Institute has provided professional development experiences that address many problems that historically underrepresented minority PhD scholars who are pursuing a career in academia encounter. Cultural disconnection, discrimination, lack of identifiable mentors, lack of minority faculty role models, isolation, and a lack of underrepresented peers in their department are some of the problems that underrepresented PhD scholars encounter in graduate study that the Institute addresses.

The AGEP-SREB Doctoral Scholars Program helps to achieve two broad goals: 1) provide AGEP scholars with the information, knowledge, related skills and professional support that enhance the likelihood of success in graduate school and completion of the PhD; and 2) provide professional development for AGEP scholars that enhances

their preparation for a successful career as a productive faculty member in academia. Through participating in the Institute, AGEP scholars are exposed to a larger body of historically underrepresented minority PhD scholars who are pursuing a career in academia and can forge relationships that can result in future professional collaborations for research and academic study. AGEP students from the following AGEP institutions attended the 2017 Institute that was held in Tampa, Florida: Alabama State University, Northwestern University, Prairie View A&M University, Purdue University, State University of New York at Stony Brook University, Texas A&M University – Corpus Christi, Texas A&M University – Kingsville, Texas A&M University – College Station, Tuskegee University, University of California – Los Angeles, University of Maryland Baltimore County, University of Maryland College Park, University of Maryland Eastern Shore, University of Michigan Ann Arbor, and West Texas A&M University.

Speaker Biographies

Alan Arnold joined the Division of Human Resource Development within the National Science Foundation's (NSF) Directorate for Education and Human Resources in September 2016 as a Science and Technology Policy Fellow from the American Association for the Advancement of Science. He will primarily focus on NSF's Alliances for Graduate Education and the Professoriate program. Dr. Arnold has developed his mentoring and teaching skills in venues from New York City to rural China, and conducted his post-doctoral research at Fox Chase Cancer Center in Philadelphia. As a member of a research team at Fox Chase, he developed novel antibody chemotherapies. His doctoral work on drug discovery was completed at Wayne State University. As an undergraduate at Ferris State University, he studied the effects of near ultra-violet rays and oxidation. His interests include education, and the implementation of novel broadening participation activities. In his spare time, Alan enjoys outdoor activities such as snowboarding and any activity with his son and daughter.

Robert M. Augustine is the Senior Vice President of the Council of Graduate Schools, where he is leading the strategic research agenda for master's education in collaboration with a team of graduate deans from across the United States. He is Dean Emeritus of the Graduate School at Eastern Illinois University where he served as dean for 15 years and earned regional and national awards for his work in graduate program review, graduate program diversity, and financial literacy for graduate education. While at Eastern, Dr. Augustine earned tenure as Professor

of Communication Disorders and Sciences, served as Department Chair and was appointed a Visiting International Scholar at Herzen State Pedagogical University of Russia. As Dean, Bob was elected to the Board of Directors of the Council of Graduate Schools and was elected Board Chair in 2013. Dr. Augustine earned his bachelor's and master's degrees in speech-language pathology from Illinois State University and was inducted into the University's College of Arts & Sciences Hall of Fame in 2015. He holds his Ph.D. in communication sciences and disorders from Southern Illinois University at Carbondale where he earned a Departmental Distinguished Alumni Award.

Sharon R. Bird is a National Science Foundation Program Director in the Education and Human Resources Directorate/Division of Human Resource Development, working with the ADVANCE and Alliance for Graduate Education and the Professoriate (AGEP) Programs. The ADVANCE program is designed to address gender equity through the identification and elimination of organizational barriers that impede full participation and advancement in academic institutions—recognizing that barriers to gender equity may not be identical for all groups in science, technology, engineering, and mathematics (STEM) disciplines. The AGEP Program seeks to advance knowledge about models to improve pathways to the professoriate and success for historically underrepresented minority doctoral students, postdoctoral fellows and faculty in specific STEM disciplines and/or STEM education research fields. Dr. Bird's previous academic work includes multi-

disciplinary research and programing on broadening participation in STEM as part of an NSF-funded ADVANCE Project at Iowa State University. Her ongoing research and teaching focus on opportunity structures and outcomes in academic STEM, organizational change in institutions of higher education, enhancing academic workplaces, and expanding opportunities in U.S. small business success. She is currently on leave from Oklahoma State University where she is a Professor of Sociology.

Jody Chase is the Acting Division Director of the Division of Human Resource Development (HRD) in the National Science Foundation's (NSF) Directorate for Education and Human Resources (EHR). Jody manages the NSF's Tribal Colleges and Universities Program (TCUP) and award portfolio, and enthusiastically partners with other program directors in the Foundation whose passions include tribal colleges and universities, indigenous research, and scholarship. She is devoted to the programs and people of HRD, and to the rest of NSF. Dr. Chase encourages collaborations between HRD and other programs as a means to extend the disciplinary expertise available to minority-serving institutions. Each year, the benefit of NSF's investment in TCUs is on display at the TCUP/1994 Research Symposium, which showcases the research findings of dozens of TCUP faculty and students engaged in projects of cultural or tribal relevance.

Luis Cifuentes earned a bachelor's degree with honors in Chemistry from Swarthmore College, an M.S. degree in Marine Studies, and a Ph.D. degree in Oceanography, both from the University of Delaware. He began his career with Texas A&M University in 1988. In November 2004 and in March 2009, he served as Executive Associate Dean and Associate Dean for Research in the College of Geosciences. In July 2007, he assumed the position of Interim Vice Provost. In September 2010, he became the Associate Vice President for Research and Scholarly Activity and Dean of Graduate Studies at Texas A&M University-Corpus Christi. In September 2012, he was promoted to Vice President for Research, Commercialization, and Outreach including the dual role of Interim Executive Director for the Lone Star UAS Center of Excellence and Innovation (LSUASC) from May 2013 - August 2015, which is one of only six FAA UAS test sites. He serves as PI on a NSF research coordination network (RCN) grant - Climate, Energy, Environment and Engagement in Semiarid Regions (CE3SAR)-that will build a research network in South Texas aggregating regional research capacities specific to sustainability in semiarid climates contiguous to the Gulf of Mexico.

L. Rashawn Fariior has been a part of the National Science Foundation since 2007 and has been responsible for numerous portfolios across the numerous NSF Directorates. Rashawn has over fifteen years of federal experience in Grant Administration including five years with National Institutes of Health at the Eunice Kennedy National Institute of Child Health & Human Development. Rashawn received his B.A degree in Political Science from North Carolina Agricultural & Technical State University and Graduate Studies in International Affairs and Development from Clark Atlanta University. Rashawn has a vast wealth of knowledge in the realm of grants administration and takes great pride speaking to the grantee community on a host of topics relevant in the grant community.

Robin L. Garrell is a Professor of Chemistry and Bioengineering at UCLA, where she has served as Vice Provost for Graduate Education and Dean of the Graduate Division since 2011. She earned her B.S. in Biochemistry from Cornell University and her Ph.D. in Macromolecular Science and Engineering from the University of Michigan. Her research centers on physical phenomena at liquid-solid interfaces, such as adsorption, adhesion and wetting. Garrell's team has pioneered applications of droplet microfluidics, a type of lab-on-a-chip device, for biomedical diagnostics, tissue culture, and the synthesis of millimeter-scale fuel capsules for nuclear fusion energy production. Her honors include the NSF Presidential Young Investigator Award, Iota Sigma Pi Agnes Fay Morgan Award, Benedetti-Pichler Award of the American Microchemical Society, and the UCLA Distinguished Teaching Award and Gold Shield Faculty Prize. She is a Fellow of the AAAS and an Honorary Fellow of the Society for Applied Spectroscopy, and currently serves on the AAAS Committee on Opportunities in Science, the GRE Governing Board and University of Michigan Rackham Board of Governors.

Christine Grant is an Academic Resilience Strategist who partners with individuals and organizations to empower women and men in science, technology, engineering and math (STEM). She obtained her degrees in Chemical Engineering (B.S., Brown University; M.S. and Ph.D., Georgia Institute of Technology). An international speaker, Grant conducts career coaching and professional development workshops across the U.S., in Ghana and Australia, empowering both women and underrepresented minorities on the STEM pathway. Her consulting company, CoolSci Productions, LLC (drchristinegrant.com) designs custom, targeted programming for corporate and academic environments. She's a

Professor of Chemical and Biomolecular engineering at NC State and the Associate Dean of Faculty Advancement in the College of Engineering. She is one of less than ten African-American women in the U.S. at that rank. Her research has focused on surface and interfacial phenomena. She has served her profession as a leader in the American Institute of Chemical Engineers (AIChE) as a member of the Board of Directors and as a Fellow. She has been a Visiting Senior Scholar at the American Association for the Advancement of Science (AAAS), an Expert in the NSF Engineering Directorate and a visiting faculty at Caltech, Duke and UPenn. Grant has been recognized with: the AAAS Mentor Award and the NSF Presidential Award for Excellence in Science, Math and Engineering Mentoring (PAESMEM). Her book, *Success Strategies from Women in STEM: A Portable Mentor* is by Elsevier/Academic Press.

Margret Hjalmarson is a Program Director in the Division of Research on Learning in Formal and Informal Settings at the National Science Foundation. She currently leads the Discovery Research K-12 program and manages proposals and awards related to mathematics and engineering education across other programs in the Division. She is also an Associate Professor in the Graduate School of Education at George Mason University. Dr. Hjalmarson's research interests include mathematics education and engineering education with a focus on mathematics teacher leadership development and STEM teaching and learning in higher education. In both of these settings, her work focuses on design-based research and models and modeling frameworks for teaching and learning. She has had multiple NSF-funded projects on STEM faculty development for interactive teaching and engineering learning. This work examines professional learning communities for teaching development for STEM instructors. She has published work related to synchronous online instruction for mathematics teacher leaders. She holds a Ph.D. in Curriculum and Instruction with a concentration in Mathematics Education from Purdue University. She also has a Master's degree in Mathematics from Purdue University and a B.S. in Mathematics from Mount Holyoke College.

Danette Gerald Howard is Chief Strategy Officer at Lumina Foundation, the nation's largest private foundation focused solely on increasing student access and success in postsecondary education. Dr. Howard oversees several key areas designed to increase Americans' attainment of high-quality postsecondary degrees and credentials, including

strategic work in both state and federal policy, and postsecondary finance. She also leads the Foundation's efforts to mobilize and engage employers, metropolitan areas, higher education institutions and other key actors with a stake in increasing attainment, and efforts to build the learning infrastructure that is needed to facilitate the postsecondary ecosystem of the future. Prior to joining Lumina, Howard served as Secretary of Higher Education in Maryland, leading the state's postsecondary education coordinating agency, the Maryland Higher Education Commission. As secretary, she oversaw Maryland's statewide financial aid program, approved new academic programs and institutions seeking to operate in the state, and advised the governor and legislators on higher education policies and initiatives. Dr. Howard earned her bachelor's degree, summa cum laude, from Howard University. She also received her master's degree from the Harvard University Graduate School of Education, and her Ph.D. in higher education policy from the University of Maryland, College Park. She resides in Indianapolis with her husband and children

Mark H. Leddy is a Program Director in the Division of Human Resource Development, in the Directorate for Education and Human Resources (EHR), at the National Science Foundation (NSF). He leads the Alliances for Graduate Education and the Professoriate (AGEP) program, and works on the EHR Core Research (ECR) and NSF INCLUDES programs. Dr. Leddy previously led the ECR and Research in Disabilities Education programs. He has also worked with the Faculty Early Career (CAREER), the Innovation through Institutional Integration (I³) and the Science of Learning Centers programs. Before joining NSF in 2006, he was employed at the University of Wisconsin-Madison as an Associate Scientist and held the Edward D. Morris endowed position at the McBurney Disability Resource Center. He completed his Ph.D. in Communication Sciences and Disorders at the University of Wisconsin-Madison, a Master of Science degree in Speech and Language Pathology at Teachers College, Columbia University, and a Bachelor of Science degree in Speech and Hearing at the College of New Jersey.

W. James "Jim" Lewis is Aaron Douglas professor of mathematics and Director of the Center for Science, Mathematics, and Computer Education at the University of Nebraska-Lincoln (UNL). Lewis is currently on leave from UNL and serving as the Acting Assistant Director for the Education and Human Resources Directorate at the National Science Foundation. At UNL, Lewis has served as President of the UNL Faculty Senate, President of the UNL chapter of AAUP, and

chair of the Department of Mathematics (1988-2003). During the time he served as chair of his department, the department won the University-wide Department Teaching Award and an NSF Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. He has received many teaching awards including the University's Outstanding Teaching and Instructional Creativity Award, membership in UNL's Academy of Distinguished Teachers, and the Carnegie Foundation's 2010 Nebraska Professor of the Year. He is also the recipient of the UNL Chancellor's Commission on the Status of Women Award for his support of opportunities for women in the mathematical sciences and UNL's Louise Pound-George Howard Distinguished Career Award. In 2015, Lewis was recognized by the Mathematical Association of America's Gung and Hu Award for Distinguished Service and the American Mathematical Society's Award for Impact on the Teaching and Learning of Mathematics. Lewis has been PI or co-PI for several NSF grants including PI for two NSF Math Science Partnerships, the Math in the Middle Institute Partnership, and NebraskaMATH. He was chair of the Committee that produced the CBMS report, *The Mathematical Education of Teachers*, in 2001 and chair of the writing team for the follow-up publication, *The Mathematical Education of Teachers II*, in 2012. He was co-chair of the National Research Council committee that produced *Educating Teachers of Science, Mathematics and Technology: New Practices for the New Millennium*. He was a member of the AMS Task Force that produced *Towards Excellence: Leading a Doctoral Mathematics Department in the 21st Century* as well as the author of the first four chapters of this book. He was also a member of the NRC Committee that produced *Preparing Teachers: Building Evidence for Sound Policy*. He is a past chair of the Conference Board of the Mathematical Sciences, the Mathematical Association of America's Coordinating Council on Education and the American Mathematical Society's Committee on Education. He received his Ph.D. in mathematics from Louisiana State University.

Denise M. Martin is a Lead Grants and Agreements Specialist at the National Science Foundation (NSF) in the Division of Grants and Agreements (DGA). Denise manages the awards issued by DGA for two NSF directorates, the Education and Human Resources and the Mathematical and Physical Sciences. Denise has 30 years of Federal service including 25 years specializing in grants management.

Kathleen McCloud received her B.S. from the College of William and Mary in 1988 and her Ph.D. from the University of Pittsburgh in 1995 in condensed

matter physics. After one year of a postdoc position in Pittsburgh, she moved to Louisiana to become a faculty member in Physics at Xavier University of Louisiana, where she remained for ten years and eventually became Chair of the Physics Department. At NSF, Dr. McCloud is the Program Officer in the Integrative Activities in Physics program within the Physics Division. She also serves as the Executive Secretary for the National Science Board Subcommittee on Facilities, and in 2013-2014 on detail in OIA coordinating the Major Research Instrumentation program.

B. Jan Middendorf serves as the Deputy Director for Feed the Future Innovation Lab for Collaborative Research on Sustainable Intensification (SILL) at Kansas State University (KSU). As Deputy Director, Dr. Middendorf conducts research and leads SILL's impact assessment and monitoring and evaluation efforts. She is also responsible for establishing and maintaining effective partnerships with other U.S. and international institutions, industry, USAID Missions and developmental partners. She has developed and implemented capacity building programs for various stakeholders related to project and program evaluation, logic models, and strategic planning for organizational change. Prior to this role, Dr. Middendorf managed a \$15.5M diverse portfolio as Program Director of Project and Program Evaluation in the Directorate for Education and Human Resources (EHR) for the National Science Foundation (NSF). She also served for ten years as director of an evaluation center at KSU. Dr. Middendorf has over 25 years of experience in project development, management, implementation and evaluation of multi-institutional, interdisciplinary programs and projects in national and international settings. Dr. Middendorf earned her Ph.D. from KSU after completing her Master's and Bachelor's from Ohio University and University of Rhode Island, respectively.

Christopher R. Meyer serves as a rotating Program Director in the Division of Biological Infrastructure at the National Science Foundation (NSF), participating in the management of the Research Experience for Undergraduates program, leading the Research Coordination Network for Undergraduate Biology Education program, and serving as a representative for the NSF I-Corps, HBCU-UP, and INCLUDES programs. He also participates in the Graduate Research Fellowship Program and the NSF Research Traineeship program. In 2008-2009, he also served at the NSF in the Division of Molecular and Cellular Biosciences. He has participated in leading an NSF Ideas Lab on enhancing photosynthesis and a national conference

focusing on enhancing student centered research at primarily undergraduate institutions. He currently serves on the national American Chemical Society's Committee on Professional Training, as well as the American Society for Biochemistry and Molecular Biology's Minority Affairs Committee. His NSF-funded lab at California State University, Fullerton, where he served as Chair of the Department of Chemistry and Biochemistry, focuses on the generation of biodegradable and renewable carbon sources.

Antonio A. Nunez received a Ph.D. in Neuroscience from Florida State University in 1977, and after a one-year appointment as Lecturer at Bowling Green State University he was awarded a post-doctoral fellowship from the National Institutes of Health (NIH) to do research at the University of Massachusetts, Amherst. In 1980 Dr. Nunez joined the Department of Psychology and Neuroscience Program at Michigan State University (MSU) where he holds the title of Professor. In 1999 he took the position of Associate Dean in the Graduate School of MSU. His current title is Associate Dean for Academic Affairs and Post-doctoral Training. Dr. Nunez' work is in the areas of neuroendocrinology and chronobiology. His research has been supported over the last 35 years by grants from NIH and from the National Science Foundation (NSF). In addition, he was Co-PI of a 5-year I³ grant from NSF that established the MSU Center for Academic and Future Faculty Excellence, which provides professional development opportunities for MSU trainees. Dr. Nunez has over 90 scientific peer-reviewed publications, many of them with graduate and undergraduate students as co-authors. He is the recipient of the MSU Teacher Scholar Award and of the Florida State University Doctoral Graduate Award of Distinction.

Hironao Okahana is a higher education researcher, currently working for the Council of Graduate Schools (CGS) as Assistant Vice President, Research and Policy Analysis. His areas of expertise include public policy and finance of postsecondary education, and he has extensive experience with large-scale national data sets. His research interest also extends to discussion of labor market outcomes, values and public good of graduate education, and their implications to social mobility. At CGS, Okahana serves as co-principal investigator for two National Science Foundation (NSF) funded projects, *Completion and Attrition in AGEP and non-AGEP Institutions* (grant# 1138814) and *Labor Market Outcomes of STEM Master's Education* (grant# 1538769). He also serves as the project director for two national benchmarking surveys: CGS/GRE Survey of Graduate Enrollment and Degrees

and CGS International Graduate Admissions Survey. Okahana earned his Ph.D. in Education and MPP in public policy from University of California, Los Angeles, and his undergraduate degrees from California State University, Long Beach. He is also an adjunct faculty of higher education at George Mason University in Fairfax, VA.

Suzanne T. Ortega became the sixth President of the Council of Graduate Schools on July 1, 2014. Prior to assuming her current position, she served as the University of North Carolina Senior Vice President for Academic Affairs (2011-14). Previous appointments included the Executive Vice President and Provost at the University of New Mexico, and Vice Provost and Graduate Dean at the University of Washington and at the University of Missouri. Dr. Ortega's masters and doctoral degrees in sociology were completed at Vanderbilt University. With primary research interests in mental health epidemiology, health services, and race and ethnic relations, Dr. Ortega is the author or co-author of numerous journal articles, book chapters, and an introductory sociology text, now in its 8th edition. An award-winning teacher, Dr. Ortega has served on review panels for NSF and NIH and has been the principal investigator or co-investigator on grants totaling more than six million dollars in state and federal funds. Dr. Ortega serves or has served on a number of professional association boards and committees, including the Executive Boards of the Council of Graduate Schools, the Graduate Record Exam (GRE), the National Academies of Science Committee on the Assessment of the Research Doctorate, the National Science Foundation's Human Resources Expert Panel, the North Carolina E-learning Commission, the North Carolina Public School Forum, the UNC TV Foundation, and the UNC Press Board of Governors.

Tykeia Nicole Robinson presently serves as the Howard Hughes Medical Institute (HHMI) Policy Fellow at the Association of American Colleges and Universities. As fellow, Dr. Robinson works on an interdisciplinary team to critically examine HHMI's Inclusive Excellence program and determine the design principles of building institutional capacity for improving diversity and inclusion in the STEM disciplines. Prior to joining AAC&U, Dr. Robinson served as the Research Associate for Policy and Programs at The Graduate School at the University of Maryland College Park. Throughout her career, Dr. Robinson's professional and scholarly work has been committed to the success of students, specifically students of historically underrepresented and underserved identity

groups and the analysis, evaluation and assessment of programs throughout and across the academic pipeline. Her passion in higher education research is in crafting rigorous scholarship that illuminates the processes of how colleges and universities, and the programs within them, function to serve students and institutional priorities. Tykeia earned a B.A. from Manhattanville College and a M.A. from the University of Connecticut. She went on to earn an Ed.M. in Higher and Postsecondary Education from Teacher's College Columbia University and a Ph.D. in Higher Education from the University of Maryland College Park.

Mark J. T. Smith received the B.S. degree from MIT and the M.S. and Ph.D. degrees from Georgia Tech, all in electrical engineering. He joined the electrical and computer engineering (ECE) faculty at Georgia Tech in 1984, where he remained for the next 18 years. While working primarily on the Atlanta campus, he spent several terms in 1991-93 on the Institute's European campus in Metz, France. Five years afterward, he served a four-year term as Executive Assistant to the President of Georgia Tech. In January 2003, he joined the faculty at Purdue University as head of the School of Electrical and Computer Engineering, and six years later was appointed Dean of the Purdue University Graduate School. He is an active member of the Big Ten Academic Alliance; the GRE Board of Directors; and the Council of Graduate Schools (CGS), where he served as Chair of the Board in 2016. Dean Smith's scholarly interests are in the area of digital signal processing. He is a Fellow of the IEEE and a former IEEE Distinguished Lecturer. In addition to his professional activities, Dr. Smith's past includes Olympic competition and U.S. national gold medals in the sport of fencing.

Renetta Garrison Tull is Associate Vice Provost for Graduate Student Professional Development & Postdoctoral Affairs at the University of Maryland, Baltimore County (UMBC), Co-PI/Founding Director for PROMISE: Maryland's AGEP for 12 institutions in the University System of Maryland (USM), and Co-PI/Co-Director for the USM Louis Stokes Alliance for Minority Participation (LSAMP) and LSAMP-BD programs. She also serves as the USM-wide Director of Graduate

and Professional Pipeline Development, and Special Assistant to the Senior Vice Chancellor for Academic Affairs. Tull has a B.S. in Electrical Engineering (Howard University), M.S. in Electrical Engineering and Ph.D. in Speech Science (Northwestern University.) She was a postdoctoral fellow in vocal physiology (UW-Madison), and later joined the Communications Sciences and Disorders faculty, with collaborations in Industrial Engineering. Tull now serves on several AGEP and other Advisory Boards, specializing in recruitment, retention, and global diversity in STEM. She has been an invited speaker for diversity in STEM in the U.S., Latin America, Taiwan, Italy, Dubai, Australia, and India. She was a 2015 "Cover Girl" for O'Reilly Media's "Women in Data," finalist for the 2015 Global Engineering Deans Council/Airbus Diversity Award, 2016 recipient of the ABET Claire L. Felbinger Award for Diversity, and a Tau Beta Pi "Eminent Engineer."

Sweeney Windchief serves as an Assistant Professor in the Department of Education at Montana State University in Bozeman, MT. Dr. Windchief co-leads the Indigenous Mentoring Program research component of the Pacific Northwest Circle of Success: Mentoring Opportunities in STEM (PNW-COSMOS). In partnership with 5 colleges and universities and two tribal colleges, the research team is establishing a mentoring community composed of faculty, staff, students as well as members of the American Indian community. Their charge is to provide support for American Indian and Alaska Native students from recruitment through completion of their graduate program. The program is designed to enhance cross-cultural awareness and provide opportunities for alliance partners to share best practices and highlight student research. Dr. Windchief serves on the American Indigenous Research Association Bylaws and Incorporation Committee, the Board of Advisors for a non-profit organization that supports the higher education of Native American students known as the Graduate Horizons program, and the American Educational Research Association's Indigenous Peoples of the Americas awards committee. He earned his Doctorate from the University of Utah after completing his bachelor's degree at the University of Central Oklahoma and master's degree from The University of Montana.

Conference Participants

Ansley Abraham, Director
SREB Doctoral Scholars Program
Southern Regional Education Board

Steve Abramowitch, Professor
University of Pittsburgh

Deloris Alexander, Associate Professor
Tuskegee University

Marilyn Amey, Professor and Chair
Michigan State University

William Andrefsky, Professor and Dean of
the Graduate School
Washington State University

Alan Arnold, AAAS Fellow, AGEP Division of Human
Resource Development, Directorate for Education
and Human Resources
National Science Foundation

Raquel Arouca, Postdoctoral Associate
University of Montana

Robert Augustine, Senior Vice President
Council of Graduate Schools

Robert L. Belle, Jr., Director
SREB-AGEP Doctoral Scholars Program
Southern Regional Education Board

Diana Bilimoria, Professor and Chair of
Organizational Behavior
Case Western Reserve University

Sharon Bird, Program Director
ADVANCE and AGEP Division of Human Resource
Development, Directorate for Education and
Human Resources
National Science Foundation

Jessica Black, Associate Professor, Environmental
Science and Studies Interim Director
Heritage University

Noel Blackburn, University Relations Manager
Brookhaven National Laboratory

Alain Bopda, Associate Professor
Alabama State University

Chastity Bradford, Assistant Professor
Tuskegee University

Erika Brown, Bridge Program Project Manager
American Physical Society

Terrence Buck, Principal Talent Acquisitions Specialist
Brookhaven National Laboratory
Beth Buehlmann, Vice President
Public Policy and Government Affairs
Council of Graduate Schools

Karen Butler-Purry, Associate Provost of Graduate and Professional Studies
Texas A&M University

Michelle Campo, Associate Dean
The University of Iowa

Lori Carris, Associate Dean
Graduate School
Washington State University

Adrienne Carter-Sowell, Assistant Professor
Texas A&M University

Page Chamberlain, Professor
Stanford University

Debra Charlesworth, Assistant Dean
Michigan Technological University

Jody Chase, Acting Division Director
Division of Human Resource Development,
Directorate for Education and Human Resources
National Science Foundation

Tabbye Chavous, Professor
University of Michigan

Luis Cifuentes, Vice President for Research,
Commercialization and Outreach
Texas A&M University-Corpus Christi

Sheri Clark, Proposal Development Specialist
Stony Brook University

Mamie Coats, Associate Professor of Microbiology
Alabama State University

Richard Coffin, Department Chair
PENS
Texas A&M University-Corpus Christi

Michael Curry, Associate Professor
Tuskegee University

Daniel Denecke, Vice President
Best Practices and Strategic Initiatives
Council of Graduate Schools

Tony Dennis, Director
Graduate Student Recruitment and Retention
Western Michigan University

Maurice Dues, Program Specialist
National Science Foundation

Jeffrey Engler, Dean-in-Residence
Council of Graduate Schools

Charity Farber, Assistant Director
Big Ten Academic Alliance

L. Rashawn Fariior, Grants and Agreements Specialist
National Science Foundation

Oladiran Fasina, Alumni Professor and Interim
Associate,Dean
Auburn University

David Feldon, Associate Professor
Utah State University

David Ferguson, Associate Provost for Diversity
and Inclusion
Stony Brook University

Carol Fierke, Vice Provost for Academic Affairs
and Dean, Horace H. Rackham Graduate School
University of Michigan

Gail Fraizer, Undergraduate Coordinator
Kent State University

Jeffrey Franke, Interim Dean of the Graduate School
University of Maryland

Ed Galindo, Director
Indigenous STEM Research & Graduate Education
Program (I STEM)
University of Idaho

Robin Garrell, Vice Provost, Graduate Education
and Dean, Graduate Division University of California,
Los Angeles

Erin Golembewski, Senior Associate Dean,
Graduate, School
University of Maryland Baltimore

Raquel Gonzalez, Senior Researcher
American Institutes for Research

Christine Grant, Professor and Associate Dean
of Faculty Development and Special Initiatives,
College of Engineering
North Carolina State University

Megan Grunert Kowalske, Associate Professor
Western Michigan University

Lynmarie Hamel, Senior Associate Dean
of Graduate Studies
Case Western Reserve University

Beverly Hartline, Vice Chancellor for Research and
Graduate Dean
Montana Tech

Katherine Hazelrigg, Communications Manager
Council of Graduate Schools

Sara Hernandez, Associate Dean of Inclusion and
Student Engagement
Cornell University

Stephen Hill, Professor
Florida State University

Peter Hitchcock, Associate Dean for Academic
Programs and Initiatives
University of Michigan

Margret Hjalmarson, Program Director, NSF INCLUDES,
Division of Research on Learning in Formal and
Informal Settings, Directorate for Education and
Human Resources
National Science Foundation

Jennifer Hobbs, Assistant Dean, Graduate and
Postdoctoral Training and Development
Northwestern University

Theodore Hodapp, Director of Project Development
American Physical Society

Sarah Hokanson, Director, Professional Development
and Postdoctoral Affairs
Boston University

Karlene Hoo, Dean of The Graduate School
Montana State University

Danette Howard, Chief Strategy Officer and Senior Vice
President
Lumina Foundation

Anita Howard, Adjunct Professor Department of
Organizational Behavior
Case Western Reserve University

Margaret Irwin, Grant Writer/Administrator
Cleveland State University

Sylvia James, Acting Deputy Assistant Director,
Directorate for Education and Human Resources
National Science Foundation

Shaik Jeelani, Vice President for Research
and Dean of Graduate Studies
Tuskegee University

Felicia Jenkins, Program Administrator
Tuskegee University

Emmitt Jolly, Associate Professor of Biology
Case Western Reserve University

Erick Jones, Program Director
Division of Graduate Education
National Science Foundation

Chandrashekhar Joshi, Professor and Chair
Biological Sciences
Michigan Technological University

Isah Veronica Juranek, Program Coordinator
Texas A&M University

John Keller, Associate Provost for Graduate and
Professional Education; Dean, the Graduate College
The University of Iowa

Barbara Knuth, Senior Vice Provost and Dean
Cornell University

Sara Kugler, Director of External Partnerships and
Initiatives, Anna Julia Cooper Center
Wake Forest University

Mark Leddy, Program Director, AGEP, Division of
Human Resource Development, Directorate for
Education and Human Resources
National Science Foundation

W. James "Jim" Lewis, Acting Assistant Director,
Office of Assistant Director, Directorate for Education
and Human Resources
National Science Foundation

Lee Limbird, Professor and Dean
Fisk University

Bonita London, Associate Professor
Stony Brook University

Sherri Lovelace-Cameron, Professor
Youngstown State University

Kelly Mack, Vice President
Association of American Colleges & Universities

Denise Martin, EHR/MPS Team Lead, Division of Grants
and Agreements, Office of Budget, Finance and
Award Management
National Science Foundation

Jaklyn Martinez, Doctoral Student
Case Western Reserve University

Linda Mason, Associate Dean of the Graduate School
Purdue University

Ambika Mathur, Associate Provost and
Dean of the Graduate School
Wayne State University

Clare McCabe, Professor
Vanderbilt University

Kathleen McCloud, Program Director Integrative
Activities in Physics, Physics Frontiers Centers and
Investigator-Initiated Research Projects, Division
of Physics, Directorate for Mathematical and
Physical Sciences
National Science Foundation

Colleen McLinn, CU-CIRTL Program Director
Cornell University

Jerry McMurtry, Interim Dean,
College of Graduate Studies
University of Idaho

Rodolfo Mendoza-Denton, Professor
University of California, Berkeley

Marisol Mercado Santiago,
Postdoctoral Research Associate
Western Michigan University

Christopher Meyer, Program Director Division of
Biological Infrastructure
National Science Foundation

William Midden, Associate Vice Provost
Bowling Green State University

Jan Middendorf, Associate Director Sustainable
Intensification Innovation Lab
Kansas State University

Kristen Mighty, Senior Program Coordinator,
Office of Postdoctoral Affairs
Northwestern University

Judy Milton, Assistant Dean
The Graduate School
University of Georgia

Marilyn Mobley, Vice President, Inclusion, Diversity
and Equal Opportunity
Case Western Reserve University

Faith Morrison, Associate Dean of the Graduate School
Michigan Technological University

Pushpalatha Murthy, Associate Provost and Dean
Michigan Technological University

Sue Nickel-Schindewolf, Personal and
Professional Coach
Case Western Reserve University

Nicole Norfles, Director
Program Practice and Innovation
Council for Opportunity in Education

Antonio Nunez, Associate Dean
Academic Affairs and Postdoctoral Training
Michigan State University

Craig Ogilvie, Assistant Dean
The Graduate College
Iowa State University

Hironao Okahana, Assistant Vice President Research
and Policy Analysis
Council of Graduate Schools

Suzanne Ortega, President
Council of Graduate Schools

Colette Patt, Assistant Dean
University of California, Berkeley

Jonathan Pelz, Professor
The Ohio State University

Christopher Perez, Associate Director for Diversity
and Inclusion
University of Maryland

Mohammed Qazi, Professor
Tuskegee University

Talat Rahman, Professor
University of Central Florida

Douglas Rees, Professor of Chemistry and
Dean of Graduate Studies
California Institute of Technology

Gloria Regisford, Professor
Prairie View A&M University

Mark Richards, Professor
University of California, Berkeley

Boakai Robertson, Professor and Executive Director
Alabama State University

Tykeia Robinson, Howard Hughes Medical Institute
Policy Fellow
Association of American Colleges and Universities
Consultant for the Council of Graduate Schools

Sandy Ross, Professor
University of Montana

Charles Rozek, Vice Provost and
Dean of Graduate Studies
Case Western Reserve University

Jared Russell, Associate Professor
Auburn University

Melody Russell, Associate Professor of
Science Education
Auburn University

Janet Rutledge, Vice Provost and Dean
of the Graduate School
University of Maryland Baltimore County

Chris Sahley, Associate Head and Professor
of Biological Sciences
Purdue University

Layne Scherer, Program Officer
National Academies of Sciences, Engineering,
and Medicine

Catherine Scott, Assessment Specialist
Stony Brook University

Heidi Shank, Senior Director of Meetings
Council of Graduate Schools

Curtis, Shannon, Andrew T. Hunt Professor and Chair,
Department of Chemistry & Biochemistry
Auburn University

Panos Shiakolas, Professor
The University of Texas at Arlington

David Siegfried, Executive Director & Evaluator
Institute for Broadening Participation

Lynn Singer, Deputy Provost and Vice President
for Academic Affairs
Case Western Reserve University

Mark J.T. Smith, Dean of the Graduate School
Purdue University

Matthew Smith, Project Director
NOA-AGEP
Case Western Reserve University

Angela Spaulding, Vice President of Research and
Compliance; Dean Graduate School
West Texas A&M University

Toni Sperzel, Assistant Dean for Diversity and Inclusion,
The Graduate School
Stony Brook University

Susan Stapleton, Dean, Graduate College
Western Michigan University

Keivan Stassun, Senior Associate Dean for Graduate
Education and Research
Vanderbilt University

Judith Stoddart, Interim Dean & Associate Provost
for Graduate Education
Michigan State University

Katherine Stone, Program Manager
Council of Graduate Schools
Keimei Sugiyama, Doctoral Student
Case Western Reserve University

Charles Taber, Vice Provost and Dean
of the Graduate School
Stony Brook University

Courtney Tanenbaum, Principal Researcher and
STEM Director
American Institutes for Research

Aeriola Taylor, Program Manager
Auburn University

Steven Thomas, Program Manager
Michigan State University

Aaron Thomas, Associate Professor
University of Montana

Marilyn Thornton, Program Manager
Alabama State University

Renetta Tull, Director of Graduate and Professional
Pipeline Development and Special Assistant to
the Senior Vice Chancellor for Academic Affairs
University System of Maryland and Associate Vice
Provost for Graduate Student Development and
Postdoctoral Affairs
University of Maryland Baltimore County

Sarah Valdovinos, Manager, Postdoctoral and Graduate
Student Professional Development
University of California, Los Angeles

Kelly Ward, Professor and Chair
Department of Educational Leadership
Washington State University

Cindy Weinstein, Professor and Vice Provost
for Education
California Institute of Technology

Cathy Wendler, Senior Strategic Advisor
Educational Testing Service

Kenneth White, Manager
Educational Programs
Brookhaven National Laboratory

Sweeney Windchief, Assistant Professor of Adult and
Higher Education
Montana State University

Sylvanus Wosu, Associate Dean for Diversity Affairs
University of Pittsburgh

Karian Wright, Program Manager
Stony Brook University

Aman Yadav, Associate Professor
Michigan State University



Conference Program

AGEP NATIONAL FORUM

Thursday, February 23 – Friday, February 24, 2017

Grand Hyatt Washington
1000 H Street, NW
Washington, DC 20001

The Alliances for Graduate Education and the Professoriate (AGEP) National Forum, convened by the Council of Graduate Schools (CGS) with funding support from the National Science Foundation (NSF), has the following goals:

- To serve as a forum for exploring promising practices with the potential to significantly improve the diversity of graduate students and the professoriate in science, technology, engineering, and mathematics (STEM) fields,
- To develop a network for sharing and fostering community among AGEP grantees, and
- To provide a platform for NSF to engage AGEP grantees by sharing its strategic priorities, policies, and procedures designed to facilitate STEM doctoral programs inclusiveness.



THURSDAY, FEBRUARY 23

7:30 AM-5:00 PM

REGISTRATION, CONSTITUTION A FOYER

7:30-8:30 AM

CONTINENTAL BREAKFAST, CONSTITUTION AB

8:30-8:40 AM

WELCOME FROM CGS, CONSTITUTION AB

Speaker:

Suzanne T. Ortega, *President, Council of Graduate Schools*

8:40-9:00 AM

WELCOME FROM NSF

Speakers:

Jody Chase, *Acting Division Director, Division of Human Resource Development, Directorate for Education and Human Resources, National Science Foundation*

Mark H. Leddy, *Program Director, Alliances for Graduate Education and the Professoriate, Division of Human Resource Development, Directorate for Education and Human Resources, National Science Foundation*

9:00-9:20 AM

MEETING OVERVIEW AND SETTING THE NATIONAL CONTEXTS

This session will include an overview of the objectives of the AGEP National Forum. Graduate enrollment and degree completion data and other key national trends in the diversity and inclusion of STEM fields and the professoriate will be discussed. The session will also present selected results from the “Completion and Attrition in AGEP and non-AGEP Institutions” project, an AGEP funded project of CGS (NSF grant number 1138814).

Speaker:

Hironao Okahana, *Assistant Vice President, Research and Policy Analysis, Council of Graduate Schools*

9:20-10:40 AM

OPENING PLENARY: ACADEMIC FAMILY: RECONCEPTUALIZING MENTORING FOR AMERICAN INDIAN/ALASKA NATIVE GRADUATE STUDENTS

Unique challenges and perspectives of American Indian/Alaska Native graduate students in STEM rarely take center stage in national discussions. To address the need for change, this session will outline the central principles of an Indigenous mentoring program as a key component of the Pacific Northwest Collaborative Opportunities for Success in Mentoring of Students (PNW-COSMOS), an emerging program that addresses culturally attuned support for American Indian graduate students in the STEM fields. This project addresses demographic disparities by applying Indigenous values to academic mentoring. It will include a discussion of the implications of the project across different subgroups of students. Open discussion will follow the plenary remarks.

Chair:

Hironao Okahana, Assistant Vice President, Research and Policy Analysis, Council of Graduate Schools

Speaker:

Sweeney Windchief, Assistant Professor of Adult and Higher Education, Montana State University

10:40-11:00 AM

COFFEE BREAK, CONSTITUTION FOYER

11:00-12:15 PM

FOCUSED DISCUSSION: PATHWAYS TO THE PROFESSORiate, CONSTITUTION AB

This session will offer a platform for a comprehensive discussion of promising ways to facilitate pathways toward the professoriate for underrepresented minorities in STEM fields through well-designed postdoctoral scholar experiences. Two panelists will share insights and lessons learned from their alliance, followed by group discussions.

Facilitator:

Robert M. Augustine, Senior Vice President, Council of Graduate Schools

Panelists:

Robin Garrell, Vice Provost, Graduate Education and Dean, Graduate Division, University of California, Los Angeles

M.J.T. Smith, Dean, Graduate School, Purdue University

12:15-2:15 PM

LUNCH PLENARY: ON THE ROAD TO TENURE - TIPS FOR SUCCESS AND MANAGEMENT, INDEPENDENCE B-E

Promotion to professor and the award of tenure are milestones in an academic career. Yet, these advancements are hurdles for even the most well-prepared candidate. This session features two colleagues who have successfully navigated the tenure and promotion process. They will offer strategic insights on how to manage complex issues during the critical tenure period and beyond. Open discussion will follow the plenary remarks.

Chair:

Robert M. Augustine, Senior Vice President, Council of Graduate Schools

Speakers:

Luis Cifuentes, Vice President for Research, Commercialization and Outreach, Texas A&M University, Corpus Christi

Christine Grant, Professor and Associate Dean of Faculty Development and Special Initiatives, College of Engineering, North Carolina State University

2:15-2:30 PM

BREAK

2:30-3:30 PM

NSF POST AWARD MANAGEMENT, CONSTITUTION AB

NSF staff will discuss and answer questions about the NSF guidelines for post-award management of AGEP awards, including, but not limited to: annual, final and project reports; award acknowledgement in publications and use of disclaimer statements; requests to add, remove or change a PI or Co-PI; requests for No Cost Extensions; and budgets.

Chair:

Mark H. Leddy, Program Director, Alliances for Graduate Education and the Professoriate, Division of Human Resource Development, Directorate for Education and Human Resources, National Science Foundation

Speakers:

Alan Arnold, AAAS Science & Technology Policy Fellow, Alliances for Graduate Education and the Professoriate, Division of Human Resource Development, Directorate for Education and Human Resources, National Science Foundation

Denise Martin, EHR/MPS Team Lead, Division of Grants and Agreements, Office of Budget, Finance and Award Management, National Science Foundation

L. Rashawn Farris, Grants and Agreements Specialist, Division of Grants and Agreements, Office of Budget, Finance and Award Management, National Science Foundation

3:30-4:00 PM

COFFEE BREAK, CONSTITUTION FOYER

4:00-5:15 PM

FOCUSED DISCUSSION: FOSTERING AND EMPOWERING PROGRAM CHAMPIONS IN STEM DOCTORAL EDUCATION, CONSTITUTION AB

This session will discuss promising ways to develop champions and advocates for underrepresented minorities in STEM doctoral programs. Two panelists will address the institutional environments that nurture and empower faculty members and program administrators to be advocates for underrepresented minorities in STEM. Open discussion will follow the panelists' remarks.

Facilitator:

Tykeia Nicole Robinson, *Howard Hughes Medical Institute Policy Fellow, Association of American Colleges and Universities and Consultant, Council of Graduate Schools*

Panelists:

Antonio A. Nunez, *Associate Dean for Academic Affairs and Postdoctoral Training, Michigan State University*

Renetta Garrison Tull, *Director of Graduate and Professional Pipeline Development and Special Assistant to the Senior Vice Chancellor for Academic Affairs, University System of Maryland and Associate Vice Provost for Graduate Student Development and Postdoctoral Affairs, University of Maryland, Baltimore County*

5:15-5:30 PM

BREAK

5:30-7:00 PM

NETWORKING RECEPTION/POSTER SESSION, PENN QUARTER AB/GRAND FOYER

FRIDAY, FEBRUARY 24

7:30-10:30 AM

REGISTRATION, CONSTITUTION A FOYER

7:30-8:00 AM

CONTINENTAL BREAKFAST, CONSTITUTION AB

8:00-9:00 AM

UNDERSTANDING PROJECT EVALUATION DESIGN,
IMPLEMENTATION AND USE, CONSTITUTION AB

The AGEP program is committed to increasing the number of historically underrepresented minorities completing STEM graduate education and contributing to the diversity of the STEM professoriate. This session will focus on the methods for evaluating program practices and using the results to improve program design. The presentation will explore the multiple dimensions of evaluation, identify challenges, and provide resources. This presentation will also discuss the integral role of evaluation in project modification, refinement, and evidence based decision-making. Open discussion will follow the plenary remarks.

Chair:

Hironao Okahana, Assistant Vice President, Research and Policy Analysis, Council of Graduate Schools

Speaker:

Jan Middendorf, Associate Director, Sustainable Intensification Innovation Lab, Kansas State University

9:00-10:00 AM

NSF FUNDING OPPORTUNITIES

NSF program officers will provide overviews of funding opportunities, including Program Solicitations, Dear Colleagues Letters, and Program Announcements of interest to AGEP awardees.

Chair:

Mark H. Leddy, Program Director, Alliances for Graduate Education and the Professoriate, Division of Human Resource Development, Directorate for Education and Human Resources, National Science Foundation

Speakers:

DEAR COLLEAGUE LETTER: IMPROVING GRADUATE STUDENT PREPAREDNESS

Margret A. Hjalmarson, Program Director, NSF INCLUDES, Division of Research on Learning in Formal and Informal Settings, Directorate for Education and Human Resources, National Science Foundation

NSF FUNDING OPPORTUNITIES (CONTINUED)

DEAR COLLEAGUE LETTER: MPS AGEP-GRS (NSF 16-125)

Kathleen McCloud, Program Director, Integrative Activities in Physics, Physics Frontiers Centers and Investigator-Initiated Research Projects, Division of Physics, Directorate for Mathematical and Physical Sciences, National Science Foundation

ADVANCE: INCREASING THE PARTICIPATION AND ADVANCEMENT OF WOMEN IN ACADEMIC SCIENCE AND ENGINEERING CAREERS (NSF 16-594)

Sharon R. Bird, Program Director, ADVANCE and Alliances for Graduate Education and the Professoriate, Division of Human Resource Development, Directorate for Education and Human Resources, National Science Foundation

NSF INCLUDES: INCLUSION ACROSS THE NATION OF COMMUNITIES OF LEARNERS OF UNDERREPRESENTED DISCOVERERS IN ENGINEERING AND SCIENCES (NSF 17-552)

Christopher R. Meyer Program Director, Division of Biological Infrastructure, National Science Foundation

10:00-10:20 AM

COFFEE BREAK, CONSTITUTION FOYER

10:20-12:15 AM

ROUND TABLE DISCUSSION, CONSTITUTION AB

This session will invite all conference participants to engage in topic-focused discussions about how the AGEP community can collectively move the needle in broadening participation and diversity in STEM doctoral education and the professoriate. Topics assigned to each table will guide conversations about leading transformative changes in STEM graduate education. Each table will have an opportunity to share insights with the entire group for additional discussion.

Facilitator:

Robert M. Augustine, Senior Vice President, Council of Graduate Schools

12:15-2:15 PM

LUNCH PLENARY: PATHWAYS TO A DIVERSE STEM PROFESSORiate, INDEPENDENCE B-E

Chair:

Mark H. Leddy, Program Director, Alliances for Graduate Education and the Professoriate, Division of Human Resource Development, Directorate for Education and Human Resources, National Science Foundation

Speaker:

W. James "Jim" Lewis, Acting Assistant Director, Office of Assistant Director, Directorate for Education and Human Resources, National Science Foundation

2:15-2:30 PM

BREAK

2:30-3:50 PM

CLOSING PLENARY: A SENSE OF URGENCY: MOVING BEYOND INCREMENTAL CHANGE, CONSTITUTION AB

By the year 2025, our workforce will be short by as many as 11 million credentialed workers. This will require many more postsecondary credentials to be awarded to African-Americans, American Indians, Hispanics, and first-generation college students. Likewise, as we move into the next several decades, more students will need to be equipped with the technological and analytical skills necessary to be successful in STEM-related fields, as well as in some technologically-based professions which do not even exist today. This concluding conversation will examine the implications of these realities for the community of AGEP scholars and practitioners and the need to dramatically increase the number of minority students pursuing and completing STEM doctorates, and entering into the professoriate. In this regard, strategies for scaling the most promising efforts, working collaboratively across institutions and developing champions to amplify your message will be shared.

Chair:

Suzanne T. Ortega, *President, Council of Graduate Schools*

Speaker:

Danette Howard, *Chief Strategy Officer and Senior Vice President, Lumina Foundation*

3:50-4:00 PM

CLOSING REMARKS

Suzanne T. Ortega, *President, Council of Graduate Schools*



