

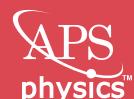
AGEP-GRS Conference

August 2 - 3, 2021



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September 2021



Authorship

The American Physical Society (APS) has sole responsibility for the contents of this report, and the questions, findings, and recommendations within. The material is based upon work supported by the National Science Foundation under Grant Number PHY-2114391. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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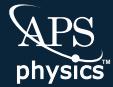
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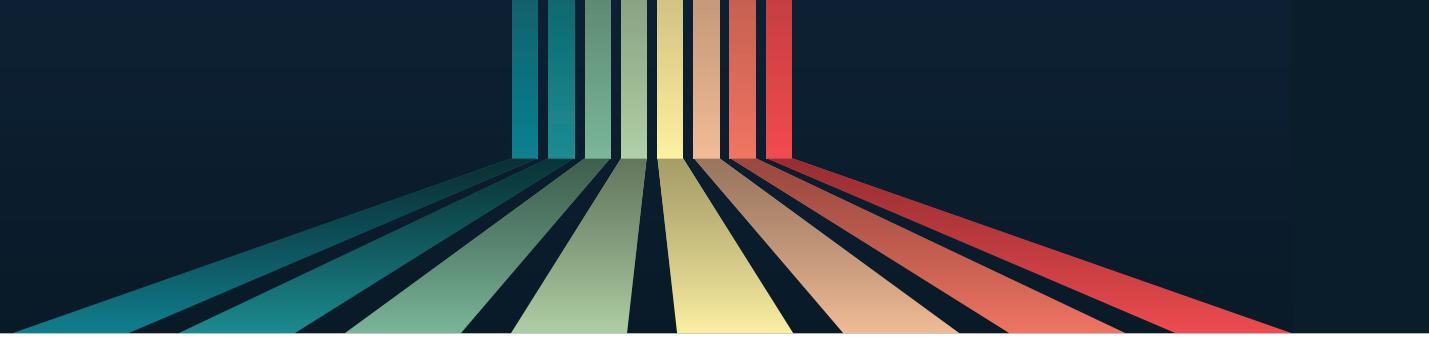
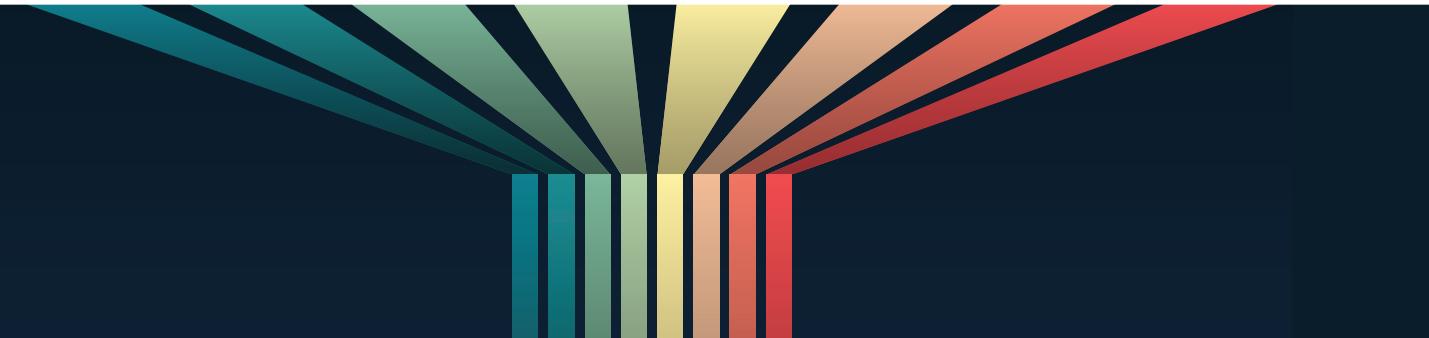


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Executive Summary



Since its inception in 2012, the MPS AGEP-GRS supplement has supported hundreds of graduate students from underrepresented groups by providing this unique funding opportunity to Principal Investigators across the five divisions represented by the NSF Directorate for Mathematical and Physical Sciences (MPS) – Astronomical Sciences, Chemistry, Materials Research, Mathematical Sciences, and Physics. The community of awardees and students are a resource to understanding the challenges facing faculty as they work to support graduate students from diverse backgrounds, and the effects on the students receiving these fellowships.

To develop a better understanding of the MPS AGEP-GRS program outcomes and to provide opportunities for professional and personal development with regards to inclusive practices in graduate education, the community convened in August 2021. The meeting was held virtually, via SpatialChat and Zoom, with plenary speakers, workshops, poster sessions, panel presentations, breakout discussions, and focus groups. Prior to the meeting, the community was surveyed and a program was developed, in collaboration with the AGEP-GRS conference steering committee and expert external evaluators. The convening brought together MPS AGEP-GRS awardees, the students supported with MPS AGEP-GRS funding, and representatives from five disciplinary societies (American Physical Society, American Astronomical Society, American Chemical Society, American Mathematical Society and Materials Research Society). The convening was characterized by open and honest communication, respect for diversity of experiences, and an establishment of a shared language, regardless of the subject being discussed. The meeting had the following set of conference themes, identified by our conference reporter, and the evaluators identified a set of key findings, as follows:

Conference Themes

- ▶ Graduate Student Professional Development
- ▶ Optimizing Mentoring Relationships
- ▶ Equity and Inclusion in Graduate Admissions and Education
- ▶ Student Wellbeing and Empowerment

Key Findings

- ▶ Awardees attributed an increase in racial diversity of their graduate programs and research groups to the AGEP-GRS program.
- ▶ The AGEP-GRS benefits graduate students by allowing them to focus on research rather than seeking additional employment.
- ▶ The AGEP-GRS application process is not aligned with graduate student recruitment.
- ▶ Graduate students seem to be more aware of supports available to them at their institutions than awardees.
- ▶ The short duration of the stipend compared to the time needed to complete the degree is a challenge for many graduate students.

Recommendations

Based on the findings and conversations with the AGEP-GRS awardees and the steering committee, we have developed a set of recommendations categorized into the following five areas. These are discussed further in the [Recommendations](#) section.

1. Publicize the AGEP-GRS program more broadly, not only to faculty, but to graduate students.
2. Allow students to have more agency in the proposal development and subsequent award.
3. Establish ongoing networking opportunities.
4. Provide career development resources to students along with the stipend.
5. Provide mentoring training opportunities to faculty members along with the award.

The specific actions recommended are also categorized by the key stakeholders, identified as these four:

National Science Foundation

AGEP Institutional Awardees

Current AGEP-GRS Awardees

Wider Community (including Professional Societies)

We note that graduate students are also key stakeholders, and we hope the recommendations empower them to be active participants in the AGEP-GRS program. Of course, we enthusiastically hope the graduate students take advantage of the recommended opportunities. However, the work described below should be done by the non-graduate student community to make the community more inclusive.

National Science Foundation:

- ▶ Clearly publicize this opportunity at eligible institutions, by reaching out to AGEP Institutional Awardees and department chairs to encourage them to promote the supplement in appropriate departments.
- ▶ Directly involve students in the application process by requiring students to co-author the application.
- ▶ Create a program-specific reporting requirement that students write and submit a status update on their research and professional development activities each year of the award.
- ▶ Expand the types of expenses allowed in the awards to include: travel support for disciplinary society membership and conferences. Both of these expenses will improve network development and professional development opportunities for the graduate students.
- ▶ Ensure that AGEP-GRS awardees are submitting the mentoring plan as required by the Dear Colleague Letter. Additionally, since this is a current requirement and yet mentors and mentees are indicating a dearth of mentoring resources, provide funds to support participation in mentorship co-training for students and mentors.



- ▶ **Note:** With the students taking co-ownership of this process, it is imperative that the NSF program officers view each submission as a new team, rather than viewing the faculty awardee alone. Faculty who have excellent mentoring skills may be viewed as having “too many awards” and there is a perception that they are discouraged from submitting additional requests or additional requests are not funded. This will be disappointing to the new student co-applicant. If there is a desire to limit the number of supplements awarded to a PI, this should be stated clearly in the program guidelines so that students are not penalized for partnering with a faculty researcher who has previously received support from the program.

AGEP Institutional Awardees:

- ▶ Reach out to eligible departments on your campus to encourage them to promote the AGEPS-GRS opportunity to eligible students and faculty in their departments.
- ▶ Reach out to supplement awardees and the supported students to encourage them to participate in development opportunities provided as a part of the AGEP Institutional Awards, including conferences and workshops at the institution.

Current AGEP-GRS Awardees: Work with your department director of graduate studies and department chair to...

- ▶ Promote this opportunity to eligible graduate students. The graduate student advising team should encourage eligible students to reach out to eligible faculty members to learn more about their research and, if appropriate, work with the faculty member to develop and submit the supplemental funding request.
- ▶ Build a culture of valuing the students and supporting their professional development in the area of pursuing external funding and managing award reporting activities.
- ▶ Ensure that students are encouraged and supported in pursuing networking opportunities in the department, the institution and more broadly. Explicitly recommend that the students join relevant professional societies. Offering reimbursement programs for membership (if students utilize the membership) is a model used successfully by graduate programs.
- ▶ Clearly advertise the existing professional development opportunities and normalize participation in professional development activities.
- ▶ Provide opportunities for mentorship training for your department members (students, staff, and faculty) either by bringing in experts to conduct training on your campus OR by developing a team of local experts (faculty and staff) to lead workshops in mentorship.

Wider Community/Professional Societies:

- ▶ Enable student memberships at reduced cost and through widely advertised initiatives.
- ▶ Encourage and normalize student participation in professional development in addition to their studies and research work, and ensure participation by students from all school types and backgrounds that are and should be represented in your field.
- ▶ Provide opportunities for your membership to attend mentorship workshops both in-person and virtually. Also, normalize the expectation that all members will benefit from mentorship training, not just the new researchers.

Survey Results

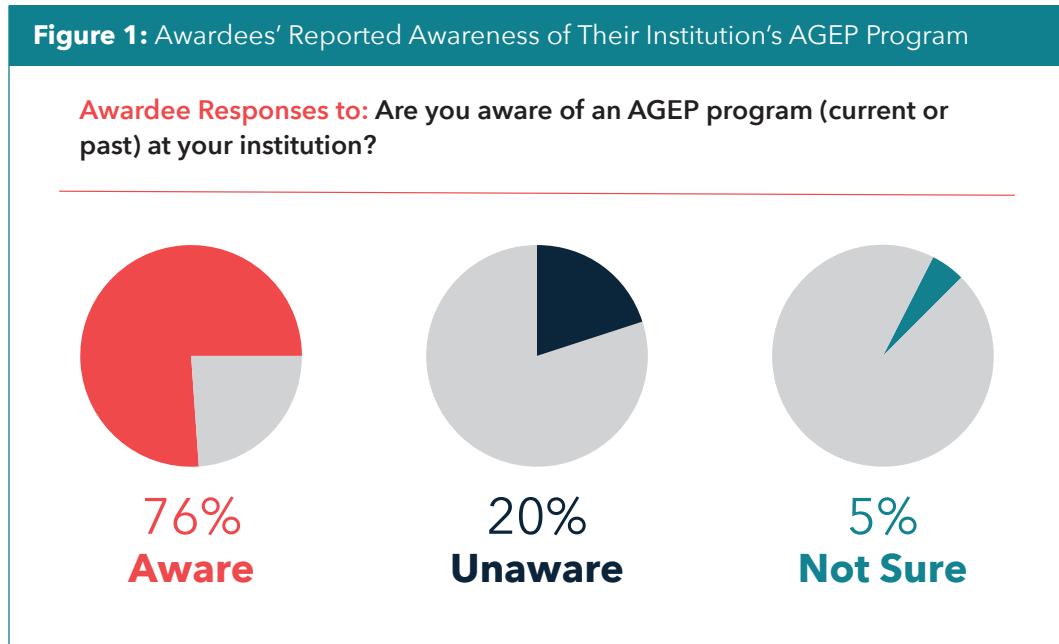


In March 2021, the external evaluator (WestEd) surveyed awardees and current/former graduate students who were funded by the AGEP-GRS. The goal of the survey for awardees was to gather information on how the supplemental funds were used, how the program could be improved, and to inform a convening of awardees and supported graduate students (to be held in August 2021). The goal of the survey for students was to gather information on how the grant award supported their work as graduate students, financially and otherwise, and how it can be improved to support future cohorts, as well as gathering their thoughts on the convening.

In total, 93 of 208 awardees completed the survey for a response rate of 46%. We received student contact information from awardees or allowed them to forward an anonymous survey link to graduate students they were currently or had formerly supported with a supplement. In total, 42 of 94 identified students completed the survey, plus 7 additional anonymous respondents, for a total of 49 students and a response rate of 52%. Note that this is out of a proposed minimum of 208 students (assuming at least 1 student for each awardee funded by AGEP-GRS). We do not know the total number of supported graduate students and could only contact the graduate students for whom awardees provided contact information. Below is a summary of the main survey results.

Awardees

The AGEP-GRS program grew out of the AGEP institutional program [1]. Most awardees reported that they were aware of their institution's AGEP program ([Figure 1](#)).



Awardees overwhelmingly reported that they supported only one graduate student through the AGEP-GRS program, with only 22% having supported two or more individuals. The respondents also indicated that if they had NOT had access to the AGEP-GRS they would have been able to support one student, with 17% indicating that they could have still taken on two or more students. In total, the awardees mostly supported one to five total graduate students in their group in a typical year (63%), with 32% reporting six to ten students and 5% reporting eleven or more students. In a typical year, these awardees overwhelmingly reported that they supported a maximum of five URM students with 86% of respondents choosing the option "1-5 URM students."

In asking awardees about the use of the AGEP-GRS for recruitment, they reported low use for recruitment to their research group (only 36% said yes) and even lower use to recruit to the graduate programs (12%). The challenges listed included the timeline for application not aligning with the graduate admissions process, the paperwork and the lack of awareness, among others (Figure 2). Despite this, there were a range of ways that awardees did find the AGEP-GRS useful for recruitment, detailed in Figure 3.



"I really think that if not for the program, I would not have been able to keep my students in our department."

AGEP-GRS Awardee



Figure 2: Challenges of Using the AGEP-GRS to Support Recruitment Efforts

Awardee Responses to: What are the challenges to using the AGEP-GRS to support recruitment efforts?



52%
Application Timeline

Timeline of AGEP-GRS application deadlines and student recruitment
(20 mentions)

Supplement must be used in conjunction with existing NSF grant (3 mentions)

Application paperwork (3 mentions)

URM status unknown (3 mentions)

Not aware of the AGEP-GRS (3 mentions)

The duration of the existing NSF grant (2 mentions)

Other (4 mentions)

Figure 3: Ways the AGEP-GRS was used to Support Recruitment Efforts

Awardee Responses to: How was the AGEP-GRS used to support your recruitment efforts?



27%
Able to make offer to a graduate student

Able to make an offer to a graduate student (7 mentions)

With the supplement, able to cover additional time or assistantships for a graduate student (5 mentions)

Able to tell applicant AGEP-GRS funding was available (4 mentions)

Able to tell applicant AGEP-GRS funding would be applied for (3 mentions)

Possible AGEP-GRS funding allowed for taking on another student (3 mentions)

Other (4 mentions)

Figure 4: AGEP awardees discuss how individual development plans (IDPs) can be used to better prepare graduate students and postdoctoral fellows for successful careers in science

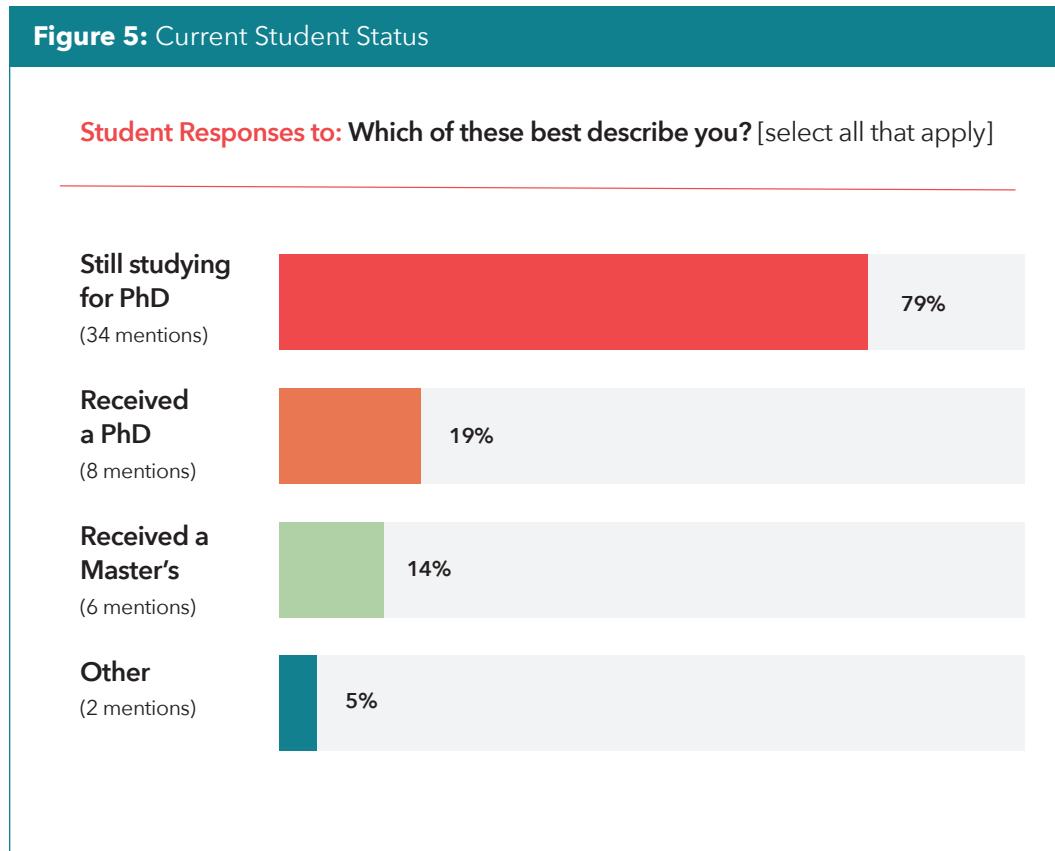
Group Discussion

To be well prepared for successful careers in 2021 and beyond, what skills do your graduate students and postdoctoral fellows need to learn?

A screenshot of a video conference call titled "Group Discussion". The call features 17 participants arranged in a grid. Each participant has a small video thumbnail and their name below it. The names listed are: Mike Chini (he/him), Anne Kornahrens (she/her), Luda Sakhaneko, Rachel S Goldman, Francois Gabbai, Claudia Ratti, Banerjee, Sarbjit, Malika Jeffries-EL (She/her), Alan Balch, Philip S Clifford, Suzanne E Mohney, Steve Diver, Karen Daniels (she), Gang-Yu Liu, Tim Chupp, and Melba Newsome. The video player interface shows controls for volume, mute, and full screen at the bottom left. The names of Jing Xia are visible at the bottom right of the screen.

Students

The student survey assessed students' current and past status to paint a picture of the outcomes for the student respondents ([Figure 5](#)). Seven survey respondents indicated the start and end date to their PhD studies, giving an average length of 5.14 years.



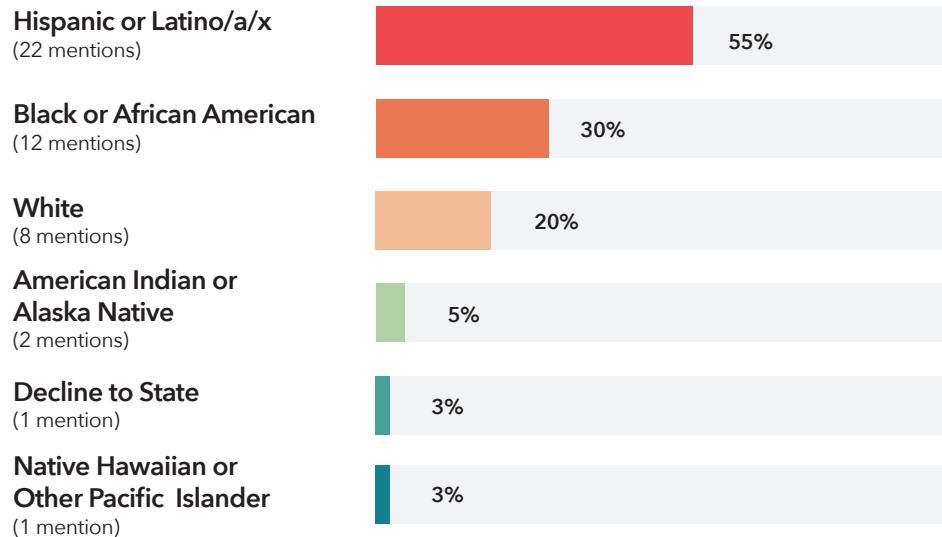
Other overall results included the number of years students were financially supported doing research (and not teaching) during their graduate school years. This ranged from 0.5 to 6 years of research support, with only 29% reporting less than two years of support on research and 27% reporting four years or more.

Students & Awardees

A few questions were asked to both students and awardees, allowing a comparison of the student and awardee demographics. The results in [Figure 6](#) and [Figure 7](#) show the need for additional faculty that are representative of the diversity of students.

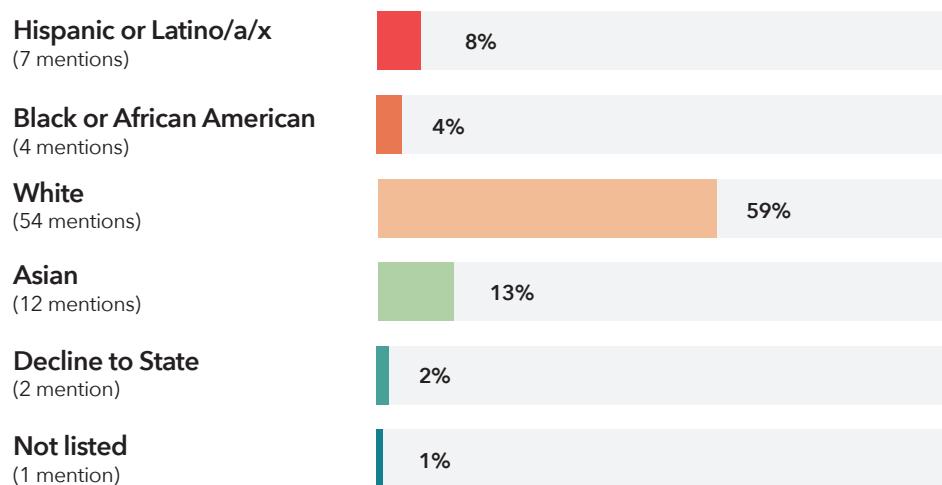
Figure 6: Student and Awardee Demographics, Race/Ethnicity

Student Responses to: I identify my race/ethnicity as: [select all that apply]



Note: Asian and Not Listed were also options on the survey that were not selected by participants

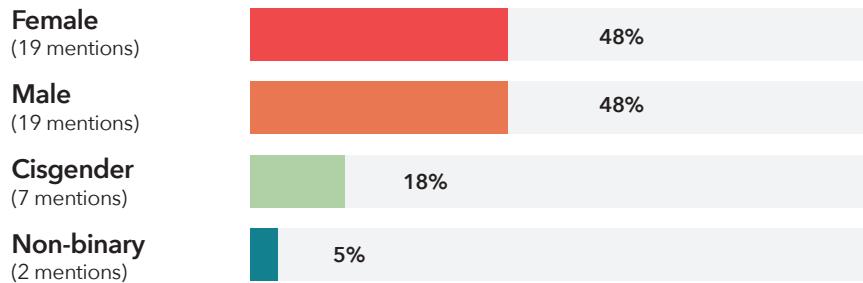
Awardee Responses to: I identify my race/ethnicity as: [select all that apply]



Note: Open-ended responses included: Middle Eastern

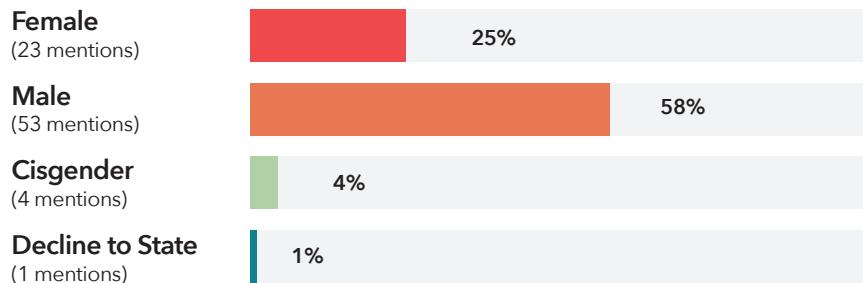
Figure 7: Student and Awardee Demographics, Gender

Student Responses to: I identify my gender as: [select all that apply]



Note: Transgender, Not Listed, and Decline to State were also options on the survey that were not selected by participants

Awardee Responses to: I identify my gender as: [select all that apply]



Students and faculty both identified supports that are available to students at their institutions, with differing results showing a difference in awareness between the two groups ([Figure 8](#)). The high availability and awareness of certain categories (career development services; peer mentoring, professional development on non-research skills) to both groups only somewhat correlated with the supports that had the highest participation rate as self-reported by students. Taking into account the availability as reported in Figure 8, these were peer mentoring, structured mentoring support for advisor/advisee relationships, and structured mentoring for mentors who are not the student's advisor.

Students shared further supports that were needed ([Figure 9](#)), as well as key topics that were not covered by the conference themes but desired:

- ▶ Financial literacy in grad school
- ▶ Transitioning to alt-academic careers or industry
- ▶ How to practice self-advocacy
- ▶ Translating research experience to industry careers

Figure 8: Student and Awardee Awareness of Available Supports

Responses to: Are the following supports available for graduate students at your institution?

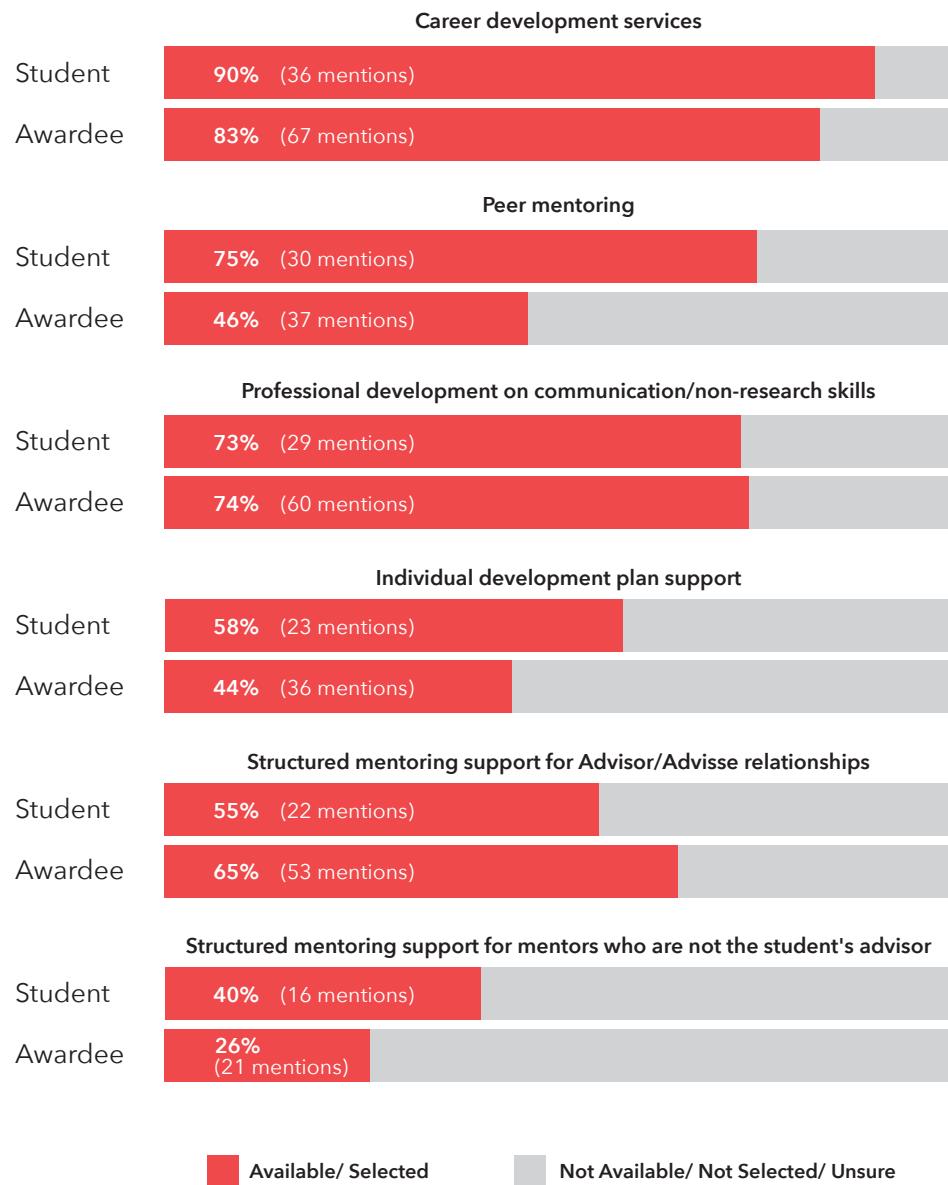


Figure 9: Further Supports Needed for Graduate Students

Student responses to: What further supports do you believe would benefit graduate students at your institution that do not currently exist?



Advisor/Advisee relationship support
(7 mentions)



Mental health support (5 mentions)

A structured mentoring role for graduate students (4 mentions)



Career development support (3 mentions)

Support for faculty members (3 mentions)



Financial literacy support (2 mentions)

Mentoring for non-research topics
(2 mentions)

More financial support (2 mentions)

Other (4 mentions)

Summary: The most common additional support identified by students was support for advisor/advisee relationships. Several respondents also said more mental health and career development support would benefit graduate students at their institution. Others requested financial literacy courses and mentoring for non-research topics.

Convening Summary & Themes

Authored by Melba Newsome,
the AGEP-GRS reporter [2]



Session Overview

Opening Plenary Session

PRESENTER: Ebony McGee, PhD, Associate Professor of Diversity at STEM Education and Medicine and Health and Society at the Peabody College of Education at Vanderbilt.

McGee's presentation, *Black, Brown, Bruised: How Racialized STEM Education Stifles Innovation*, revealed what it means to be a STEMer of color and academically successful in contexts where people of color are few and negative beliefs about their ability and motivation persist.

Optimizing Mentoring Relationships

PRESENTER: Melissa McDaniels, PhD, Associate Executive Director CIMER and co-investigator for NSF INCLUDES Alliance: IGEN, University of Wisconsin Madison subaward.

The workshop is based around the findings and recommendations of [The Science of Effective Mentorship in STEMM](#), a practical resource guide for mentoring practitioners to create and support viable, sustainable mentoring support systems created by the National Academies of Science, Engineering and Medicine.

Student Wellbeing

PRESENTERS: Licensed clinical professional counselors Sydnei Woodly and Jill Rawl of Second Stories Therapeutic Interventions.

The presentation, *Our Mental Health & Wellness In An Ever Stressful and Changing World*, was geared toward helping students effectively manage their personal stress.

Engaging with Professional Societies

PRESENTERS: Geraldine Cochran, PhD, the American Physical Society; Joerg Schlatterer, PhD, the American Chemical Society; Rodolfo Montez, PhD, the American Astronomy Society; Abbe Herzig, PhD, the American Mathematical Society; and Todd Osman, PhD, the Materials Research Society.

Representatives discussed their society's mission statements, gave overviews of the available resources and ways they support their members' success with a focus on equity and inclusion.

Student Empowerment

PRESENTERS: Arianna Long, graduate student in Physics at UC Irvine; Annabelle Lolinco, Iowa State Chemistry graduate student; Steven Lopez, PhD, Assistant Professor of Chemistry at Northeastern University.

Panelists discussed their unique experiences in developing inclusive initiatives, leading to increased benefits for themselves and their broader communities.



Fostering Successful Scientific Careers with Individual Development Plans

PRESENTERS: Philip Clifford, PhD, Associate Dean for Research in the College of Applied Health Sciences at the University of Illinois, Chicago; Jenna Hicks, Program Manager, Office of Professional Development at University of Minnesota-Twin Cities.

An individual development plan (IDP) is a systematic process to help individuals structure and track their professional progress. An overview of the process and its benefits was presented.

Equity in Graduate Admissions / Holistic Review

PRESENTERS: Julie Posselt, PhD, Associate Professor of Education at the University of Southern California; Casey Miller, PhD, Associate Dean for Research and Faculty Affairs at Rochester Institute of Technology.

Holistic Review is an alternative admissions model that considers the applicants' experiences, attributes and academic metrics, as well as the value an applicant would contribute to learning, practice, and teaching.

Developing an Inclusive Research Space

PRESENTERS: Aireale Rodgers, Research Assistant at the Pullias Center for Higher Education and PhD Student in the Urban Education Policy program at USC Rossier School of Education; Annie Wofford, Postdoctoral Scholar, Northern Arizona University.

The presentation focused on the key implications for disrupting power and privilege to promote racial and gender equity in a variety of graduate learning environments.

Conference Themes

The conference presentations fell into four broad themes: student professional development, mentoring, equity and inclusion, and student well being. An overview of these themes, with key takeaways from the presentations and the participants is presented below.

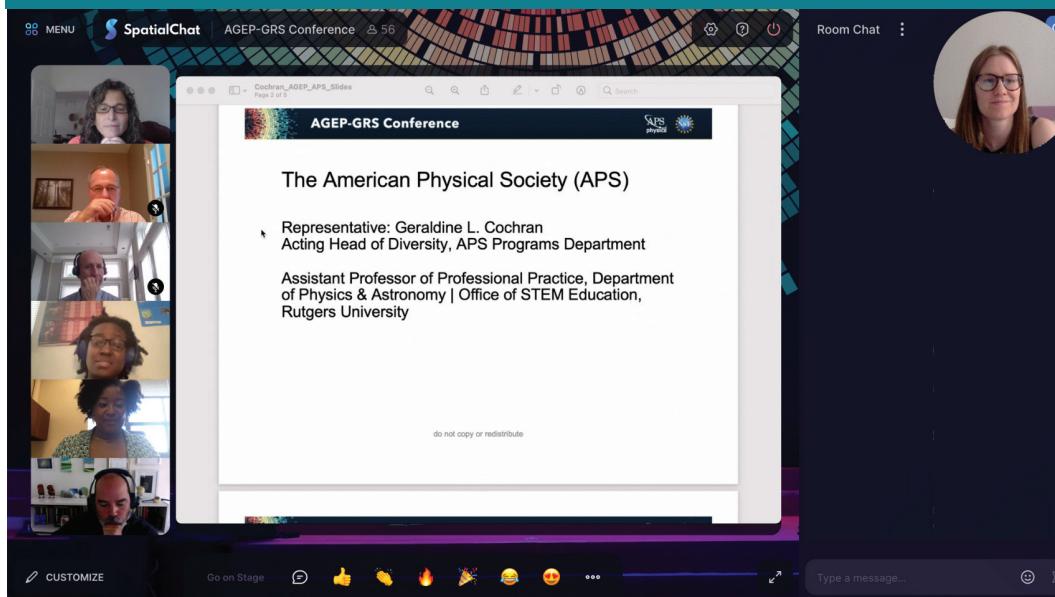
Graduate Student Professional Development

Two panels were centered around ways students could enhance their careers and professionalism by becoming a member of a professional society and creating an individual development plan.

Engaging with Professional Societies

The American Physical Society, American Chemical Society, American Astronomical Society, the American Mathematical Society and the Materials Society are nonprofit organizations, ranging in membership from 7,700 to 155,000. Using the lens of increasing diversity, representatives from the professional societies gave overviews of their organizations and discussed resources and development opportunities available to help their members flourish ([Figure 10](#)). Opportunities shared included employment services, networking, conferences, volunteer opportunities, mentoring, bridge programs, career guides, e-courses, and travel grants. Each society has made equity, diversity and inclusion a priority by offering a variety of programs to help students define their goals and interests and choose the graduate path that aligns with those goals and interests.

Figure 10: Society representatives gave overviews of resources available to members before discipline-specific small group conversations



Advice shared by panelists in the session included:

- ▶ Choosing the society that's right for you depends on your interests and future goals. Consider which aspect of your studies you would like to maximize, where you see the greatest potential for networking with people who can help you to find new job and/or career opportunities. Joining a society is also a great way to learn how the broader profession works.
- ▶ Consider the benefits of joining more than one society. There is a lot of crossover in membership and many people belong to several different organizations. Having multiple memberships allows you to participate in different conferences and meetings and, because most societies have highly discounted membership rates for graduate students, the cost isn't necessarily prohibitive. There is also a great deal of reciprocity among societies. In some cases, joining one organization will give you a discount membership rate with another organization. Members of one organization are often allowed to attend another organization's meetings.
- ▶ For underrepresented students who experience racism and isolation, these societies are a way to connect and share experiences with others from similar backgrounds and experiences.



Fostering Successful Scientific Careers with Individual Development Plans

An individual development plan (IDP) is a systematic process to help individuals structure and track their professional progression. This session introduced the concept of IDPs and provided an overview of the process of developing an IDP. A separate session for trainees and awardees followed.

There are four steps to creating an IDP: Self-assessment, career exploration, setting goals, and implementing the plan.

While most students enter graduate school because they love the field, many have not defined their career goals and do not do so even by the time they enter a postdoctoral fellowship. The faculty session discussed how to use IDPs to better prepare graduate students and postdoctoral fellows for successful careers in science by detailing the **core competencies** and **science knowledge** (see orange box below for details).

National Postdoctoral Association Core Competencies:	Core Science Knowledge
<ul style="list-style-type: none">▶ Disciplinary Knowledge▶ Research Skills▶ Communication Skills▶ Professionalism▶ Leadership and Management▶ Responsible Conduct of Research	<ul style="list-style-type: none">▶ Lab Skills▶ Analytical Skills▶ Teaching Skills▶ Communication Skills▶ Management Skills▶ Career Development Skills▶ Professional Ethics

Mentoring

Establishing and sustaining a good mentoring relationship in graduate school is essential for success. Too often, the parameters of effective mentoring can be difficult to navigate, leaving both mentor and mentee frustrated. This conference theme included two sessions, one for awardees and one for students, to help ensure a mutually beneficial and respectful relationship.

Optimizing Mentoring Relationships

Mentoring discussions centered around the National Academies report [3] that defines mentorship as a professional working alliance where both parties play a significant role and achieve growth. The consensus study sought to answer several questions:

- ▶ How can you create a culture of effective mentorship in STEM fields?
- ▶ What are some systematic ways to align expectations that satisfy the student and advisor?
- ▶ How can you support graduate students, postdocs or trainees in balancing personal and academic work challenges?
- ▶ How do you motivate and support a mentee's independence in a developmentally appropriate way?
- ▶ What's the best way to be accommodating without compromising on rigor?



Effective mentorship has been linked to enhanced resilience, productivity, self-efficacy, and career satisfaction. It is also an important predictor of academic persistence and student success. Good outcomes include an enhanced sense of science identity, belonging and self-efficacy, and the belief in one's ability to achieve and succeed in a specific domain.

Mentoring also increases an institution's ability to recruit and retain people from traditionally underrepresented groups. Institutions should take into account the quality of research mentorship into the criteria for annual review, promotion, and tenure.

Conference participants engaged in activities and used various tools to optimize their research mentoring relationships to serve both inclusion and scholarly productivity. Recognizing and responding to cultural identities and the importance of culturally responsive mentoring were key metrics.

Key elements to optimize mentorship:

- ▶ Trust among all parties
- ▶ Explicitly aligning expectations with more precise instruction and guidance
- ▶ Establishing a certain level of comfort and transparency

Participants were asked to analyze and give their opinions about a case study in which an advisor was struggling to connect with the mentee around a particular item: the advisor thought there should be weekly progress meetings. Although the mentor believes the student needs help, the student doesn't seem open to guidance; the student often fails to follow through, skips meetings, shows up unprepared and doesn't take notes. Faculty and students, in their separate sessions, provided feedback and suggestions for this hypothetical situation.

Faculty feedback and suggestions

- ▶ If weekly sessions are too demanding, consider meeting biweekly or monthly.
- ▶ Simply assigning tasks is not a good project management strategy. Including the mentee's input when designing the project will make the student more engaged.
- ▶ Form small teams and assign specific responsibilities to students on a rotating basis. This may ensure that progress is made even when one of the students is struggling.
- ▶ Look for indicators of personal problems or roadblocks with the experiment or apparatus.
- ▶ Consider allowing mentees to present at a departmental seminar or regional meeting as an option. They gain experience presenting their science and may find the project more engaging than an advisor meeting.

Student feedback and suggestions

- ▶ Fewer restrictions and more flexibility with scheduled meetings based on how things are going at any given time.
- ▶ Face-to-face mentoring is preferred over Zoom meetings.
- ▶ Advisors should be more flexible and willing to consider new information and make adjustments.

Equity and Inclusion

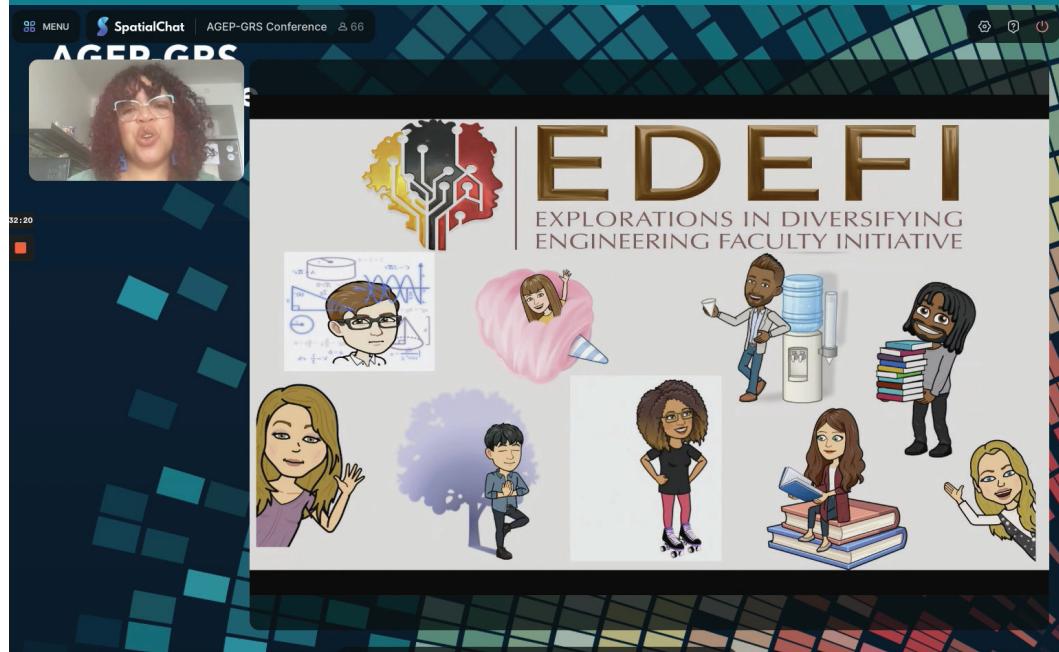
Three panels focused on ensuring equity (fair treatment, equality of opportunity, and fairness in access to information and resources) and inclusion (building a culture of belonging by actively inviting the contribution and participation) of all people.

Black, Brown, Bruised: How Racialized STEM Education Stifles Innovation.

Ebony McGee's presentation laid out how students survive in racialized academic climates and at what cost. She discussed why institutions recruit underrepresented racially minoritized (URM) people into STEM disciplines into a climate and culture that alienates and eliminates them.

Dr. McGee presented evidence that excluding people of color from STEM disciplines limits innovation. She argued for the implementation of sustainable actions that create equitable and inclusive contexts in which URM within the STEM ecosystem can feel welcome, can be open about who they are, and can see themselves as thriving in their chosen disciplines.

Figure 11: Ebony McGee speaks about EDEFI (Explorations in Diversifying Engineering Faculty Initiative) regarding the empowerment of minoritized students, researchers, employees (especially faculty), administrators and entrepreneurs in the engineering and computing ecosystem



Introduction to Equity Based Holistic Review

The goal of holistic review is to make access to graduate education more equitable and improve retention and recruitment. The discussion took a deep dive into the role admissions may be playing in the lack of equity, implicit bias, patterns of undergraduate



grade inflation, impediments for minority participation, GRE score gaps, and useful ways of assessing and predicting student success.

Relying on decades of data about the bachelor's degrees awarded to Black, Latinx and Indigenous students across a variety of disciplines, Drs. Posselt and Miller led awardee participants in a broad conversation centered around inequalities in US graduate education, the legal landscape for race conscious admissions, and how current practices limit access for women and people of color.

Participants wanted to know how they can convince naysayers at their institutions that this is an issue and things need to change. The facilitators suggested that highlighting the gap between stated commitments to diversity and the realities of things on the ground is perhaps the best way to get individuals and institutions to live up to their commitments. If there is an underlying question about the value of diversity, discussing the data about the benefits of diversity in higher education can be a starting point.

Some attendees expressed concerns that the presenters may be cherry-picking data to support a specific perspective or that the intent of certain statements or actions were misinterpreted. The presenters noted that a good deal of racism and discrimination is not intended but, nonetheless, has the same effect.

Developing an Inclusive Research Space–Building Capacity for Transformation

Presenters Drs. Rodgers and Wofford shared research from the social sciences to facilitate a conversation about the racialized and gendered dimensions of graduate education. The presenters defined racialization as the process by which societies construct races as real, different and unequal in ways that matter to economic, political, and social life.

A perspective on white privilege was shared as "when your history is part of the core curriculum and mine is taught as an elective." This type of discrimination and erasure is commonplace in academia and is tied to epistemic oppression or the unwarranted infringement on the Epistemic Agency of Knowers. Whose knowledge is deemed legitimate, in which context and which problems get classified as scientific? These decisions are bound up with and are responsive to structural racism and white supremacy.

These disciplinary logics expose the taken-for-granted answers to questions such as "what is considered the shared work of the discipline?" or "what are the tools of our trade?" Presenters pushed attendees to think about the right ways to put these tools into action in service of the problems that the representative disciplines are trying to solve.

The presenters laid out three steps for ensuring racial and gender equity:

- ▶ Commit to giving marginalized students learning environments that embrace and develop their whole selves. Reimagine learning environments in ways that are reflective of and responsive to the growing needs of diverse students.
- ▶ Move beyond diversity to wholesale transformation. Bringing in a more diverse population is an important first step, but it's essential to give students decision-making power and to provide them with the necessary tools to assimilate into the existing culture.
- ▶ Gain a deep understanding of the racialized and gender-biased nature of our educational contexts.

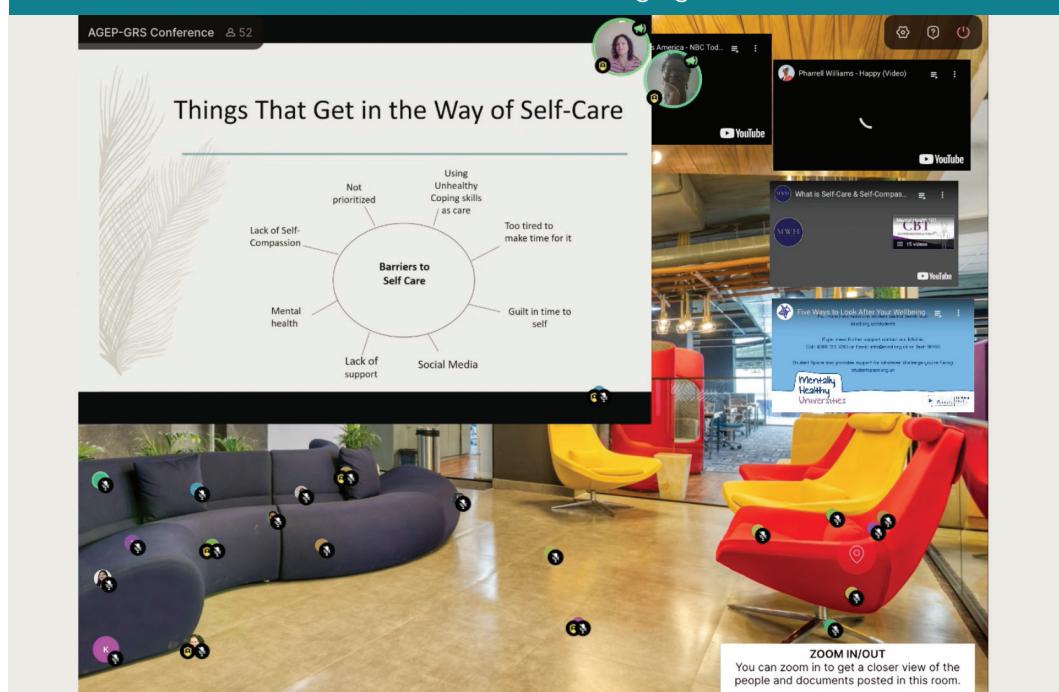
Student Wellbeing and Empowerment

Two panels focused on ways students can practice self-care for their emotional and physical health and how to become stronger and more effective in controlling one's life and career.

Student Wellbeing

Sydney Woody and Jill Rawl focused on mental health and self-care and provided information about how to recognize the signs of trouble, what to do in difficult times, and what resources are available ([Figure 12](#)).

Figure 12: Sydney Woody and Jill Rawl speak about factors that get in the way of self-care for students in an ever stressful and changing world



Mental health is negatively impacted by a variety of factors, including a lack of support, social media, feelings of guilt and, of course, the pandemic. Stress manifests in many different ways. It can decrease motivation, disrupt sleep patterns, cause physical ailments like headaches, stomach aches, and high blood pressure. Impulsive behaviors like drinking more, increase in negative coping skills like drinking, smoking, poor hygiene, under-eating or overeating are also common.

Engaging in physical and mental activities can help reduce anxiety and depression. Examples shared included getting close to nature or performing mindfulness exercises like meditation, breathing exercises, or yoga. Studying the arts, learning new things, or helping others can also relieve stress and help students to feel better.



Student Empowerment

Pursuing graduate studies can be both empowering and intimidating. The three first-generation STEM presenters reflected on their personal challenges and opportunities of their grad school experiences. From small campus mentoring groups to national non-profits, presenters Long, Lolinco and Lopez developed initiatives that benefitted themselves, as well as their broader communities. Students engaged with panelists on ways to enhance their abilities and prepare for the next steps.

Ariana Long is in her final year of her PhD in physics and astronomy at UC Irvine. During undergrad she often felt ostracized, dismissed and made to feel as if she didn't belong. That led her to build a community around herself by mentoring other women of color. She has mentored over 100 Black, Indigenous and Latinx undergrads and is currently creating an international mentoring program for women of color in STEM through Vanguard STEM [4].

While a PhD student at UCLA, Steve Lopez created the Alliance for Diversity in Science and Engineering (ADSE) [5] to increase the participation of underrepresented groups in academia, industry, and government. He continued his efforts during his postdoc at Harvard and spent two years growing the organization there. ADSE supports, organizes and oversees local, graduate student-run organizations that reach out to students and scientists of all ages and backgrounds.

Annabelle Lolinco is on the leadership council for the National Science Policy Network [6], an early career group dedicated to fostering engagement among early career scientists and engineers in policy making by fostering community, training the next generation of leaders and empowering advocates for the role of science in society. She co-chairs the diversity, equity and inclusion committee. "This is a really important part of navigating STEM was figuring out places where we can lift up people and make people of all groups kind of feel like they belong," said Lolinco.

Key Findings & Recommendations

Key Findings

The following key findings emerged from the pre-conference survey, focus groups, and post-conference survey. They include input and feedback from the participating awardee and graduate students, whose active engagement contributed to the success of the conference.

Awardees attributed the increase in racial diversity of their graduate programs and research groups to the AGEP-GRS program. Open-ended survey responses indicate the AGEP-GRS program allowed awardees to financially support more graduate students of color. This achievement was supported by discussions in focus groups, in which awardees spoke about the ability to take on additional students of color with the stipend. Many told success stories of students who had faced personal or systemic challenges to persevere in or complete their graduate programs with financial support from the AGEP-GRS.

The AGEP-GRS benefits graduate students by allowing them to focus on research. Through the surveys and focus groups, the most commonly identified theme was the financial benefit the stipend provided students, who could focus on research rather than teaching during their graduate programs. This gave students time to establish better relationships with their advisors, make progress in research and publications, and take care of their physical and mental well-being. During focus groups with awardees and students, nearly every success story was related to the students' ability to focus on research because of the AGEP-GRS.

The AGEP-GRS application process is not aligned with student recruitment. The misalignment of the AGEP-GRS application process and student recruitment was the most common challenge identified by awardees in the pre- and post-conference surveys. Many awardees said that they were not able to use the supplement for recruitment because they had to identify a specific student before applying for the supplement. On the pre-conference survey, a high percentage of awardees indicated the AGEP-GRS was not used to recruit students to their research group (64 %) or departments (88 %). This was also a common theme identified in focus group discussions.

Graduate students seem to be more aware of supports available to them at their institutions than awardees. Survey responses from awardees and graduate students suggest students are more aware of supports available to them at their institution. For example, 90 % of students indicated that career development services were available at their institution, compared to 74 % of awardees. Similarly, 75 % of students reported that peer mentoring support was available at their campus, compared to 40 % of faculty members.

The duration of the stipend is a challenge for many graduate students. Data from surveys and focus groups suggest the three-year limit on the stipend presents challenges for graduate students, who are typically enrolled in graduate programs for five or six years. Faculty members described the challenges they often faced to continue supporting students after the AGEP-GRS funds ended. Students also described the tension of financial insecurity after their stipend expired.

Recommendations

The external evaluator WestEd, in conjunction with the steering committee and conference organizing team, compiled and presented the following recommendations for improvement of the program and the environment for Black, Latinx and Indigenous students in the mathematical and physical sciences. These are based on survey results, focus groups, steering committee conversations, and AGEP-GRS awardee/student input. Bulleted actions particularly call on key stakeholders to engage in further actions:

National Science Foundation

AGEP Institutional Awardees

Current AGEP-GRS Awardees

Wider Community (including Professional Societies)

We note that graduate students are also key stakeholders and we hope the recommendations empower them to be active participants in the AGEP-GRS program. Of course, we enthusiastically hope the graduate students take advantage of the recommended opportunities. However, the work described below should be done by the non-graduate student community to make the community more inclusive.

Publicize the AGEP-GRS program more broadly, not only to faculty, but to graduate students. Both awardees and students recommended advertising the AGEP-GRS program and providing more details about the program on the NSF website. Some awardees said that they had only recently discovered the program, and a few admitted they were still unfamiliar with many of the details. Increasing awareness of the program could make it accessible to more faculty members and graduate students, who would benefit from a better understanding of NSF funding as future researchers and academics.

- ▶ **NSF:** Clearly publicize this opportunity at eligible institutions, by reaching out to **AGEP Institutional Awardees** and department chairs to encourage them to promote the supplement in appropriate departments.
- ▶ **Current AGEP-GRS Awardees:** Work with your department director of graduate studies and department chair to promote this opportunity to eligible graduate students. The graduate student advising team should encourage eligible students to reach out to eligible faculty members to learn more about their research and, if appropriate, work with the faculty member to develop and submit the supplemental funding request.

Allow students to have more agency in the proposal development and subsequent award. AGEP-GRS participants said that providing more agency to students would improve the program. Allowing students to take part in the process is a form of professional development that could benefit future researchers and academics. It also has the potential to increase their sense of ownership in the program and decrease feelings of imposter syndrome and tokenism.

- ▶ **NSF:** Directly involve students in the application process by requiring students to co-author the application. NSF should also require a program-specific reporting requirement that students write and submit a status update on their research and professional development activities each year of the award.
- ▶ **Note:** With the students taking co-ownership of this process it is imperative that the NSF program officers view each submission as a new team, rather than

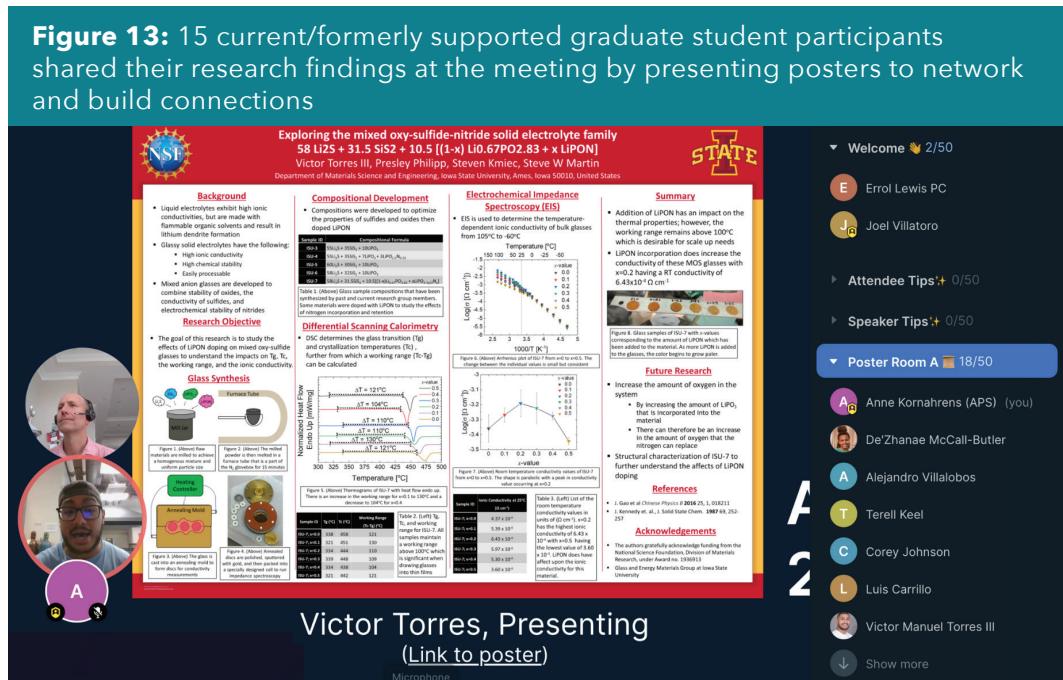


viewing the faculty awardee alone. Faculty who have excellent mentoring skills may be viewed as having “too many awards” and there is a perception that they are discouraged from submitting additional requests or additional requests are not funded. This will be disappointing to the new student co-applicant. If there is a desire to limit the number of supplements awarded to a PI, this should be stated clearly in the program guidelines so that students are not penalized for partnering with a faculty researcher who has previously received support from the program.

- ▶ **Current AGEP-GRS Awardees:** By working with your department colleagues to promote this opportunity to eligible students and helping the students connect with eligible faculty, the department will build a culture of valuing the students and supporting their professional development in the area of pursuing external funding and managing award reporting activities.

Establish ongoing networking opportunities. Data collected in focus groups and the post conference survey suggest attendees found the conference valuable, especially the networking opportunities and the resources that were provided. Establishing ongoing networking opportunities would allow students and faculty to build and maintain relationships, share professional and personal experiences, and take part in professional development. Both awardees and students requested these opportunities.

- ▶ **NSF:** Provide support for students to attend disciplinary society conferences where they can develop their professional network and engage in professional development workshops. The NSF can also support student professional development by providing funds for society membership dues to enable the students to become part of a professional community and to participate in professional development opportunities provided by the society.
- ▶ **AGEP Institutional Awardees:** Reach out to supplement awardees and the supported students to encourage them to participate in development opportunities provided as a part of the AGEP Institutional awards, including conferences and workshops at the institution.
- ▶ **Current AGEP-GRS Awardees:** Work with your department colleagues, including the director of graduate studies, to ensure that students are encouraged and supported in pursuing networking opportunities in the department, the institution and more broadly. Explicitly recommend that the students join relevant professional societies. Offering reimbursement programs for membership (if students utilize the membership) is a model used successfully by graduate programs.
- ▶ **Wider Community/Professional Societies:** Enable student memberships at reduced cost and through widely advertised initiatives.



Provide career development resources to students along with the stipend. Students commonly requested career development resources in survey responses and in focus groups. Some said that the stipend was very appreciated, but that the AGEP-GRS program should also provide resources to help graduate students secure employment after their programs. Specifically, students requested networking events with industry professionals, interview workshops, and resume development support.

- ▶ **NSF:** Allow awardees to request funds to cover graduate student membership dues for professional societies and travel to conferences so students can attend meetings to develop their research network by presenting their research findings and attend professional development workshops.
 - ▶ **Current AGEP-GRS Awardees:** Encourage your department and the director of graduate studies to clearly advertise the existing professional development opportunities for graduate students. Work with colleagues to assure graduate students that participation in these activities is a normal activity for graduate students and that professional development is a part of their work/educational responsibilities, not an extra activity they need to find time for. Also, encourage the department to ask the graduate students what types of professional development they would find valuable.
 - ▶ **Wider Community/Professional Societies:** Encourage and normalize student participation in professional development in addition to their studies and research work, and ensure participation by students from all school types and backgrounds that are and should be represented in your field.



Provide mentoring training opportunities to faculty members along with the award. Awardees consistently identified conference sessions about mentoring as the most valuable and requested more mentoring sessions and resources at future conferences. Graduate students also suggested providing additional mentoring resources to awardees and possibly requiring them to attend future conferences.

- ▶ **NSF:** Ensure that AGEP-GRS awardees are submitting the mentoring plan as required by the Dear Colleague Letter. Additionally, since this is a current requirement and yet mentors and mentees are indicating a dearth of mentoring resources, provide funds to support participation in mentorship co-training for students and mentors.
- ▶ **Current AGEP-GRS Awardees:** Encourage your institution or department to provide opportunities for mentorship training for your department members (students, staff and faculty) either by bringing in experts to conduct training on your campus or by developing a team of local experts (faculty and staff) to lead workshops in mentorship.
- ▶ **Wider Community/Professional Societies:** Provide opportunities for your membership to attend mentorship workshops both in-person and virtually. Also, normalize the expectation that all members will benefit from mentorship training, not just the new researchers.

References



- [1] Ambroso, E. (2021). Evaluation of the Alliances for Graduate Education and the Professoriate Graduate Research Supplements (AGEP-GRS) Program and Conference. San Francisco, CA: WestEd.
<https://beta.nsf.gov/funding/opportunities/alliances-graduate-education-and-professoriate-agep>
- [2] Newsome, M. (2021). AGEP-Graduate Research Supplement Conference 2021.
- [3] National Academies of Sciences, Engineering, and Medicine. 2019. The Science of Effective Mentorship in STEMM. Washington, DC: The National Academies Press.
<https://doi.org/10.17226/25568>.
- [4] <https://www.vanguardstem.com/>
- [5] <https://www.allianceinscience.org/>
- [6] <https://scipolnetwork.org/>

Appendix

Conference Resources



The resources shared by presenters and attendees throughout the meeting are compiled in this appendix.

Student Professional Development

Engaging with Professional Societies

AAS Resources

- ▶ [Dropbox Link to AAS Resources](#)

ACS Resources

- ▶ [2019 ACS Graduate Student Survey Report](#)
- ▶ ACS Bridge Project: acs.org/bridge
- ▶ Careers & the Chemical Sciences: acs.org/c2s
- ▶ ChemIDP: ChemIDP.acs.org
- ▶ Grad & Postdoc Chemist Magazine: gpchemist.acs.org
- ▶ ACS Career Kick-Starter: acs.org/careerkickstarter
- ▶ E-Courses
- ▶ [C&EN's Grad Student Survival Guide](#)
- ▶ [How to Land Your First Job](#)
- ▶ [Get Experience – Research, experience, internships, co-ops and more](#)

AMS resources and suggestions

- ▶ How to choose your path: ams.org/education/pre-grad
- ▶ Find a Grad Program: ams.org/find-graduate-programs
- ▶ Grad School Fair: ams.org/programs/students/gradfair
- ▶ Other fun stuff
 - ▶ ams.org/posters
 - ▶ ams.org/mathimager
 - ▶ ams.org/mathmoments
- ▶ Job listings: mathjobs.org
- ▶ Join committees to get involved / break into a new area
- ▶ Think about how to get earlier career folks to know about resources
- ▶ Session about flight

- ▶ Don't be shy to reach out to someone if they're doing something interesting.
Doesn't have to be profound
- ▶ What's the 1 thing to do to explore: can't do them all, just choose 1.
 - ▶ Go to [JMM - Joint Mathematics Meetings](#)
 - ▶ Look for travel grants, share room work other students
 - ▶ Look through the sessions in advance
- ▶ Go to business meetings for sections

APS Resources

- ▶ [Physics Job Listings and Career Fairs](#)
- ▶ [APS Innovation Fund](#)
- ▶ Speaker Contact:
 - ▶ Geraldine Cochran, she/her/hers, cochran@aps.org

MRS resources

- ▶ [Diversity, Equity and Inclusion](#)
- ▶ AcERS
- ▶ [Careers & Advancement | Materials science jobs, awards, professional development](#)
- ▶ [Graduate Student Awards](#)
- ▶ Career Discovery Series
- ▶ Volunteer with societies - helps build network and develop leadership skills
- ▶ Speaker Contact:
 - ▶ Michele Feder, feder@mrs.org

Fostering Successful Scientific Careers with Individual Development Plans

Student/Trainee IDP Breakout

- ▶ [Session Slides](#)

Awardee/Faculty IDP Breakout, Compiled list of "Essential skills for Success"

- ▶ Communication - listeners and speakers, broad audience
 - ▶ Presentation
 - ▶ Writing papers
- ▶ Problem solving skills
- ▶ Writing grant proposals
- ▶ Scientific authority in one area, expert
- ▶ Self-critical, analytical, develop intuition, think
- ▶ Open to career possibilities
- ▶ Mentor others

- ▶ Market themselves, enthusiasm
- ▶ Empathy
- ▶ Independence
- ▶ Collaboration, teamwork
- ▶ Team building
- ▶ Leadership
- ▶ Dealing with criticism
- ▶ Multi-tasking
- ▶ Time management
- ▶ Mental health, work-life balance
- ▶ Research compliance, ethics, lab safety
- ▶ Accounting budgeting

Group brainstorm: what do faculty need to do?

- ▶ Connect students to relevant people in desired job, and their discipline
- ▶ What is the class that brings in people to the field - talk about how careers develop, how individuals grow in job, networking
- ▶ Do seminar/talks from industry/labs personnel, and also career counseling.
- ▶ "Life after graduate school" - not required and low attendance. Does anyone do this as a required class?
- ▶ I-Corps - really transformative, not the full necessarily but regional node runs regional conferences that are just a weekend.
- ▶ Example of core competency, micro credentialing: bu.edu/pdpa/for-doctoral-students/phd-core-capacities/
- ▶ NC State example - offered as train the trainer. grad.ncsu.edu/professional-development/opa/current-postdocs/resources/
- ▶ What about Internships?
 - ▶ Have a pot of money to make sure that students aren't doing unpaid work
 - ▶ Find part time, unpaid options while students continue to work full time - allows international students to participate.
 - ▶ NSF Intern program
- ▶ Other ideas?
 - ▶ Teaching - learn about pedagogy as well as get experience



Mentoring

- ▶ Mentoring, Awardee [Session slides](#)
- ▶ Mentoring, Student [Session slides](#)
- ▶ Científico Latino: cientificolatino.com
 - ▶ Científico Latino aims to help undergraduate, graduate, and professional students by providing mentorship, open-access resources on scholarships, fellowships and blog posts on professional development.
- ▶ #VanguardSTEM: vanguardstem.com
 - ▶ #VanguardSTEM is an online network and empowered community of women of color, girls of color and non-binary people of color living at the intersections and thriving on the STEM frontier. Current initiatives include the Conversation series (live interviews where our identities and paths are celebrated), #HotScience-Summer (publicly funded science initiatives led by WOC), and Guerilla Mentoring (new mentoring programming rolling out in the Fall!)

Equity and Inclusion

BLACK, BROWN, BRUISED: How Racialized STEM Education Stifles Innovation

- ▶ EDEFI: Explorations in Diversifying Engineering Faculty Initiative
- ▶ Institute in Critical Quantitative and Mixed Methodologies Training for Underrepresented Scholars (ICQCM): CriticalScholars4QuantResearch.org

Equity in Graduate Admissions / Holistic Review

- ▶ [Jamboard for Brainstorming](#)
- ▶ bit.ly/GradEquity
- ▶ aapt.scitation.org/toc/ajp/79/4?size=all
- ▶ The Toolkit: fisk-vanderbilt-bridge.org/toolkit
- ▶ [The Fisk-Vanderbilt Master's-to-Ph.D. Bridge Program: Recognizing, enlisting, and cultivating unrealized or unrecognized potential in underrepresented minority students](#)

Inclusive Research Spaces

- ▶ [Session slides](#)
- ▶ Conference dashboard: sites.google.com/aps.org/agep-grs2021/home
- ▶ native-land.ca/
- ▶ [AGEP Student Jamboard](#)
- ▶ [AGEP Faculty Jamboard](#)
- ▶ [AGEP Staff Jamboard](#)

- ▶ I consider this to be required reading for better understanding grad students of color experiences in doc education: Gildersleeve, R. E., Croom, N. N., & Vasquez, P. L. (2011). "Am I going crazy?!" A critical race analysis of doctoral education. *Equity & Excellence in Education*, 44(1), 93-114.
- ▶ Speaker Contact:
 - ▶ Aireale J. Rodgers (she/her) twitter is @airealejoi
 - ▶ Annie Wofford (she/her) @annie_woff on Twitter!
- ▶ [Rodgers and Wofford Resource Guide](#)

Student Wellbeing and Empowerment

Student Wellbeing

- ▶ [Session slides](#)
- ▶ Student questions around building social network, coping with others' stress, ideas around self-care activities, identity guiding self-care
- ▶ Interventions discussed include distress tolerance: activities, contributing, comparisons, emotions
- ▶ Speaker Contact:
 - ▶ Jill Rawl, jillianrawl@gmail.com
 - ▶ Sydnei Woody, sydneiwoody@gmail.com

Student Empowerment

- ▶ National Science Policy Network: [scipolnetwork.org](#), early-career organization for those interested in science policy, advocacy, and diplomacy
- ▶ ComSciCon: [comscicon.com](#); hub for opportunities to partake in Science Communication workshops
- ▶ Science Policy [Resources AirTable](#): a crowd-sourced table that has a myriad of opportunities in science policy, diplomacy, and communication from conferences, fellowships, communities, and more!
- ▶ NPR SciCommers: npr.org/2017/08/24/537735624/friends-of-joes-big-idea-fojbis great space to meet with other academics interested in SciComm and participate in mentor chats with professional / experienced SciCommers of all varieties
- ▶ Alliance for Diversity in Science and Engineering: [allianceinscience.org/](#)
- ▶ Científico Latino: [cientificolatino.com](#), Científico Latino aims to help undergraduate, graduate, and professional students by providing mentorship, open-access resources on scholarships, fellowships and blog posts on professional development.
- ▶ #VanguardSTEM: [vanguardstem.com](#) #VanguardSTEM is an online network and empowered community of women of color, girls of color and non-binary people of color living at the intersections and thriving on the STEM frontier. Current initiatives include the Conversation series (live interviews where our identities and paths are celebrated), #HotScienceSummer (publicly funded science initiatives led by WOC), and Guerilla Mentoring (new mentoring programming rolling out in the Fall!)

- ▶ SACNAS NDiSTEM Conference sacnas.org/what-we-do/conference2021 One of the BEST* STEM conferences that splits the time between scientific content and cultural celebration of all traditionally marginalized folks in STEM. *= and most fun
- ▶ Reclaiming STEM reclaimingstem.wardofcode.com/ Science communication, policy, advocacy and justice training with communities of color, first-gen, disabled, LGBTQIA+, undocumented, etc.
- ▶ Speaker Contact:
 - ▶ Annabelle Lolinco (she/her) My email: alolinco@iastate.edu Twitter: @VivaceBelles
 - ▶ Arianna Long (she/her) email: arianna.long@uci.edu Twitter: @astroarianna

NSF Resources

- ▶ Speaker Contact:
 - ▶ Kathy McCloud, kmccloud@nsf.gov
- ▶ [Launching Early-Career Academic Pathways in the Mathematical and Physical Sciences \(LEAPS-MPS\) | NSF](#)
- ▶ [Mathematical and Physical Sciences Ascending Postdoctoral Research Fellowships | NSF](#)
- ▶ [AGEP-Graduate Research Supplement Conference 2021](#)



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