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Gender Disparities in Pandemic Productivity

J.L. Malisch, Office of Research and Epidemiology, St. Mary's County Health Department; Assistant Professor, St. Mary's College of Maryland

A.L. Graves, Fellow of the APS and Walter Kemp Professor in the Natural Sciences, Dept. of Physics and Astronomy, Swarthmore College

Gender disparities in academia are not a recent development. Women (meaning those people who have a female gender identity) have had to lean in against bias, in order to achieve metrics of academic success. These include positive manuscript and grant reviews, and equitable student evaluations of teaching. Even in disciplines where the academic pipeline has ceased to “leak” at critical junctures like promotion and tenure; people continue to be differentially employed according to gender. (In academic physics for example, women are more likely than men to be found in part-time, non-tenure line, or two- rather than four-year institutions.) In myriad ways, women need to be more productive just to be perceived as equal to men, and typically carry a higher load of undervalued service both at work and at home. Yes, there have been gains toward gender parity in academia. But this hard earned motion has been painfully slow for White women; and the forward motion for women of Color has been barely perceptible. In STEM research, as in other parts of the human sphere, the COVID-19 pandemic has amplified race and gender inequalities. It threatens to decrease forward momentum for equity in the STEM academic workforce, and may prefigure devastating consequences for a diverse academe.

Initially the impacts of the pandemic on women’s productivity were anecdotal - blogs by academic mothers and opinion pieces warning of emerging disparities. Now at the one year mark with COVID-19, tangible evidence is verifying speculation. Namely, women have not been able to maintain their research productivity during the pandemic. The final section of this article is a set of links to scholarly references on the differential impact of COVID-19 by gender. These demonstrate that the frequency of women’s names on author lists have diminished. So have grant submissions and the success rate of grants from women. The “childcare penalty”, already palpable for STEM academic women, is documented anew; as lockdown creates environments where women must nurture their families and help homebound children with their

schoolwork, to the detriment of these women’s own scientific labor.

Meeting abstract submissions can be a source of insight on the health of the research community and research productivity. The APS March Meeting is the world’s largest physics conference, with attendees from across the world, and approximately 10,000 abstracts submitted each year. The APS Office of Governmental Affairs (OGA) has stepped up to both survey registrants to the upcoming 2021 APS March Meeting; and to mine abstract submission data from both 2021 and 2020. (The latter were submitted in Fall, 2019, before the pandemic had begun.) Reference 1 below is a link to a February, 2021 APS OGA issue brief titled “US R&D Community Pandemic Recovery Lagging”. Among the APS OGA findings is that experimental physics was particularly hard-hit, with more than 20% fewer abstract submissions in 2021 than 2020. The analysis also revealed that both recent graduates (<5 years since PhD) and early-career faculty/researchers (5-10 years post-PhD) are negatively impacted by the pandemic. Both career-stage groups have a strong career incentive to attend scientific conferences and present their work to advance their careers.... a dismal sign for the career pipeline. Women scientists are also disproportionately affected. Figure 1, shows that submissions from early career US women decreased by a factor more than double that of men in the same group. Given an obvious gender disparity in this group even before the pandemic, a further depression of women’s abstract submissions is quite troubling. This represents dozens of young women whose research was stalled or perhaps completely derailed by the pandemic. In a career landscape that typically requires women to achieve more than men to achieve tenure and promotion, the effects of gender based disparities will be felt for years after the pandemic has abated.

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Gender Disparities in Pandemic Productivity (continued from page 1)

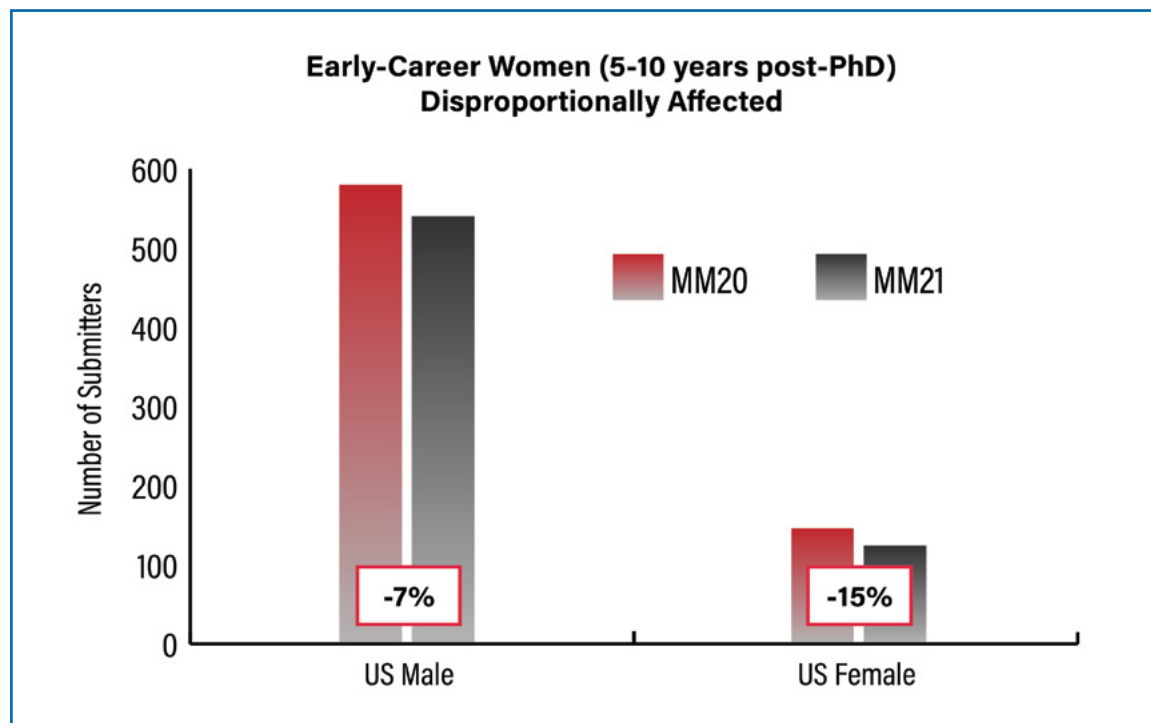


Figure 1: Taken from Reference 1, this depicts numbers of early career US women physicists who submitted abstracts to the APS March Meeting prior to (MM20) and after almost a year (MM21) of the pandemic.

One of us (J.M.) has the following reflections on her recent career. She was in her fourth year on the tenure-track, and highly productive of research. An AAUW Fellow, she had course releases and childcare compensation to focus on writing an all-important NSF CAREER proposal. In her words “Nothing could get in my way ... except a microscopic, enveloped strand of RNA”, the novel coronavirus. By early March, schools were closed, childcare eliminated and she was attempting to write her grant while sharing an office with three school-age children. Quiet time for concentration was inaccessible. NSF’s announcement of a two week extension on the submission deadline was not enough to salvage four months of no school or childcare. She opted to step back and seek a career with more flexibility outside of the academy. J.M. is now director of research and epidemiology at her local health department, and is one more woman out of the academic pipeline.

This personal story is certainly not unique. It is being replicated across academia. The long-term impact of COVID-19 on our workforce, disproportionately by race and gender, is cause for great concern. Historically, leaning in by women helped to make meaningful gains for White women toward parity in physics and other STEM fields. Gains for women of Color has been a strong focus of the APS and AAPT, as a 2020 “Team Up” report exemplifies [<https://www.aip.org/sites/default/files/aipcorp/files/teamup-full-report.pdf>]. But the pandemic has given new power to

identity-based inequities. References 1, 8, 10, and 11 below are among those that suggest strategic solutions to what would otherwise be a devastating setback for gender equity.

APS OGA does report encouraging steps that Congress and the National Science Foundation (NSF) are taking to address the pandemic’s impacts on the R&D community, many of which align with the recommendations included in the OGA issue brief (reference 1). They include the House Science Committee’s bipartisan reintroduction of the Supporting Early-Career Researchers Act and the STEM Opportunities Act and the bipartisan, bicameral reintroduction of the RISE Act early in the 117th Congress. Additionally, comments made during a recent public National Science Board meeting indicate NSF is planning for the prioritization of relief funding to researchers most impacted by the pandemic and those at vulnerable transition points in their careers. A video is available at https://www.youtube.com/watch?v=RI3HttPA_b4&t=4703s.

References

We conclude this article by offering the following list of selected links to references on the toll taken and solutions proposed, related to the pandemic’s effects on research productivity of women. As a community, we need to continue to implement solutions to address bias, boost research productivity, and mitigate the losses of the past year.

1. Issue Brief authored by the APS OGA on adverse effects of the pandemic, based on APS March Meeting Abstract Submissions for 2020, 2021.
<https://www.aps.org/policy/analysis/covid-impact.cfm>
2. Gender disparities in preprint submissions as well as personal narrative by a STEM Associate professor/mother/spouse (M. King and M. Frederickson, 2020; M. Frederickson, 2020).
<https://osf.io/preprints/socarxiv/8hp7m/>
<https://theconversation.com/women-are-getting-less-research-done-than-men-during-this-coronavirus-pandemic-138073>
3. Journal and preprint data on the fraction of women publishing during the pandemic, showing a decrease across disciplines and exacerbated in poorer countries (G. Muric et al, 2020).
<https://arxiv.org/abs/2006.06142>
4. Decrease in women authors on papers whose subject is COVID-19 research (J.P. Andersen et al, 2020; A-C. Pinho-Gomes et al, 2020).
<https://elifesciences.org/articles/58807>
<https://gh.bmj.com/content/5/7/e002922>
5. Decrease in women authors on papers in the social sciences (J. P. Andersen et al, 2020).
<https://voxeu.org/article/who-doing-new-research-time-covid-19-not-female-economists>
6. Women and parents of small children who are “bench scientists” have greatest losses of research productivity/time during the pandemic (K.R. Meyers et al, 2020).
https://www.nature.com/articles/s41562-020-0921-y?fbclid=IwAR01DwrDBRX4gwMFm7XsKD_sRIIpl4tkT-mgdgq3J3QJG8KjxDigytN_ml68
7. Various studies/working papers showing disproportionate effect on academic mothers (K. Langin et al, 2021).
<https://www.sciencemag.org/careers/2021/02/pandemic-hit-academic-mothers-especially-hard-new-data-confirm>
8. Mitigation of gender-related COVID-19 productivity gap performed by a national health funding organization (H.O. Witteman et al, 2021).
<https://www.pnas.org/content/118/6/e2023476118>
9. Analysis of decreased submission of research papers by women, relating pandemic lockdown to childcare responsibilities (D. Matthews, 2020).
<https://www.timeshighereducation.com/news/pandemic-lockdown-holding-back-female-academics-data-show>
10. Literature review on COVID-19 related gender disparities and strategies that administrators can adopt to address them (M. Oleschuk, 2020).
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7436417/>
11. Gender-related barriers to academic equity, and recommendations on the need for solutions related to new, COVID-19 related disparities (J. Malisch et al, 2020).
<https://www.pnas.org/content/117/27/15378?fbclid=IwAR35UV0UQBb8Ex>
12. Companion webpage to Ref. 11
<https://academicquity.smcn.edu/>

Acknowledgements

We are grateful to the APS OGA staff for a conversation on issues of pandemic productivity, and for the study described in Reference 1; and to M. Frederickson for her insights, and for sharing her list of references.



J.L. Malisch



A.L. Graves



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CUWiP Goes Online

*Evangeline J. Downie, Associate Professor of Physics, George Washington University,
CUWiP NOC Past Chair*



Evangeline J. Downie

The APS Conferences for Undergraduate Women in Physics (CUWiP) are three-day regional conferences which aim to help undergraduate women continue in physics by providing them with the opportunity to experience a professional conference, information about graduate school and professions in physics, and access to other women in physics of all ages with whom they can share experiences, advice, and ideas. CUWiP began in 2006, with a single site at the University of Southern California. It has grown into a nationwide effort of up to twelve US conferences and one in Canada taking place simultaneously, historically on the weekend before Martin Luther King Jr. Day, supporting up to 2,000 attendees.

With the advent of the current global public health situation, the National Organizing Committee of CUWiP made the decision to convert the 2021 conference to a single-site, online event. With help from a Student Advisory Council, the CUWiP leadership structured the conference to allow time for plenary sessions, and a multitude of parallel workshops and panel discussions covering diverse subjects such as: cutting-edge research, work-life balance, life in graduate school, a broad range of careers, and issues of diversity, equity and inclusion in the physics community. Between sessions, students could mingle with the speakers in individual Zoom break-out rooms. During sessions, students enthusiastically used the “chat” functions to share ideas and reactions to the ongoing discussions. There were several opportunities for “Speed Geeking”: being randomly assigned to a Zoom break-out room with a small group of other attendees. Participants were encouraged to join, and interact with each other, via the APS Engage platform [<https://engage.aps.org/home>]. There are now over 450 people signed up, forming a community which can be supportive well beyond the end of the conference. There was also a networking fair in Gather.Town, a web-based application which allows video callers to move around in custom, interactive spaces. This virtual fair had representation from industry and graduate schools, and over 400 attendees. Thus, despite the physical distance, attendees, speakers, and panelists were able to network with each other in multiple ways, and discuss and exchange ideas after the exciting workshops and presentations. During the Millie Dresselhaus Keynote Lecture by Dr. Mary James the webinar chat was filled with student comments, reactions, and praise and delight at Dr. James’ wonderful and humorous self-drawn slide illustrations. Students shared experiences, offered one another support, expressed gratitude for the conference and to the speakers for making them feel supported and encouraged. One even asked if we could hold CUWiP every weekend!

While moving a unique conference like CUWiP online was challenging, it also offered some unique

opportunities. As CUWiP 2021 received generous support from the Heising Simons Foundation, the typical federal funding limitation on CUWiP participation to students studying at US-based institutions did not apply and CUWiP could be open to participants from other countries. The conference was attended by students from Australia, Brazil, Columbia, Dubai, Germany, Guadeloupe, India, Kenya, Malaysia, Mexico, Morocco, Nigeria, Singapore, Spain and Turkey. The National Organizing Committee Leadership (NOC-L) worked with APS International Affairs team to invite faculty from universities in several other countries to participate. This is an ongoing effort, with a long term aim to establish partner CUWiPs around the globe. The NOC-L was also able to adjust the schedule of CUWiP to occur the weekend after (rather than before) MLK Day, thereby making the conference yet more inclusive.

Overall, the conference was a great success, with 900 student participants and approximately 200 helpers, speakers and panelists, including a multitude of APS staff members whose contributions were invaluable to the success of the conference. The National Organizing Committee are already working towards the next CUWiP, which will be held from January 21-23 2022, and are currently being planned as in-person events. They are working to maintain an online element, as the students were very enthused by this, as exemplified by one attendee who wrote, “I hope that CUWiP continues to hold a virtual option for the conference, even when things go back to normal. I had never attended before because I always went back home.... A virtual option would make the conference more accessible to people worldwide! This has been an amazing experience and I am so glad I got to attend this year!”

The National Organizing Committee Chair, Barbara Szczerbinska, said “I’m very grateful for being part of the amazing group of people who made Virtual CUWiP 2021 reality! Together with Evie Downie (past chair) and Brianna Mount (chair elect) we want to thank our sponsors, the National Science Foundation, the Department of Energy, Heising-Simons Foundation, Google Quantum AI, General Atomics and Alfred P. Sloan Foundation, volunteers, APS staff and participants for making CUWiP 2021 extraordinary!”

If you would like to learn more about CUWiP or consider being a Host Site in the future, you can find more information about CUWiP here: <https://www.aps.org/programs/women/cuwip/>.

eAlliances and Latinas in Astronomy and Physics

Idalia Ramos, Professor of Physics and Electronics, University of Puerto Rico at Humacao

Cindy Blaha, George H. and Marjorie F. Dixon Professor of Physics and Astronomy, Carleton College

Anne Cox, Professor of Physics, Eckerd College

Beth Cunningham, Executive Officer of the American Association of Physics Teachers

Barbara Whitten, Professor Emeritus of Physics, Colorado College

Being a woman in physics or astronomy can be a very isolating experience. Being Latina, Black, Native American, LGBTQ+, or a woman with disabilities can increase that isolation (Ivie & Tesfaye, 2012; Atherton et al., 2016). eAlliances is a program funded by NSF ADVANCE and hosted by AAPT, to establish mutual mentoring networks of women faculty within the physics and astronomy community (ealliances.aapt.org) (Cox et al., 2021). Peer mentoring has proven to be effective in combating isolation and marginalization (Karukstis et al., 2010; Cox et al., 2014; Petersen et al., 2020).

NSF funding for eAlliances began in 2015 and is expected to end in 2022. Currently, there are 11 eAlliances for women faculty in physics, each of them with 3 to 5 members for a total of 44 participants. The first 5 eAlliances were formed early in the grant period and we identify them as the first cohort. A second and a third cohorts of eAlliances were organized in subsequent years. Attracting women of color and from other under-represented groups, who are particularly marginalized, is an important goal for our program. We have tried to reach underrepresented women through professional organizations



like *National Society of Hispanic Physicists (NSHP)*, *National Society of Black Physicists (NSBP)*, and *Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS)*. Furthermore, members of the leadership team and the External Advisory Board have sought participants from these groups through personal outreach. Despite all of our efforts, participants in the first eAlliances cohort are predominantly white women organized around career-related issues like tenure status, career stage or type of

(l-r) Idalia Ramos, Cindy Blaha, Anne Cox, Beth Cunningham, Barbara Whitten

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Members of Latinas eAlliance (E-6) Saida Caballero Nieves from Florida International University and Beatriz Burrola Gabllondo from Ohio State University at the 2019 eAlliances Mini-Summit in Provo, Utah.



Participants and leadership team at 2019 eAlliances Mini-Summit in Provo Utah.

institution. In the other cohorts, we reached a more diverse population with the formation of one eAlliance of Latinas and another of Black Women faculty. However, not only attraction, but retention of eAlliance members is a goal, in order to sustain gender identity equity (APS). Despite successes in attracting these women, we have had difficulties retaining members of the Latinas group. The main concern expressed by Latinas for not staying in the eAlliance has been time commitment. This is understandable: besides teaching, research, and service responsibilities, most Latinas in physics and astronomy departments are actively involved in their academic and wider communities. They do more than their fair share of recruiting and mentoring students and helping overcome underrepresentation for their institution and the public at large (Jimenez et al., 2019).

To comply with the stated goals of this NSF-funded program, participants must meet regularly with other eAlliance networks and occasionally with the leadership team as part of the summative and formative evaluation. We expect each eAlliance to meet electronically at least twice a month, prepare brief reports of their meetings, and meet face-to-face once a year (when social distancing was not a concern). The existing networks have explored various ways of communicating until they find one that suits their network. Some meet asynchronously because they are in different time zones, have complicated schedules, or small children. The ways the networks organized themselves are also diverse, some have very structured plans with short- and long-term professional and personal goals for each member, while others meet to discuss a book reading¹ or talk freely about professional or personal

issues. Some networks designate a leader or facilitator, others rotate leadership for each meeting. We don't have a recipe to follow, our goal is for each eAlliance to find what works for them.

At the time of this article, eAlliances is a thriving program. Some eAlliances are currently in the process of organization; others have already developed strong connections between members. The following are quotes from eAlliances participants of the 2019 eAlliance Mini-Summit held at the AAPT Summer Meeting in Provo, Utah, that illustrate these connections: "The goals (of my eAlliance) help me focus and keep on track.", "We benefit from the collaboration... learn how different schools do things.", "Four of us went (through) tenure together.", and "(We) absolutely need each other's support." In more recent communications, they highlight the value of having an electronic support group in a time of pandemic. How Covid-19 restrictions have changed the way eAlliances members interact and support one another is a timely question which we are studying. We are collecting data from participants through electronic reports and hope to share results with the APS and broader STEM communities in the future. We are excited with the celebration of the Summer 2022 eAlliances Summit for all participants to meet in person and exchange experiences and best practices. A mini summit (online) is also in our calendar for Summer 2021.

Rather than being a burden, we believe that for Latinas in physics and astronomy, joining others with similar interests and concerns in a mutual mentoring group holds worthwhile, long-term career benefits. For example, it may help ease their workload by learning how others deal with work-life issues similar to their own. It is difficult to imagine that participants would want to/are able to stop the social justice work that they do for their communities. Mutual mentoring will

¹ A popular book is "Daniell, E., *Every Other Thursday: Stories and Strategies from Successful Women Scientists*, Yale University Press, 2008".

strengthen their choices around this work as well.

We encourage Latinas and members from other under-represented groups whose gender identity is that of "woman" to join an eAlliance. In the long term, experiences with the eAlliances program can contribute to understanding the characteristics and complexities of multiple forms of marginalization; and to developing inclusive and diverse programs for Latinas, and other under-represented women in physics and astronomy.

The eAlliances are formed in an asynchronous way, so one can join at any time. For more information and to join eAlliances you can visit ealliances.aapt.org. Please feel free to contact us to join and/or to share ideas on how we can better address the needs of your community.

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APS-IDEA: Transforming Physics Culture through Building Communities

Monica Plisch, Director of Programs, APS

Erika Brown, Diversity Program Manager, APS



Monica Plisch



Erika Brown

The APS Inclusion, Diversity, and Equity Alliance (APS-IDEA) aims to transform the culture of physics by building the capacity of physics organizations to identify and enact strategies for improving equity, diversity, and inclusion (EDI). In recent years, the physics community has directed increased attention to EDI within the profession. However, many physicists are working in isolation, lack knowledge about EDI, run into barriers trying to change the culture, and experience burnout. APS-IDEA offers critical support needed for physicists to be effective in their change efforts, including an introduction to change strategies based in social science, guidance in developing effective EDI plans, and connection to a broader community engaged in this work.

The initiative was launched with a two-year pilot grant from the APS Innovation Fund in October 2019. Since then, we have experienced rapid progress toward our long-term goal of building a social movement to transform the culture of physics. In 2020, we were extremely pleased to receive over 100 team applications from physics departments, laboratories and collaborations in just over one month, greatly exceeding our expectations (estimated 25). As a result, the project decided to not accept new team applications through the end of 2021.

At the conclusion of the review process, 99 teams were selected to join the inaugural cohort of the APS-IDEA Network [Figure 1]. The initial cohort of teams represent a wide geographical spread, including the United States, Australia, Brazil, Canada, Finland, Germany, Nigeria, and Spain [Figure 2]. All applicants were required to reflect the principle of shared leadership in the composition of their teams. As a result, network participants represent a broad array of perspectives and experiences [Figure 3].

To maximize access, we engage network participants virtually through facilitated online workshops and an online learning community, including synchronous and asynchronous interaction spaces. As part of the APS-IDEA community, each team is supported to build relationships with other teams, connect with aligned projects and organizations, deepen knowledge of social science research and effective practices, and create a theory of change to guide development of an effective action plan.

Ultimately, we seek to establish a community of transformation, which is a community of practice with a shared set of principles that guide its work, in order to envision and enact a new paradigm for equity, diversity and inclusion in physics. More information, including statements of the APS-IDEA Vision, Mission, and Guiding Principles are available on the APS-IDEA Website [<https://www.aps.org/programs/innovation/fund/idea.cfm>].

Three successful inaugural workshops were held in the summer of 2020 to accommodate the nearly 100 APS-IDEA teams. Our goals for the inaugural workshop were: (1) launch the network, (2) introduce teams to each other and the project leadership, (3) define and practice shared leadership, and (4) introduce cultural change models and social movement context.

A second workshop held in September 2020 introduced teams to a key concept underpinning effective change strategies called a “theory of change.” A total of 96 teams participated, maintaining a high level of engagement from the inaugural workshop. An overview of cognitive, cultural and political theories of change was provided, contextualized in modern EDI change movements such as Black Lives Matter and the fight for marriage equality. Participants indicated strong interest in learning more about these concepts and how to apply them in their local context.

To provide support for ongoing learning among all members of the 99 teams in APS-IDEA, we launched Online Learning Communities (OLCs) in the fall of 2020. The 21 OLCs were formed by grouping 4-5 teams with a similar institutional context. Each OLC has a Facilitator to guide teams in their learning process, assist them with making connections, and provide targeted assistance on specific issues.

OLCs hold monthly virtual meetings (via Zoom) and teams are encouraged to meet monthly by themselves and engage asynchronously in the APS-IDEA online workspace (Slack). The Slack workspace includes over 1,400 individuals who are members of teams, project leadership and other partners. Each OLC has a Slack channel and teams also have the ability to connect through channels focused on specific topics or for particular groups.

With the community launched and key infrastructure established, the project is positioned to take significant strides in 2021 toward enhancing the capacity of APS-IDEA teams to identify and enact strategies for improving EDI. Primary goals for 2021 include:

- Foster a well-connected network of teams and partner organizations
- Build the capacity of teams to enact APS-IDEA guiding principles
- Support teams to develop a theory of change and EDI action plans

Toward realizing these goals, we will continue holding a workshop each semester, currently scheduled for February and September 2021. OLCs will continue meeting monthly to support each team’s learning and development of a theory of change and EDI action plan. We will seek to maintain a high level of participation by our teams and to develop a more robust communications capability to support teams that desire to connect with others on topics of common

interest. Further, we will introduce partner organizations and projects with aligned goals to establish synergistic connections. This will be accomplished in part by launching an APS-IDEA Colloquium series with webinars led by EDI experts both external and internal to the Network.

If you would like to stay updated on the APS-IDEA project, please join the APS-IDEA mailing list [<https://www.aps.org/programs/innovation/fund/idea.cfm>]. This list will provide information on the project outcomes, as well as announcements for upcoming opportunities to connect with the project.

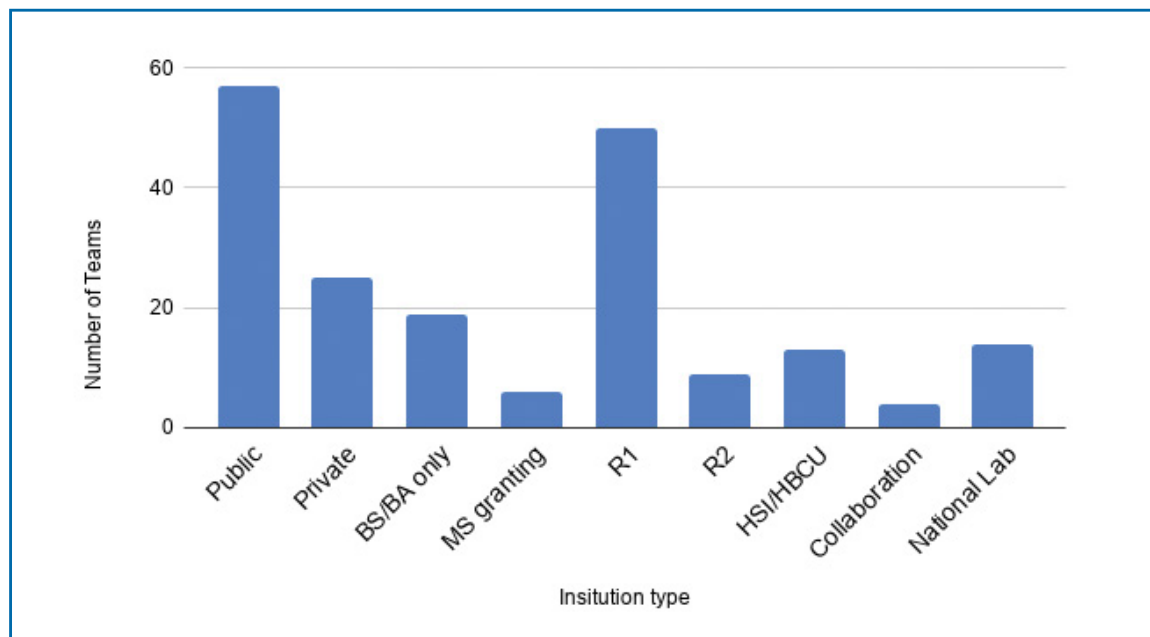


Figure 1: Network Demographics. 99 teams (including over 10% of U.S. physics departments) are currently participating in APS-IDEA, directly engaging a large segment of the physics community. As a result of joining, over 50 new EDI committees were formed that had not previously existed.

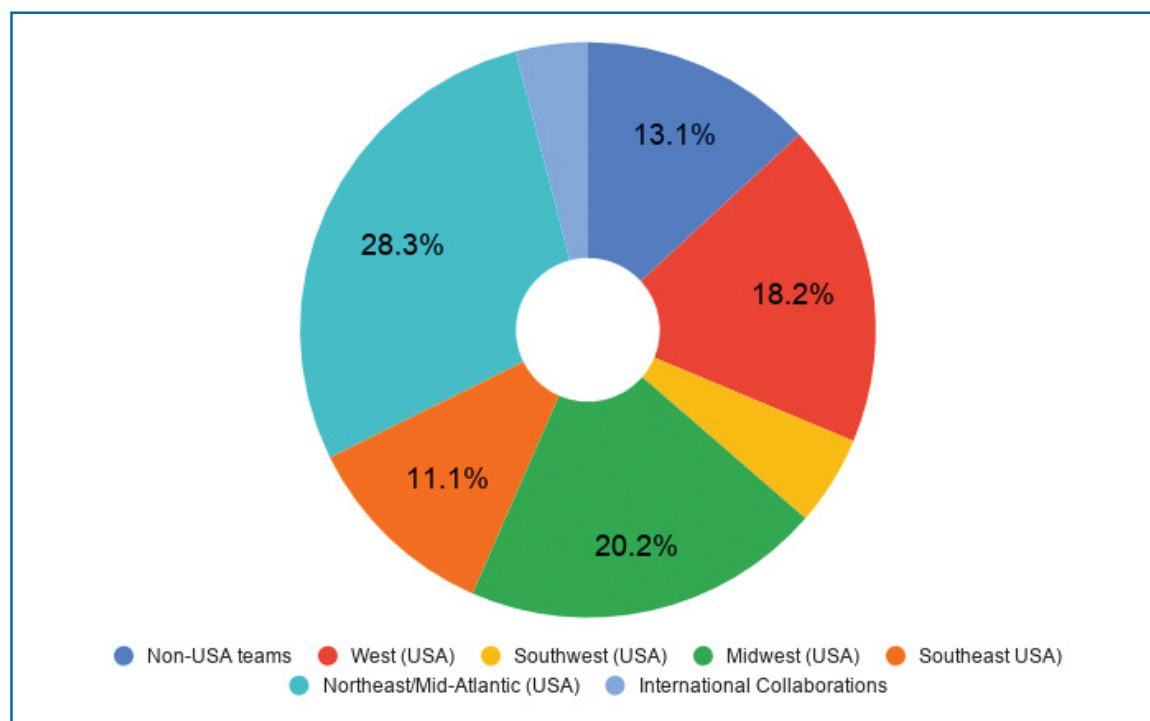


Figure 2: Geographical Distribution of APS-IDEA Teams. Countries represented by APS-IDEA teams include the United States, Australia, Brazil, Canada, Finland, Germany, Nigeria, and Spain. Several teams represent international physics research collaborations.

APS-IDEA: Transforming Physics Culture through Building Communities

(continued from page 9)

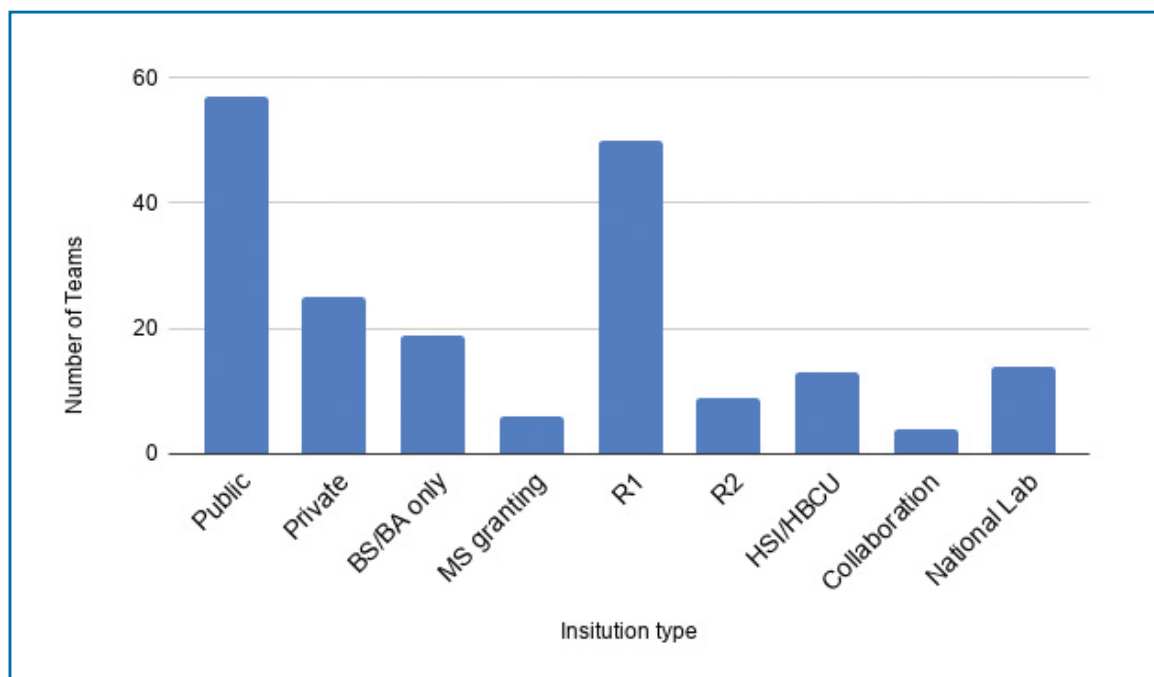


Figure 3: APS-IDEA Team Composition. All applicants were required to reflect the principle of shared leadership in the composition of their teams, with special emphasis on engaging students and staff. As a result, team members represent a broad array of perspectives and experiences.

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