

## INSIDE

*Thousands of Scientists Protest Institutional and Systemic Racism in Academia and the World*

1

*Indigenous Peoples Exist Within Physics*

4

*Celebrating and Supporting Black Women in Physics: Creating a Culture of Inclusivity*

10

*How to Actively Not be a Barrier to Diversity Efforts in Physics*

12

*From Where I Sit: Equality, Equity, and Justice*

14

## Thousands of Scientists Protest Institutional and Systemic Racism in Academia and the World

*Mario F. Borunda, Associate Professor of Physics, Oklahoma State University and APS COM Chair-Elect, with revised introduction by Brittany Kamai, Heising-Simons Postdoctoral Fellow, UC Santa Cruz & Caltech*

On June 10, 2020, STEM professionals and academics took action for Black Lives. This day was a coordinated day of action in the form of a strike known as #ShutDownSTEM, #ShutDownAcademia, and #Strike4BlackLives. Dr. Chanda Prescod-Weinstein (University of New Hampshire), Dr. Brian Nord, (of Fermilab and the University of Chicago), Dr. Brittany Kamai (University of California, Santa Cruz and Caltech), and Dr. Jedidah Isler (Dartmouth University) designed and coordinated #Strike4BlackLives and #ShutDownSTEM effort. Dr. Prescod-Weinstein and Dr. Nord coordinated with the group Particles For Justice, Dr. Kamai coordinated with the #ShutDownSTEM group, (a multi-identity, intersectional coalition of STEM professionals spanning physics, astronomy, biology, physics education, music industry, tech) and Dr. Isler coordinated with VanguardSTEM, an online community that centers the experiences of women of color, girls of color and non-binary people of color in STEM.

The Particlesforjustice website published a letter ([particlesforjustice.org](http://particlesforjustice.org)) led by Dr. Nord and calling for members of the physics community and related fields to confront the institutional barriers to justice for Black people in academia and to take actions that will change the material circumstances of how Black lives are lived. #ShutDownSTEM ([shutdownstem.com](http://shutdownstem.com)) published a letter that activated the broader global STEM community on their ethical responsibility to stop “business-as-usual” and work towards eradicating anti-Black racism. June 10th, 2020 was designed to activate people unfamiliar with the experiences of their Black colleagues and what Black people face every day to get educated, take action, and start developing a long-term plan. Those who experience the daily effects of anti-Black racism were invited to take to time to heal from the racial injustices experienced in and out STEM. Both websites provided an extensive lists of resources ([shutdownstem.com/resources](http://shutdownstem.com/resources), [particlesforjustice.org/resources](http://particlesforjustice.org/resources), [shutdownstem.com/healing](http://shutdownstem.com/healing)) while VanguardSTEM led the online campaign #AmplifyBlackSTEM and host a community event.

The effort had a large, global reach with over six thousand participants signing onto the #Strike4BlackLives website by noon eastern time on June 10th, most of them physicists. Both websites received millions of page views and became a social media trend in both the U.S. and Canada. The reach of these efforts extended into many other scientific disciplines including biology, chemistry, math, engineering, etc. Scientific journals including *Nature*, *Science*, *Physical Reviews*, *Cell*, the research repository arXiv, and many others halted operations on this day to focus on addressing systemic racism. Science organizations, universities, and research collaborations participated in this day and encouraged their member base to participate. This included organizations like AAAS, AMS, SACNAS, the National Academy of Science, Engineering, and Medicine, the American Institute of Physics, Society of Neuroscience, the Association for Psychological Science, the American Statistical Association, the International Science Council, the Association of Environment and Engineering Science Professors, and many more.

By most accounts, 2020 has been a horrible year. We are in year four of an executive government that is anti-science, pro-discrimination, fuels racial attacks on minorities, foments xenophobia, embraces white nationalists’ ideals, and is determined to make life dreadful for refugees seeking asylum in the United States. Some of those ideals oozed by the executive branch have seeped into the other branches of government; a prominent senator has advocated for deploying military troops in response to peaceful protesters and endorsed the idea that slavery was a “necessary evil.” As a Mexican-American, a member of the board of the National Society of Hispanic Physicists, and a member of the Committee on Minorities in Physics of the APS, I feel outraged at all the harm these and other policies inflict. Despite all this, the approval rating of the administration hovers around forty percent. I feel disgusted that people that are homophobic, misogynistic, and racist get elected.

*continued on page 2*

*Managing Editor*  
Della Richardson

*COM Guest Editors*  
Sowjanya Gollapinni  
Mario F. Borunda

*Members of COM*  
Geraldine L. Cochran, Chair  
Mario F. Borunda  
Mario Claudio Diaz  
Clayton E. Simien  
Jose L. Mendoza-Cortes  
Donnell Walton  
Sowjanya Gollapinni  
Gabriela B. Gonzalez  
Jami Valentine Miller

*Members of CSWP*  
Miriam Deutsch, Chair  
Arati Dasgupta  
Maria J. Rodriguez  
Rana Ashkar  
Heather Lewandowski  
Qiuzi Li  
Hume A. Feldman  
Amy Graves  
Evangeline Downie  
Kaitlin Moore  
Angela Hight Walker

*APS Liaison*  
Theodore Hodapp  
Director of Project  
Development and Sr.  
Advisor to APS Education  
& Diversity Department

*Graphic Designer*  
Nancy Bennett-Karasik

#### **Publication Information**

The COM/CSWP GAZETTE, a newsletter of the American Physical Society Committee on Minorities (COM) and Committee on the Status of Women in Physics (CSWP), is mailed free of charge to all those listed on the Roster of Women and Minorities in Physics, all U.S. physics department chairs, and others upon request. Please address all correspondence to: COM/CSWP Gazette, American Physical Society, One Physics Ellipse, College Park, MD 20740-3844, or email to: [gazette@aps.org](mailto:gazette@aps.org). Opinions expressed are those of the authors and do not necessarily reflect the views of the APS or of the COM and CSWP.

## Thousands of Scientists Protest Institutional and Systemic Racism in Academia and the World (continued from page 1)

Further, our world is in the middle of a global pandemic caused by a virus for which there are no vaccines, cures, or effective treatments. The coronavirus kills about 4% of people who test positive for it and seems to spread very easily. Scientists believe that the virus mainly spreads when the respiratory droplets produced when an infected person coughs, sneezes, or talks are inhaled into the lungs. Evidence has shown that isolating at home is the best strategy to prevent this illness and that the use of a mask when near people is the second best. As a scientist, I find it mindboggling that people have made the use of a mask or the reopening of society a partisan issue.

Yet, despite the danger posed by a deadly virus, the executions of George Floyd and Breonna Taylor by police officers prompted people to leave isolation and join the Black Lives Matter movement. Change is needed in our society and this is reflected by the tens of millions of Americans that have taken to the streets. These protests are demanding an end of police brutality, profiling, and racially motivated violence against Black people. The #ShutDownSTEM and #Strike4BlackLives on June 10th was created to ensure that the STEM community actively took a part in eradicating anti-Black racism in and out of academic and the tech industry. The academic strike activated a broader community inside several departments to engage in a dialogue on equity and inclusion for STEM and actions that would support Black students.

A recent study revealed evidence of persistent racial/ethnic inequality in STEM degree attainment not found in other fields [1]. Inequality in higher education is evident in the gender, racial, and ethnic representation of physics faculty. A report from the American Institute of Physics shows that despite the US population being 13% Black and 17% Hispanic, the representation of these two groups in the physics faculty was 2.1% and 3.2% as of 2012 [2]. These numbers can be compared to the faculty representation of all disciplines in academia as a whole which in 2009 were 6.6% and 4.0%, respectively [3] so that we can see that physics is shockingly low. Not only that, but Black faculty are also clustered in HBCUs. Data on the representation of Native American and Indigenous people in the physics faculty is not available. However, we can compare the percentage of Physics bachelor's degrees awarded to Native Americans and Alaska Natives (0.5% in 2011 down to 0.2% in 2017 [4]) to the 1.7% of people that the 2010 census shows as identifying as American Indian or Alaska Native and see the same trend. Physics departments should work to end the exclusion and gross underrepresentation of groups in our discipline.

The National Task Force to Elevate African American representation in Undergraduate Physics & Astronomy, TEAM-UP, recognized reasons for the persistent underrepresentation of African Americans in physics and astronomy [5]. This task force, charged

by the American Institute of Physics, reported their research-based findings and produced recommendations for faculty, departments, and professional societies. They identify five factors affecting success: belonging, physics identity, academic support, personal support, and leadership structures.

TEAM-UP also has twenty-five recommendations, five for each factor. Most of these recommendations and best practices also apply to students from other marginalized race/ethnicity/gender groups. Several of the recommendations can be implemented by faculty, department heads, and diversity committees in the departments/colleges. Some of these include: (1) faculty should learn, practice, and improve skills that foster student belonging; (2) departments should establish clear rules of engagement that ensure that everyone is welcomed and valued while conveying that inappropriate behavior will not be tolerated; (3) departments should examine whether their current activities foster physics identity, assess their efficacy across race/ethnicity/gender and other social identities, and modify such activities as necessary; (4) departments should diversify their faculty with respect to race/ethnicity/gender and other social identities in such a way that support of underrepresented students is provided; (5) departments should adopt policies and practices that encourage multiple faculty, including those who are not members of marginalized groups, to engage in formal and informal mentoring of students, and they should recognize and reward those efforts.

I encourage all physicists to become familiar with the TEAM-UP report and educate themselves on the issues faced by all underrepresented groups. Several programs at APS, such as the National Mentoring Community (NMC), the Bridge Program, and the Inclusive Graduate Education Network (IGEN), offer resources to both individual faculty and physics departments to accomplish the recommendations above. The APS NMC facilitates and supports mentoring relationships between Black, Latinx, and Native American undergraduate physics students and mentors. Membership in the NMC is free for both mentors and mentees (contact [nmc@aps.org](mailto:nmc@aps.org) for more information). Both the APS Bridge program and the IGEN program have the goals of creating sustainable transition programs and a national network of doctoral-granting institutions to mentor students to complete Ph.D. programs.

Physics departments that have supportive graduate educational environments should apply to become APS Bridge Partnership institutions. For departments looking for ways to improve their program, the APS Bridge website hosts an induction manual outlining best-practices including academic assessment, support of URM students, mentoring and retention of URM, and how to transition students to the Ph.D. (see [apsbridgeprogram.org](https://apsbridgeprogram.org) for more). Physicists should regularly interact with organizations such as SACNAS, NSBP, NSHP, and AISES by attending their yearly scientific conferences

to meet with scholars across many fields who have the exact expertise to help improve the conditions within our field of physics. The strike and continued efforts should galvanize changes that allow initiatives that will help the physics community confront the institutional barriers to justice for Black people in academia.

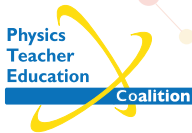
We need physicists to recognize that they have a role to play. We need to do that in many forms by addressing the lack of injustice that Black people experience in their everyday lives in the U.S., the racism that does exist within physics, academia, and the tech industry. All physicists each have an enormous role to play in changing given the huge influence we have on society. ■

### Endnotes

- [1] Riegler-Crumb, C., King, B., & Irizarry, Y. (2019). *Does STEM Stand Out? Examining Racial/Ethnic Gaps in Persistence Across Postsecondary Fields*. *Educational Researcher*, 48(3), 133–144. /doi.org/10.3102/0013189X19831006
- [2] [aip.org/sites/default/files/statistics/faculty/africanhispanic-pa-12.pdf](https://aip.org/sites/default/files/statistics/faculty/africanhispanic-pa-12.pdf)
- [3] [nces.ed.gov/fastfacts/display.asp?id=61](https://nces.ed.gov/fastfacts/display.asp?id=61)
- [4] [aip.org/statistics/resources/data-underrepresented-groups-physical-sciences-and-engineering](https://aip.org/statistics/resources/data-underrepresented-groups-physical-sciences-and-engineering)
- [5] *AIP National Task Force to Elevate African American Representation in Undergraduate Physics & Astronomy (TEAM-UP)*. (2020). *The Time Is Now: Systemic Changes to Increase African Americans with Bachelor's Degrees in Physics and Astronomy*. [aip.org/sites/default/files/aipcorp/files/teamup-full-report.pdf](https://aip.org/sites/default/files/aipcorp/files/teamup-full-report.pdf)



Mario F. Borunda



Physics  
Teacher  
Education  
Coalition

## Save The Date

Join the nation's  
largest meeting dedicated to the  
education of future physics teachers

# 2021 PhysTEC Conference

March 5 - 6  
Virtual

phystec.org/conferences/2021





## Indigenous Peoples Exist Within Physics

*Brittany Kamai, Heising-Simons Postdoctoral Fellow in Astrophysics, UC Santa Cruz & Caltech*

*Ximena Cid, Associate Professor of Physics & Department Chair, California State Univ, Dominguez Hills*

*Xandria R. Quichocho, Graduate Student in Physics Education, Michigan State University*

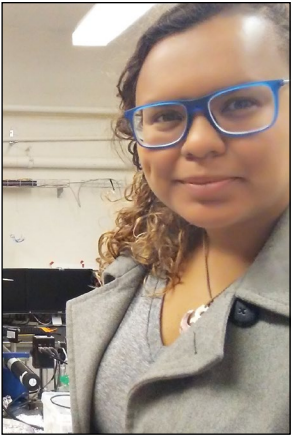
*Angela Little, Researcher in Physics Education, Michigan State University*

*Kathryne Daniel, Assistant Professor of Physics, Bryn Mawr College*

*Corey Gray, Detector Operator at LIGO Hanford Observatory*

*Hilding Neilson, Assistant Professor in Astronomy, University of Toronto*

*Julia Blue Bird, Graduate Student in Astronomy, Columbia University*



*Brittany Kamai*

### Abstract

In this article, we introduce and explain our adopted definition of Indigeneity and barriers to participation Indigenous peoples experience within the physics community. We then outline some of the impressive work done by Indigenous physicists within the scientific community to shift the integrity of the field. We close with some thoughts about how non-Indigenous physicists can contribute to building a physics community that is a better place for Indigenous physicists, the broader physics community, and every community impacted by physics.

### Indigenous Peoples in Physics

It is critically important to address the fact that we, as Indigenous Peoples, exist within Physics. This has to be said because we are systemically erased from studies that aim to increase participation within physics spaces. If we are lucky, we can point to a study that may address indigeneity with an asterisk that says the “numbers are too low”. More often than not, Indigenous People are not even in comprehensive studies that are used to increase the representation of historically marginalized communities.

Indigeneity is important for the physics community to understand on a deep level. Each of us are physically located on the ancestral land of the First Peoples of that specific location. Every physics experiment, university, and research center takes place on ancestral lands. That means that the physics community must pay close attention to the relationship with Indigenous populations and have careful consideration with the lands they occupy.

A natural question arises is - Who are Indigenous Peoples? Given that we are writing in the U.S.-based American Physical Society newsletter, this simplistic definition will be a U.S.-centered definition. It is the responsibility of the reader to take an active role in learning more about the Indigenous Populations in every physical location that you occupy.

There is no monolith to the Indigenous experience. A commonality is that: **Indigenous Peoples are the very first people to exist on the land. They developed strong familial relationships with their lands and built rich knowledge systems.** Depending on the geographic location of the Indigenous population, a person may choose to identify with terms such as Indigenous, American Indian, Native American,

First Nations, Alaska Native, Native Hawaiian, Chamorro, and Native Samoans. Many will also identify with more specific terms from their Indigenous languages or sovereign nations. The term Indigenous is the most general, encompassing, and widely accepted terminology and we recommend its use. Native also has been largely adopted in other areas such as in the arts, humanities and social areas.

The modern-day expression of Indigeneity is wide-reaching given the impact of colonization and genocide. There are some Native people who are federally recognized while others are not. There are some who have lands that have been designated by the federal government to be sovereign to individual tribes, called ceded lands, that in some cases are called reservations. Some Indigenous People grew up on reservations while there are others who did not. Some have grown up in rural areas while others have grown up in urban and suburban spaces. There are Indigenous populations who have been able to rescue their language from extinction whereas there are others that are lost forever. There are some Indigenous groups that know their genealogical history whereas others have lost those direct links due to colonialism and genocide. With this history, Indigenous populations will likely be mixed with other ethnic populations.

Indigeneity transcends U.S. borders. Indigenous Peoples have familial and cultural ties across North, South and Central Americas and the Pacific Ocean. There are Indigenous Peoples whose tribal lands do in fact span across and beyond both the U.S.-Mexico border as well as the U.S.-Canada border. This is important to keep in mind when thinking about solutions to reduce barriers for Indigenous Peoples. We need to be in dialogue with the Indigenous Populations in the Pacific Islands, Mexico, Canada, Central and South America<sup>1</sup>. This is a solvable problem for the physics community given its experience with creating large international scientific collaborations like CERN, LIGO, LISA, etc.

This becomes important to ensure that our collective understanding of Indigeneity and Indigenous People is truly global and current. **We must move beyond siloed definitions to achieve our collective goal, which is to create representative and holistic**

<sup>1</sup> It should be noted that Indigenous Peoples exist across all parts of the globe. Describing all aspects of indigeneity, however, is beyond the scope of this article.



Attendees of "Indigenous Physicists" at SACNAS 2017 - session organized by Ximena Cid

**understandings in the physics community that will enable each individual's truest expression in any space.**

When we are asked about the barriers that impact Indigenous People within physics, we need to be clear about what we mean by diversity, equity, and inclusion for Indigenous populations.

- **Diversity:** Do we have meaningful representation and engagement with Indigenous peoples in physics and related fields of astronomy, planetary sciences, and engineering? How are Indigenous Peoples represented within the historical development of physics concepts in the curriculum?
- **Equity:** Do Indigenous People have realistic access to opportunities to engage in physics, and related fields of astronomy, planetary sciences, and engineering?
- **Inclusion:** How are the concepts of Indigeneity discussed within different physics spaces? Is there racist rhetoric perpetuated in the form of racial slurs that would create a hostile environment for Indigenous People to participate?

When we start talking about Indigenous Peoples existence in Physics, we run into major problems. To date, there are core issues with a lack of data collection and/or misrepresentation of populations of Indigenous students and professionals. We are aware of only one limited report that is focused on statistics surrounding Indigenous peoples in physics from the American Institute of Physics (Merner & Tyler, 2017). Very few institutions have gathered the numbers of Indigenous people who have earned bachelors, masters, and/or Ph.D.s in physics and related fields. If an institution does aim to collect data about Indigenous people, they often misrepresent these individuals. For example, when someone clicks multiple boxes for their ethnic identity, which is often the case for Indigenous populations, they are often dropped into the 'other' category. Those people who have intersectional ethnic identities are lost, nor tracked nor added into studies to understand what interventions would be the most effective for those individuals.

Additionally, there are categorizations that do not understand the cultural overlaps. For example, Asian should not be within the same category as Pacific Islanders and Native Hawaiians. Some studies to track Indigenous Peoples are built upon the narrow definitions of enrolled members of federally recognized

tribes only, which misses out on large populations of people who are not. While the NSF collects data for every Ph.D. granted, that is not enough data to know what numbers exist at undergraduate, masters, and Ph.D. levels. Moreover, that is far from a comprehensive study to understand what solutions will increase access, inclusion, and representation of Indigenous People in these fields. This complete lack of data in itself is a major barrier.

APS needs to truly integrate the Indigenous community into the fabric of the society. The Forum on Diversity & Inclusion and Committee on Minorities is not the only place where our identities need to exist. When APS states that they address "the needs of our physics community", there needs to be an extensive audit on whether or not that is happening across the entire organization. For example, there is an [office on government affairs](#) which has no projects to directly address the Black, Indigenous, and People of Color (BIPOC) community. The [Forum on Physics & Society](#) has yet to address topics that address the relationship with physicists to the BIPOC community within physics and society as a whole. For example, there was no mention around the topics of police brutality, racial profiling, and discrimination that our Black physics colleagues experience in and out of academia. The Black Lives Matter movement started in 2013 yet it took until [2017 for APS to comment generally on racial violence](#). Furthermore, it wasn't until 2020 when APS issued member-wide statements acknowledging the more specific experience of our Black Physics colleagues in and out of academia. It wasn't until 2020 when they encouraged their membership to take action and participate in the June 10, 2020 [#Strike4BlackLives](#) and [#ShutDownSTEM](#), which were one day events to do a self audit and come up with solutions to eradicate systemic racism.

Another example is that there are no long-term conversations to deeply understand what is happening in and around Maunakea about the Thirty Meter Telescope. Herein lies a gigantic instrument largely led by physicists that interfaces with an Indigenous Population, the Native Hawaiians or Kanaka Māoli. Attention from the demonstration reached into global conversations and world-wide demonstrations. International governments passed legislation to protect mountain tops. There are mainstream cultural references includ-



Angela Little, Corey Gray and Ximena Cid (L to R)

ing A-list celebrities who brought it to the attention of their fanbase of tens of millions of followers. Yet the conversations were minimal within the physics membership. Furthermore, we are unaware of ongoing projects by the Forum on Physics & Society or Office of Government Affairs to address the conflict.

Importantly, these conflicts that interface between physics and Indigenous Populations are not only in Hawai'i. [Astrobites.org](http://Astrobites.org) wrote a series of articles talking about the history between large scale instrumentation and Indigenous land such as the Kitt Peak National Observatory on Tohono O'odham land, Mt. Graham International Observatory on Apache land, and in Chile where many of the observatories were forcibly taken from Indigenous People. Another example is the flagship neutrino experiment Deep Underground Neutrino Experiment (DUNE) that will be in Black Hills

in South Dakota. **The relationship between Indigenous People and the physics community will have a huge impact on the future of large scale instrumentation anywhere in the U.S., which many physics experiments are. We must know our history in order to be able to do better in the future.**

Given this gaping hole and the lack of engagement from the physics community, many Indigenous Peoples in the areas of Physics, Astronomy, Engineering, and Planetary Science, have taken up the work to ensure that our presence is known, we are not erased, and there is long-term investment for change. **As Dr. Ximena Cid famously states - "We exist. Our numbers are not zero."** We exist within academia, non-profit, and industry sectors having earned undergraduate and graduate degrees. We exist as members of the American Physical Society, American Association of Physics Teachers, and American Astronomical Society to name a few. Many of us have had to do this work at early stages of our careers as undergraduates, graduate students, postdocs, early career faculty, and in non-profit and industry sectors. Throughout the rest of this article, we will highlight the small group of Indigenous Peoples who are showing up powerfully within the physics community. This is only a small set of selected activities and is far from an exhaustive list of the work that this group does.

### Creating Space & Conversation

Dr. Ximena Cid has been at the forefront of signaling and creating space for us to come together. At the 2017 Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) yearly conferences, she proposed the first-ever session titled "Indigenous Physicists." That session was well at-

tended to hear the stories of Dr. Angela Little, Corey Gray, and Dr. Cid herself about the ways in which they are weaving in their identities into their practice of physics.

Dr. Angela Little served on the APS Committee on Minorities (COM), which is infrequent to have an Indigenous physicist serve on that committee. Dr. Little was Chair of 2018-2019 APS COM Taskforce on Indigenous Topics. The goal of the taskforce was to engage in relationship building, information gathering, and to work toward a sustainable model through which APS could lend its support to Indigenous-led work happening in the physical sciences. APS COM plans to build on lessons learned from the taskforce in the coming years.

Within the Astronomy community, Dr. Charee Peters led conversations at the Inclusive Astronomy Conference to educate the community about topics of Indigeneity and how the community needs to play an active role in learning, "[Astronomy from an Indigenous Perspective](#)". Dr. Peters served on the American Astronomical Society Committee on the Status of Minorities in Astronomy to ensure topics of Indigeneity were addressed.

### Weaving Indigenous Language into New Science Discoveries

An important marker of a culture is its words, language, and poetry. This is why Indigenous languages were specifically targeted by federal governments to assimilate and erase Indigenous cultures. For the United States and Canada, federal governments used Residential/Boarding schools to attack Indigenous culture and language. It is a historical tragedy whenever a language becomes extinct, but it is also an inspiring testament to Indigenous resilience when our languages survive, thrive, adapt to our present times, and are carried on with our youth. It is important for us to bring our Indigenous languages to the table, and let them be incorporated into every aspect of our modern-day culture, including physics.

Indigenous physicists are creatively figuring out ways to use their languages to open physics to their people and to share their language on a global scale. Indigenous language within the physics community has a value in countless ways that we are still discovering. Whether it is through deepening our understanding of core physics concept, Science Communication, and/or inspiring Indigenous youth, doing this work requires expanding Indigenous language itself with the genesis of new and beautiful scientific words. **Indigenous languages in physics pushes boundaries of language itself.**

Within the last 5 years, we have been incorporating Indigenous language into key astronomical discoveries. In Hawai'i, [A Hua He Inoa](#) is a partnership between Native Hawaiian language experts and as-

tronomers. This initiative was led by Native Hawaiians and brought to the global scale by having the Hawaiian name be the official name of the objects. Thousands of research papers utilize the official Hawaiian name, such as the interstellar objects ‘Oumuamua.

Indigenous physicist, Corey Gray worked closely with his mother Sharon Yellowfly on Translating Gravitational Wave documents into Blackfoot. Mr. Gray shares “In 2016, a few weeks before LIGO made their big announcement for the first direct detection of gravitational waves, the LIGO Scientific Collaboration (LSC) had a call out to translate the historic press release into as many languages as possible. I jumped at this opportunity, which would receive worldwide attention, to ask if I could recruit my mother into translating the press release into an Indigenous language, Blackfoot. About 2-weeks before the public announcement, my mother & other family members went to work and translated the [GW150914 into Blackfoot!](#)” This was the first of [many translations](#) Sharon Yellowfly would do for the LSC. In 2020, she has moved on to translating Scientific Summaries for LIGO; in total thus far she has translated 10 documents into Blackfoot. This Indigenous language story garnered national attention in 2019 with a radio piece on [NPR’s All Things Considered](#) as well as an article for [Atlas Obscura](#).

Dr. Franklin Dollar has been advancing the world of supercomputers, equipping the next generation to participate in the computing revolution and bring about the special interest to Indian Country. In 2015, he was awarded the “[Most Promising Scientist](#)” honor from the American Indian Society of Engineers and Sciences. At the University of California, Irvine, Dr. Dollar has recently been named the Vice-Chancellor of Inclusive Excellence at UCI.

Indigenous Physicist, Dr. John Greendeer Lee wrote a Ho-Chunk translation of the [abstract of his Ph.D. thesis](#) about testing the gravitational inverse square law at short distances. [Whereas Indigenous Astrophysicist, Julia Blue Bird](#) is studying her Native Oglala Lakota tongue while studying galaxy evolution as part of her Ph.D.

### **Evaluating how we teach physics in the Classroom and sharing Indigenous voices**

In a recent publication, Dr. Ximena Cid and her colleague Dr. Steve Kanim highlights how much of the findings from Physics Education Research (PER) have been based on samples of homogenous populations (well prepared mathematically, elite non-diverse institutions, affluent) and almost completely ignore high school and community college students (Kanim & Cid, 2020). Although there are notable exceptions, almost none of the data that PER is based on came from Minority Serving Institutions (MSIs), Hispanic Serving Institutions (HSIs), Historically Black Colleges and Universities (HBCUs), or Tribal Colleges. Because of this, much of PER knowledge is based on sample populations that would not include Indigenous populations or BIPOC populations in general. Because of this, best practices and curriculum are not including

scientific histories that would highlight the advanced knowledge Indigenous peoples from the Americas and Pacific Island populations cultivated.

Dr. Sophia Ciserno has gone beyond traditional classroom structures and developed math and physics-focused labs that take place outside of classroom walls and within intergenerational communities, specifically with K-12 Indigenous populations in mind. It should also be noted that these types of projects are often described as non-traditional educational environments, whereas Indigenous peoples have worked with the natural land in all of their traditional knowledge ways since time immemorial. To describe natural environments as non-traditional educational spaces is another example of colonial language and educational frameworks that already ‘others’ indigenous knowledge. Dr. Ciserno has gone on to win a 2019 APS Outreach Mini Grant to further her work on centering Native culture in science through a project called Indigilogix.

Indigenous Astronomer Dr. Hilding Neilson has translated [their experiences of racism during his hiring practice as a junior contract faculty](#) at the University of Toronto into developing curriculum and practices to [Indigenize astronomy and the classroom](#). He brings his cultural heritage of who he is as a person of Mi’kmaq ancestry into their study of stellar astrophysics. He has taught undergraduate courses on astronomy through Indigenous stories and is teaching graduate seminars on the challenges of astronomy and ongoing colonization of Indigenous peoples from around Turtle Island and Pacific Islands.

Indigenous Physicist, Xandria Quichocho led a recent paper titled “[Understanding physics identity development through the identity performances of Black, Indigenous, and women of color and LGBTQ+ women in physics](#)”. Their study looked at how women were navigating and developing racialized identities, womanhood, sexual orientations alongside their identity as a physicist, while studying physics at Hispanic-Serving Institutions - a notable context since most previous studies took place at Predominantly White Institutions as Dr. Cid and Dr. Kanim’s paper pointed out.

### **On the Impact of the Thirty Meter Telescope**

The construction of the Thirty Meter Telescope on the summit of Maunakea, Hawai‘i is a profoundly complex and an emotionally-rich topic. The views on construction range from strong opposition to resounding support. The reason for such a wide ranging view has a lot to do with the relationships amongst the Native Hawaiian community, residents of that state of Hawai‘i, the state government, the local and international astronomical communities. It comes down to who has agency over making decisions on the future of these lands.



*Corey Gray and Sharon Yellowfly*



*Xandria Quichocho*

Describing a complete story view is far beyond the scope of this article; we suggest that readers review the collection of articles referenced below. Throughout this section, we will highlight the most recent work done by Indigenous Physicists and Astronomers to create spaces where meaningful and respectful dialogue can take place and voices are heard.

In July 2019, the construction of the Thirty Meter Telescope was slated to begin on the summit of Maunakea. This led to demonstrations at the Maunakea access road and around the globe. The timing was at the cusp of the SACNAS 2019 conference, occurring only a few months later in October 2019. Given that Dr. Brittany Kamai is an experimental astrophysicist, Native Hawaiian and long-time SACNISTA, she committed a substantial amount of work to ensure meaningful, respectful, and representative dialogue took place. Dr. Kamai worked closely with Native Hawaiian Engineer and Physicist, Dr. Lelema Irvine, and Native Hawaiian Astronomer, Dr. Heather Kaluna to ensure that the broad spectrum of community voices about Maunakea were represented in all aspects of the conference. Additionally, Drs. Kamai and Irvine served as core members of the conference cultural advisory committee to ensure overall cultural competency for the conference. Indigenous physicist and long-time SACNAS leader, Dr. Cid contributed her lens on what could be incorporated into the conference. They coordinated with the SACNAS staff as well as Native Hawaiian, physics, and astronomy community members to create a broad array of ways conference attendees could learn and engage.

An example was the creation of Ka Hale No‘ono‘o Pono, a safe, brave and gracious space for anyone with any background, identity, and STEM discipline can have space to process the impact of Maunakea on them. Importantly, within this space, we hosted facilitated dialogues by Native Hawaiian practitioners to ensure the conversation was held in a respectful manner. Additionally, Native Hawaiian SACNAS members redesigned conference sessions to ensure a broad spectrum of views on Maunakea were represented and provided a reading list to the community.

These conversations at SACNAS created a way for over 5,000 conference attendees to have a place to learn and share how constructing the Thirty Meter Telescope has been making a far reaching impact on members of the Native Hawaiian community, residents of the state of Hawai‘i, and scientists across many other fields beyond physics and astronomy. This led to substantial contributions to the Astronomy and Astrophysics Community Decadal Survey, Astro2020, with over 10 more papers contributed from Native Hawaiian people beyond the field of astronomy, Native Hawaiians within astronomy, and Native Hawaiians who lead community-based astronomy efforts. Nearly

all of those contributions to Astro2020 would not have happened, except that Indigenous Astronomer Dr. Kathyne Daniel, a member of the Astro2020 Panel on the State of the Profession and Societal Impacts, made a commitment to hear voices from all the communities impacted by the construction of this astronomical instrument. Through the efforts led by Indigenous Astronomer Dr. Hilding, the Canadian Astronomical Societies Long Range Plan now ensures that construction of any astronomical facility must be based on consent from the local Indigenous communities.

Most recently, Indigenous astronomers and Planetary Scientists Dr. Heather Kaluna and Dr. Kat Gardner-Vandy led multiple publications to ensure that Indigenous voices are part of the Decadal process for Planetary Science. Dr. Kaluna connected with Polynesian Navigator Kālepa Baybayan and Dr. Kamai to create a series of papers titled “Creating Spaces for Indigenous Voices within Planetary Science - Part 1 & 2.” Dr. Gardner-Vandy led “Relationships First and Always: A Guide to Collaborations with Indigenous Communities”. Each of these publications describe ways in which Indigenous voices have a profound impact on the future of our field.

**Indigenous members of the physics and astronomy community cannot, and should not, bear the full responsibility required to produce the sort of cultural interpretation necessary for a truly respectful dialogue.** Contributions by Indigenous scientists toward this end are contributions to the integrity of the scientific process. However, it is neither equitable nor in the best interest of science for these efforts to be born by so few. If the scientific community is truly committed to the inclusion of and removal of barriers for Indigenous members, every non-Indigenous member of the community needs to share this weight and contribute to the necessary cultural change. True inclusion requires that the broader physics community do the work to build genuine and lasting relationships with Indigenous community members as active participants in the scientific community. These include cultural humility, active listening, and establishing trust; and must be preceded by the fundamental recognition that Indigenous people exist, matter, and have significant intellectual contributions to make.

The physics community needs to understand that the current discourse around Maunakea is an essential lesson. We strongly encourage the readers of this article to review the content in the reading lists above to gain a deeper understanding of what is happening. Prioritize this learning to be as fundamental as understanding Classical Mechanics. It exemplifies how important it is for the physics community to have a strong relationship with their local communities and wherever their instrumentation resides. When there is not a culture within physics and astronomy to form continuously meaningful relationships inside and out of the field, this manifests as painful legal disputes,



harm to local communities, and questionable ethics, but also results in projected timeline delays, budget costs for observatories and R&D experiments done by them, and a loss of talented scientific community members. We, as a physics community, need to prioritize this essential work. Otherwise, the large-scale physics and astronomy facilities, which enable furthering our understanding of fundamental questions such as the nature of matter, energy and the universe depend on, will become obsolete.

### Closing Thoughts

**We, as Indigenous People, are not ancient peoples. We are alive, living, working and growing.** When we talk about core physics concepts, we keep physicists like Newton, Fourier, Gauss, Compton, etc. alive by using their names and do not refer to them as ancient people, even though their time periods coexist with thriving Indigenous cultures. We all know the stories of how Einstein developed his theories of relativity, yet we do not know that the Mayan people independently created the concept of zero, a foundational concept in mathematics centuries earlier. Nor do we know of their complex and accurate astronomical observations and celestial calendars, some of which are still the most accurate to date. History courses often teach how Stonehenge relates to early astronomical phenomena, yet rarely discuss the astronomical knowledge developed and used by the peoples of the Americas and Pacific Islands. **We need to change the way we talk about ‘who discovered physics and math’ and we all must play an active role in this.**

Upon reading this article, you now know that we, as Indigenous Peoples in Physics exist. To date, we only know of roughly 25 people who hold degrees in Physics, Astronomy, Engineering and Planetary Sciences. We only know that number because we each put in years of work to find each other. Indigenous contributions and visibility cannot be solely on the shoulders of so few. **You, as the reader, can take an active role in keeping Indigenous knowledge alive.** Start by learning whose ancestral lands you currently occupy, where those people are now, and what are their languages. Find events that are open to the public and listen to the stories. Many universities have American Indian/Indigenous Studies Centers that host such public events. Be a respectful guest in any space you decide to participate in, do not make yourself central to the experience, and do you expect to be granted trust you haven't earned. A valuable resource to get you started in understanding the land you are on, see the [Native land app](#).

For researchers, any dataset that has been used in your research project, learn whose lands that data was collected on. First, take some time to see if local Indigenous communities have written up any preferences around how they would like to be acknowledged. Ask if you can pay community leaders or Directors of Indigenous Studies centers for consulting time if you cannot find anything public. Many Indigenous communities will ask that you acknowledge their lands in your presentations, email signatures, acknowledgement sections of papers, and other pro-

fessional communications. Although somewhat less typical, some communities ask that you not use an email signature with a land acknowledgement unless that is preceded by real relationship building with Indigenous communities because “Land Acknowledgements are a Responsibility<sup>2</sup>.” In general, following best practices means that it is important to follow up land acknowledgments with real, concrete action that supports Indigenous causes<sup>3</sup>. To move beyond land acknowledgements, you can learn the names of Indigenous physicists and take an active role in supporting research papers led by these people. Take care to acknowledge Indigenous voices and experiences. Ensure that facilities built on lands that have traditional, legal, ancestral, spiritual, or historical significance to Indigenous people are conceived, constructed, and maintained through an ethically-responsible partnership with those people. Every non-Indigenous person participating in that scientific collaboration or with the data itself needs to regularly assess if this relationship is truly there, where an excellent barometer is feedback from the Indigenous people.

For educators, take the time to educate yourself and then teach students about Indigenous contributions to science, and about the living, working Native and Indigenous people in physics. Connect with the curriculum that is Indigenous-led such as the ones mentioned above by Dr. Cid, Dr. Cisernos, Dr. Little, and Dr. Neilson.

For conference organizers, center the Indigenous Peoples of the land in the programming of that conference. Even during virtual events, encourage each participant to share what Indigenous ancestral lands they occupy. Take conference planning a step further by creating a cultural advisory committee at inception, as was formed for SACNAS2019, to create a meaningful relationship with the local population. Conference organizers should invite Indigenous peoples to participate in any capacity from serving on a panel or provide free or discounted registration for local residents.

For the physics community as a whole, hold yourself and your colleagues accountable for their language and attitudes around Indigenous peoples. Educate yourself in the particular forms of racism experienced by Indigenous peoples and our histories. We each play a role in ensuring that the language used and practices within the culture of physics are anti-racist towards Indigenous populations.

We, Indigenous physicists, are forming a [Society of Indigenous Physicists](#). You, as a reader, can become an active ally in learning about the work of the people within this community and connect these efforts with any students or scholars who identify as physicists. Be creative in figuring out ways to keep Indigenous voices alive and support environments where we thrive. ■

<sup>2</sup> This quote is taken from the Michigan State University American Indian and Indigenous Studies Land Acknowledgement page: [aisp.msu.edu/about/land/](http://aisp.msu.edu/about/land/)

<sup>3</sup> This is a helpful resource for people interested in making Land Acknowledgments more meaningful: [usdac.us/nativeland](http://usdac.us/nativeland)

## Celebrating and Supporting Black Women in Physics: Creating a Culture of Inclusivity

*Naomi M. Hall, Professor of Psychological Sciences, Winston-Salem State University*

*Danielle Dickens, Assistant Professor of Psychology, Spelman College*



*Danielle Dickens*



*Naomi Hall*

In the wake of the historical and recent murders of Black people in the U.S., #Shutdownstem was a hashtag that was established in 2020, publicly acknowledging how Black academics and science, technology, engineering and mathematics (STEM) professionals continue to be impacted by institutional and systematic racism (Chen, 2020). Additionally, trending hashtags, #BlackintheIvory and #BlackinSTEM, provide personal accounts of lived experiences of Black academics and STEM professionals. Both Black men and women are using social media to elucidate their challenges, as such, due to the double marginalization of one's race and gender, women of color in science have shared how they are often receiving messages that they "do not belong." Due to the lack of culturally diverse faculty in physics, isolation in the academy emerged as a common theme in a qualitative study on the experience of Black women physicists, in particular (Rosa & Mensah, 2016). Changing the cultural landscape that has been established, supported, and transmitted throughout much of the academy, will take intentional, action-oriented strategies by those in positions of power and influence. To simply acknowledge and/or understand the barriers that Black women encounter in universities is not sufficient. There must be personal, institutional, and systemic commitment to recruitment, retention, and supporting Black women to thrive in physics.

In 2017, the American Physical Society (APS) Committee on Minorities sponsored a gathering of Physics Chairs from Historically Black Colleges/Universities (HBCUs) and Black Serving Institutions (BSI) with the goal of discussing the drastic decrease in the number of physics bachelor degrees awarded to Black students, and identifying actions to reverse these numbers by providing recommendations. The recommendations for APS included the following: 1) strengthening relationships with HBCUs/BSIs, 2) convening with HBCU/BSI physics chairs periodically, 3) disseminating best practices for recruiting and retaining physics majors, and 4) advocating for HBCU/BSI physics departments. Recommendations were also provided to HBCU/BSI physics chairs, which included: 1) actively recruit physics majors, 2) implement a curriculum to recruit and retain physics majors, 3) foster student community, 4) form a recruitment and retention committee of physics majors, 5) seek partnerships and collaborations to bring in resources, 6) advocate for their program, and 7) be in contact with APS. Although the recommendations were not specific to Black women, many focused on the need to make the curriculum and departments more inclusive, emphasize agency amongst students, and focus on mentoring relationships (APS, 2017). Specifically, predominantly White institutions should

require faculty to create culturally relevant pedagogy for its students that encourages students to make connections between the physics curriculum and students' real world experiences (Johnson & Atwater, 2014). HBCUs, over the years, granted more than half of the bachelor degrees in physics to Black students. Furthermore, Perna and colleagues (2008) conducted a case study on Spelman College, a HBCU for women, and discussed factors that contribute to their success in supporting Black women in STEM through receiving faculty encouragement to persist, academic support through peer tutoring, and undergraduate research opportunities. Additionally, HBCUs have been effective in attracting Black physics faculty and supporting and graduating Black women, in particular, who go on to receive doctoral degrees in physics. According to Ivie, Anderson, and White (2014), HBCU physics departments account for half of the number of Black physics faculty members in the U.S, while HBCUs with Black physics faculty members account for only 4% of all physics departments.

Fries-Britt and Holmes (2012) also note that young Black women graduate from high school prepared and excited about pursuing physics in college and graduate school. However, the culture and *climate* they encounter from faculty in many university science departments discourages them from continuing on this path. Those who do continue on to graduate programs often experience difficulty establishing meaningful relationships with faculty and peers, and encounter stereotypical behavior that perceives them to be less capable than their male counterparts. These, and other, microinsults (communications that subtly convey insensitivity by demeaning one's racial heritage or identity) continue for Black women as faculty (Sue et al., 2007). Questions and comments by administration, peers, and even students whether or not they were products of Affirmative Action decisions and not in the academy because of earned success is offensive. Additionally, putting Black female faculty in positions where they have to prove their competence (as if earning a PhD in physics is not adequate) greatly diminishes their sense of belonging, which leads to some making the decision to leave the academy (Lewis, Stout, Pollock, Finkelstein, & Ito, 2016). One way to create a culture of inclusivity is through the use of microaffirmations, also known as microcompliments, which are subtle communications implying praise, admiration, or respect for an individual's identity or heritage (Sue et al., 2007). Examples of microaffirmations include a person who actively listens, recognizing and validating experiences by demonstrating that one is interested in what the colleague/student is sharing, affirming feelings, expressing interest and attention, or providing resources to colleagues and students (Ellis

et al., 2019). As research has suggested that microaffirmations can create a climate of inclusivity that builds self-esteem, self-efficacy, and improves the classroom climate for all (Rowe, 2008).

Of particular importance for creating a culture of inclusivity in physics are the ways implicit biases affect hiring committee decisions. Research has shown that there is an implicit hiring bias towards maintaining the status quo such that if the majority of the applicant pool is White, then people are more likely to choose a White applicant; the same is true if the majority of the applicant pool is Black (Johnson, Hekman, & Chan, 2016). Moreover, Eaton, Saunders, Jacobson, and West (2019) examined how intersecting stereotypes about race and gender can influence faculty perceptions of post-doctoral candidates in STEM fields, including physics. The results showed, in terms of race, that while faculty members in biology viewed male and female applicants similarly on levels of competence, physics faculty members gave male applicants higher competence ratings. Also, in terms of race, physics faculty members gave higher competence and hireability ratings to Asian and White applicants over Black and Latino applicants. Lastly, exploring the intersection of race and gender, Black and Latina women were rated three points lower on average in hireability than White and Asian men (Eaton et al., 2019). Since the predominantly White male field of physics is reflected in its applicant pool, the continued underrepresentation of Black female faculty in physics seems clear. Departments should put their resources into actively recruiting Black women physicists in their departments and creating an environment that would allow them to thrive.

Previous research discussed illustrate an immediate need for culturally responsive programs that not only encourage STEM persistence, but specifically persistence in those fields where Black women are grossly underrepresented, such as physics. These programs must consider cultural and contextual factors relevant to not just the academic success of Black women, but also factors that impede their progress. In our paper published in *The Physics Teacher*, tokenism, implicit bias, and gendered racism were presented as examples of the many ways in which Black female faculty are marginalized (Dickens, Jones, & Hall, 2020). More specifically, we discussed how Black women physicists may experience tokenism, which describes when employers showcase few successful employees of color as a misrepresentation of diversity in their department (Holder et al, 2015). Furthermore, due to being the only one or one of few Black faculty members in their department, token Black women experience hypervisibility, isolation, and may feel pressured to perform well due to concerns that their actions may be a reflection upon their entire race and gender social group (Dickens, Womack, and Dimes, 2019; King, Hebl, George, & Matusik, 2010; McDonald, Toussaint, & Schweiger, 2004). We also note that it is imperative to consider the broader social context of why Black women faculty in physics persevere, as this may serve as a point of intervention for a cultural shift.

One of the main findings from the five-year qualitative study with Black women scientists conducted by Fries-Britt and Holmes (2012) was that Black women's perceptions as scientists and the role of science in their lives, was connected to broader values such as community empowerment and social justice. The absence of these important factors can be psychologically isolating and play a prominent role in the decision whether to leave or stay in the academy and can prevent faculty from serving in a capacity that could help cultivate the next generation of physicists. Physics, like all sciences, needs to stay on the cutting edge of discovery for both relevance and survival, and the inclusion and diversity of perspectives is critical. ■

## References

- American Physical Society (APS) (2017). *Report on the HBCU/BSI Physics Chairs Summit Convened by the APS Committee on Minorities*. [aps.org/programs/minorities/upload/HBCU-Summit-Report-2017.pdf](https://aps.org/programs/minorities/upload/HBCU-Summit-Report-2017.pdf)
- Chen, S. (2020). *Researchers around the world prepare to #ShutDownSTEM and 'Strike For Black Lives'*. [sciencemag.org/news/2020/06/researchers-around-world-prepare-shutdownstem-and-strike-black-lives](https://www.sciencemag.org/news/2020/06/researchers-around-world-prepare-shutdownstem-and-strike-black-lives)
- Dickens, D., Jones, M., & Hall, N. (2020). *Being a Token Black Female Faculty Member in Physics: Exploring Research on Gendered Racism, Identity Shifting as a Coping Strategy, and Inclusivity in Physics*. *The Physics Teacher*, *58*(5), 335-337. [doi.org/10.1119/1.5145529](https://doi.org/10.1119/1.5145529)
- Eaton, A. A., Saunders, J. F., Jacobson, R. K., & West, K. (2019). *How Gender and Race Stereotypes Impact the Advancement of Scholars in STEM: Professors' Biased Evaluations of Physics and Biology Post-Doctoral Candidates*. *Sex Roles*, *1-15*. [link.springer.com/article/10.1007/s11199-019-01052-w](https://link.springer.com/article/10.1007/s11199-019-01052-w)
- Ellis, J. M., Powell, C. S., Demetriou, C. P., Huerta-Bapat, C., & Panter, A. T. (2019). *Examining first-generation college student lived experiences with microaggressions and microaffirmations at a predominately White public research university*. *Cultural Diversity and Ethnic Minority Psychology*, *25*(2), 266. [doi.org/10.1037/cdp0000198](https://doi.org/10.1037/cdp0000198)
- Fries-Britt, S. and Holmes, K. (2012). "Prepared and Progressing: Black Women in Physics", Renee Chambers, C. and Vonshay Sharpe, R. (Eds.). *Female Undergraduates on Campus: Successes and Challenges* (Diversity in Higher Education, Vol. 12), Emerald Group Publishing Limited, Bingley, pp. 199-218.
- Holder, A., Jackson, M. A., & Ponterotto, J. G. (2015). *Racial microaggression experiences and coping strategies of Black women in corporate leadership*. *Qualitative Psychology*, *2*(2), 164-180. [doi.org/10.1037/qup0000024](https://doi.org/10.1037/qup0000024)
- Ivie, R., Anderson, G. & White, S. (2014). *African Americans & Hispanics among physics & astronomy faculty. Results from the 2012 Survey of Physics & Astronomy Degree-Granting Departments. A publication of the American Institute of Physics (AIP) Statistical Research Center*. [aip.org/sites/default/files/statistics/faculty/africanhispanic-fac-pa-12.pdf](https://aip.org/sites/default/files/statistics/faculty/africanhispanic-fac-pa-12.pdf)

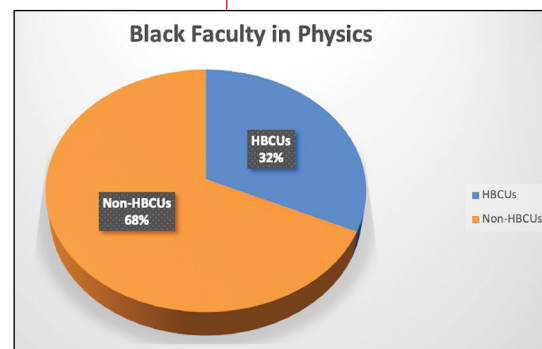


Figure 1 Representation of Black physics faculty at historically Black colleges and universities (HBCUs) and non-HBCUs (e.g., predominantly White institutions and Hispanic serving institutions) in 2012

(continued from page 11)

- Johnson, N. H., & Atwater, M. M. (2014). *The impact of beliefs and actions on the infusion of culturally relevant pedagogy in science teacher education*. In *Multicultural science education* (pp. 81-102). Springer, Dordrecht.
- Johnson, S. K., Hekman, D. R., & Chan, E. T. (2016). *If there's only one woman in your candidate pool, there's statistically no chance she'll be hired*. Harvard Business Review, **26**(04). [researchgate.net/profile/David\\_Hekman3/publication/303003812\\_If\\_There's\\_Only\\_One\\_Woman\\_in\\_Your\\_Candidate\\_Pool\\_There's\\_Statistically\\_No\\_Chance\\_She'll\\_Be\\_Hired/links/575eea9908ae9a9c955f8e2c/If-Theres-Only-One-Woman-in-Your-Candidate-Pool-Theres-Statistically-No-Chance-Shell-Be-Hired.pdf](https://researchgate.net/profile/David_Hekman3/publication/303003812_If_There's_Only_One_Woman_in_Your_Candidate_Pool_There's_Statistically_No_Chance_She'll_Be_Hired/links/575eea9908ae9a9c955f8e2c/If-Theres-Only-One-Woman-in-Your-Candidate-Pool-Theres-Statistically-No-Chance-Shell-Be-Hired.pdf)
- King, E. B., Hebl, M. R., George, J. M., & Matusik, S. F. (2010). *Understanding tokenism: Antecedents and consequences of a psychological climate of gender inequity*. Journal of Management, **36**(2), 482–510. [doi.org/10.1177/0149206308328508](https://doi.org/10.1177/0149206308328508).
- Lewis, K. L., Stout, J. G., Pollock, S. J., Finkelstein, N. D., & Ito, T. A. (2016). *Fitting in or opting out: A review of key social-psychological factors influencing a sense of belonging for women in physics*. Physical Review Physics Education Research, **12**(2), 1-10. [doi.org/10.1103/PhysRevPhysEducRes.12.020110](https://doi.org/10.1103/PhysRevPhysEducRes.12.020110)
- McDonald, T. W., Toussaint, L. L., & Schweiger, J. A. (2004). *The influence of social status on token women leaders' expectations about leading male-dominated groups*. Sex Roles, **50**(5-6), 401–409. [doi.org/10.1023/B:SERS.0000018894.96308.52](https://doi.org/10.1023/B:SERS.0000018894.96308.52).
- Perna, L., Lundy-Wagner, V., Drezner, N. D., Gasman, M., Yoon, S., Bose, E., & Gary, S. (2009). *The contribution of HBCUs to the preparation of African American women for STEM careers: A case study*. Research in Higher Education, **50**(1), 1-23.
- Rosa, K., & Mensah F. M. (2016). *Educational pathways of black women physicists: Stories of experiencing and overcoming obstacles in life*. Physical Review Physics Education Research, **12**, 020113-1-15. [doi.org/10.1007/s11162-008-9110-y](https://doi.org/10.1007/s11162-008-9110-y)
- Rowe, M. (2008). *Micro-affirmations and micro-inequities*. Journal of the International Ombudsman Association, **1**(1), 45–48. [marypendergreene.com/bookshelf/docs/Rowe-2008-microaffirmations\\_microinequities.pdf](https://marypendergreene.com/bookshelf/docs/Rowe-2008-microaffirmations_microinequities.pdf)
- Sue, D. W., Capodilupo, C. M., Torino, G. C., Bucceri, J. M., Holder, A. M., Nadal, K. L., & Esquilin, M. (2007). *Racial microaggressions in everyday life: Implications for clinical practice*. American Psychologist, **62**, 271–286. [dx.doi.org/10.1037/0003-066X.62.4.271](https://doi.org/10.1037/0003-066X.62.4.271)

## How to Actively Not be a Barrier to Diversity Efforts in Physics

Sowjanya Gollapinni, Senior Scientist, Physics Division, Los Alamos National Laboratory and APS COM member

(Originally based on themes co-developed by the author and Dr. Brian Nord, Fermilab & U. of Chicago, for Diversity & Inclusion parallel sessions for the APS DPF 2017 meeting.)

Systemic racism permeates all facets of our society and the recent horrific killings of George Floyd, Breonna Taylor and many others are just one of the many reminders of this. The serious lack of under-represented minorities (URMs) in physics is proof that our field is no exception to discrimination and racism. In light of the recent events, it is important to confront ourselves about how our own complicity and inaction have perpetuated racism and a culture that allows racist actions to thrive.

In addition to inaction and complicity, there are other serious barriers to actively carrying out efforts towards Equity, Diversity, and Inclusivity (EDI) in physics due to the underlying culture. Physicists who show enthusiasm and commitment towards EDI issues and are openly active in these efforts suffer the risk of becoming “typecast” within the science community. This is especially true for women and URMs. This not

only impacts one's standing as a scientist but has a major impact on early career scientists, for example, resulting in diminished science opportunities. This is due to the underlying assumption that if someone is active in diversity efforts then they are not dedicated to doing science and as a result, are not seen as a physicist first. Many early career physicists are advised by senior colleagues to not highlight their active involvement in EDI efforts in job applications as it can negatively impact their prospects given how it is perceived in the community. The collective impact of this phenomenon is that it ultimately discourages scientists from actively and openly participating in diversity efforts. Another related phenomenon in the science community is “stereotyping” those who openly call out discriminatory behavior as “aggressive”, “emotional”, or “angry”. The fear of being portrayed as “angry black woman” or “angry person of color” again discourages one to openly speak against bias and discrimination. This is one of the reasons why biased language is so prevalent in the community. Some common examples of biased language include gender assumptions and failing to

use gender-neutral, inclusive phrases and preferred pronouns.

False objectivity among scientists is another barrier in fighting discrimination in physics. Scientists claim to carry over assumed objectivity from science into their other relationships which essentially ignores the underlying science culture shaped by white supremacy and patriarchy over the years. This approach also ignores learned biases and often leads to assuming one's own perspective that doesn't detect discrimination is the correct one. This poses a challenging question that needs to be addressed: "How do we break an individual's hold on pseudo-objectivity and address the false dichotomies and equivalencies among scientists that arise due to it?" False objectivity is manifested in many ways during interactions. One classic example is "gaslighting" where the experiences shared by minorities are trivialized and minimized by calling them into question or by creating a sense of doubt. This often happens when someone discusses racism or sexism or points out a specific act related to it and they are told by a privileged member in the group who has no real experience or demonstrated expertise on the matter that they are either being oversensitive or overthinking it. Gaslighting is deeply rooted in social inequalities and plays a powerful role in upholding social conditioning in a subtle way. This phenomenon is pervasive in the science community and can sometimes be personally devastating to those experiencing discrimination and seeking out help.

Another common experience in the community that happens on a daily basis is "Microaggressions" [1, 2] where marginalized groups are casually degraded by privileged groups during scientific interactions and meetings. These daily microaggressions add up and can have significant impact on the emotional well-being of minoritized groups and their scientific productivity. Not to mention the emotional energy that is spent in responding to and fighting these micro and macroaggressions. Micro-aggressors are usually given an "easy pass" in the community by implying that their comments are not to be taken seriously. This essentially shows the lack of seriousness towards addressing inclusivity at work place. In addition, minorities who raise their voice against microaggressions are often told they are being oversensitive, another example of gaslighting. Microaggressions are also most often intercepted by minorities putting an undue burden on those experiencing it to also fight against them. One way to reduce this burden is to actively train [3] colleagues from privileged groups on various strategies to intercept microaggressions and serve as active bystanders.

However, educating and training scientists anew poses significant challenges in itself. Scientists often assume they have expertise in EDI without any demonstrated effort, experience or expertise and apply their own approach to these problems, not realizing that there are best practices and tried and true ap-

proaches. This lack of acknowledgement that expertise in EDI is real and separate from their own, and the unwillingness to listen and learn from experiences of marginalized groups is where the core of the problem lies. In addition, many disregard the evidence minorities see and downplay the importance of EDI issues failing to take any action. This again leads to a scenario of epistemic inequity where minorities are unfairly expected to teach and educate unwilling non-minorities about issues of non-inclusion. This is often experienced while convening sessions on EDI for conferences and meetings where some scientists assume their experiences are equivalent to those of minorities and refuse to acknowledge and learn from the EDI expertise present in the group. In these contexts, it is important to understand how to set ground rules of interaction, leadership, effort expectation (e.g. before joining a conference-organizing committee) in order to prevent scientists unqualified in EDI (and uninterested in learning) from doing harm from their leadership positions.

Tokenism is another issue that is prevalent across the nation. Tokenism simply gives a false sense of equality without actually achieving it. For many institutes, EDI stops at tokenism once a certain number of women and URMs are hired. It has become more of a symbolic effort and signifies the profound lack of realization in the community that diversity and inclusion need to go hand in hand and that one cannot sustain without the other.

Discrimination and racism is built into the American social fabric and is reflected in every walk of our life. The current COVID pandemic, disproportionately affecting African Americans, Indigenous peoples and Hispanics only sadly confirms this fact. Despite what is being witnessed, discussing racism openly is still an inconvenience to many and is most often discouraged as being divisive or unproductive. This sort of perception and the culture that supports it has real impact on our community by significantly impeding our efforts towards EDI. It is everyone's responsibility to actively strive to dismantle systemic racism and implement reforms at the fundamental level. In the absence of any action, at the very least one should not actively present barriers to those who are working towards the EDI cause. ■



Sowjanya Gollapinni

#### References:

- [1] R. S. Barthelemy, M. McCormick, and C. Henderson, "Gender discrimination in physics and astronomy: Graduate student experiences of sexism and gender microaggressions", *Phys. Rev. Phys. Educ. Res.* **12**, 020119 (2016).
- [2] C. Harrison and K. D. Tanner, "Language Matters: Considering Microaggressions in Science", *CBE Life Sci. Educ.*, 2018 Spring, 17(1): fe4. doi: 10.1187/cbe.18-01-0011
- [3] [web.mit.edu/bystanders/index.html](http://web.mit.edu/bystanders/index.html)

## From Where I Sit: Equality, Equity, and Justice

Hanna Song, Senior Director for Inclusion & Diversity, Caltech



Hanna Song

We seem to be in a constant state of crisis. From COVID-19 to the come and go of an egregious immigration ban, from the ever-growing political divisiveness to natural disasters, we just can't catch a break in 2020. Within this unstable and unpredictable context, many are also experiencing a reawakening of the racial injustices and perils experienced by our Black communities today. The veil of White immunity<sup>1</sup> has lifted and we're recognizing that despite the gains made for equity and justice since the Civil Rights movement, so much of the outcomes and dynamics have remained the same. Policies, programs, initiatives, and the best of intentions have failed to make radical changes for the lives and experiences of our most marginalized communities. As scientists and academics, we tend to respond immediately to acts of crisis with a brainstorm of solutions and reactionary initiatives. Our office has received a slew of requests for workshops and trainings, reviews of material, and just overall consultation on how *not* to be part of the problems and to instead, be proactive in enacting initiatives that improve diversity and promote inclusion within their labs, majors, and departments.

Because we are currently faced with an unprecedented opening in history where organizations, specifically, higher education institutions have been given an opportunity to reexamine the seemingly foundational tenets of how we offer higher education and the global purposes of higher education. Higher education institutions are microcosms of the American society, and thus, are situated and complicit in the history of anti-blackness, that has manifested in all of our policies, processes/procedures, and even in the replication of the racial inequities found in our student populations. Specifically, the watershed moment of George Floyd for the Black Lives Matter movement, mandatory quarantine and physical distancing as a response to the COVID-19 pandemic, and the constant state of anxiety we seem to live in has created a perfect opportunity for us to assess, question, and critically examine how "we've always done things."

As a "professional" in the field of diversity, equity, and inclusion (DEI), I have very mixed feelings about all of the good faith efforts. Yes, I am excited that there is a new onslaught of folks who want to be more inclusive and value diversity. I love the momentum of change, the excitement and synergy these watershed moments have created across our campuses. Yet, I worry. I worry that the changes promised are episodic, not funded, and not sustainable. I worry that in our quest to be responsive, we have not stopped to dig deeper on how we got here in the first place and be thoughtful in a proposed strategy to move forward. I worry that as scientists we attempt to be objective on matters that

are rooted in the core of what makes us humans—our feelings, morality, and subjective interpretations of the world around us. In our desperation to respond and "fix" problems, engineer solutions with timetables, we devalue the need to take a moment to reflect and feel deeply what is happening around us. And yet, in our reactionary state, we are missing the central tenet to DEI, which is to question who is invited to the proverbial table of decision-making (diversity), whose voice matters (inclusion), and who is given the power and agency to enact change (representation).

Let's take a step back. The lexicon of DEI work is as important as the way we see it applied to our programs and responses. As college presidents symbolically address their campuses and all of their internal and external constituents, they have a common thread of confirming that Black Lives Matter on their campus and beyond and ending with a commitment to diversity and inclusion. These initiatives, programs, and promises can be categorized in three distinct categories: equality, equity, and justice. **Equality** has traditionally been the easiest, and defensibly, the backbone of our meritocratic narrative of how we see ourselves in science. We have rested on the laurels of equality to imply that we, as individuals and institutions, are fair and just in how we create, produce, and innovate within our scientific fields. *Anyone can apply to our programs and institutions. I treat everyone the same in my lab. I objectively discern my student's research by their results and other empirical outcomes.* I challenge that the definition of equality is not fairness, but rather, synonymous to sameness. Equality means that we provide the SAME set of conditions, resources, and experiences to all of our students, staff, and faculty. Equality can negate the reality that we all start at very different places in life. *Studies show that students from diverse backgrounds and identities that are traditionally underrepresented in STEM will not apply to our institutions.*<sup>2</sup> *The way you are treating your students ignores the fact that they are fundamentally different in their needs, skills, abilities, life situations; no two are the same. Students' access to resources and research opportunities are predicated on many subjective factors. Empirical research shows that students of color are not given the same opportunities to succeed in STEM.*<sup>3</sup> Sameness may be appropriate when we are fundamentally starting from a state of sameness—our identities, life experiences, opportunities, cultural contexts, capital, etc.

<sup>1</sup> Cabrera, Nolan L. (2018). White Immunity: Working Through Some of the Pedagogical Pitfalls of "Privilege," *Journal Committed to Social Change on Race and Ethnicity* (JCSOCRE), 3(1)

<sup>2</sup> Jensen, L.E. & Deemer, E.D. (2019). Identity, Campus Climate, and Burnout Among Undergraduate Women in STEM Fields. *The Career Development Quarterly*, 67(2).

<sup>3</sup> Estrada, M. Burnett, M., et. al. (2017). Improving Underrepresented Minority Student Persistence in STEM. *Life Sciences Education* 15(3).

If equality is not adequate in creating “fairness,” then what approach considers the empirical fact that we are diverse and unequal from the start? **Equity** is the term to describe the idea of fairness. Recognizing that people are different and structurally have not been afforded equal footing in the resources, opportunities, and experiences they’ve had in their lifetime, we can level the playing field by enacting initiatives that are equity-based. Fixing the past grievances and wrongs and acknowledging that we are different from the start is imperative in understanding the values and the importance of equity-based programs and solutions. Higher education institutions will have identity-centric programs to create equitable environments. These include summer bridge programs, cohort-building programs, mentorship programs, diversity fellowships and awards, and other initiatives that are designed to promote equitable opportunities for those who have historically been excluded, marginalized and underserved. Equity is not for the faint of heart. Although the masses may understand the logic for equity-based programs and initiatives, the backlash from those who traditionally hold the value of sameness will adopt languages like “reverse discrimination” and challenge why individuals should bear the consequences of historic, systemic and structural inequalities.

When we take a deeper cut and start identifying patterns in the differences of starting places, we will uncover the roots of inequality that are structural and historical within our systems, policies, culture, and standard operating procedures. Critically examining the underpinnings of why and how we do education, work, and science, we find problematic, systemic issues that are at the root cause of the inequality we’re seeing now. Responding to this requires us to take a **justice**-based approach in removing structural barriers that keep a diverse group of people from achieving and/or experiencing resources, opportunities and life chances. Our educational systems were historically designed to benefit a very specific White, male constituent body. The rules, processes, and policies were tailored to further advance their place in society and thus, we’ve had to reexamine, protest, and amend.

A **justice**-based approach is contentious because it requires individuals to wrestle with the privileges and benefits they’ve been afforded as we begin to ad-

dress the wrongs of a collective. In other words, those who have been successful in achieving success in the current systems are being asked to question the merits of their entry and make room for those who will be playing a different game. The rules are shifting, and the purposes of higher education have become more inclusive. Some traditionally, privileged individuals who are sitting at the table will resort to seeing the current tide as a zero-sum game, one in which they may be displaced by someone who was structurally left out of the room altogether. At this point, will that privileged individual recognize their displacement as a sign of progress and justice? The perception of losing power, the feelings of entitlement to keep things the way they’ve always been, and other attitudes that stem from colonial imperialism must be realized and addressed before we can truly make progress with a justice framework. I hope that we can remain steadfast to a global perspective and commitment to right the wrongs of injustice, unroot the tenacious and pervasive culture of anti-blackness, and be willing to dismantle these myths of objectivity and meritocracy.

“Do not get lost in a sea of despair. Be hopeful, be optimistic... Never, ever be afraid to make some noise and get in good trouble, necessary trouble.”

—*John Lewis, June 2018*

Now is the time to make good trouble, using the same scientific method we’ve held on to for centuries. Being strategic means to employ the same research lens to the problems we see around us. What do the literature, theories, and data suggest for organizational change to promote diversity, mandate inclusion, and pursue justice? We have to be willing to experiment, collect data, and learn from our mistakes along the way. We should also be transparent with our data and examine our results with a critical eye for growth and improvisation.

Perhaps we could not have predicted the extent of 2020 tragedies, but we have the responsibility and opportunity to strategically respond in moving forward, advancing humanity to create a more just world. Our science will be better for it because we will finally be acknowledging that we are fallible, yet ever-evolving humans who do science. ■

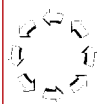
**American Physical Society  
One Physics Ellipse  
College Park, MD 20740-3844**



---

**Request to join the**  
**APS Minorities in Physics Facebook group**  
[www.facebook.com/groups/APSMinorities](http://www.facebook.com/groups/APSMinorities).

---



The *Gazette* is printed with soy ink  
on recycled paper. When you are  
finished with this newsletter, please  
recycle it or pass it on to a friend.

**Questions? Comments?**  
**Email: [women@aps.org](mailto:women@aps.org)**