



Accountability: Federal Research Grants Should Be Tied to Diversity Outcomes

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Note: The opinions expressed here are not necessarily those of Notices.

This article calls for the reexamination of diversity as it pertains to the historical people of the United States. It also outlines a plan to intentionally align federal funding awards with diversity goals.

People of Color. We see this everywhere. Who is this describing? Are there people who have no color? Even white is a color. Hardware stores carry white paint. Are we the only country in the world, besides South Africa, that uses the term “color” to distinguish a group of people? There are characteristics of individuals that do separate populations and impact their career paths: access to resources, quality schools, a safe neighborhood, drug habits, modes of dress, culture [1]. By looking at a person’s color, can we ascertain these characteristics? Nonsense. “People of color” is a term that is now used to group together populations that have lived in the United States for generations as well as those who have recently arrived in the country. It is a sort of whitewash. Recent immigration patterns have brought in many different cultural/ethnic groups. Blending these new populations into American society has not always worked well. Being the only ethnic/racial minority in a classroom can lead to discrimination, as so many recent immigrants have found.

As a nation of immigrants, the United States continues its efforts to integrate new populations into the educational system. English as a second language programs exist to fa-

cilitate the integration of these students into our schools. Financial aid programs for college help new immigrants afford an education. Even programs that were initially aimed at increasing minority participation in STEM have representatives from these new populations. The annual meeting of the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) is an example of the diversity of the American workforce. But there is a counterpoint to the support we give to new immigrants. These could be described as English as the only language programs.

In the last century, reservation schools did their best to eradicate not only the language of the Native American children but also their culture. In the Southwest, Mexican-American children were discouraged from speaking Spanish in their schools. As we formulate plans to encourage new immigrant populations to pursue STEM careers, it is important to remember that there is still an underrepresentation of minority populations in the STEM workforce.

For decades the underrepresentation of the Mexican-American (Chicano), Native American, Native Hawaiian and Pacific Islanders, and African American populations in STEM careers has been recognized, and efforts have been made to increase representation. These are not immigrant populations, however, as they have had a presence in the United States for centuries. I will refer to these four populations as the Traditionally Excluded American Minorities (TEAM).

It is painful to reflect on the past and confront the atrocities that invading Europeans inflicted upon the TEAM. But this past forms the present reality, and TEAM populations

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DOI: <https://dx.doi.org/10.1090/noti1936>

confront this painful dichotomy daily. Let me say a few words about this history.

The ancestors of African Americans were brought to this country as slaves. Segregation in the early 1900s was accepted, and the civil rights of the African American were greatly curtailed. Their experiences have recently been portrayed very powerfully in many movies, such as *The Help* and *Twelve Years a Slave*. These movies have brought at least a certain consciousness to the plight of the African American community. That it is necessary to mention that black lives matter tells us something about the current culture. Relative to STEM, a recent article [2] in the *New York Times* described the experiences of an African American mathematician in a research department.

The genocide that Europeans inflicted upon the Native American community is perhaps less in the public mind. How difficult must it be for Native Americans to see prominent institutions, like Amherst College, named after an individual, Lord Jeffrey Amherst, whose goal was to extinguish the Native American population by any means necessary, including giving Native Americans blankets that were contaminated by smallpox [3, pp. 67–68]. Those that survived extermination were relegated to reservations often far from their ancestral homes. Sherman Alexie has written very poignantly about life on the reservations [4].

The United States stole half of Mexico's land in the mid-1800s with the Treaty of Guadalupe Hidalgo and the Gadsden Purchase. Because of that action, Mexican Americans became a conquered people living in a conquered land. My parents were born in the state of Sonora in Mexico, making me a first-generation American in a nation of immigrants. But I am not a first-generation American. My parents were not immigrants. I can trace my lineage to a soldier at the Presidio de Tucson in 1750. Our families lived in the Arizona-Sonora desert for generations and moved through this region freely. The border created this artificial separation between us and our land [5, 6].

The impact of this violence brought poverty and lack of resources to the TEAM. As the United States entered the Sputnik age in the 1960s, TEAM populations did not have access to a level playing field in education. Prior to the 1954 Supreme Court decision that desegregated schools, the policy of separate but equal schools produced schools for African Americans that were separate but certainly not equal. It would take more than ten years before desegregation would become a reality. However, since schools are often funded by property taxes, TEAM members continue to attend lesser-quality schools and continue to be sorely underrepresented in STEM fields.

In 1961 President Kennedy issued Executive Order 10925, which used the words "affirmative action." By the 1970s this term was often referenced in academic circles with regard to the hiring of TEAM members. But given the lack of TEAM STEM students in the pipeline, TEAM STEM faculty were in short supply, and, in my opinion, STEM

departments saw little benefit in hiring TEAM faculty. As a result, TEAM faculty are almost invisible among faculty in mathematics departments, especially in the top twenty departments. Given this lack of progress, the word "traditional" began to disappear, and the word "underrepresented" began to encompass larger populations with the expectation that some progress could at least be recognized.

Toward the end of the last century US demographics began to change. The term Hispanic or Latinx now encompasses a rich milieu of cultures from many different countries. It is no longer just Mexico exporting large populations to the United States. It would be impossible to try to differentiate among this population, nor is it desirable. In fact, the number of Hispanics who are majoring in mathematics is growing. Part of this is due to the sheer growth in the Hispanic population. Minority organizations like SACNAS have also formed to increase interest in STEM fields among Hispanics. US-born Hispanics are different from Hispanics educated abroad, as poverty is still one of our birthrights. It is a sad commentary that if you are a Hispanic in one of our top twenty mathematics departments, you are probably foreign born. TEAM representation in the top twenty departments is almost nonexistent, and the fact that we are not there makes us invisible to the educational concerns of these departments.

Diversity efforts had little impact on TEAM individuals going into careers leading to the professorate. (In 1977 I was the first Chicano mathematician hired in a tenure-track position in the mathematics department at the University of Arizona. When I retired in 2018, I was also the last.) With situations like this describing the failure of these efforts, something had to be done. The solution that came out was to downplay the roles that these TEAM populations have in the history of the United States and instead whitewash the issue. The term "people of color," though not defined, came into vogue, and departments could now at least claim that there was some color among their faculty. One hears announcements that the first "person of color has been appointed to a position." It is likely that this person is not a TEAM member. Problem solved. Or so it appears. "People of Color" in fact has marginalized the most underrepresented members of this group.

I believe that this serious underrepresentation of TEAM members in the mathematical enterprise has much to do with the fact that there are so few TEAM graduate students and faculty in the top twenty departments. If these departments are not producing TEAM PhDs, where are these departments going to find TEAM faculty? Very few TEAM mathematicians have earned a PhD at Princeton or Harvard. Given that these two institutions appear to have so little interest in educating TEAM members, why is the federal government continuing to support these two institutions with grants? For many years the National Science Foundation has been very explicit that increasing diversity is one of its strategic goals. The 2018 White House Strate-

gic Plan, *Charting a Course for Success: America's Strategy for STEM Education*, lists three goals, including to "Increase Diversity, Equity and Inclusion in STEM."

A careful examination of graduate education needs to occur in this country. How is it that we have graduate programs that are not accessible to US citizens? Graduate programs create artificial barriers, such as GRE scores, that limit the number of applicants. In the United States we demand that students have a liberal arts education. That typically means that US students take one or two mathematics courses per semester. International students have an entirely different system of education. When applying to universities, students are accepted into a program of study, like mathematics. These students take four or five mathematics courses per semester. When they graduate they essentially have a master's degree knowledge of mathematics. It is no wonder that they score better than US students on the GRE. Are these international students destined to become better researchers than US students? In conversations that I have had with departments that are limiting the number of international students in their graduate program, they report that US students produce doctoral theses on a par with international students. There are many qualities that are essential to completing a PhD: determination, curiosity, creativity, and a basic knowledge of mathematics. The GRE measures only the last item. We value creativity, yet when we admit students, we evaluate only their knowledge.

Increasing diversity is explicit in the goals of the federal government and its funding agencies. If departments display no interest in supporting these goals they should not be funded with research grants. Mathematics departments, particularly those that receive funding from the federal government, have a responsibility to this country. It is not enough that they are creating new knowledge. The better the research potential of a department, the more responsibility it has to bring TEAM members into that environment.

Let's envision what the faculty will be like in twenty years. Given that there are so few TEAM graduate students in the top twenty graduate programs, the number of TEAM faculty in these departments will not change. Moreover, are these departments part of the problem or part of the solution? If these departments are not graduating substantial numbers of TEAM undergraduates, then they are part of the problem. In selecting the "best" students for graduate programs, programs should also answer the question, What is best for this country?

How should the mathematical community move forward to address the serious problem of underrepresentation of women and TEAM members among our faculty? Part of the answer rests on our doorstep: the undergraduates in their first year of study. These students do not select mathematics as a major because they know of only one profession with that major. Departments need to reach out to these students to inform them of the many career paths

available for a mathematically prepared student. And to go along with this, faculty need to answer the question, What would a student do with an undergraduate degree in mathematics? In answering this question, departments need to update their own undergraduate programs of study to prepare students for tomorrow's jobs [7].

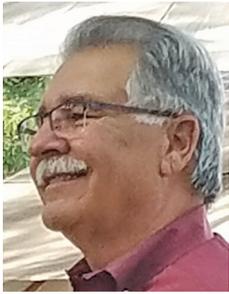
Mathematics departments are not service departments. The best tool that we have to interest students in mathematics is the material that we teach, as long as we present it in an entertaining and interesting form. There should be no dead-end courses. The central purpose of a mathematics course should be to convince the student to take the next mathematics course. New teaching techniques are being developed, and departments should invest efforts to determine which would work best for their faculty and student body.

Mathematics departments are not research institutes. They are part of a university, and as such the vision statement of the department should support the goals of the university. A university needs much more than good research faculty. Effective teaching, motivating and mentoring students, and performing outreach to the community are all important tasks. The announcements for faculty positions should reflect the departmental vision and how the department is meeting the goals of the university.

Finally, departments should utilize the opportunities available to meet TEAM mathematicians at national meetings and to talk to them about possible job openings. Currently both the Math Alliance and the National Association of Mathematicians provide opportunities to meet new TEAM PhDs at the JMM. Getting to know TEAM mathematicians would be an important step towards diversifying your faculty.

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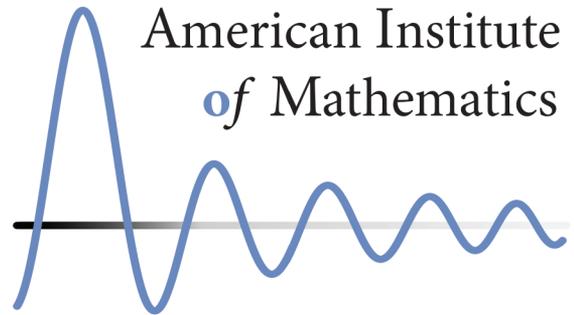
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