Inclusive Science: Editorial
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Excluded

David Asai
Howard Hughes Medical Institute, Chevy Chase, MD 20815

"All paradises, all utopias are designed by who is not there, by the people who are not allowed in."
–Toni Morrison

Science excellence depends on our ability to harness the powerful potential of our nation's diverse talent pool. A scientific community that actively seeks the full participation of persons from all backgrounds and perspectives is better positioned to find innovative solutions to complex scientific problems; the more difficult the problem, the greater the benefit of diversity in finding the solution (1). While diversity has many different facets, the dimension of race and ethnicity stands out because of persistent racial and ethnic disparities in society and science.

This essay focuses on PEERs—Persons Excluded due to Ethnicity or Race. Our exclusion of people has been systematic and intentional, and therefore, in order to pivot from exclusion to inclusion, our strategies must be systematic and intentional.

The year 2020 marks the 75th anniversary of the end of World War II. When they returned home, many of the American veterans took advantage of the benefits afforded them through the Servicemen's Readjustment Act of 1944. The G.I. Bill provided low-interest federal loans for education and housing to all honorably discharged veterans who served for at least 90 days in the active military during the war years.

Sixteen million Americans—nearly one-tenth of the entire U.S. population in 1945—were eligible for the G.I. Bill, and one million of them were African Americans. The federal law provided equal benefits to all persons regardless of race. The implementation of the law, however, was left to the system of local and state jurisdictions, banks, and colleges, and that system was overtly unequal.

Mailing address: Howard Hughes Medical Institute, 4000 Jones Bridge Road, Chevy Chase, MD. 20815. Phone: 301-215-8874. Fax: 240-497-2304. E-mail: asaid@hhmi.org.
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In 1947, in Mississippi, 3,229 Veterans Affairs (VA) home loans were awarded; only 2 went to blacks. In 1950, of the 69,666 VA loans in the New York City metropolitan area, only 69 went to blacks. The intentional exclusion of African Americans resulted in the more than doubling of the home ownership gap between whites and blacks between 1940 and 1960 (2). In education, because many of the nation's colleges and universities were either completely white or admitted very few blacks, 95% of the African Americans seeking educational loans were forced to apply to the 100 or so Historically Black Colleges and Universities (HBCUs). Most of the HBCUs were small, underresourced, and unable to accommodate the large influx of potential students. Thus, well over half of all African American WWII veterans seeking admission to college were turned away (3).

The profound impact of the G.I. Bill is evident today. The way the law was implemented not only was instrumental in creating America's middle class, it also erected a racialized filter to determine who got to join the middle class. The story of the G.I. Bill is an example of intentional and systematic exclusion. It is a poignant reminder that it is not sufficient to establish well-meaning programs if the programs operate in a noninclusive environment.

Science is neither separated from the rest of society nor innocent in the practice of exclusion. In American science, systematic exclusion has resulted in the underrepresentation of people belonging to certain racial and ethnic groups, including African Americans, Latinx/Hispanics, and Native Americans. Today, PEERs comprise more than 30% of the U.S. population but only about 11% of STEM PhDs, 9% of the scientific workforce, and approximately 6% of the tenure-track STEM faculty.

PEERs are twice as likely to leave the STEM disciplines as whites and Asian Americans (4). Most of these departures occur during the introductory STEM experience, typically in the first year of college. Why do PEERs switch out of science at disproportionately high rates? It is not because of lack of interest; indeed, PEERs are actually OVER-represented among students entering college intending to major in one

of the STEM disciplines (5). Nor are the higher switching rates by PEERs due to a lack of preparation. When comparing students with similar high school preparation and family commitment to higher education, PEERs exit STEM at significantly greater rates than whites and Asian Americans (6). It is striking that the higher switching rates by PEERs are a phenomenon not found in other disciplines, including non-STEM subjects that require quantitative skills (7). It is time we ask ourselves why the way we teach STEM disproportionately excludes PEERs.

For five decades, science has tried to increase diversity. During that time, we have become good at designing student-centered interventions that are intended to help students "fit" (a term used to rationalize eugenics) into a science community built on selective exclusion. Activities like research experiences, peer advising, summer bridge programs, and cohort-based learning can be effective at improving retention of the participating students and supporting their learning. But in our enthusiasm to help students from certain backgrounds, we have neglected the important task of improving the learning environment for all students. As the G.I. Bill treated veterans to certain benefits but failed to make more inclusive the system in which those benefits were to be accrued, so too have we focused too much on treating the students without sufficient attention to changing the culture of science and higher education.

The culture change we seek requires the active engagement of science faculty. We must create time and safe spaces for honest reflection on our beliefs and behaviors. We must provide faculty the opportunity to learn the skills of inclusive teaching and mentoring. We must reexamine the content and prerequisites of our curricula to ensure that the focus is on learning the dynamic process of scientific discovery and not on weeding out persons who do not belong. We must develop ways to measure and then reward effective and inclusive behaviors.

As science accelerates forward, each of us has the duty to ensure that those who are excluded today are not left further behind tomorrow. Our aspirations should be high and not apologetic. Our approaches should be based on responsibility and not on deficit-thinking. Our actions should be intentional and measurable, and not an after-thought. For too long we've excluded too many people. We cannot afford to repeat that history.

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