

Voices of Black Talent in Chemistry: Retention Strategies and Personal Success Stories

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Juneteenth, a federal holiday officially recognized in 2021, is celebrated annually in the United States to honor the emancipation of enslaved Black Americans. As a symbol of racial justice, equality, and equity, Juneteenth represents an opportunity to pay tribute to the achievements of a wide range of Black chemistry students and the initiatives taken to promote the success of every student within an environment that has historically not been inclusive.

While the U.S. STEM workforce has become more diverse in the past 10 years, Black people continue to be underrepresented in science, and in chemistry, in particular. The recent National Science Foundation report *Diversity and STEM: Women, Minorities and Persons with Disabilities 2023* shows that only 9% of the STEM workforce identifies as Black, 3 percentage points (roughly 7.7M people¹) lower than their overall representation in the adult U.S. population.² The U.S. Bureau of Labor Statistics paints a similar picture—in 2022 only 10% of the chemical manufacturing workforce was Black.³ *Chemical & Engineering News* culled the chemistry data from the 2023 NSF report revealing even bleaker figures—in 2021, Black people comprised only 4.4% of employed chemists,⁴ and were more likely to occupy lower paying STEM jobs that do not require a college degree.²

Recent publications have emphasized the importance of scientists and scientific institutions welcoming and supporting the development of individuals from groups historically marginalized in fields such as chemistry, biology, mathematics, computer science, and physics.⁵ Not only is such intentional support a moral imperative, but numerous reports have demonstrated that increasing diversity and inclusion in these fields leads to a more innovative and productive scientific community.⁶

Marginalized groups often face systemic barriers to accessing education and career opportunities, resulting in a chemical workforce that lacks diversity. To address this, chemists and chemistry organizations have taken steps to actively support and mentor individuals from historically excluded groups, providing access to resources and opportunities, and promoting a culture of inclusivity in academia and the workplace. For instance, since 1965, the American Chemical Society (ACS) Project Seed program has provided summer research experiences for more than 11,000 high school students, while the ACS Scholars program has provided renewable scholarships for more than 3,500 undergraduates interested in chemistry-related careers.

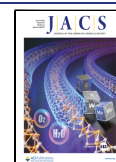
This focus is to be applauded, but more is needed. Black students are interested in STEM—they enroll in college-level introductory math and science courses at 3.5 percentage points

higher than their representation in the general population.^{7,8} However, some time between initial first-year interest and graduation, we lose a significant portion of this talent, with only 5.6% of the STEM bachelor's degrees awarded to Black students in 2020, unchanged from 2011. Black representation in higher education continues to decline in post-baccalaureate settings, with only 5.1 and 3.7% participation at the master's and doctoral levels.²

If the field of chemistry is to remain robust and relevant, we need to do more to recruit and retain talent. We cannot simply blame the dearth of minoritized students in our applicant pools. Higher education must take concrete steps to support all individuals, especially students from historically excluded groups. Furthermore, our faculty hiring, tenure, and promotion criteria must value these efforts. We must intentionally support those students who do find their way to STEM, and strive to remove systemic barriers to inclusion that exist in prior levels of education. For example, graduate programs could operationalize this initiative by purposefully engaging with undergraduate programs that support inclusion, undergraduate programs could do more to support high school efforts, and so on.⁹

This Editorial presents one example of efforts underway to recruit and retain talent, and its impact. The University of Richmond (UR) is a research-intensive, predominately undergraduate, predominately white institution (PU-PWI). Over the past 18 years, UR has taken concrete steps to recruit and retain all STEM-interested students, especially those from underrepresented groups. These efforts have culminated in the development and establishment of the Integrated and Inclusive Science (IIS) program.¹⁰ The IIS program encompasses a pre-matriculation summer research orientation for students (URISE), a cohort-based academic program for first-year students introducing concepts in biology, chemistry, and calculus (SMART), and a guarantee of at least one summer of closely mentored research in a faculty member's laboratory. Strong peer–peer and faculty–student advising and mentoring relationships and persistent research opportunities have allowed UR, in the past 10 years, to graduate more than 13 Black students who have gone on to pursue a Ph.D. in the chemical

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sciences. UR has always had a robust flow of students populating chemistry graduate programs, but with the introduction of the IIS program, that pipeline contains significantly more students from minoritized and underrepresented groups. In addition to the above chemistry placements, more than 10 Black students who performed undergraduate research in UR chemistry laboratories have graduated with STEM degrees and are working in a STEM or STEM-related field, or are pursuing further graduate training in health-related or non-STEM fields.

In what follows, 18 of those students who elected to participate in this Editorial are highlighted, and they provide sound advice for supporting future talent in chemistry specifically and in STEM more generally.

Dr. Thais Scott – Thais received the Ph.D. in theoretical chemistry with Professor Laura Gagliardi at the University of Chicago. A recipient of the National Science Foundation Graduate Research Fellowship, Thais worked on the development of multi-configuration pair-density functional theory (MC-PDFT). Thais is currently a MolSSI Post-Doctoral Fellow in Professor Keiron Burke's laboratory at UC–Irvine, and considering faculty positions at PUIs.

Davina Adderley – Davina is a fifth-year graduate student in Professor Steven Metallo's laboratory at Georgetown University. As a graduate research fellow for the Institute for Soft Matter Synthesis and Metrology, Davina studies the energetics of liquid–liquid phase separation in disordered protein systems using small molecules. Davina is considering industrial positions.

Yasmin Ali – Yasmin is a Product Manager at IBM, working on IBM Data products. She is considering a shift into health technology.

Michael Amanuel – Michael is a Laboratory Manager in the Department of Biology at Stevenson University. He is actively seeking graduate school opportunities.

Alexis Blake – Alexis is a third-year graduate student in Professor David Lynn's laboratory at Emory University, working on developing dynamic chemical networks with emergent properties and behaviors. Alexis is considering government positions, specifically focusing on regulatory policy.

Makayla Callender – Makayla graduated from the University of Richmond in 2022. She is pursuing a Doctor of Physical Therapy degree at the University of Colorado Anschutz Medical Campus.

Camryn Carter – Camryn is a fourth-year undergraduate at the University of Richmond. She will be pursuing the Ph.D. in chemistry at MIT in Fall of 2023.

Hilary Djomnang Fokwa – Hilary is a third-year Ph.D. candidate working on the synthesis of conjugated polymers for optoelectronic devices in Professor Alex Zhukhovitskiy's group at the University of North Carolina at Chapel Hill. Hilary is considering industry positions.

Reginald O. Gooden – Reggie is a Public Health Advisor for the Centers for Disease Control and Prevention. He received the master's degree in public health from Georgia State University. He has worked in a variety of quantitative and epidemiological areas.

Abra Granger – Abra is a National Institutes of Health post-baccalaureate Intramural Research Award fellow in Dr. Roel Schaaper's laboratory, working collaboratively with Dr. Lalith Perera in molecular dynamics. Abra is planning to pursue a career as a physician-scientist.

Kiana Gunn – Kiana is a second-year graduate student in Professor Colleen Wu's laboratory at Duke University investigating the cellular and molecular mechanisms of

radiation-induced marrow adiposity. Kiana is considering industrial positions.

Afryea Henderson – Afryea is a third-year medical student at Boonshoft School of Medicine at Wright State University pursuing a dual degree in medicine, and pharmacology and toxicology.

Michael Kitimet – Michael is an officer at Equity Bank Kenya Limited. He plans to pursue the Ph.D. in applied mathematics.

Erica Modeste – Erica is finishing her Ph.D. in molecular and systems pharmacology in Professor Nicholas Seyfried's laboratory at Emory University. She specializes in using mass spectrometry to determine biomarkers for Alzheimer's disease in African-American populations.

Zachary Stewart – Zachary is a second-year Ph.D. candidate in Spanish linguistics at Georgetown University. With interests in second and third language acquisition, Zachary is considering a career as a college professor following his graduate training.

Joel Teah – Joel is a first-year dental student at the East Carolina School of Dental Medicine.

Salmika G. Wairegi – Salmika is a fourth-year Ph.D. candidate in Professor Abraham Badu-Tawiah's laboratory at The Ohio State University, working on the development of an ambient ionization method, thread spray mass spectrometry, for clinical applications. Salmika is considering post-doctoral and industry positions, with a focus on biopharmaceutical positions.

Dr. Lyniesha Wright Ward – Lyniesha received the Ph.D. with Professor Maria Oliver-Hoyo at North Carolina State University. She is currently a Post-Doctoral Fellow in Professor Maia Popova's laboratory at the University of North Carolina at Greensboro. Lyniesha will join the chemistry department at Indiana University–Purdue University Indianapolis in Fall 2023 as a tenure-track assistant professor.

Generally, our advice for ways in which to retain Black talent can be grouped into the following categories:

- *Encourage early and frequent involvement in undergraduate research.* The subsequent student–faculty and student–student relationships that develop are critically important. These activities lead to belonging, professional and personal development, relationships with other similarly motivated students, and a better understanding of career options and learning the hidden curriculum of the academic and professional workplace.
- *Emphasize inclusive pedagogy.* Once students have been recruited to a campus or department, be intentional about supporting their passion for science. This often involves structural and programmatic efforts designed to encourage the formation of inclusive student cohorts, peer-mentoring, consistent and longitudinal faculty development, advising and mentoring, and intentional efforts to provide a welcoming environment where all students feel that they can succeed. Include professional development for faculty and students to encourage a growth mindset, understand stereotype threat, embrace active modes of learning coupled to societal contexts, and provide holistic student support. Recognize the additional challenges associated with being a Black student at a PWI.
- *Partner with admissions.* At the college or university level, a critically important first step is to partner with the Admissions Office to help communicate with students from minoritized communities to make sure they are aware of all resources, programs, and student opportunities. Work with the Admissions Office to expand the

list of schools from which you recruit, provide fee waivers to encourage applications, participate in visitation week-ends, and visit schools to recruit science-interested students. Additionally, hire faculty and staff from the demographics you want to recruit.

- *Representation is the lens through which we aspire.*¹¹ Young people cannot become what they cannot see. We need to highlight Black scholars in our teaching, intentionally recruit to the professoriate people from minoritized backgrounds, and amplify the successes and careers of our students, especially those whose presence diversifies our field.

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(6) Calhoun, L.; Jayaram, S.; Madorsky, N. Leaky Pipelines or Broken Scaffolding? Supporting Women's Leadership in STEM. *Stanford Social Innovation Review*, Jun 1, 2022. DOI: 10.48558/8Y3B-5F80.

(7) Grinnell, F.; Dalley, S.; Reisch, J. High school science fair: Ethnicity trends in student participation and experience. *PLoS One* 2022, 17 (3), e0264861.

(8) Dalton, B.; Ingels, S. J.; Fritch, L. High School Longitudinal Study of 2009 (HSL:09). 2013 Update and High School Transcript Study: A First Look at Fall 2009 Ninth-Graders in 2013. NCES 2015-037rev, U.S. Department of Education, Washington, DC, April 2018. <https://nces.ed.gov/pubs2015/2015037rev2.pdf>.

(9) Oluo, I. *So you want to talk about race*; Seal Press: New York, NY, 2018.

(10) Jones, S.; Blake, A.; Corado-Santiago, L.; Crenshaw, J.; Goldman, E.; Gomez, F.; Hall, C.; Hoke, H.; Holmes, S.; Kornegay, B.; Kwarteng, P.; Lawson, B.; Leber, M.; Leconte, G.; Modeste, E.; Nolin, K.; Norris, M.; Santinni, R. J.; Swackhammer, A.; Torres, M.; Wares, J.; Williams, D.; Hill, A.; Hoke, K.; Parish, C.; Pierce, B. D. A SMART Decade: Outcomes of an Integrated, Inclusive, First-Year, College-Level STEM Curricular Innovation. *Front. Educ.* 2023, under review.

(11) Fleming, B. P. On the Self-Education of Frederick Douglass, Malcolm X, and the Insatiable Quest for Literacy. *Literary Hub*, Jun 18, 2021. <https://lithub.com/on-the-self-education-of-frederick-douglass-malcolm-x-and-the-insatiable-quest-for-literacy/>, accessed 2023-05-18.

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Notes

Views expressed in this editorial are those of the authors and not necessarily the views of the ACS.

REFERENCES

(1) Kids Count Data Center, The Annie E. Casey Foundation. Adult Population by Age Group in the United States. <https://datacenter.kidscount.org/data/tables/6538-adult-population-by-age-group#detailed/1/any/false/2048,574,1729,37,871,870,573,869,36,868/117,2801,2802,2803/13515,13516>, accessed 2023-05-18.

(2) National Center for Science and Engineering Statistics (NCSES). Diversity and STEM: Women, Minorities, and Persons with Disabilities. NSF 23-315, National Science Foundation, Alexandria, VA, Jan 30, 2023. <https://ncses.nsf.gov/wmpd>, accessed 2023-05-18.

(3) U.S. Bureau of Labor Statistics. Labor Force Statistics from the Current Population Survey. <https://www.bls.gov/cps/cpsaat18.htm>, accessed 2023-05-18.

(4) Widener, A., Women and underrepresented people of color make small gains in science employment, new diversity report shows. *Chem. Eng. News* 2023, 101, Issue 5. <https://cen.acs.org/careers/diversity/Women-underrepresented-people-color-make/101/i5#>.

(5) Wilson-Kennedy, Z. S.; Winfield, L. L.; Nielson, J.; Arriaga, E. A.; Kimble-Hill, A. C.; Payton-Stewart, F. Introducing the Journal of Chemical Education's Special Issue on Diversity, Equity, Inclusion, and Respect in Chemistry Education Research and Practice. *J. Chem. Educ.* 2022, 99 (1), 1–4.