

BLACK WOMEN IN CANADIAN PHYSICS

BY THELMA AKYEA



As a Black Canadian woman, graduate student, teacher and mother who attained a bachelor's degree in biophysics, my experiences highlight challenges that drew me toward or away from physics. In this piece, I consider some research on equity, diversity, and inclusion (EDI) issues in physics and I pose critical questions that drive my teaching practice and research. I hope my experiences will prompt stakeholders to further address EDI issues in Canadian physics programs, with a specific focus on Black women.

PRE-UNIVERSITY SCHOOLING

In grade 8, I wanted to learn about a Black woman scientist for my independent study project. The class library contained biographies about different Nobel Prize-winning scientist — no Black women. The only non-white men were George Washington Carver and Marie Curie. I settled upon Dr. Carver's biography. In a time before Google and a variety of diverse resources in science, I settled with the options I had. A good friend, Karon, also stymied by the limited choices available, studied the javelin. On presentation day, after I spoke of Carver's innovation and activism while Karon wowed us with the physics of the javelin. I was stimulated by her passion for physics. Thanks to her project, I learned the satisfaction of physics study.

During my final year of high school physics, I could not settle on a topic for independent study. When I asked Mr. Charles, my outstanding teacher, how to combine my interest in the human body with physics. He responded, "Have you heard of biophysics?" I had not. He explained how biophysicists apply physical principles to understand biological systems. I designed an independent study, and modeled stress and strain on the human femur during rest and locomotion. I researched twisting, torsion, and

compression. With chicken bones, my experiment would model the stress and strain in a human femur.

The weekend before the experiment, I pulled the bones out of raw chicken and left the bones in a container on a kitchen counter. As I got ready for school two days later, I opened the container and met the sickening smell of rotting poultry. I hurriedly washed the bones in bleach, dried them and rushed out the door. In the physics lab, Mr. Charles asked, "Why are these bones so dry and brittle?" I shrugged and explained the bleach. Mr. Charles laughed and said, "Well, here goes!" When tested, most bones snapped like kindling, but I was ecstatic when one bone withstood 3° of torsion. This experience, coupled with a great final exam score, solidified my passion for physics and set me on the path to study biophysics in university.

SEEKING A PLACE IN PHYSICS

If I had seen myself in the curriculum, it would have supported my sense of belonging in Canadian science at a young age. Instead, my class library demonstrated Black women's erasure in Canadian science. Research shows that recognition is one of the hardest characteristics for minority scientists to attain [1]. In Canada, inroads toward confronting Black women's invisibility can start in the elementary classroom, by promoting Black women's research in Canada and sharing their stories.

In contrast, my partnership with Mr. Charles exemplifies how a strong affinity for physics develops. When students and educators develop good subject knowledge and a keen interest in physics, the results are long-lasting [2]. I felt like a biophysicist during that investigation. I imagined myself conducting similar research in the future. To work alongside a physics teacher who seemed to be as interested in the project outcome as me was life-altering and set me on the path to pursue a biophysics major in university. While the experiment was unsuccessful, the partnership was a victory.

LEARNING IN UNIVERSITY

In university, I was part of a small cohort of biophysics students. We developed a close friendship during our time together. We often collaborated on physics problems to complete assignments and prepare for tests. This collaboration helped me to think critically about solving

Thelma Akyea
<thelma.akyea@utoronto.ca>
Ph.D. Candidate,
Department of
Curriculum, Teaching
and Learning,
Ontario Institute for
Studies in Education,
University of Toronto,
252 Bloor Street W.,
Toronto, Ontario
M5S 1V6

SUMMARY

Thelma Akyea is a mother, aunt, wife, sister, and daughter. She is an elementary teacher, working in Toronto. Thelma is also a doctoral candidate at OISE, University of Toronto. Her research interests include gathering the educational experiences of Black women in post-secondary physics and astronomy.

problems. Even though the program was competitive, our camaraderie boosted my confidence.

In my second-year physics course, I was the only Black person in an all-white physics class. I was often the only person in the front row, which was an opportunity to ask questions and volunteer answers. Once, the professor requested a volunteer to determine a missing variable within one Schrödinger equation. I volunteered and solved the question correctly in front of the class. I was proud of myself. The surprised look on the professor's face, however, quickly replaced any satisfaction I felt. His expression suggested he did not expect me to know an answer that no one else knew. While normally he would ask students to explain their thinking, at that moment he moved on without asking me to elaborate. His disbelief in my capabilities, in addition to other experiences of exclusion in the second-year physics course (difficulty finding a lab partner, no one accepting me into their study group, and so on), left me feeling alienated.

BEING SEEN IN PHYSICS

I attended a predominantly white Canadian university, and in many courses, I was the only Black person, so I stood out. Yet, I was *not seen* as a credible physics student by professors and peers who were a part of the second-year physics courses. My university experience aligns with many Black women's stories from across Canada in varying departments [3,4]. However, the friendships I cultivated within the biophysics department made the undergraduate journey bearable. Black women use many coping strategies to stay in physics [5,6]. Biophysics community support helped me cope with many obstacles in undergraduate study. Our socials, late-night study sessions, and ongoing banter were essential because, through our interaction, I knew they saw me for who I was.

CRITICAL QUESTIONS

- How might you find out more about Black women's contributions to research in Canada?
- Where could you insert Black women's research, storied histories, and obstacles faced into my curriculum/prospectus/deliverables?
- How do teachers, professors, and department chairs in physics develop relationships with Black women that provide a setting to address issues that stem from intersections of racism, sexism, and classism in physics?

CLOSING THOUGHTS

It is well-known that Black women and Black girls address obstacles on multiple fronts that inform their identities in physics [7-9]. What do we know about intersections of race, class, and gender for Black women in Canadian physics? Since the narrative of Black women in Canadian physics is less discussed, now is the opportunity for Canadian physics organizations to learn more. Department heads, physics educators, administrators, and organizations should (a) collect qualitative data on the experiences of Black women in physics and (b) address the inequitable representation of Black women in physics across Canada. Furthermore, I implore *Physics in Canada's* readership to implement changes in their spheres of influence that dismantle the barriers that Black women face in Canadian physics.

GRATITUDE

I offer my sincerest gratitude to the family, friends, and colleagues who continue to support my research (Wole, Vivienne, De Gyal Dem and Prissy) and who take me for photoshoots (Micah and Brad). Peace.

REFERENCES

1. Carlene, and Johnson (2007).
2. Hazari, Z., Sonnert, G., Sadler, P.M., and Shanahan, M.C. "Connecting high school physics experiences, outcome expectations, physics identity, and physics career choice: A gender study", *Journal of Research in Science Teaching*, **47**(8), 978-1003 (2010).
3. Wane, N.N., and Massaquoi, N. (Eds.). *Theorizing empowerment: Canadian perspectives on Black feminist thought*. Toronto, ON: Inanna Publications and Education Incorporated (2007).
4. Wane, N.N., Deliovsky, K., and Lawson, E. (Eds.). *Back to the drawing board: African-Canadian feminisms*. Toronto: Sumach Press (2002).
5. Perna, L., Lundy-Wagner, V., Drezner, N.D., Gasman, M., Yoon, S., Bose, E., and Gary, S. "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 (2009).
6. Rosa, K.D. *Gender, Ethnicity, and Physics Education: Understanding How Black Women Build Their Identities as Scientists* (unpublished doctoral dissertation). Columbia University, New York (2013).
7. Hyater-Adams, S., Fracchiolla, C., Williams, T., Finkelstein, N., and Hinko, K. "Deconstructing Black physics identity: Linking individual and social constructs using the critical physics identity framework", *Physical Review Physics Education Research*, **15**(2), 020115 (2019).
8. Prescod-Weinstein, C. "Making Black women scientists under White empiricism: The racialization of epistemology in physics", *Signs: Journal of Women in Culture and Society*, **45**(2), 421-447 (2020).
9. Rosa, K., and Mensah, F.M. "Educational pathways of Black women physicists: Stories of experiencing and overcoming obstacles in life", *Bulletin of the American Physical Society*, **62** (2017).