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Science, technology, engineering, and mathematics (STEM) education in the United States has benefited greatly in the last decade from a proliferation of research studies exploring the field. A growing vanguard of scholars, some STEMers themselves, have advanced research specifically regarding underrepresented and minoritized (URM) students. These scholars have broadened our understanding of the ways in which URM students navigate issues of representation, access, and opportunity in STEM education. The greater attention, however, has been paid to examining barriers to success for URM students. Structural critiques of STEM education and the racist structures that underlie it have, until Black, Brown and Bruised, remained elusive. McGee, in this book does away with academic niceties to, as David Stovall writes, “[name] the devil concerning the exclusion of Black, Brown and Indigenous folks in the physical, natural and medical sciences, engineering, technology and mathematics.” She offers a critical analysis of racism in STEM education that examines and challenges traditional notions of academic success” for URMs at Historically White institutions (HWIs).

Who is Ebony McGee to be disrupting conventional notions of STEM and its relationship to URMs? By most measures, she is one of the foremost authorities of race and equity in STEM. She is a prolific scholar with a breadth of work on STEM education spanning much of the last decade and over 70 publications and, most importantly, as a black female STEMer herself she is uniquely situated to be the guide for “a journey through STEM with STEMers of Color.”

McGee structures her book around three main themes which I adopt for this review. These themes are: (1) the value of diversity and equity in STEM, (2) the root causes of the underrepresentation of minorities and, (3) the contributions of Black, Latinx and indigenous people to STEM.

Value of diversity and equity in STEM

In the introductory chapter to Black, Brown and Bruised, McGee shares details of her childhood fascination with the cartoon, The Jetsons, and the captivating vision of the future that it modeled. Disappointingly, as McGee notes, the future The Jetsons promised—with flying cars and robotic maids—has yet to arrive. McGee argues that the failure to achieve these technological wonders is largely the fault of STEM culture. STEM culture as she defines it, is “individualistic, ultracompetitive, overwhelmingly white (with some tokenized Asians), mostly hetero-sexual,

1 Baber 2015; Gasman and Nguyen 2017; Strayhorn 2014; Toldson 2019.
militaristically grounded, middle-to upper-class, nationalist, able-bodied.” By ignoring the value of diversity and equity to innovation, STEM has limited its potential and overall effectiveness. McGee examines research from psychology, education, health science and technology that highlights the importance of diversity in STEM. She does well to address the complexity of engaging diversity citing research not only on the benefits of racial diversity but also gender and cultural diversity. She also references research on economic impact suggesting that closing equity gaps in STEM could result in significant economic gains for state economies.

McGee’s overall argument echoes a thesis advanced more than a century ago by W.E.B. Du Bois, who noted the resistance of the White planter class to broadening access to public education in the American South at the end of the Civil war. The Southern states largely ignored public education, even for poor whites, until freed Blacks, at great financial cost and sacrifice, organized and created their own successful school systems. The success of Black schools galvanized White legislatures in the South into action, spurring them belatedly into funding the creation of public school systems. Free, tax supported mass education for all in the South according to Du Bois, was largely an innovation of freed Blacks. The understated part of Du Bois’ argument is the cost of innovation for freed blacks, who in many instances had to subject themselves to what was effectively a system of double taxation—paying state taxes for schools they could not attend and also contributing funds for schools of their own.

McGee addresses the costs of a continued lack of diversity and equity in STEM to URMs but she only hints at the impact it might have on the larger society. While she does astutely query whether greater diversity in STEM could have headed off Covid-19, such questions fall into largely uncharted waters in STEM research but not in science fiction and popular culture. In his review of DC Comics, The Jetsons, Devon Maloney introduces us to a dystopic future where the imagined paradise that is Orbit City and home to the Jetsons family, hides the reality of a planet devastated by a meteor crash. Massive earthquakes, entire cities drowned by rising sea levels, and billions of people dead. Orbit city, in this refresh of The Jetsons, is one of several orbital stations created as insurance by those with power and privilege [white people] in the event of such a calamity. The future as portrayed by The Jetsons, Maloney notes, is “defined not by just what it shows us but, by what it doesn’t.”

The Root Causes of the Underrepresentation of Minorities in STEM

According to McGee, 88 percent of professionals in science and engineering in the U.S. in 2017 were White or Asian. URMs as the math would suggest make up only 12 percent of this population. McGee identifies and examines institutional racism specifically as a significant impediment to equitable opportunities in STEM for URMs. McGee delves into the roots of institutional racism in STEM by exploring the relationship of the disciplines to the negative eugenics movement of the 20th century. She makes clear that HWIs were modeled on eugenic principles characterized by the following: “(1) restricting non-whites from positions of power; (2) the development of organizing principles that normalize white racial superiority; (3) the construction of white-centered curricula;

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3 Maloney 2017.
and (4), the endorsement of knowledge production and dissemination as “neutral and unconnected to power relations.”

McGee’s analysis fits well with historical research done by Juan Miro and Edmund Gordon. They argue that many HWIs served as incubators for the eugenics movement and were complicit in promoting and enforcing racist, heteronormative and ableist ideas of white supremacy. Some of the nation’s leading private institutions including Harvard, Yale, Stanford, and public universities like the University of Michigan and the University of Wisconsin were active in promoting eugenics. By the late 1920’s, more than 300 American universities and colleges offered courses on eugenics. Many faculty members and alumni served as spokespersons and helped to shape racist policies and practices of the movement.4

A more extensive exploration of this history, and of STEM education in general, by McGee would have added more context to situate the glaring underrepresentation of minority students and faculty in contemporary STEM that McGee addresses in this book. Some of the statistics she cites are alarming. Black students have the lowest attainment rates for the engineering doctorate. More than fifty percent of engineering schools surveyed as a part of a national study reported awarding no doctoral degrees to Black students. The majority of the faculty in engineering are white males, even at HBCUs. Since 2009, Black engineering faculty have never made up more than three percent of the total faculty in the field.

McGee has an extensive background in studying the underrepresentation of minority students in STEM and she applies this accumulated knowledge to addressing this issue. As McGee learned from her many interviews with URM students, some of the reasons why URMs leave STEM or dislike their fields include: dealing with demeaning racial stereotypes, a lack of student and faculty representation, and a lack of opportunities to pursue racial justice and activism. Students also spoke to the realities of being faced with tokenism, and colorblind faculty. Even those students who had been successful in STEM education at HWIs were not invulnerable to racism.

The Contributions of Black, Latinx and Indigenous people to STEM

There is a wealth of research on the contributions of HBCUs and other minority serving institutions to addressing inequity in STEM education.5 Much less is known about what URM students individually and collectively within their communities, add to our understanding of STEM. This is one of the many areas where McGee’s research proves invaluable. McGee affirms that the communities that Black, Latino and Indigenous STEM students come from have valuable educational traditions that support STEM education and should be acknowledged. As an example, McGee highlights Luis Moll and Norma Gonzalez’s work on Latino families and communities. Moll and Gonzalez use the concept of funds of knowledge, “reservoirs of accumulated knowledge and strategies for survival that households possess” to demonstrate that Latino communities have “robust bodies of knowledge and skills essential for communal functioning and well-being.”6

Successful URM students, as McGee argues, are uniquely motivated to pursue careers

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4 Miro and Gordon 2018.
5 Arroyo and Gasman 2017.
in the fields. This is driven by what McGee and Bentley term the equity ethic, a “set of moral values that includes a principled concern for justice, particularly racial justice, for addressing racial inequities and for the well-being of people suffering under various inequities.” In a related study of black engineering students and their motivations for PhD attainment, McGee found that students ranked intrinsic factors, including a desire to help others more highly than extrinsic factors.\(^7\) Though the majority of URM students indicated helping behaviors, female STEM students in this study specifically, had more active participation in racial and global justice events during their education than their male counterparts. The equity ethic is also evident in the practical research choices that students make. McGee highlights as an instructive example, the experiences of Kami, a Black chemistry and math major. In her interview with McGee, Kami conveyed that she intended to dedicate her studies to countering the racism she perceived in the cosmetic industry with the creation of cosmetic products for people of color.

**Moving STEM Education Forward**

In the last two chapters of *Black, Brown and Bruised*, McGee begins to sketch the rough outlines of what anti-racist STEM education can look like. At the foundational level, it involves raising awareness of existing initiatives and resources which have been proven to be effective in broadening participation in STEM for URMs. McGee points to several existing and effective initiatives and strategies working to combat racism in STEM education. She does acknowledge however, that most of these interventions are focused on fixing the student and not the environment. The next level of McGee’s plan involves disrupting the status quo leading to structural change. She lays out seven practical steps for universities interested in increasing the representation of URM students on their campuses. These steps include, implementing identity-conscious STEM mentoring programs” and hiring counselors of color to address STEM related stresses experienced by students and faculty. Other suggested steps are, increasing the hiring of faculty of color, retaining STEM faculty, acknowledging the work of STEM research educators and the contributions of Minority serving institutions (MSIs) to STEM student success. In her short but very compelling afterword which reveals her own personal journey through STEM education. She stresses the need to dismantle existing racist structures of STEM, specifically at HWIs, and to replace them with a more equitable and inclusive system. The pathway to achieve this vision of STEM, she declares is Afrofuturism, which she defines as “Black speculative fiction and signification, fused with intelligent science and technological conjecture.” Describing her attraction to Afrofuturism McGee writes, I’m still dreaming about the future of STEM, but the Jetsons are no longer my model of the future…I have found the genre [Afrofuturism] that foresees STEM in the future in a way that values my racial identity and intellectual curiosity and creativity.” With its ideology of a future free from the bondages of oppression with better conditions facilitated by technology, it has mainly appealed to many in the arts, music, and literature. Now, with McGee’s declaration we can add STEM to this list. It should not be understated how radical a departure from conventional approaches to addressing racism in STEM education this is. It is a great act of courage by McGee to introduce Afrofuturism in her book, and, to establish an argument for it as an

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7 McGee and Bentley 2017.
ideological platform on which to base her future research in STEM. I cannot help but wonder how many more STEMers will heed the siren call of Afrofuturism to acknowledge as Isiah Lavender notes, that “skin color matters in our vision of the future.”

Conclusion

Black, Brown, Bruised, is a pivotal resource for URMs navigating the pitfalls of racism in STEM education. With its critical examination of the impact of racism in STEM education for URMs and its call for an anti-racist, justice oriented as a replacement it should be required reading across the spectrum of higher education. It is a dynamic work that will appeal to multiple audiences. STEMers of all backgrounds, especially those at HWIs who no doubt will identify themselves as the focus of this work.

References


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Lavender 2014.
