

BOOK REVIEW

Hidden Figures No More: A Book Review of *Hidden Figures: The American Dream and the Untold Story of the Black Women Mathematicians Who Helped Win the Space Race*¹

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The best thing about breaking a barrier was that it would never have to be broken again.
– Margot Lee Shetterly

When you think of the “figures” 3, 1.3, and 0.6, what comes to mind? One probably would not realize that these figures represent the average percentages of Black women in the United States who earned their bachelor’s, master’s, and doctoral degrees, respectively, in mathematics between the years of 2003–2012 (National Science Foundation, 2015). With such low figures, it is no wonder why the notion of Black women in mathematics is practically nonexistent. Thus, discovering and reading Margot Lee Shetterly’s (2016) non-fiction book *Hidden Figures: The American Dream and the Untold Story of the Black Women Mathematicians Who Helped Win the Space Race* (i.e., *Hidden Figures*) was a welcoming revelation. Finally, Black women mathematicians, often ignored and invisible, are now the protagonists of a true story. Throughout the pages of *Hidden Figures*, Shetterly takes readers into the personal and professional lives of four Black women mathematicians: Dorothy Vaughn, Mary Jackson, Katherine Johnson, and Christine Darden. These women, individually and collectively, continuously broke a variety of gender, racial, and social barriers during their time working for the National Aeronautics and Space Administration (NASA) at the Langley Research Center in Hampton, Virginia.

¹ Shetterly, M. L. (2016). *Hidden figures: The American dream and the untold story of the black women mathematicians who helped win the space race*. New York, NY: Marrow. 368 pp. ISBN 978-0-06-236359-6 (hb), \$27.99 <https://www.harpercollins.com/9780062363596/hidden-figures>

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Shetterly's (2016) book takes readers on an exhilarating journey of breaking barriers and opening doors for women—particularly Black women—at NASA. While readers become intrigued by the women's success and progression inside of NASA, the realities of segregation and racism outside of the Langley facility is also explored. It is quickly realized that progress in one area does not imply advancement everywhere. Shetterly provides an historical account, highlighting events that played a major role in American (education) history such as Sputnik and the *Brown v. Board of Education* decision. Her active writing style allows readers to place themselves in the same positions and situations faced by these Black women mathematicians and to relive the experiences they encountered. In many ways, Shetterly's prose allows Black women to see themselves as mathematicians. It creates a surge and excitement not just for Black women in mathematics but all women in science, technology, engineering, and mathematics (STEM) fields.

In this review, we not only explore the nuances and specific themes of *Hidden Figures* but also provide personal reflections on how the book impacted our lives as Black women mathematicians. In addition, we briefly discuss the Hidden Figures Book Circle and semester-long Hidden Figures Colloquium both created at Spelman College to further highlight how the book influenced faculty and students.

Background Information

Motivation for Hidden Figures

Margot Lee Shetterly (2016), the author of *Hidden Figures*, is a former investment banker, media consultant, and entrepreneur. She grew up in Hampton, Virginia, and was familiar with NASA's Langley Research Center given that her father worked there as an atmospheric scientist. Often when visiting her father at Langley, Shetterly and her siblings recalled seeing several other African Americans. It was therefore common for her to see Blacks who were in science or working for NASA at church, in her neighborhood, and throughout the Hampton community. Later, through listening to stories from her father about some of the mathematicians and engineers at NASA, Shetterly realized that there was so much she did not know about the women who worked at Langley. While being privileged to hear about some of them through her father's stories, Shetterly understood that there existed an audience of people who would never know of these *hidden* women unless someone shared their stories. Intrigued by their stories and driven by her curiosity to know more, Shetterly set out to research the Black women who worked for NASA at the Langley Research Center, known as the West Area Computers.

Overview of Chapters, Figures, and Their Influence at NASA

As one begins to read *Hidden Figures*, one recognizes the various forms of symbolism in the book. Throughout the 23 chapters, the titles alone will have one feeling nostalgic and desiring to recall and review historical events that took place during that time. Chapter titles such as Mobilization, Manifest Destiny, War Birds, and With All Deliberate Speed will have many historians and history enthusiasts reliving important events that shaped American history. Additionally, STEM readers will also be enthused with chapter titles such as The Area Rule, Turbulence, Angle of Attack, and Degrees of Freedom. Although there are explanations given within the text to why the chapter titles were selected, the book focuses on the lives of four African American women mathematicians: Dorothy Vaughn, Mary Jackson, Katherine Johnson, and Christine Darden.

In the early 1940s, the National Advisory Committee for Aeronautics (NACA), later known as NASA, recruited the first African American women “computers” (NASA, n.d.). Prior to this decade, human computers were positions held only by White women. During this time, a young civil rights and labor activist, Asa Phillip Randolph, a close friend of Eleanor Roosevelt, demanded that President Roosevelt open lucrative war jobs for Negro applicants. After the persistence of Randolph’s labor initiatives, including threatening to bring thousands of Negroes to the capital to protest the president, President Roosevelt issued an executive order in 1941 banning employment discrimination by federal agencies (Shetterly, 2016). Thus, the recruitment of African American women for the human computing positions began. Due to segregation at the time, however, the Black women of the West Area were kept separate from the White women computers (Shetterly, 2016).

When reading *Hidden Figures*, readers learn about the endless glass ceilings that were broken by these Black women (Shetterly, 2016). Dorothy Vaughn, who began working for NASA in 1943, paved the way for Black women computers in the West Computing area. Vaughn was resilient and through her perseverance and determination at NASA, she became the first Black supervisor of the West Computing Area in 1949. To avoid losing her job and eliminating the future positions of Black women in the West Computing Area, she taught herself the programming language FORTRAN, making herself indispensable at NASA. Under Vaughn’s leadership, Mary Jackson began working as a human computer in 1951. In 1958, after overcoming many hurdles, Jackson became the first Black female engineer at NASA. During her 20-year stint of working as an engineer, authoring and co-authoring several papers, Jackson noticed the inequities of Langley’s female professionals. As a result, she decided to leave the engineering field, for the greater good, and take a demotion to become Langley’s Federal Women’s Program Manager.

In the early 1950s, the segregation of the women computers began to change (Shetterly, 2016). After integrating West Virginia University’s graduate mathematics program, Katherine Johnson joined the West Area Computers in 1953. Within a

few weeks of joining, Johnson moved to the Space Task Force. She was the first woman to attend meetings that detailed the specifics regarding the logistics and mathematics for the space flights. In 1962, while preparing for the orbital flight of John Glenn, astronauts were not comfortable with the accuracy of mechanical computers. Johnson was requested to verify the calculated trajectories for what became the first successful orbital flight by humans for the United States.

The West Area Computers officially ended in 1958. During the West Area years, there were up to 80 African American women computers. Even after 1958, African American women continued to play a vital role, now being integrated within different departments at NASA (Shetterly, 2016). In fact, in 1967, Katherine Johnson mentored a young African American computer named Christine Darden who had just started her career at NASA. Darden challenged the norms of NASA's culture by approaching supervisors about why women with similar or more education were sent to computing pools, while men were placed in engineering groups. The response she received was that no one had ever complained. Within weeks of her meeting with the supervisor, Darden was assigned to an engineering group where she worked on sonic boom research. Although the West Area Computers ended in 1958, these Black women's legacy, perseverance, and tenacity of breaking barriers paved the way for future African American women and women in general at NASA.

Professional Evaluation

Shetterly's (2016) thoughtful wording of the book's title and chapters make it an exciting read. When reading across the chapter titles, readers may become introspective wishing to connect the titles with the STEM or historical content in that section. Throughout the book, Shetterly maintains a nice balance between juxtaposing the women's professional lives and careers at NASA with their personal lives and families at home. *Hidden Figures* would be a great read for K-12 and higher education students across the globe, especially those in the United States. Specifically, students in urban mathematics classrooms will benefit by exposure to historical figures they may relate to in gender and/or race. Additionally, *Hidden Figures* can be an excellent motivator for teachers to engage students in the discussion of STEM and historical events. Young women may find the book to be an inspiration for them to pursue a career in a field that has been historically dominated by White men. For Black females, *Hidden Figures* allows young women to see others who look like them in a field where they seem almost invisible. *Hidden Figures* is an inspiration for men as well. It allows men to see the benefits of having equity across gender and race, evident when John Glenn decided not to orbit the Earth until Katherine Johnson confirmed the computer's calculations.

As Black female mathematicians, we desire to hear about all the stories of the women who worked at NASA during this time. *Hidden Figures* is an inspiration for future women in STEM, especially Black women. Readers will gain knowledge about the role of women in the aeronautical field and beyond. As Shetterly (2016) states, “There was virtually no aspect of twentieth-century defense technology that had not been touched by the hands and minds of female mathematicians” (p. 189). The significance of this alone is paramount, especially in fields that have often been regarded as White male dominated arenas. Non-mathematics readers, however, might find it difficult at times to follow the mathematical terminology used throughout the book. Nevertheless, Shetterly contextualizes the mathematical ideas to assist readers with comprehending the ideas being communicated.

Personal Reflections

Movies are often filmed in and around the city of Atlanta, which is quickly becoming known as the Hollywood of the South. Sometimes movie production equipment and trailers hinder our access to and from campus at Spelman College (a women’s historically Black college in Atlanta, Georgia). A few years ago, students, staff, and faculty were excited that Hollywood movie production was literally next-door on the campus of Morehouse College (a men’s historical Black college), making a movie about Black women mathematicians. After investigating and discovering who these women were, we learned of the book *Hidden Figures*. We were both ecstatic to read the book; someone who shared our gender and race wrote the mathematical language and jargon in the text. Although we are from a different generation than the main figures of *Hidden Figures*, reading the book motivated us to reflect on our own struggles and trials and tribulations that we encountered (and continue to encounter) during our academic journeys toward becoming mathematicians.

Viveka’s Reflection

Growing up in an urban area and being a first-generation college student, my family valued education but knew little about deciding on careers and majors in college. While developing my love of mathematics, I was not aware that it was a predominantly male field. Although there were no professors who looked like me until my Ph.D. program, I was oblivious to the fact that my presence in mathematics was an exception and not the rule. Nonetheless, I soon realized that prejudices due to gender and race held true in mathematics when I encountered a professor who always called on the male students. Furthermore, when female students did ask questions he would speak down to us or ignore our presence altogether. I do, however, remember breaking the silence of women in his class one day by challenging his

reasoning. After one of my female classmates asked a valid question and was dismissed, I quickly interjected and explained why her reasoning was correct. He agreed. Sadly, such incidents were all too common during my undergraduate years.

Other micro-aggressions occurred throughout my undergraduate and graduate programs while attending predominantly White institutions. These micro-aggressions included, for example, non-Black peers excluding me from study sessions, non-Black peers speaking to me only when my White friends were present, and non-Black peers erasing work they had completed on the board when I walked in the room. Too often my classmates held preconceived notions about my mathematical prowess simply due to my gender and/or race. Hearing the stories of the women in *Hidden Figures* allowed me to connect with their experiences on a deep personal level. Other Black women mathematicians shared similar experiences—I was not alone. Their (our) stories inspire an intrinsic motivation to dismantle the norms of mathematics being a gender and race specific domain.

Joycelyn's Reflection

As a child, I always had a love of mathematics. In high school, I was encouraged by teachers to pursue my passion by majoring in mathematics. Taking their advice, I enrolled in a 5-year Bachelor's of Science/Master's of Science program in mathematics at Clark Atlanta University, a historical Black university. Up to that point, I, like Shetterly, saw mathematics role models who looked like me. Going to primary and secondary schools as well as college in an urban area, I often saw women of color in STEM areas who encouraged and supported me in my endeavors. It was not until I attended graduate school for my Ph.D. that very few people looked like me anymore. I was no longer encouraged by faculty to persevere, and I was even told that graduate school was not for me. However, with a strong family and community outside of school supporting me, I was able to push forward.

While reading *Hidden Figures*, I could directly relate to the plight of the women in the book. At home, they had the support of their families and friends and the support of other Black women “computers” within the walls of Langley. However, they consistently had to prove themselves and work harder to get into positions that were generally held by White men. I, like these women, had to prove myself not only to my professors but also to my classmates who assumed that I was not as smart or capable as they were in mathematics. While I had learned of the contributions of Katherine Johnson about ten years prior to the book's release, I only knew a few things about her and did not know of the other women in the book. While reading the book, I was so intrigued and excited to not only learn about the mathematical contributions of these women but also to learn more background information about their lives. One of the most exciting things for me is that all communities, even outside of STEM fields, will know of these women and their trailblazing accomplishments.

With respect to our personal reflections, Shetterly's (2016) book motivates us to do more for Black women and their visibility in mathematics. Moreover, this book incites an internal rage that stems from this history being knowingly kept or "hidden" from us. To combat the disparities in the number of women mathematicians, we must acknowledge the astounding roles that these women mathematicians played at NASA. One can only imagine the untapped talent and motivation that may have sparked young girls' dreams hearing the stories of these women mathematicians.

Hidden Figures Book Circle and Colloquium

Faculty members in the Department of Mathematics at Spelman College have always found it important to share the accomplishments of women mathematicians with their students. As a part of a mathematics seminar course, students are asked to research a Black woman mathematician and present their findings to the class. While Katherine Johnson is usually among the women researched, little was known about the other women who worked at NASA. Upon learning about the book *Hidden Figures*, we decided that it provided an opportunity to engage students in a setting outside of the classroom to learn more about Black women mathematicians. A Hidden Figures Book Circle was formed, where nine mathematics majors, one physics major, three mathematics faculty members, and Spelman's president gathered to read and discuss the book.

All those who joined the book circle appeared to enjoy the three reading circle sessions, where the book was discussed by chapters and then as a whole at the culminating meeting. Students pointed out that they enjoyed reading about the mathematics that they were currently learning in their courses and the subtle mathematics terminology that was sprinkled throughout the book in chapter titles and within the reading. One student stated: "Shetterly had a strong command of words, vocabulary was not too cumbersome, and her style was very engaging. It reminded me of a diary and a textbook at the same time." Another student expressed that she "enjoyed that the book was written in a manner that not only shared the details of the characters' lives but also did it in a story format chronicling current events happening at the same time."

The circle participants discussed the work-life balance and the sacrifices that these women endured while working for NASA. The women in the book had support from their spouses and families and sometimes had to live away from their families for periods of time for work. One student found the book eye opening given how it unveiled hidden history and illuminated the still relevant challenges faced by the women in the book. Shetterly's book provoked discussion on what could be done now to prevent future women in STEM from being hidden.

In addition to the Hidden Figures Book Circle at Spelman College, first-year

students from different majors at Spelman College took a semester-long colloquium entitled *Hidden Figures: Unheralded Black Women Who Expand Our Imagination*. In this course, students explored the women of *Hidden Figures* and similar hidden figures across all disciplines. They also examined the work of Black women who have broken barriers in fields within and outside of STEM. The following three questions guided the discussions and assignments in the course:

1. What does it mean to be a hidden figure?
2. Who are other hidden figures and what roles have they played in society?
3. Why and, perhaps more importantly, how have these important figures been hidden and their stories untold?

Students enrolled in this course were required to read *Hidden Figures* as well as excerpts from other texts that discussed female hidden figures regardless of race or discipline. At the conclusion of the course, students had to develop ways to prevent future hidden figures in society. Overall, the course was engaging for students because it allowed them to see women, in particular those who look like them, in roles where their acknowledgment has been limited and/or hidden.

Concluding Thoughts

Hidden Figures takes readers on a historical mathematical space adventure. Reading about the achievements of the four protagonists and other Black women computers mentioned in the book will enlighten and encourage readers. Transformative was a word used by one of our students during our discussion group to describe the book, and we agree that this text was transformative indeed. *Hidden Figures* can motivate one to begin or continue to pursue a career in mathematics. Additionally, it spans across generations and allows students to reflect and realize that there are no limits to their future aspirations. As Shetterly (2016) states, “To keep moving forward, they [the Black women computers] needed to take advantage of every opportunity to make themselves as valuable as possible to the laboratory” (p. 139). Becoming trailblazers, breaking barriers, and setting standards allowing these women to go from hidden to visible accomplished this feat. Therefore, the charge to all who read *Hidden Figures* is to support, expose, and encourage future women in mathematics and other STEM fields to create their own trajectories of success and work to ensure that they are hidden figures no more.

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