Perseverance and Representation: A Memorial for Katherine Coleman Goble Johnson (1918–2020)

Ranthony A.C. Edmonds and Omayra Ortega

> ***"Lady Mathematician Played Key Role in Glenn Space Flight"***

splashed across the front page of *The Pittsburgh Courier* on March 10th of 1962, just a little over a week after nearly 3,500 tons of ticker tape confetti showered upon John Glenn in a presidential caliber parade with thousands of attendants in New York City. While the world celebrated Glenn as a national hero, one of the most influential Black newspapers in the United States with a circulation of a quarter of a million people, praised Katherine Johnson as "one of the most brilliant mathematicians of the present era"; a mother, wife, and career-woman whose work in trajectory analysis played a crucial role in the safe return and extraction of John Glenn during his mission as the first American to orbit the Earth.

When Margot Lee Shetterly released her 2016 text *Hidden Figures: The American Dream and the Untold Story of the Black Women Mathematicians Who Helped Win the Space Race*, which inspired the award-winning film, Katherine Johnson's story was catapulted to the forefront, no longer hidden from the greater American consciousness. It took a popular film, created 60 years after she had completed most of her work, for her story to come to light. Why, when her work was instrumental to the success of NASA's early space missions, did it take decades for her work behind the scenes to come to the forefront? If her

The Story of Katherine Johnson

Lady Mathematician Played Key Role in Glenn Space Flight

Travel Bias Ruled Out

A Way of Life Ends In South

McCrey to Speak For Allen CIA

Swarthmore, Pa., 'Model' City

'Liberal' Swim Club Votes Down Negro

Zuber Blasts U.S. Space Program

Why No Negro Astronauts?

"I'm Fenced Out!"

Figure 1. *The Pittsburgh Courier*, Pittsburgh, Pennsylvania, Saturday, March 10, 1962, page 19.

Ranthony A.C. Edmonds is a Ross Assistant Professor of Mathematics at The Ohio State University. Her email address is `edmonds.110@osu.edu`.

Omayra Ortega is an assistant professor of mathematics & statistics at Sonoma State University. Her email address is `ortegao@sonoma.edu`.

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Figure 2. Katherine Johnson at NASA in 1966.

contributions could have been hidden for so long, how many other exceptional stories have been lost to time?

Katherine Johnson's story is an incredible one of a humble woman who quietly lived a "normal" life while breaking barriers as a Black female Computer at NASA. She seamlessly slipped between two worlds, a racially integrated hub of scientific innovation at work, and a Virginia Commonwealth that strongly resisted the victories of the Civil Rights Movement. Despite the challenges of her being both Black and female, she used her voice and expertise to help a man travel to the moon at a time when African-American women could not even vote. It is unbelievable!

The themes of perseverance, representation, advocacy, service, and activism add a universality to her story. She had many intersecting identities—as a scientist, a mathematician, an African American, a woman, a mother, and a wife—and many people have connected with different parts of her journey. She is an inspiration and much needed role model for generations of people who have not seen themselves reflected in the scientific community and in history books.

In the epilogue of her *Hidden Figures* text, Margot Shetterly wrote about how Katherine's story resonated with people of all races, genders, ages, and occupations. She penned, "Katherine Johnson's story can be a doorway to the stories of all the other women…whose contributions have been overlooked. By recognizing the full complement of extraordinary women who have contributed to the success of NASA, we can change our understanding of their abilities from the exception to the rule. Their goal wasn't to stand out because of their differences; it was to fit in because of their talent" [1].

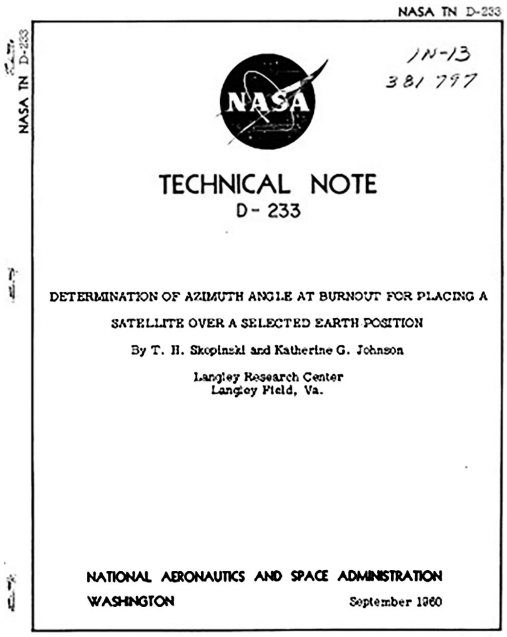
In this article, we celebrate the impact and legacy of Johnson's life and career. In addition to highlighting the mathematical legacy that came from her thirty-year career at NASA, we focus on the human impact of her story on those who have also felt hidden within the mathematical community.

Contributions to NASA

Katherine Johnson started her career at Langley Research Center in the segregated West Computing group under the supervision of Dorothy Vaughan. She was there only two weeks before she was sent to work with the engineers in the Flight Research Division. Six months into the job she found herself assisting on a project that involved exploring why a small propeller airplane had seemingly fallen out of the sky and crashed. Through her meticulous data analysis and computations, engineers were able to discern that the disturbance from a large plane that had flown perpendicular to the path of the propeller had acted like an invisible concrete wall in the air. Her work on this research, along with similar reports, paved the way for changes in air traffic regulation, setting lower bounds on the distance between flight paths. She was quickly recognized by her superiors as an important member of the team, and she was soon promoted to a permanent position in the Maneuver Loads Branch within the Flight Research Division.

Katherine Johnson would continue to gain the respect and attention of colleagues throughout Langley Research Center. She is best known for her work in two NASA initiatives, Project Mercury and Project Apollo. Project Mercury was NASA's first attempt to put a man into space via orbital flight. One of the most important questions of the orbital mission was the following: what exact path will the spacecraft travel across the Earth's surface, and where will it land? A big challenge was getting the astronaut to return in the Atlantic Ocean close enough to a retrieval Navy ship to be quickly recovered from the water to safety. Katherine Johnson played a pivotal role in solving this problem. "Tell me where you want the man to land, and I'll tell you where to send him up."

Her mastery of analytical geometry led to a groundbreaking research report in 1960 entitled "Determination of azimuth angle at burnout for placing a satellite over a selected Earth position" that answered the question of where the space capsule would land. Her primary collaborator on this report was Ted Skopinski. When it came time to write up their work he remarked, "Katherine should finish the report, she's done most of the work anyway" [1]. This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DETERMINATION OF AZIMUTH ANGLE AT BURNOUT FOR PLACING A SATELLITE OVER A SELECTED EARTH POSITION

By T. H. Skopinski and Katherine G. Johnson

Langley Research Center
Langley Field, Va.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON September 1960

Figure 3. Technical report written by Ted Skopinski and Katherine Johnson.

marked the first time a woman in the Flight Research Division had received credit as an author of a research report. This was acclaimed in the article written about her in *The Pittsburgh Courier*, where they exclaimed, "Mrs. Johnson co-authored the paper which tracked the rocket cone upon its re-entry into the earth's atmosphere" [2].

The Apollo mission, with its goal of landing an American on the moon, was even more ambitious than Project Mercury. In order to make the 238,900 mile journey to the moon they would need two vehicles. One command module to reach the lunar orbit and then head back to earth, and a separate vehicle that would descend from the lunar orbit to the moon's surface. While the astronauts navigated the moon's surface in the lunar lander, the command module would continue to orbit the moon until the two vehicles met again, a moment called the lunar rendezvous. Johnson worked on the lunar rendezvous, determining the precise time that the lunar lander needed to leave the Moon's surface in order to redock with the orbit and command module. Her work set the stage for Neil Armstrong to become the first person to set foot on the moon!

From 1963 to 1969 she coauthored four reports on problems related to lunar orbits and various scenarios in case of an emergency. She and her coworkers determined a method to use visible stars to navigate a course back to Earth without computer guidance. This was an important option for astronauts. For example, the Apollo 13 astronauts had to consider such backup methods after an on-board explosion damaged the electrical system during their mission. Johnson continued to collaboratively develop aspects of the space shuttle and Earth resources satellite programs for the rest of her career at NASA. She was awarded NASA's Group Achievement Awards for her work on Project Apollo and the Lunar Orbiter Project.

Katherine Johnson received numerous honors and awards for her contributions to science throughout her career. In 2015, President Barack Obama awarded Johnson the highest civilian honor, the Presidential Medal of Freedom, for her work on many NASA missions including the first manned space flight, John Glenn's momentous trip on the Friendship 7. "In her 33 years at NASA, Katherine was a pioneer who broke the barriers of race and gender, showing generations of young people that everyone can excel in math and science, and reach for the stars," Obama said. In 2019, the Hidden Figures Congressional Gold Medal Act awarded the Congressional Gold Medal to Katherine Johnson and Dr. Christine Darden, and posthumously to Mary Jackson and Dorothy Vaughan.

Dr. Johnny L. Houston, professor of mathematics at Elizabeth City State University, noted many of Johnson's accomplishments in a previous tribute [3], also appearing in these *Notices*. He reiterated in his correspondence regarding this article, "[T]he Congressional Gold Medal is scheduled to be awarded in her honor in late 2020. She received 13 Honorary Degrees, the last one from the University of Johannesburg, S. Africa. There are four major buildings that bear her name, including two major NASA facilities. The West Virginia State Senate has designated August 26 as a state holiday in her honor. The University of West Virginia and West Virginia State University are jointly planning a special physical facility in her honor (housing her awards/recognitions, artifacts and other items) to be available for viewing by the public and tourists who visit the state of West Virginia in the future. The National Association of Mathematicians (NAM) gave her an impressive Centenarian Award in 2019 at NAM's 50th Anniversary Celebration in January 2019 at the JMM in Baltimore."

Impact on the Mathematical Community

We are fortunate to bask in the legacy of Katherine Johnson as we live our lives as women, as educators, as parents, and as mathematicians. People of all walks of life can draw inspiration from Johnson's successes. We asked members of the mathematical community to reflect on how the legacy of Katherine Johnson has impacted their lives.

A special reflection from another hidden figure.[1]

> ***"I stood on the shoulders of Katherine Johnson, Mary Jackson, and Dorothy Vaughn."***

[1]*Dr. Darden's reflections are from private communications with the authors.*

Figure 4. Building at NASA Langley named in Johnson's honor.

Figure 5. Christine Darden (left) and Katherine Johnson (right).

These words from Dr. Christine Darden rose prominently from a thoughtful reflection she penned on the impact that Katherine Johnson had on her life. Rather than focus on Johnson's scholarship, she painted a more human picture of a woman who was a mentor, a jovial spirit, and a community builder dedicated to uplifting African Americans in STEM.

Dr. Christine Darden was the fourth hidden figure in Margot Shetterly's text. Due to the timeline in which she worked at NASA, she was not featured in the film. This generational gap between Darden and the women who came before her at Langley Research Center shines a light on why she felt that she stood on the shoulders of their legacies. In a sense, the boundaries that Katherine Johnson and others broke paved the way for Dr. Darden's monumental 40-year career at NASA. She retired in 2007 as an internationally recognized expert in sonic booms, the author of over 60 technical reports, and the first African American to be appointed to NASA Langley's Senior Executive Service, the top rank in the federal civil service.

In her reflection, Dr. Darden noted the intersections of her life with Johnson's at the very beginning of her mathematical training. Dr. Darden attended college at what is now Hampton University in Virginia. She knew all of Johnson's daughters well, and was particularly close to Johnson's daughter Joylette. During this phase of her life, Johnson was a mentor, encouraging Darden and others to pursue mathematics.

"I attended Hampton Institute in the class of 1962. I had fallen in love with mathematics during my junior year of high school. I came with the intention of majoring in mathematics. Katherine's oldest daughter, Joylette, was in my class and majored in mathematics. Joylette recommended Katherine Johnson as our 'Class Mother' and she spoke to our class at least once or twice during the year. A photo of Katherine with her new husband (James Johnson) was in our Freshman yearbook at a podium speaking to our class. Katherine would also reach out to help several of the church children with their mathematics."

After Darden graduated from the Hampton Institute, she went on to pursue a Masters degree in applied mathematics from Virginia State College, which is now Virginia State University. Darden was recruited to NASA upon graduating with her Masters degree.

"When I was hired by NASA in 1967 the segregated West Computers at NASA did not exist at that time. I was working with the Computer Section of the High-Speed Aeronautics Division and there were three Computers in that group who had been in the West Computers during the 1950s with Katherine Johnson and Mary Jackson. They explained to me how engineers would bring work to the West Computers to be done. That way, the engineers became familiar with the quality of individual Computer's work and occasionally, when their offices were pressed for help, the engineering section would ask to borrow particular Computers for long-term help. Katherine was one of those Computers who ended up staying with the engineering group and so was the current supervisor of my office."

For her first three years at NASA, Darden commuted 70 miles round trip to work each day. After Darden moved closer to the city of Hampton, Johnson's relationship with Darden as a distant colleague started to shift as Darden became more integrated into the local Hampton community. During this period, Katherine Johnson was not in the front of her class, but in the front of her church. Dr. Darden recounted how she was intentional about helping her get involved.

"Katherine was president of the Carver Senior Choir for many, many years until she dropped out because of health.

Figure 6. Katherine Johnson tutoring in a church basement in 1989.

The first day I visited Carver after moving to Hampton, VA, in 1970, I sat in the back of the church with my [three] daughters. When church was over, Katherine came out of the choir, walked all of the way to the back of the church and invited me to come to choir rehearsal on Wednesday evening—which I did.

"After I had been there about four years, [Katherine] invited me to join her to sing at funerals at Carver which were usually held during lunch time on a weekday. I did join, and we were able to help out during our lunch hour without taking leave. I visited Katherine's office several times and I met her coworkers and the boss. In fact, Katherine's boss attended several of our Carver Choir Concerts at her invitation. She seemed to have a great relationship with her coworkers."

Dr. Darden also shared other community connections with Katherine Johnson and other colleagues at Langley. They were both active in their local chapter of Alpha Kappa Alpha Sorority, Inc., the first historically African American Greek lettered sorority. Darden joined as an undergraduate at the same time as Katherine's daughter Joylette. Johnson joined Alpha Kappa Alpha at the age of 15, and was an active participant in the organization throughout her lifetime. In fact, in the *Hidden Figures* text, Shetterly notes that Katherine Johnson watched the media coverage of the Apollo Mission while at a sorority leadership conference [1].

Darden and Johnson also worked together in the National Technical Association (NTA), one of the oldest professional organizations for Black engineers and scientists. Dr. Darden noted some of the details of her service work with Johnson and her close friend Eunice Smith (who also worked at Langley).

"I got to know Katherine and Eunice better by interacting with them both at church and through working with them at the NTA, the first all-Black technical society that had a chartered chapter in Hampton. We technical folk at Langley reinvigorated that chapter at NASA Langley. We sponsored Math Contests for local middle and high school African-American students. We sponsored SAT tutorials for [African-American] students in high school. We sponsored symposia for [African-American] college students in surrounding states to give talks about their summer jobs involving research or other technical activities. The speakers were judged and awarded cash prizes for their presentations.

"At large conferences that NTA sponsored, Katherine, a very outgoing and welcoming person, would meet everyone in the room. Eunice would often be in the background working the logistics of making the conference run. I was probably some place in between. We worked with NTA for many years. Katherine was national treasurer for several terms and I was national secretary for a few years."

In *Hidden Figures*, Shetterly also noted Johnson's service work. Just as she had done when their lives intersected in Darden's course her first year at the Hampton Institute, Johnson continued to make school visits throughout her life. Shetterly remarked that Katherine Johnson praised Christine Darden extensively, saying that "I never go into a school without mentioning Christine" [1]. Dr. Darden has tapped into this same passion for outreach throughout her career. She ended her reflection with encouragement for future generations of STEM.

"Since 2017, I have continued to speak with students and young professionals all over the country encouraging careers in STEM, especially as we hear from Apple and other Silicon Valley companies that they need to hire students from overseas because they cannot find them in America. I tell them they are just as smart. They need to take the right classes and work hard. I share my P4 philosophy which led me to NASA after deciding what my dream career would be. **P1**—Perceive myself as a mathematician. **P2**—Plan what classes or experiences I need to have to be a mathematician. **P3**—Prepare: work the Plan I developed in P2. And **P4**—Persist. If I run into roadblocks, find a way around them. Solve the problems I encounter! **Take risks! But, keep going.**"

Reflections from the mathematical community.[2] Dr. Johnny L. Houston had the honor of first meeting Katherine Johnson when presenting her with the Distinguished Service Award at NAM's Regional Conference in Norfolk, Virginia, in 1996. Years later, he wrote an article for the *Notices* honoring Katherine Johnson's legacy entitled, "The

[2]*These reflections are from private communications with the authors.*

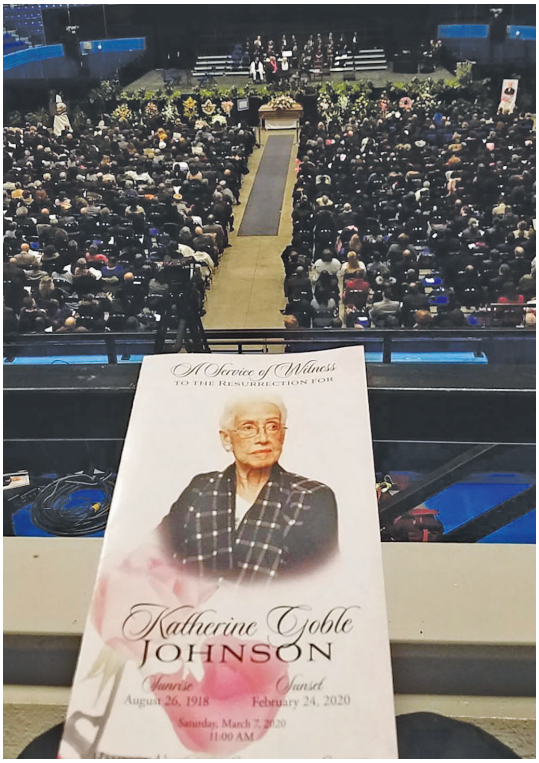

Figure 7. Program from Homegoing Celebration of Katherine Johnson.

life and pioneering contributions of an African American centenarian: Mathematician Katherine G. Johnson" [3]. Over the last several years he has been in touch with her family, learning more about her life story. In February of 2018 he had the honor of delivering Johnson's Centenarian Award on behalf of the National Association of Mathematicians (NAM). He was fortunate to be able to attend her homegoing celebration to pay his respects to her legacy. He shared with us some reflections from that day.

"On the morning of March 7, 2020, I attended her Celebration of Life service at the Hampton Univ. Convocation Center in Hampton, VA. Prior to [the] Service beginning, I walk[ed] down front and viewed her body; saying to myself, 'what a world class giant whose life impacted humanity!' The service attracted hundreds who came to honor her, family members, friends, celebrities (astronauts, high governmental and NSA officials, etc.).

"She lived such a fascinating and impactful life that during her later years when she began receiving so many recognitions, she raised the question: 'What is all the fuss about? I was only doing my job.' She has many more quotations; however, perhaps my favorite is the following: 'Be anxious to learn. You don't know everything about everything. There's always more to be learned—but you have to want to learn it.' I see this as great advice for future students and scholars.

Figure 8. After the Hidden Figures Panel at the 2017 Joint Mathematics Meetings. (left to right) Dr. William Hawkins, Dr. Jamylle Carter, Dr. Roselyn Williams, Dr. Johnny L. Houston, Dr. Christine Darden, Margot Shetterly, Dr. Talitha Washington, Dr. Edray H. Goins, Dr. Sylvia Bozeman, and Dr. Robert Bozeman.

"It has been my good fortune to relate/communicate personally with her family; especially her daughter, Mrs. Joylette Hylick. I close these Reflections with some rephrasing of words on her Celebration of Life Program, words that seem both profound and appropriate: 'We know why the caged bird sings.' The poet Maya [Angelou] reminded us that it sings with a fearful thrill for freedom. Uncaged, an eagle rests upon a mountaintop of dreams. Not soaring because it knows what needs to be done. All this time we did not know about you. Why? Because of your gender or the color of your skin? You are the reason the greatest space project could begin. John Glenn knew that your figures were better than the computer's best. Now you and co-human computers are no longer hidden figures in NASA's vast space. The world recently began to offer you honors that were so long overdue. Katherine G. Johnson, our admiration for you is forever sealed. Today, many birds are leaving cages, following great role models like you. We thank you, whole-heartedly, for all that you did for humanity!"

Dr. Jamylle Carter, a professor of mathematics at Diablo Valley College, noted that, "Katherine Johnson just did it, only to be acknowledged for her work in her later years. She lived her life—remarried and raised her children—while so many remained unaware of her accomplishments. Ms. Johnson reminds me of the legacy of Black women mathematicians who continue to live and work with grace, if not recognition."

Like so many before her, Johnson's story was almost lost to time. There is a history of erasure of the stories of people of color and the stories of women in this country. Karoline Pershell, Director of Strategy and Evaluation at Service Robotics & Technologies and former Executive Director of the Association for Women in Mathematics, states that, "[l]earning about Katherine Johnson and the

amazing mathematics contributions she made to the space program at a time when the country and her workplace overtly made her a second-class citizen was the starting point of realizing how many hidden voices there were across STEM's history."

Unfortunately, people of color have few historical examples of themselves thriving in the government or in STEM. Most of us were not aware even of the existence of the group of female African-American Computers powering the United States' race to the moon. Dr. Jacqueline Brannon-Giles, a professor of mathematics at Houston Community College and Texas Southern University, shares a story from her youth. "I remember a Texas Southern University professor encouraged a few of us to apply to work at NASA. I turned it down because I was young and did not think I could be comfortable with the lack of diversity. After I viewed and studied the movie, I cried because I did not understand how selective exposure in the media and suppression of women could exist, and still exists in America."

Dr. Rachel Levy, former Deputy Executive Director of the Mathematical Association of America, reflects on time spent at NASA when she was a student researcher. "In the late 1980s as an undergraduate I participated in a practicum at NASA under the direction of Dr. Sylvia Washington. More than thirty years later, hearing Margot Lee Shetterly and Dr. Christine Darden talk about Katherine Johnson and her colleagues in *Hidden Figures* helped me reexamine my experiences at NASA from a new perspective. I had noticed that Dr. Washington was probably Black (I didn't ask her) but had never thought about what it might have been like for her to work up to a leadership role at NASA. Now I have."

Dr. Tanya Moore, founder and managing partner at Intersecting Lines, as well as the cofounder of the Infinite Possibilities Conference, further posits that, "Katherine Johnson's legacy serves as a reminder to pursue excellence no matter the circumstance or situation you find yourself in. There can be bravery and beauty in the willingness to share your talents, knowledge and creativity for a larger mission and purpose beyond yourself. I am grateful for her life, her brilliance and her humanity."

Valerie Jean-Pierre, a post-baccalaureate student at Medgar Evers College in New York City, saw Johnson's story as a revelation. "As a Black mathematics student, it has been inspiring to see a Black woman become a mathematician and be a part of history. Even in my darkest hour, I know I can persevere and not only achieve greatness for myself, but aid others on their path."

Dr. Ronald E. Mickens, professor of physics at Clark University, reminds us that, "…these successes occurred because of her personal desire and will to make this happen. She defined herself and her capabilities, and would not allow others to do this. This latter quality is her real legacy."

Dr. Candice Price, an assistant professor of mathematics and statistics at Smith College in Massachusetts, found the fact that these stories could have ever been hidden as a rallying cry. She states, "Katherine Johnson's strength and legacy inspired me to continue to work towards breaking down barriers, not just for myself but for others. Her story helped motivate the creation of a historical Black mathematicians poster so that stories like Katherine Johnson's mathematical contribution do not go unknown."

Christina Eubanks-Turner, an assistant professor at Loyola Marymount University in southern California, shared that, "Katherine Johnson's story inspired me to persevere and be bold even if I'm the only person of color or female in the room. Her resilience in the face of adversity reminds me that I belong and deserve to be heard."

Dr. Emille Davie Lawrence, department chair and term associate professor of mathematics at the University of San Francisco, observes a sentiment that every reader can relate to. "Katherine Johnson stood fast against a system that was built to suppress and subdue the career aspirations of Black women. The perseverance she displayed over half a century ago inspires and motivates me to reach for higher heights and even shoot for the moon."

Brandi M. Adams, a high school mathematics teacher at Destrahan High School in Southeastern Louisiana, uses Johnson's example to empower her students. "[W]hat are truly the expectations of African Americans in the classroom? Sharing the legacy of Katherine Johnson with my kids opened eyes. It made them think: 'Yes, I can be good at math. Yes, Black women have done this. Yes, Black women ARE doing this' [and t]hey are doing this fully, wholeheartedly, intentionally, and intensively."

Sofía Martínez, an NSF Graduate Research Fellow at Purdue University in Indiana, received one message from Katherine Johnson's story: ''Persevere no matter the obstacle." Despite this lack of representation,

Katherine. Johnson. Persisted.

It is Katherine Johnson's perseverance that seeds her legacy and will inspire generations of mathematicians, as long as her story continues to be shared.

Reflections from the authors. **R. Edmonds**: I recall the satisfaction of printing out my homemade name tag for Halloween in 2016—Katherine Johnson, NACA. I pinned it onto my best interpretation of 1950s work attire and spent the day on campus explaining to my classes, and to anyone else who would listen, who Katherine Johnson was and why she was so amazing. The *Hidden Figures* text had been a gift for passing my comprehensive

exams, and I immediately found myself immersed in the story and amazed at the brilliance and resiliency of the featured women. Here was this phenomenal woman, from the same sorority as me, who also had a passion for mathematics and giving back to her community, that made amazing accomplishments as a scientist despite the lack of representation outside of West Computing amongst her colleagues at Langley Research Center.

This heightened visibility of excellence in STEM by other Black women made a world of difference as a graduate student questioning my place within mathematics. I felt then, and sometimes still do, that even though I love mathematics, I do not fit into the greater mathematical community. Katherine Johnson knew that she belonged, even if she was the "only" along various axes of diversity. I draw inspiration from this personally, and I have used the *Hidden Figures* story to discuss intersections of mathematics and society, belonging in STEM, and access to mathematical communities through my service, outreach, and teaching. Recently I developed a course at The Ohio State University, *Intersections of Mathematics and Society: Hidden Figures*, that focuses on the space race as well as diversity and inclusion in mathematical communities.

O. Ortega: In 2017 I had no plans to attend the JMM, but I could not let the small issue of being in another state stop me from an opportunity to hear directly from Christine Darden and Margot Lee Shetterly at the *Special Panel Presentation: The Mathematics and Mathematicians Behind Hidden Figures*, which was cosponsored by the National Association of Mathematicians. The event was not being streamed, and so I enlisted a close colleague to videoconference with me so that I could still "attend." With her laptop hidden under her chair, it was hard to hear the panelists through the cacophony of ambient noise, but I persevered through the coughing and seat shuffling to hear their pearls of wisdom.

I needed to learn more about the phenomenal women of the *Hidden Figures* story. My curiosity was fueled by my own personal struggle of being a woman and member of several marginalized groups in the mathematical sciences. Their successes were critical to my own edification. Katherine Johnson and her contemporaries were humble women who balanced their family lives and careers at NASA at a time when Black American females could not even vote! I am humbled by the balance Katherine Johnson achieved between work, family, and service to her community, and I continue to draw on her exceptional story as I strike this balance in my own life.

R. Edmonds and O. Ortega: For future generations of STEM leaders, those who see themselves reflected in the communities around them and those who don't, we encourage you to continue your unique path within the mathematical sciences. If there is one lesson that we should take from Katherine Johnson's model of a life well-lived—one with a healthy balance of loved ones, community, service, career success, purpose, and meaning—it is that we should pursue the dreams that we hold most dear, regardless of what the outside world may say we are destined for. It is important that we each define, for ourselves, what it means to be successful. It is important that we decide, for ourselves, what we can and cannot achieve, and then stick to our plan. The mathematical sciences and their intersections with other disciplines of study provide a wealth of opportunities, and we encourage you to hold tight to your personal goals as you move through your unique path to success. Persevere! Dream Big!

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Ranthony A.C. Edmonds

Omayra Ortega

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