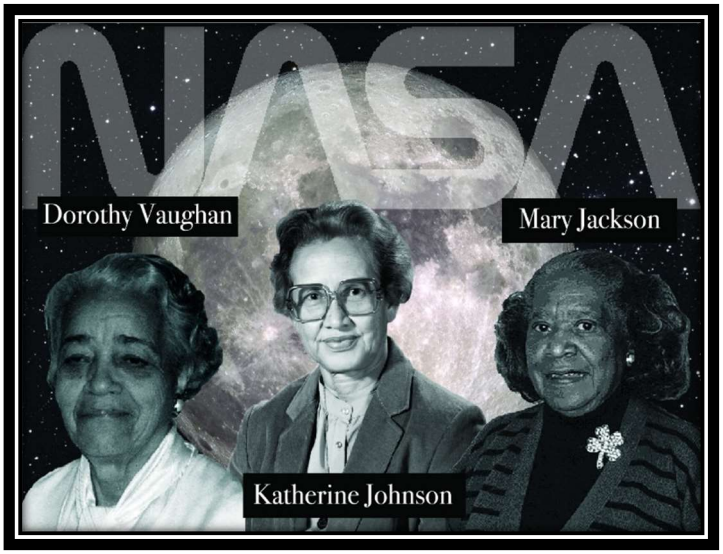
THE TRUE STORY OF 'HIDDEN FIGURES' AND THE WOMEN WHO CRUNCHED THE NUMBERS AT NASA

WHILE TELLING THE STORY OF THREE UNKNOWN SPACE HEROES, HIDDEN FIGURES ALSO REVEALS A GREATER TRUTH ABOUT NASA

391



Popular Mechanics

FEB 3,2017

There's a moment halfway into *Hidden Figures* when head NASA engineer Paul Stafford refuses the request of Katherine Johnson (Taraji P. Henson) to attend an editorial meeting about John Glenn's upcoming mission to become the first American to orbit the Earth. *Stafford's response is dismissive—"There's no protocol for women attending." Johnson replies, "There's no protocol for a man circling Earth either, sir."*

The quote underlines this based-*on-a-true-story movie.* For NASA to get John Glenn into space and home safely, institutions that supported prejudices and biases needed to start tumbling down. All hands (and brains) had to be on deck.

Adapted from Margot Lee Shetterly's book *Hidden Figures: The American Dream and the Untold Story of the Black Women Mathematicians Who Helped Win the Space Race*, the film focuses on three real-life African-American female pioneers: *Katherine Johnson, Dorothy Vaughan,* and *Mary Jackson,* who were part of NASA's team of *human "computers."* This was a group made up of mostly women who calculated by hand the complex equations that allowed space heroes like Neil Armstrong, Alan Shepard, and Glenn to travel safely to space. Through sheer tenacity, force of will, and intellect, they ensured their stamp on American history—*even if their story has remained obscured from public view until now.*

Editor's note: After we published this story on Dec. 21, 2016, Hidden Figures was nominated for three Academy Awards, including Best Picture. It didn't win those categories, but did take home Best Movie at the BET Awards, Outstanding Motion Picture at the NAACP Image Awards, Best Action or Adventure Film at the Saturn Awards, and other accolades.

THEIR STORY BEGINS

Real-life women of "Hidden Figures"- NASA

Women working as so-called *"human computers* "dates back decades before space exploration. In the late 19th century, the Harvard College Observatory employed a group of women who collected, studied, and cataloged thousands of images of stars on glass plates. As chronicled in Dava Sobel's book The Glass Universe, *these women were every bit as capable as men despite toiling under less-than-favorable conditions*.

Williamina Fleming, for instance, classified over 10,000 stars using a scheme she created and was the first to recognize the existence of white dwarfs. While working six-day weeks at a job demanding "a large capacity for tedium," they were still expected to uphold societal norms of being a good wife and mother.

In 1935, the NACA (National Advisory Committee for Aeronautics, a precursor to NASA) *hired five women to be their first computer pool at the Langley campus.* "The women were meticulous and accurate... and they didn't have to pay them very much," NASA's historian Bill Barry says, explaining the NACA's decision.

The first black computers didn't set foot at Langley until the 1940s. Though the pressing needs of war were great, racial discrimination remained strong and few jobs existed for African Americans, regardless of gender. That was until 1941 when A. Philip Randolph, pioneering civil rights activist, proposed a march on Washington, D.C., to draw attention to the continued injustices of racial discrimination.

With the threat of 100,000 people swarming to the Capitol, President Franklin D. Roosevelt issued Executive Order 8802, preventing racial discrimination in hiring for federal and war-related work. This order also cleared the way for the black computers, slide rule in hand, to make their way into NACA history.

In June 1941, with war raging in Europe, President Franklin Roosevelt looked to ensure the growth of the federal workforce. *First he issued Executive Order 8802, which banned "discrimination in the employment of workers in defense industries or government because of race, creed, color, or national origin" (though it does not include gender).*

Six months later, after the *attack on Pearl Harbor* brought the U.S. into the throes of war*, NACA and Langley began recruiting African-American women with college degrees to work as human computers.*

While they did the same work as their white counterparts, African American computers were paid less *and relegated to the segregated west section of the Langley campus*, where they had to use separate dining and bathroom facilities. *They became known as the "West Computers." **Despite having the same education, they had to retake college courses they had already passed and were often never considered for promotions or other jobs within NACA.***

Mary Jackson was one of the "human computers" portrayed in the film "Hidden Figures." (Image credit: NASA)

Hidden Figures depicts this in a scene in which "computer" Mary Jackson is asked if she's wanted to be an engineer if she were a white man. Jackson responds, "I wouldn't have to. I would already be one."

Katherine Johnson -NASA

Katherine Johnson, the movie's protagonist, was something of a child prodigy. Hailing from the small West Virginian town of White Sulphur Springs, *she graduated from high school at 14 and the historically black West Virginia State University at 18. In 1938, as a graduate student, she became one of three students—and the only woman—to desegregate West Virginia's state college. In 1953, Johnson was hired by NACA and, five years later, NACA became NASA thanks to the Space Act of 1958.*

The movie muddies the timeline a bit, but Johnson's first big NASA assignment was computing the trajectories for Alan Shepard's historic flight in 1961. Johnson and her team's job was to trace out in extreme detail Freedom 7's exact path from liftoff to splashdown. Since it was designed to be a ballistic flight—in that, it was like a bullet from a gun with a capsule going up and coming down in a big parabola—it was relatively simple at least in the context of what was to come. Nonetheless, it was a huge success and NASA immediately set their sights on America's first orbital mission.

The film primarily focuses on John Glenn's 1962 trip around the globe and does add dramatic flourishes that are, well, Hollywood. *However, most of the events in the movie are historically accurate*. Johnson's main job in the lead-up and during the mission was to double-check and reverse engineer the newly installed IBM 7090s trajectory calculations. As it shows, there were very tense moments during the flight that forced the mission to end earlier than expected. And *John Glenn did request that Johnson specifically* check and confirm trajectories and entry points *that the IBM spat out* (albeit, perhaps, not at the exact moment that the movie depicts). As Shetterly wrote in her book and explained in a September NPR interview, Glenn did not completely trust the computer. *So, he asked the head engineers to "get the girl to check the numbers... If she says the numbers are good... I'm ready to go."*

While Johnson is the main character, *Hidden Figures* also follows the trajectories of *Dorothy Vaughan and Mary Jackson as they work on the Friendship Seven blast-off*. *Vaughan (Octavia Spencer) was one of NACA's early computer hires during World War II. She became a leader and advocate for the "West Computers." In 1948, she became NACA's first black supervisor and, later, an expert FORTRAN programmer.*

Despite these successes and her capability, she was constantly passed over for promotions herself. As Spencer tells Popular Mechanics, Vaughan struggled with the same things all female computers did while at NASA. "The conflict of working outside of the home to provide the best life for your children and, yet not physically being there.

But she knew she was changing the world."

While *Mary Jackson* (Janelle Monáe) is also considered a "hidden figure," she certainly stood out during her time at NASA. *After graduating with dual degrees in math and physical science,* she was hired to work at Langley in 1951. After several years as a computer, Jackson took an assignment in assisting senior aeronautical research engineer Kazimierz Czarnecki and he encouraged her to become an engineer herself.

To do that, however, she needed to take after-work graduate courses held at segregated Hampton High School. Jackson petitioned the City of Hampton to be able to learn next to her white peers. She won, completed the courses, and was promoted to engineer in 1958, making her NASA's first African American female engineer—and, perhaps, the only one for much of her career.

"She knew she was changing the world too."

But life at Langley wasn't just the churn of greased gears. Not only were the women rarely provided the same opportunities and titles as their male counterparts, *but the West Computers lived with constant reminders that they were second-class citizens.* In the book, Shetterly highlights one particular incident involving an offensive sign in the dining room bearing the designation: *Colored Computers.*

One particularly brazen computer, Miriam Mann, took responding to the affront as her own personal vendetta. She plucked the sign from the table, tucking it away in her purse. When the sign returned, she removed it again. “That was incredible courage,” says Shetterly. “This was still a time when people are lynched, when you could be pulled off the bus for sitting in the wrong seat. [There were] very, very high stakes.”

But eventually Mann won. The sign disappeared.

JOHN GLENN

While these three women's stories remain front and center, John Glenn's recent death (Dec 8, 2016) makes this film particularly timely. Featured prominently, Glenn is depicted as a goal-oriented, joke-making, tension-cutting, folksy, equal opportunist. According to Barry, that's pretty much exactly how he was.

"Everybody thinks of John Glenn as this iconic war hero... and astronaut, but what's missed a lot is his humanity," says Berry, *"Glenn was in a classic sense, a gentleman*. He was always concerned about the people around him and it didn't matter what package they were in. *He was a real people person."*

Barry also notes that there's an "easter egg" in the film that most people who aren't deep into NASA history will not catch. There's a short scene where Glenn is talking to reporters, and beside him there's a woman—CeCe Bibby—painting the Friendship Seven logo onto the spacecraft.

The true story is that NASA officials originally did not allow Bibby access to the launch pad, but Glenn intervened and insisted that his artist be allowed to do her job.

ANOTHER DAY’S WORK

The Movie Girls

There's no way a two-hour movie could tell the full story of these women; Shetterly's book paints a much fuller picture.

But *Hidden Figures* highlights NASA's (*relatively) progressive attitude for the time*, driven in large part by necessity.

This happens literally in the film, when the head of the Space Task Group, Al Harrison (Kevin Costner) destroys the "colored ladies’ room" bathroom sign. As Shetterly says to *Popular Mechanics*, the movie also focuses on Johnson, Jackson, and Vaughn's "transcendent sense of humanity" that allowed them to endure.

Johnson would go on to work on the Apollo program, too, including performing trajectory calculations that assisted the 1969 moon landing. She would retire from NASA in 1986.

In 2015, President Obama gave *Katherine Johnson* *The Presidential Medal of Freedom*.

Last May, a NASA computational research facility in her hometown of Hampton, Virginia *was named in Johnson's honor.*

And yet, despite the accolades and getting the Hollywood treatment, she told the audience in May that she was just doing her job and "it was just another day's work."

Sometimes changing the world is just that!

ABOUT THE AUTHOR

Margot Lee Shetterly

“These women were both ordinary and they were extraordinary,” says Margot Lee Shetterly. Her new book *Hidden Figures* shines light on the inner details of these women’s lives and accomplishments. The book's film adaptation, starring Octavia Spencer and Taraji P. Henson, is now open in theaters.

“We've had astronauts, we’ve had engineers—John Glenn, Gene Kranz, Chris Kraft,” she says. “Those guys have all told their stories.” *Now it’s the women’s turn.*

Growing up in Hampton, Virginia, in the 1970s*, Shetterly lived just miles away from Langley*. Built in 1917, this research complex was the headquarters for the National Advisory Committee for Aeronautics (NACA) which was intended to turn the floundering flying gadgets of the day into war machines. *The agency was dissolved in 1958, to be replaced by the National Aeronautics and Space Administration (NASA) as the space race gained speed.*

The West Computers were at the heart of the center’s advancements. They worked through equations that described every function of the plane, running the numbers often with no sense of the greater mission of the project. They contributed to the ever-changing design of a menagerie of wartime flying machines, making them faster, safer, and more aerodynamic. Eventually their stellar work allowed some to leave the computing pool for specific projects—Christine Darden worked to advance supersonic flight, *Katherine Johnson calculated the trajectories for the Mercury and Apollo missions.* NASA dissolved the remaining few human computers in the 1970s as the technological advances made their roles obsolete

Exactly how many women computers worked at NACA (and later NASA) over the years is still unknown. One 1992 study estimated the total topped several hundred but other estimates, including Shetterly’s own intuition, says that number is in the thousands.

As a child, *Shetterly knew these brilliant mathematicians as her girl scout troop leaders, Sunday school teachers, next-door neighbors and as parents of schoolmates. Her father worked at Langley as well,* starting in 1964 as an engineering intern and becoming a well-respected climate scientist. “They were just part of a vibrant community of people, and everybody had their jobs,” she says. “And those were their jobs. Working at NASA Langley.”

Surrounded by the West Computers and other academics, *it took decades for Shetterly to realize the magnitude of women's work.*

"It wasn't until my husband, who was not from Hampton, was listening to my dad talk about some of these women and the things that they have done that I realized," she says.

"That way is not necessarily the norm"

While I knew these women, I didn't really know their stories – why they were at NASA, what they were doing and why there were so many women who worked there. Investigating these stories set off a whole chain of dominoes, which eventually became *Hidden Figures.*

The spark of curiosity ignited, Shetterly began researching these women. Unlike the male engineers, few of these women were acknowledged in academic publications or for their work on various projects. Even more problematic was that the careers of the West Computers were often more fleeting than those of the white men. Social customs of the era dictated that as soon as marriage or children arrived, these women would retire to become full-time homemakers, Shetterly explains. Many only remained at Langley for a few years.

But the more Shetterly dug, the more computers she discovered. "My investigation became more like an obsession," she writes in the book. "I would walk any trail if it meant finding a trace of one of the computers at its end."

She scoured telephone directories, local newspapers, employee newsletters and the NASA archives to add to her growing list of names. She also chased down stray memos, obituaries, wedding announcements and more for any hint at the richness of these women's lives. "It was a lot of connecting the dots," she says.

"I get emails all the time from people whose grandmothers or mothers worked there," she says. "Just today I got an email from a woman asking if I was still searching for computers. [She] had worked at Langley from July 1951 through August 1957."

Langley was not just a laboratory of science and engineering; "in many ways, it was a racial relations laboratory, a gender relations laboratory," Shetterly says. The researchers came from across America. Many came from parts of the country sympathetic to the nascent Civil Rights Movement, says Shetterly, and backed the progressive ideals of expanded freedoms for black citizens and women.

The women fought many more of these seemingly small battles, against separate bathrooms and restricted access to meetings. It was these small battles and daily minutes that Shetterly strove to capture in her book. *And outside of the workplace, they faced many more problems, including segregated buses and dilapidated schools*. Many struggled to find housing in Hampton. The white computers could live in Anne Wythe Hall, a dormitory that helped alleviate the shortage of housing, but the black computers were left to their own devices.

"History is the sum total of what all of us do on a daily basis," says Shetterly. "We think of capital "H" history as being these huge figures—George Washington, Alexander Hamilton and Martin Luther King." Even so, she explains, "you go to bed at night, you wake up the next morning, and then yesterday is history. These small actions in some ways are more important or certainly as important as the individual actions by these towering figures."

The book and movie don't mark the end of Shetterly's work. She continues to collect these names, hoping to eventually make the list available online. She hopes to find the many names that have been sifted out over the years and document their respective life's work.

The few West Computers whose names have been remembered, have become nearly mythical figures—a side-effect of the few African American names celebrated in mainstream history, Shetterly argues.

She hopes her work pays tribute to these women by bringing details of their life's work to light. "Not just mythology but the actual facts," she says. "Because the facts are truly spectacular."

THE "COLORED COMPUTERS" & HOLLYWOOD

KATHERINE G. JOHNSON **TARAJI P. HENSON**

Photo: Courtesy of NASA; Twentieth Century Fox Film Corporation

A physicist and mathematician, Katherine G. Johnson worked with NASA in calculating trajectories, launch windows and the return paths for many famous space flights. Her background includes such projects as Project Mercury (the first man to fly into space), 1969's Apollo 11 (first flight to the Moon) and the Space Shuttle program (plans for a mission to Mars).

At the time of her work, African Americans and women were not respected in the workplace. In 1953, she was hired by NASA and struggled to receive equal recognition for her work. During her time at NASA, she worked under segregated conditions as a "computer."

Johnson lived in Virginia, where the movie takes place. She saw the movie and enjoyed it. "It was well done. The three leading ladies did an excellent job portraying us," she said, according to *The Los Angeles Times.* She passed away on Feb 24, 2020, at the age of 101.

Taraji P. Henson, who portrays Johnson, said she felt pressure playing someone who is still alive and wanted to make sure she got it right. "And I owe her the truth and all of me," Henson told *The Hollywood Reporter*. "I got to sit with her and started studying her mannerisms, and I asked her a lot of questions. What I did find that was parallel in our lives was math, which I hated.

DOROTHY VAUGHN **OCTAVIA SPENCER**

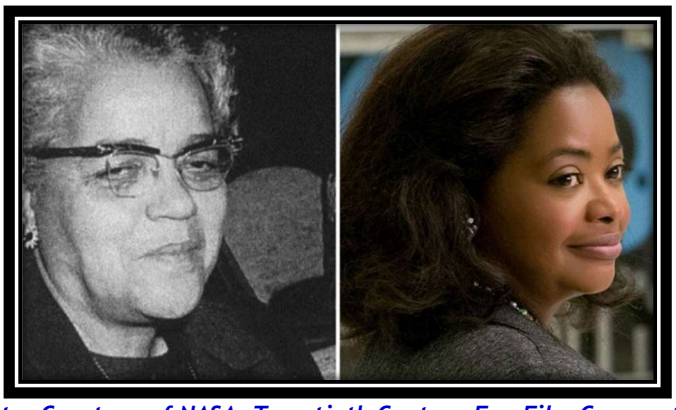


Photo: Courtesy of NASA; Twentieth Century Fox Film Corporation

A mathematician, Dorothy Vaughan was the first African American woman to be promoted as a head of personnel at the National Advisory Committee for Aeronautics, later known as NASA.

She was the head of the West Area Computers, leading a group of African American mathematicians through crucial space projects.

Oscar winner Octavia Spencer, who plays Vaughan, told *THR* she knew math and science prior to the role but not to the level of a rocket scientist. “I understood her work to an extent, but she's a rocket scientist and there are very few people in the world who get that type of physics and can work interchangeably in the math disciplines,” Spencer said. “It's a small group of people, and my hat is off to them. I am not a member of that club!”

Spencer said the cast wanted to present these women “in a truthful way” and “in the best light possible.” Since Vaughan died in 2008, the first audience she wanted to impress was the family, and she was proud to learn she did.

“What I learned from playing Dorothy Vaughan is that I have a voice and that I have to use it for people who don't have a voice or whose voice is somehow subdued by whatever's happening in society,” she told *THR.*

MARY JACKSON **JANELLE MONA’E**

Photo: Courtesy of NASA; Twentieth Century Fox Film Corporation

Mary Jackson was a mathematician and NASA's first black female engineer in 1958. She influenced the hiring and promoting of women in science, engineering and mathematics careers at NASA. Jackson died in 2005 at age 83.

Grammy-nominated singer Janelle Monáe, who portrayed Jackson in the film, said she was proud to be a part of a story so many people didn't know about. "These [women] are our true American heroes," she told CNN. "It's because of them that we can have that as America. We can feel proud that we achieved something so extraordinary."

DISCLAIMER

**PLEASE UNDERSTAND THAT EVEN THOUGH THIS INFORMATION
HAS BEEN TAKEN FROM WHAT APPEARS TO BE AUTHENTIC WEBSITES
I CANNOT GUARANTEE THAT ALL THE DATA IN THIS ARTICLE IS ACCURATE AND CORRECT.**