Hidden Figures

INTRODUCTION

BRIEF BIOGRAPHY OF MARGOT LEE SHETTERLY

Margot Lee Shetterly was raised in a middle class black community in Hampton, Virginia. Her father was a climate scientist at the NASA-Langley Research Center and her mother was an English Professor at Hampton University. She attended the University of Virginia, where she studied business, and then she moved to New York, where she worked at several prestigious investment banking firms and media startups. After marrying writer Aran Shetterly, the two moved to Mexico in 2005 to start a magazine for Anglophone expats in Mexico, and Shetterly began writing and researching *Hidden Figures* while living in Mexico in 2010. To support her writing, Shetterly has received fellowships from the Alfred P. Sloan Foundation and from the Virginia Foundation for the Humanities. *Hidden Figures* was released as both a book and an Oscar-nominated movie in 2016. Shetterly is also the founder of the Human Computer Project, which aims to be a complete record of women who contributed to research at the National Advisory Committee for Aeronautics.

HISTORICAL CONTEXT

Hidden Figures begins during World War II and takes place largely during the Cold War era, when the Soviet Union and the United States engaged in a nuclear arms race and competed to be the first nation to master spaceflight. During this time, the United States government poured money into science and technology that could help the war effort (such as fighter jets) and lend the country international prestige (the space program), both of which meant investment in the Langley Research Center where the book is set. While the 1950s and 60s were a time in which the country progressed rapidly in science and technology, social progress was more complex. By examining the gradual integration of the workplace at Langley over the course of several decades, *Hidden Figures* shows the shift from Jim Crow laws (which enforced segregation in the Southern United States) to the effects of the 1954 Supreme Court decision in *Brown vs. Board of Education* (which ushered in an era of increased integration of American institutions) to the passage of the Civil Rights Act of 1964 (which outlawed discrimination based on race, color or creed). Shetterly depicts the mid-twentieth century as a time of social and technological progress in the United States, but she shows that science moved forward more swiftly than social equality.

RELATED LITERARY WORKS

For more information about African-Americans' role in the development of NASA, read *We Could Not Fail: The First African-Americans in the Space Program* by Richard Paul. *The Rise of the Rocket Girls, From Missiles to the Moon to Mars* by Nathalia Holt offers a look at the forgotten female scientists who helped get the first Americans into space. Rebecca Skloot's *The Immortal Life of Henrietta Lacks* tells the story of a black woman whose life played an integral and essential role in science—in this case, the development of life-saving medical technology. *The Girls of Atomic City: The Untold Story of the Women who Helped Win World War II* provides further insight into the role of women in the advancement of military technology. *Code Girls: The Untold Story of the American Women Code Breakers of World War II* by Liza Mundy also provides an inside look at this same topic.

KEY FACTS

- **Full Title:** *Hidden Figures: The Story of the African-American Women Who Helped Win the Space Race*
- **When Written:** 2010-2014
- **Where Written:** Mexico and Virginia
- **When Published:** 2014
- **Literary Period:** Contemporary
- **Genre:** Non-fiction, 20th century American history
- **Setting:** Hampton, VA

EXTRA CREDIT

All in the Family. Margot Lee Shetterly was raised near the Langley Research Center, where her father worked for forty years, ultimately becoming an internationally renowned climate scientist. One of the women featured in the book, Mary Jackson, was once Shetterly's father's employees.

And the Oscar Goes To... *Hidden Figures* was made into a film the same year it was published. The film was nominated for three Academy Awards.

PLOT SUMMARY

In 1943, in the midst of World War II, the Langley Memorial Aeronautical Laboratory in Hampton, VA seeks to hire hundreds of junior physicists and mathematicians to help in the war effort by supporting engineers in performing aeronautical research as part of the National Advisory Committee for Aeronautics (the NACA). At the time, mathematicians, who are commonly called "computers," are almost all women. Further, Jim Crow laws are still in place in the South, which means that

Hampton is a segregated place. Langley hires some black female computers, but places them in a segregated office called West Area.

In the summer of 1942, Dorothy Vaughan, a math teacher, is also working in a miltary laundry room in order to earn extra money and to support the American war effort. Married with children, Dorothy comes from a middle class black family, well-respected and well-known by other black families in town. One day she sees an advertisement for jobs at the NACA. She applies, and is hired as a mathematician. She accepts the job, even though it requires her to move quite a distance and be away from her family.

At around the same time, Katherine Coleman is a math major at West Virginia. She is such an excellent mathematician that she is invited to integrate a nearby university, where she has been accepted into a master's program in mathematics. She completes the summer session of the master's program, but then drops out of the program to start a family.

Meanwhile, Dorothy Vaughan begins work at the NACA. As a black computer, she must work in the segregated West Area Computing room. White computers, run by white Head Computers Margerey Hannah and Blanche Shopsin, work out of a different office on the East Side of Langley's campus, called East Area. The black computers, much to their consternation, are also made to sit together in the cafeteria at a table marked with a sign that reads "Colored Computers." Nonetheless, the black computers play an important role in helping the engineers at Langley improve American fighter planes and develop ever more powerful bomb payloads.

After the war, Dorothy fears she will be let go by the NACA, but instead she is made a permanent employee in 1946. Even so, she finds it hard to move up the ranks: there are few opportunities available to women, and even fewer for black women. Yet when the Head Computer Margery Hannah gets promoted and Margarery's second, Blanche, unexpectedly falls ill and dies, Dorothy is asked to fill the role. For a number of years she serves only as the "acting head" of the West Area computing division, but she performs so well that she becomes full head of the unit in 1951. That same year, Mary Jackson joins West Computing, working as a computer under Dorothy Vaughan.

Globally, the "Cold War" between the United States and the Soviet Union becomes more intense. Yet as the United States dedicates itself to fighting the spread of Communist oppression around the globe, many black Americans, including many at the NACA wonder why at the same time the United States perpetuates the oppression of African-Americans on its own soil.

Yet the NACA, perhaps, offers more opportunities than much of the rest of society. An NACA engineer named Kazimierz Czarnecki invites Mary Jackson to join his research team. Impressed by Mary's intelligence, he then pushes her to become an engineer. Slowly, but surely, the NACA begins to integrate. That doesn't mean bias against women and blacks is absent from the organization. It is a place where the chief officer, John Becker, thinks little of accusing Mary of making a mistake in her calculations. But it is also a place where she can use her skills to prove to him that *he'd* actually made the mistake. Her willingness to stand up for herself inspires other black computers, and shows those in leadership positions that Mary has what it takes to succeed.

Katherine starts work at Langley in 1953, after learning about the job from a relative at a wedding. She joins the Flight Research Division, where she impresses the engineers in the group with her expertise in analytical geometry. Once again, the NACA proves to be a place where prejudice continues to exist, and yet also a place where it seemingly can be overcome. On her first day in her new office, a white man one desk over stands up and walks away when she greets him. She ignores his rudeness, knowing if she's going to survive at Langley, she'll have to be resilient. Two weeks later she and the white man become fast friends, after they discover they are both from West Virginia. Similarly, it is a place where Katherine's mathematical skill can get her moved from the computing pool into a group led by the head of the Flight Research Division, Henry Pearson. But Pearson, while seemingly promoting Katherine, also fails to give her a raise. Yet the integration that has already occurred continues to make change, as Dorothy Vaughan fights to get Katherine the raise she has earned.

Katherine quickly proves herself in her new role. Her first assignment is to solve the reason behind the recent crash of a small propeller plane. Her research helps reveal how turbulence from one plane can affect the flight of another, a discovery that ultimately leads to changes in air traffic regulations. Katherine's abilities ensure that she is accepted by her white peers, and as she gains this acceptance she starts to ignore the COLORED bathroom signs at Langley.

Meanwhile, the world rapidly changes, both technologically and socially. Technologically, electronic computers become increasingly powerful (and the NACA buys its first computer), and in 1957 the Soviet Union launches Sputnik, the first satellite into space. Meanwhile, Civil Rights protests lead to lawsuits which result in *Brown v. Board of Education*, the landmark 1954 Supreme Court decision that bans segregation in all public schools in the United States. Yet despite the ruling, many states, including Virginia, fiercely resist integrating. These different events affect the black computers at Langley in all sorts of ways. For instance, Mary Jackson has to fight anti-integration efforts in her question to get continuing education and become an engineer. At the same time, Dorothy starts to realize that her role as a computer is likely to get replaced by the electronic computers.

The launch of Sputnik also kicks off a Space Race between the

United States and the Soviet Union. In particular, the United States ramps up its efforts to develop spacecraft that can send a man into space — an effort given the name Project Mercury. (The NACA is also renamed; it becomes NASA.) These efforts offer opportunity, and Katherine, thrilled at the challenge, contributes massive amounts of research to the NACA's efforts to build a working spacecraft. However, she is also initially not allowed to attend the editorial meetings where research reports are critiqued before they are published. She persists in her effort to be included, however. Not only does she eventually get to join these meetings, but she also becomes the first woman to publish a research report for the newly formed Space Task Group. NASA also becomes increasingly integrated, even as the regions around Langley continue to fight against desegregation, which creates an odd and frustrating contradiction for NASA's black engineers and their families.

As time passes, Mary Jackson helps her son win the local soap box derby race, making him the first African-American child ever to do so. Mary is painfully aware any daughter of hers would have been shut out of the competition because of her gender, but is also grateful that the racial barrier, at least, has been broken. For her part, faced with the rise of electronic computers, Dorothy Vaughan teaches herself the programming language FORTRAN so that she can program the computers that will replace her, thereby saving her job.

Project Mercury progresses, with a launch date in 1961. That same year, President John F. Kennedy signs an executive order mandating Affirmative Action employment policies. Even so, the Russians remain ahead of the United States in the Space Race, and are the first to launch a cosmonaut (Yuri Gagarin) into space. While the United States accomplishes the same feat with John Glenn in 1962 (and with Katherine checking the electronic computers calculations for Glenn's flight), President John F. Kennedy announces the ambition for Americans to land the first man on the moon.

Katherine Johnson and the rest of the Space Task Group work hard on figuring out how to send a man to the moon. While some black activists protest the mission, angry that poor African-Americans have been neglected while federal money goes to space travel, Katherine, though sympathetic to these arguments, remains dedicated to her scientific mission. In 1969, Katherine and a group of hundreds of other black women watch Apollo 11 land safely on the moon, thanks in part to Katherine's calculations and contributions. Katherine remembers all the women who helped her get to this point. She dreams of someday calculating the flight trajectory that will send humans to Mars.

CHARACTERS

MAJOR CHARACTERS

Margot Lee Shetterly – Margot Shetterly is the author of *Hidden Figures* and the daughter of a climate research scientist who worked at Langley Research Center. Growing up, Shetterly would visit her father often at his office at Langley, but she did not find it remarkable that so many black scientists—including black women—worked there. Shetterly was inspired to write *Hidden Figures* when she realized that the community of black professionals and intellectuals within which she grew up was a result of a unique intersection of war, technology, civil rights, and the persistent efforts of underrepresented scientists, particularly black women. Inspired by these women, who helped put a man on the moon, Shetterly sets about documenting their experiences as thoroughly as she can. Though only a few of the pioneering black female mathematicians who work at Langley are still alive, Shetterly manages to interview many people who knew them, and she spends years writing their story.

Dr. Robert B. Lee III – Dr. Robert B. Lee III is Margot Lee Shetterly's father and a renowned climate scientist who, for years, worked at Langley. He is a supportive father who maintains a close relationship with his daughter. On a visit home for Christmas, Shetterly asks him about the women who worked alongside him at Langley, and he helps her start research for her book by taking her around the neighborhood to meet his former colleagues.

Katherine Coleman Goble Johnson – Katherine Coleman (who took on the married names Goble and Johnson) is a passionate, outspoken black mathematician who works in the Flight Research Division at the Langley Research Center. Born in White Sulphur Springs, West Virginia, Johnson worked as a math teacher and briefly pursued graduate study in mathematics before joining the National Advisory Committee for Aeronautics as a computer under Dorothy Vaughan. Upon joining the segregated NACA workforce in 1953, she refuses to use the colored bathrooms or to allow prejudice to make her feel small. Though she comes up against racism more than once at the NACA, she maintains her sparkplug personality and manages to charm everyone she comes into contact with, without losing sight of her dedication to her work and her community. In one memorable event, astronaut John Glenn—who doesn't trust the calculations performed by NASA's new IBM computers—asks Johnson to double-check the numbers for his flight trajectory and landing, and she does so successfully. She distinguishes herself first as a computer for the Flight Research Team and later as an aerospace technologist, becoming the first woman to publish a research paper on space flight. Johnson is the one of the only living computers Shetterly features in the book and one of the few Shetterly meets with in person.

Dorothy Vaughan – Dorothy Vaughan is a strong-minded, black mathematician who joins Langley as a human computer in 1943 and then works her way up to become the organization's

first black section head. She is extremely pragmatic and fiercely devoted to her church and her children. Taking the job as a mathematician at the NACA means leaving her small town life, something that frightens her, though she embraces the opportunity to make more money to support her family. At the NACA, she climbs from computer to section head, supervising the onboarding and placement of computers who go on to become leaders in their fields, like Katherine Johnson and Mary Jackson. Worried she'll be replaced in her role by electronic computers, she teaches herself the programming language FORTRAN and paves the way for other female mathematicians, black and white, to learn it as well. Over the course of the book, she evolves from an ambitious young woman to a vocal force for equality at the NACA, where she fights to make sure women are paid fairly for their titles and duties.

Mary Jackson – Mary Jackson works as a teacher and a USO secretary before taking a job as a computer at the NACA. She is extremely bright, and she finds herself frustrated when the intelligence that landed her a job at Langley doesn't shield her from discrimination at the hands of her white colleagues. She is vocal about her frustrations, and her willingness to speak out helps her move up the ladder at work. Engineer Kazimierz Czarnecki gives her a job working outside of the computer pool, in aerodynamics. He encourages her to pursue greater opportunities at Langley, something she can only do after petitioning the city to allow her, as a woman, to take segregated engineering classes. Her persistence pays off, and she makes history, becoming the Langley Research Center's first black female engineer. After decades of performing research at a senior level at the Langley Research Center, she takes a demotion to work in Human Resources, where she works alongside Gloria Champine to ensure that black women (and women in general) will have a fair opportunity to pursue careers as engineers. She is dedicated to her community and to the concept of **the double V**, which drives her to host open houses at the NACA and to do everything she can to draw young black students into its gates. Her enthusiasm and optimistic spirit sustain her and help her build a long and fruitful career marked by her dedication to gender equality in the sciences, something she views as a means to bridge the differences between races. She is one of the four women at the center of *Hidden Figures*, and was once an employee of Margot Shetterly's father.

Christine (Mann) Darden – Christine Darden (Also Christine Mann) is a black female aeronautical engineer who worked at the Langley Research Center for many years as a data analyst before rising to the top level in her field. She is from a large family and is renowned for her strong work ethic and intellectual curiosity. As a high school senior in 1957, she follows the news of Little Rock and Sputnik closely, and these events help galvanize her dedication to American scientific and technological progress and to civil rights. She graduates from a master's program at Virginia State University with a plan to apply for professorships at Hampton Institute and Norfolk State, but when she goes to the placement office, they steer her towards NASA instead. Katherine Johnson takes Christine under her wing and introduces her to the black community in Hampton and Newport News. When, after several years in the same position, Christine feels stuck in her job as a data analyst, she complains to the head of her department, asking why men tend to be promoted while many women have been let go due to budget cuts. He tells her that no one has ever brought the issue up with him before, and he promotes her. She ultimately receives a PhD in engineering. Some of the code she writes while at the NACA is still at the core of sonic boom minimization programs in use today. Christine is younger than the other women featured in *Hidden Figures* and she represents the generation of women after Katherine Johnson, Dorothy Vaughan and Mary Jackson, who grow up in a time of more freedom and opportunity for black people.

Margerey Hannah – Margerey Hannah is West Area computing's white section chief. She treats the West Area women as equals and even invites a few of them to work-related social affairs at her home, something that makes her a pariah in the eyes of her white peers. When she leaves her position to take a position with the Full-Scale Research Division, her old job passes down to her assistant, Blanche Sponsler and then to Dorothy Vaughan, making Dorothy Langley's first black section head. Margerey eventually publishes scientific papers under her own name, making her an early female pioneer at Langley.

John Glenn – John Glenn is an astronaut and the first American to orbit the Earth. Confident, charismatic and well-prepared for his role, he represents the American dream of spaceflight and technological prowess. He helps make Katherine Johnson famous among her peers after he chooses her to double-check the electronic computer's calculations for his trajectory into and back from space.

A. Philip Randolph – A. Philip Randolph is an African-American Civil Rights leader and labor organizer who fights for equal rights for African-American workers. He works tirelessly to secure better work opportunities for black people, including threatening to stage a march on Washington D.C when President Roosevelt refuses to outlaw segregation in hiring. It is because of his efforts that black men and women are allowed to apply for lucrative wartime job contracts.

Henry Pearson – Henry Pearson is the head of the branch of the Flight Research Division where Katherine Johnson works. He pulls her from Dorothy Vaughan's computing group, but he has to be persuaded to hire her on officially and give her the raise she deserves, in part because he doesn't believe women should work.

William Waldron Schieffelin Claytor – William Waldron

Schieffelin Claytor is a black research mathematician who graduates from Howard University in 1929 and earns a PhD in math from the University of Pennsylvania in 1933 (only the third black person in the country to do so). He mentors Katherine Johnson and encourages her to pursue graduate study in mathematics.

MINOR CHARACTERS

Blanche Sponsler – Blanche Sponsler is Margerey Hannah's assistant who takes over for Margery when Margery is promoted. She suffers a mental breakdown at work, and is taken to an asylum, where she passes away. When she dies, Dorothy Vaughan takes over the role of West Area computing's acting section head.

Charles Hamilton Houston – Charles Hamilton Houston is a black lawyer and former military officer who leads the NAACP's Legal Defense Fund in fighting several discrimination and segregation cases that make it to the Supreme Court, including *Brown vs. Board of Education*, which leads to the desegregation of public schools nationwide.

Howard Vaughan – Howard Vaughan is Dorothy Vaughan's husband. She leaves him behind when she moves to Hampton, VA to take a job as a computer at Langley.

President Woodrow Wilson – Woodrow Wilson was the President of the United States from 1913-1921 and a native Virginian. Although he is awarded the Nobel Peace Prize for his humanitarian efforts in founding the League of Nations, he is dedicated to reinstating and preserving segregation in the Civil Service after Reconstruction.

Virginia Tucker – Virginia Tucker is Langley's head female mathematician and Margerey Hannah's boss.

Harry Byrd – Harry Byrd is Virginia's Democratic Senator who mounts a major resistance effort to federally mandated integration of schools.

Robert "R.T." Jones – R.T. Jones is one of the most brilliant engineers on Langley's staff, and a progressive scientist who supports equal rights for African-Americans.

Henry Reid – Henry Reid is the engineering director of the Langley laboratory.

Miriam Mann – Miriam Mann is one of the first black female mathematicians to take a job at Langley. She steals the **"Colored Computers"** sign that marks the table where black computers are supposed to sit, and keeps stealing it until it disappears.

Joshua Colemans – Joshua Coleman is Katherine Johnson' father and a brilliant mathematician who encourages Katherine's educational pursuits.

Dorothy Hoover – Dorothy Hoover is a black aeronautical research scientist in Langley's Stability Analysis Division and one of the first women at Langley to publish research papers.

Doris Cohen – Doris Cohen is a female mathematician and the first woman at the NACA to publish a research paper. Between 1941 and 1945, she publishes nine reports on high-speed aeronautical research, five as sole author and four coauthored with R.T. Jones whom she eventually marries.

James Williams – James Williams is a black engineer and former Tuskegee airman who graduates from the University of Michigan before joining Langley in the early 1950s.

John Becker – John Becker is the chief of the NACA's Compressibility Division. He inadvertently helps Mary Jackson make a name for herself at Langley when he challenges her numbers, and she proves that the error is his fault, not hers.

Kazimierz Czarnecki – Kazimeirz Czarnecki is an aeronautical engineer and assistant section head in the NACA's Four-by-Four-Foot Supersonic Pressure Tunnel. He offers Mary Jackson a job on his team and helps her become an engineer.

Thomas Byrdsong – Thomas Byrdsong is a black engineer who joins Langley in 1952 and becomes friends with Mary Jackson.

President Dwight D. Eisenhower – President Dwight D. Eisenhower is the 34th president of the United States. He presides over a portion of the Cold War and passes measures to increase U.S. proficiency in science and engineering.

Levi Jackson, Jr. – Levi Jackson Jr. is Mary Jackson's son. She helps him become the first black winner of the soap box derby race.

J. Lindsay Almond – J. Lindsay Almond is a Virginia governor who opposes integration and forces the closing of Virginia's public schools after the Supreme Court outlaws segregation.

President John F. Kennedy – John F. Kennedy was the President of the United States from 1961 until his assassination in 1963. In *Hidden Figures*, Kennedy signs an Executive Order to ensure equal opportunity for all job applicants regardless of race, color, creed, or national origin.

Alan Shepard – Alan Shepard is an American astronaut and the first American to travel into space. Katherine Johnson plays a major role in calculating his flight trajectory.

Gloria Champine – Gloria Champine is a female mathematician at Langley who advances from a clerical position in the Dynamic Loads Division to a job as Technical Assistant to the Division Chief of Space Systems, a role that had previously only been held by men.

Pearl Young – Pearl Young is the NACA's first female engineer and the founder of the organization's rigorous editorial review process for research reports.

Yuri Gargarin – Yuri Gargarin is a Russian cosmonaut who becomes the first human in space and the first human to orbit Earth.

Melvin Butler – Melvin Butler is the personnel officer at the

Langley Memorial Aeronautical Laboratory who opens the doors to the facility's earliest black female mathematicians.

Emma Jean Landrum – Emma Jean Landrum is a female engineer at Langley. She is close friends with Mary Jackson and teams up with her to advocate for the advancement of women engineers of all colors.

THEMES

In LitCharts literature guides, each theme gets its own color-coded icon. These icons make it easy to track where the themes occur most prominently throughout the work. If you don't have a color printer, you can still use the icons to track themes in black and white.

RACISM AND INEQUALITY

In 1943, the United States found itself embroiled in World War II, and the National Advisory Committee for Aeronautics (the NACA) in Langley, VA needed mathematicians to crunch numbers for its engineers. Jim Crow laws mandated segregation between blacks and whites in the NACA's home state of Virginia, and African-Americans who lived there had to make do with "separate but equal" bathrooms, water fountains, parks, restaurants and schools. The NACA recruited highly qualified female mathematicians (called "computers") regardless of color, but the organization housed its black computers in a segregated workspace (called West Area) and made their career advancement difficult. *Hidden Figures* author Margot Lee Shetterly examines the long-term impact of this segregation and racial discrimination at an international, national and interpersonal scale. Ultimately, she shows how, at each level, the United States worked against its own self-interest to enforce racist laws.

Shetterly shows the impact of racism at the international level by highlighting the racial implications of WWII. While the United States fought for equality and freedom abroad, the country demonstrated its hypocrisy by enforcing segregation on its own soil. *Hidden Figures* takes place against the backdrop of World War II, with Americans (black and white) following with horror the torture and deportation of Jewish people in Europe. Black Americans couldn't help but compare the plight of Jewish people abroad with that of people in their own communities, where blacks were beaten, tortured, and imprisoned for demanding the rights they were owed as U.S. citizens. For example, restaurants in Virginia readily served enemy prisoners-of-war, some of whom were kept in detention facilities near Langley. These same restaurants refused to wait on the West Area computers, even though they worked at the NACA in the service of the U.S. military. Shetterly writes, "the contradiction ripped Negroes asunder, individually and as a people, their American identities in all-out, permanent war with their black souls."

Shetterly also shows the self-defeating consequences of racism at the national level through the lens of the NACA. The NACA's segregated workplace—like segregated workplaces nationwide—created cruel and taxing obstacles that kept black employees from performing to the best of their abilities. Although the NACA badly needed the skills and expertise of its black computers, its segregationist policies devalued their contributions. White computers rode a special bus to the office while black computers had to walk, drive, or take public transportation. White female computers could live in a dormitory at Langley (the Air Force Base that hosted the NACA), but black Computers could not. Black computers were only allowed to use bathrooms designated "colored" (which were few and far between), while all other restrooms were off-limits. "The women of West Computing were the only black professionals at the laboratory—not exactly excluded, but not quite included either," Shetterly writes. Because of the obstacles the NACA put in their way, black computers had to fight hard to succeed in the very duties they'd been hired by the NACA to perform.

Segregation at the NACA was only one symptom of a larger national problem, one put in place and encouraged by the highest office in the land. Shetterly writes, "It was no small irony that Woodrow Wilson, the President who had authorized the creation of the NACA and who received a Nobel Peace Prize for his promotion of humanitarianism through the League of Nations, was the very same one who was hell-bent on making racial segregation in the Civil Service part of his enduring legacy." The NACA enforced racist federal laws at the expense of its employees' own progress, and thus, at the expense of the nation's WWII military effort.

In the face of relentless racism and without much institutional support, the West Area computers succeeded in their jobs and became crucial assets to the NACA. This begins to imply the collateral damage of racism: had these individuals been less courageous and persistent, their lives and career contributions might have been utterly stifled. On Katherine Johnson's first day as a computer for Langley's Flight Research Division, a white man stood up and walked away when she sat beside him. Although it wasn't the most blatant display of racism she had ever faced, moments like these created an "insecurity that plagued black people as they code-shifted through the unfamiliar language and customs of everyday life." Later in Katherine Johnson's career, astronaut John Glenn picked Johnson over everyone else on her team (male and female, white and black) to double-check the computer's calculations for his return trajectory from space. This shows that, even in a hostile and unsupportive environment, some black computers managed to overcome Jim Crow and surpass their white peers—even while the NACA continued to enforce

segregationist codes whose implication was that these women were genetically inferior to their colleagues. Likewise, after Mary Jackson reported an incident of workplace racism to an engineer at the NACA, the engineer invited her to work for him on the spot. Working outside of the segregated West Area computing office, Jackson excelled so fully in her duties that she became the NACA's first black female engineer, and one of the first women to work her way up to the level of senior aerospace engineer. In tracing Jackson's life story, Shetterly shows that the NACA only hurt itself by segregating its workplace and nearly denying Mary Jackson the ability to fulfill her potential.

Shetterly uses *Hidden Figures* to denounce the contradictions inherent in the Jim Crow laws that kept the NACA segregated in the years during and after WWII. At an international, national and interpersonal level, she shows how racism impacted not only the oppressed but the people in power who were doing the oppressing, requiring the United States and the NACA to act in self-defeating ways that, illogically, worked against their own prosperity and success.

COMMUNITY

Black computers like Dorothy Vaughan, Katherine Johnson, and Mary Jackson depended on their families and communities to thrive. Extended family, the church, and civic organizations like the Girl Scouts all played a part in their achievements. Shetterly offers a portrait of the bonds between members of the black middle class in the Jim Crow South, then demonstrates the ways in which the NACA's black employees also benefitted from the integrated community that slowly developed at work. Finally, Shetterly shows how this community effort allowed the West Area computers to lay the foundations for the success of the generations of black professionals who came after them.

Dorothy Vaughan, Mary Jackson and Katherine Johnson all came from close-knit black neighborhoods where civic action formed an important part of their daily lives. These communities helped set the stage for each of their professional achievements.

In college, Katherine Johnson was a member of the Alpha Kappa Alpha sorority, the first sorority established for and by black women. She was mentored by "a gifted young math professor," William Waldron Schieffelin Claytor, one of the first black men to earn a PhD from Penn, "who created advanced math classes just for her." Later, the president of West Virginia State College (Katherine's alma mater) chose her to be one of the first black master's students at West Virginia University. Clearly, Katherine Johnson was wildly talented, but she could never have made it to the NACA without mentors.

Dorothy Vaughan has a similar story. When she won a place at an all black college in Ohio, a black community church underwrote a scholarship for her and marked the occasion with an eight-page pamphlet that it distributed to members. When Vaughan was looking for work as a teacher, she found a job through a network in which "black colleges received calls from schools around the country requesting teachers, then dispatched their alumni to fill open positions." This shows, again, that Vaughan did not achieve her goals alone, but through a collective effort.

Hidden Figures takes place in the context of the Civil Rights movement. Activists like A. Phillip Randolph and Charles Hamilton Houston helped end segregation in the schools and forced the government to open wartime jobs up to black people, setting the groundwork for the West Area computers to achieve their dreams. "The social and organizational changes occurring at Langley were buoyed by the civil rights forces gathering momentum in the country," Shetterly writes. Here, Shetterly shows the passing of the torch from those active in the Civil Rights Movement to women like the West Area computers.

Johnson, Vaughan and Jackson's time at the NACA coincided with the internal relaxation of some of its strict segregationist codes. The integrated community cultivated at Langley made the NACA more welcoming for black women and their families, helping the West Area computers carve out places for themselves and build long-term careers. About the NACA, Shetterly writes, "True social contact across the races was well nigh impossible, yet within the confines of their offices, relationships cultivated over intense days and long years blossomed into respect, fondness and even friendship. The colleagues exchanged Christmas cards with one another, asked after spouses and children…and came together for extracurricular activities based at the laboratory." Shetterly emphasizes the importance of community at the NACA, showing how even its partial integration helped spur the West Area computers on to greater success than they would have achieved alone.

Shetterly also outlines the ways people at the NACA strategized around Jim Crow laws to maintain a sense of community: "The activities building was the site of club meetings and branch get-togethers, an end run around the embarrassment and difficulty of finding a venue in the town that would accommodate a racially mixed group," she explains. Because of the relative freedom the Langley base offered, "The Negro employees began attending center wide events such as the annual Christmas party… Dorothy Vaughan's children counted the days until the laboratory's giant picnic, where they could romp and play with the other kids and eat their fill of grilled hot dogs and hamburgers." Shetterly highlights again how the sense of community that marked the West Area computers' childhood and early adulthoods also came to characterize the NACA, helping to provide the West Area computers with the support they needed to thrive in their roles.

The women who benefitted from community support, in turn, did everything they could to provide that same support to other African-Americans in their neighborhoods and at the NACA, paving the way for black engineers and mathematicians who would come after them. During her time at the NACA, Shetterly writes, "Katherine Johnson was involved in so many civic and social associations….that folks came to expect to see her broad smile and firm handshake wherever the professional set of the black community gathered." Johnson never forgot the role community played in her early success, and she also knew that it was crucial for her to give back to her own community in turn.

Mary Jackson, after reaching a senior technical position in her field, took a demotion at the age of 58 to join the human resources department, where she could more easily fight for equal opportunity hiring. "Helping girls and women advance was at the core of Mary's humanitarian spirit," Shetterly writes. This was a direct result of Jackson having benefitted from community support early on in her career and making a commitment to help smooth the way for black women who came after her. Dorothy Vaughan, as a section head at the NACA, took advantage of her seniority to help shepherd the careers of dozens of black female mathematicians, becoming the first black supervisor at the organization, and making it possible for black women like Johnson and Jackson to progress from mathematician to senior engineer.

Although the women in *Hidden Figures* accomplished a great deal, none of them would have been able to do so without the support of their communities, both at home and at the NACA. The women, in turn, did what they could to shape and improve their own communities and to promote the progress of the next generation.

LUCK, PERSISTENT ACTION, AND HARD WORK

Pioneering black computers like Johnson, Vaughan and Jackson worked very hard. They also benefitted from healthy doses of luck. Shetterly argues that hard work and persistence set the stage for luck to make a difference in a person's life, and she uses the term "serendipity" to describe what happens when random chance collides with preparedness. Serendipity, according to Shetterly, was a key ingredient in the West Area computers' accomplishments.

Black computers like Johnson and Vaughan demonstrated a unique grasp of what Shetterly calls the "long-term impact of persistent action." This hard work and persistence characterized all the work they did for the NACA. Katherine Johnson's calculations wound up in significant scientific papers, but Johnson was forbidden to sit in on the editorial meetings where these papers were reviewed and scrutinized. So she kept asking to be included. "Her requests were gentle," Shetterly writes, "like the trickle of water that eventually forces its way through rock…. She asked early, she asked often, and she asked penetrating questions about the work." Finally, she broke through. "The engineers just got tired of saying no. Who were they, they must have figured, to stand in the way of someone so committed to making a contribution, so convinced of the quality of her contribution that she was willing to stand up to the men whose success—or failure—might tip the balance in the outcome of the Cold War?" Here, Shetterly shows how Johnson's unique diligence set her apart and helped her achieve her dreams.

Dorothy Vaughan took advantage of a similar strategy. At 50, realizing she was going to be put out of a job by the IBM computers that were rapidly replacing her team, she reinvented herself as a programmer, teaching herself to code. "If anyone could bear witness to the long-term impact of persistent action, and also to the strength of the forces opposing change, it was Dorothy Vaughan," Shetterly writes. Here, she shows how Vaughan, like Johnson, demonstrated unflagging resilience so that she could achieve her goals.

The computers were also very lucky, both to get jobs at the NACA, and because they happened to find themselves there at a time when, slowly but surely, opportunities were opening up for women and black people in the sciences. Shetterly writes that Katherine Johnson's friends and colleagues tended to think of her as "lucky," explaining that it had always been her "great talent to be in the right place at the right time." It was, for example, sheer luck that Johnson was at a wedding in 1952 where her brother-in-law mentioned that the NACA was looking for black female computers. Johnson applied for a position that same year. She felt "'very, very fortunate,' to have lucked into a job that paid her three times her salary as a teacher." Shetterly writes, highlighting the role Johnson believed luck played in her career.

Shetterly also examines the function of luck in the advancement of some female computers into senior roles. She writes, "In 1974, an equal opportunity program gave Gloria [Champine] the chance to advance from a clerical position in the Dynamic Loads Division into a faster-track administrative position in the Acoustics Division." In part because of the luck of her timing (her work at the NACA coincided with the equal opportunity program), Champine was able to work her way up from secretary to Technical Assistant to the Division Chief of Space Systems, "a job that had previously only been held by men." Shetterly again shows that luck—in this case related to timing—played a crucial role in the progress women and people of color made at the NACA in this era.

Shetterly is clear, however, that luck alone does not account for the success of black computers at the NACA; it was luck on top of a bedrock of perseverance, talent, and effort. Shetterly calls this combination of luck and hard work "serendipity," a term she applies to the life-changing opportunities that present

themselves when random chance collides with preparedness.

For example, though Katherine Johnson had the luck to get a job at the NACA, and to be assigned as a computer to the space flight team, it was her hard work and persistence that led astronaut John Glenn to single her out over all the other mathematicians to double check calculations for his historic flight. Shetterly writes, "Simple luck is the random birthright of the hapless….Serendipity happens when a well-trained mind looking for one thing encounters something else: the unexpected. It comes from being in a position to seize opportunity from the happy marriage of time, place, and chance. It was serendipity that called [Johnson] in the countdown to John Glenn's flight." Shetterly's argument is that hard work, perseverance and luck all combined to allow Johnson to build a lasting legacy.

Shetterly applies the same notion to the career trajectory of Gloria Champine. After winning a role in the Acoustics Division, she competed for "an even higher position as the Technical Assistant to the Division Chief of Space Systems, a job that had previously been held by men." Champine interviewed three times and came out on top each time. A friend in HR later told her that they kept interviewing her because they didn't want to give the position to a woman, but ultimately they did hire her because she was the best candidate for the job. Through Champine, Shetterly shows that it was the most assiduous computers, those who knew what to do with good luck when it found them, who ultimately prevailed.

Though it was often luck and good timing that landed them their jobs, while they were at NACA, the best female computers had no choice but to work hard and persevere. Because of this, when opportunities for advancement presented themselves, they were ready. These women fought for acceptance and for equal opportunity by taking advantage of chance and meeting it with preparedness and persistence.

SCIENTIFIC PROGRESS VS. SOCIAL AND POLITICAL PROGRESS

During World War II, military and computing technology advanced rapidly, a trend that continued through the end of the twentieth century and into the twenty-first. Hidden Figures traces a part of that history, which Shetterly calls "Aeronautics' evolution from a wobbly infancy to a strapping adolescence." She contrasts the high-speed evolution of defense and computing technology with the slow progress of the movement for equality and civil rights, which moved haltingly in the face of persistent opposition.

The NACA was a part of many of the biggest scientific developments of the twentieth century, driving human flight capability from fighter planes to rocket ships, and laying the groundwork for the United States to become the first nation to land a man on the moon. Shetterly also emphasizes the important advances made in the field of electronic computers during this period, as they replaced human mathematicians in the NACA's mathematical research departments. "Only the most shortsighted," Shetterly writes, "failed to recognize that electronic computers were around for the long haul."

Shetterly counterbalances the rapid evolution of computers and planes with the stunted progress of civil rights legislation. "Scientific progress in the twentieth century had been relatively linear," Shetterly writes. "Social progress, on the other hand, did not always move in a straight line, as the descent from the hopeful years after the Civil War into the despairing circumstances of the Jim Crow laws proved." Charles Hamilton Houston, a young soldier who would eventually become a prominent civil rights activist and lawyer, recalled a white man's refusal to sit next to him on a train. Houston was wearing his military uniform, proof that he'd served. "I felt damned glad I had not lost my life fighting for my country," Hamilton said, expressing gratitude that he hadn't been killed fighting a war for a white population that refused to see him as an equal. Even as the United States saw great advances at home and abroad, it found itself left behind by more progressive nations when it came to human rights.

As a result of this racial short-sightedness, other countries looked at the U.S. with disdain, an issue that plagued the nation through the end of World War II and into the Cold War, when it found itself pitted against the Soviet Union in a nuclear arms race. Black Americans pointed to Russia's willingness to educate all its citizens—putting them ahead of the U.S. when it came to technological capability—while segregation meant resources were often withheld from black students. After public schools were desegregated by Federal mandate, for example, Virginia's Prince Edward County defunded its entire public school system so that white students wouldn't have to go to school with black students. The schools would stay closed for five years, creating a group of children known as the "Lost Generation," some of whom never made up for what they lost in education. Here, Shetterly shows how, at the same time as the US advanced in its military capabilities, it undermined that progress by sewing division among its own people.

Shetterly also contrasts the NACA's technological foresight with the backwards view of gender that plagued the organization. Even as the NACA could influence and forecast the future of science, the organization remained blind to struggles for racial and gender equality that would reshape the nation in the second half of the twentieth century. After hiring Katherine Johnson to work for the Flight Research Division, for example, Henry Pearson fought to avoid paying her what she was worth. "Pearson," Shetterly writes, "was not a big fan of women in the workplace. His wife did not work; rumor had it that Mrs. Henry Pearson had been forbidden by her husband from holding a job." Shetterly implies here that men like Pearson were not uncommon at places like the NACA, where

women were not seen as equals by the people who hired them.

This widespread inequality between male and female employees was also reinforced by a system in which, "Seasoned researchers took the male upstarts under their wings initiating them into their guild over conversations in the cafeteria and in after-hours men-only smokers. By contrast, women "had to wield their intellects like a scythe, hacking away against the stubborn underbrush of low expectations." Even women who made important contributions to major projects had trouble getting credit for their work. "A woman who had worked closely with an engineer on the content of a research report was rarely rewarded by seeing her name alongside his on the final publication. Why would the computers have the same desire for recognition that they did? Many engineers figured. They were women after all." Again, Shetterly shows how one of the most forward-thinking technological organizations in the world found itself unable to face the obvious fact that male and female employees deserved equal pay, recognition, and opportunities to advance in their careers.

Through the first half of the twentieth century, as aerospace and computing technology advanced more quickly than ever, the United States lagged behind the rest of the world when it came to gender equality and civil rights. This contradiction was not lost on the West Area computers. About Katherine Johnson, Shetterly writes, "The broader implication of her role as a black woman in a still-segregated country, helping to light the fuse that would propel that country to achieve one of its greatest ambitions, was a topic that would occupy her mind for the rest of her life." Johnson's ability to mentally negotiate this inconsistency played a pivotal role in her success as a West Area computer.

SYMBOLS

Symbols appear in **teal text** throughout the Summary and Analysis sections of this LitChart.

"COLORED" SIGNS

Throughout the offices at Langley are signs indicating where black employees are and are not allowed to go. These signs segregate bathrooms and lunch tables, and they are a stark symbol of the inequality and oppression that the black computers at the NACA suffer while doing their jobs serving the United States government and military. When, in 1940, Miriam Mann (a member of the first generation of black computers) steals the "Colored Computers" sign and puts it in her purse, and then continues to steal it until the sign stops reappearing, what she's really doing is allowing the black women at the NACA to begin to regain some of their dignity in the face of the prejudice and discrimination they encounter daily. Her nonviolent, persistent action mirrors the sit-ins and protests that will characterize the Civil Rights movement throughout the South into the second half of the twentieth century. Afterwards, the black computers continue to eat at a separate table, but the removal of the sign marks the removal of a silent but constant reminder that the they are considered inferior by their colleagues, not good enough to eat at the same table or share the same bathrooms with white women. Mann's small act of rebellion, therefore, turns out to be a small step in the battle for equality for all black men and women, not just those who have achieved a certain status, or who have the confidence to break the rules. Later, chief officials at the NACA remove the "Colored" signs from the bathrooms, marking the point when true integration at the NACA finally begins.

THE DOUBLE V

"The Double V," short for "The Double Victory," is a term first mentioned in a letter sent to *The Pittsburgh Courier* by an activist. The letter reads, "Let colored Americans adopt the double VV for a double victory; the first V for victory over our enemies from without, the second V for victory over our enemies within. For surely those who perpetrate these ugly prejudices here are seeking to destroy our democratic form of government just as surely as the Axis forces." The Double V, then, represents the simultaneous struggle against America's enemies around the globe and against those Americans whose prejudices debase America from within. The Double V is a guiding principle for the black female computers at Langley who are uniquely identified with this concept, since they dedicate themselves professionally to serving their country during wartime and personally to proving their abilities in the face of discrimination, as well as uplifting other black Americans. The Double V does not only apply to the black computers at Langley, of course—it also encompasses black soldiers, progressive whites working to integrate the Civil Service, and black families working in the war effort.

QUOTES

Note: all page numbers for the quotes below refer to the William Morrow Paperbacks edition of *Hidden Figures* published in 2016.

Prologue Quotes

❝ Before a computer became an inanimate object, and before Mission Control landed in Houston; before Sputnik changed the course of history, and before the NACA became NASA; before the Supreme Court case Brown v. Board of Education of Topeka established that separate was in fact not equal, and before the poetry of Martin Luther King, Jr.'s "I Have a Dream" speech rang out over the steps of the Lincoln Memorial, Langley's West Computers were helping America dominate aeronautics, space research, and computer technology, carving out a place for themselves as female mathematicians who were also black, black mathematicians who were also female. For a group of bright and ambitious African American women, diligently prepared for a mathematical career and eager for a crack at the big leagues, Hampton, Virginia, must have felt like the center of the universe.

Related Characters: Margot Lee Shetterly (speaker)

Related Themes:

Page Number: xviii

Explanation and Analysis

In this introduction, Shetterly is situating the reader in Hampton, VA, where most of the narrative's events will take place. This passage brings together many of the elements she'll touch on, tracing the evolution of WWII flight technology to manned space flight alongside the transition from segregationist Jim Crow laws to Brown v. Board of Education and Martin Luther King's "I Have a Dream" speech. The purpose of Shetterly's book, in part, is to situate America's technological evolution in the context of the fight for equal rights for African-Americans. She offers a preview of that project here, suggesting that the black women working in the American space program were as big a part of American history as events and figures that all Americans know and recognize.

Chapter 1 Quotes

❝ The black female mathematicians who walked into Langley in 1943 would find themselves at the intersection of…great transformations, their sharp minds and ambitions contributing to what the United States would consider one of its greatest victories. But in 1943, America existed in the urgent present. Responding to the needs of the here and now Butler took the next step, making a note to add another item to Sherwood's seemingly endless requisition list: a metal bathroom sign bearing the words Colored Girls.

Related Themes:

Related Symbols:

Page Number: 8

Explanation and Analysis

Langley in 1943 was the center of the U.S. WWII effort, where the best and brightest scientists gathered to help strengthen the country's defense. The war also brought about great social change. The Fair Employment Practice Committee was created to enforce President Roosevelt's ban on racial discrimination in the workplace, and more jobs became available for women and black people than ever before. African American computers at Langley find themselves at the center of these scientific and social transitions, and, due to their timing, will have the opportunity to change the course of American history forever. However, their employment at Langley in no way protects them from the racist attitudes of the time, and in this passage, through her mention of the colored sign, Shetterly begins to give us a hint about what they will be up against.

Chapter 2 Quotes

❝ Dorothy worked as a math teacher…. As a college graduate and a teacher, she stood near the top of what most Negro women could hope to achieve. Teachers were considered the "upper level of training and intelligence in the race" a ground force of educators who would not just impart book learning but live in the Negro community and "direct its thoughts and head its social movements." Her in-laws were mainstays of the town's Negro elite. They owned a barbershop, a pool hall, and a service station. The family's activities were regular fodder for the social column in the Farmville section of the Norfolk journal and Guide, the leading Negro newspaper in the southeastern United States. Dorothy, her husband, Howard, and their four young children lived in a large, rambling Victorian house on South Main Street with Howard's parents and grandparents.

Related Characters: Margot Lee Shetterly (speaker), Howard Vaughan, Dorothy Vaughan

Related Themes:

Page Number: 10

Explanation and Analysis

This description of Dorothy Vaughn is important because it

signals that Dorothy was college-educated and from a middle class background, which will be true of all the other black computers, as well. The women at the heart of Shetterly's story are professionals even before they arrive. They come to Langley prepared for the work and deeply ensconced in their communities and their respective fields. They are, in fact, no different from the high-achieving white women who come to work at Langley as computers, and, once they are given the same opportunities as their white peers, they will manage to excel and, in some cases, outshine them.

Chapter 3 Quotes

❝ ...At the end of November 1943, at thirty-two years old, a second chance—one that might finally unleash her professional potential—found Dorothy Vaughan. It was disguised as a temporary furlough from her life as a teacher, a stint expected to end and deposit her back in the familiarity of Farmville when her country's long and bloody conflict was over. The Colemans' youngest daughter would eventually find the same second chance years in the future, following Dorothy Vaughan down the road to Newport News, turning the happenstance of a meeting during the Greenbrier summer into something that looked a lot more like destiny.

Related Characters: Katherine Coleman Goble Johnson, Dorothy Vaughan

Related Themes:

Page Number: 25

Explanation and Analysis

This passage appears in the context of Shetterly's introduction of Dorothy to the reader. Dorothy's stint as a computer at Langley was meant to be temporary. The fact that it ultimately becomes permanent, and the success she achieves there, come as a result of a combination of both her natural mathematical brilliance and of serendipity, a combination of good luck and hard work, that factors into all the computers' storylines. The "Colemans' youngest daughter" is Katherine Johnson, who will play a pivotal role in the development of manned spaceflight and whose destiny and fate are entangled with Dorothy's from the beginning. (Dorothy and Katherine first meet at the upscale Greenbrier hotel when Katherine is a child, because Dorothy's husband and Katherine's father both work there. Later Dorothy will pave the way for Katherine to get her job at Langley.)

Chapter 4 Quotes

❝ The American mosaic was on full display, youngsters barely over the threshold of adolescence and men in the sinewy prime of manhood, fresh from the nation's cities, small towns, and countrysides, pooling in the war towns like summer rain. Negro regiments piled in from around the country. One detachment was composed entirely of Japanese Americans. Enlistees from Allied countries, like Chinese medical officers and the first Caribbean Regiment, presented themselves to the port's commanding officers before shipping out. Companies of the Women's Army Corps (WACs) stood ramrod straight and saluted. The port band sent soldiers off with "Boogie Woogie Bugle Boy," "Carolina in My Mind," "La Marseillaise"—the melodies of a hundred different hearts and hometowns.

Related Characters: Dorothy Vaughan

Related Themes:

Page Number: 28

Explanation and Analysis

Newport News, VA, where Dorothy arrives on her way to Langley from the small town of Farmville, is booming. Dorothy isn't the only outsider who has come to seek her fortune and find a better life for herself. There will be plenty of other black people—and people from all over—to help her get her footing and find a community. This passage also indicates the ways in which the war was directly intertwined with social progress, as it provided opportunities for those from different classes, genders, races and cultural backgrounds to come together in the service of the nation's defense. The chaos and bustling activity depicted here comes about as a direct result of the war effort.

❝ Negroes joined their countrymen in recoiling at the horrors Germany visited upon its Jewish citizens by restricting the type of jobs they were allowed to hold and the businesses they could start, imprisoning them wantonly and depriving them of due process and all citizenship rights, subjecting them to state-sanctioned humiliation and violence, segregating them into ghettos, and ultimately working them to death in slave camps and marking them for extermination. How could an American Negro observe the annihilation happening in Europe without identifying it with their own four-century struggle against deprivation, disenfranchisement, slavery, and violence?

Related Themes:

Page Number: 31-32

Explanation and Analysis

Here, Shetterly points out the hypocrisy of Jim Crow and America's endemic racism, a thread that ties together almost every element of the book. Americans are horrified by the Germans' treatments of Jewish people, and black soldiers are fighting against it abroad. However, the long litany of abuses Shetterly provides here also happen to be the same crimes that white Americans visit upon African Americans and their communities almost every day. Black people working in the service of the war notice this contradiction and have to figure out how to negotiate it while also holding on to their jobs and the security those jobs provide.

Chapter 5 Quotes

In 1940, just 2 percent of all black women earned college degrees, and 60 percent of those women became teachers, mostly in public elementary and high schools. Exactly zero percent of those 1940 college graduates became engineers. And yet, in an era when just 10 percent of white women and not even a full third of white men had earned college degrees, the West Computers had found jobs and each other at the "single best and biggest aeronautical research complex in the world."

Related Characters: Dorothy Vaughan

Related Themes:

Page Number: 40

Explanation and Analysis

This passage comes in the context of Dorothy's first introduction to West Area computing, where she meets Langley's other black computers, joining what Shetterly calls "the most exclusive sorority in the world." The statistic presented here is important because it shows how special and talented Dorothy and the other black computers really were—and how lucky.

The highest job most black women with college degrees could aspire to at the time was that of a teacher, a position that was considered the pinnacle of black female achievement. To become an employee at an organization as crucial to the nation's development as the NACA was nearly unthinkable.

At some point during the war, the colored computers sign disappeared into Miriam Mann's purse and never came back. The separate office remained, as did the segregated bathrooms, but in the Battle of the West Area Cafeteria, the unseen hand had been forced to concede victory to its petite but relentless adversary... Miriam Mann's insistence on sending the humiliating sign to oblivion gave her and the other women of west computing just a little more room for dignity and the confidence that the laboratory might belong to them as well.

Related Characters: Miriam Mann

Related Themes:

Related Symbols:

Page Number: 48

Explanation and Analysis

This passage comes when Shetterly introduces us to the segregated Langley cafeteria, where black computers have to sit at a table marked with a sign that reads Colored. The black women at Langley also have to use separate bathrooms. The removal of the sign doesn't mark the end of segregated cafeteria tables, but it does return to the black computers some modicum of power and control, since none of the other workers at Langley have signs telling them where they have to sit. Miriam's tiny revolution also mirrors the larger-scale protests taking place as part of the Civil Rights movement throughout the country.

Chapter 6 Quotes

Readers of black newspapers around the country followed the exploits of the Tuskegee Airmen with an intensity that bordered on the obsessive. Who said a Negro couldn't fly! Colonel Benjamin O. Davis Jr. and the 332nd Fighter Group took the war to the Axis powers from thirty thousand feet. The papers sent special correspondents to shadow the pilots as they served in the skies over Europe, each dispatch from the European front producing shivers of delight. Flyers Help Smash Nazis! Negro Pilots sink Nazi warship! 332nd Bags 25 Enemy planes, Breaks Record in weekend victories! No radio serial could compete with the real life exploits of the men who were the very embodiment of the Double V.

Related Themes:

Related Symbols: V

Page Number: 51

Explanation and Analysis

In this chapter, Shetterly offers a deep dive into the physics and engineering of the fighter planes the NACA designed at Langley. Black soldiers known as the Tuskegee Airmen would fly these top-of-the-line planes into battle, and so they served as a symbol of hope and aspiration for African-Americans everywhere. Meanwhile, back home, black computers like Dorothy Vaughn learned how to do the calculations involved in designing those same planes. The Double V mentioned here points to the relationship between progress for African Americans at home and progress for the nation on the global stage. This was the ultimate goal of many African Americans who worked in the service of the war, as represented both by the work Dorothy Vaughn and the other computers were doing and by the Tuskegee Airmen.

Chapter 7 Quotes

With victory over the enemies from without assured, Negroes took stock of their own battlefield. Almost immediately after V-J Day, some employers returned to their white, Gentile-only employment policies. The FEPC, however feeble it might have been in reality during the war, had nonetheless become a powerful symbol of employment progress for Negroes and other ethnic minorities. With labor markets loosening, the dream that many black leaders had of establishing a permanent FEPC slipped away with the war emergency, in spite of President Truman's support.

Related Themes:

Page Number: 65-66

Explanation and Analysis

This passage is an explanation of what happens to black contract workers after WWII ends. With the end of the fighting comes a return to instability for many African American men and women who had managed to carve opportunities out for themselves in the years before. War brought new chances for social progress to Hampton and to the nation, but the end of the war threatens to return the country to its prewar status quo. The "FEPC" mentioned here is the Fair Employment Practice Committee, formed by President Franklin D. Roosevelt, to enforce Executive Order 8802, which banned discrimination against blacks in the workplace and forced companies to open lucrative wartime job contracts up to everyone.

Chapter 8 Quotes

As if trying to redeem his own professional disappointment through the achievements of one of the few students whose ability matched his impossibly high standards, Claytor maintained an unshakable belief that Katherine could meet with a successful future in mathematical research, all odds to the contrary. The prospects for a Negro woman in the field could be viewed only as dismal. If Dorothy Vaughan had been able to accept Howard University's offer of graduate admission, she likely would have been Claytor's only female classmate, with virtually no postgraduate career options outside of teaching, even with a master's degree in hand. In the 1930s, just over a hundred women in the United States worked as professional mathematicians. Employers openly discriminated against Irish and Jewish women with math degrees; the odds of a black woman encountering work in the field hovered near zero.

Related Characters: William Waldron Schieffelin Claytor , Dorothy Vaughan, Katherine Coleman Goble Johnson

Related Themes:

Page Number: 74

Explanation and Analysis

This passage comes as part of Shetterly's introduction of Katherine Johnson and serves both to highlight Katherine's brilliance and to further emphasize her connection to Dorothy Vaughn. It also indicates the massive loss of brainpower caused by institutions' refusal to hire black men and women.

Claytor is Dr. William Waldron Schieffelin Claytor, a gifted mathematician who held a master's degree from Howard, and was part of the same class Dorothy Vaughn would have joined had she accepted their offer to matriculate. Though he was brilliant enough to teach at the highest level, because he was black, Claytor's opportunities in his field were very limited. At West Virginia State College, he took Katherine under his wing and pushed her to pursue mathematics professionally, helping to prepare her for the work she would take on at Langley.

Chapter 9 Quotes

❝ Seasoned researchers took the male upstarts under their wings, initiating them into their guild over lunchtime conversations in the cafeteria and in after-hours men-only smokers….women, on the other hand, had to wield their intellects like a scythe, hacking away against the stubborn underbrush of low expectations. … Even a woman who had worked closely with an engineer on the content of a research report was rarely rewarded by seeing her name alongside his on the final publication. Why would the computers have the same desire for recognition that they did? many engineers figured. They were women, after all.

Related Themes:

Page Number: 83

Explanation and Analysis

In this passage, Shetterly explains why it was so difficult for women to move ahead at Langley. Unlike for male engineers, there was no path for women to follow as they attempted to move up the ranks. They had to come up with their own strategies and provide support for one another, as the male engineers did little to help them.

The research reports Shetterly mentions here are important because it was by authoring these reports that scientists made names for themselves and got promoted. Because women couldn't even get their names on reports, their prospects for advancement were low. Computers like Katherine and Dorothy faced even more challenging odds, since they were discriminated against both for being women and because they were black. This made their eventual accomplishments all the more extraordinary.

Chapter 10 Quotes

❝ In 1947, a Mississippi hotel denied service to the Haitian secretary of agriculture, who had come to the state to attend an international conference. The same year, a restaurant in the South banned Indian independence leader Mahatma Gandhi's personal doctor from its premises because of his dark skin. Diplomats traveling from New York to Washington along Route 40 were often rejected if they stopped for a meal at restaurants in Maryland. The humiliations, so commonplace in the United States that they barely raised eyebrows, much less the interest of the press, were the talk of the town in the envoys' home countries. Headlines like "Untouchability Banished in India: Worshipped in America" which appeared in a Bombay newspaper in 1951, mortified the US diplomatic corps. Through its inability to solve its racial problems, the United States handed the Soviet Union one of the most effective propaganda weapons in their arsenal.

Related Themes:

Page Number: 103-104

Explanation and Analysis

After WWII ended, America confronted the spread of Communism and found itself pitted against a new enemy, the Soviet Union. Even as American scientists worked in laboratories to win the nuclear arms race that resulted, the country undermined its ambitions and embarrassed itself internationally because of its racist attitudes. This passage offers examples of the ways in which America's hypocrisy when it came to race and racism worked against its own interests. How could the country expect to win allies and support throughout the rest of the world when it treated its own people so badly?

Chapter 11 Quotes

❝ Compared to the white girls, she came to the lab with as much education, if not more. She dressed each day as if she were on her way to a meeting with the president. She trained the girls in her Girl Scout troop to believe that they could be anything, and she went to lengths to prevent negative stereotypes of their race from shaping their internal views of themselves and other Negroes. It was difficult enough to rise above the silent reminders of Colored signs on the bathroom doors and cafeteria tables. But to be confronted with the prejudice so blatantly, there in that temple to intellectual excellence and rational thought, by something so mundane, so ridiculous, so universal as having to go to the bathroom . . . In the moment when the white women laughed at her, Mary had been demoted from professional mathematician to a second-class human being.

Related Characters: Mary Jackson

Related Themes:

Related Symbols:

Page Number: 108

Explanation and Analysis

This is an important moment in which Mary asks white colleagues for directions to the bathroom and they make fun of her for thinking they would know where the "colored" bathroom is. Mary is outraged because she realizes that the intelligence and stamina that got her to Langley won't be enough to protect her from being seen as a second-class citizen. Though she's contributing directly to Langley's technological advancement through her work, the social progress that would allow her to be viewed as equal to whites at Langley and in the US lags far behind.

Chapter 12 Quotes

❝ It had always been Katherine Goble's great talent to be in the right

place at the right time.

Related Characters: Katherine Coleman Goble Johnson

Related Themes:

Page Number: 117

Explanation and Analysis

This sentence serves as an introduction to Katherine Coleman Goble Johnson's character. Katherine was born under a lucky star, and this will help her throughout her life. As a child, she's singled out by visiting dignitaries at the upscale hotel where her father works, and as an adult, she's called upon to take part in some Langley's toughest, most exciting scientific endeavors. Like the other computers, it's this luck, mixed with preparedness and hard work, that helps her to accomplish extraordinary things during her time at Langley. Shetterly calls this combination "serendipity."

Chapter 13 Quotes

❝ Everything depended on Katherine's ability to hold her family together; she could not fall apart. Or perhaps she *would* not fall apart. There was, and always had been, about Katherine Goble a certain gravity, a preternatural self-possession ... She seemed to absorb the short-term oscillations of life without being dislodged by them, as though she were actually standing back observing that both travail and elation were merely part of a much larger, much smoother curve.

Related Characters: Katherine Coleman Goble Johnson

Related Themes:

Page Number: 134

Explanation and Analysis

This passage comes after Katherine's husband dies of a brain tumor and she is left to raise their daughters alone as a working single mother. Katherine's ability to handle life's misfortunes also explains why she was able to achieve as much as she did at Langley. The attitude Shetterly describes here is an important aspect of the serendipitous nature of Katherine's upward trajectory. Yes, she was lucky, but she was also strong. Notice the language Shetterly uses to describe Katherine here, describing her mindset in terms (oscillation, curve) that call to mind physics and mathematics, emphasizing the fact that science and math formed an integral part of who she was.

Chapter 14 Quotes

Scientific progress in the twentieth century had been relatively linear; social progress, however, did not move in a straight line, as the descent from the hopeful years after the Civil War into the despairing circumstances of the Jim Crow laws proved. But since World War II, one brick after another had been pried from the walls of segregation. The Supreme Court victories opening graduate education to black students, the executive orders integrating the federal government and the military, the victory, both real and symbolic when the Brooklyn Dodgers signed Negro baseball player Jackie Robinson, were all new landings reached, new corners turned, hopes that pushed Negroes to redouble their efforts to sever the link between separate and equal decisively and permanently.

Related Themes:

Related Symbols: V

Page Number: 140

Explanation and Analysis

As Shetterly states many times, social progress and technological progress go hand in hand, even though they don't always move at the same pace. Here, we see signs of the nation's slow movement towards integration in the years since Dorothy Vaughn first arrived at Langley in 1943. Dorothy has seen the rapid evolution of fighter planes and the switch within Langley from human computers to electronic computers, but Langley is still segregated. Still, the gradual movement towards equality taking place in the country as a whole gives the black computers hope that integration will come, and that their work and advocacy and support of one another won't be in vain.

Chapter 15 Quotes

The morning of October 5 was the official dawn of the space age, the public debut of man's competition to break free of the bonds of terrestrial gravity and travel, along with all his belligerent tendencies, beyond Earth's atmosphere.

Related Characters: Christine (Mann) Darden

Related Themes:

Page Number: 151

Explanation and Analysis

This comment comes after Christine Mann reads about Sputnik, the Russian satellite, in the newspaper. Christine doesn't know it yet, but she's witnessed the birth of the space race, when the United States, finding itself falling behind the Soviet Union in technological advancement, tries to beat its enemy to the development of manned spaceflight. This period of tension leads to massive and rapid scientific development, just as WWII did in the years previous. Right before Sputnik took over the headlines, Christine had been following the news about the Little Rock Nine, the nine students who tried to integrate a public school in Arkansas after *Brown v. Board of Education*. These two massive shifts—the moves towards space technology and integration—took place alongside one another, and the course of Christine's life will be influenced by both of them.

Chapter 16 Quotes

"Eighty percent of the world's population is colored...In trying to provide leadership in world events, it is necessary for this country to indicate to the world that we practice equality for all within this country. Those countries where colored persons constitute a majority should not be able to point to a double standard existing within the United States."

Related Themes:

Related Symbols: V

Page Number: 170

Explanation and Analysis

This is the text of the statement made by the NACA's lawyers when the NACA finally integrates. After years of lagging behind, social progress within Langley finally catches up, at least part of the way, with the technological innovation the organization has made possible. A. Philip Randolph, Martin Luther King Jr., Claudette Colvin, and Ralph Abernathy are black activists who have been working non-stop to help bring black workers and students to this moment, while, on the inside, the black computers like Dorothy Vaughn, Katherine Johnson, and Mary Jackson have been helping the US to maintain its status as a global leader, embodying the Double V.

Chapter 17 Quotes

❝ "Why can't I go to the editorial meetings?" she asked the engineers. A postgame recap of the analysis wasn't nearly as thrilling as being there for the main event. How could she not want to be a part of the discussion? They were her numbers, after all.

Related Characters: Katherine Coleman Goble Johnson

Related Themes:

Page Number: 179

Explanation and Analysis

Katherine poses this question constantly to the engineers in the Flight Research Division. As a member of this team, she crunches the numbers and even writes a textbook, but, because she is a woman, she is not allowed to attend the meetings where new research papers are vetted and subjected to intense review. This is particularly unfair because the calculations being discussed are sometimes her own. Katherine asks the engineers why she can't go to the meetings repeatedly and politely, applying gentle pressure until they finally let her in. This is an example of Katherine's knack for navigating the racism and gender discrimination that stood in her way, which, combined with her natural good fortune, helped her get ahead.

Chapter 19 Quotes

❝ Being part of a Black First was a powerful symbol, she knew just as well as anyone, and she embraced her son's achievement with delight. But she also knew that the best thing about breaking a barrier was that it would never have to be broken again.

Related Characters: Levi Jackson, Jr., Mary Jackson

Related Themes:

Related Symbols: V

Page Number: 200

Explanation and Analysis

This is an explanation of how Mary Jackson feels after she helps her son, Levi Jackson, become the first black child in Virginia to win the regional Soapbox Derby. Mary is devoted to the advancement of black people, and she pushes her children to excel, designing Levi's derby cart with him and all but ensuring, using her top-level engineering expertise, that he will win the race. This moment is also important, however, because Mary herself is a "black first," as the first black female engineer at Langley. Shetterly reminds us that women like Mary matter not only because they are the first to succeed in their fields but because they break down barriers for African-Americans and make sure that they will not be the only ones to make it. Through their collective effort and dedication, people like Mary paved the way for black women who would come after them and helped mitigate some of the damage caused by racism and gender discrimination. In this way, they catalyzed the slow evolution towards racial and gender equality even while working at Langley to help the country advance towards its military and scientific goals.

Chapter 20 Quotes

❝ Virginia, a state with one of the highest concentrations of scientific talent in the world, led the nation in denying education to its youth.

Related Themes:

Page Number: 204

Explanation and Analysis

In 1959, as the Langley laboratory begins to integrate naturally (with women like Katherine Johnson, Mary Jackson and Dorothy Vaughn helping to lead the way) Prince Edward County in Virginia clamps down on enforcing segregation.

The county defunds its public education system rather than allowing African-Americans into white schools. White parents send their children to "segregation academies" while black parents have to send their children to live elsewhere in the state with relatives or simply keep them home. This lasts for five years, resulting in a "lost generation" of students, some of whom never manage to make up the missing years of education. It's tragic and ironic that all of this occurs mere miles from the government laboratory where some of the most forward thinking technological innovation is taking place.

Chapter 21 Quotes

Many years later, Katherine Johnson would say it was just luck that of all the computers being sent to engineering groups, she was the one sent to the Flight Research Division to work with the core of the team staffed on an adventure that hadn't yet been conceived. But simple luck is the random birthright of the hapless. When seasoned by the subtleties of accident, harmony, favor, wisdom, and inevitability, luck takes on the cast of serendipity. Serendipity happens when a well-trained mind looking for one thing encounters something else: the unexpected. It comes from being in a position to seize opportunity from the happy marriage of time, place, and chance. It was serendipity that called her in the countdown to John Glenn's flight.

Related Characters: John Glenn, Katherine Coleman Goble Johnson

Related Themes:

Page Number: 220

Explanation and Analysis

In February of 1962, the United States prepares to send its first astronaut, John Glenn, into orbit. John Glenn doesn't trust the calculations performed by the electronic IBM computer—a new technology at the time—and he asks Katherine to double check them. Katherine's work helps guide Glenn safely home, turning her into a local celebrity in her own right. Although she is modest about her accomplishments, this is a pivotal moment in history, and one that only comes about because she'd worked hard enough to be prepared when opportunity found her. Her natural good luck would be useless to her if she hadn't also studied and worked to have the skills to back it up.

Chapter 22 Quotes

The resonances and dissonances of the images in the book were sharpest there at Langley, ten miles from the point where African feet first stepped ashore in English North America in 1619, less than that from the sprawling oak tree where Negroes of the Virginia Peninsula convened for the first Southern reading of the Emancipation Proclamation. In a place with deep and binding tethers to the past, Katherine Johnson, a black woman, was midwifing the future.

Related Characters: Katherine Coleman Goble Johnson

Related Themes:

Page Number: 228

Explanation and Analysis

These lines explain the context of Katherine's appearance in a booklet about black workers in the space program. Here, Shetterly explains how Katherine herself is an integral part of a long chain of events in the slow evolution towards freedom and racial equality in the United States. Katherine represents the freedom and forward progress that black men and women have been working towards since the Emancipation Proclamation (and even before that, when their ancestors had been brought to the U.S. in chains). She's also part of a larger social movement that includes A. Phillip Randolph and Martin Luther King Jr., as, like them, she's using the skills she has and her natural talents to open the doors for black people who will come after her.

Chapter 23 Quotes

At the beginning of the decade, the Space Program and the civil rights movement had shared a similar optimism, a certain idealism about American democracy and the country's newfound drive to distribute the blessings of democracy to all its citizens. On the cusp of the 1970s, as the space program approached its zenith, the civil rights movement—or rather many of the goals it had set out to achieve—were beginning to feel as if they were in a state of suspended animation.

Related Themes:

Page Number: 240

Explanation and Analysis

This passage helps explain some African-Americans' reaction to the Apollo mission. The U.S. government manages to send a man to the moon, but still fails to provide most of its poor black citizens with adequate opportunities and resources for economic and social advancement. Many black people therefore look at the space program as a kind of slap in the face.

In spite of some very important gains, including legislation enforcing equal opportunity and equal rights for African-Americans in the workplace, the Civil Rights movement has progressed much more slowly and in the face of much more opposition than the space program. For this reason, black activists like Ralph Abernathy protest the mission, asking the head of NASA how he can justify the expense of the mission when there are black families that can't afford to eat. Others wonder why there are no black astronauts or black workers in mission control. Though Katherine,

Dorothy and Mary have worked hard to recruit other black women, NASA is still overwhelmingly white.

Epilogue Quotes

Katherine Johnson is the most recognized of all the NASA human computers, black or white. The power of her story is such that many accounts incorrectly credit her with being the first black woman to work as a mathematician at NASA, or the only black woman to have held the job. She is often mistakenly reported as having been sent to the "all-male" Flight Research Division, a group that included four other female mathematicians, one of whom was also black. One account implied that her calculations singlehandedly saved the Apollo 13 mission. That even Katherine Johnson's remarkable achievements can't quite match some of the myths that have grown up around her is a sign of the strength of the vacuum caused by the long absence of African Americans from mainstream history.

Related Characters: Katherine Coleman Goble Johnson

Related Themes:

Page Number: 250

Explanation and Analysis

With these lines, Shetterly makes the point that people tend to think of African-Americans as binary—either superhuman overachievers or members of the oppressed black masses entirely subject to the whims of white people in power. Part of the importance of Katherine's trajectory is that she wasn't the only one to achieve what she did. There were other black women around her also working on the same calculations. The purpose of the book is to help erase that binary by revealing that many black women played a role in the space program, and that though Katherine was exceptional among them, she wasn't the only one there.

SUMMARY AND ANALYSIS

The color-coded icons under each analysis entry make it easy to track where the themes occur most prominently throughout the work. Each icon corresponds to one of the themes explained in the Themes section of this LitChart.

PROLOGUE

The author, Margot Lee Shetterly, visits her parents in Hampton, VA, where she grew up. Shetterly's father recalls that "a lot of the women around here, black and white, worked as computers [mathematicians]" at NASA's Langley Research Center, which causes Shetterly to remember what it was like to grow up in a community full of black scientists and engineers.

Although Shetterly grew up next door to the Langley Research Center, where several history-making events in race and gender relations took place, even she knew very little of the truth about Langley's segregationist history. In displaying her own ignorance about the facts of Langley's history, Shetterly puts herself in a position similar to the reader.

Shetterly once spent her days off from school at her father's office at the Langley Research Center. They would visit the other engineers in their cubicles, many of whom had brown skin like Shetterly, which she never found remarkable. She writes, "growing up in Hampton, the face of science was brown like mine." Shetterly's father, Robert Benjamin Lee III, worked at Langley for forty years before retiring as an internationally respected climate scientist. Many of his friends and family followed the same career trajectory, and Shetterly grew up in the midst of a community of middle-class black intellectuals and professionals, which gave her, as a black child, "previously unimaginable access to American society."

As Shetterly begins to ask more and more questions, and more facts become clear, the true range of Langley's hidden history in regards to race relations reveals itself, both to Shetterly and to her audience. She also suggests the personal importance of growing up around successful black professionals, which will be true of all the women in the book.

Shetterly realizes that the community of black scientists and mathematicians at Langley—and particularly the black women—have important, untold stories. "The idea that black women," she writes, "had been recruited to work as mathematicians at the NASA installation in the South during the days of segregation defies our expectations and challenges much of what we think we know about American history." In light of this, Shetterly decides to interview the women who laid the groundwork for Langley's integration, including Katherine Johnson. In Langley's archives, she finds the names of around fifty black women who worked as mathematicians for the space program, starting when it was not called NASA, but rather the National Advisory Committee for Aeronautics (the NACA). She notes that, while these black women are the least well-known workers at Langley, there are also many white women who labored in the shadows alongside them.

Shetterly lays out the groundwork for her exploratory journey clearly, explaining the far-reaching and detailed investigation she will undertake to find the truth about Langley's history. She also lays out the stakes of the book: the fact that black women contributed significantly to the space program is so counterintuitive to the way most people understand American history that she hopes her book will shake people's assumptions about what roles black Americans have played in history.

Shetterly's interest in the NACA's hidden figures becomes an obsession. She wants to memorialize their accomplishments in a way that won't be lost to history, giving them the kind of epic narrative previously only granted to figures like the Wright Brothers, Alexander Hamilton, and Martin Luther King Jr.

Shetterly's desire to raise the NACA's forgotten black computers to the status of some of U.S. history's most well-known icons again sets out the parameters of her investigation, alerting readers to the breadth and depth of the story she intends to tell.

Shetterly's hometown today looks like any other town in America. It is no longer segregated and the WHITES ONLY signs are gone. The space program has been downsized, which means that ambitious, scientifically-minded college graduates no longer stick around to work at Langley. Instead, they head to Silicon Valley or Washington D.C. But once upon a time, Shetterly recalls, Hampton was the center of the universe for a certain type of mathematically inclined African American woman who wanted a chance to use her skills to change the world.

Hampton, VA has both lost and gained since the period during and after WWII. Overt segregation no longer exists, but the merit-based opportunities that its science-based aerospace program offered to African-Americans are gone, too. In some ways, by becoming "like any other town," its uniqueness, and the uniqueness of the people who worked there, have been lost.

CHAPTER 1: A DOOR OPENS

It's 1943 and Melvin Butler, the personnel officer at the Langley Memorial Aeronautical Laboratory, has a problem: one of Langley's divisions needs to hire 100 junior physicists and mathematicians, 100 assistant computers, 75 minor laboratory apprentices, 125 helper trainees, and 50 stenographers and typists immediately. That division, the National Advisory Committee for Aeronautics (the NACA), is a civilian agency "charged with advancing the scientific understanding of aeronautics and disseminating its findings to the military and private industry." Since the NACA operates out of the Langley airfield, its scientists are in the midst of army planes, which reminds them that the physics and engineering problems they are working out will have real world implications.

By listing numbers and quoting primary sources, Shetterly tosses the reader into a world of manic activity, a time when American military technology has begun to move at breakneck speed. She also signals to the reader, through her mention of the army planes, that her story is not simply about the forgotten computers—it's also about the significance of Langley and the technology developed there to the American military and to scientific history.

America's aircraft industry has recently become the largest in the world. To build and design planes, aircraft manufacturers work daily with scientists at the Langley laboratory. Every plane prototype gets checked by a team at Langley, so there is a great need for engineers, but also for support staff for these engineers, including mathematicians. At this time, mathematicians are mostly women, and Melvin Butler spreads the word throughout colleges and universities in the South that Langley needs math graduates to come and work.

Here, Shetterly immediately trains her spotlight on the women who served as support staff, indicating that this story will be about them, rather than the male physicists and engineers who tend to dominate conversations about aerospace technology. She also positions the reader at a point in history when US aerospace technology was advancing more rapidly than ever before, demonstrating again the role technology and science will play in her story.

A. Philip Randolph, the head of the largest black labor union in the country, has recently demanded that President Roosevelt open wartime job contracts to black applicants. Under much pressure, Roosevelt gives in, which means that jobs at Langley open up to black women. Black women from colleges in and around the South apply for, and win, spots as computers at Langley. Because Hampton, VA is segregated, the black women work in a separate workspace on the west side of the laboratory, called West Area. Butler keeps their hiring relatively quiet, allowing them to matriculate into the Langley Laboratory without fanfare. He does, however, affix a metal sign to a bathroom that reads **COLORED.**

Shetterly begins to situate the events in her book within the greater context of American and African American history. She points to the significance of the fact that black women started working alongside white women at Langley at a point when the South operated under segregationist Jim Crow laws. Here, Shetterly also places racial progress and technological progress side by side, suggesting that integration and the development of aerospace technology happened in parallel (even in tandem). This will continue to be true throughout the book.


CHAPTER 2: MOBILIZATION

In the summer of 1943, 32-year-old Dorothy Vaughn works in the sorting station of a massive laundry room at Camp Pickett in central Virginia. The women who work there fold socks and trousers for the black and white solders who come to Camp Pickett for basic training. They worry over their loved ones who are headed off from Virginia to fight in World War II. Most of the women have left behind jobs working as domestic servants or laborers to work in the laundry. They earn 40 cents an hour, which means that they are paid the least of all those who work in the service of the war. Nonetheless, it feels like a lot to them.

Here, Shetterly establishes the type of labor generally available to black women at the time when Langley opened its doors to them. Shetterly is about to show us how much more they are capable of, and how much they are able to prove themselves once they get higher level jobs. This contrast drives home the injustice of the denial of equal opportunity for black women.

Dorothy, a recent college graduate, also works a job in Farmville, Virginia as a teacher. Teachers are considered very accomplished in the black community because they are thought of as the leaders of social movements. Vaughn's husband's parents are business owners and members of the black elite, and her family's name regularly appears in the social columns in the newspaper. She lives in a large Victorian house with her in-laws and their parents.

Dorothy's work as a teacher signals that she is a woman from a middle class background and an important member of her community. It also shows that Dorothy was already relatively privileged when she came to work at Langley, hinting at the class dynamic of the book: it was only women who could afford an education who were hired at Langley.


Dorothy eagerly accepts the work at Camp Pickett, even though another woman in her position and of her status might have looked down on it. The laundry is 40 miles away from her home, which means she has to live in worker housing during the week. But the 40 cents an hour is more than what she earns as a math teacher, and she has four children who can use the extra money. She wants to use it to send them to college. Even the most successful black people know that discrimination can, at any moment, destroy everything they have built, and a good education will offer her children a better chance at a good life.

Dorothy's work at Camp Pickett points to the sacrifices many black women had to make at this time simply to ensure a future for their children. Dorothy was not without resources or connections, and yet she had to go to great lengths to support her family. Due to racial discrimination and economic inequality, black families had to work harder than whites for less pay to ensure their children's' futures.

Dorothy knows the money she is making at the laundry will buy school clothes and help her send her children to school. They inform every move she makes, though she often has to choose between spending time with them and working to make sure they have what they need.

This moment shows the difficult choices black women faced: to support their children, they often couldn't spend as much time with them as they wanted. This is cruel and tragic.

Dorothy was born in 1910 in Kansas City, Missouri. Her mother died when she was two, and her father, a waiter, married Susie Johnson, a housekeeper. Susie taught Dorothy to read before she started school, which allowed her to skip two grades. She also enrolled Dorothy in piano lessons. Dorothy graduated early from high school as valedictorian, then won a full-tuition scholarship to Wilberforce University, the country's oldest private black college. The African Methodist Episcopal Sunday School Convention of West Virginia underwrote her scholarship.

Shetterly sets the groundwork for Dorothy's success, highlighting the resources she had access to because of her supportive family and community. From her work at Camp Pickett, it's clear that Dorothy is hardworking and focused, but this passage makes clear her intelligence and ambition. These elements all play a major role in her story, ultimately leading her to Langley.

At Wilberforce, Dorothy's professors recommended her for a master's degree in mathematics at Howard University, which was the best black university in the country. The first two black men in the country to earn PhDs in mathematics ran the department. Dorothy decided not to go to graduate school, however. The Great Depression had just begun and Dorothy's parents could not find work. She stayed home to help out and to ensure that her sister could also go to college. Dorothy was only 19 but she felt a great responsibility towards her family, so she chose to pursue a degree in education and become a teacher, which was the most stable career she would be able to find. At the time, black colleges got calls from schools nationwide requesting teachers and Dorothy, through her alma mater, landed a job at a school in rural Illinois.

The fact that Dorothy made it into the master's program at Howard as a young woman signals that she was a rare talent. However, Shetterly also indicates that Dorothy was subject to the same constraints that restricted the opportunities available to many women (black and white) at the time. Women were expected to take care of their families, pursue stable careers, and work in the service of others uncomplainingly before they could follow their own ambitions.


Dorothy lost her job, however, when the Depression led the school to close after her first year. After losing a second teaching job, she took a job as a waitress until 1941, when she took a teaching job in Farmville. There, she met Howard Vaughan, a bellman for various hotels in the region. The two married. While he traveled for work, she attended Beulah AME Church, becoming the church's pianist.

Here, Shetterly emphasizes Dorothy's resilience. Though she was brilliant enough to get into a master's program in math, Dorothy faces tremendous obstacles in finding work, even as a teacher. Even though Dorothy's intelligence and ambition are thwarted at every turn, she still builds a meaningful life for herself, finding work, community, and family.



In 1943, Dorothy goes to the post office and sees Melvin Butler's bulletin advertising jobs at the NACA. She also sees an article about the job in the *Norfolk Journal and Guide*. The article is called "Paving the Way for Women Engineers" and under the headline, Dorothy spots a picture of eleven "well-dressed Negro women," all graduates of Hampton's engineering school. This opportunity represents something Dorothy has never imagined for herself before. That spring, she fills out the application.

Serendipity and luck play a massive role in the fates of Shetterly's computers, and this is only the first of many moments in the book that demonstrate this. Dorothy happens to see this article and to have the resources to apply, which is lucky. However, it's not only luck—her preparation for the role, her intelligence, and her persistence ultimately allow her to succeed.

CHAPTER 3: PAST IS PROLOGUE

It's 1943. Dorothy is a member of her local parent-teacher association and a founding board member of her town's chapter of the NAACP. She teaches algebra in a severely underfunded school with eight classrooms and no gym, lockers, or cafeteria. Nevertheless, she maintains high standards, to the point of correcting errors she finds in the school's textbooks and contacting their publishers. She leads the school choir and helps push them into statewide music competitions. She also teaches a class called "Wartime Mathematics," using math to help students understand household budgeting and wartime rations, and writing fighter plane trajectories into her lesson plans.

Shetterly provides more examples of the ways in which Dorothy's background and her work as a teacher prepared her for her success as one of the first black computers at the NACA. Here, Dorothy is shown to be hardworking, detail-oriented, and particularly interested in how math and military technology intersect. Throughout the book, Shetterly will repeat the key phrase "luck favors the prepared," and here she highlights Dorothy's preparation, showing how qualified Dorothy was for the job she will ultimately have.

After filing her application to the NACA, Dorothy wins a place there as a Mathematician, Grade P-1, where she'll earn more than twice her teaching salary. To take the job she has to leave her family and the school and town she loves behind. Langley is too far away for her to come home on weekends, and so she simply says goodbye to her family and tells them she'll be home for Christmas.

To take advantage of her new opportunities, Dorothy had to be willing to give up the security and comfort of her home and family, something that would have been very difficult to do. These sacrifices are further evidence that it is more than luck that allows Dorothy to make major strides in her career.

Dorothy waits at the Greyhound bus station to board the bus to Newport News, 137 miles away from Farmville. In her new home, she will live in a rented room for black tenants. On the bus, she wonders what it'll be like to work with white people, whether she will be homesick, and how she will adjust. She wonders how she'll handle being so far away from her children.

Dorothy's insecurity about her decisions points to the larger economic insecurities that plagued black people attempting to seek their fortunes in white-dominated work places. In the Jim Crow South, searching for new and better financial opportunities often meant exposing oneself to racism and discrimination, or worse.

Dorothy had supported her husband's travels for his hotel work. The year before, they'd moved to be closer to his job at the Greenbrier, an upscale, white hotel. The Vaughan children played around the hotel grounds, though they were forbidden to set foot inside. The family rented a house across the street from the home of Joshua Coleman and Howard Vaughan who both worked at the front desk of the Greenbrier, while Dorothy and Joylette Coleman watched the children. Dorothy listened to the Colemans tell stories about their oldest daughter, Katherine Coleman, who was very bright.

Though Katherine was younger than Dorothy, the two women's families knew one another, and, though they didn't know it yet, their paths would cross again and again going forward from this point. This shows, once again, the ties among middle-class black families.

Katherine and her brothers and sisters had grown up in rural southwest Virginia. Like Dorothy, Katherine worked as a math teacher, and she too had graduated early from high school and enrolled at a nearby black college. There, William Waldron Schieffelin Claytor, a brilliant black mathematician who was only the third black man in the country to earn a PhD in the subject, took her under his wing. He'd graduated from Howard in 1929 and taken a seat in the school's master's degree program in mathematics—which was the same opportunity Dorothy had been offered but had been unable to accept because of the Great Depression.

Black men and women in mathematics were divided by the opportunities available to them. Claytor was able to pursue his advanced degree at Howard because, unlike Dorothy, he wasn't expected to leave school to start a family. Though they were perhaps equally gifted, they did not have the same opportunities to make a mark in their field.

In 1936, the NAACP Legal Defense Fund, led by Charles Hamilton Houston, successfully argued the Supreme Court case *Murray vs. Pearson*, which brought an end to graduate school admission policies that explicitly barred black students. Afterwards, the NAACP brought another case demanding that states either allow black students to integrate into white schools or provide black students with separate but equal graduate and professional school programs. The state of Virginia refused to comply, and instead set up a fund to subsidize the graduate educations of black students if they pursued them outside of Virginia, a practice that continued until 1950.

Shetterly situates Katherine and Dorothy against the backdrop of the Civil Rights movement, explaining the ways in which black activists fought to pave the way for integration and worked tirelessly to improve the prospects of black students. The opportunities Dorothy and Katherine were able to pursue came because of the foundation laid down by lawyers and activists before them, again highlighting the importance of community to the forward progress of African-Americans.


West Virginia, where Katherine Coleman was from, did integrate. Katherine Coleman was accepted to West Virginia University in Morgantown in the summer of 1940. She accepted, but then left school after the summer session to be a full-time wife to her husband, a chemistry teacher named Jimmy. Both Katherine and Dorothy followed parallel trajectories in that they chose not to pursue master's degrees even though they had the opportunity to do so.

Just like Dorothy, Katherine left school to support her family. The odds were stacked against women—especially black women—at this time, because, in general, society expected them to prioritize the home above their careers and ambitions. This was yet another set of circumstances Katherine and Dorothy had to overcome to succeed.


Meanwhile, on the bus to Newport News at the end of November 1943, 32-year-old Dorothy Vaughn has taken a temporary furlough from her job as a teacher to accept the contract job as a computer at Langley. Just like Dorothy, Katherine will ultimately find herself at Langley, too, in a coincidence that resembles destiny.

By emphasizing the role of destiny here in bringing Dorothy and Katherine together at the same time at the NACA, Shetterly highlights the fact that their fates are deeply intertwined. Dorothy will open up the path necessary for Katherine to succeed, though she doesn't know it yet.

CHAPTER 4: THE DOUBLE V

Dorothy Vaughn disembarks from her bus in Newport News, a booming hub of military manufacturing activity. She sees boats on the James River carting rations and ammunition, K9 dogs and mules, and allied troops departing from the pier. She hears the port band play "Boogie Woogie Bugle Boy," "Carolina in My Mind," La Marseillaise"—a mix of sounds from the soldiers' various hometowns.

The wartime atmosphere makes clear the importance—moral, patriotic, and historical—of the job that Dorothy is about to do. Shetterly includes details about how the soldiers' hometowns are all so different to show that Newport News is a draw for young talent from all over, which indicates that Dorothy might find community there.

Many women work at filling stations, shining shoes, or they staff the shipyard and military offices. The city's population has recently exploded and the economy is booming. The Norva Theater nearby shows movies all day, including *Casablanca*. Newsreels before and after each show keep Americans up to date with battlefield exploits. Plenty of money flows through the banks and the city infrastructure groans under the weight of the influx of people. A federally-funded housing project for workers in Newsome Park, designed to fix the sudden housing shortage, is where Dorothy will eventually live.

Dorothy is but a small part of a massive transformation taking place in Newport News as a result of the war. The same circumstances that have allowed her to leave her small hometown and embark on a new life are changing the entire country, and her journey is just one piece of a story that combines financial growth, technological advancement, and changes in racial and gender dynamics in the workplace as a result of WWII.

Dorothy lives in Hampton Roads, a region straining under the weight of segregation. Complicated Jim Crow laws make public transportation confusing for both blacks and whites, slowing down travel for everyone. Black riders are sometimes dragged off buses or beaten by police, and some drivers refuse to give rides to black passengers, even when they're in military uniform.

Shetterly indicates that every aspect of the black worker's life was fraught at this time, demonstrating how difficult it was for any African-Americans to carve out a financial foothold for themselves, given that even taking the bus to and from work posed a risk.

This moment in history proves especially confusing for black soldiers, who are called upon to serve their country while at the same time facing discrimination and prejudice in their daily lives. Blacks recoil with other Americans at Germany's torture of its Jewish citizens, but they wonder why the U.S. is fighting against racism abroad while still practicing it at home. On the front lines, black soldiers can't serve alongside whites and they have to use segregated showers. At home, black men in uniform encounter violence at the hands of whites who believe blacks shouldn't be allowed to join the army.

African-American soldiers faced a significant conundrum: Although they were risking their lives for their country at the front and on the battlefield, at home, they weren't granted the same rights as white citizens. This contradiction was particularly stark in light of the fact that they were fighting against racial prejudice and discrimination abroad.

CHAPTER 5: MANIFEST DESTINY

Dorothy Vaughn swears the US Civil Service Oath and accepts her employee badge, a blue metal circle with an image of her face on it and the winged NACA logo on either side. She takes the shuttle bus to the West Area, the office where black computers work.

This badge symbolizes the U.S. Government's recognition of Dorothy's potential to contribute to national defense. And yet, her ride to West Area highlights the fact that the organization doesn't yet think of her as equal to her white peers.

The Langley Laboratory was established in 1917, starting with a single wind tunnel. The lab saved the city of Hampton from economic collapse after Prohibition, when the sale of alcohol was outlawed and the liquor industry, from which a large proportion of Hamptonites earned their income, was brought to a halt. The city's clerk of courts sold parcels of land to the federal government to test planes and perform aeronautical research.

Shetterly introduces the origins of Langley and, by pointing out that it started with a single wind tunnel, shows how much it has grown. By highlighting the fact that Langley saved the city of Hampton, Shetterly is emphasizing its centrality to the surrounding community, and its importance to the city's financial well-being.

Construction of the West Area, where the black computers work, started in 1939. In 1942, the entire structure was painted dark green to camouflage the facility against possible attack by Axis forces. Arriving at her office, Dorothy finds herself in a futuristic arena featuring the Sixteen-Foot High-Speed Tunnel, which stretches three hundred feet wide and one hundred feet deep.

The Langley Laboratory has grown a great deal since its inception, something that the sixteen-foot high-speed tunnel, a great technological achievement and an important tool for Langley's physicists, represents. Dorothy, as an employee at Langley, will now have the chance to grow with it.

Dorothy gets dropped off at the Warehouse Building. Through one window, she has a view of the construction taking place on the Langley grounds. The room is full of black women using calculating machines to research aeronautical engineering at its most finely-detailed level. Dorothy's work area is segregated from the East Computing Area where white female mathematicians do the exact same work. The white women in the East Area come from schools like Sweetbriar and Hollins, while the West Area computers come from black colleges like the Virginia State College for Negroes and Hampton Institute. The first five black women to work in this area were named Miriam Mann, Pearl Basette, Yvette Brown, Thelma Stiles and Minnie McGraw. The previous May, it was their photo Dorothy had seen in the newspaper.

Dorothy finally encountering black women performing finely detailed mathematics at the highest level would have come as a welcome shock. Here was a place where the mathematical skill that set her apart would finally be put to good use. By naming the black colleges from which the black computers graduated, Shetterly shows that the black women workers who come to Langley to work as computers have similar educational backgrounds to the white workers. Dorothy is just as qualified to be at Langley as her white counterparts.

Margerey Hannah, and her assistant Blanche Sponsler, both of whom are white, run the West Area computing office, under the supervision of Virginia Tucker, also white, who runs the entire computing division. Virginia parcels out assignments to Margerey and Blanche who then pass them down to the other computers, including the West Area Computers. The NACA plans to double the size of the West Area in the coming three years. The American aircraft industry has gone from the country's forty-third largest industry in 1938 to the world's number one in 1943.

Just as the American aerospace industry is booming, the face of Langley is changing more rapidly than it has in the past. However, racial relations are not changing at the pace of scientific innovation. Though Dorothy will be working alongside other black female mathematicians, their supervisors are still white, demonstrating that Langley has not granted its black workers equal status to its white employees

The NACA employees go to hear Secretary of the Navy Frank Knox speak about the war effort. He tells them "the war is taking place in the laboratories as well as on the battlefields." Most of the faces in the room during his speech are white, but a group of about twenty or so black male workers, as well as the faces of the black computers, stare back at him, taking in everything he says.

Frank Knox's speech is momentous for all the NACA's scientists, but his visit is all the more significant because of the presence of black men and women in the audience. Knox is speaking to the importance of the work done by everyone at Langley, not just its white employees.

In the cafeteria after this speech, West Computers have to sit together at lunch. A white cardboard **sign reading COLORED COMPUTERS** marks their table. The black women have had to learn to accept things like this, in spite of the fact that equality in the workplace has recently been mandated by Executive Order 8802. Langley allows the women to work for white engineers, but the facility keeps them separate under Virginia's "separate but equal" statutes.

The Colored Computers sign is an important indicator of the second-class status black employees had at Langley. Although they were allowed to work there, they were not going to be granted the same rights as whites, and they were also not going to be allowed to forget their place in the Langley hierarchy.

Miriam Mann steals **the COLORED COMPUTERS sign** and puts it in her purse. The next day the sign is back. Mann steals it again. This small action mirrors a larger one that is playing out in Gloucester County, twenty miles away, where a woman named Irene Morgan is refusing to sit in the Colored section of a Greyhound Bus. The NAACP Legal Defense Fund is readying itself to take her case to the Supreme Court.

Mann's rebelliousness is not only a means of fighting for her dignity and that of the other black computers at Langley. It is also a step in a much larger struggle for equality that is taking place across the country and bolstered by black activists nationwide.

CHAPTER 6: WAR BIRDS

Black readers follow the exploits of the Tuskegee Airmen in the press. Colonel Benjamin O. Davis Jr. and the 332nd Fighter Group make headlines flying fighter planes. They fly Bell P-39 Airacobras, then Republic P-47 Thunderbolts and then, by the summer of 1944, North American P-51 Mustangs.

The Tuskegee Airmen are black World War II soldiers. They fly the newest, most technologically advanced planes on the front. Ironically, they aren't granted the rights of full citizens by their own government at home.

The NACA tries to build planes that will allow them to defeat the Germans from the air, destroying the science that will hand the opposition a military advantage. Langley is one of the United States' most powerful secret weapons. Henry Reid tells his staff to be on the lookout for spies. Famous people frequent the laboratory: Amelia Earhart, Howard Hughes, Clark Gable, Spencer Tracey, and Myrna Loy. Locals call the people who work at Langley "NACA nuts," "weirdos," or "brain busters."

The Langley laboratory gains prominence among important cultural figures, indicating its status as a linchpin in the flight against the Axis forces. Scientists there tend to be regarded askance by the locals, even as their status grows on the national stage.

NACA scientists drive salesmen in department stores crazy by doing things like dismantling toasters to check their quality. But people come from all over the country to take entry-level jobs at the NACA, which offers better training and hands-on experience than the best engineering graduate school program in the world. White boys from MIT and Virginia Tech fight to enter the place where Dorothy has already won a spot.

Though Langley scientists stand out among the Hampton locals, the NACA is a source of pride for the community, and it draws scientists from the country's top educational institutions. This makes it all the more extraordinary that Dorothy and other black computers have made a place for themselves there.

The lab sponsors engineering physics classes for new computers. Two days a week after work, Dorothy and the other new computers take immersion classes in the fundamental theory of aerodynamics. They also attend a weekly two-hour laboratory session for hands-on training in one of the wind tunnels. Dorothy goes from being a teacher at the head of the classroom to a student. She learns about aerodynamics and what makes planes fly.

Dorothy's trajectory from working as a school teacher to tackling the cutting edge of aerospace technology represents both a huge achievement and a major change. She has to start over as a student and learn about new concepts and ideas if she wants to succeed in her new role.


In the early days of flight, aeronautics evolved quickly. Dorothy, like most people at that time, has never even flown on a plane, so she has a lot to learn. The wind tunnel offers an opportunity to research flight without the danger of death. Engineers blast air over planes or parts of planes, observing how they interact with the air flow. Other tools include the Variable-Density Tunnel, the Free-Flight Tunnel, the Two-Foot Smoke-Flow Tunnel, the Eleven-Inch High-Speed Tunnel and the Sixteen-Foot High-Speed Tunnel. Engineers quantify the performance of planes against a nine-page checklist of features.

Every aspect of the work done at Langley is held to the highest standard and run on the most advanced equipment. Therefore, Langley symbolizes the frontier of American industry and intelligence. The resources, volume and elite nature of the research being done there represent a huge leap forward for Dorothy and others.

Dorothy learns that fighter planes are complicated tools that can be deployed in many different situations on the battlefield. The testing of the planes results in reams of numbers and measurements, which Margerey passes on to Dorothy and other West Computers to process. Sometimes, all Dorothy sees as a result of this testing are columns of equations. Dorothy and the others do the calculations, and then they're sent back to the engineers, which means the engineers get credit for the work that the computers do—though the computers are, of course, given full credit if they make a mistake.

Just because Dorothy is smart enough to get a spot at Langley doesn't mean her work will afford her the respect she deserves: Dorothy's progress at Langley is undermined both because she is African-American and because she is a woman. Male engineers communicate with her through her white supervisor, then take credit for the work that she does when she does it correctly. Langley is famous, but Dorothy's work there is not glamorous and sometimes it can even be tedious and unrewarding.

Either way, Dorothy's apprentice work as a mathematician is making a difference in the war effort. She also has a part in enabling the U.S. military to carry the heavy bomb loads that the B-29s drop over Japan.

Shetterly makes the point here that the work Dorothy is doing has a direct impact on the nation's history, for better or for worse. The air raids on Japan resulted in the deaths of innocent civilians and, at the same time, helped to bring about an end to WWII.

CHAPTER 7: THE DURATION

Over the July 4 holiday in 1944, Dorothy still doesn't know whether she will be made a permanent employee at Langley or whether she will be let go when her contract is up, but she decides to sign a lease on a two-bedroom apartment in Newport News. She plans to move her children in, suggesting that she will leave Farmville for good and move to Newport News.

Dorothy has been hired as a short-term employee, so moving her family to Newport News represents a major financial risk. It's one she decides to take—another example of courage helping her to overcome the obstacles placed in the way of black, female workers at the time.

Newsome Park, Dorothy's new neighborhood, has been built as temporary housing for workers during the war, but black families are drawn there from all over. The Newsome Park Community Center is directed by a man named Eric Epps, an activist who was fired from his teaching job for fighting for equal pay. The Newsome Park shopping center boasts a grocery store, a drugstore, a barbershop, a beauty shop, a beer joint, a cleaners, and a TV repair shop. It's Dorothy's first apartment that is hers alone since she was a young teacher. Meanwhile, her husband, Howard, stays behind in Farmville. They begin to grow apart.

Langley's forward progress gives rise to a thriving black community nearby. This community will be as important as Langley itself when it comes to giving Dorothy and her family some semblance of normalcy. However, in embracing her new life, Dorothy also has to leave her husband and strike out on her own—just one of the many sacrifices she'll have to make to move ahead and ensure a future for her family.

By 1945, half the people in southeastern Virginia work for the government. Much of the state's woodland area has been paved over to make room for military bases and their accoutrements. V-J Day, on August 15, 1945, marks the end of long years of fighting, and people across Virginia celebrate the end of the war long into the night. After that comes an uncertain period. Overnight, many women are laid off.

The war has drastically changed the area around Langley, but as the fighting ends, the flourishing defense economy it helped give rise to threatens to disappear. This shift threatens women in particular, as they are seen as more expendable than men. Opportunities granted because of the war can easily be taken away.

Some employers who hired black workers during the war return to discriminatory hiring practices after it ends. Racist lawmakers like Virginia's Democratic senator, Harry Byrd, liken integration in the workplace to Communism—a strong accusation, as Russia looms on the horizon as a new threat. Byrd thinks of segregation as sacred, and he does everything he can to keep the poor of all races divided against one another.

The status of the black worker is always precarious, but in the wake of the end of the war, it becomes even more so. Even the small progress African-Americans in the workforce have made suddenly seems as if it's going to disappear thanks to the machinations of cruel politicians and racist employers.

Dorothy commits to her new lease without knowing the status of her employment at Langley. Newsome Park is also under siege, as white neighbors attempt to dismantle the black community's property. Dorothy tries to navigate the transitional period, sending her children to school nearby and supporting the local community as much as she can. She goes to see Marian Anderson sing with her friend Miriam Mann.

Just as Dorothy finds out she may lose her job, she learns she may lose her friends and community at Newsome Park as well. She seeks solace in the work of great black artists, just as she once looked for inspiration to the black computers who first integrated Langley.

CHAPTER 8: THOSE WHO MOVE FORWARD

In 1944, Katherine's husband, a teacher, falls ill with fever. Because he can't work, his school principal offers his yearlong teaching contact to Katherine instead. Katherine had graduated from West Virginia State Institute in 1937 and then had taken a teaching job at the Marion school in Virginia. A year after she left, the NAACP Legal Defense Fund filed suit against the state of Virginia for equal teacher pay. Alston v. Norfolk went to the US Supreme Court, which ordered Virginia to bring black teachers' salaries up to the white teachers' level. The decision passed too late for Katherine, however, who had to leave Virginia and go to Morgantown, West Virginia to make more money.

Katherine is able to obtain a teaching job because her husband is too sick to take on the work, but she also doesn't get paid what she should simply because of her timing. Many of the circumstances that determine the course of her life are out of her control. As was the case for many black women at the time, her fortune depends on luck, timing and, often, unfortunately, the whims of white men in positions of power.

Katherine loves West Virginia and she always makes sure that people know that she is from there, rather than Virginia. West Virginia seceded from Virginia during the Civil War to join the Union. Though it was not a bastion of equality (West Virginia was still segregated), West Virginia offered its black citizens slightly more space and dignity than Virginia did. Katherine's father, Joshua, was a math whiz who helped engineer Katherine's academic success, even though he only made it to the sixth grade.

Here Shetterly explains where Katherine came from, identifying two of the most important elements of her character: her love for and dedication to her roots in West Virginia and the support she received from her family.

During the Depression, income from Katherine's family's farm fell. Joshua moved the family into town and took a job as a bellman at the Greenbrier, the country's most exclusive resort. (It was here that Dorothy Vaughan's husband, Howard, and Joshua would later become friends.) Katherine also worked in the hotel as a personal maid to wealthy guests, cleaning, washing, ironing, and setting out clothes. At one point, a French countess Katherine was serving discovered that Katherine understood French and told the administration; after that, Katherine worked in the kitchen with the resort's Parisian chef. The next summer, she was put to work in the hotel's antique store, rather than as a maid. There she met the brother of President William Howard Taft and taught him his Roman numerals.

Starting when Katherine was young, people with the power to help her tended to be charmed by her and to recognize her intelligence and talents. They put her in situations where she was able to succeed. Because she was black and a woman, her brilliance and her knack for displaying it in front of the right people would turn out to be a major advantage, helping her to overcome many of the obstacles racial prejudice and gender discrimination put in her way.

In 1933, Katherine entered West Virginia State College as a fifteen-year-old freshman with a full academic scholarship. She worked under math professor William Waldron Schieffelin Claytor. Claytor created advanced math classes just for her and he encouraged her to become a research mathematician. Claytor himself wanted to join the country's top math departments, but found his options limited to a job at West Virginia State College because he was black. He tried to push Katherine forward so she could take advantage of opportunities he hadn't been offered.

Claytor represents only one of the many brilliant mathematical minds that were never able to fully contribute to the field because of institutional racism and discrimination. Because he wants to make sure Katherine doesn't meet the same fate he did, he does everything he can to ensure her progress, an example of how members of the black scientific community propped one another up to make up for the lack of institutional support.

Katherine meets her husband Jimmy while she is teaching. In the spring of 1940, she is invited to be one of the first students to integrate the all-white West Virginia University by joining the math department. She enrolls in the 1940 summer session and is accepted by the white student body, but she drops out at the end of the summer session after she discovers she is pregnant.

Even though Katherine is brilliant enough to be invited to West Virginia University, the expectation that she would start a family had to come first. In this way, her gender holds her back from pursuing a career as much as her race.

Katherine leaves graduate school to raise her child with Jimmy. She wonders sometimes what would have happened if she'd continued to pursue a career as a research mathematician, but she is happy to work as a schoolteacher. Meanwhile, in Hampton Virginia, Dorothy Vaughan is paving the way for women like Katherine to help propel aeronautics research into the future.

Katherine and Dorothy, though they don't yet know it, have destinies that are connected across time and space, with Dorothy's success helping to set the foundation for Katherine's, another indication of how Shetterly's hidden figures helped pave the way for one another.

CHAPTER 9: BREAKING BARRIERS

Dorothy's husband Howard Vaughan continues to work at the Greenbrier Hotel alongside Joshua Coleman, Katherine's father. Dorothy and Howard have two more children, but the children move with Dorothy to Newport News. Dorothy returns to work because the family counts on her income at Langley.

Dorothy and Katherine are connected through their roles at the NACA and through their loved ones' employment at a local upscale hotel. Their fates are intertwined from the very beginning.

The other West Computing area women become surrogate aunts and uncles to Dorothy Vaughan's children. They organize picnics and retreats along the river. This freeform socializing (different from the church outings and planned home visits that characterized most black communities in the South) helps bring them closer together.

Dorothy's continued success at Langley comes in part because of the support that comes from other black women with their own families. Because she can't be with her husband, she has to form her own network and carve out a new family at Langley.

Dorothy worries that she might be fired after the war ends. Luckily, it turns out that she won't have to leave. The country turns out to be on the edge of a defense industry boom that will keep her employed for decades. Local military installations grow. The defense industry tightens its grip on the economy of southeastern Virginia. Virginia becomes a warfare state, the embodiment of what Cold War president Dwight D. Eisenhower will call "the military-industrial complex."

Virginia's economy continues to boom as the aerospace industry flourishes—the state's economic success has a direct impact on Dorothy's own financial well-being, allowing her to maintain the foothold she's managed to find for herself at Langley. With this, Shetterly indicates how the development of the sciences and the economic fortunes of black Virginians were deeply entangled.

Dorothy has been at Langley for three years by this point. Her work is flawless and she consistently earns "excellents" on employee evaluations. In 1946, she is made a permanent Civil Service employee. All of the West Area computers have done their best to hold onto their seats. Now they have to learn how to advance in a world of white men.

Even though Dorothy is good enough to win a permanent role at Langley, her continued success is by no means ensured. She continues to be aware of how precarious her position is as a black worker among her white colleagues.

But this is difficult. Veteran scientists welcome male researchers into their folds, but women have to work much harder to get ahead. The most impressive computers are invited to work permanently with certain research teams, while other women specializing in certain fields have the luck to watch those fields grow, and to grow with them. One example of this is the research team trying to solve the problem of faster-than-sound flight. The women working on that high-profile project are able to become junior engineers, simply because it's a growing field in need of people.

Men tend to take their male counterparts under their wing, helping to put them on the fast track to success. Women either have to be judged to have extraordinary ability and skill or they have to be on the right research team at the right time. This is another way in which the computers' fates tend to be determined by forces outside their control, and another indication of the role luck and timing will play in their fates.

From 1941-1945, Doris Cohen, a mathematician who began work at the lab in the late 1930s publishes nine reports documenting research in high-speed aeronautical research. She is for many years the NACA's only female author. Publishing a research report under one's own name is the first step to becoming an engineer. For a woman, having the opportunity to do so is unusual.

In the same way Dorothy helped lay down a path for Katherine to follow into Langley, women like Doris showed the computers—black and white— that there was a way forward. She set an example for women during a time when gender discrimination made progress seem difficult or impossible.

Head Computer Virginia Tucker continues to relentlessly recruit women to work in the lab. However, as the war effort ends, the women who work under her are drawn into engineering pools and away from East Computing. As they leave for permanent assignments, no one is hired to replace them. Tucker eventually leaves, moving to the West Coast to join a different engineering company in Los Angeles.

The end of the war leads to changes in personnel at Langley, something that disproportionately affects the black computers, as West Area begins to be phased out. The same organization that once made it possible for black women to find a place for themselves in the sciences now seems ready to discard them.

Meanwhile, it becomes harder for West Area Computers to migrate out of their computing pool. When three black women manage to join Cascade Aerodynamics, a group that studies rotating bodies, it causes a scandal. Some conservatives see the race mixing as a terrible thing. However, because the women are so good at their jobs, those who are against them soon quiet. Dorothy Hoover, a black computer with a master's degree in mathematics, is the first black computer to get the opportunity to become an engineer, accepting an offer from R.T. Jones to work directly for him.

The black computers have to work harder than whites to hold on to their jobs. When they do manage to find roles elsewhere within the company, however, they come up against the racism of their white peers. Women like Dorothy Hoover, however, help prove to everyone at Langley that black women are capable of achieving at the highest level.

Margerey Hannah takes an offer to work as an engineer with the Full-Scale Research Division. Soon she publishes a paper under her own name with her boss about sound waves. Blanche Sponsler tries to follow in her footsteps, but eventually becomes mentally ill. One day, she covers the blackboard in one of the West Computing offices with "meaningless words and symbols" and begins speaking unintelligibly. After that she is transferred to a sanatorium and a hospital. Dorothy is appointed to take her place as the acting head of West Computing.

Dorothy reaches a supervisor position only after Margery takes another job and Blanche falls ill, which shows, again, how much the forward progress of black computers at Langley depended on chance, luck, and forces outside of their control. Nevertheless, Dorothy's previous hard work and persistence put her in a position to take advantage of this opportunity to rise in the ranks when it presented itself.

Some white computers break into management ranks through persistence, though generally they only become supervisors in other divisions with many female employees. For most black women, Dorothy Vaughan's position as West Area supervisor is the highest they can expect to go. She eventually becomes full head of the unit in 1951.

Dorothy's new role marks an extraordinary achievement while at the same time indicating that she still hasn't been allowed to move forward as far or as quickly as her white counterparts. She finds herself at the head of a division which may soon become obsolete.

CHAPTER 10: HOME BY THE SEA

In April 1951, Mary Winston Jackson joins West Computing. She'd grown up in downtown Hampton, upon the site of a camp founded by slaves who liberated themselves during the Civil War. Now, she works on former plantation land as a black female mathematician, a rebuke to the short-sightedness and racism of people like President Woodrow Wilson who was hell-bent on keeping the Civil Service segregated.

Mary's role as a black computer on grounds in which black people were once enslaved marks a huge leap forward, but also shows that there is still an enormous amount of work to be done when it comes to racial equality in the US, as she's still not allowed to work in the same room as her white counterparts.

Mary studies to become a teacher then takes a job as a secretary and bookkeeper at the local USO, working with military families and managing the organization's financial accounts. Mary's father was a pillar of the community. Her sister received a citation from President Roosevelt, thanking her for her community service. Mary, meanwhile, took her duties working for the USO seriously. Her family is dedicated to the **Double V**, victory for blacks and for the nation. She eventually marries a young man named Levi Jackson and leaves the USO after the birth of her son.

Here, Shetterly is introducing Mary Winston Jackson in the context of the elements that have defined and shaped her life trajectory up to this point: her dedication to community service, her parents, and her husband and son. By showing Mary in this context, Shetterly is setting up the idea that her accomplishments belong not just to her, but also to the community she's a part of and that helped shape her.

Mary organized a girl scout troop and served her community, helping students with their homework, sewing them dresses for school functions, and helping guide them to college. She once arranged an afternoon tea at the Hampton Institute to show students how the school's African-American president lived, and to show them that they could someday achieve the same heights.

There is a parallel to be drawn here to Dorothy's own service as a teacher, indicating that the pioneering black computers demonstrated ambition and a dedication to community service from the start, and that it was ingrained in each of their characters.

After joining the Civil Service, Mary worked as a clerk typist then accepted an offer to work as a computer for Dorothy Vaughan, eight years after Dorothy had first joined the NACA.

By juxtaposing Mary and Dorothy here, Shetterly is making the point that Dorothy's first day at Langley, almost a decade before, helped make everything that will happen for Mary possible.

The grounds had expanded a great deal since Dorothy started work there, as the sound barrier had been breached and the possibilities for flight extended. The military was trying to develop fighter planes capable of supersonic flight. When Mary started working at the NACA in April of 1951, the Cold War had begun and Americans were worried about Communism.

A lot has changed since Dorothy began at Langley, and technological innovation continues to expand and flourish. Socially and politically, things are changing too, as America looks towards a new enemy, the Soviet Union, and moves beyond WWII.

At Langley, an engineer was accused of stealing classified NACA documents and funneling them to the Soviet Union. The FBI began interrogating Langley employees, spending hours questioning physicists and engineers, bringing up notes of the anti-Semitism that accompanied the racial prejudice at the laboratory and the community. A black computer was accused of espionage and fired. She was an outspoken advocate for black empowerment and a local leader of the NAACP, which may have worked against her.

The US also looks for enemies within, sparking new avenues for suppression of integration and equal rights. In some ways, the US fear of communism allows conservatives to ferret out social progressives within Langley and get rid of them under the guise of exposing Communists, yet another threat to progressive black workers fighting for a better position.

The fear of Communism was exploited by people like Senator Harry Byrd to stoke fears and drum up support for segregation. Those who didn't denounce Communism were subject to accusations of radicalism. Even important black activists like A. Philip Randolph, a socialist who worked hard to ensure fair employment and civil rights legislation, denounced Communism as antithetical to the interests of black people.

The same politicians who resisted integration within the civil service used the Communist threat to further their own agendas, while black revolutionaries had to be careful to dissociate themselves from Communism publically so that they could continue to make progress in their work.

Black leaders like Paul Robeson, Josephine Baker and W.E.B. Du Bois connected America's treatment of black people to European colonialism. They traveled the world making speeches declaring their solidarity with people in other developing countries. Meanwhile, the U.S.'s dedication to segregation was making the nation look bad. Mahatma Gandhi's personal doctor was banned from a restaurant in the South. A Haitian secretary of agriculture was denied service at a Mississippi Hotel. Headlines decrying the U.S.'s racial problems appeared, handing the Soviet Union effective propaganda weapons. Newly independent nations around the world wondered why they would ever turn to the United States' model of democracy when the U.S. enforced racism and savagery in its bylaws.

America's work abroad seems to directly contradict the segregation and discrimination it enforces at home. This hypocrisy hurts its image on the world stage and undermines its fight against the spread of Communism.

To counter growing opposition abroad, in 1947, Truman desegregated the military through Executive Order 9981. He also issued Executive Order 9980, making heads of each federal department personally responsible for maintaining a work environment free of discrimination on the basis of race, color, religion or national origin. The NACA appointed a fair employment officer to enforce the new rules.

International pressure finally results in important steps being taken towards integration and an end to discrimination at Langley, at least on paper. It's frustrating and disheartening, however, that this comes about as a result as international pressure, and not because of the country's dedication to its own black citizens.

Just like supersonic technology was changing the course of the Cold War, so were racial relations. The West Area Computers played a role in both elements. More and more women came to work for "Mrs. Vaughan." Mary Jackson was one of the young women swept up in the growing wave of black women coming to work at Langley.

Mary and Dorothy represent two different generations of black women who take on jobs at Langley, but they will both confront similar challenges as a result of their race.

CHAPTER 11: THE AREA RULE

Two years after Mary Jackson joins West Computing, Dorothy Vaughan sends Mary to the East Side to staff her on a project with a group of white computers. She doesn't know the East area very well, and when she asks the white women there where she can find a bathroom, they laugh at her, telling her they don't know where the Colored bathroom is. Mary is incredibly angry about the fact that even though she is good enough to work at the NACA, she isn't good enough to share a toilet with white women.

Mary, like Dorothy before her, will face opposition in the form of racism, segregation, and prejudice in her quest to build a career for herself at Langley. The same small indignities that have plagued black computers at Langley for years, like segregated bathrooms and lunch tables, will plague Mary as well. Technology has changed but policies surrounding race have not.

Later that day, she runs into Kazimierz Czarnecki, an assistant section head in the Four-by-Four-Foot Supersonic Pressure Tunnel. When he asks her what's wrong, she tells him what the women said. He asks her to come and work for him so that she will have the chase to rise in ranks and will no longer have to work in the computing pool.

Mary complains about the incident of racism to an engineer and he opts to help her by promoting her. This is a massive stroke of good luck for Mary, though she would not have been able to take advantage of it had she not had the skill to succeed there.

A different female engineer—the woman who paved the way for black computers, Dorothy Hoover— continues to build an illustrious publication record, publishing studies on aircraft wings and other detailed analyses. Dorothy leaves Langley in 1952 to pursue a master's degree in mathematics. Then she enrolls in a Fellowship Program at the University of Michigan.

Dorothy's connection to Langley, and her success, show that black women, given the opportunity, can not only keep pace with white male engineers, but can reach the pinnacle of their field if granted the right opportunities.

A black man named James Williams also starts working at the NACA around this time. He is the first black engineer to last for a significant period at Langley. On his first day, he has to convince Langley security that he isn't a groundskeeper or cafeteria worker so that he can be processed for acceptance. White supervisors refuse to give him a place in their groups, but he eventually wins a position in the Stability Research Division. Unlike the West Area computers, black engineers don't get to benefit from the support of a group of people who look like them. However, the women have to fight much harder to win the title of engineer.

Institutional racism impacts men and women in different (but similarly insidious) ways. Like the computers, black male engineers, hired for their talent and abilities, have to endure daily humiliations simply to do their jobs. However, black men don't benefit from the support of a larger pool like the computers do, while black women don't have as many chances to prove themselves on research teams.

Mary Jackson, working on the Four-by-Four-Foot Supersonic Pressure Tunnel, is given an assignment by the chief of her division, John Becker, a very important figure at the NACA. He then accuses Mary of making a mistake in the assignment he's given her, but she insists that she is correct. Sure enough, he discovers that the numbers he gave her in the first place were wrong. Becker apologizes to Mary Jackson, which bolsters her reputation among all the other black female mathematicians. This moment marks her as her as someone who has the capacity to lead.

Here Shetterly puts forth an important example of a black computer having to prove her worth at Langley simply by being better than others—including her supervisor—at the work she's been assigned to do. Mary's actions offer more proof that the color of an engineer's skin and their gender have nothing to do with their ability to do high level work.

CHAPTER 12: SERENDIPITY

Katherine Johnson is known for being always in the right place at the right time. In 1952, twelve years after she leaves graduate school to become a teacher, she attends the wedding of her sister-in-law. At the wedding, Katherine meets Eric Epps, the community park director at Newsome Park in Newport news. Eric tells her about the jobs available at Langley Field, in Hampton.

Katherine's luck depends, yes, on chance, but also on the support of her extended circle of family and friends. This includes community leader Eric Epps, who helped welcome Dorothy to Newsome Park when she moved in. It's these forces combined—good timing and the support of her extended circle— along with her gift for math that put her on the road to success.

Katherine and her husband, Jimmy, have three children. Katherine decides to take the job. Though she is working as a teacher, she is very ambitious and misses her work in mathematics. Jimmy gets a job in Newport News as a painter in a shipyard. They enroll the girls in school.

And yet, though luck, coincidence, community and good timing all play a role, it's ultimately Katherine's courage and ambition—and her desire to support her family— that lead her to Langley.

Katherine starts working at Langley in 1953. In the interim year, she works as a substitute math teacher at a local high school and meets families in the area. She is involved in the local chapters of her sorority, Alpha Kappa Alpha, and her church, Carver Presbyterian. At the NACA, Katherine works an entry-level job filling out data sheets under the supervision of Dorothy Vaughan. Then she is asked to join the Flight Research Division, one of the most powerful groups in the laboratory. When she sits down at her new desk, the white man next to her gets up and walks away.

Katherine's trajectory resembles that of Dorothy and Mary—she teaches, devotes much of her time to community service, then starts in the temp computing pool at Langley before finding a place for herself within the larger organization. Like Dorothy and Mary, Katherine also learns that her intelligence and skill won't protect her from her white colleagues' racism, indicating that the move for equality among races at Langley is progressing slowly.

Katherine ignores him and eats her lunch. The outside world is still segregated at this point, and even at Langley the black computers still have to use separate bathrooms. But some racial prejudice is yielding to pressure from international forces. Katherine knows that if she is going to avoid being chased out of Langley, she will have to mount a charm offensive, by being impeccably dressed, well-spoken, patriotic, and charming. Katherine's charm works—the engineer who had walked away from her desk two weeks before becomes her friend after they discover that they are both from West Virginia.

In addition to doing their jobs, the black employees at Langley have to take on the extra work of negotiating the racial boundaries still in place at the laboratory. They invent strategies that will allow them to succeed in spite of the organization's deeply rooted prejudice. Katherine has the social skills necessary to make a difficult, almost impossible to navigate situation, tenable.

CHAPTER 13: TURBULENCE

In 1954, Dorothy Vaughan secures Katherine's permanent position (and pay raise) as a member of the Flight Research Division. Katherine works for Henry Pearson who is not a big fan of women in the workplace. Dorothy also wields her power to win a raise for a white colleague at the same time.

Dorothy's influence as a black woman in a senior position means that the success of women after her comes a bit more easily. As people like Dorothy gain power, Langley women slowly become less dependent on the whims of white men in power to advance.

Katherine's familiarity with higher-level math makes her an important figure in the Flight Research Division. Her confidence leads her to ask the engineers many questions about their work, and they, in turn, enjoy teaching her. Her first assignment is to help find the cause of an accident involving a small Piper propeller plane. Katherine participates in an experiment designed to recreate the circumstances of its crash. Her data leads the team to the conclusion that the plane crossed the flight path of a jet plane that passed through the area half an hour before. Her research catalyzes changes in air traffic regulations mandating minimum distances between flight paths.

Katherine's contributions to the Flight Research Division demonstrate from the start that her gender and race don't stop her from performing at the highest level. She uses her intelligence to control her own fate and progress in her career as much as she can. In doing so, she helps Langley advance as well, showing that having black women at Langley helps the organization achieve its stated goals.

Katherine can't believe her good fortune in getting paid to do math. She also likes her colleagues and feels completely at home at Langley. She ignores the **"COLORED" Signs** and uses whichever bathroom is closest. She eats lunch at her desk rather than in the segregated cafeteria. She fits in seamlessly with the male engineers around her, and the other men in the Flight Research Division soon accept her as one of them.

Though Katherine enjoys her work and likes the people she works with, she still has to contend with discrimination and segregation on a daily basis. Her choice to ignore the "colored signs" and to eat at her desk are ways in which she controls her own daily existence in a fraught racial situation.

Like other middle-class black families, Jimmy and Katherine move out of Newsome Park, buying a house in a World War II-era neighborhood. But in 1955, Jimmy gets sick from a tumor at the base of his skull and takes leave from his job at the shipyard. He is sick for over a year before he dies in 1956, five days before Christmas.

Katherine's luck isn't always good, however, and she suffers from some terrible misfortunes. Now, on top of the challenges of her job at Langley, she becomes a single working mother—yet one more obstacle she'll have to overcome.

Katherine continues to raise her daughters alone, preparing them for college. She also continues not to be thrown by racism in the workplace, mingling with white and black engineers alike. In January 1957, she goes back to work, 38 years old and a widow, but still a professional pursuing her dream.

Katherine has to contend both with her husband's death (which left her a single mother) and racism at work. Her persistence in the face of setbacks helps set her apart.

CHAPTER 14: ANGLE OF ATTACK

Jet engines are replacing propellers, supersonic technology is leading to hypersonic technology, and planes are starting to look beyond the limits of the atmosphere to space. Human computers at this time are also giving way to electronic calculating devices, room-sized machines that use paper punch tapes as input and generate answers sixteen times faster than human computers, in addition to not having to adhere to normal human working hours.

The United States aerospace industry continues to thrive, leading to rapid innovation in military technology and within the Langley Laboratory itself. However, just as the end of WWII threatened the jobs of women and African Americans, the accelerating technology of the Cold War threatens to put female computers out of work.

In the mid-1950s, the NACA buys an IBM computer to calculate a trajectory for a plane designed to leave earth's atmosphere. Electronic computers bring incredible power to the research process. The propeller research tunnel is also declared obsolete around this time. Female mathematicians know they will have to try to find new specialties if they don't want to be replaced. West Area computers especially have reason to be worried.

Black women at Langley will be particularly affected by this shift. Their position at Langley remains precarious because their work opportunities are limited due to discrimination. Some see the black computers as disposable once electronic computers come on the scene.

Activists in Virginia stage walkouts against the school system that keeps schools segregated and unequal. Their campaign leads to *Brown v. Board of Education*, the 1954 Supreme Court decision that bans segregation in all public schools in the United States. Virginia Senator Harry Byrd tries to resist the desegregation order for longer than any other state. Dorothy Vaughan signs up to take computation classes at Hampton Institute, the local black college.

Just as technology is changing rapidly, social change is happening, as well. These changes come at the national level (with Brown v. Board of Education desegregating schools nationwide), the state level (where VA Senator Byrd attempts to block desegregation), and at Langley, where computers have to pursue educational opportunities outside of the office to advance.

Kaz Czarnecki puts Mary Jackson at the controls in the wind tunnel, showing her how to fire up the tunnel's engines. He suggests that she enroll in the lab's engineer training program. It is still rare for a woman to win the title of engineer and there are almost no black female engineers. Most of the country's engineering schools don't accept women. Mary has to petition the city of Hampton for special permission to attend engineering classes at the local school.

Mary has proven herself able to do the work, she has the support of her boss, and segregation has been outlawed, but Mary still has to fight to take the classes she needs to become an engineer because she is a woman. This shows just how much she was still up against and what she has to overcome to move ahead.

Though she is working in the service of her country, Mary has to beg to be allowed to do so, which is its own special kind of indignity. She gets the pass and takes classes at the all-white school, shocked at how dilapidated it is, and wondering why they do so much to keep black students off its grounds.

The dilapidation of the all white school demonstrates how ridiculous segregationist laws are, and how much racism and segregation hurt everyone. After all, if the black school and the white school joined economic forces, they could build an institution with enough resources for all students.

Thomas Byrdsong, another black engineer, regularly frequents Mary Jackson's home, where they discuss the daily indignities visited upon them. Black engineers face worse racism than the women, unable to rely on their charms like Katherine does or on the group support provided for women by leaders like Dorothy Vaughan.

Even rising to the rank of engineer (and being a man) doesn't provide an advantage against the discrimination prevalent and Langley. Black men and women find ways to provide support for each other and serve as resources for each other to replace the resources Langley won't grant them.

Over the next few years, black men and women will continue to fight for their country's freedom abroad while also fighting discrimination at home.

Thomas and Mary represent the larger black population, working in the service of a country that won't recognize them as full citizens.

CHAPTER 15: YOUNG, GIFTED AND BLACK

In 1957, Christine Mann, a rising senior at the Allen School for girls in Asheville, North Carolina, starts her day at the library where she collects and sets out the daily newspapers. The news that season is all about the Little Rock Nine, the nine black teenagers trying to integrate the all-white Central High School in Little Rock, Arkansas. Christine, following the story with interest, imagines herself in their shoes while standing in the Allen's library.

By introducing the Little Rock Nine using Christine Mann, Shetterly conveys how significant this news is on the national stage, and at the individual level, as Christine will be a member of the first generation of black students able to attend previously all-white schools in the South.

The rest of the world is also following the story with interest. Photos of black children menaced by large white police officers circulate the globe. The United States tries to use its propaganda machine to turn the story around, but fails. Then, the Soviet Union causes a distraction.

The U.S. continues to fight to fix its image abroad. Federal officials are more worried about the country's international reputation than the health and well-being of its black citizens.

The Russians become the first people to send an object—the Sputnik satellite—into space and control its trajectory. Christine lives through a massive shift in American history, the official start of the Space Age. Christine is as frightened by Sputnik as she was by the dropping of the atomic bomb on Japan. As tensions increase between the US and Russia, extreme violence begins to seem more likely. Fallout shelter signs proliferate. Christine takes part in defense drills at school. Many people think of Sputnik as a technological Pearl Harbor.

Just as WWII led to rapid advancements in military technology, Sputnik sparks a turn towards space. Whereas stories about this shift generally center white Americans, by explaining all of this from Christine's point of view, Shetterly shows how these massive political transitions impacted the individual black women who lived through them.

Just before World War I, the country's lack of air force intelligence and technology gave rise to the NACA. Then, America's inadequate aircraft industry was forced to catch up to, and then outplace, that of its enemies. Now the country has to rise against a new competitor: Russia and its space program. Many black newspapers and their readers fault the segregated school systems for America's lag when it comes to space technology. Russians compel all their students to get the best possible educations, while the United States shuts black students out of the schools with the most resources. Until the United States cures itself of its racism, it will never best Russia.

America's international problems relate directly to its internal conflict, something black journalists don't hesitate to point out. Racism and segregation in America have hurt the country's forward progress by locking many of its best and brightest out of its public school systems and depriving them of resources. The racism that plagues the US hurts not only African-Americans, but also the white Americans who perpetuate it.

Three years before, Christine had witnessed the desegregation of the schools after the Supreme Court ruled on *Brown v. Board of Education*. Christine grew up in a town full of black people, where most of the men made their living working for the railroad line, while black women held jobs in the cotton mill or as domestic servants. In Newtown, she wonders how she will compete with white students from across the tracks. Her father works as a sales rep for North Carolina Mutual Insurance Company, the successful black-owned company that underwrites the home loans of the black home buyers in Hampton. Christine attends a private school for black girls run by white Christian missionaries.

The sudden opportunity for black students to attend all-white schools comes with its own set of worries. Christine is from an entirely black community and she chooses to attend a school for black women, rather than an integrated school, in part because white people and white schools seem foreign to her. This shows that Brown vs. Board is not an immediate cure all for the country's racial woes. The movement towards integration will happen slowly and over a long period of time.

Christine matriculates at the Hampton Institute on a scholarship covered by the United Negro College Fund after graduating from high school in 1958. Between 1957 and 1958, the Soviets launch two more satellites: Sputnik II, carrying the space dog Laika, and Sputnik III. The United States manages to put satellites Explorer I and Vanguard I into orbit, but the nation laments its lack of talented scientists and engineers. Eisenhower initiates the National Defense Education act to cultivate STEM talent. Russian engineering schools are filled with women (1/3 of the graduates from these schools were female) but the US still does not fully support women and black people in the sciences.

Christine will be in a position to watch the changes that come about as Russia continues to outpace the US and the US scrambles to catch up. It's important here to note how much more ready America is to mobilize itself to compete with Russia than it is to undo the harm caused by institutionalized discrimination against women and people of color, even though a push for equal opportunities for all genders and races would only increase its pool of talented scientists and engineers, making it more competitive on the world stage.

CHAPTER 16: WHAT A DIFFERENCE A DAY MAKES

Sputnik circles in the sky. Americans are frustrated, scared and furious. It seems as if the Russian foray into space marks the end of American global dominance. From where Katherine stands, however, Sputnik looks like a new beginning for the NACA. With aerial dominance assured and supersonic military aircraft a concrete reality, it is time for a new revolution in engineering. The Flight Research Division is ready to take on the problem of space travel.

America teeters on the edge of losing its global military dominance, but Katherine sees this shift as a moment of opportunity rather than insecurity. She's more than ready to take on the challenge. It's this consistently forward-thinking attitude that allows her to overcome not only racism and gender discrimination, but also the major technological obstacles facing her field.

The NACA had historically avoided the issue of space. Congress didn't want the organization to waste money on "science fiction" dreams of manned spaceflight. The technical library carried very few books on spaceflight.

Up to this point, space has not been a priority for the U.S. government. Spaceflight researchers will be starting almost from zero and building the space program from the ground up.

Still Langley engineers enjoy imagining the trajectories of missile bodies and rocket engines as they enter space. Now the engineers get full reign to exercise their creativity. Flight Research works with PARD (the Pilotless Aircraft Research Division) to develop rockets. Katherine is excited to use her talents and potential to push American flight to its next stage.

Just as Langley boomed during WWII, a new boom is about to begin, offering new opportunities for innovation. Katherine, as ever, is in the right place at the right time and more than ready to take on the challenge, her persistence once again countering the idea that black women aren't as capable in the sciences as white men.

Dorothy Vaughan now works out of the building that housed the Unitary Plan Wind Tunnel, Building 1251. She's been downsized to an office there. The West Area computing group has been disbanded, and now each research team manages its own computers. But Dorothy, unlike the others, hasn't found a new job, because she doesn't have a specialized skill or area of research expertise. Dorothy still presides over the West Area computers, but their presence is no longer central to the NACA's performance.

While Dorothy benefitted from the boom surrounding World War II, the Space Race puts her job at risk. In this way Shetterly shows us that, though Katherine thrives in this new environment, the position of black women—and women in general—at Langley is still by no means ensured.

The West Area computers have done a lot to integrate the NACA, normalizing the presence of brown faces at company-wide functions and picnics. They've helped put in place the sense of community that will allow black mathematicians and engineers to thrive there in later years. This work happens in the context of people like A. Philip Randolph, Martin Luther King Jr., Claudette Colvin, and Rosa Parks who fought to make segregation illegal. Langley begins to integrate in keeping with the law, though the state of Virginia continues to resist. Southern Democrats pass laws that give the legislature the right to close any public school that tries to integrate. But the NACA is integrating naturally, whether Virginia likes it or not.

Integration doesn't happen all at once—it's a slow process that comes about as the result of new legislation, activists' efforts to change the laws, and the bravery of individuals like the black computers. These efforts take years, extraordinary community mobilization, and massive amounts of manpower before they begin to have real world impact, even as the NACA itself progresses in leaps and bounds when it comes to technological innovation.

To win over countries repelled by the U.S.'s attitude towards racial relations, the government has to relinquish some of its dedication to racism. The NACA's chief legal counsel writes in 1956 that the NACA should put an end to the double-standard regarding race that exists within the United States. In 1958, the US government fuses the Jet Propulsion Laboratory and its other military agencies together to form the National Aeronautics and Space Administration, or NASA.

Desegregation of the NACA and the birth of NASA go hand in hand. Shetterly juxtaposes these two events to show us that the massive technological shifts happening at this time didn't happen in a racial vacuum—they were in the context of broader (and complicated) racial shifts. The history of desegregation is as significant to the development of the United States as the evolution of its space technology.

NASA will be the highly visible successor to the NACA. Everything it does will be made public to the American people and to the world. The NACA expands greatly in size, with its number of research centers and employees increasing almost exponentially. Around this time, the West Area Computers Unit is dissolved. The women left behind, including Dorothy Vaughan, have to find a new place for themselves.

This is the beginning of modern space technology as we know it now. With this new age comes the end of an old era, which Dorothy struggled to help integrate so that this one could be born.

CHAPTER 17: OUTER SPACE

In March 1958, the US government wants to make sure Americans know space exploration is in the best interest of everybody for reasons that include national defense, global prestige, and the opportunity to expand human knowledge. Katherine and her colleagues at Langley try to learn everything they can about space, using their knowledge of flying vehicles to teach themselves how to build spacecraft. They all know they are facing a once-in-a-lifetime opportunity.

Nothing less than America's image as a world leader is at stake. That means Katherine will have a chance to prove herself and make foundational contributions to this period in U.S. history. Katherine knows how important this moment is, and she knows how to use it to her advantage. The daring and bravery that are integral to her character will prove to be of particular importance now.

Katherine gets the chance to advance in her career by preparing charts and equations for space technology lectures. She uses what she's learned under Dr. Claytor to write a textbook for space travel in real time. She wants to go to the lectures and editorial meetings where important scientific research reports are reviewed, scrutinized, and stress-tested, but she is not granted entry because she is a woman.

Though Dr. Claytor didn't get to fulfill his dreams, he pushed Katherine to fulfill hers, and she did. However, even though she's made huge strides, benefitted from the support of others, and written textbooks demonstrating her expertise in her field, her gender holds her back. This is par for the course at the time, though deeply frustrating.

Langley's research process is incredibly grueling. The authors of reports at the NACA face off against four or five experts on their topic. After they present their findings, the researcher has to answer many questions and comments. The point is to find any inaccuracies, inconsistencies, or illogical statements buried in the text. After that, the report is subject to intense critical review of its grammar and clarity. It can take months or years for a scientific report to make it to publication.

Shetterly focuses a great deal on how hard it was to work at Langley as a woman or a person of color. Here she delves into how rigorous and demanding the work was for all scientists, showing just how unique Katherine was to have made it this far. Not only did she have to overcome racial and gender discrimination, she also had to be the best of the best in her field.

Katherine sits with the engineers outside these meetings and asks many, many questions about the scope of their work. She also asks why she isn't allowed to attend the editorial meetings. When they tell her it just isn't done, she continues to press the issue.

Katherine's ability got her onto the Flight Research Team but it's the confidence, persistence, and fearlessness that characterize her tenure there and that get her past that point.

In 1958, women have to balance being coy with being aggressive. Men analyze the data women produce but they don't think of women as peers. Women are interested in the work the men do but they are not allowed to do it. The most ambitious women have to strategize to advance in their careers. Katherine's confidence drives her to fight until she is finally allowed to join the editorial meetings of the Guidance and Control Branch of Langley's Flight Research Division, which will soon become the Aerospace Mechanics Division of NASA.

The Flight Research Division is doing some of the most innovative work of its time and the fact that Katherine, a black woman, finally gets to attend the editorial meetings points to massive social change and hard-won progress for all African Americans, while demonstrating how extraordinary Katherine is as a person.

CHAPTER 18: WITH ALL DELIBERATE SPEED

In 1958, the NACA officially becomes the headquarters for the National Aeronautics and Space Administration. The American space program begins. The Space Task Group includes engineers from the Flight Research Division and PARD. They name the first manned space program Project Mercury. Project Mercury's goals are to investigate the human ability to function in space and to bring both man and spacecraft back to Earth safely.

Now the next stage of the NACA truly begins, with the aerospace industry's focus shifting from planes to rockets and space and towards a new goal—not global military dominance, but dominance of space. While the US focuses on its international and interplanetary goals, it remains blind to some problems of racial and gender discrimination within its borders.

While Virginians feel pride at the fact that they will host the team that sends the first men into space, this is also the year when Virginia's public schools close. The state's governor chains shut the doors of any schools that attempt to integrate under *Brown vs. Board of Education*. Thirteen thousand students find themselves sitting at home. As the barriers at NASA continue to be erased, the children of the employees there attend segregated schools.

The very same goals NASA plans to pursue are undermined by the state's refusal to provide an equal education to all children, regardless of race. By shutting children of color out of white schools that offer more resources and better opportunities, the state reduces its own potential, even as the NACA expands its reach and its goals.

Katherine, Mary Jackson, and Dorothy Vaughan push their children to excel in school and concentrate on getting into college. They also keep up with social functions and appear regularly in the newspaper as models of upwardly mobile and professional black families.

The black women at Langley do what they can to maintain their livelihoods and secure success for their children, knowing that both remain precarious and the future is by no means guaranteed.

At work, Katherine tackles Project Mercury with her colleagues by breaking it down into its constituent parts. Airplanes have evolved since 1915 from awkward machines to more sleek ones. Spaceship research shows that the shape of airplanes won't work for the extreme heat caused when rockets pass through the friction of the atmosphere. A blunt, cork-shaped body works better. Astronauts are chosen, in part, based on their ability to fit into such a small space. Each also has to be a qualified test pilot under the age of 40. Soon "the Mercury Seven" astronauts have been selected. They go from being anonymous military men to becoming the most famous people in the world.

Just as Katherine once helped design planes, now she's designing spaceships. And just as she helped change flight safety forever (recall her work on the crash caused by the propeller plane) she begins the hard work of designing manned spaceships. Her central role in this trajectory over time is important because it points to the direct impact she's had on research normally associated with white male physicists.

Katherine helps calculate rocket trajectories into space. The workload is heavy. She works with her team members to do computing runs and she figures out where the astronauts have to take off from to achieve orbital flight safely. Her analytical geometry skills help her play an important role in the mission. Once again, she is in the right place at the right time.

Katherine again ensures her own success through her extraordinary abilities and her natural good fortune and luck.

The Space Task Group completes its work. Katherine gets to complete and put her name on the research report in 1959. Her paper is the first report to come out of Langley's Aerospace Mechanics Division by a female author. Around this time, she also agrees to marry a man named Jim Johnson. She changes her name to Katherine Goble Johnson.

Katherine's research paper marks yet another huge accomplishment in a series of accomplishments, but she maintains her life outside of work too. For her, getting remarried is of no less importance.

CHAPTER 19: MODEL BEHAVIOR

Mary Jackson helps her son, Levi, build a car to race in the 1960 soap box derby. She works closely with her son, the way she worked with Kazimierz Czarnecki. They follow the official rules and buy all the equipment. The race sets off from the Twenty-Fifth Street Bridge in Newport News.

Here, Shetterly introduces us to the long-term impact of some of the work the computers did, and its effect on the next generation of black scientists and engineers.

Levi is one of fifty thousand boys to compete in races around the country. Mary is one of the few women who helped build her son's car. Mary, like other engineers, hopes her children will follow her into her profession. She pushes Levi to take the most challenging math and science classes and helps him with his work. He wins prizes in his school science fair.

Mary's devotion to her son is an extension of her dedication to her community and to the advancement of her race. Not only does she have to prove she's worthy of success—she also has to make sure her son can prove the same thing too.

Most black families don't participate in the soap box derby because advertisements for it appear primarily in white publications. Segregation also makes it difficult for black parents to believe they might win. It takes a lot for a black child to believe he can. Mary is also aware that her daughter would have been rejected from the race outright because of her gender. Frustrated, she does what she can at work and at home to fight against racial and gender inequality.

Mary is actively working against segregation's larger implications not only through her work at Langley but also by training her son for the soap box derby, since, though it is open to black families, no effort is made to find or recruit them. It falls on Mary's shoulders to prove to the world that it can be done.

Mary works with the National Technical Association, the professional organization for black engineers and scientists. She brings students from public schools in Hampton to the Langley facility to see the scientists at work and invites career counselors from nearby colleges so they can steer their students towards job opportunities at Langley. She also goes out of her way to help new black employees and find them places to live.

Mary pays her success forward, helping those who could use her encouragement and assistance. Her intrepidness and willingness to help others allows her to give black people the ability to control their destinies and futures, rather than be subject to the control of those in power at Langley, in the same way Dorothy did for the black computers at Langley.

Mary also cultivates friendships with the white women she works with. She collaborates with Emma Jean Landrum, who is also an engineer, and they invite girls from nearby schools to visit Langley and show them how women can work together, and how black women have been embraced, to an extent, at Langley.

Mary is fighting sexism—not just racism—and that means partnering with white women, too.

Mary serves as the leader of one of the largest girl scout troops in the area. Frustrated by the segregated troop system, she campaigns for integration. She nominates her assistant troop leader to visit the Girl Scouts' national conclave in Cody, Wyoming and she even trains the woman in hiking before she leaves, returning afterwards with a view of what life looks like far away from home.

Mary also supports women outside of work, helping open the doors and expose them to opportunities they wouldn't otherwise get, passing down the chance Kaz gave to her when she started out at Langley and helping smooth the way for those who will come after her.

Mary gives everything she has outside of work to community service. She is able to do her job because of women like Dorothy Vaughan and Katherine Johnson and Dorothy Hoover, who demonstrated that black women are capable of the highest level of theoretical aeronautical research. It is important for Mary to give back as much as she's been given.

Mary is part of a chain and her success is due not simply to her own efforts to succeed, but also to the efforts of those who came before her. She feels obligated to pass this on.

Mary and her son win the soapbox derby race. Levi tells the *Norfolk Journal and Guide* that he wants to be an engineer like his mother. He wins a trophy and a spot at the national race in Ohio. He is the first black person to win the derby. Mary knows it is an important symbol for the rest of the black community, and she is grateful that there will never again have to be another "first" black winner of the soapbox derby.

By becoming the first black child to win the soapbox derby, Levi shows that it is possible for black competitors to win. The question won't be posed again going forward. Mary's dedication to the advancement of black people wasn't limited to her work at Langley—it was part of her overall personality and a goal in her life.

CHAPTER 20: DEGREES OF FREEDOM

In February 1960, as NASA progresses on the Mercury Project, four students from North Carolina Agricultural and Technical, a black college in Greensboro, North Carolina stage a sit-in at a segregated lunch counter. Inspired by Mahatma Gandhi, the movement spreads across the South, with protestors often violently arrested. Hampton Institute is the first school outside North Carolina to stage a protest. Many of the students know Rosa Parks because she'd taken a job at the university after being blacklisted from employment in Montgomery, Alabama, where she refused to give up her seat on a bus to a white man.

Shetterly puts the beginning of the Space Race in the context of the Civil Rights movement, which is also making headlines and helping to change the trajectory of the country at this point. Not only is this period a time of massive scientific and technological change—it's also a time of serious social and political transformation. Neither process occurs in a vacuum and both influence the other.

Christine Mann, an 18-year-old Hampton junior is earning a teaching certificate and a degree in the sciences. She joins the protests and the voter registration drives organized at Hampton. Some of the activists believe the astronauts are contributing to the student organizing, but this is an unconfirmed rumor. Still, the spirit of the space race infects everyone and helps motivate the activists in their own mission.

Christine Mann, who attends school near Langley, will be deeply influenced by this period of scientific and political change as she grows up. Notice how her journey begins like that of Mary, Katherine, and Dorothy, all of whom studied teaching or worked as teachers before coming to Langley.

Meanwhile, Virginia's governor Lindsay Almond gives in and reopens Norfolk, Charlottesville, and Front Royal schools in 1959, moving the state closer to integration. In Prince Edward County, the entire school system is defunded so that it won't have to integrate. Black parents have to send their children to relatives around the state so they can go to school. These schools stay closed for five years, creating a group of affected children known as the "Lost Generation," some of whom never make up for what they lost in education. Virginia, first in the US in science, is also last when it comes to educating its children.

White leaders undermine the well-being of citizens in their own counties in the interest of keeping blacks out of the schools. Their actions have devastating long term effects. It's ironic that the state known for its scientific innovation continues to be nationally known for its incredibly broken public school system.

Langley begins to desegregate more rapidly. Dorothy Vaughan and the rest of the remaining West Area computers join other engineering groups. Dorothy goes to work with the advanced electronic computers—room-sized IBM machines—alongside white women, and men too, as they become a launch pad to a new career. Here ends the era of computing being thought of as women's work.

The end of the West Area computing office also marks the end of the era Dorothy knew when she joined the NACA. Dorothy helps control her own fate by learning how to code and therefore making herself indispensable. Decades have passed, but she must continually achieve at the highest level to keep her job at Langley.

Dorothy teaches herself FORTRAN, the programming language for IBM computers. NASA purchases more computers to support its dream of spaceflight. It also sets up a network of communications stations around the globe to track the radio signal of Project Mercury on its flight.

Just because Dorothy has been at Langley for a long time doesn't mean she's safe or that she can relax into her seniority there—instead, she must reinvent herself if she wants to continue to have control over her destiny and her children's future.

The launch date for Project Mercury moves to 1961. That year, the US cuts diplomatic ties with Cuba. President Eisenhower, in his farewell speech, rails against the military-industrial complex. On March 6, President John F. Kennedy announces executive order 10925, which mandates affirmative action to ensure equal opportunity for all employees and applicants. In April of that year, Russian cosmonaut Yuri Gagarin becomes the first human in space and the first human to orbit Earth, hastening NASA on its mission to send an American into space.

Executive Order 10925 marks a major step forward in the fight for equal rights for blacks in the workplace, while Russia's manned space mission pushes the scientists at Langley to get their own astronauts into space. It's not often that we see these two elements of history in juxtaposition, much less that we see the direct impact of one on the other. In this way Shetterly reminds us that African-American history is American history.


After some failed launches involving chimpanzees and capsules, astronaut Alan Shepard completes the first suborbital flight, which lasts fifteen minutes and 22 seconds and covers 303 miles. After that, President Kennedy calls for the U.S. to land a man on the moon and return him safely to Earth. NASA needs many more resources than Langley can handle, and so they move to Houston. Katherine stays in Virginia.

By including Katherine alongside President Kennedy and the astronauts in this section about the status of US spaceflight, Shetterly implies that Katherine will play a major role in the scientific progress still to come.

CHAPTER 21: OUT OF THE PAST, THE FUTURE

In 1957, John Glenn is picked for MA-6, the orbital flight that will determine whether the space agency gets to continue existing. He runs, lifts, and swims to make sure he's physically fit and ready for the mission. He completes many simulations at Langley. Meanwhile, in Russia, Gherman Titov becomes the second man in space. Americans are disappointed and frustrated, and they wonder if NASA should be defunded. Finally, the spacecraft is ready to launch in 1962.

Shetterly builds tension here by outlining the competition between the Russians and the US and explaining both that the United State's image of itself, and NASA's very existence, hang in the balance. The events taking place at Langley will have both a global impact and a national one.

Astronauts resist computers because they are new. Glenn asks Katherine Johnson to double check the numbers that will send him into space. She is the only one he trusts to do the math correctly.

This is the historical moment that will put Katherine on the map. John Glenn is a celebrity, and, because he asks for Katherine's help, she becomes a celebrity in her field too. This moment comes about as a result of serendipity—when Katherine's hard work and preparedness collide with opportunity and chance.


Meanwhile, the number of black employees at Langley is growing, with many black engineers playing important roles in space flight and reaching higher ranks than they ever had before. West Computing no longer exists, but Dorothy Vaughan works with the new IBMs. Katherine Johnson plays the most immediate role in human spaceflight, but black engineers throughout the organization contribute to each mission. Everyone follows John Glenn's trajectory into space with bated breath. Glenn lands safely back on Earth. Katherine and the rest of the team are celebrated, and Glenn receives a hero's welcome.

Katherine and John Glenn's destinies are entangled, and when he succeeds, she does also. His successful space flight ensures the future of NASA—but he couldn't have done it without her. Katherine isn't the only person who played a pivotal role here, as Shetterly makes clear by mentioning Dorothy, as well. After all, without Dorothy's help, Katherine wouldn't have gotten as far as she did.



CHAPTER 22: AMERICA IS FOR EVERYBODY

It's 1963 and the Civil Rights movement continues. Project Mercury concludes in a twenty–two orbit flight. A. Phillip Randolph works with Martin Luther King, Jr. to organize the March on Washington for Jobs and Freedom, where Mahalia Jackson, Bob Dylan, and Joan Baez all perform. King addresses the crowd and gives his "I Have a Dream" speech. Dorothy Vaughan completes twenty years of service to the Federal Government.

Dorothy, in her 20 years, has seen a major shift in the work done at Langley while watching the move towards equal rights progress much more slowly. Just as the nation gathered around the space race, activists and artists have come together to help in the fight for equality, which will shape the nation's image of itself no less than NASA.

Langley looks to hire more talented African-Americans. Mary Jackson and the others help make sure new black employees feel welcome. In 1967, Christine Mann takes a job at Langley and meets Katherine Johnson. Katherine continues to be very active in community service. She also continues to work on spaceflight, grieving in 1967 when an electrical fire aboard the Apollo 1 leads to the deaths of three astronauts. She and the other engineers at Langley dream of going to the moon. Katherine works hard to make this dream a reality.

Christine Mann's entry into Langley also points to a new beginning, one that Mary, Katherine, and Dorothy all made possible by forging a path for black women to work in the computing pool and rise to become engineers and scientists. Langley's ambitions continue to grow—just because a new story has begun doesn't meant that Katherine's story is over, only that it's continuing.

CHAPTER 23: TO BOLDLY GO

In 1969, Katherine Johnson attends a sorority conference in the Poconos while also watching the Apollo 11 astronauts make their way to the moon. This is a momentous occasion in US history, and Katherine herself, as a worker at NASA, helped make it happen.

Katherine, at 53, embodies the Double V, having worked hard for the advancement of US technology while also serving as a leader in the larger black community (demonstrated by her continued involvement with her all black sorority).

Black activists challenge the Apollo mission, wondering why so many resources have been spent on sending white men to the moon when poor black families in some parts of the country can barely eat. Other black people wonder why they are not represented among the astronauts or in mission control.

Though the space race and the civil rights movement started in similar places, the space race has been successful while Civil Rights activists have progressed slowly in the face of a great deal of opposition. This frustrates black activists who see it as further evidence that the US government doesn't care about the lives of its black citizens.

The TV show Star Trek and the black female character Lieutenant Uhura help black Americans feel more closely connected with the Space Program. At one point, the actress who plays Uhura decides she wants to quit the show to go back to acting on Broadway. At an event for the NAACP in Los Angeles, Martin Luther King Jr. himself tells her that he is a fan and that she can't leave the show. "We are there because you are here," he tells her. Nichols is frustrated by King's order at first, then decides her role on the show is important and that she won't resign.

The presence of a black face on a show about outer space is meaningful because it allows African-Americans to imagine themselves as part of one of the nation's most ambitious initiatives. Social progress and technological progress go hand in hand, and the African-American community sees Uhura's presence on the Star Trek enterprise as a stride in the fight for equal rights.

Back in the Poconos, Katherine feels grateful to Dorothy Vaughan and to the other women and teachers who helped her get to this point. She thinks about the challenges ahead and imagines plotting a course to Mars, followed by a grand tour of the outer planets. "Once you took the first step," she thought, "anything was possible."

Katherine is at the forefront of the space program, but she knows she couldn't have gotten there without an entire army of women and black teachers behind her. She reflects on her past while also thinking about the future and the many possibilities now open to her that without the effort of Dorothy and the others would have been unimaginable.

EPILOGUE

Katherine Johnson continues to work with NASA, distinguishing herself again during the 1970 Apollo 13 crisis, when an explosion destroys the spacecraft's electrical system making it impossible to navigate. The astronauts first try a method from a paper coauthored by Johnson to use the stars to map their way home, then a second method that only works because one of the astronauts tested it out on the same spacecraft previously, yet another sign that "luck favors the prepared." Johnson works with the astronauts onboard Apollo 13 for the rest of her days and becomes one of NASA's most celebrated scientists.

Katherine's story has a triumphant ending, proving what intelligence, persistence, luck, and hard work (along with community support) can make possible. She's an important example because she contributes not just to one world-changing space mission, but to several, proving herself again and again, in spite of occupying a doubly unique position at Langley as both a black woman and an elite research scientist working on some of the world's hardest problems.

Mary Jackson lives through the 1960s and 70s, as the promise of the space race era gives way to collateral damage including pollution, nuclear proliferation, and natural resource depletion. In 1972, NASA cancels its supersonic transport program, which leads to massive budget cuts and reorganizations. Mary manages to surf the turmoil and continues to work with Kaz, promoting work in the sciences and traveling to visit local schools. At 58, after hitting a glass ceiling, she makes the difficult decision to take a demotion to work in Human Resources, pushing for the advancement of women at the agency.

Mary Jackson's trajectory takes a surprising turn. Even though she's contributed a great deal to her team and become a black female engineer at a time when it was nearly impossible to do that, she still doesn't advance as far as a man would have been able to. By taking on a role in HR, she hopes to change the future for the women who come after her.

Mary works with Gloria Champine to fight for the advancement and equality of women at NASA. Though Gloria is white, the two combine their forces and energy to champion feminism. They travel together to NASA headquarters to train as equal opportunity specialists to make sure that new generations of women scientists don't get trapped in the same temp pools where computers in the 1950s and 60s languished. In this capacity, they work for a few years under Robert Benjamin Lee III, Margot Lee Shetterly's father.

Mary is aware that working across color lines will result in the lifting up of all women, white and black. Here, she takes that realization and puts it to good use. Shetterly also explains how Mary worked for her father to remind us of her own direct connection to this story—after all, by working for the rights of all black women, Mary helped Shetterly (a black woman) advance in her own career, generations later.

After Mary dies, Gloria tracks the careers of women at NASA, making sure they advance according to their qualifications and talents. When Christine Mann (now Darden) discovers that she is going to be laid off because of budget cuts, she points out to her male supervisor that women are downsized more often then men, and she gets a promotion for her insight. She writes code designed to minimize sonic boom for different airplane configurations that is still in use today. Christine pursues a PhD, and with Gloria's help, gets promoted to a senior executive position in her field.

Gloria inherits Mary's pursuit of equality. Christine pushes Mary's agenda forward in other ways, stepping up and advocating for herself to make sure she gets the opportunities she deserves. Like Mary, Christine's vocal nature and willingness to fight lead directly to a better job, as well as a future and a career in which she influences the course of American technical innovation.

Dorothy Vaughn retires in 1971 after being passed over for a promotion to section head of a division that would have included black and white men and women. She spends the rest of her life traveling with her family. Though she never speaks about the heartbreak of leaving Langley, she also never returns to the complex after leaving her job there. Meanwhile, her legacy—the women whose careers she midwifed into existence, and those who came after them, continue to live on and thrive on Langley's campus.

It's heartbreaking that Dorothy's story ends in this way, but Shetterly is careful to note that it doesn't really end here—rather, it continues via the women who come to work at Langley in the decades during and after she leaves, and who are only able to be there because of the opportunities she helped make possible.

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