



A Letter from the Editor:

Dear Students,

Four days until our winter break! Let's hold strong and push through to the very end.

This week we will finish sections 2 and 3 for Chapter 2. I will also be giving you an extra credit opportunity to complete over the break. Earth science study hall is cancelled for this week.

Be sure to get your Chapter one Challenge turned in. A lab report is required to receive full credit.

Sincerely,
Mr. Tarbert

'Hidden Figures,' 'The Glass Universe,' And Why Science Needs History

Genevieve Valentine December 18, 2016:59 AM ET

The earth spins at 1,040 miles an hour. Light travels 186,000 miles per second. It takes just over eight seconds for sunlight to reach the Earth; light from the moon reaches us in just under one and a half. Light travels so far in a year that we use shorthand to describe that 13-digit unit of distance when mapping celestial bodies; the star nearest to our sun is Proxima Centauri, 4.24 light years away.

Science often exists in the public mind as a tidy series of facts; anonymous and absolute things we know. Hydrogen is the universe's most abundant element. Air traffic controllers have to keep passing planes free of wake turbulence. But the history of science is, like so much else, a human history. The process of discovery isn't a timeline of data points, but a search for meaning undertaken by people looking for answers. And some of them achieve the fame that fixes them on that timeline (we all know Galileo).

But history tends to get simplified; a map becomes a single road leading from point to point. It's not surprising that some scientists who contributed invaluable to the field have been kept out of the dominant narrative because they were women, and they were considered anomalies of their time. (That those times practically overlap — meaning a steady line of crucial work being done by women — is one of those scientific patterns that tend to get forgotten.)

But in the last days of the 19th century and the early days of the 20th, Henrietta Swan Leavitt — one of the many woman "computers" at the Harvard Observatory — used the measurements of variable stars to determine fixed distances across space. And fifty years later, Katherine Johnson — a black woman working at NASA's Langley Research Center in Virginia when the state was still deeply segregated — would map John Glenn's space flight, and America's trip to the moon. Women are indelible contributors to the field, and two of this year's best histories — Margot Lee Shetterly's *Hidden Figures*, and Dava Sobel's *The Glass Universe* — are out to prove it.

The Glass Universe is a deft history of the white women of the Harvard Observatory, who began as computers working for Professor Edward Pickering, and increasingly branched out into special projects that made marked strides in the field. The degree of official credit they could receive for their work was an ongoing disappointment, but the depth and breadth of their discoveries is astounding. Equally interesting is how widely, if unofficially, their involvement was accepted; most of "Pickering's Harem" had advantages of race, class, and education that prepared them to be taken seriously. And Sobel's careful sketching of the wider scientific community means we understand both the intricacies of their work, and the global nature of this research boom; a glassmaker in France crafted the glass for a Peruvian telescope that took images Scottish computer (and former housemaid) Williamina Fleming would unpack in the Harvard office.

Sobel's restrained, but the flashes of personality she teases out suggest women determined to be heard. Annie Jump Cannon, who classified several hundred thousand stars while developing the spectral filing system we use today, described her first experience with the Committee on Classification of Stellar Spectra with a wink that carries over the intervening century: "Since I have done almost all the world's work in this one branch, it was necessary for me to do most of the talking."



Student of
the week!
Noah Angle



Noah has earned this coveted award for his unaverred dedication to passing Earth Science. "Problems cannot be solved by the same level of thinking." Albert Einstein



Unfortunately, history can be a more slippery bedrock than science, and it took World War II to break the next social barriers in science and admit black women as equals. The mathematicians and engineers at the center of Shetterly's *Hidden Figures* operated under such systemic injustice that only a handful of them ever even achieved official recognition of their job descriptions. They were recruited to Langley as computers in the segregated "West Area," and their work in aeronautics was crucial to the war effort and the development of the aviation industry. (Katherine Johnson's first big break was her work with wake turbulence, which changed air traffic regulations worldwide.)

Even after the war, black women had become so invaluable as mathematicians and engineers that despite the dawn of room-sized mechanical computers that "marked the beginning of the end of computing as women's work," they carved out places for themselves in the burgeoning space race. Glenn reportedly asked for Johnson specifically when going over trajectory checks for his historic spaceflight; he trusted her more than the machines.

Of course, the women of *Hidden Figures* had to deal with the pervasive indignity of racism, which is as palpable a force as gravity. Occasionally, the reminders of its cruelty can be crushing. (In a particularly pointed detail for a town that prided itself on its patriotism, "Restaurants that refused to serve Dorothy Vaughan had no problem waiting on Germans from the prisoner-of-war camp" in Newport News.) But it's equally crushing in the little banalities that effectively tried to separate the women from their work. Mary Jackson, offered the chance at promotion to *de facto* engineer if she completed a course of study, was forced to petition the Hampton High school board for the right to enter the building. Shetterly's biographical sketches offer vivid portraits of women for whom strength of character was as much a driving force as their skill; they had, she writes, "internalized the Negro theorem of having to be twice as good to get half as far." She lets us imagine how good Johnson, Jackson, and their contemporaries must have been, to get farther than any woman in the field ever had.

Taken together, these books make a case not just for acknowledging women's contributions to the field, but for the value of science itself.

Often, stories like these are considered curiosities; footnotes on something that already has a fixed narrative. But one of the reasons bringing these accounts back into the spotlight is such crucial work is precisely because it's so easy to let a dominant narrative become history, and history to become

establishment. There's deep value to these stories in the here and now.

Women fought prejudice (twice over, in the case of *Hidden Figures*) and did crucial work that shaped our understanding and exploration of the universe. From a glass-plate storage room in the Observatory, Williamina Fleming could look at a far-off star and map it in a sea of numbers; in a segregated Virginia, Katherine Johnson could look at a sea of numbers and map out a path to the Moon. Taken together, these books make a case not just for acknowledging women's contributions to the field, but for the value of science itself. In an era when NASA's funds are slashed and many scientists struggle to make themselves heard on issues ranging from climate change to bacteria, it's quietly galvanizing to read about those whose passion for science shaped the world, and took the measure of the stars.