



FILM REVIEW

Hidden Figures

Reviewed by Fern Y. Hunt

Editor's Note: At the Joint Mathematics Meetings in Atlanta in January, a panel was held about the movie *Hidden Figures*. Featured on the panel was the author of the book *Hidden Figures*, Margot Lee Shetterley, as well as one of the women profiled in her book, Christine Darden. The article "Spotlight Shines on *Hidden Figures* at JMM," by Alexandra Branscombe, appeared in the February/March 2017 issue of *MAA FOCUS*.

Hidden Figures

Twentieth Century Fox Films, 2016

Director: Theodore Melfi

Screenplay by: Allison Schroeder and Theodore Melfi

Based on the book by Margot Lee Shetterly

Ask an American of a certain age when America was great and many if not most would point to the years 1940–1965. In 1940, unprepared and still shaken by depression, our country waged total war against fascism and emerged confident and dominant both economically and technologically. The airplanes of WWII, the missiles and

rockets of the postwar period, and the development of space flight culminating in the landing of American astronauts on the moon in 1969 were powerful and visible demonstrations of this ascent. That mathematics played an indispensable supporting role in these developments is well known to readers

of the *Notices*. Less well known is that before electronic computers were available, women were the human beings carrying out the required computations. And until the 2016 book *Hidden Figures* by Margot Lee Shetterly, and the release of the currently popular movie of the same

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name, few knew that dozens of black women worked as human computers, computer scientists, engineers, and mathematicians at the Langley Memorial Aeronautical Laboratory, the principal federal government institution tasked with the development and testing of aircraft. Later, Langley became the command center for NASA's human space flight program. During this time many of these women made significant technical contributions while experiencing and overcoming the dual humiliations of sex discrimination and racial segregation.

The movie portrays three of these extraordinary people: Dorothy Vaughan, the supervisor of the pool of "colored" human computers in the West Building; Mary Jackson, who broke the colored glass ceiling and achieved professional status as an engineer; and Katherine Johnson, the mathematician whose orbital calculations at a critical point in John Glenn's Friendship 7 flight are the dramatic focus of the movie. For her work on orbital trajectories and the application of celestial navigation to space flight, Johnson was awarded the Presidential Medal of Freedom in 2015.

The film set largely in the early 1960s is based on, but is not entirely coincident with, Shetterly's nonfiction book. It nevertheless deftly captures the emotional tone and drama of these characters' lives during a complex and very important period of American history. That it manages to do so in a way that is attractive to the general movie-going audience is a notable achievement. The film appealed to me as a viewer because it starts to answer my question "How did they do it?" in scenes that at once showcase these women's talent, daring, and humanity. Often the portrayal is lighthearted. For example, when we first see Dorothy Vaughan, she is lodged underneath her stalled car on the side of the road correctly diagnosing the cause of the problem. Her passengers Mary and Katherine look on, and a police cruiser suddenly approaches them.



Women "computers" working at NASA made a substantial contribution to the effort to launch astronaut John Glenn into orbit. The movie *Hidden Figures* tells their remarkable story.



Katherine G. Johnson (portrayed by Taraji P. Henson) makes one of many key contributions to the effort to send John Glenn into orbit.

Mathematicians will also enjoy seeing references to real mathematics. For example, I saw the polar form equation for conic sections on the blackboard, and we learn that Katherine's numerical calculation of the required position and velocity for the safe transition of a space capsule from an orbital trajectory to a reentry path back to earth employed Euler's method. Technical consultant Rudy Horne of Morehouse College and the team of NASA consultants should be commended. One caveat: The film elides the systemic, institutional character of the

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prejudices the women faced. This is perhaps inevitable given the constraints of a Hollywood dramatization—a more faithful recounting should be handled in a future documentary. For example, colored signs for bathrooms in the West Building were maintained because they were required to be there by Virginia state law (see Shetterly's book, pages 43–44). They did not disappear because one of them was taken down in righteous anger by a NASA manager. Rather, cold war abroad and more importantly civil rights victories, both legal and in the streets, eventually forced an end to the practice. Meanwhile, Katherine Johnson (defiantly?) used the unlabeled white bathrooms while working in the East Building. Those who want the full history and context for the events portrayed in the movie could do no better than read the meticulously researched and beautifully rendered account in Shetterly's book.

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Photo of women "computers" is courtesy of TM & ©2017 Twentieth Century Fox Film Corporation.

Photo of blackboard work is by Hopper Stone. Courtesy of TM & ©2017 Twentieth Century Fox Film Corporation.

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Fern Hunt is a mathematician at the National Institute of Standards and Technology. Her research interest lies in the application of probability to networks, dynamical systems, and biology. In 2000, she received the Arthur Flemming Award for Outstanding Federal Service.



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