Book Review

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Miss Leavitt's Stars: The Untold Story of the Woman Who Discovered How to Measure the Universe

George Johnson, 2005, 162 + xiv pages, 16 cm × 24 cm, (ISBN 0-393-05128-5). Price $22.95, hardcover. Published by Atlas Books/W. W. Norton & Company.

One of the strongest impressions of my early years in astronomy was reading Jack Heard's delightful allegory, published in the *Journal of the Royal Astronomical Society of Canada* (vol. 51, p. 273, 1957), about two fictitious teams of philosophers recently unlocked from ivory towers and asked to determine the nature of trees from only one day of observation. The story was created to describe by analogy how astronomers are able to study all aspects of stellar evolution from careful observation of stars over a minuscule portion of their lifetimes. *Miss Leavitt's Stars* begins in similar fashion with the allegory of villagers living in an unscalable chasm attempting to establish the distances to a hill and mountain remotely visible along the length of the canyon from their isolated site using initially parallax, and then the angular sizes of trees, as measuring gauges. It is an effective, if rather fanciful, allegory, but does link directly to the main theme of the book, which is to fit Henrietta Leavitt's discovery of the Cepheid period-luminosity relationship into the history of astronomers' attempts to establish the accurate dimensions of our Milky Way Galaxy and the distances to spiral nebulae.

The allegory, which is contained in the Prologue to *Miss Leavitt's Stars*, a chapter entitled "The Village in the Canyon," raises high expectations for the remainder of the book—expectations that regrettably are not fully satisfied. And the allegory on the use of "botanical parallax" as a distance measuring gauge is later revealed to be the brainchild of Harlow Shapley, not of the author. So where is George Johnson's expertise to be found in the book? Presumably it is in his historical research to discover more details on the life of the elusive Henrietta Leavitt than are presently available. She was certainly a rather mysterious woman, given that she left so little in the way of archival material behind to help us unravel the details of her life, which was sadly shortened by health problems. Born in July 1868, she died of stomach cancer in December 1921 at the relatively early age of 53.

As a professional astronomer, I was dismayed to find some very fundamental errors in the early sections of *Miss Leavitt's Stars*. The first occurs in Chapter 1, "Black Stars, White Nights," where the author has totally garbled a description of the magnitude scale. There he explains that the difference between a fifth magnitude star and a first magnitude star is 5 magnitudes, rather than 4, and compounds the error by converting his erroneous magnitude differences into brightness ratios—presumably tied to first magnitude stars, although that is not always obvious. Next, at the end

of Chapter 3, "Henrietta's Law," he implies that δ Cephei was the first Cepheid to be discovered, by John Goodricke in the fall of 1784, when that honor belongs to η Aquilae, whose variability was detected by Goodricke's friend Edward Piggott a month earlier. Someone writing a book on the history of astronomy ought to know that, right? Lastly the author manages to garble the spelling of Linnaean Street in Cambridge, the main route between the Harvard Plate Stacks and Massachusetts Avenue and also where Henrietta Leavitt resided during the final days of her life. Having spent many days myself walking along the street to the plate stacks, I have become intimately familiar with its difficult spelling, and recognize how an "outsider" might easily misspell it.

Has the author succeeded in discovering additional information about Henrietta Leavitt not already known to earlier historians providing glimpses into her life? My first impressions were no, given that much of the book's bibliography includes several early histories of the Harvard women, including that of Dorrit Hoffleit. But I could be convinced otherwise.

Johnson's purpose in writing *Miss Leavitt's Stars* is to tie the story of Leavitt's discovery of the Cepheid period-luminosity relation into the broader story of how the true dimensions of our Galaxy and the nature of extragalactic nebulae were ultimately revealed through the efforts of astronomers working in the early years of the twentieth century. It is a well known story in astronomy, since it led to the Shapley-Curtis debate in April 1920 that is described in Chapter 6, "The Late, Great Milky Way." That event, arranged by George Ellery Hale for the annual spring meeting of the National Academy of Sciences in Washington, D.C., was intended to promote interest in the distance scale of the universe. It featured Harlow Shapley arguing for a Milky Way large enough to encompass the spiral nebulae, and Heber Curtis arguing that the latter are galaxies in their own right. In light of our current knowledge of the vastness of the universe, such arguments appear absurd. At the time, however, it brought to the forefront the various methodologies used by astronomers to establish distances well outside the realm of everyday comprehension. Johnson does a good job of describing the circumstances leading to the 1920 debate, and attempts to provide some of the flavor of the debate itself with reference to available published summaries provided by Shapley and others.

In spring 1996 a modern version of the "Great Debate" was reenacted in the lecture hall of the National Academy of Sciences in Washington, this time featuring Sidney van den Bergh and Gustav Tammann arguing for their favorite value of the Hubble constant. The story of the second debate is found in Chapter 10, "Ghost Stories," and, while the scientific arguments are not described in detail, the flavor of the debate is described for the reader.

Johnson's main goal in the text, however, is to provide more information about Henrietta Leavitt's life and her involvement with Cepheids in the Small Magellanic Cloud, at the same time speculating about her own thoughts on the discovery. But the meager amount of evidence available, namely the preserved correspondence of E. C. Pickering, Harlow Shapley, and Henrietta Leavitt, permits very little in

the way of extrapolation into the mindset of Miss Leavitt. What does emerge from the preserved correspondence is the story of one of several women computers employed at Harvard College Observatory a century ago. Henrietta Leavitt was almost certainly exploited to the extent of being tied to rather tedious work on photometric calibration of the North Polar Sequence—work that was essentially of little importance relative to the less extensive but more imaginative work she did on the Small Magellanic Cloud Cepheids. Although Johnson speculates about what she might have been able to accomplish if she had been left to direct her own research with the Harvard plate collection, the picture that eventually emerges is much less flattering. Although Johnson himself would probably protest, the clear interpretation of the correspondence that one reaches is that the importance of the Cepheid period-luminosity relation was recognized primarily by Shapley himself.

But I suspect I may side with Cecilia Payne-Gaposchkin, to whom in Chapter 7, "In the Realm of the Nebulae," is attributed the speculation that what really killed Leavitt was the tedium of working on Pickering's North Polar Sequence project. I do not think that Johnson has uncovered anything new about Leavitt's life that would justify the book's subtitle of "the untold story." I suspect that everything found within the covers has already been stated previously.

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