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# Milky Way Morphology

Laurence A. Marschall
*Gettysburg College*



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## Abstract

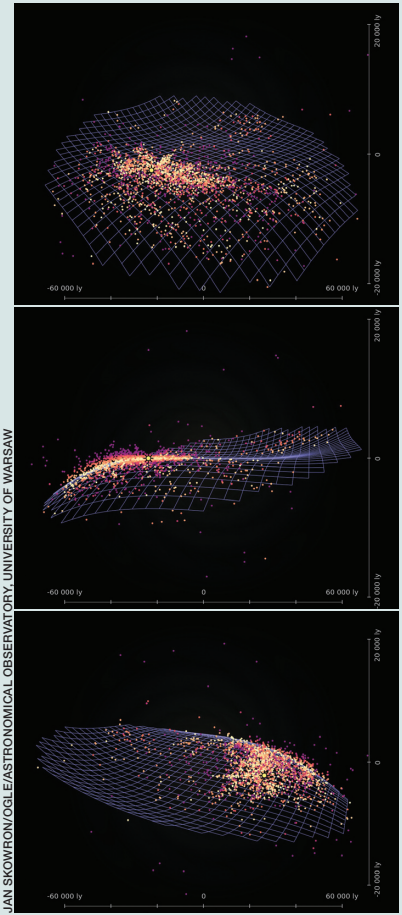
From our limited perspective—living on a planet that orbits one of several hundred billion stars inside the Milky Way—the detailed structure of our home galaxy is difficult to determine. It has long been recognized by astronomers as a typical spiral galaxy, one of countless flattened pinwheels of stars seen throughout the universe. By mapping the distances to more than 2,400 stars, scientists have now created, with unprecedented precision, a three-dimensional map that shows the Milky Way has a twisted shape. [*excerpt*]

## Keywords

Astronomy, Milky Way, Galaxies, Variable Stars

## Disciplines

Astrophysics and Astronomy | Stars, Interstellar Medium and the Galaxy




JAN SKOWRON/OGLE/ASTRONOMICAL OBSERVATORY, UNIVERSITY OF WARSAW

*3D structure of the Milky Way based on over 2,400 precisely measured Cepheid stars*

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From our limited perspective—living on a planet that orbits one of several hundred billion stars inside the Milky Way—the detailed structure of our home galaxy is difficult to determine. It has long been recognized by astronomers as a typical spiral galaxy, one of countless flattened pinwheels of stars seen throughout the universe. By mapping the distances to more than 2,400 stars, scientists have now created, with unprecedented precision, a three-dimensional map that shows the Milky Way has a twisted shape.

The map is based on measurements from an ongoing survey called the Optical Gravitational Lensing Experiment (OGLE), which collects repeated telescopic images of the Milky Way. Dorota M. Skowron and her collaborators at the University of Warsaw searched for objects whose brightness varies over time. Such stars, called Classical Cepheid Variables, are ideally suited to trace the contours of our galaxy. Cepheids are luminous enough to be visible to the outer edges of the Milky Way and beyond, and they vary in brightness with a distinctive rapid-rise and slow-decline over periods of one to one hundred days, making them easy to distinguish from a vast background population. Each Cepheid's period of brightness variation is proportional to the amount of light it gives off. By comparing that to the amount of light received on Earth, and taking into account absorption of light by interstellar dust, the distance of the star can be determined to better than 5 percent accuracy.

In profile, the disk of our galaxy resembles the brim of a fedora hat, pitched down on one side and up on the other. Though astronomers had previously reported warping of the galaxy through lower-precision observations of gas, dust, and stars, Przemek Mróz of the OGLE collaboration notes, "This is the first time we can use individual objects to trace its shape in three dimensions." The astronomers suggest that the distortion may have been caused by a past collision with a smaller galaxy, by interactions with clouds of interstellar gas, or by the gravitational pull of unseen dark matter. Further detailed mapping of the Milky Way, notes lead author Skowron, may reveal more about how spiral galaxies form and how they change over time. (*Science*)

*—Laurence A. Marschall*