

Huge, Newfound Part of Milky Way Rotates Backwards

Posted by [Lee DeCovnick](#) on 12/14/2007 7:16 PM

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By Robert Roy Britt
12 December 2007

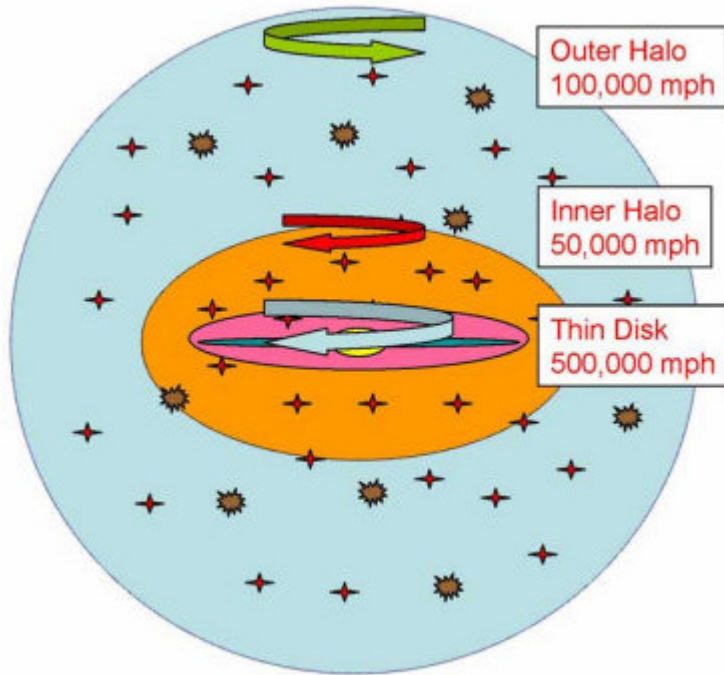
Our Milky Way Galaxy has two distinct parts in its outer reaches that rotate in opposite directions, astronomers announced today.

The galaxy has a bulbous core where stars are tightly packed and orbiting rather furiously around the central black hole. Then there's the big flat disk with its spiral arms, also orbiting the galactic center somewhat in the manner of a hurricane's spiral bands. We live on one of those arms. Around it all is a halo of stars that don't all behave in such an orderly fashion. That much researchers knew.

Now they find the halo has two parts.

"By examining the motions and chemical makeup of the stars, we can see that the inner and outer halos are quite different beasts and they probably formed in different ways at different times," said Daniela Carollo, a researcher at Italy's Torino Observatory and the Australian National University.

The finding, detailed in the Dec. 12 issue of the journal *Nature*, is based on 20,000 stars observed as part of the Sloan Digital Sky Survey.



The new study finds an inner halo (orange area) that is more flattened and dominates the population of stars up to 50,000 light years from the Milky Way's center. The outer halo (blue) is more spherical, and dominates the population beyond 65,000 light years from the galactic center. It may extend out to more than 300,000 light years. The red plus symbols represent stars and the brown burst-like symbols are star clusters. CREDIT: SDSS-II, Masashi Chiba, Tohoku University, Japan

The main galactic disk, home to our sun, rotates at an average speed of 500,000 mph. Surrounding the disk is what's now called the inner halo. It orbits in the same direction at about 50,000 mph. The outer halo, a sparsely populated region, spins in the opposite direction at roughly 100,000 mph.

There are chemical differences between the two parts, too. Stars in the inner halo have three times as many heavy atoms, including iron and calcium. These heavy elements were produced by massive stars that exploded fantastically and begat subsequent generations of stars.

"The halo is clearly divisible into two, broadly overlapping components," said study team member Timothy C. Beers of Michigan State University. "The discovery gives us a much clearer picture of the formation of the first objects in our galaxy and in the entire universe."

The study adds to other evidence showing the galaxy was not built in a cosmic day. Rather, it assembled over time, gobbling smaller galaxies in one of nature's greatest construction projects.

The inner halo probably formed first, from collisions between smaller galaxies that had been captured by the Milky Way's gravitation. The outer halo formed later, the thinking goes, as small galaxies (orbiting opposite our own) were lured in and torn apart.

"We still have a lot to understand," said Masashi Chiba of Japan's Tohoku University.