

A massive collision in the Milky Way's past

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The colliding spiral galaxies in Arp 272 located in the constellation of Hercules. Astronomers have studied a suite of galaxy merger simulations to conclude that our own Milky Way galaxy suffered a similar kind of merger. In particular, they found that some of the peculiar features in the Galaxy's halo structure can be best explained by a head-on collision with a dwarf galaxy six to ten billion years ago. Credit: NASA, ESA, the Hubble Heritage (STScI/AURA)-ESA/Hubble Collaboration, and K. Noll, STScI

Our Milky Way galaxy has probably collided or otherwise interacted with other galaxies during its lifetime; such interactions are common cosmic occurrences. Astronomers can deduce the history of mass accretion onto the Milky Way from a study of debris in the halo of the galaxy left as the tidal residue of such episodes. The approach has worked particularly well for studies of the most recent events like the infall of the Sagittarius dwarf galaxy a few billion years ago that left tidal streamers of stars visible in galaxy maps. The damaging effects these encounters can cause to the Milky Way have, however, not been as well

studied, and events even further in the past are even less obvious as they become blurred by the galaxy's natural motions and evolution.

Some episodes in the Milky Way's history, however, were so cataclysmic that they are difficult to hide. Scientists have known for some time that the Milky Way's halo of stars drastically changes in character with distance from the galactic center as revealed by the composition of the stars (their "metallicity"), the stellar motions, and the stellar density.

CfA astronomer Federico Marinacci and his colleagues analyzed a suite of computer cosmological simulations and the galaxy interactions in them. In particular they analyzed the history of galaxy halos as they evolved following a merger event.

They conclude that six to ten billion years ago the Milky Way merged in a head-on collision with a massive dwarf galaxy containing about one-to-ten billion [solar masses](#) in size, and that this collision could produce the character changes in stellar population currently observed in the Milky Way's stellar halo.

More information: Azadeh Fattahi et al. The origin of galactic metal-rich stellar halo components with highly eccentric orbits, *Monthly Notices of the Royal Astronomical Society* (2019). [DOI: 10.1093/mnras/stz159](https://doi.org/10.1093/mnras/stz159)

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