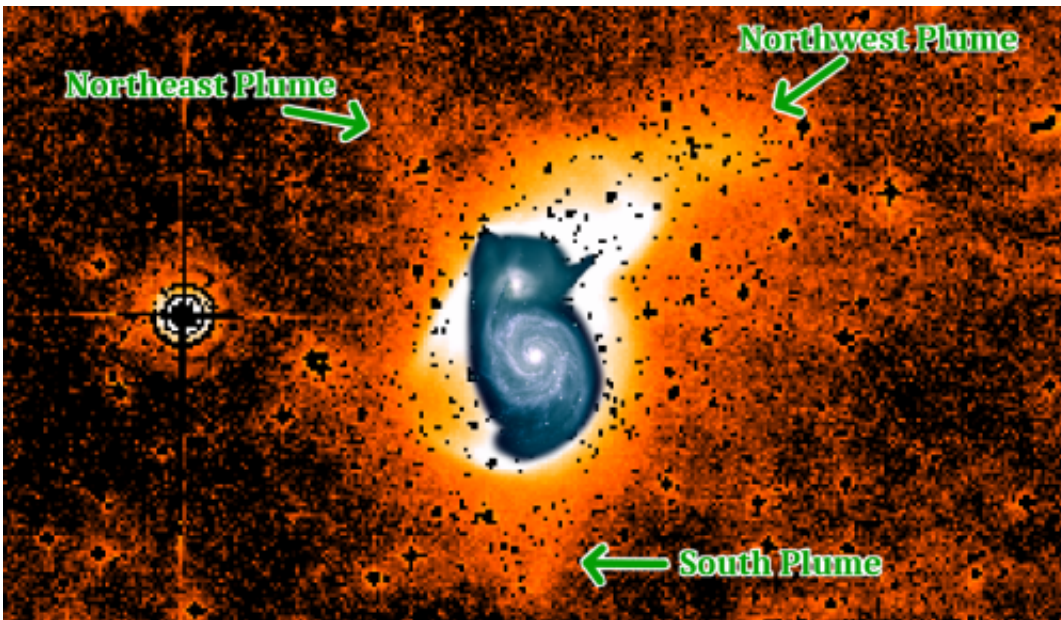


Astronomers find new details in first known spiral galaxy

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Case Western Reserve University astronomers found new features on the first-known spiral galaxy, M51a, which has been sketched and photographed for 170 years. Credit: Aaron Watkins

Case Western Reserve University astronomers peered deep into space to discover new features of a galaxy that's been sketched and photographed for 170 years.

The researchers were able to see faint plumes extending from the northeast and south of the nearby spiral galaxy M51a, also called the

"Whirlpool Galaxy," by taking what is essentially a photograph made by a 20-hour exposure.

The image also provides new details of the linear northwest plume, which itself is nearly 120,000 light-years long, and reveals a lack of [stars](#) in a portion of the southeast tail.,

"These features can be used in future modeling to understand the history of M51, when it and its [companion galaxy](#) first started to interact," said Aaron Watkins, a PhD student in the department of astronomy at Case Western Reserve and lead author of the study.

Modeling that's already been done fails to match the structures of the system, ages and more.

Watkins worked with the CWRU astronomy professor Chris Mihos and Observatory Manager Paul Harding. The research is published in *Astrophysical Journal Letters*.

M51a is the first known spiral galaxy, identified and sketched by William Parsons, the Earl of Rosse, in 1845. The whirlpool and its small companion, M51b, are in the hunting dogs constellation, Canes Venatici, about 31 million light years away.

"No professional astronomer we know of has ever taken such a deep image of this galaxy," Watkins said. The images were taken from the CWRU's Burrell Schmidt telescope at Kitt Peak National Observatory near Tucson during February, March and April in 2010 and 2012.

The team aimed the telescope at M51 on moonless nights and exposed its digital camera to the light from the galaxy at 20-minute intervals, recalibrating in between. For a total of 10 hours, light was filtered to reveal younger stars. For another 10 hours, light was filtered to reveal

older stars. These 10-hour images were merged to create the 20-hour final image.

The northwest plume was seen in the 1970s, but the technology provided limited detail. The astronomers found it's dominated by older, redder stars and has little gas, found in small patches. Due to the age of the stars and the extreme length of the plume, they suggest the plume was created by the interaction of an outer disk of M51 with another galaxy 200 million years ago or more.

The southern plume is an oddity. It has no morphological similarities with the surrounding parts of M51 and no gas. The plume has comparatively few stars and, therefore, mass, and little total light. One possibility, the researchers suggest, is the plume could be the remnants of a third satellite or body in the M51 system.

The northeast plume has about the same total light as the southern one. It may be an extension of the north side of the galaxy, but that is impossible to tell, Watkins said.

Other researchers discovered the southeastern gas tail in 1990 and assumed it was pulled out during an interaction with another galaxy. This new, deeper view still found no stars. That's unusual for such a tail, but it provides a clear test for future interaction models.

The astronomers are now devising other ways to look at M51, particularly to gather more detail from the faint plumes. The northwest [plume](#) is bright enough that it may be a good candidate for further study using the Hubble telescope, Watkins said.

More information: *Astrophysical Journal Letters*,
<http://iopscience.iop.org/2041-8205/800/1/L3/article>

Provided by Case Western Reserve University

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