Dwarf galaxy has giant surprise

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Huge gas disk may be similar to stuff of early universe

An astronomer studying small irregular galaxies has discovered a remarkable feature in one of them that may provide key clues to understanding how galaxies form and the relationship between the gas and the stars within galaxies.

Liese van Zee of Indiana University Bloomington, using the National Science Foundation's Very Large Array radio telescope in New Mexico, found that a small galaxy 16 million light-years from Earth is surrounded by a huge disk of hydrogen gas that has not been involved in the galaxy's star-formation processes and may be primordial material left over from the galaxy's formation. "If that's the case, then we may have found a nearby sample similar to the stuff of the early universe," van Zee said.

"Why the gas in the disk has remained so undisturbed, without stars forming, is somewhat perplexing. When we figure out how this happened, we'll undoubtedly learn more about how galaxies form," she said.

She presented her findings on Wednesday (Jan. 12) at the national meeting of the American Astronomical Society in San Diego, Calif.

The galaxy van Zee studied, called UGC 5288, had been regarded as just one ordinary example of a numerous type called dwarf irregular galaxies. As part of a study of such galaxies, she had earlier made a visible-light image of it at Kitt Peak National Observatory in Arizona.

When she observed the galaxy later using the radio telescope, she found that it is embedded in a huge disk of atomic hydrogen gas. In visible light, the elongated galaxy is about 6,000 by 4,000 light-years, but the hydrogen-gas disk, seen with the VLA, is about 41,000 by 28,000 light-years. "The gas disk is more than seven times bigger than the galaxy we see in visible light," she said.

The hydrogen disk can be seen by radio telescopes because hydrogen atoms emit and absorb radio waves at a frequency of 1420 MHz, a wavelength of about 21 centimeters.

A few other dwarf galaxies have large gas disks, but unlike these, UGC 5288's disk shows no signs that the gas was either blown out of the galaxy by furious star formation or pulled out by a close encounter with another galaxy. "This gas disk is rotating quite peacefully around the galaxy," van Zee explained. That means, she said, that the gas around UGC 5288 most likely is pristine material that has never been "polluted" by the heavier elements produced in stars.

What's surprising, said Martha Haynes, an astronomer at Cornell University in Ithaca, N.Y., is that the huge gas disk seems to be completely uninvolved in the small galaxy's star-formation processes. "You need the gas to make the stars, so we might have thought the two would be better correlated. This means we really don't understand how the star-forming gas and the stars themselves are related," Haynes said.

It's exciting to find such a large reservoir of apparently unprocessed matter, Haynes said. "This object and others like it could be the targets for studying pristine material in the universe," she said.

Haynes was amused that a galaxy that looked "boring" to some in visible-light images showed such a remarkable feature when viewed with a radio telescope.

"This shows that you can't judge an object by its appearance at only one wavelength. What seems boring at one wavelength may be very exciting at another," Haynes said.

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