Not from around here: Atoms in our solar system came from distant stars

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The newest camera on NASA/ESA Hubble Space Telescope captured a spectacular pair of galaxies engaged in a celestial dance of cat and mouse or, in this case, mouse and mouse. The pair will eventually merge into a single giant galaxy.

Galaxies are clusters of stars — thousands of millions of them. Our own galaxy is called the Milky Way.

Where did it come from? How did it get so big? A recent study in the Monthly Notices of the Royal Astronomical Society used computers to try to estimate how galaxies grow and shrink over time. Specifically, it modeled how matter moves between galaxies, flowing across space in huge, speeding clouds.

Based on these models, scientists concluded that most of the stuff that makes up our galaxy probably came from elsewhere. The finding was a surprise to the researchers. No one had expected that so much of our galaxy would be made out of material that came from other galaxies.

Death Of Stars

How does stuff get from one galaxy to another? It has to do with what happens when stars die.

What happens at the end of a star's life depends on its size. Large stars explode, shooting matter out into space. Really big stars result in supernova explosions. These explosions are incredibly massive.

During these explosions, a cloud of matter is shot out in all directions. These clouds carry material to neighboring galaxies. The matter itself is a mix of different elements, like hydrogen and helium. Some of it becomes new stars. The rest forms comets, asteroids, planets and even life.

This is how more than half of the matter in the Milky Way probably got there.

Our Place In The Universe

“Science is very useful for finding our place in the universe,” said Daniel Anglés-Alcázar. He is a scientist who worked on the study. He said that in a sense, we're visitors in the Milky Way. Most of what makes us up probably came from other galaxies.

When a star explodes, its matter isn't shared equally by its neighbors. More of it goes to the larger galaxies. This make sense because bigger galaxies have stronger gravitational pulls.

Given its size, the Milky Way should absorb a lot of outside matter. The study estimated that it should add about one sun’s-worth of material every year.

Pushed By Galactic Winds

“The surprising thing is that galactic winds contribute significantly more material than we thought,” said Anglés-Alcázar. He added, “We’re very excited about these results. It’s a new mode of galaxy growth we’ve not considered before.”

The simulations showed that matter traveling on intergalactic winds could travel huge distances before getting sucked into a new galaxy. They might travel up to a million light-years. A light-year is a measure of distance, not time. Light travels faster than anything in the universe. A light-year is the distance that light can travel in one year.

Claude-André Faucher-Giguère was another astronomer on the team. He said that before their simulations, galaxies were thought to grow primarily by absorbing material left over from the Big Bang. That's the explosion scientists think occurred at the beginning of the universe.

“What we did not anticipate, and what’s the big surprise, is that about half of the atoms that end up in Milky Way-like galaxies come from other galaxies,” he said. “It gives us a sense of how we can come from very far corners of the universe.”

Computer Modeling Of Star Explosions

The scientists used computer models that dramatically sped up changes in the galaxies. They created animations showing whether stars in a galaxy formed from material already in the galaxy, or from huge clouds of gas that fell in from neighboring galaxies.

The simulations show that the stronger winds flow from bigger galaxies. There are two reasons for this. Bigger galaxies have more exploding stars. Also, gravity is stronger in these galaxies, so only the fastest, strongest winds can escape.

For Faucher-Giguère, the study adds to our understanding of our own galaxy. “Our origins are much less local than we thought,” he said. “This study gives us a sense of how things around us are connected to distant objects in the sky," he added.