

Close-up view of galaxies prompts re-think on star formation

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This is the "South Pillar" region of the star-forming region called the Carina Nebula. Like cracking open a watermelon and finding its seeds, the infrared telescope "busted open" this murky cloud to reveal star embryos tucked inside finger-like pillars of thick dust. Credit: NASA

Astronomers have identified for the first time one of the key components of many stars, a study suggests.

A type of gas found in the voids between galaxies - known as [atomic gas](#)

- appears to be part of the star formation process under certain conditions, researchers say.

The findings overturn a long-standing theory about the conditions needed for star formation to take place - a process that happens when dense clouds of dust and gas inside galaxies collapse.

It was previously thought that stars could form only in the presence of a different type of gas - called [molecular gas](#).

Atomic gas is composed of individual hydrogen atoms. It is usually found in regions of space that do not contain any planets or stars and are largely empty, researchers say.

Molecular gas is made up of pairs of [hydrogen atoms](#) bound together, and is present in the densest parts of galaxies, where most planets and stars form.

The new study, led by the University of Edinburgh, provides the first evidence that atomic gas can fuel star formation. This happens when atomic gas flows into galaxies but does not have time to convert to the molecular form, the team says.

The discovery was made by studying galaxies in which explosions of massive stars - known as gamma-ray bursts - have been observed. It was thought the stars formed from molecular gas, but recent studies have shown these galaxies to be almost entirely deficient in molecular gas.

Using a radio telescope in New South Wales, Australia, researchers measured the levels of atomic gas present in the galaxies. The team found they contain large amounts of atomic gas, distributed close to [gamma-ray bursts](#), suggesting it can act as the fuel for [star formation](#).

Stars form in the same way regardless of the type of gas involved, scientists say. Gas molecules are destroyed early in the process, so the stars they produce are the same, they add.

The study, published in the journal *Astronomy & Astrophysics*, was funded by the Science and Technology Facilities Council. The research was carried out in collaboration with researchers at institutions across Europe, the US and Australia.

Dr Michal Michalowski, of the University of Edinburgh's School of Physics and Astronomy, who led the study, said: "We were analysing the atomic gas data for these [galaxies](#) when the results about their molecular gas deficiency were announced. We pieced together all the information, and found that [stars](#) may in fact form out of atomic gas, which was previously believed to be impossible."

Provided by University of Edinburgh

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