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News Release

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Galactic winds caused by huge explosions slow new star formation

Scientists have created computer simulations of events soon after the Big Bang to better understand how stars today are being formed.

Researchers have formed the clearest picture yet of massive explosions that controlled the creation of galaxies, including our own, and continue to influence star formation today.

The findings confirm a long-held theory about the after-effects of these spectacular explosions called supernovae, and how they slow down the formation process.

Scientists at the University of Edinburgh say supernovae trigger powerful gusts of wind that slow the rate at which gas needed to make new stars pours into developing galaxies.

Using the Curie supercomputer in France, the team created computer simulations of the dark matter, hydrogen and helium formed post Big Bang – all key elements of galaxy formation. They compared these with measurements of the amount of hydrogen that surrounds galaxies.

The team found that more hydrogen is present outside galaxies than expected. This suggests that violent winds produced by supernovae slow down the flow of gas into galaxies.

However, the simulations were unable to reproduce the amount of hydrogen around the most massive galaxies, which contain the most energetic objects in the Universe.

These objects – known as quasars – are powered by black holes as massive as a billion Suns, and can emit 100 times the combined luminosity of the entire Milky Way.

The team suggests that quasars may have an even greater influence than supernovae on new star formation, by producing enormous jets of hot gas fuelled by black holes.

The study is published in the journal *Monthly Notices of the Royal Astronomical Society* by Oxford University Press. The research was carried out in collaboration with scientists at the Universities of Cambridge and Nottingham.

Professor Avery Meiksin, of the University of Edinburgh's School of Physics and Astronomy, who led the study, said: "Our simulations provide highly accurate descriptions of the properties of dark matter and gas found between galaxies. Understanding how galaxies form presents new challenges because the physical processes involved are much more complex. Our results suggest we are on the right track."

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