

# Exeter physicist advances early universe theory

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Research by a University of Exeter astrophysicist has helped to explain how the first stars and galaxies formed.

Research led by Professor Gilles Chabrier of the University of Exeter suggests that large magnetic fields were generated shortly after the [Big Bang](#) and played a key role in the formation of the first [stars and galaxies](#)

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The international team of researchers, headed by Professor Chabrier and Dr Christoph Federrath of the Ecole Normale Supérieure de Lyon (France), used three-dimensional computer simulations to make their discovery. Their simulations show that even under extreme physical conditions, magnetic fields are efficiently amplified by turbulent flows. The findings are now published in the journal *Physical Review Letters*.

Both the gas between the [stars](#) in a galaxy and the medium between galaxies are magnetised. However, little is known so far about how these magnetic fields, which can be seen with telescopes, actually came about. Now, the international research team has proposed an answer.

Professor Gilles Chabrier said: “The question of why there are huge magnetic fields in the intergalactic media has been puzzling us for a long time and this is the first reasonable explanation for how they came about. Magnetic fields are important for everything, including life, so this is an area of major interest to astronomers.

“We now know that turbulence and magnetic fields play a dominant role in star formation, besides gravity. This discovery significantly advances our understanding of how galaxies, stars and planets are formed.”

The research team used three-dimensional computer simulations performed on more than 32,000 processors in parallel. They demonstrated how [magnetic field](#) lines are stretched, twisted and folded by turbulent flows. The energy required for these processes is extracted from the turbulence.

Provided by University of Exeter

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