# Big Bang theory challenged by big chill

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(Phys.org) -- The start of the Universe should be modeled not as a Big Bang but more like water freezing into ice, according to a team of theoretical physicists at the University of Melbourne and RMIT University.

They have suggested that by investigating the cracks and crevices common to all crystals - including ice - our understanding of the nature of the Universe could be revolutionised.

Lead researcher on the project, James Quach said current theorising is the latest in a long quest by humans to understand the origins and nature of the Universe.

"Ancient Greek philosophers wondered what matter was made of: was it made of a continuous substance or was it made of individual atoms?" he said. "With very powerful microscopes, we now know that matter is made of atoms."

"Thousands of years later, Albert Einstein assumed that space and time were continuous and flowed smoothly, but we now believe that this assumption may not be valid at very small scales.

"A new theory, known as Quantum Graphity, suggests that space may be made up of indivisible building blocks, like tiny atoms. These indivisible blocks can be thought about as similar to pixels that make up an image on a screen. The challenge has been that these building blocks of space are very small, and so impossible to see directly."

However James Quach and his colleagues believe they may have figured out a way to see them indirectly.

"Think of the early universe as being like a liquid," he said. "Then as the universe cools, it 'crystallises' into the three spatial and one time dimension that we see today. Theorised this way, as the Universe cools, we would expect that cracks should form, similar to the way cracks are formed when water freezes into ice."

RMIT University research team member Associate Professor Andrew Greentree said some of these defects might be visible.

“Light and other particles would bend or reflect off such defects, and therefore in theory we should be able to detect these effects,” he said.

The team has calculated some of these effects and if their predictions are experimentally verified, the question as to whether space is smooth or constructed out of tiny indivisible parts will be solved once and for all.

The team is supported by the Australian Research Council, and their research was published in the latest edition of the journal *Physical Review D*.

Provided by University of Melbourne