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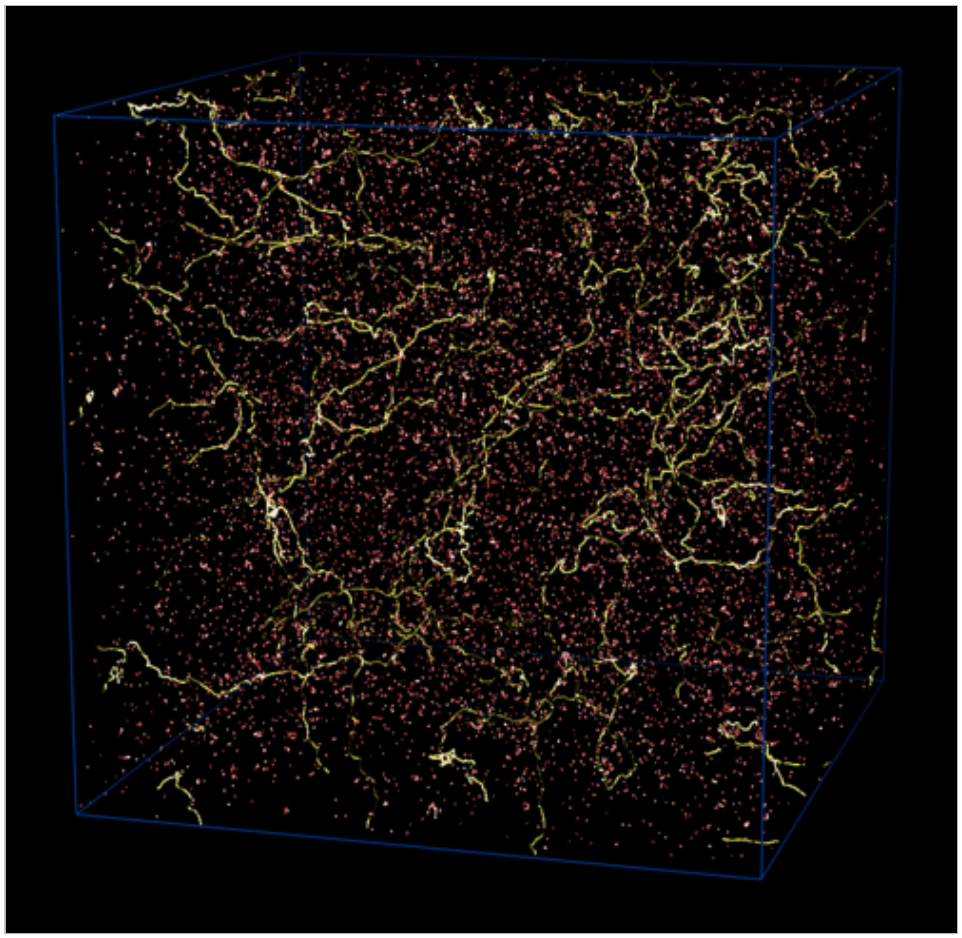
Cosmic strings are super-massive, ultra-thin cracks in the universe



By Alasdair Wilkins

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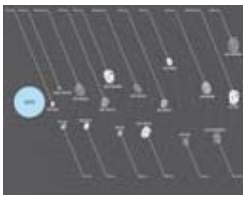

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Cosmic strings are theoretical fault lines in the universe, defective links between different regions of space created in the moments after the Big Bang. And they might be theoretical no longer - distant quasars show the fingerprints of these strings.

Compared to cosmic strings, black holes seem downright sensible. These strings - no relation to the subatomic strings of theoretical physics - are one-dimensional objects, meaning they have length, but no height or width. They are defects in the fabric of the universe, a byproduct of the universe cooling in the first instants after the Big Bang. The easiest way to think about these strings is to see them as the cosmic equivalent of the cracks that form in ice over a frozen lake.

Of course, that doesn't capture the full measure of their one-dimensional weirdness. Since they have no width or height, they are incomprehensibly narrow, with a diameter that would make even a tiny photon look fat. They're also dense, as a string that's even a mile long would weigh considerably more than Earth. These strings expanded right along with the universe, ultimately stretching across the entire known universe in a more or less straight line, or forming massive rings many thousands of times bigger than our galaxy.

We've not yet directly observed these strings, but researchers at the University of Buffalo say they've found clear indirect proof. They studied 355 quasars - incredibly bright galaxies with super-massive black holes at their center - at the furthest corners of the observable universe. All quasars emit massive energy jets pointed in a particular direction, and through very careful study it's possible to figure out the directions of the jets.

183 of those quasar jets lined up to form a pair of enormous rings in the sky, suggesting two massive circular structures exist - or had existed - to orient the direction of the jets. The only known candidates for such colossal structures are cosmic strings, providing compelling indirect evidence for them. If we confirm the existence of cosmic strings, it will greatly improve our understanding of the formation of the earliest galaxies.

This isn't clinching proof - some scientists, like Arizona State's Tanmay Vachaspati, are skeptical cosmic strings that formed nanoseconds after the Big Bang could last long enough after the Big Bang to affect quasars in this way. But this new hypothesis provides testable predictions to further explore the existence of these strings, and these quasar rings might eventually prove to be for cosmic strings what Cygnus X-1 was for black holes.

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