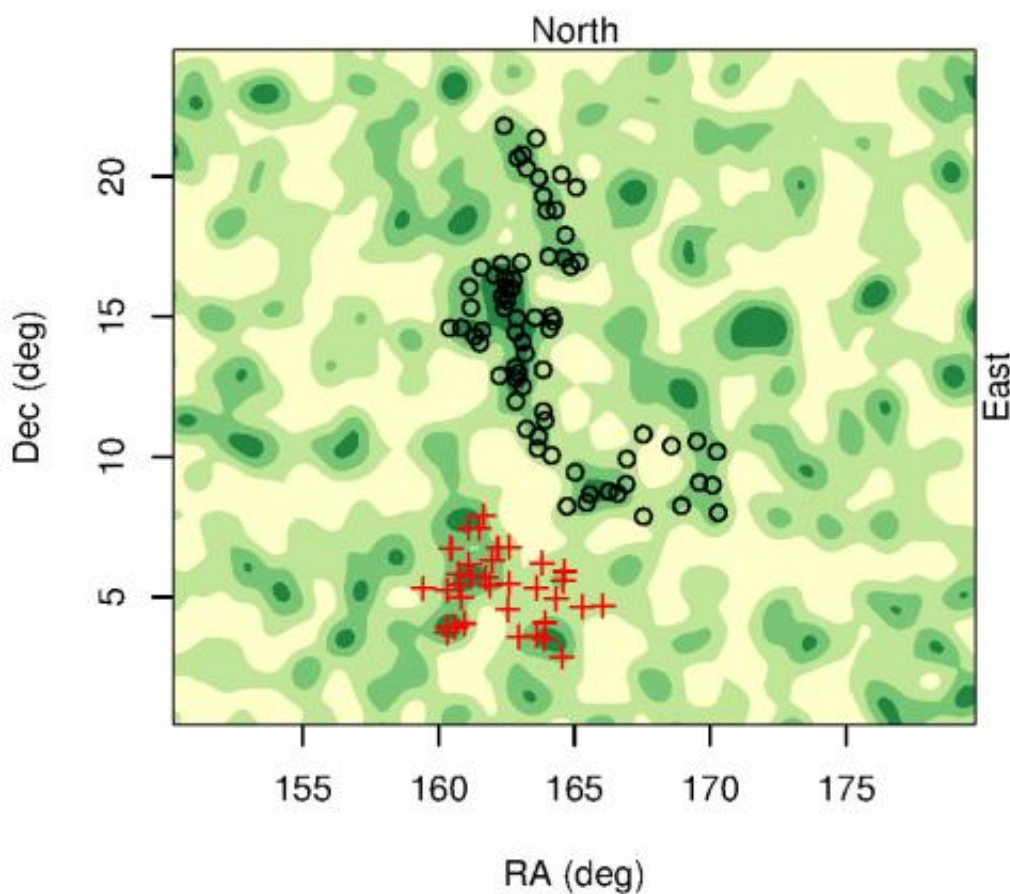


Astronomers discover the largest structure in the universe

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The coloured background indicates the peaks and troughs in the occurrence of quasars at the distance of the LQG. Darker colours indicate more quasars, lighter colours indicate fewer quasars. The LQG is clearly seen as a long chain of peaks indicated by black circles. (The red crosses mark the positions of quasars in a

different and smaller LQG). The horizontal and vertical axes represent right ascension and declination, the celestial equivalent of longitude and latitude. The map covers around 29.4 by 24 degrees on the sky, indicating the huge scale of the newly discovered structure. Credit: R. G. Clowes / UCLan

(Phys.org)—An international team of astronomers, led by academics from the University of Central Lancashire (UCLan), has found the largest known structure in the universe. The large quasar group (LQG) is so large that it would take a vehicle travelling at the speed of light some 4 billion years to cross it. The team publish their results in the journal *Monthly Notices of the Royal Astronomical Society*.

Quasars are the nuclei of galaxies from the early days of the universe that undergo brief periods of extremely high brightness that make them visible across huge distances. These periods are 'brief' in astrophysics terms but actually last 10-100 million years.

Since 1982 it has been known that [quasars](#) tend to group together in [clumps](#) or 'structures' of surprisingly large sizes, forming large quasar groups or LQGs.

The team, led by Dr Roger Clowes from UCLan's Jeremiah Horrocks Institute, has identified the LQG which is so significant in size it also challenges the Cosmological Principle: the assumption that the universe, when viewed at a sufficiently large scale, looks the same no matter where you are observing it from.

The modern theory of cosmology is based on the work of [Albert Einstein](#), and depends on the assumption of the Cosmological Principle. The Principle is assumed but has never been demonstrated observationally 'beyond reasonable doubt'.

To give some sense of scale, our galaxy, the Milky Way, is separated from its nearest neighbour, the [Andromeda Galaxy](#), by about 0.75 Megaparsecs (Mpc) or 2.5 million light-years.

Whole clusters of galaxies can be 2-3 Mpc across but LQGs can be 200 Mpc or more across. Based on the Cosmological Principle and the modern theory of [cosmology](#), calculations suggest that astrophysicists should not be able to find a structure larger than 370 Mpc.

Dr Clowes' newly discovered LQG however has a typical dimension of 500 Mpc. But because it is elongated, its longest dimension is 1200 Mpc (or 4 billion light years) - some 1600 times larger than the distance from the [Milky Way](#) to Andromeda.

Dr Clowes said: "While it is difficult to fathom the scale of this LQG, we can say quite definitely it is the largest structure ever seen in the entire universe. This is hugely exciting – not least because it runs counter to our current understanding of the scale of the universe.

'Even travelling at the [speed of light](#), it would take 4 billion light years to cross. This is significant not just because of its size but also because it challenges the Cosmological Principle, which has been widely accepted since Einstein. Our team has been looking at similar cases which add further weight to this challenge and we will be continuing to investigate these fascinating phenomena."

More information: [mnras.oxfordjournals.org/conte ...](https://mnras.oxfordjournals.org/content/07/mnras.sts497.full)
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arxiv.org/abs/1211.6256

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