Tight-knit trio of quasars discovered

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David Shiga, Seattle

A tight-knit trio of ultrabright objects called quasars has been discovered for the first time. Their proximity is probably not a coincidence – violent interactions between their merging host galaxies may be responsible for igniting the quasars.

Quasars are very bright, compact objects in the distant universe. Each is thought to be powered by matter heating up as it falls into a supermassive black hole at the centre of a galaxy.

Of the 100,000 known quasars, only a few dozen are close enough together to be considered binaries. Even so, that is still greater than would be expected if the quasars were distributed randomly in the sky (see *Two for one*).

Now, astronomers have found the first case of a triple quasar system, an association that is even less likely to be due to chance. The trio hints that galaxy interactions have triggered the quasar activity.

George Djorgovski of Caltech in Pasadena, US, led the discovery team. The astronomers trained the Keck Observatory atop Mauna Kea in Hawaii, US, on a previously known double quasar and discovered a faint third quasar nearby.

1 in 200 trillion

The quasars are all within about 160,000 light years of each other. This distance is more than 10 times closer than the nearest major galaxy to our own Milky Way and is typical of galaxies that are observed to be interacting violently. The astronomers have named the triple system QQQ 1432-0106.

Virginia Trimble of the University of California in Irvine, US, who was not involved in the research, says the observation does not appear to be an accidental alignment of three quasars or some other type of optical illusion. "This is presumably truly a first triple quasar," she says.

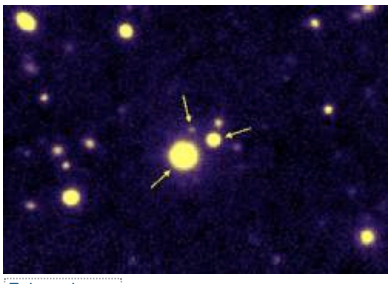
If quasar activity were not tied to galaxy interactions, and quasars were simply randomly distributed in space, the chances of observing three quasars so close together would be just 1 in 200 trillion.

The discovery of three quasars so close together confirms the theoretical picture that galaxy interactions can turn quasars on, which implies that quasars should tend to be found in pairs, trios, and multiple systems.

Chaotic dance

"When the galaxies interact, gas that is present in galaxies easily sinks to the centre, where it is gobbled by the black hole and triggers quasar activity," says Djorgovski.

Fred Rasio of Northwestern University in Illinois, US, who has done computer simulations of supermassive black hole interactions, says the black holes in this system will begin a chaotic dance about 100 million years from now.



Enlarge image

Arrows denote the three newly discovered quasars in an image by the Keck Observatory (Image: S Djorgovski et al/ Caltech/EPFL)

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By then, they will all have sunk to the middle of a single large galaxy resulting from the merger of the three original galaxies, he says.

After about a million years of complicated interactions, one black hole will be ejected from the centre of the galaxy at tremendous speed, leaving a binary black hole, he says. Such ejections always happen in simulations with three interacting black holes, which, unlike pairs of black holes, are not stable, he says: "The case of three is fundamentally different."

Watch an animation showing a trio of interacting black holes.

The results were presented on Monday at a meeting of the American Astronomical Society in Seattle, Washington, US.