



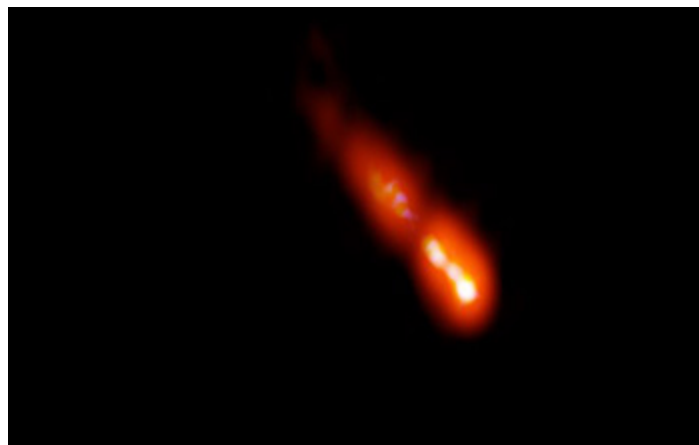
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Research News

## Glimpse of a blazar in the early universe

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Discovered with supersharp radio 'vision' of the National Science Foundation's Very Long Baseline Array



A blazar with its jet pointed toward Earth, the brightest radio-emitting blazar yet seen.

[Credit and Larger Version \(/discoveries/disc\\_images.jsp?cntn\\_id=301928&org=NSF\)](https://www.nsf.gov/discoveries/disc_images.jsp?cntn_id=301928&org=NSF)

**January 13, 2021**

The supersharp radio "vision" of the [U.S. National Science Foundation <https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=1647378&HistoricalAwards=false>](https://www.nsf.gov/awardsearch/showAward?AWD_ID=1647378&HistoricalAwards=false)'s Very Long Baseline Array has revealed previously unseen details in a jet of material ejected at three-quarters the speed of light from the core of a galaxy some 12.8 billion light-years from Earth.

The galaxy, dubbed PSO J0309+27, is a blazar, with its jet pointed toward Earth. A blazar is a feeding super-massive black hole in the heart of a distant galaxy that produces a high-energy jet viewed face-on from Earth. PSO J0309+27 is the brightest radio-emitting blazar yet seen at such a distance; it's also the second-brightest X-ray emitting blazar at such a distance.

PSO J0309+27 is viewed as it was when the universe was less than a billion years old, or just over 7% of its current age.

In this image, the brightest radio emission comes from the galaxy's core, at bottom right. The jet is propelled by the gravitational energy of a supermassive black hole at the core and moves outward, toward the upper left. The jet seen here extends some 1,600 light-years and shows structure within it.

An international team of astronomers observed the galaxy in April and May of 2020. The researchers report their results in the journal *Astronomy & Astrophysics* ([/cgi-bin/good-bye?https://www.aanda.org/articles/aa/pdf/2020/11/aa39458-20.pdf](https://www.aanda.org/articles/aa/pdf/2020/11/aa39458-20.pdf)).

"This research is important for understanding jets launched by feeding supermassive black holes," says Joseph Pesce, a program director in NSF's Division of Astronomical Sciences. "The observation allows for a more detailed assessment of differences between objects that are large distances from Earth (and in the early universe) and those relatively closer to Earth."

The [National Radio Astronomy Observatory \(/cgi-bin/good-bye?https://public.nrao.edu/news/blazar-in-the-early-universe/\)](https://public.nrao.edu/news/blazar-in-the-early-universe/) is a facility of the U.S. National Science Foundation, operated under cooperative agreement by Associated Universities, Inc.

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