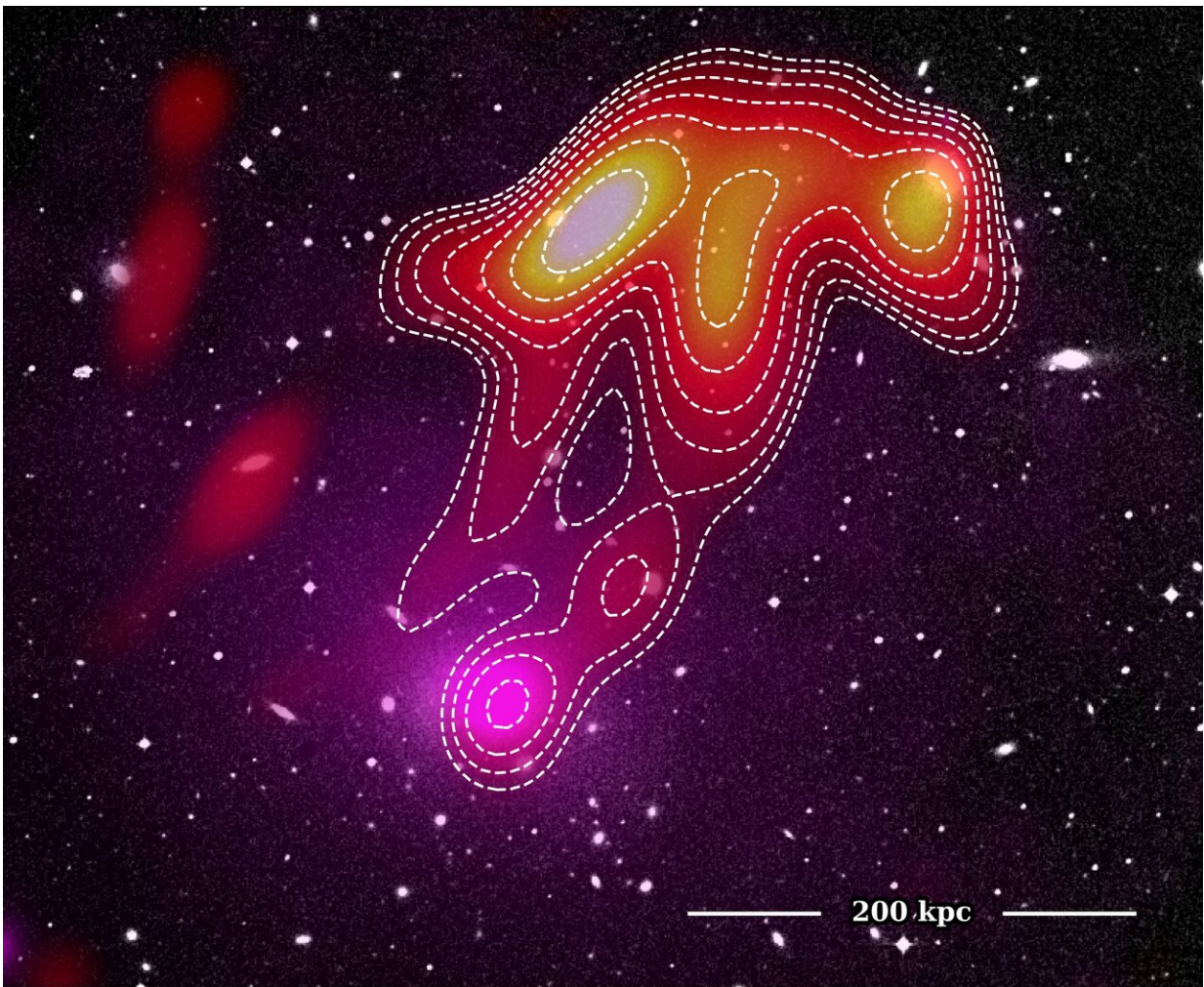


Astronomers spot a 'space jellyfish' in Abell 2877

March 18 2021, by Pete Wheeler, Vanessa Beasley



A composite image of the USS Jellyfish in Abell 2877 showing the optical Digitised Sky Survey (background) with XMM X-ray data (magenta overlay) and MWA 118 MHz radio data (red-yellow overlay). Credit: Torrance Hodgson, ICRAR/Curtin University

A radio telescope located in outback Western Australia has observed a cosmic phenomenon with a striking resemblance to a jellyfish.

Published today in the *Astrophysical Journal*, an Australian-Italian team used the Murchison Widefield Array (MWA) telescope to observe a cluster of galaxies known as Abell 2877.

Lead author and Ph.D. candidate Torrance Hodgson, from the Curtin University node of the International Centre for Radio Astronomy Research (ICRAR) in Perth, said the team observed the cluster for 12 hours at five [radio frequencies](#) between 87.5 and 215.5 megahertz.

"We looked at the data, and as we turned down the frequency, we saw a ghostly [jellyfish](#)-like structure begin to emerge," he said.

"This [radio](#) jellyfish holds a world record of sorts. Whilst it's bright at regular FM radio frequencies, at 200 MHz the emission all but disappears.

"No other extragalactic emission like this has been observed to disappear anywhere near so rapidly."

This uniquely steep spectrum has been challenging to explain. "We've had to undertake some cosmic archaeology to understand the ancient background story of the jellyfish," said Hodgson.

"Our working theory is that around 2 billion years ago, a handful of supermassive black holes from multiple galaxies spewed out powerful jets of plasma. This plasma faded, went quiet, and lay dormant.

"Then quite recently, two things happened—the plasma started mixing at

the same time as very gentle shock waves passed through the system.

"This has briefly reignited the plasma, lighting up the jellyfish and its tentacles for us to see."

The jellyfish is over a third of the Moon's diameter when observed from Earth, but can only be seen with low-frequency [radio telescopes](#).

"Most radio telescopes can't achieve observations this low due to their design or location," said Hodgson.

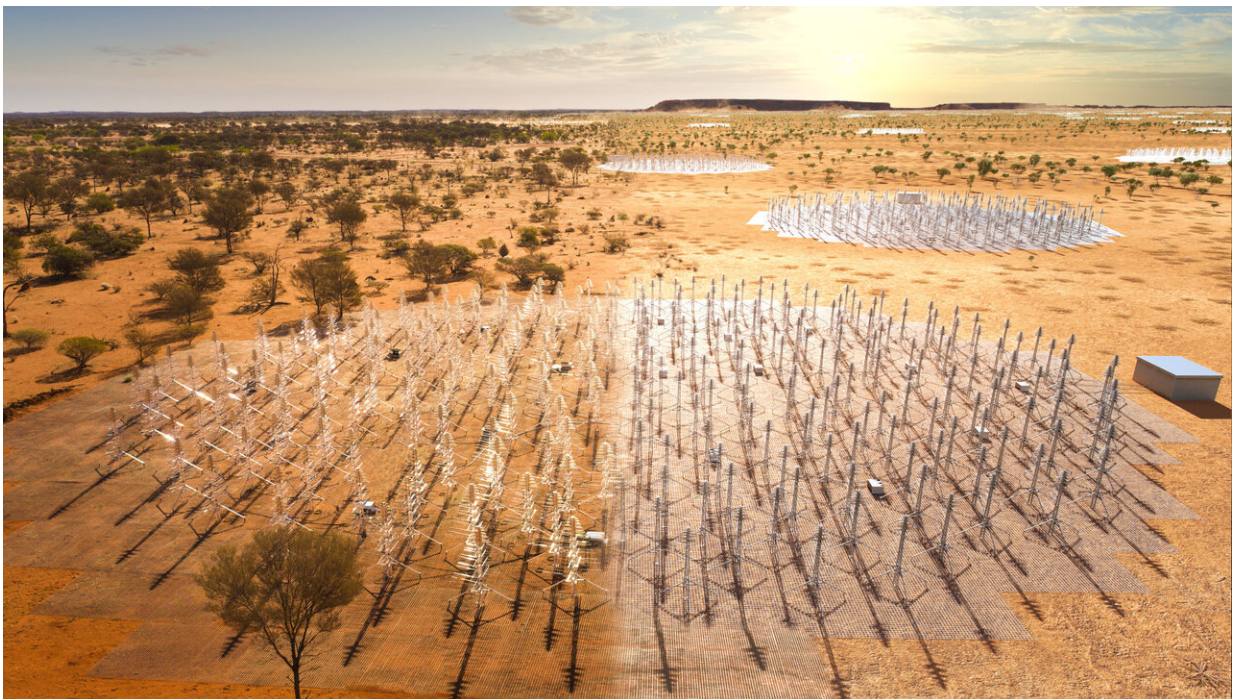


Tile 107, or “the Outlier” as it is known, is one of 256 tiles of the MWA located 1.5km from the core of the telescope. The MWA is a precursor instrument to the SKA. Credit: Pete Wheeler, ICRAR

The MWA—a precursor to the Square Kilometre Array (SKA)—is located at CSIRO's Murchison Radio-astronomy Observatory in remote Western Australia.

The site has been chosen to host the low-frequency antennas for the SKA, with construction scheduled to begin in less than a year.

Professor Johnston-Hollitt, Mr Hodgson's supervisor and co-author, said the SKA will give us an unparalleled view of the low-frequency Universe.



Composite image of the SKA-Low telescope in Western Australia. The image blends a real photo (on the left) of the SKA-Low prototype station AAVS2.0 which is already on site, with an artists impression of the future SKA-Low stations as they will look when constructed. These dipole antennas, which will number in their hundreds of thousands, will survey the radio sky in frequencies as low as 50Mhz. Credit: ICRAR and SKAO

"The SKA will be thousands of times more sensitive and have much better resolution than the MWA, so there may be many other mysterious radio jellyfish waiting to be discovered once it's operational.

"We're about to build an instrument to make a high resolution, fast frame-rate movie of the evolving radio Universe. It will show us from the first stars and galaxies through to the present day," she said.

"Discoveries like the jellyfish only hint at what's to come, it's an exciting time for anyone seeking answers to fundamental questions about the cosmos."

More information: Torrance Hodgson et al. Ultra-steep-spectrum Radio "Jellyfish" Uncovered in A2877, *The Astrophysical Journal* (2021). [DOI: 10.3847/1538-4357/abe384](https://doi.org/10.3847/1538-4357/abe384)

Provided by CSIRO

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