

Outback telescope captures Milky Way center, discovers remnants of dead stars

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A new view of the Milky Way from the Murchison Widefield Array, with the lowest frequencies in red, middle frequencies in green, and the highest frequencies in blue. Huge golden filaments indicate enormous magnetic fields, supernova remnants are visible as little spherical bubbles, and regions of massive star formation show up in blue. [The supermassive black hole at the centre of our galaxy is hidden in the bright white region in the centre.] Credit: Dr Natasha Hurley-Walker (ICRAR/Curtin) and the GLEAM Team

A radio telescope in the Western Australian outback has captured a spectacular new view of the center of the Milky Way galaxy. The image



from the Murchison Widefield Array (MWA) telescope shows what our galaxy would look like if human eyes could see radio waves.

Astrophysicist Dr. Natasha Hurley-Walker, from the Curtin University node of the International Centre for Radio Astronomy Research (ICRAR), created the images using the Pawsey Supercomputing Centre in Perth. "This new view captures low-frequency radio emission from our galaxy, looking both in fine detail and at larger structures," she said. "Our images are looking directly at the middle of the Milky Way, towards a region astronomers call the galactic center."

The data for the research comes from the GaLactic and Extragalactic Allsky MWA survey, or GLEAM for short. The survey has a resolution of two arc minutes (about the same as the human eye) and maps the sky using <u>radio waves</u> at frequencies between 72 and 231 MHz (FM radio is near 100 MHz).

"It's the power of this wide frequency range that makes it possible for us to disentangle different overlapping objects as we look toward the complexity of the galactic center," Dr. Hurley-Walker said.



The 27 newly-discovered supernova remnants--the remains of stars that ended



their lives in huge stellar explosions thousands to hundreds of thousands of years ago. The radio images trace the edges of the explosions as they continue their ongoing expansion into interstellar space. [Some are huge, larger than the full moon, and others are small and hard to spot in the complexity of the Milky Way.] Credit: Dr Natasha Hurley-Walker (ICRAR/Curtin) and the GLEAM Team.

"Essentially, different objects have different 'radio colors,' so we can use them to work out what kind of physics is at play."

Using the images, Dr. Hurley-Walker and her colleagues discovered the remnants of 27 massive stars that exploded in supernovae at the end of their lives. These stars would have been eight or more times more massive than our sun before their dramatic destruction thousands of years ago.

Younger and closer supernova remnants, or those in very dense environments, are easy to spot, and 295 are already known. Unlike other instruments, the MWA can find those which are older, further away, or in very empty environments.





This 28 image photomosaic captures the arch of the milky way over the Guilderton Lighthouse in Western Australia, and the Large and Small Magellanic Clouds. The location of a supernova that would have exploded 9,000 years ago and been visible in the night sky is shown in the image. Credit: Paean Ng / Astrordinary Imaging

Dr. Hurley-Walker said one of the newly discovered supernova remnants lies in such an empty region of space, far out of the plane of our galaxy, and so despite being quite young, is also very faint. "It's the remains of a star that died less than 9,000 years ago, meaning the explosion could have been visible to Indigenous people across Australia at that time," she said.

An expert in cultural astronomy, Associate Professor Duane Hamacher from the University of Melbourne, said some Aboriginal traditions do describe bright new stars appearing in the sky, but we don't know of any definitive traditions that describe this particular event. "However, now that we know when and where this supernova appeared in the sky, we



can collaborate with Indigenous elders to see if any of their traditions describe this cosmic event. If any exist, it would be extremely exciting," he said.

Dr. Hurley-Walker said two of the supernova remnants discovered are quite unusual "orphans," found in a region of sky where there are no <u>massive stars</u>, which means future searches across other such regions might be more successful than astronomers expected. Other supernova remnants discovered in the research are very old, she said. "This is really exciting for us, because it's hard to find supernova remnants in this phase of life—they allow us to look further back in time in the Milky Way."

The MWA telescope is a precursor to the world's largest <u>radio</u> telescope, the Square Kilometre Array, which is due to be built in Australia and South Africa from 2021. "The MWA is perfect for finding these objects, but it is limited in its sensitivity and resolution," Dr. Hurley-Walker said. "The low-frequency part of the SKA, which will be built at the same site as the MWA, will be thousands of times more sensitive and have much better resolution, so should find the thousands of <u>supernova</u> remnants that formed in the last 100,000 years, even on the other side of the Milky Way."

More information: 'New candidate radio supernova remnants detected in the GLEAM survey over 345° www.icrar.org/wp-content/uploa ... etected_in_GLEAM.pdf

'Candidate radio supernova remnants observed by the GLEAM survey over 345° www.icrar.org/wp-content/uploa ... /gleam-survey-ii.pdf

'GaLactic and Extragalactic All-sky Murchison Widefield Array (GLEAM) survey II: Galactic Plane 345° www.icrar.org/wpcontent/uploa ... erved_by_GLEAM-1.pdf



Provided by International Centre for Radio Astronomy Research

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