EMU discovery of an X-ray Binary associated with a new Galactic supernova remnant G289.6+5.8

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WHAT IS THE EMU PROJECT?

Evolutionary Map of the Universe (EMU) is a new-generation radio survey conducted with the Australian Square Kilometre Array telescope Pathfinder (ASKAP), located in remote Western Australia. Covering the entire Southern sky, EMU aims to create the most sensitive atlas of continuum radio emission ever made (15”x15”). The survey is obtained at a central frequency of 944MHz.

WHAT ARE X-RAY BINARIES?

X-ray binaries are a type of binary star system in which one of the stars is a compact object, such as a neutron star or a black hole, while the other is a normal star like our Sun. The compact object accretes matter from its companion star, and as this matter spirals inwards, it forms an accretion disk around the compact object (Fig 1). The intense gravitational forces involved in this process heat up the accretion disk to extremely high temperatures, causing it to emit X-rays.

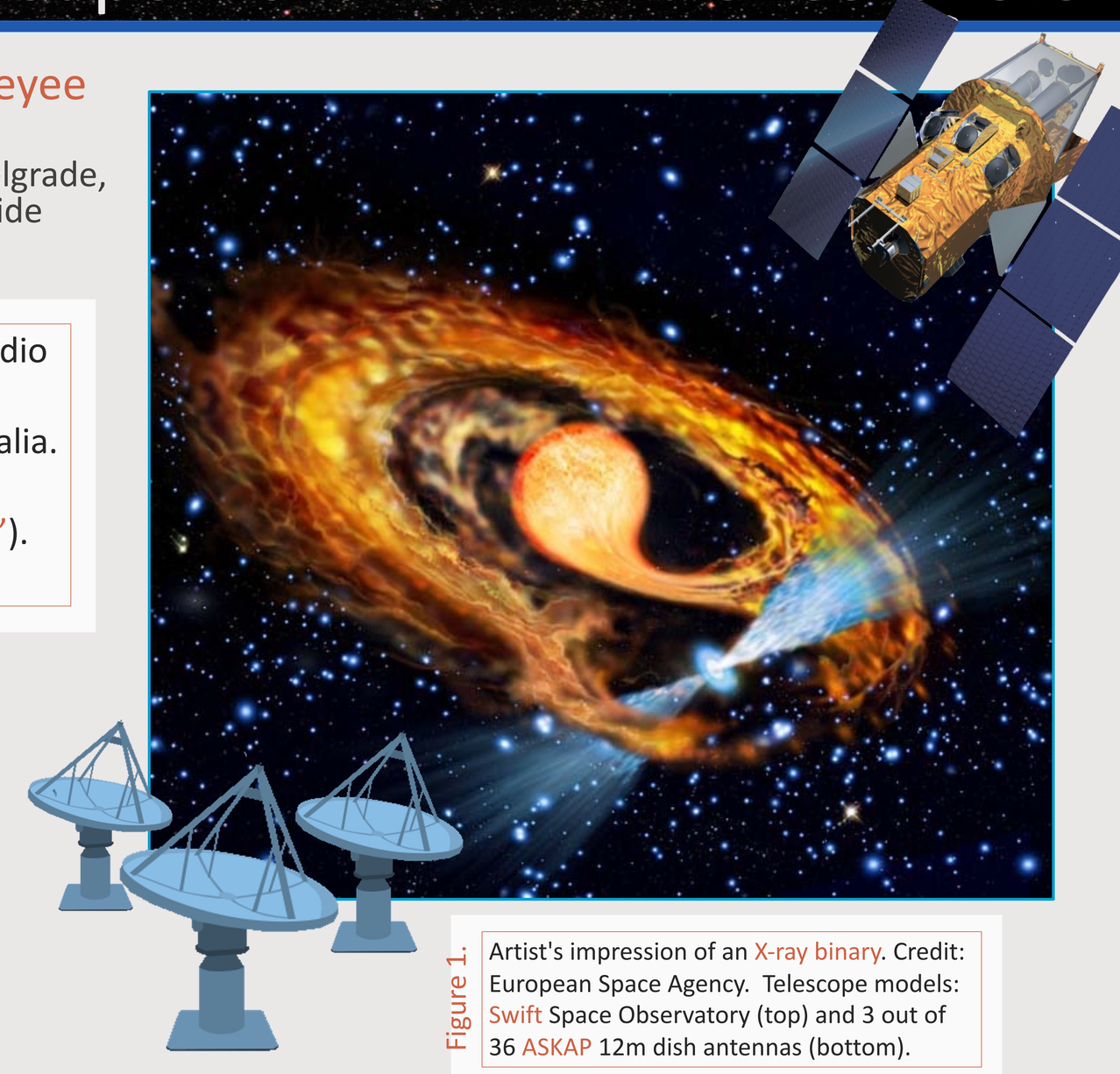

Figure 1. Artist's impression of an X-ray binary. Credit: European Space Agency. Telescope models: Swift Space Observatory (top) and 3 out of 36 ASKAP 12m dish antennas (bottom).

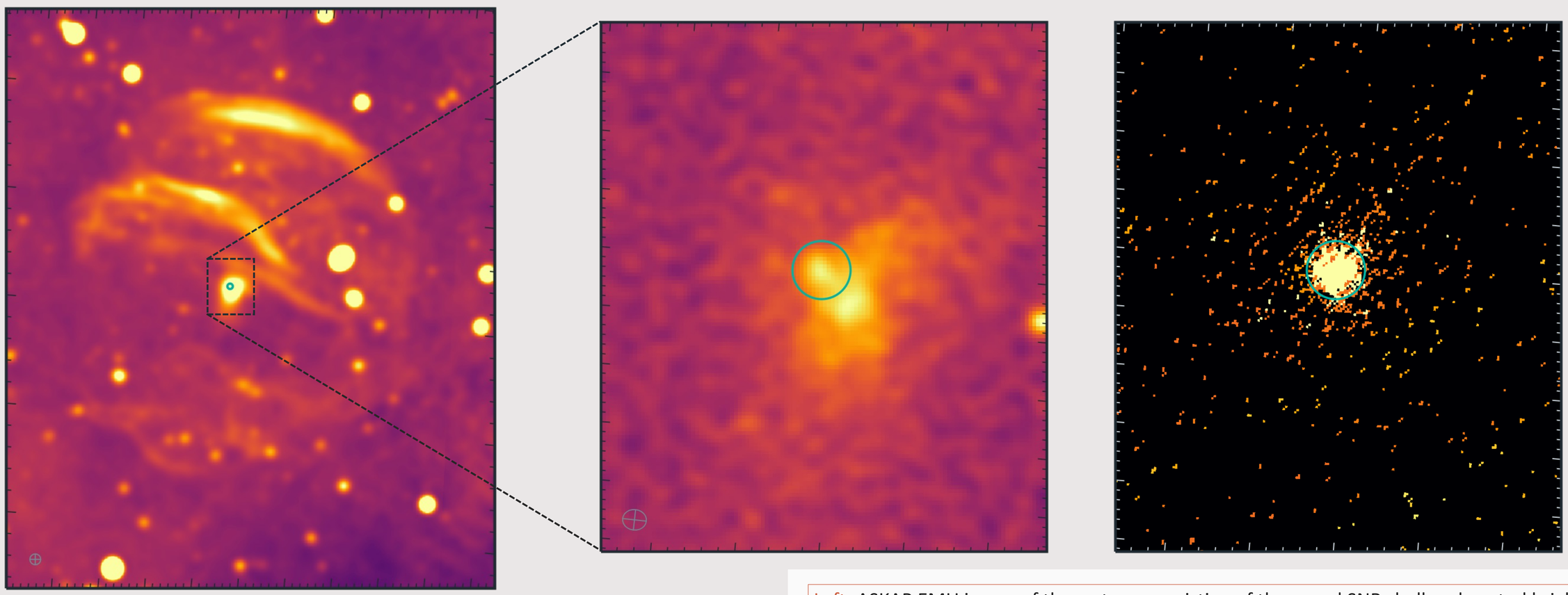

Figure 2. Left: ASKAP EMU image of the system, consisting of the round SNR shell and central bright emission. Middle: Zoom-in view of the central region, showing a point-like source with extended diffuse emission. Right: Swift image of the same area as the middle, indicating a hard X-ray source that coincides with the radio point source (marked with the cyan circle in all three images).

WHAT HAVE WE DISCOVERED?

Using EMU data, we discovered an X-ray binary system associated with a previously unknown supernova remnant (SNR) G289.6+5.8. Located high above the Galactic plane, the SNR has expanded within a low-density environment, preserving the characteristic circular shape. The central complex emission coincides with a hard X-ray source (known from the SWIFT legacy), suggesting a millisecond pulsar as the compact object (Fig 2).

WHY IS THAT IMPORTANT?

X-ray binaries associated with SNRs are exceptionally rare, and this object provides a unique cosmic laboratory for the investigation of binary system formation and its survival under the extreme conditions of a supernova's explosion.

References:

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