Astronomers have studied the remains of a fatal interaction between a dead star and its asteroid supper in detail for the first time, giving us a glimpse of the distant fate of the Solar System. The international team, who used the Very Large Telescope (VLT) at the European Southern Observatory’s Paranal site in Chile, publishes its work in Monthly Notices of the Royal Astronomical Society.

"When we discovered this debris disc orbiting the white dwarf back in 2006, we could not have imagined the exquisite details that are now visible in this image," explained Manser.

The new long-term study with the VLT has also now enabled the team to make the first detailed map of the structure of the glowing gaseous remains of the dead star’s meal orbiting J1228+1040. While large stars — those more massive than around ten times the mass of the Sun — suffer a spectacularly violent climax as a supernova explosion at the ends of their lives, smaller stars are spared such dramatic fates. When stars like the Sun come to the ends of their lives they exhaust their fuel, expand as red giants and later expel their outer layers into space. The hot and very dense core of the former star — a white dwarf — is all that remains.

Remnants such as J1228+1040 can provide key clues to understanding the processes that occur in planetary systems, and even forecast the fate of the Solar System when the Sun meets its demise in about seven billion years’ time.

This artist’s impression shows how an asteroid torn apart by the strong gravity of a white dwarf has formed a ring of dust particles and debris orbiting the Earth-sized burnt out stellar core SDSS J1228+1040. Gas produced by collisions within the disc is detected in observations obtained over twelve years with ESO’s Very Large Telescope, and reveal a narrow glowing arc. Credit: Mark Garlick (http://www.markgarlick.com) and University of Warwick/ESO. Click for a larger image
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More information

This research appears in “Doppler-imaging of the planetary debris disc at the white dwarf SDSS J122859.93+104032.9”, C. Manser et al., Monthly Notices of the Royal Astronomical Society, Oxford University Press, in press. Download a preprint of the paper here.

The team is composed of Christopher Manser (University of Warwick, UK), Boris Gaensicke (University of Warwick), Tom Marsh (University of Warwick), Dimitri Veras (University of Warwick, UK), Detlev Koester (University of Kiel, Germany), Elmé Breedt (University of Warwick), Anna Pala (University of Warwick), Steven Parsons (Universidad de Valparaiso, Chile) and John Southworth (Keele University, UK).

See the full ESO press release for full size images and videos.

Notes for editors

The European Southern Observatory, ESO, is the foremost intergovernmental astronomy organisation in Europe and the world’s most productive ground-based astronomical observatory by far. It is supported by 16 countries: Austria, Belgium, Brazil, the Czech Republic, Denmark, France, Finland, Germany, Italy, the Netherlands, Poland, Portugal, Spain, Sweden, Switzerland and the United Kingdom, along with the host state of Chile. ESO carries out an ambitious programme focused on the design, construction and operation of powerful ground-based observing facilities enabling astronomers to make important scientific discoveries. ESO also plays a leading role in promoting and organising cooperation in astronomical research. ESO operates three unique world-class observing sites in Chile: La Silla, Paranal and Chajnantor. At Paranal, ESO operates the Very Large Telescope, the world’s most advanced visible-light astronomical observatory and two survey telescopes. VISTA works in the infrared and is the world’s largest survey telescope and the VLT Survey Telescope is the largest telescope designed to exclusively survey the skies in visible light. ESO is a major partner in ALMA, the largest astronomical project in existence. And on Cerro Armazones, close to Paranal, ESO is building the 39-metre European Extremely Large Telescope, the E-ELT, which will become “the world’s biggest eye on the sky”.

The Royal Astronomical Society (RAS), founded in 1820, encourages and promotes the study of astronomy, solar-system science, geophysics and closely related branches of science. The RAS organizes scientific meetings, publishes international research and review journals, recognizes outstanding achievements by the award of medals and prizes, maintains an extensive library, supports education through grants and outreach activities and represents UK astronomy nationally and internationally. Its more than 3900 members (Fellows), a third based overseas, include scientific researchers in universities, observatories and laboratories as well as historians of astronomy and others.

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