Watching a Cannibal Galaxy Dine

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This image of the central parts of Centaurus A reveals the parallelogram-shaped remains of a smaller galaxy that was gulped down about 200 to 700 million years ago. The image is based on data collected with the SOFI instrument on ESO's New Technology Telescope at La Silla. The original image, obtained by observing in the near-infrared through three different filters (J, H and K) was specially processed to look through the dust, providing a clear view of the center. The field of view is about 4 x 4 arcminutes. Credit: ESO/Y. Beletsky

(PhysOrg.com) -- A new technique using near-infrared images, obtained with ESO's 3.58-metre New Technology Telescope (NTT), allows astronomers to see through the opaque dust lanes of the giant cannibal galaxy Centaurus A, unveiling its "last meal" in unprecedented detail -- a smaller spiral galaxy, currently twisted and warped. This amazing image

also shows thousands of star clusters, strewn like glittering gems, churning inside Centaurus A.

Centaurus A (NGC 5128) is the nearest giant, elliptical galaxy, at a distance of about 11 million light-years. One of the most studied objects in the southern sky, by 1847 the unique appearance of this galaxy had already caught the attention of the famous British astronomer John Herschel, who catalogued the southern skies and made a comprehensive list of nebulae.

Herschel could not know, however, that this beautiful and spectacular appearance is due to an opaque dust lane that covers the central part of the galaxy. This dust is thought to be the remains of a cosmic merger between a giant elliptical galaxy and a smaller spiral galaxy full of dust.

Between 200 and 700 million years ago, this galaxy is indeed believed to have consumed a smaller spiral, gas-rich galaxy — the contents of which appear to be churning inside Centaurus A's core, likely triggering new generations of stars.

First glimpses of the "leftovers" of this meal were obtained thanks to observations with the ESA Infrared Space Observatory , which revealed a 16 500 light-year-wide structure, very similar to that of a small barred galaxy. More recently, NASA's Spitzer Space Telescope resolved this structure into a parallelogram, which can be explained as the remnant of a gas-rich spiral galaxy falling into an elliptical galaxy and becoming twisted and warped in the process. Galaxy merging is the most common mechanism to explain the formation of such giant elliptical galaxies.

The new SOFI images, obtained with the 3.58-metre New Technology Telescope at ESO's La Silla Observatory, allow astronomers to get an even sharper view of the structure of this galaxy, completely free of obscuring dust. The original images, obtained by observing in the near-

infrared through three different filters (J, H, K) were combined using a new technique that removes the dark, screening effect of the dust, providing a clear view of the centre of this galaxy.

What the astronomers found was surprising: "There is a clear ring of stars and clusters hidden behind the dust lanes, and our images provide an unprecedentedly detailed view toward it," says Jouni Kainulainen, lead author of the paper reporting these results. "Further analysis of this structure will provide important clues on how the merging process occurred and what has been the role of star formation during it."

The research team is excited about the possibilities this new technique opens: "These are the first steps in the development of a new technique that has the potential to trace giant clouds of gas in other galaxies at high resolution and in a cost-effective way," explains co-author João Alves. "Knowing how these giant clouds form and evolve is to understand how stars form in galaxies."

Looking forward to the new, planned telescopes, both on the ground and in space, "this technique is very complementary to the radio data ALMA will collect on nearby galaxies, and at the same time it poses interesting avenues of research for extragalactic stellar populations with the future European Extremely Large Telescope and the James Webb Space Telescope, as dust is omnipresent in galaxies," says co-author Yuri Beletsky.

Previous observations done with ISAAC on the VLT have revealed that a supermassive black hole lurks inside Centaurus A. Its mass is about 200 million times the mass of our Sun, or 50 times more massive than the one that lies at the centre of our Milky Way. In contrast to our own galaxy, the supermassive black hole in Centaurus A is continuously fed by material falling onto into it, making the giant galaxy a very active one. Centaurus A is in fact one of the brightest radio sources in the sky

(hence the "A" in its name). Jets of high energy particles from the centre are also observed in radio and X-ray images.

The new image of Centaurus A is a wonderful example of how frontier science can be combined with aesthetic aspects. Fine images of Centaurus A have been obtained in the past with ESO's Very Large Telescope and with the Wide Field Imager on the MPG/ESO 2.2-metre telescope at La Silla.

More information: This research was presented in a paper in *Astronomy and Astrophysics* (vol. 502): "Uncovering the kiloparsec-scale stellar ring of NGC5128", by J.T. Kainulainen et al. www.aanda.org/10.1051/0004-6361/200912624

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