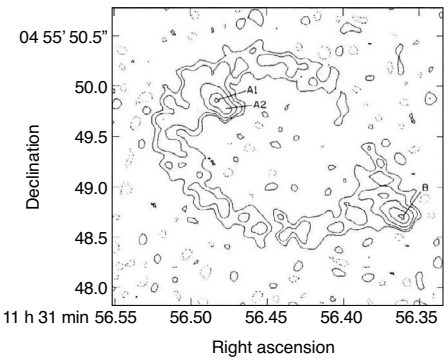
GALAXIES

Revisiting an old friend

Astrophys. J. Lett. **895**, L38 (2020)



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Einstein rings are perhaps gravity's most spectacular manifestations, with light from a background source being bent as it passes close to a foreground massive object. Daniel Stern and Dominic Walton take a stroll down memory lane to revisit the first-ever Einstein ring, discovered in 1988 by Jacqueline Hewitt (pictured, at radio frequencies). By analysing archival optical and X-ray data, the authors make a precise measurement of the lensed galaxy's redshift and reveal it to be an obscured quasar.

The (re)analysis of optical spectra from the Keck telescope reveals two narrow emission lines, which the authors identify as [C III] and He II. These high-ionization narrow lines are typical for obscured quasars, and pinpoint the redshift of this source to $z = 1.849 \pm 0.002$. Stern and Walton also analyse archival X-ray observations from Chandra that clearly reveal two X-ray images of the lensed quasar. Multiple images were originally seen in radio (A1+A2 and B in the figure). By modelling its X-ray spectrum, the authors calculate a photon index ($\Gamma = 1.7^{+0.4}_{-0.3}$) and column density ($N_{\rm H} = 3.0^{+1.7}_{-1.5} \times 10^{22}$ cm^{-2}) that are typical of this kind of source.

With an accurate distance at hand, the authors note that the lensed galaxy appears more luminous in the X-rays than expected from its mid-infrared luminosity. Due to lensing magnification, Stern and Walton propose this X-ray excess as a way to identify candidate lensed active galaxies in wide-area X-ray surveys like the one currently performed by eROSITA. The derived redshift opens the door to a multitude of possibilities for following up this rare lensed obscured quasar and for precise modelling of the lens system as a whole.

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Published online: 13 July 2020
https://doi.org/10.1038/s41550-020-1154-8