



# Chandra Science Highlight

## Giant X-ray Light Echo from Flaring Neutron Star Circinus X-1



**Scale:**  
Image is 34 arcmin across (about  
300 light years)

**Distance Estimate:**  
31,000 light years

Chandra image of Circinus X-1 taken after a bright flare.

Four separate rings of dust scattering echoes due to four separate interstellar dust clouds are visible in the image. Red, green and blue colors correspond to low (1-2 keV), medium (2-3 keV) and high (3-5 keV) X-ray energies, respectively. The sharp edges are caused by the large size of the X-ray rings relative to the field-of-view of the Chandra detectors, providing only partial coverage.

- ❑ Circinus X-1 exhibited a bright X-ray flare in late 2013. Follow-up observations with Chandra and XMM-Newton from 40 to 80 days after the flare revealed a bright X-ray light echo in the form of four well-defined rings with radii from 5 to 13 arcminutes, growing in radius with time.
- ❑ Radio data from the Mopra radio telescope in Australia show several intervening clouds of dust and gas along the line of sight.
- ❑ The light echoes are produced by X-rays bouncing off the clouds and arriving at Earth from different angles.
- ❑ Observations of the sizes of the rings at a known time after the flare provide the distance to the source, and an accurate estimate of the energy in the flare.

**Reference:** Heinz, S. et al, 2015, ApJ accepted, arXiv:1506.06142

**Credit:** X-ray: NASA/CXC/Univ. of Wisconsin-Madison/S.Heinz et al;  
Optical: DSS

**Instrument:** Chandra ACIS Observation

**CXC Operated for NASA by the  
Smithsonian Astrophysical Observatory**



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