



Chandra Science Highlight

M33 X-7: Heaviest Stellar Black Hole Discovered in Nearby Galaxy



Chandra X-ray Observatory ACIS image.

Scale: inset image is 0.95 arcmin across.

Estimated distance: 2.6 million light years

Credit: Illustration: NASA/CXC/M.Weiss; X-ray: NASA/CXC/CfA/P.Plucinsky et al.; Optical: NASA/STScI/SDSU/J.Orosz et al.

The artist's representation shows M33 X-7, an X-ray source that is part of a binary star system in the nearby galaxy M33. Gas flowing from the blue companion star is captured in a disk around a black hole. As the gas spirals toward the black hole, it is heated to temperatures ~ 10 MK, producing X-rays. The inset shows a composite of data from NASA's Chandra X-ray Observatory (blue) and the Hubble Space Telescope. The bright objects in the inset image are young, massive stars around M33 X-7, and the bright, blue Chandra source is the M33 X-7 system.

- M33 X-7 orbits a companion star that eclipses the black hole every three and a half days. Data from Chandra and the Gemini optical telescope led to the determination of a mass of the black hole and its companion star.
- The mass of M33 X-7 is 15.7 solar masses, making it the most massive known stellar black hole.
- The companion star also has an unusually large mass, 70 times that of the Sun, making it the most massive companion star in a binary system containing a black hole.
- The properties of the M33 X-7 binary stem – a massive black hole in a close orbit around a massive companion star – require that before it exploded, the black hole's progenitor star must have shed gas at a rate about 10 times less than predicted by current theoretical models.

Reference: J. Orosz, et al. 2007, Nature, 449, 872