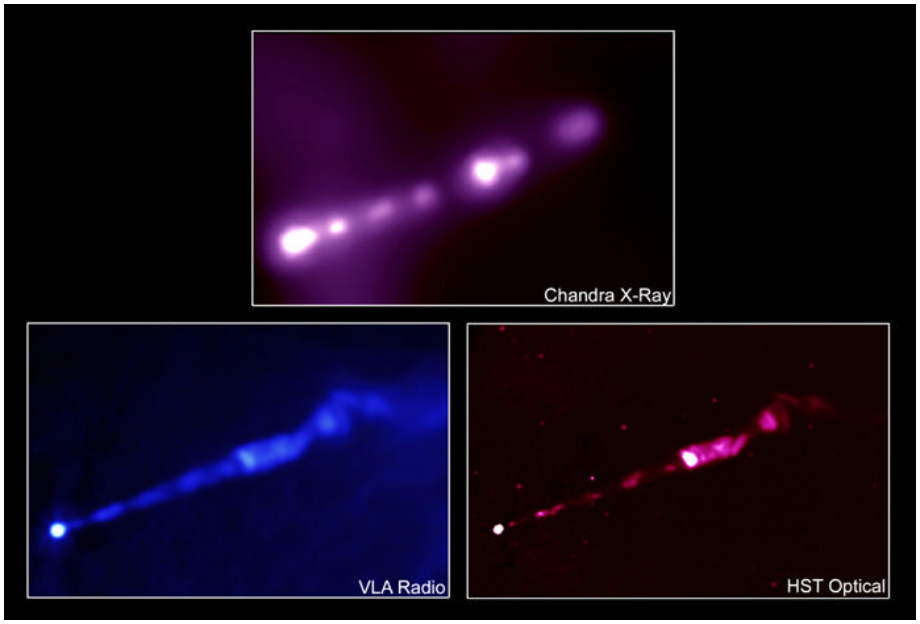
Chandra Science Highlights

M87 Jet: A jet in a giant elliptical galaxy about 50 million light years from Earth in the constellation Virgo



Scale: 25 arcsec along the jet

The Chandra image (top) shows the bright nucleus of M87 (extreme left) where a supermassive black hole resides, and a "knotty" X-ray jet extending outward. The Very Large Array radio image of the jet (lower left) and the Hubble optical image (lower right), show a similar structure in the jet. Detailed Chandra data suggest that the jet is produced by strong electromagnetic forces created by matter swirling toward the supermassive black hole. Inside the jet, shock waves produce high-energy electrons that radiate as they spiral around the magnetic field, creating the observed radio, optical and X-ray knots.

Credit: (X-ray) NASA/CXC/MIT/H. Marshall et al.; (Optical) NASA/STScI/UMBC/E. Perlman et al; (Radio) NSF/NRAO/VLA

Reference: H. Marshall et al "A High Resolution X-ray Image of the Jet in M87", http://xxx.lanl.gov/abs/astro-ph/0109160

Chandra X-ray Observatory ACIS/HETG Image; total exposure time: 10.6 hours

- The X-ray spectrum of the jet is consistent with synchrotron radiation from high energy electrons spiraling in a magnetic field. The electrons have energies of a few trillion electron volts.
- The Chandra X-ray image shows evidence for emission outside the bright knots, in contrast to the optical Hubble Space Telescope image.
- The X-ray flux and spectrum from the galactic nucleus are consistent with synchrotron radiation from an unresolved small scale jet rather than accretion onto a supermassive black hole.
- The X-ray luminosity of the jet is $L = 4.4 \times 10^{44}$ erg/s, about 1.6 times as great as the luminosity of the galactic nucleus.

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