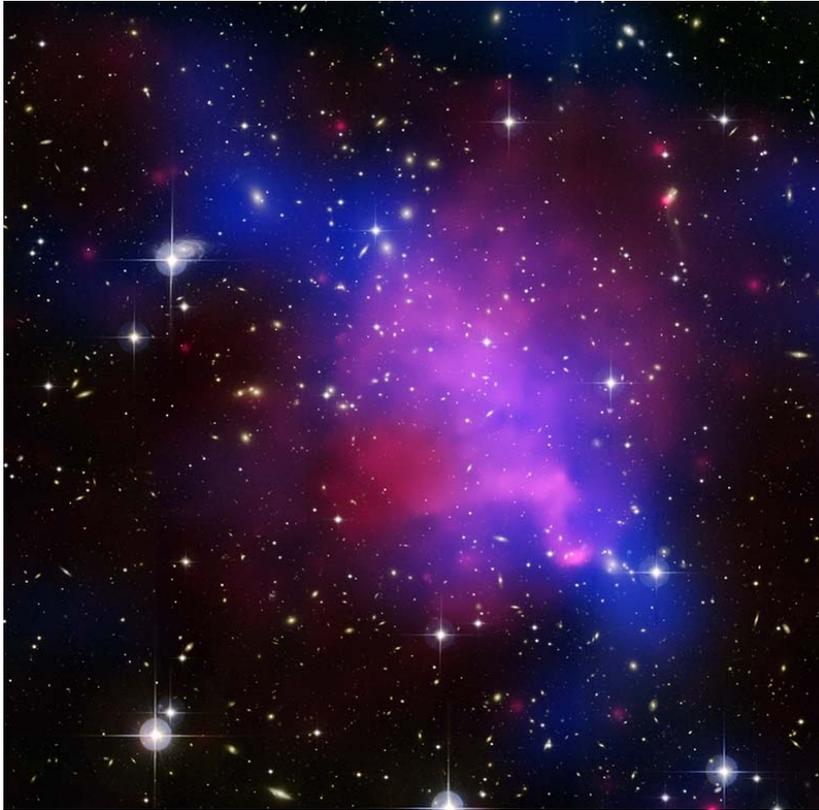




Chandra Science Highlight

Galaxy Cluster Abell 520:

DARK CLUSTER CORE DEEPENS DARK MATTER MYSTERY



Chandra X-ray Observatory ACIS image. Scale: 9.25x9.25 arcmin
Distance Estimate: Approximately 2.4 billion ly

Credit: X-ray: NASA/CXC/Univ. of Victoria/A. Mahdavi;
Optical: CFHT/CNOC; Map: Univ. of Victoria/A. Mahdavi

This composite image of Abell 520 shows the three main components of a galaxy cluster: individual galaxies composed of billions of stars (white), hot gas in between the galaxies (purple), and dark matter (blue), a mysterious substance that dominates the cluster mass and can be detected only through its gravitational effects. Here the concentration of dark matter is mapped indirectly through its subtle light-bending effects on distance galaxies.

- The cluster is undergoing a violent merger, with two sub-clusters colliding at high speeds.
- The image reveals two remarkable features not detected in other clusters: a central core of dark matter that contains hot gas, but is largely devoid of galaxies, and a corresponding region about 1.6 million light years away (below the foreground stars at the about 10 o'clock) that contains galaxies and hot gas, but little dark matter.
- Two possible explanations for these features are (1) that the galaxies were separated from the dark matter through a complex set of gravitational “slingshots,” or (2) that dark matter is affected not only by gravity, but also by an as-yet-unknown interaction between dark matter particles.

Reference: A. Mahdavi, et al, 2007, ApJ (accepted),
also arXiv: 07-6-3048v1 [astro-ph]