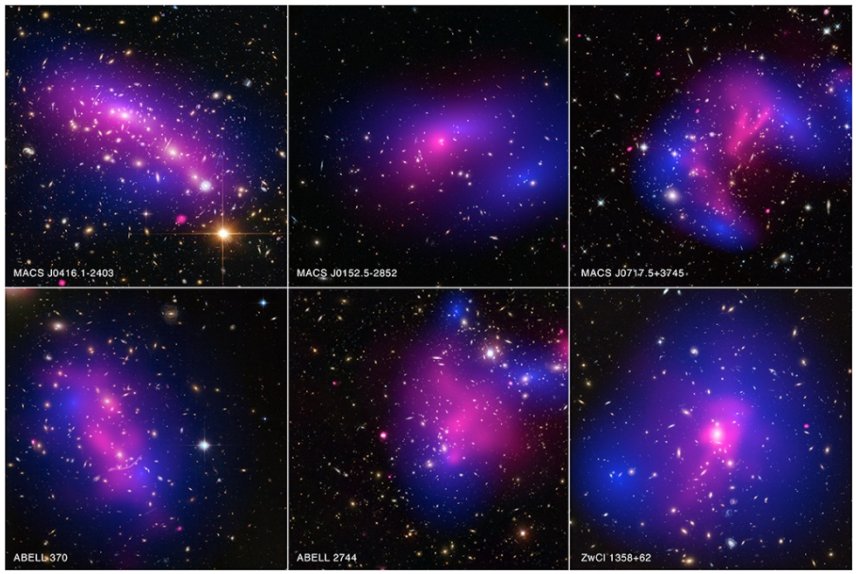
Chandra Science Highlight

Dark Matter Interactions in Colliding Galaxy Clusters



This panel of images represents a study of 72 colliding galaxy clusters conducted by a team of astronomers using NASA's Chandra X-ray Observatory and Hubble Space Telescope. The X-ray data are shown in pink, the optical light from the galaxies is shown in red, green, and blue, and the distribution of dark matter, deduced from a study of distortion of background galaxies by gravitational lensing, is shown as the blue clouds.

- Collisions between galaxy clusters provide a measure of the non-gravitational forces acting on matter.
- The drag force between colliding clouds of baryons separates them from stars in galaxies.
- The position of the dark mass is observed to remain closely aligned with the associated stars.
- The implied dark matter cross section is $<0.47\ cm^2/g$, disfavoring some proposed extensions of the standard model for particle physics.

Scale:
Various, ranging from 3.8 million light years (A2744) to 7.6 million light years for MACS J0717.5+3745.

Distance Estimate:
Various, ranging from 3.64 billion light years (redshift z = 0.308) for Abell 2744, to 5.58 billion light years (z = 0.546) for MACS J0717.5+3745.

Reference: D. Harvey et al, Science, 347, 1462-1465 (2015)

Credit: X-ray: NASA/CXC/Ecole Polytechnique Federale de Lausanne, Switzerland/D.Harvey & NASA/CXC/Durham Univ/R.Massey; Optical & Lensing Map: NASA, ESA, D. Harvey (Ecole Polytechnique Federale de Lausanne, Switzerland) and R. Massey (Durham University, UK)

Instrument: Chandra ACIS Observation

CXC Operated for NASA by the Smithsonian Astrophysical Observatory

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