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X-ray Analysis of Merging Elliptical Galaxies

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Introduction

- Analyze features of merging elliptical galaxies, using Chandra's X-ray analysis software, CIAO.

- Understand the high energy properties of the merging sequence

- Create a sequence for merging ellipticals using X-ray and optical images.

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Elliptical Galaxies

Image Credit: SDSS

- No new star formation
- Red color
- Tends to be found in clusters and groups

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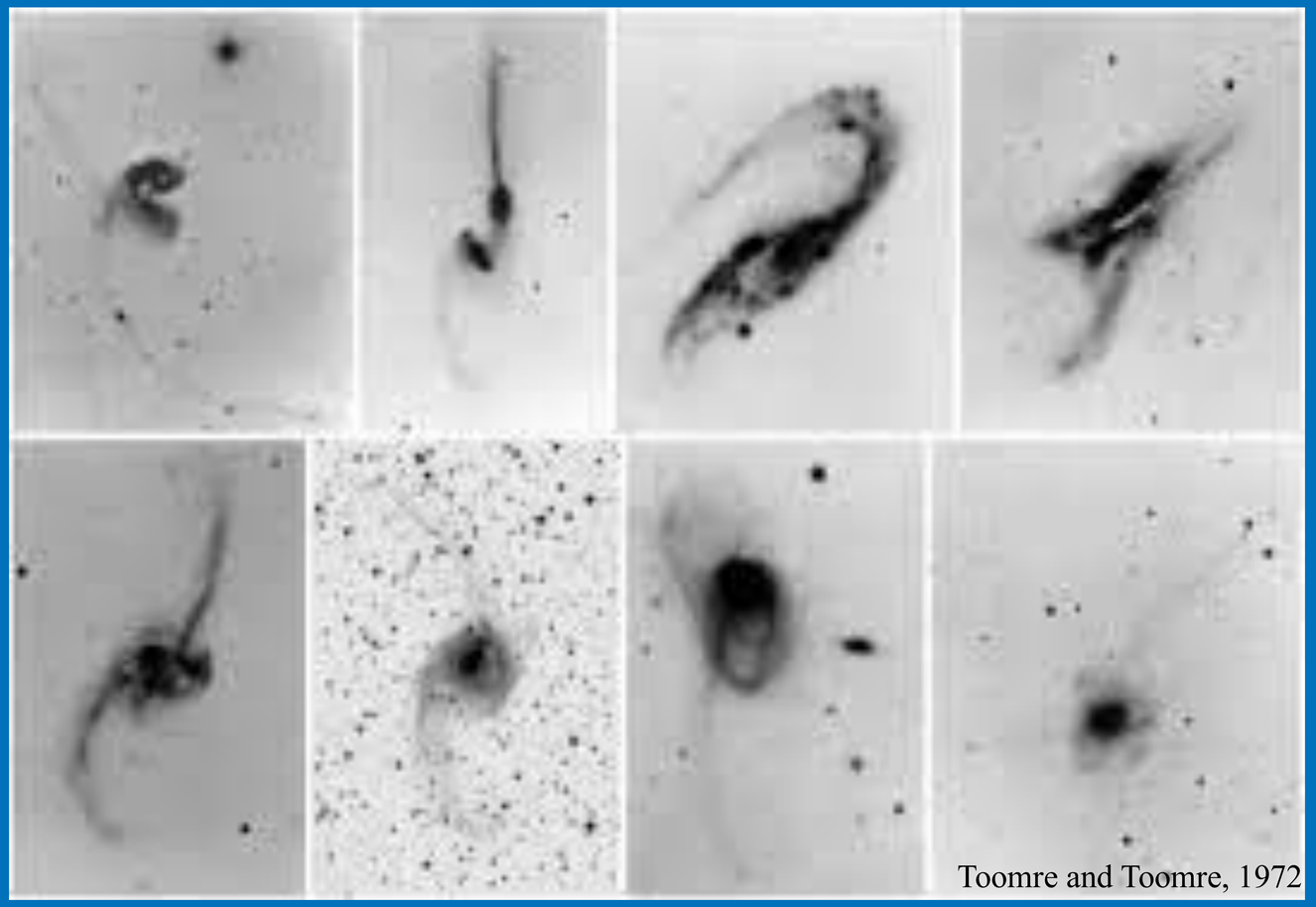
Toomre Sequence



Toomre and Toomre, 1972

- The Toomre sequence is the standard cycle for spiral galaxy mergers

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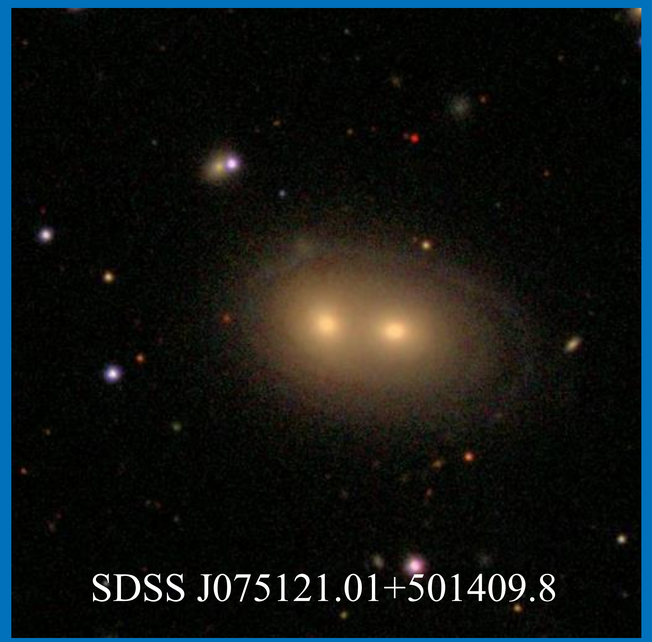
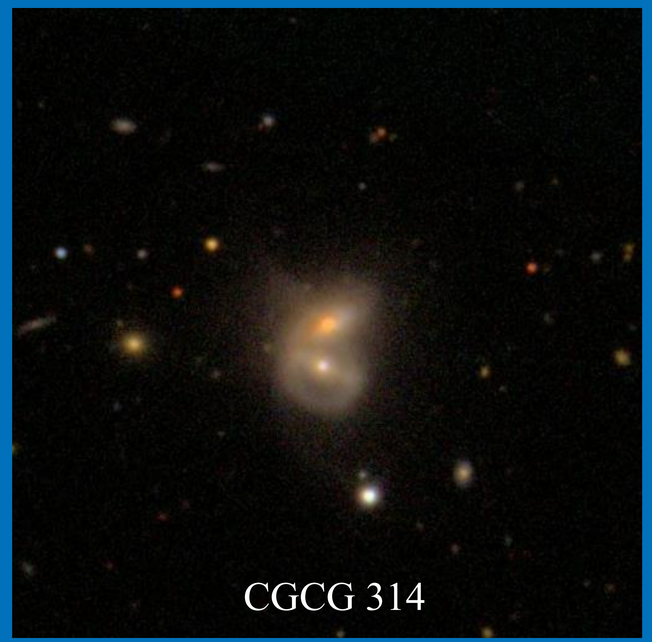
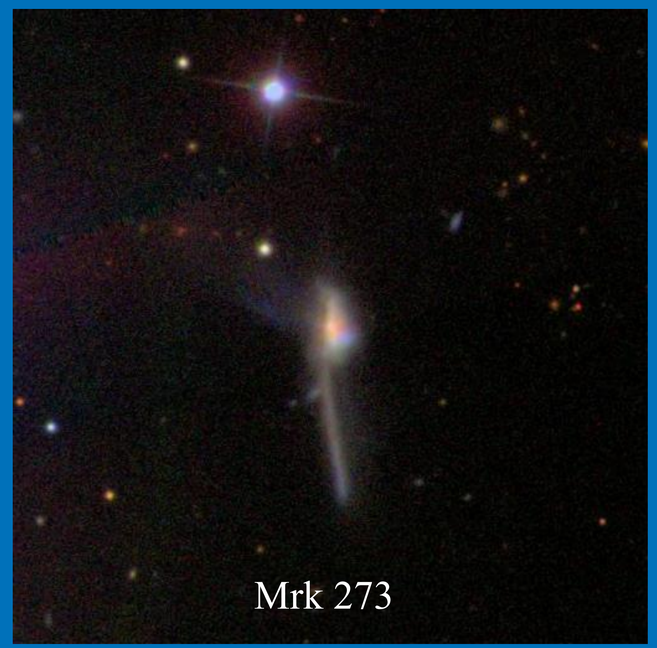
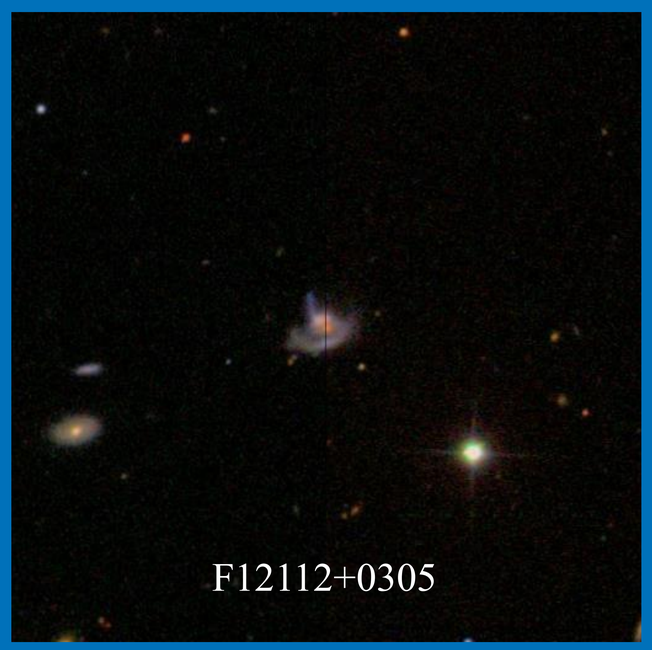
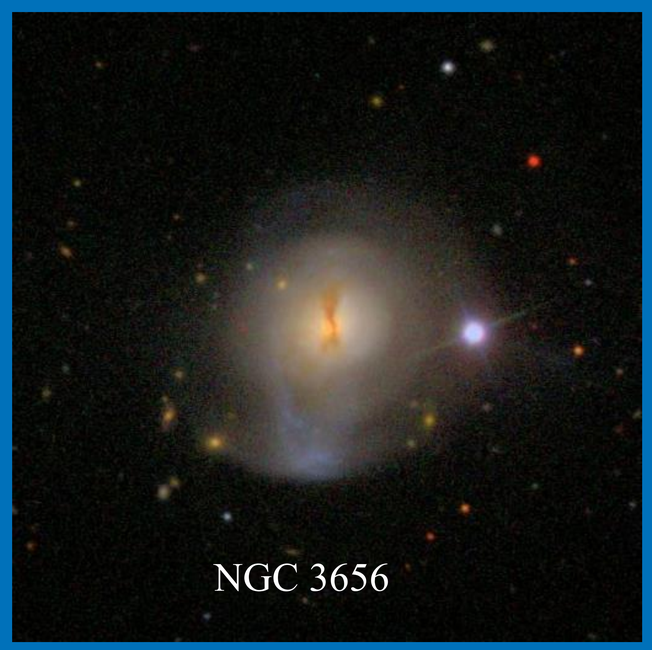
Sequence


SDSS J075121.01+501409.8


CGCG 314


Mrk 273


F12112+0305


NGC 3656

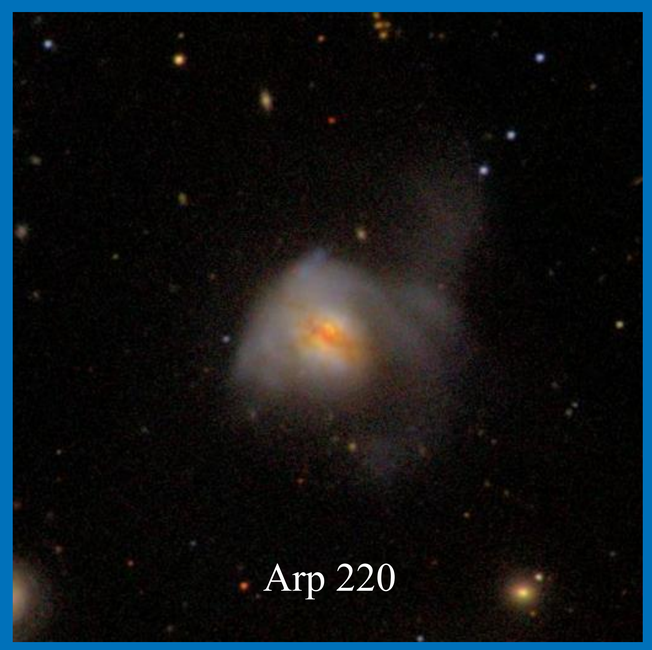

Arp 220

Image Credits: SDSS

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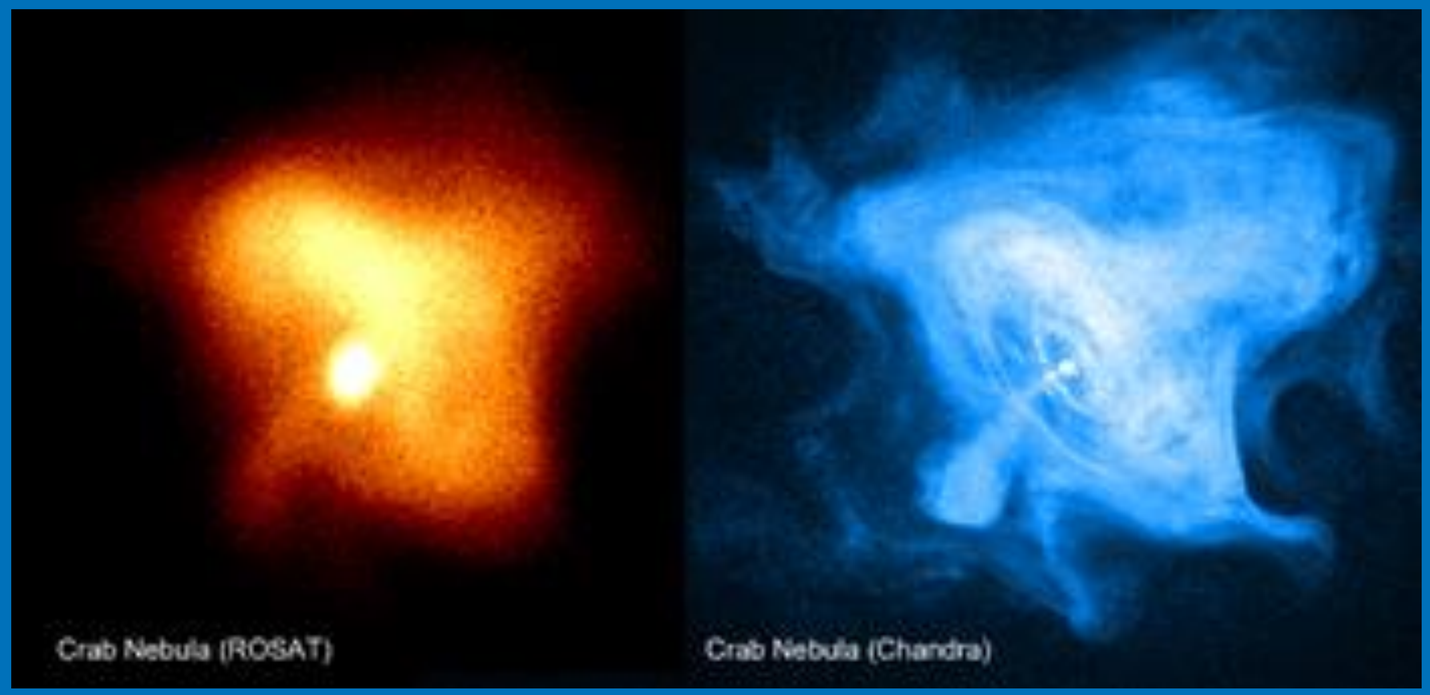
Chandra Observatory

- Orbits 139,000 km in space
- Pointed telescope
- Meant to observe and record X-rays from high-energy regions of space.


Image Credit: NASA/CXC & J. Vaughn



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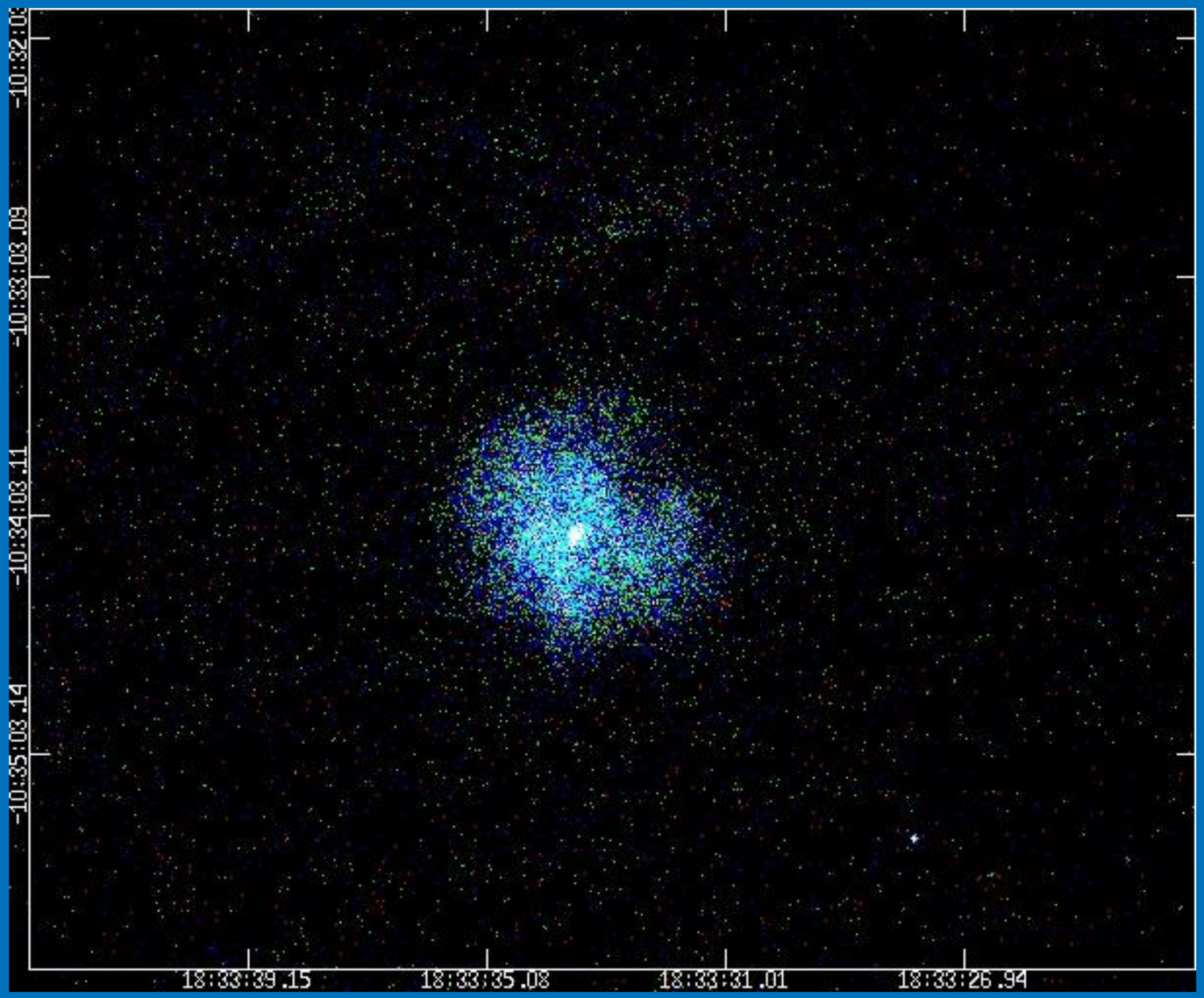
True Color Image



- 0.2 keV to 1.5 keV
- 1.5 keV to 2.5 keV
- 2.5 keV to 8.0 keV

True color images show different levels of energy differentiated by color.

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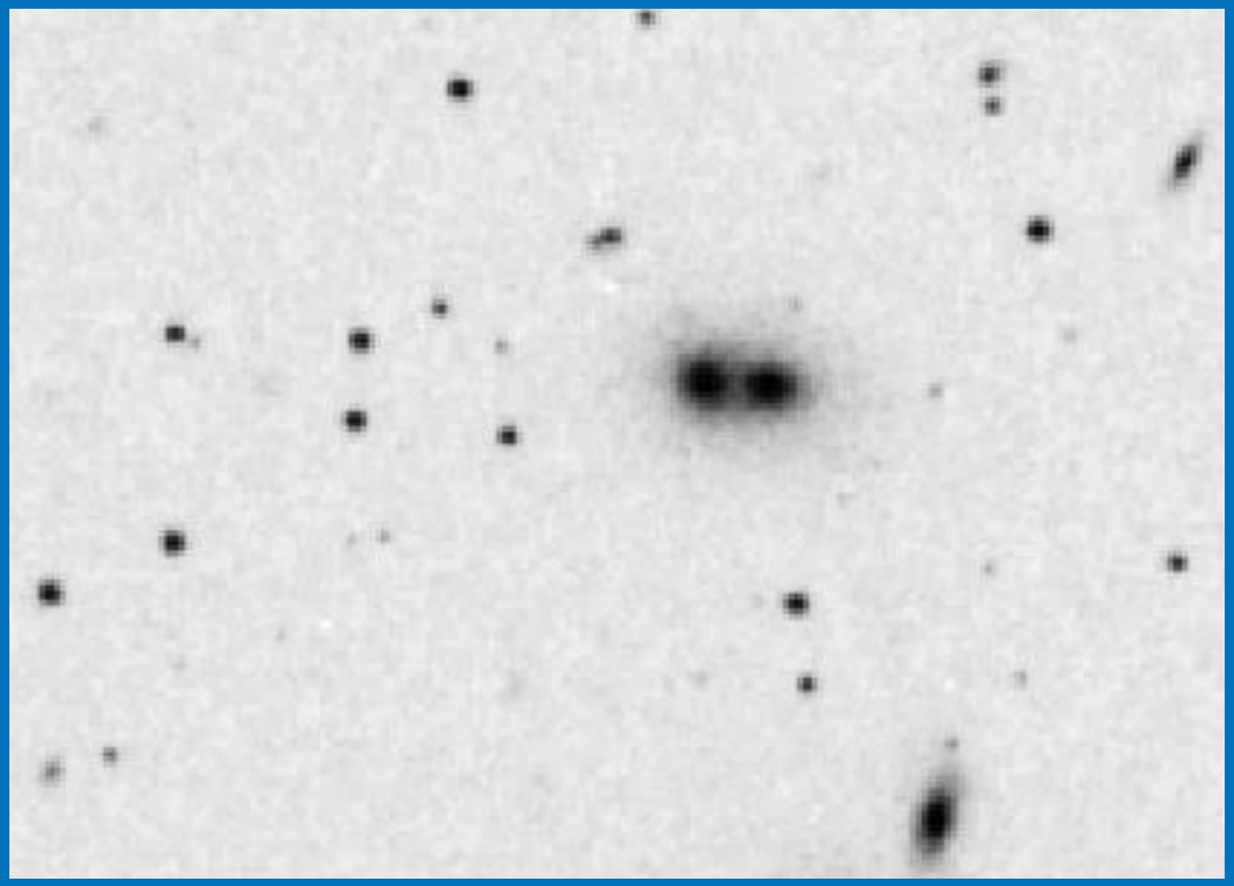
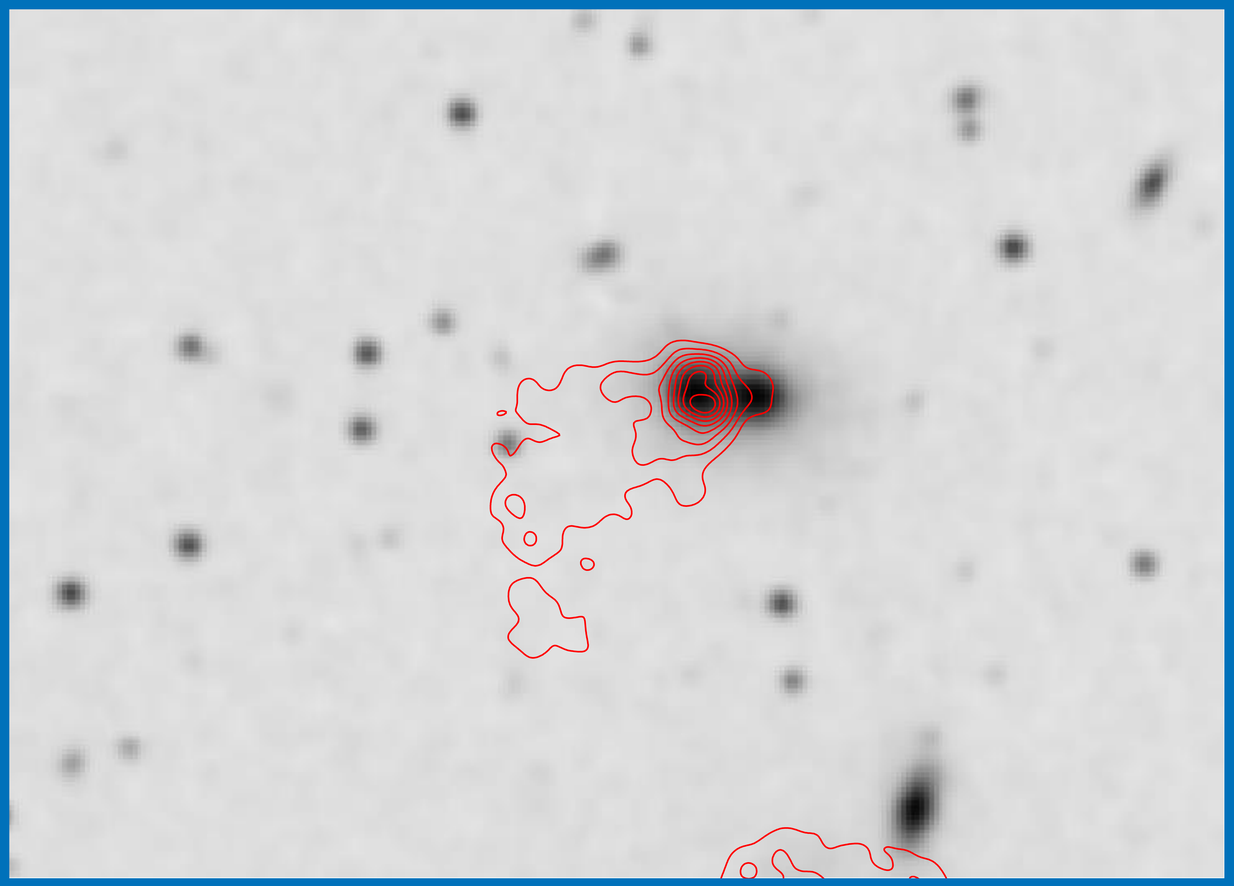
Image of Diffuse Gas





The diffuse emissions shows us the amount of gas from an x-ray image taken

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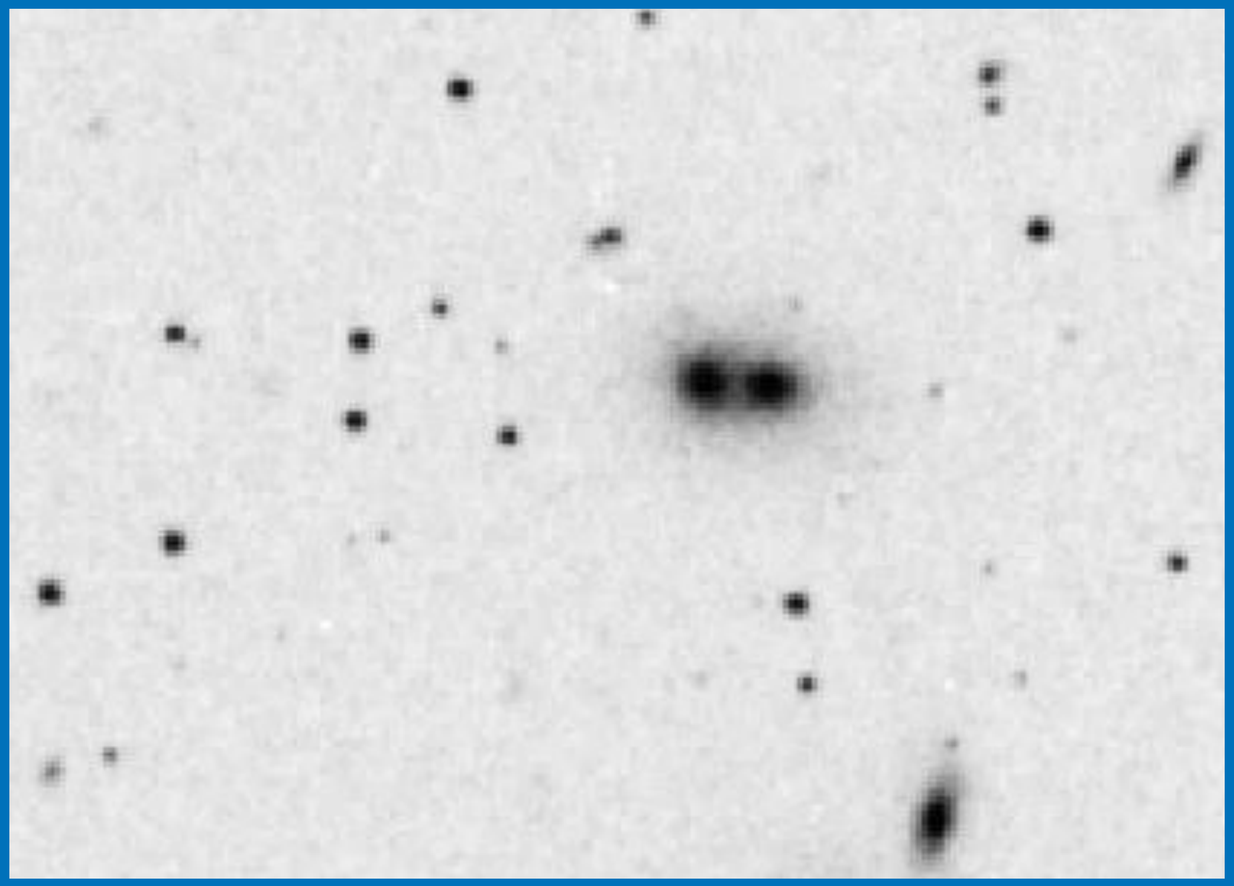
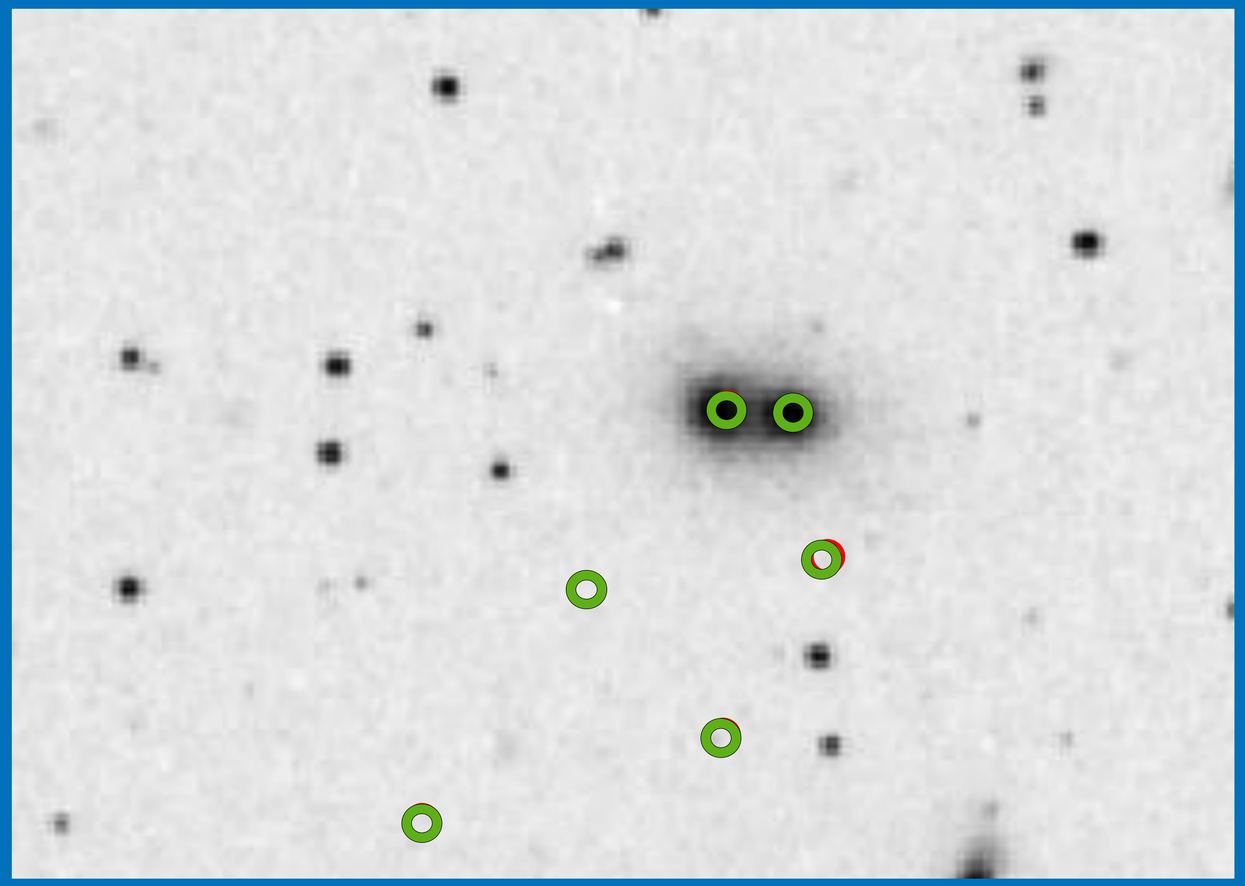
Point Sources





Point sources are able to be detected either from the desired object being observed, but nearby objects can interfere with the observation.

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Takeaways So Far

- The impact having X-ray images has
  - Gas contours shows interactions not seen by optical images
- Still very early in the process of analyzing data

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References

- Toomre, A. and Tomre, J. 1972, ApJ, 178, 623--666

- Sloan Digital Sky Survey

- NASA Extragalactic Database