

# NASA's Chandra Finds Unexpected Fireworks in Aftermath of Stellar Explosions

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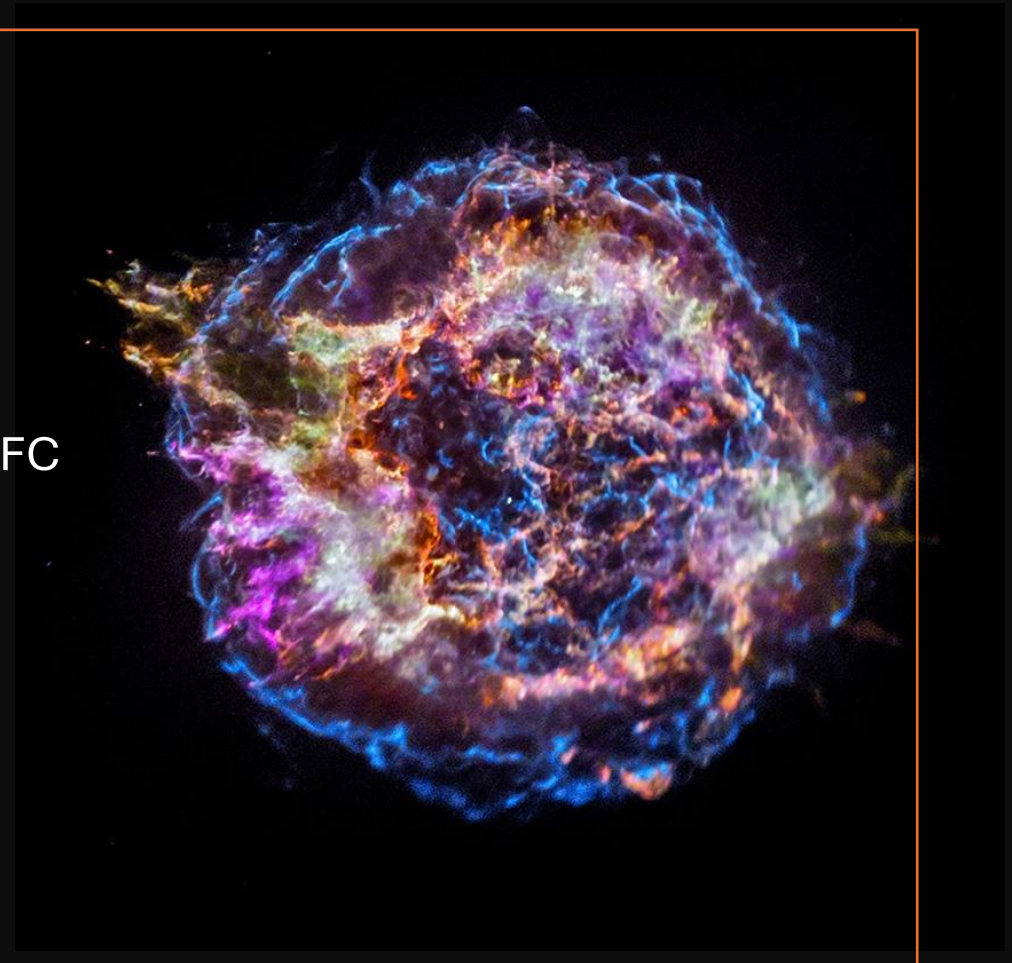
Zoe Hoiland, Vassar College

Michael McCollough, Harvard|Smithsonian CfA

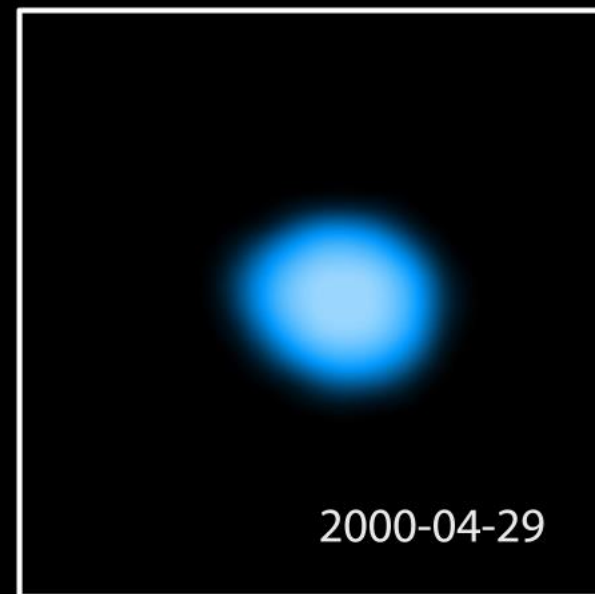
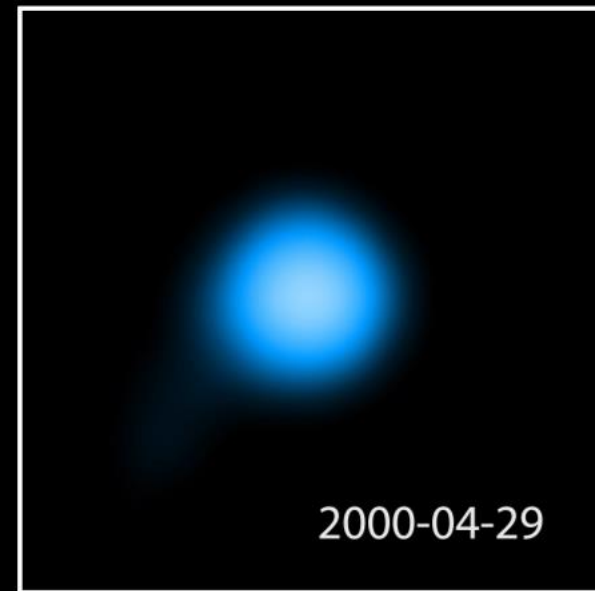
Francis Primini, Harvard|Smithsonian CfA

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Miltiadis Michailidis, Stanford University

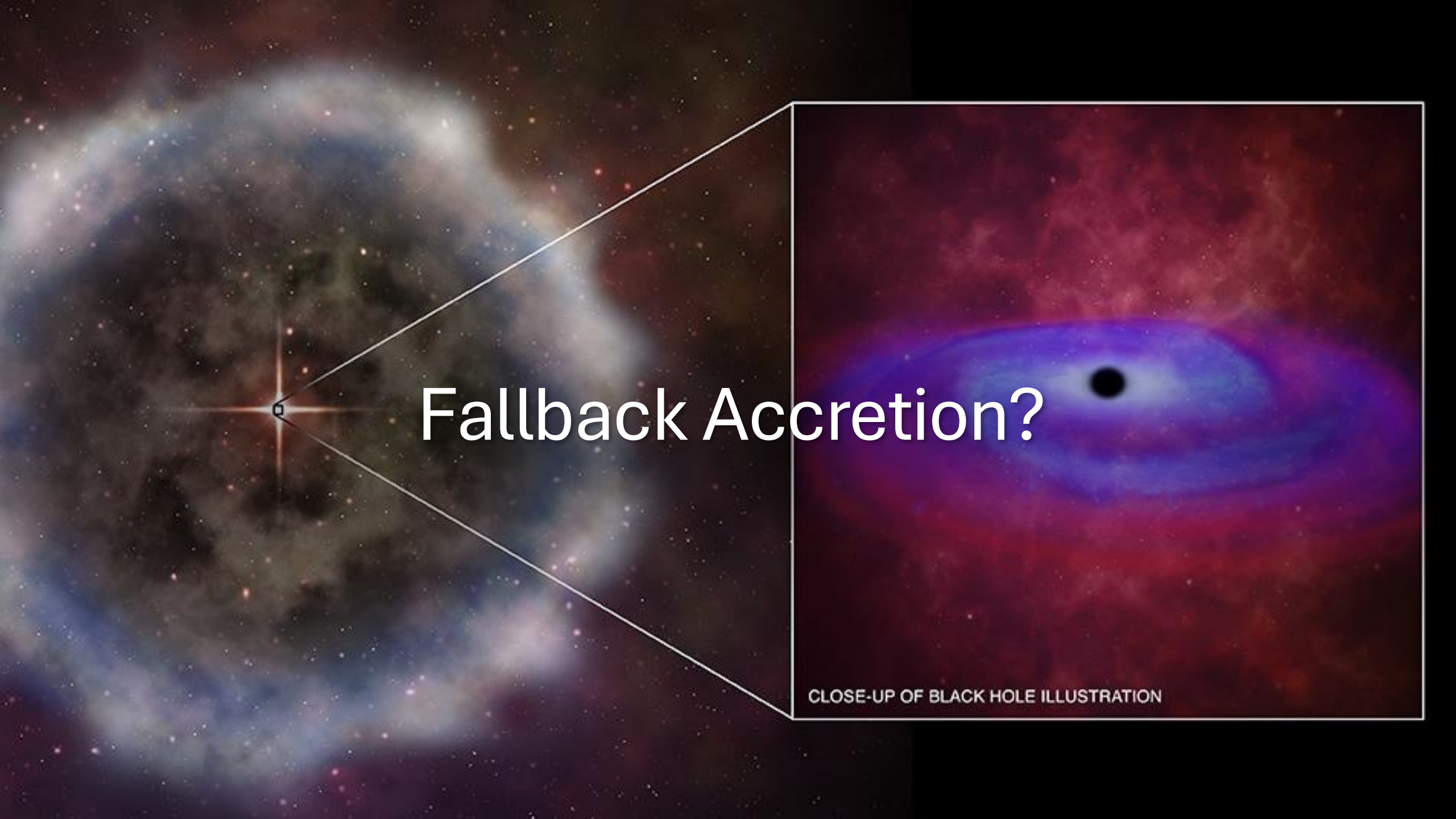






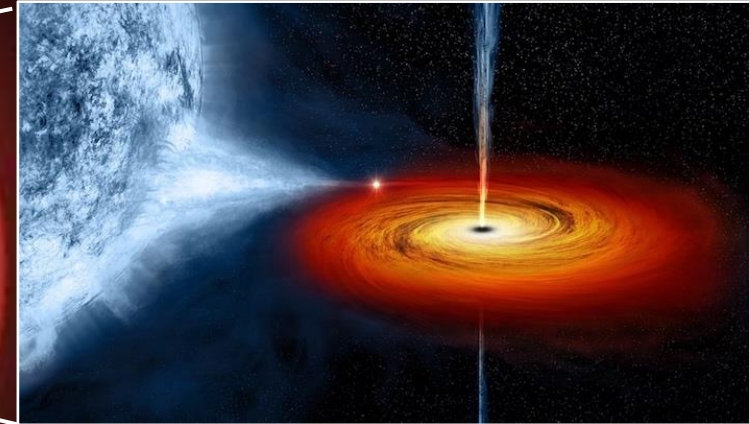
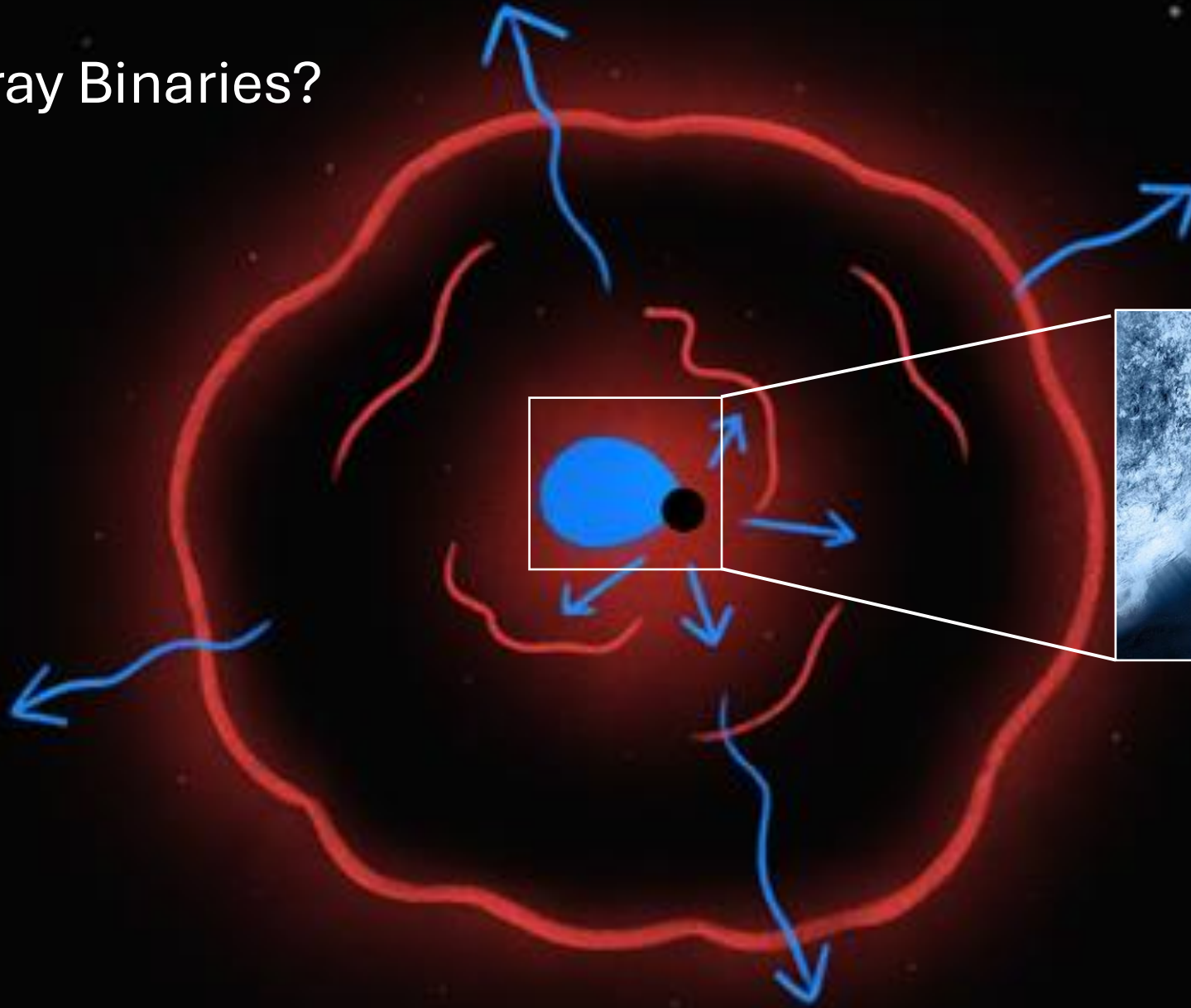
# Fallback Accretion?

CLOSE-UP OF BLACK HOLE ILLUSTRATION



# Supernova Remnant

High Mass X-ray Binaries?





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## M83 is not unique!

50% of X-ray SNR in M51 exhibit variability

Two sources display rapid variability on hour-long timescales — a hallmark of High Mass X-ray Binaries (HMXBs)

Both sources are among the brightest we expect from this kind of binary

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M83  
~50 X-ray/SNR  
~25 variable



M51  
~50 X-ray/SNR  
~25 variable



M101  
~20 X-ray/SNR  
0 variable

Connection to star formation



## Summary

- The X-ray flux from supernova remnants in some star forming galaxies is highly variable – not what's expected from supernova remnants that cool and dissipate over 1000s of years.
- High Mass X-ray Binaries buried in the gas is our current favorite hypothesis but that could change.
- These extreme systems appear to thrive in galaxies undergoing rapid, intense bursts of massive star formation.