**Key Themes**

- How Supernovae Work
- Heating of The Early Intergalactic Medium
- Origin of Gravitational Wave Sources

**Science Questions**

- Prevalence of super-Eddington pulsars & the accretion mechanism?
- Progenitor paths for gravitational wave sources?
- Role of supernova kicks in dynamical evolution of BH/NS populations?

**Nearby Galaxies with Chandra**

Chandra has transformed our understanding of accreting compact objects (X-ray binaries - XRBs) over cosmic time, from the local Universe to high-redshift. Nearby galaxy XRBs have historically been classified by their donor star as high-mass or low-mass. Compact object classification has been limited to the Galaxy, Magellanic Clouds, and a few of the brightest nearby extragalactic systems.

**Wolf-Rayet X-ray Binaries**

The number of galaxies surveyed to limits sufficient to characterize the bulk of actively accreting systems (E~10^{36} erg/s) remains relatively modest; Athena WFI will swiftly reach such sensitivities. Sensitivity limits for nearby galaxies in the Chandra archive. Vertical lines roughly indicate the NS Eddington limit and the transition luminosity for LMXBs having evolved red giant donors to less luminous LMXBs with main sequence donors.

**Motivation**

What are the most important conditions and processes governing the growth of stellar-origin compact objects? The identification of compact object type as either black hole (BH) or neutron star (NS) is fundamental to understanding their formation and evolution. To date, time-domain determination of compact object type remains a relatively untapped tool. Measurement of orbital periods, pulsations, and bursts will lead to a revolution in the study of the demographics of NS and BH populations, linking source phenomena to accretion and galaxy parameters (e.g., star formation, metallicity). To perform these measurements over sufficient parameter space, next generation X-ray telescopes having a large field of view, improved angular resolution, increased sensitivity/effective area, and timing capabilities are required.

**Time Domain Studies of Neutron Star & Black Hole Populations:**

The Post Chandra and XMM-Newton Era


**Decadal White Paper (Vulic et al. 2019): Time Domain Studies of Neutron Star & Black Hole Populations:**

X-ray Identification of Compact Object Populations