

Colliding Wind Binaries

- Binaries containing two powerful stellar winds are great laboratories for the study of particle acceleration and the **relationship of radio and X-ray generation in shocks**.
- **X-rays are dominated by thermalization of the two winds**: provides direct diagnostics of winds and mass loss rates (wind speed often known). General behavior depends on competition between radiative cooling and dynamical timescales.
- **Radio requires acceleration to relativistic energies** at the shock (1st order) or in turbulence (2nd order).
- Great examples of cooperation of radio + X-ray: **radio can image shocks, see thermal winds; X-rays give you energetics**.
- Because basic geometry is simple, simulations can be set up and forced to match data from both X-ray and radio data.
- Understanding difference in properties between single stars and binaries is a **powerful tool for studying locations such as galactic center clusters**.
- **Can single hot O and WR stars produce nonthermal radio emission?** X-rays show that the shocks in the winds of these stars are weak: does that matter for acceleration of electrons?