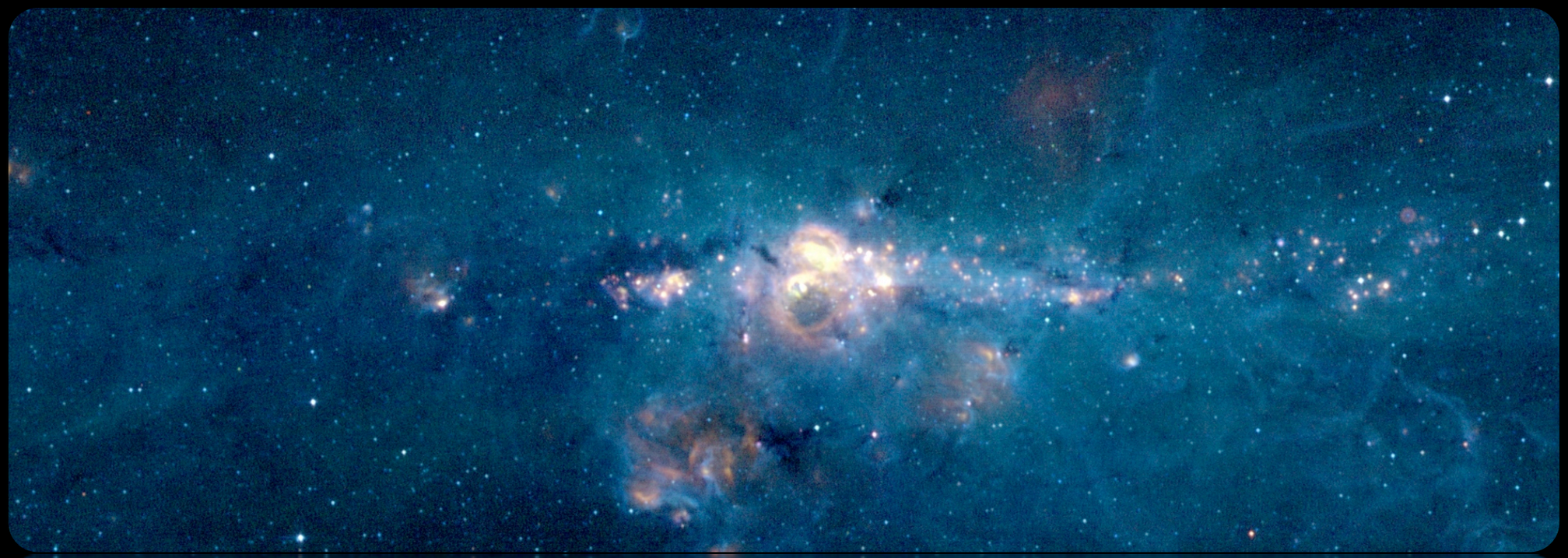
Dark Matter Burners



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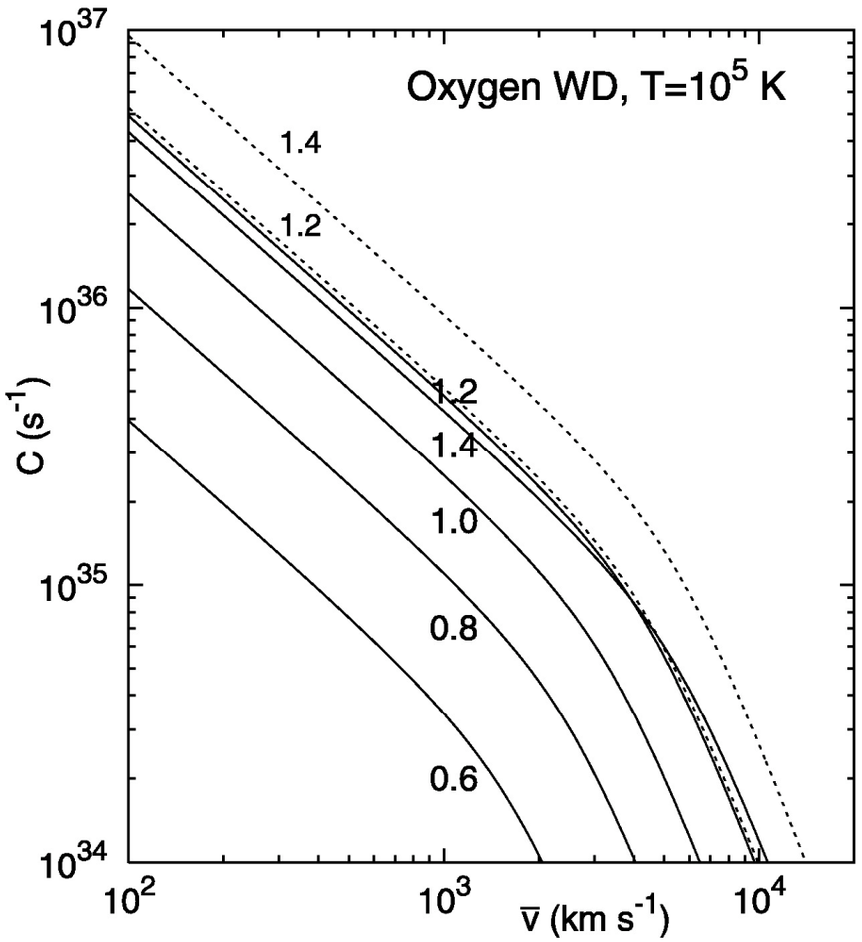
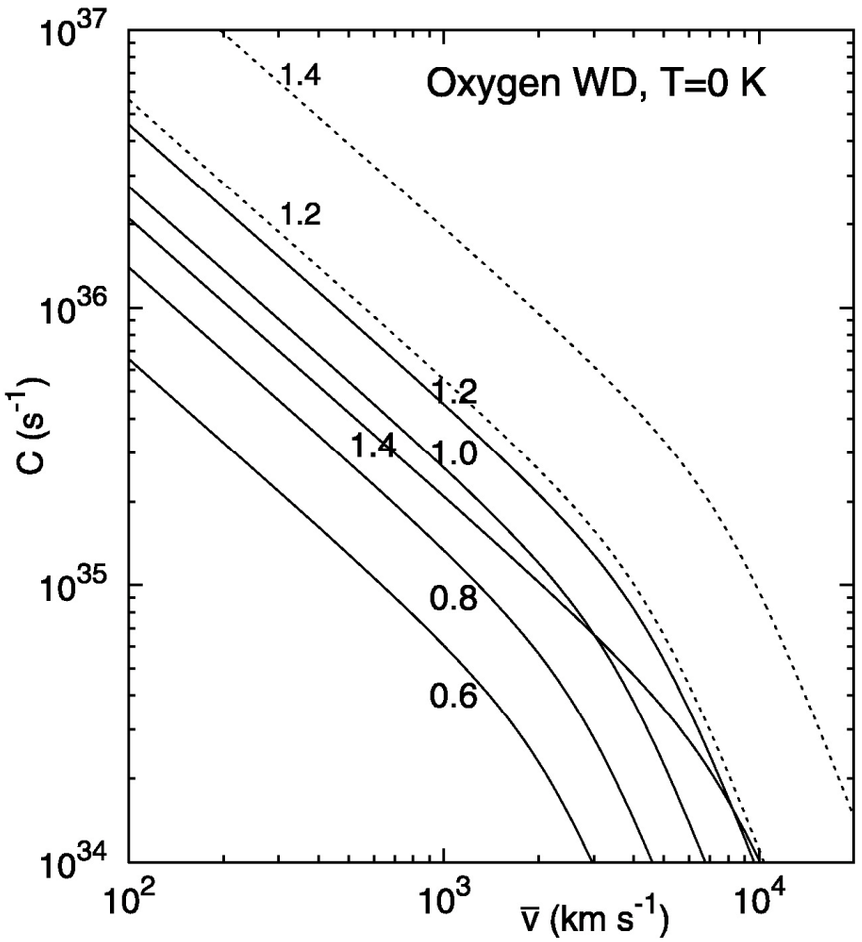
Introduction

- Dark matter forms clumps
  - Highest density expected in galactic centers
  - Stars near galactic center could gain even higher densities at their cores
- Particle dark matter (WIMPs) could annihilate at such high densities
  - Energy released could affect appearance and evolution of stars
  - White Dwarves should have the highest capture rate

WIMP Accumulation in Stars

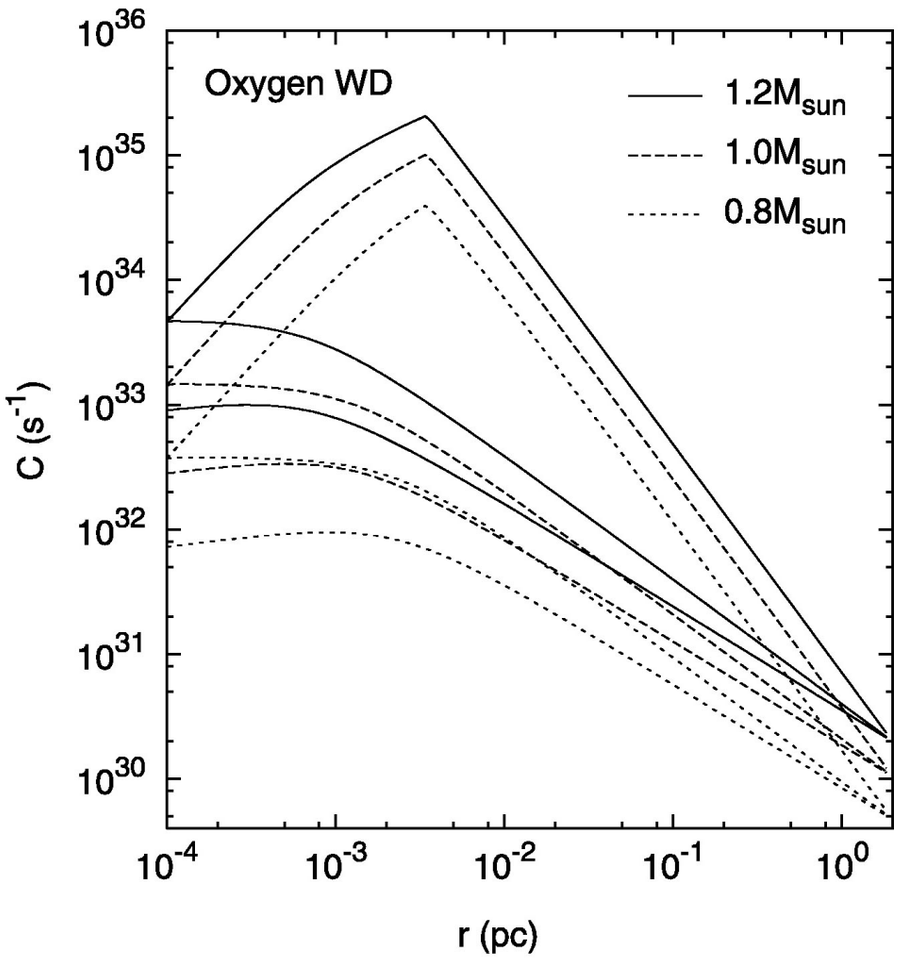
- Assumes: steady state, effective radius for WIMP annihilation core, Keplerian velocities, Maxwellain WIMP velocity distribution
- Limit on WIMP-nucleon scattering cross section: $\sigma_0 < 10^{-43}$ cm^2
- For "heavy" white dwarves the geometrical limit dominates

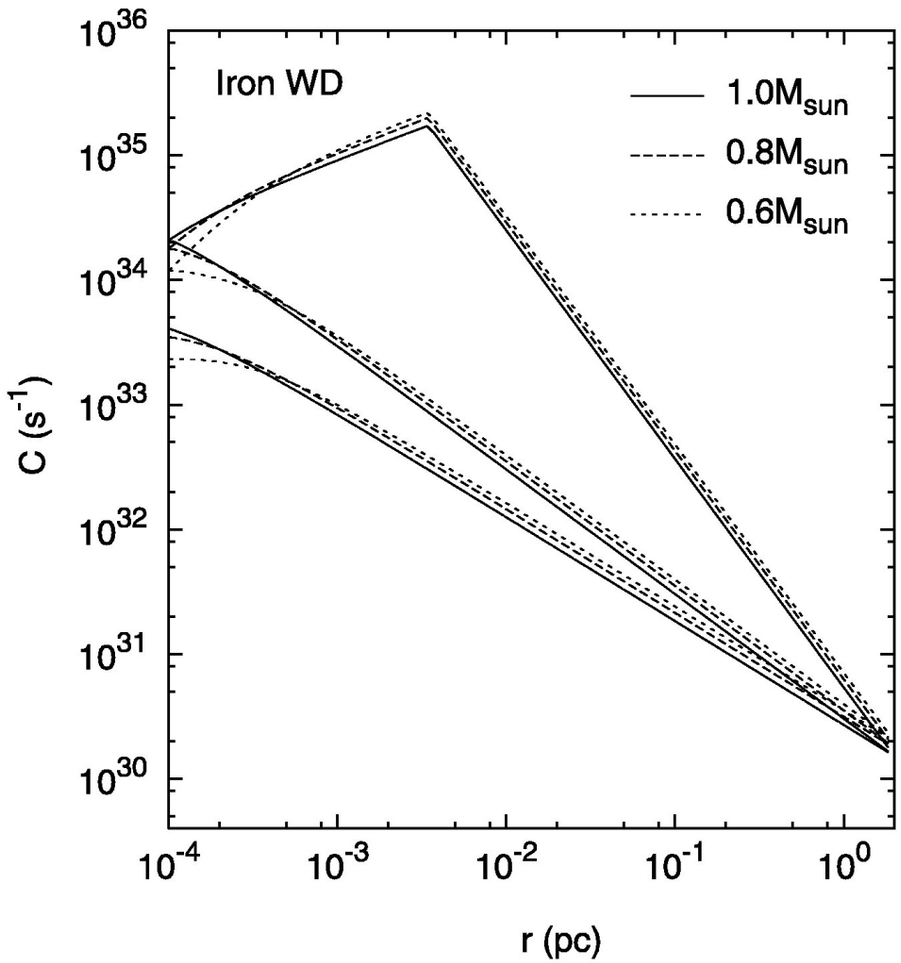




WIMP Capture Rate:

Two White Dwarf Models





WIMP Capture Rate:

vs. Distance to Central Black Hole

Observation Potential

- Radius of WIMP burning core << $R_\star$ so annihilation manifests as thermal or neutrino emission
- Estimated that L ~ 10 L_{sun}, T ~ 140,000 K, peaking in the UV
- Since the population of very hot white dwarves is limited, a concentration near galactic center could indicate dark matter burning