Faint Thermonuclear Supernovae from AM CVn Binaries

Lars Bildsten[1,2], Ken J. Shen[2], Nevin N. Weinberg[3] and Gijs Nelemans[4]

[1] *Kavli Institute for Theoretical Physics, University of California, Santa Barbara CA* [2] *Department of Physics, University of California, Santa Barbara, CA* [3] *Astronomy Department and Theoretical Astrophysics Center, University of California, Berkeley, CA* [4] *Department of Astrophysics, Radboud University Nijmegen, The Netherlands*

Powering celestial events with radioactive decays of freshly minted elements has been understood for over 30 years now, with the Type Ia supernovae being the most observed event. We (Bildsten, Shen, Weinberg and Nelemans 2007, ApJ, 662, L95) have recently predicted a new kind of thermonuclear supernovae from AM Canum Venaticorum binaries. Helium that accretes onto the C/O white dwarf in these binaries undergoes one large flash that is violent enough to create (and eject) $0.02 - 0.1 M_\odot$ of radioactive ^{56}Ni, ^{52}Fe and ^{48}Cr. This powers a faint and rapidly rising (few days) thermonuclear supernova every 5,000-15,000 years in a typical elliptical galaxy (about $2 - 6$ % of the Type Ia supernovae rate). These ".Ia" supernovae (one-tenth as bright for one-tenth the time as a Type Ia supernovae) are excellent targets for all upcoming celestial surveys, yielding between 1 (Pan-STARRS-1) and 30 (LSST) .Ia supernovae per month.