Identifying the Progenitors of Core-Collapse Supernovae

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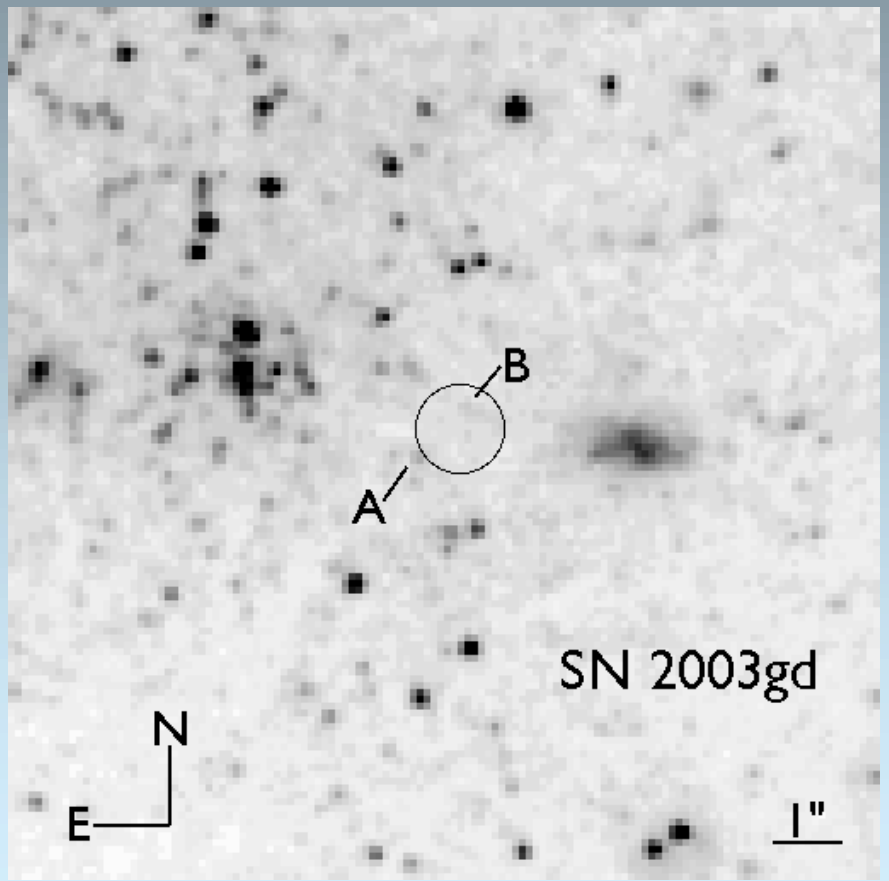
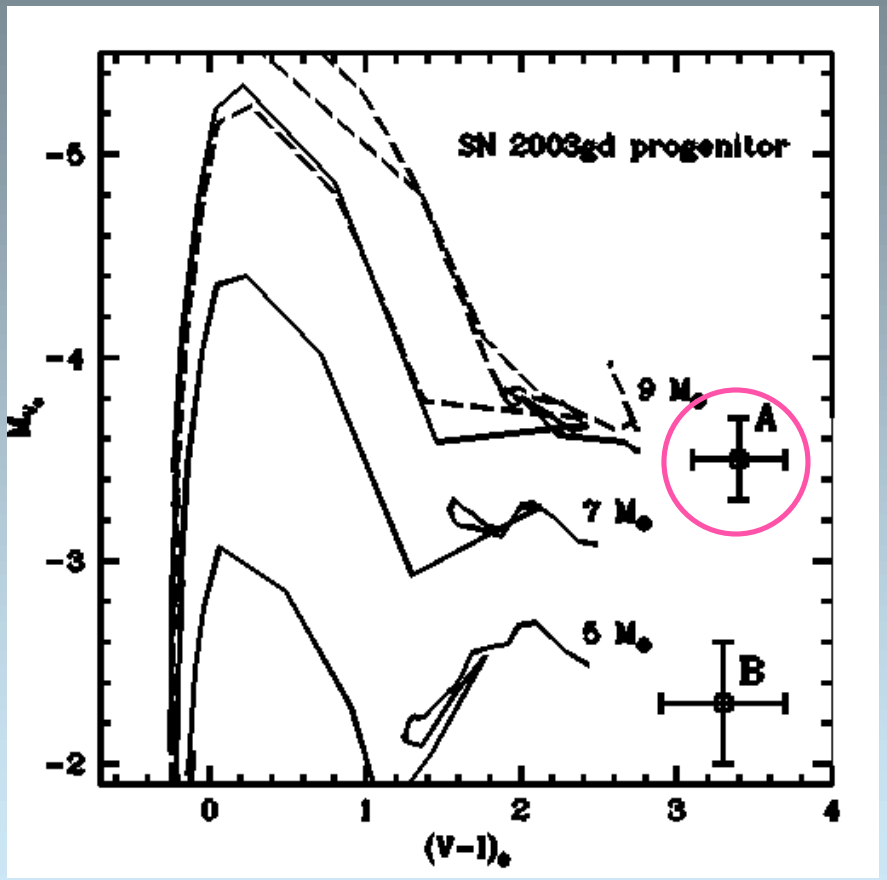
The progenitors of most core-collapse SNe

- SN II-P 2003gd in M74



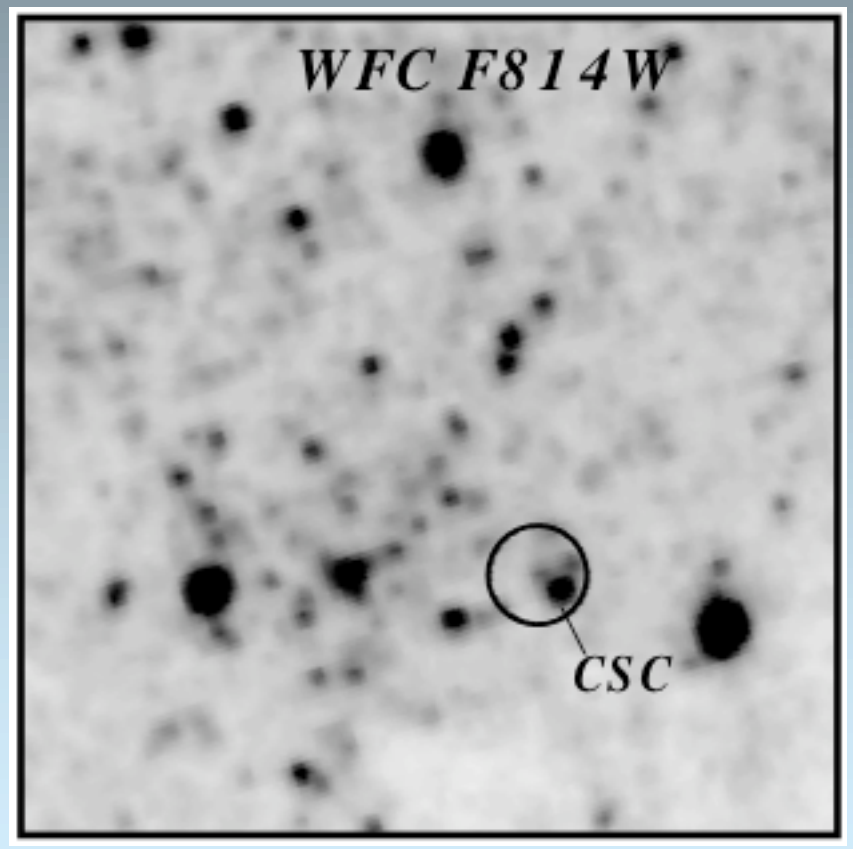


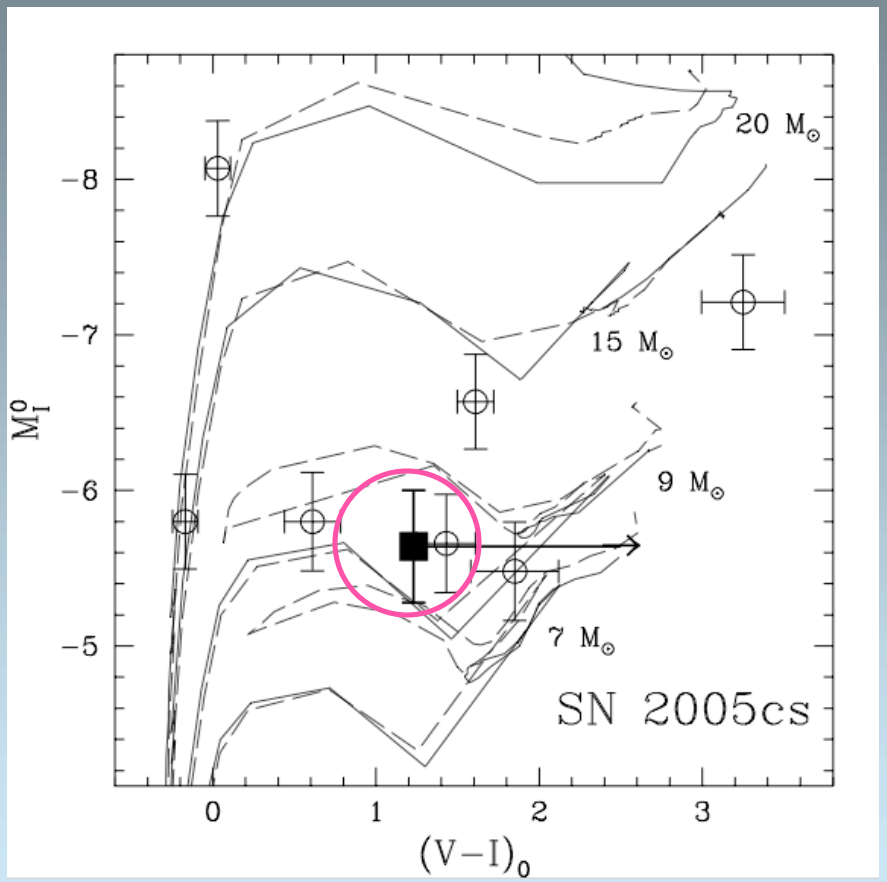
M_{ZAMS} = 8 -- 9 $M_{\odot}$

(Van Dyk, Li, & Filippenko 2003c; Smartt et al. 2004)

The progenitors of most core-collapse SNe

- SN II-P 2005cs in M51





M_{ZAMS} = 8 +/- 1 M_o

(Li et al. 2006; Maund et al. 2005)

The progenitors of most core-collapse SNe

- SN II-P 1999em in NGC 1637
  (Leonard et al. 2003; also Smartt et al. 2002)

  $M_{ZAMS} < 20 (+/- 5) M_o$

- SN II-P 1999gi in NGC 3184
  (Leonard et al. 2002; also Smartt et al. 2001)

  $M_{ZAMS} < 15 (+5, -3) M_o$

- SN II-P 2001du in NGC 1365
  (Van Dyk et al. 2003b; also Smartt et al. 2003)

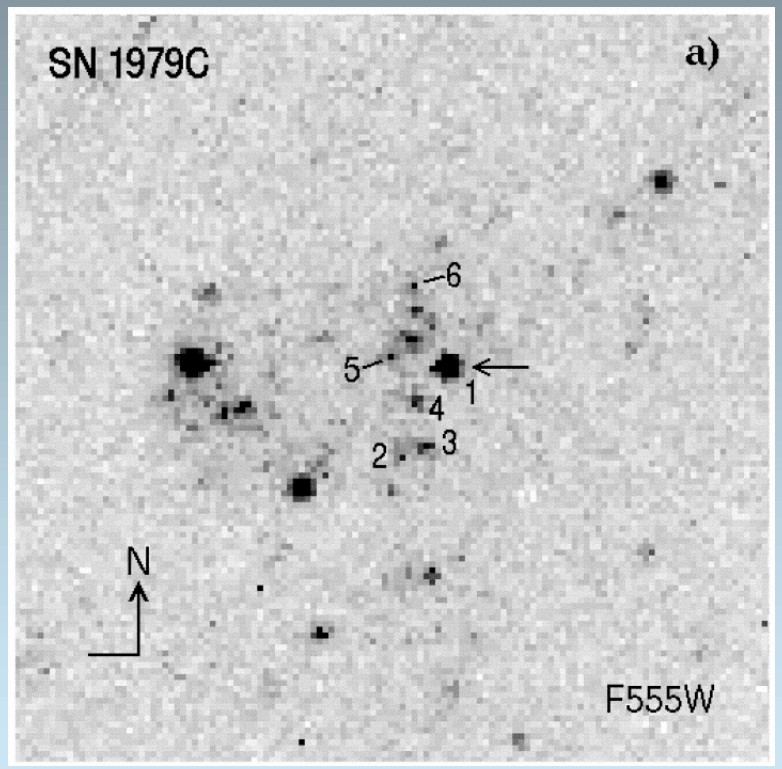
  $M_{ZAMS} < 13 (+7, -4) M_o$

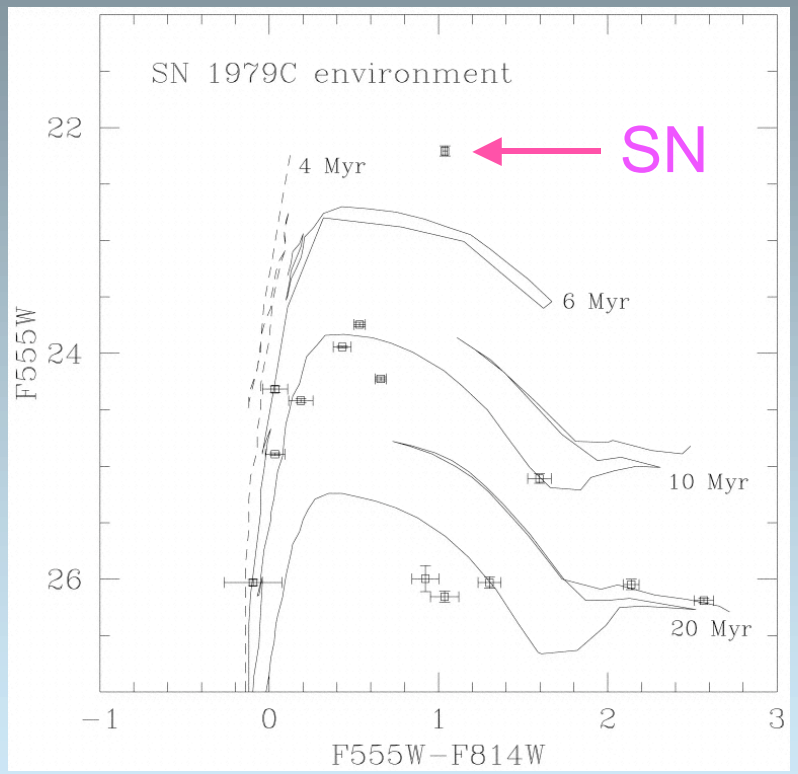
- SN II-P 2004A in NGC 6207
  (Hendry et al. 2006)

  $M_{ZAMS} = ??? M_o$

The progenitors of other core-collapse SNe

- SN II-L 1979C in M100

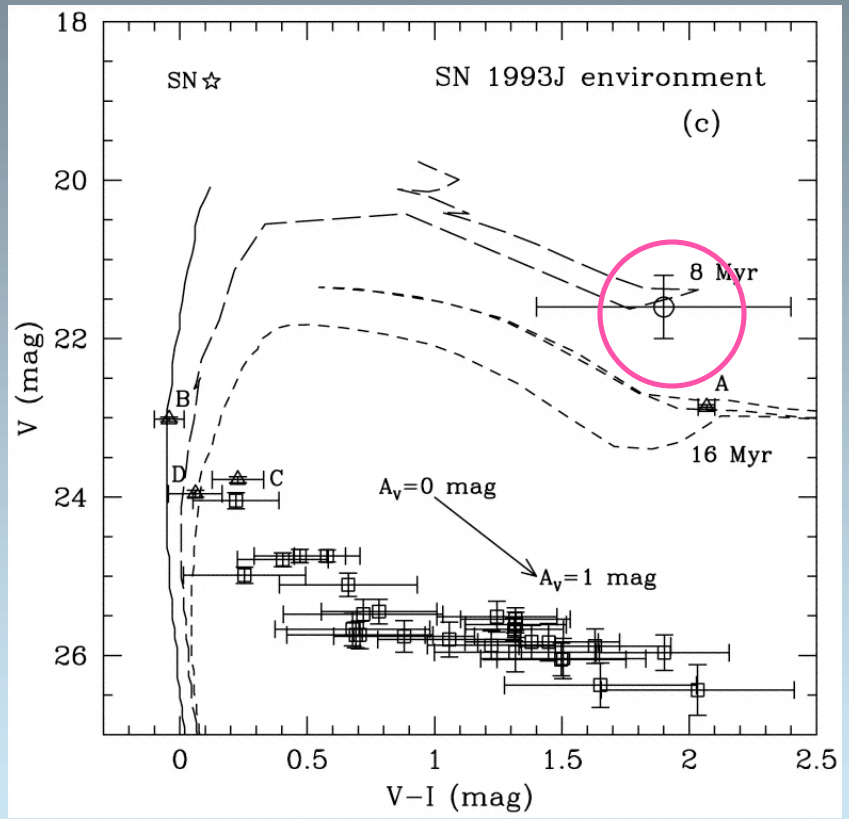




M_{ZAMS} = 17--18 (+/ 3) M_o (Van Dyk et al. 1999)

The progenitors of other core-collapse SNe

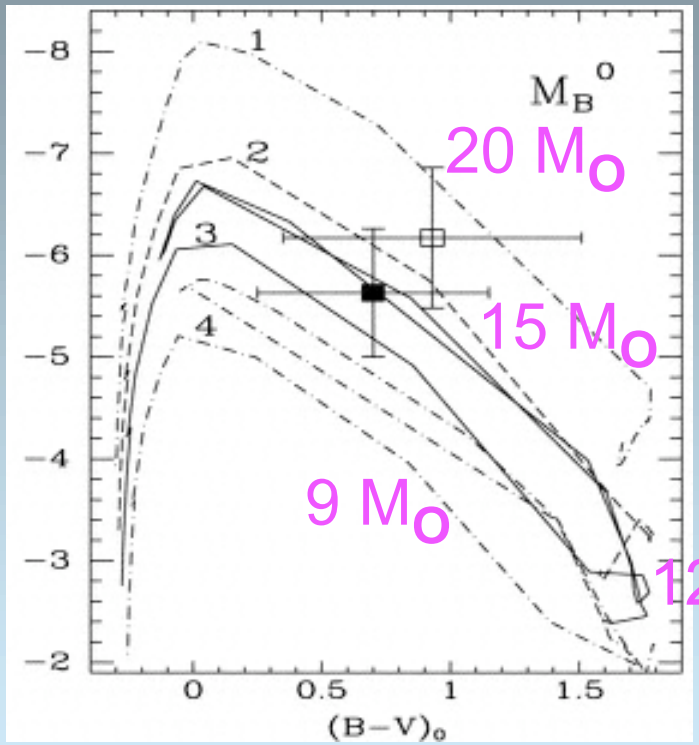
- SN IIb 1993J in M81



Early K-type;
M_{ZAMS} = 13 -- 22 M_o

(Van Dyk et al. 2002a)

- SN II-P? 2004et in NGC 6946

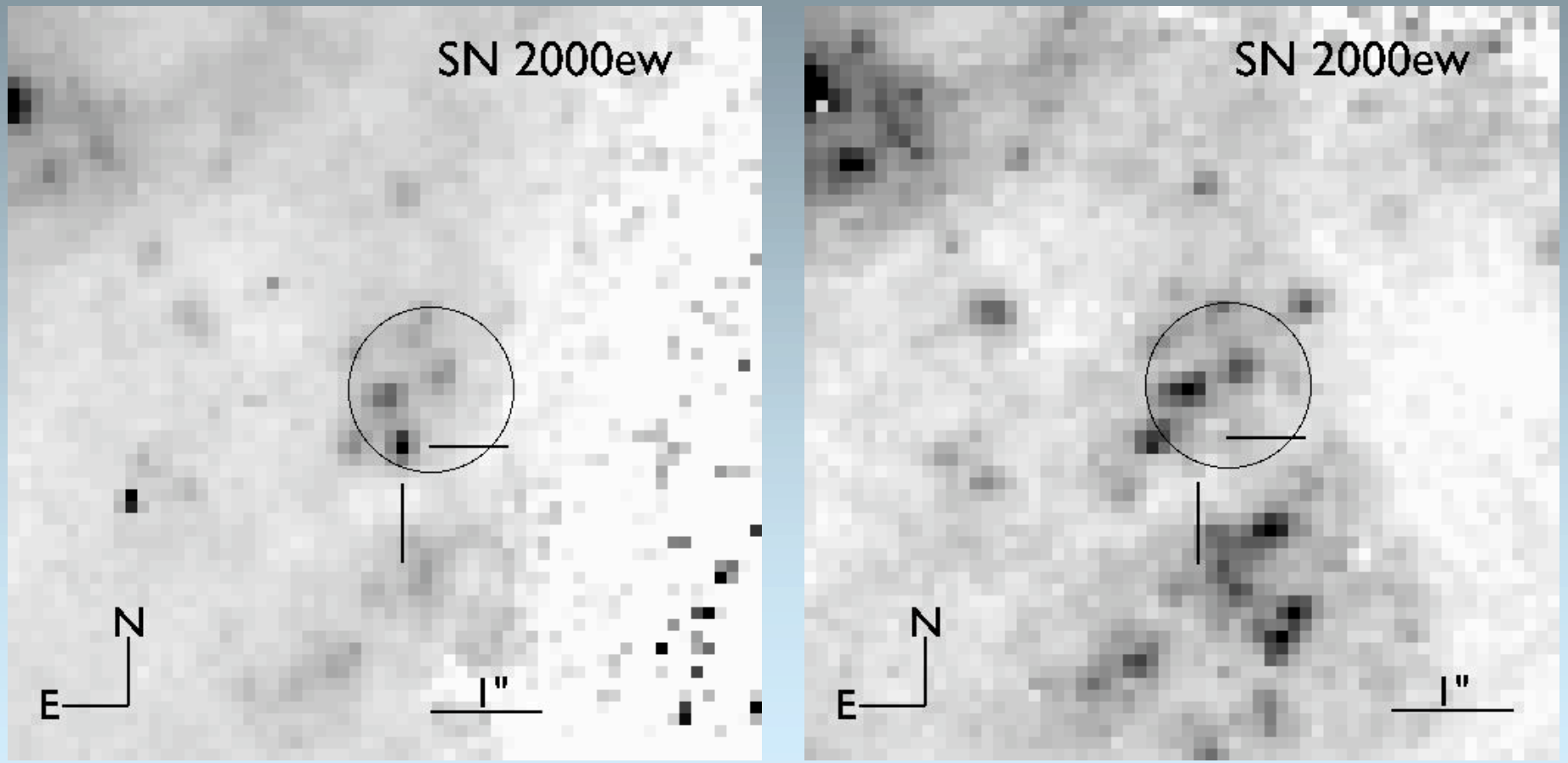


Yellow supergiant;
M_{ZAMS} = 15^{+5}_{-2} M_o

(Li et al. 2005)

The progenitors of other core-collapse SNe

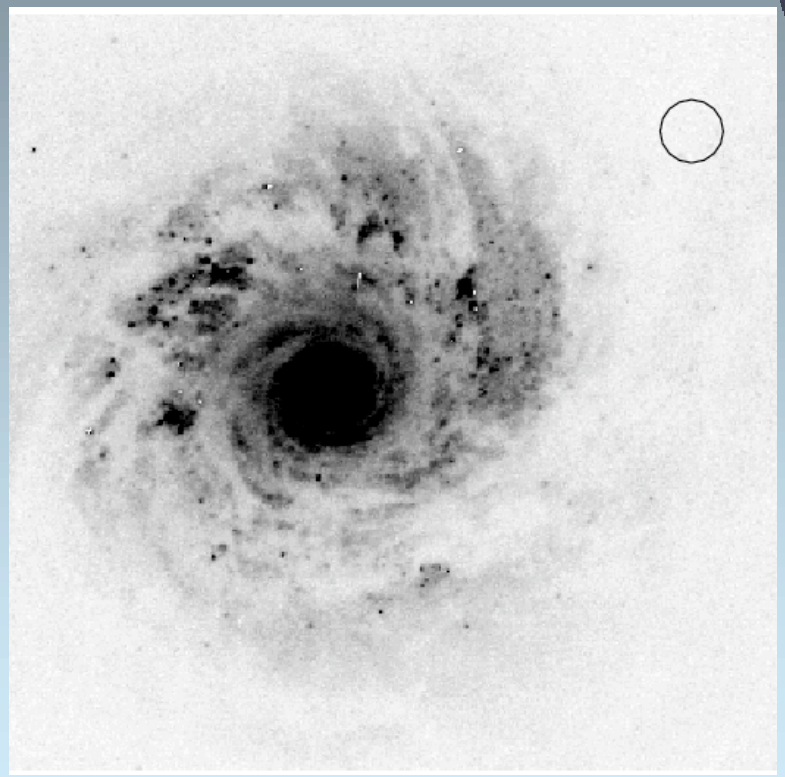
- SN Ic 2000ew in NGC 3810



(Van Dyk et al. 2003a)

The progenitors of other core-collapse SNe

- SN Ib/c 2003jg in NGC 2997

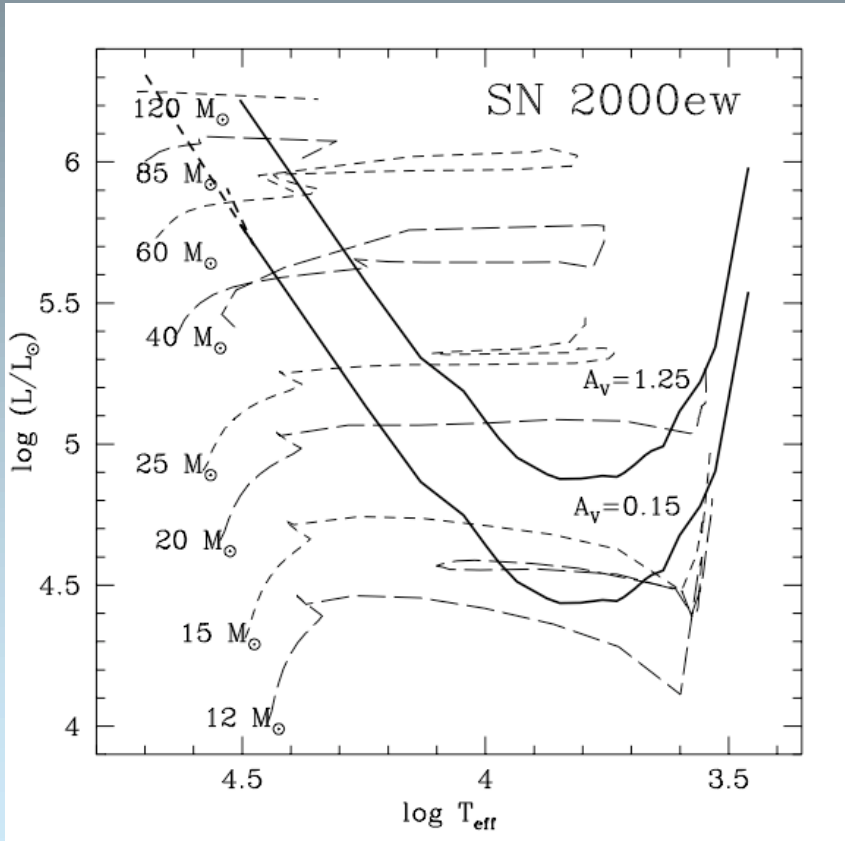


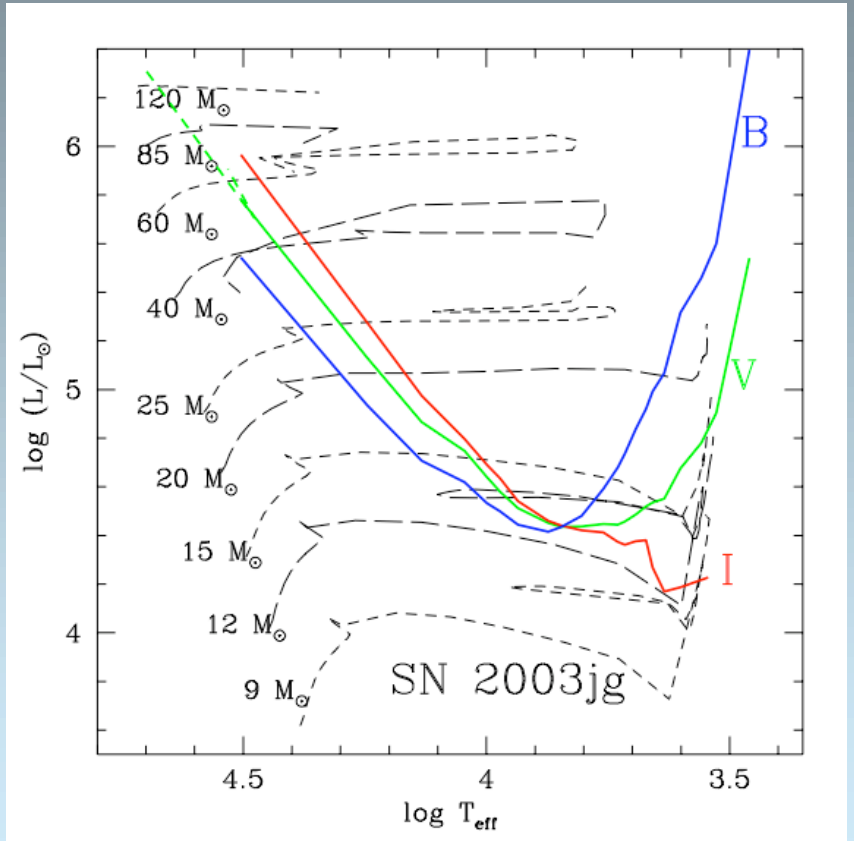
(F606W, pre-SN; also F450W, F814W)

ACS/HRC UBVI images
(2003; with M. Sirianni, ACS Team)

The progenitors of other core-collapse SNe

- SN Ic 2000ew
- SN Ib/c 2003jg





$m_{F606W} > 24.7$ (limit not restrictive)

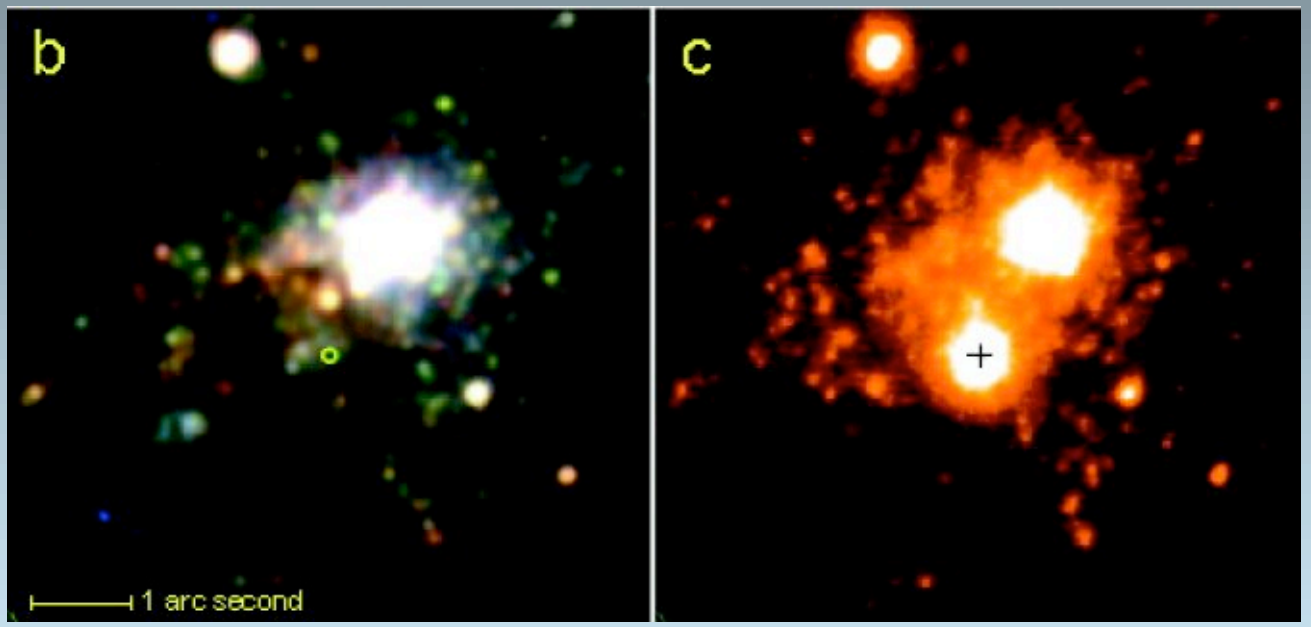
(Van Dyk et al. 2003a)

$m_{F450W} > 25.3$, $m_{F606W} > 24.9$, $m_{F814W} > 24.5$

$M_{ZAMS} < 40\ M_{\odot}$?

The progenitors of other core-collapse SNe

- SN Ic 2004gt in NGC 4038/9



$M_B > -6.5$, $M_V > -5.5$ (Gal-Yam et al. 2005)

Progenitor was either a WNE, WC, or WO
…or a massive binary

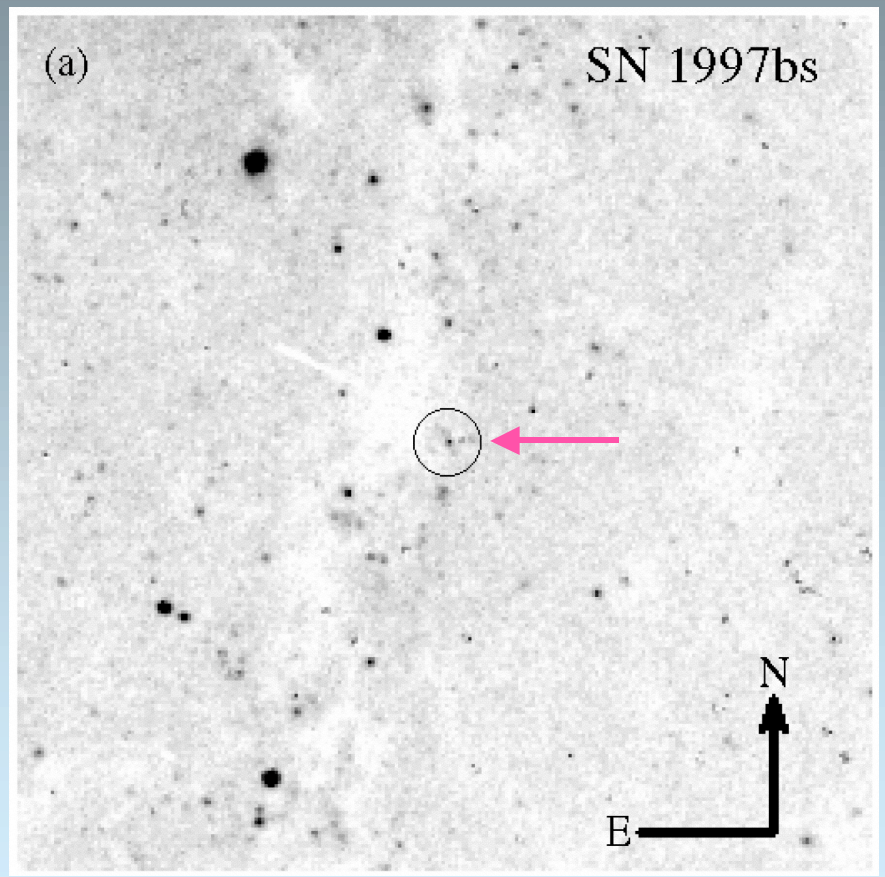
(also Maund et al. 2005)

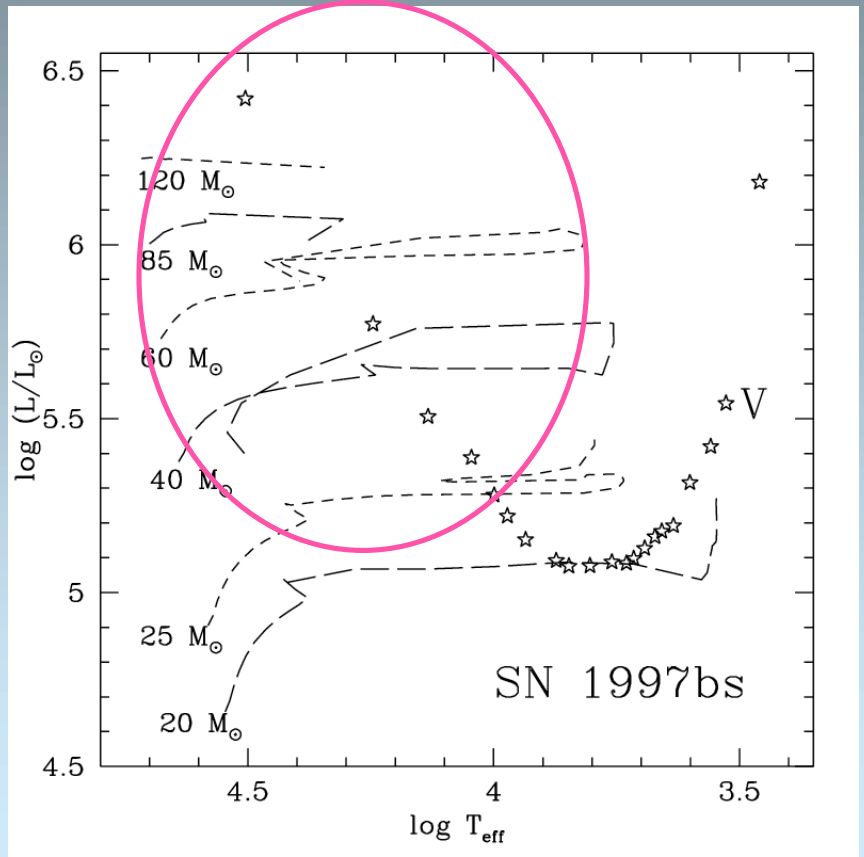
Why this is not relevant to GRBs

- Progenitors of (long duration) GRBs may have low metallicity (Woosley & Heger 2006; Fruchter et al. 2006)
- Cas A progenitor may have been a WR (e.g, Fesen, Becker, & Blair 1987; Fesen talk, Young talk)
- Cas A's CCO not detected by HST (Fesen, Pavlov, & Sanwal 2006) -- neutron star?
- Westerlund 1 pulsar: progenitor had $M_{ini} > 40\ M_O$ (Muno et al. 2006)

The precursors of "SN impostors"

- SN IIn 1997bs in M66

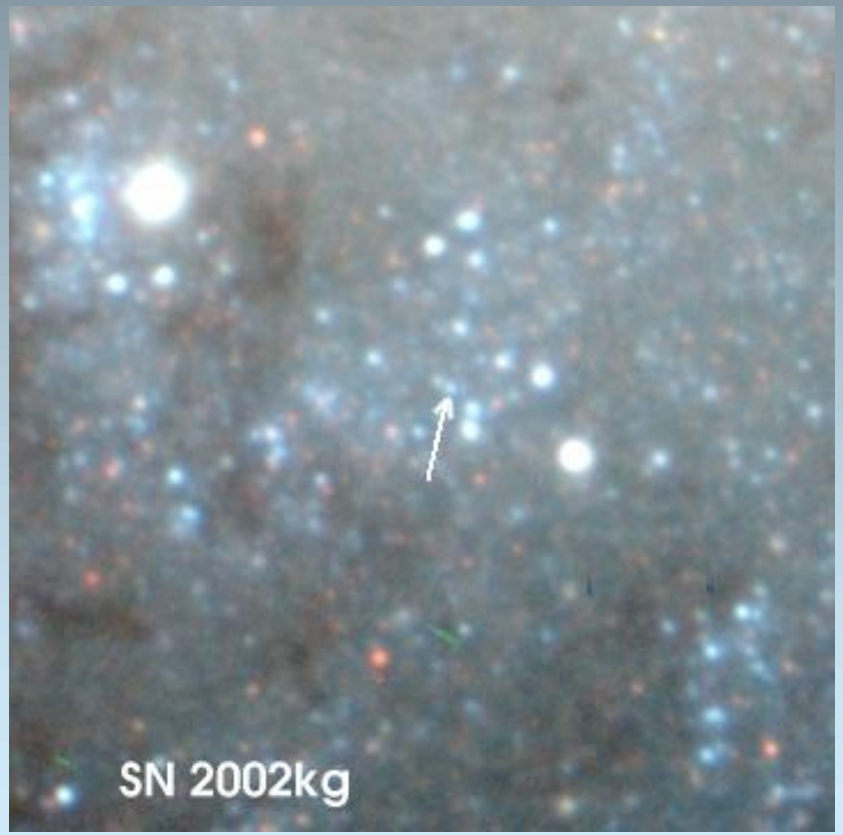


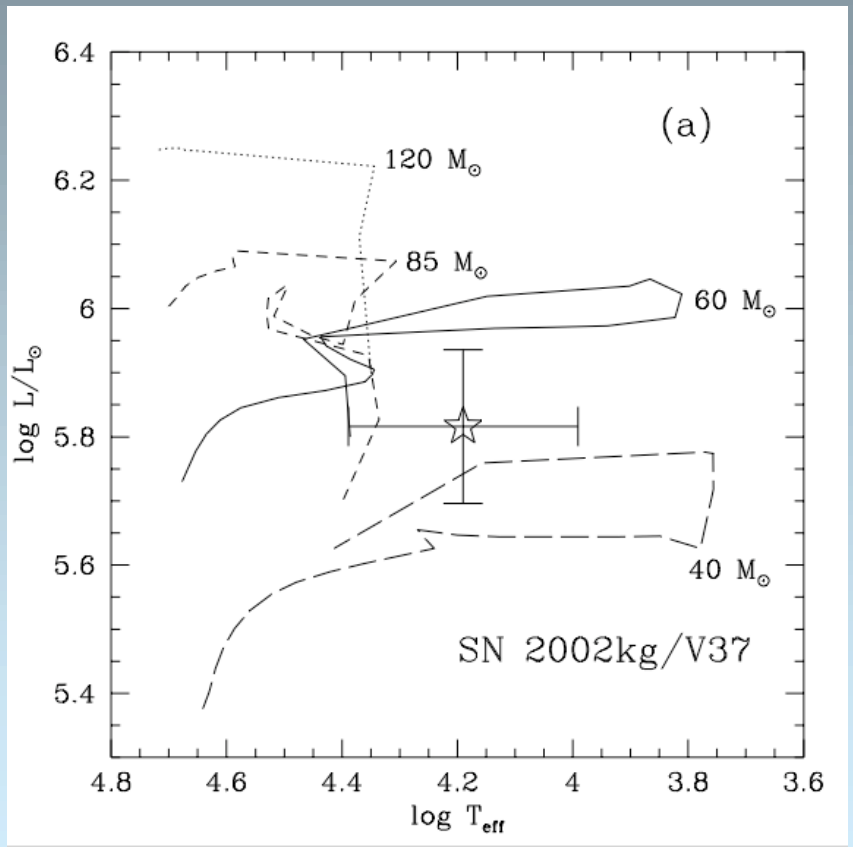


$M_V \sim -8.1$ (Van Dyk et al. 1999, 2000)

The precursors of "SN impostors"

- SN IIn 2002kg in NGC 2403

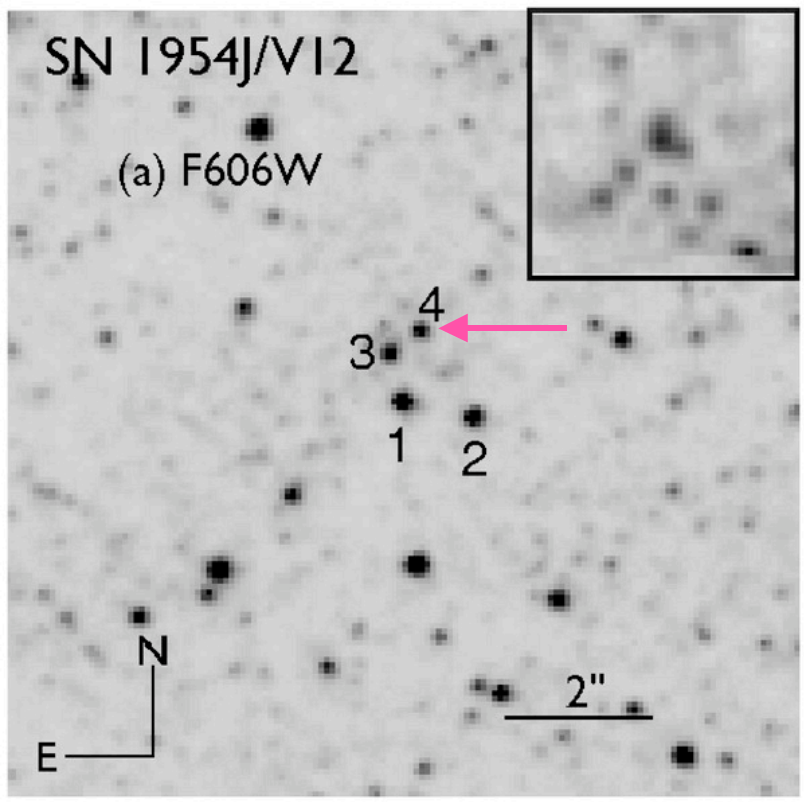


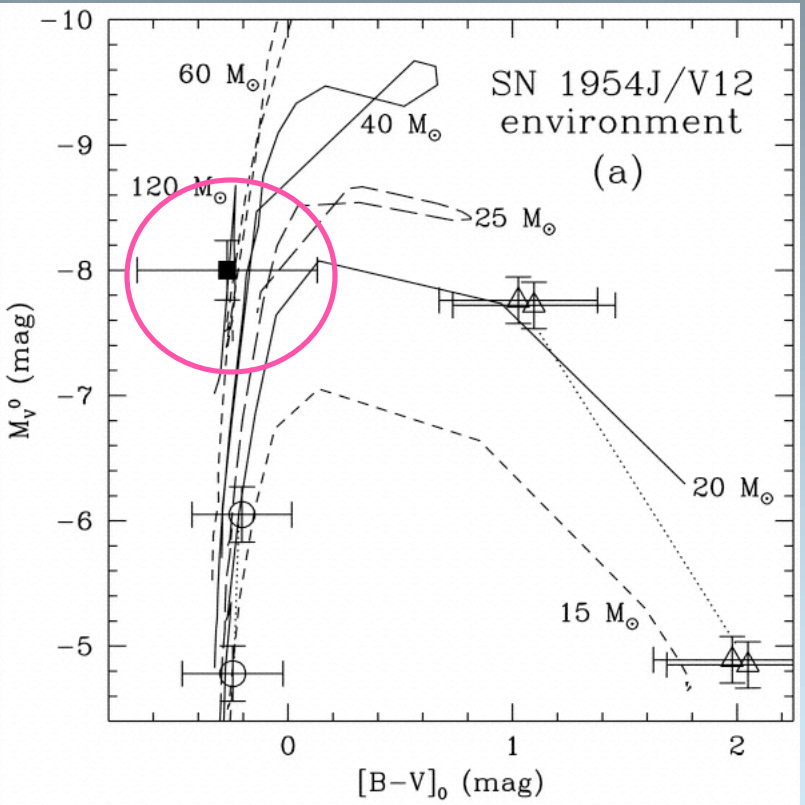


M_{V0} ~ **-7.4** (Van Dyk et al. 2006)

The precursors of "SN impostors"

- SN "V" 1954J in NGC 2403

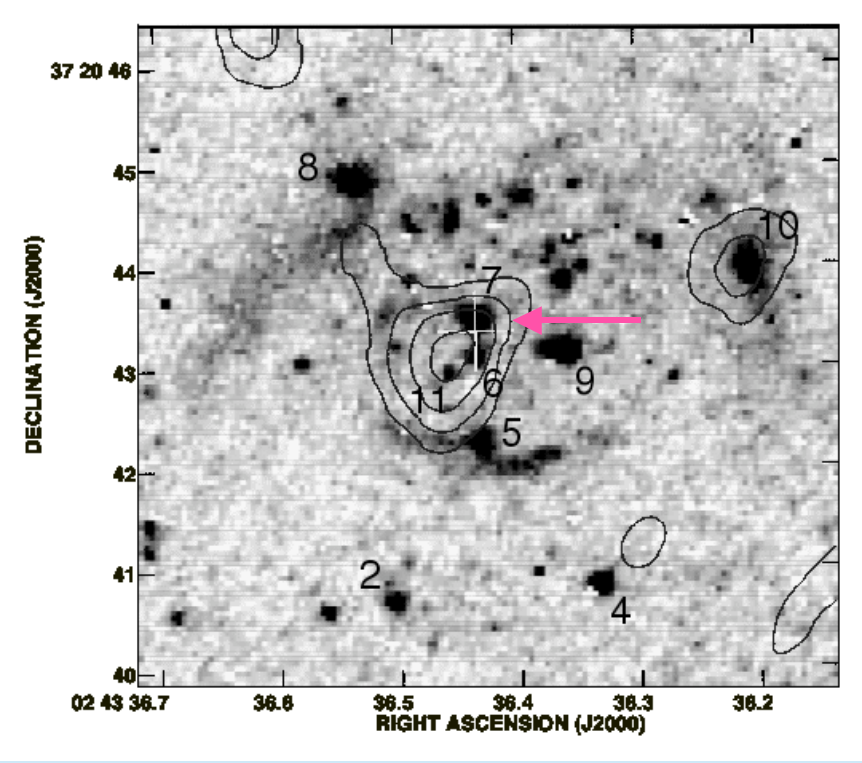


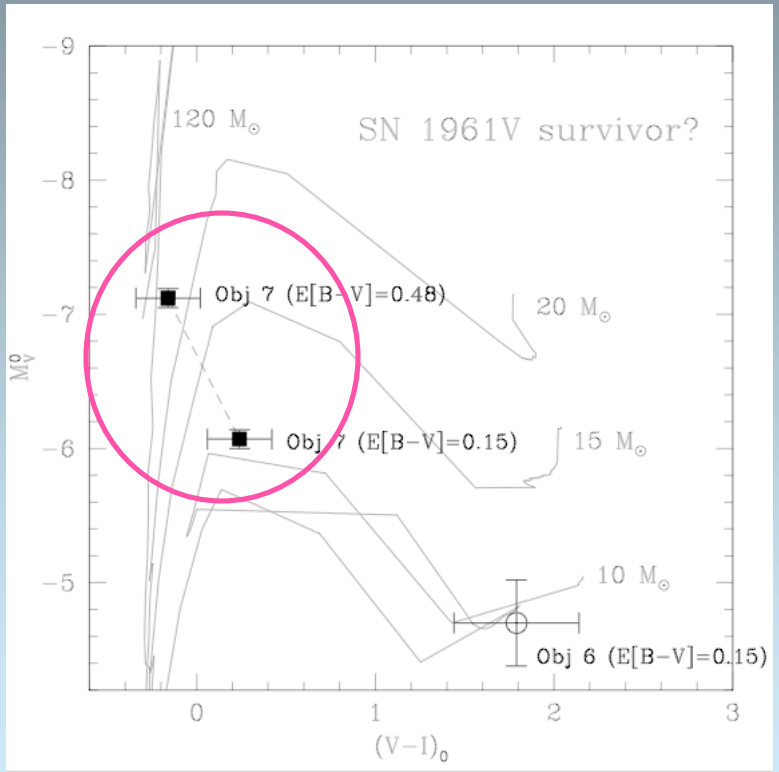


M_{V0} ~ **-8.40** (Van Dyk, Filippenko, & Li 2005)

The precursors of "SN impostors"

- SN "V" 1961V in NGC 1058





(Van Dyk, Filippenko, & Li 2002b; Chu et al. 2004; SVD 2005)