Wide-Field Photometric Survey of Young Southern Open Clusters

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March 13, 2015

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Overview

- Quickly and deeply surveyed 12 young and nearby open clusters.

- Open cluster parameters and IMF.

- The foundation for follow up spectroscopy to analyze white dwarfs and cluster MS stars.

DECam Observations

- Observed 12 open clusters in ugriz with 1 field each.

  - Nearby (< 1 kpc; span ~0.5 to 2 degrees)

  - Young (< 250 Myr)

- Shutter accurate to ~2 ms; 0.1 second exposures.

  - Saturating only stars brighter than V = 6 to 7.

Separating the Field

- We are given an "off-field" for free.

- Statistical field subtraction plus comparisons across multiple colors.
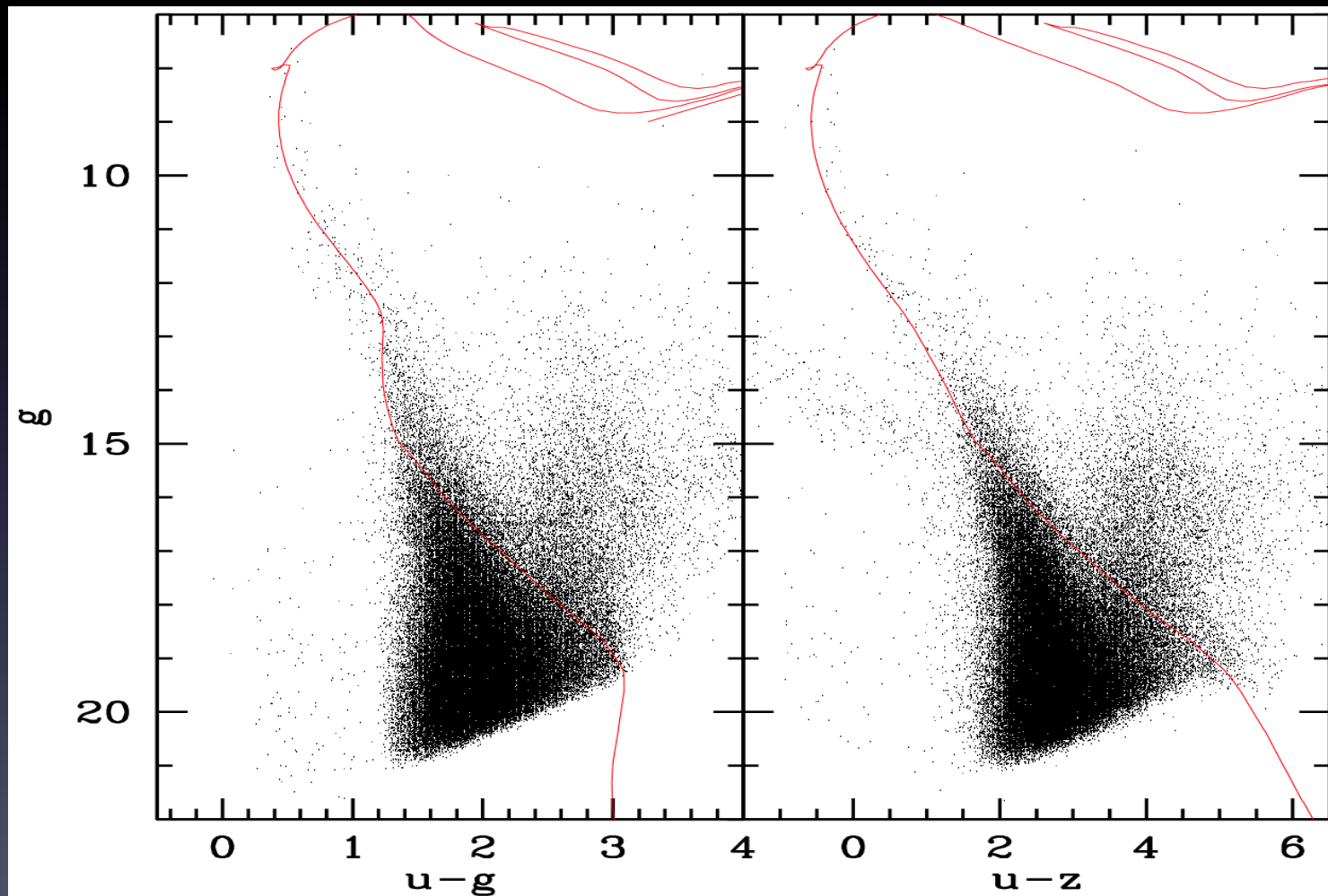
Cluster Parameters

- u provides strong sensitivity to both reddening and metallicity.

- Use multiple color-color diagrams and CMDs to derive cluster parameters and IMF.

Massive White Dwarfs in Clusters

- White dwarfs in clusters provide an invaluable tool to analyze evolution and integrated mass loss of their progenitors.

- No known cluster white dwarfs with mass $> 1.1\ M_\odot$

- No empirical initial final mass relation (IFMR) at high mass.

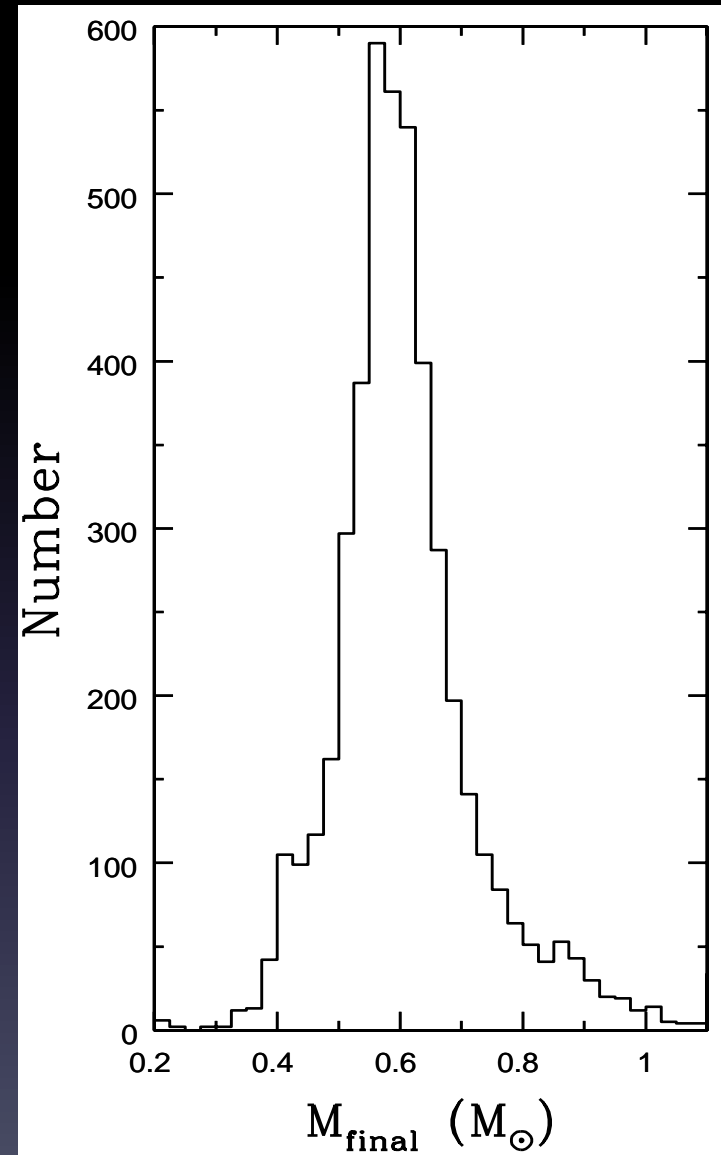# ~35 Years of IFMR Work

- Many difficulties remaining:

- Large scatter   -   Limited numbers in key regions
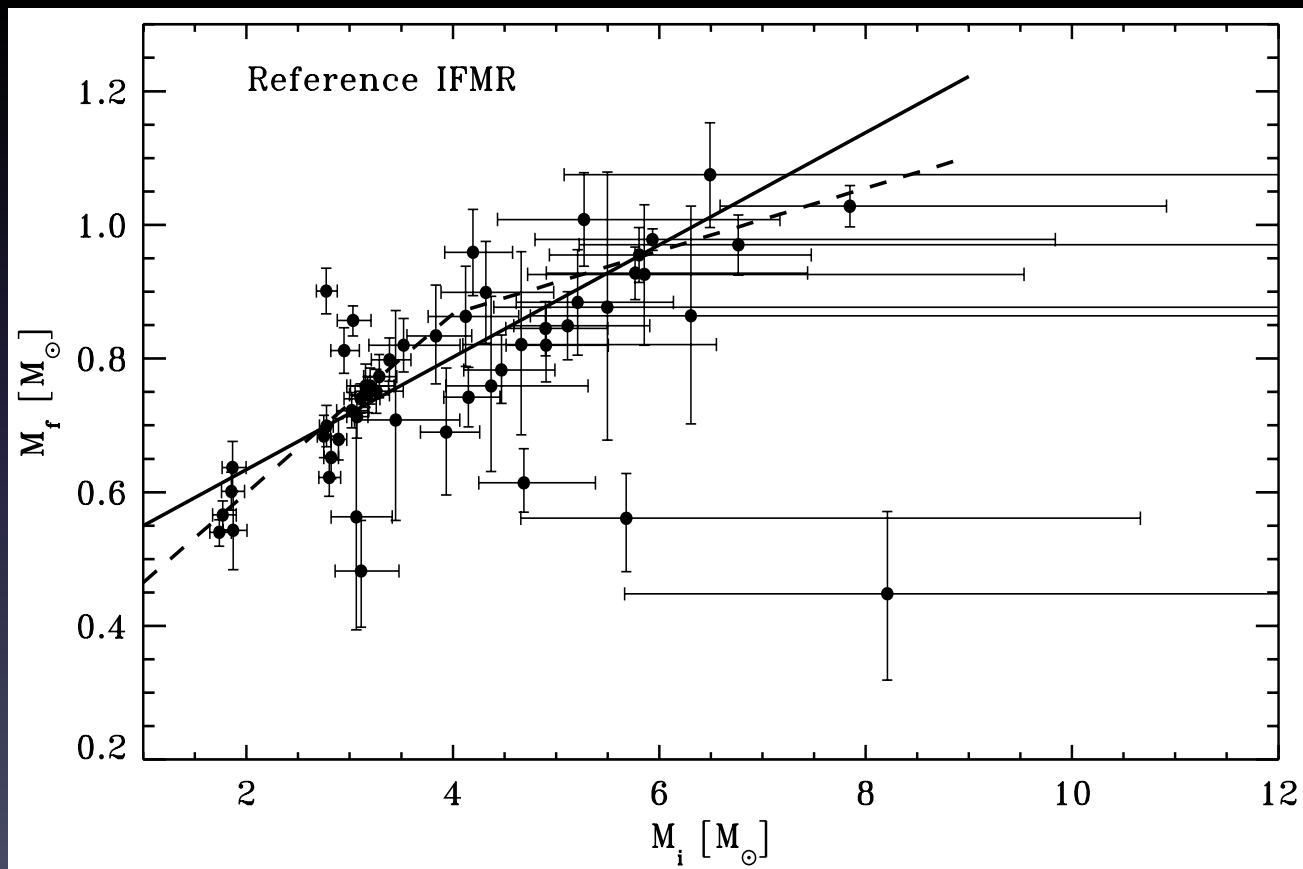

Salaris et al. (2009)

IFMR Applications

- Minimum mass of Type II SNe.

- Predicting Type Ia SNe rates.

- Stellar feedback and evolution in galaxies.

- Stellar core mass evolution.

- Understanding white dwarf populations

  - luminosity function

  - mass distribution.
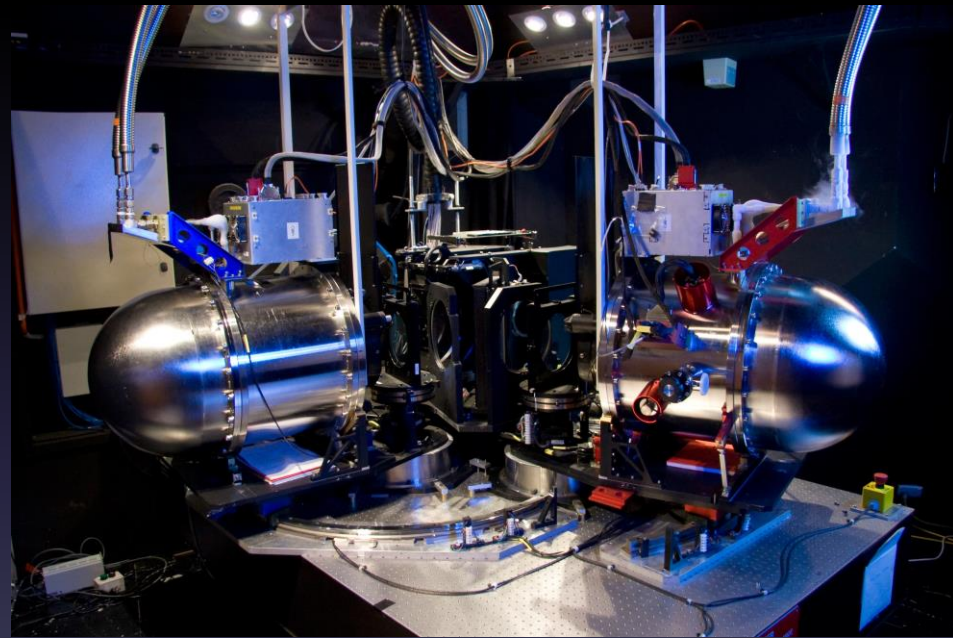

SDSS DR7 (Tremblay et al. 2014)

In Search of the Faint and Blue

- High mass white dwarfs form rapidly (~50 Myr) but also cool rapidly.

- More likely to be ejected.

- Nearby and young clusters provide bright and high mass white dwarfs.
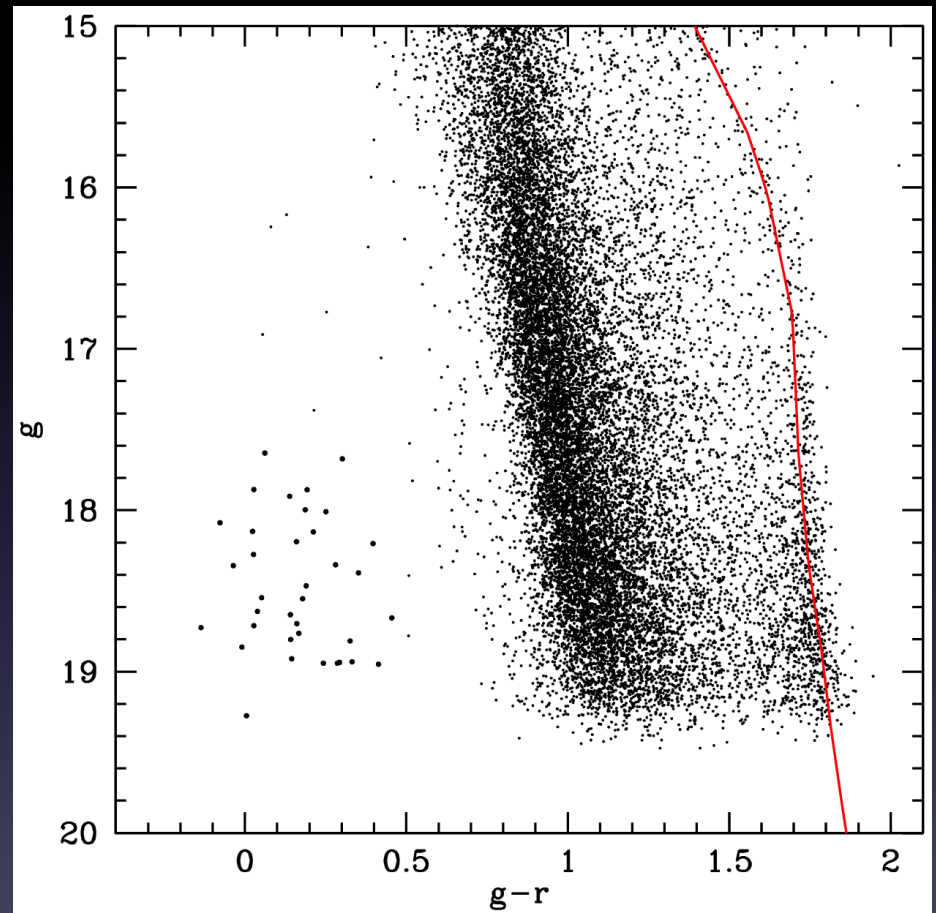
AAOmega Spectrograph

- 2 deg FOV

- 392 fibres

- Red & Blue beams

- Good blue sensitivity

  below 4000 Å

Summary

- Field Correction

- Derive cluster parameters & IMF

- Search for massive white dwarfs ($> 1\ M_{\odot}$)

- Further analyze cluster [Fe/H] and Li abundances with MS stars.