Speaker Contact Information

- Joe Huehnerhoff & Chris Laws: jwhueh@uw.edu, laws@astro.washington.edu
- Charli Sakari: sakaricm@u.washington.edu
- Michael Tremmel: mjt29@astro.washington.edu
- Emily Levesque: emsque@uw.edu
- Paul Szkody: szkody@astro.washington.edu

Undergraduate Opportunities in Telescopes and Instrumentation at UW

Chris Laws

Joseph Huehnerhoff

Manastash Ridge Observatory

2015-11-6

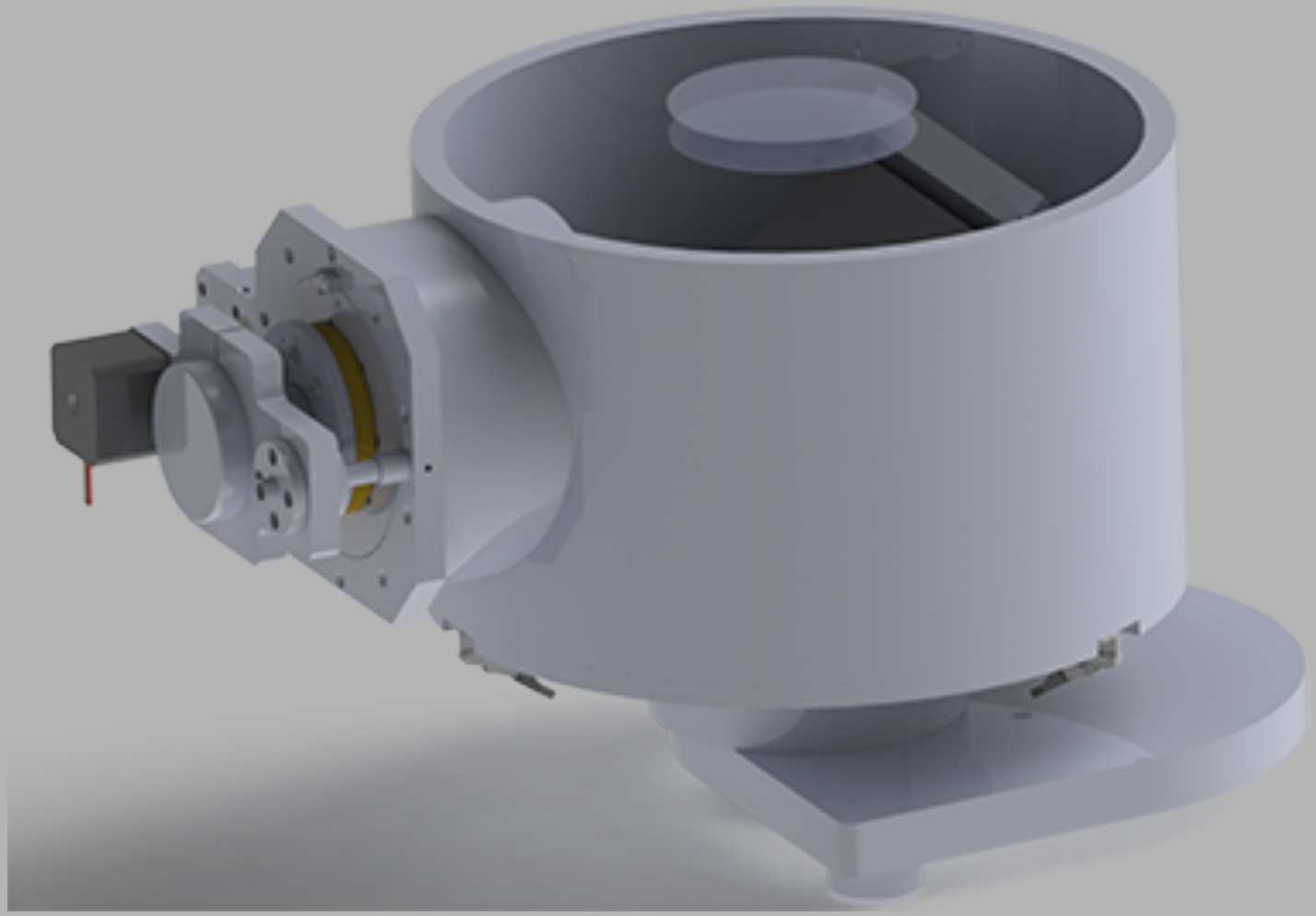
University of Washington
Department of Astronomy

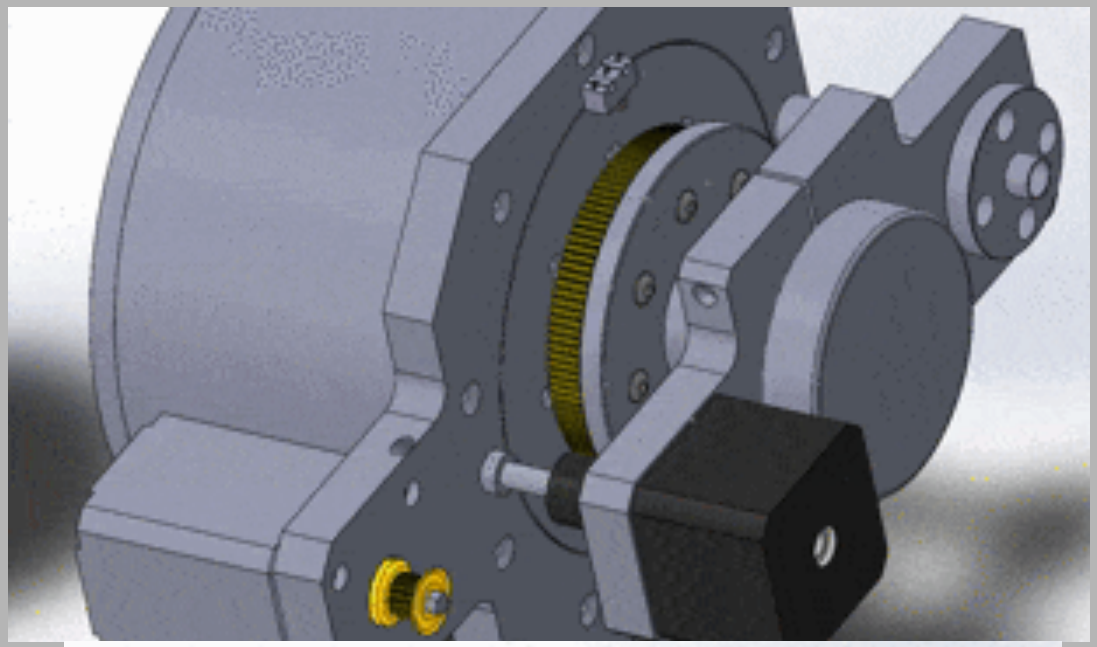
AUEG

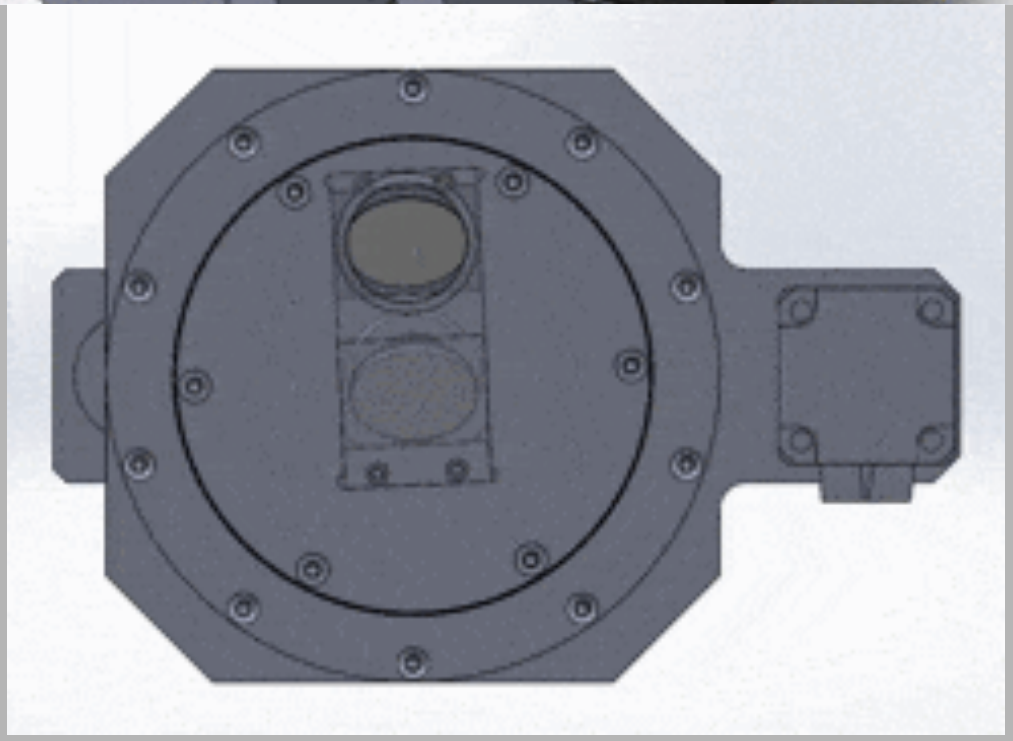
Astronomy Undergraduate Engineering Group

- Teach
  - Project Management – break into team
  - Industrial Skills
  - Professional Work Ethic
- MRO Projects
  - New Science Camera
  - Sustainability Upgrade
  - Guider Upgrade
  - TCC upgrade
  - Filter Wheel Replacement
- APO
  - Dome Flow Analysis 35m
  - Temp Sensor Replacement 25m
  - Summer Shutdown Support

http://staff.washington.edu/jwhueh/AUEG/







Fun with Mirrors

2015-11-6

Talk to Us to Get More Info

- If you are interested in Astronomical instrumentation and engineering come talk with Chris or myself about the current opportunities available.

  Chris Laws - laws@astro.washington.edu

  Joseph Huehnerhoff – jwhueh@uw.edu

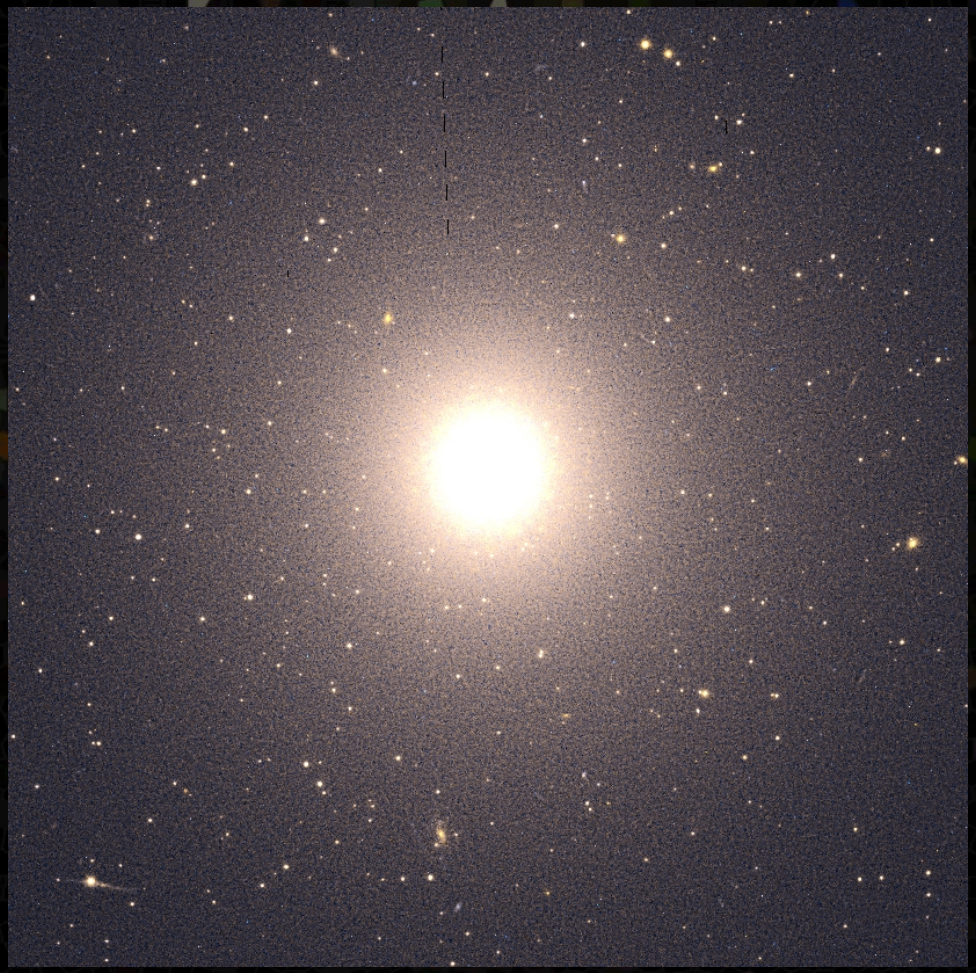
Chemical Abundances of Globular Cluster Stars

Charli Sakari

Post-doctoral Research Associate

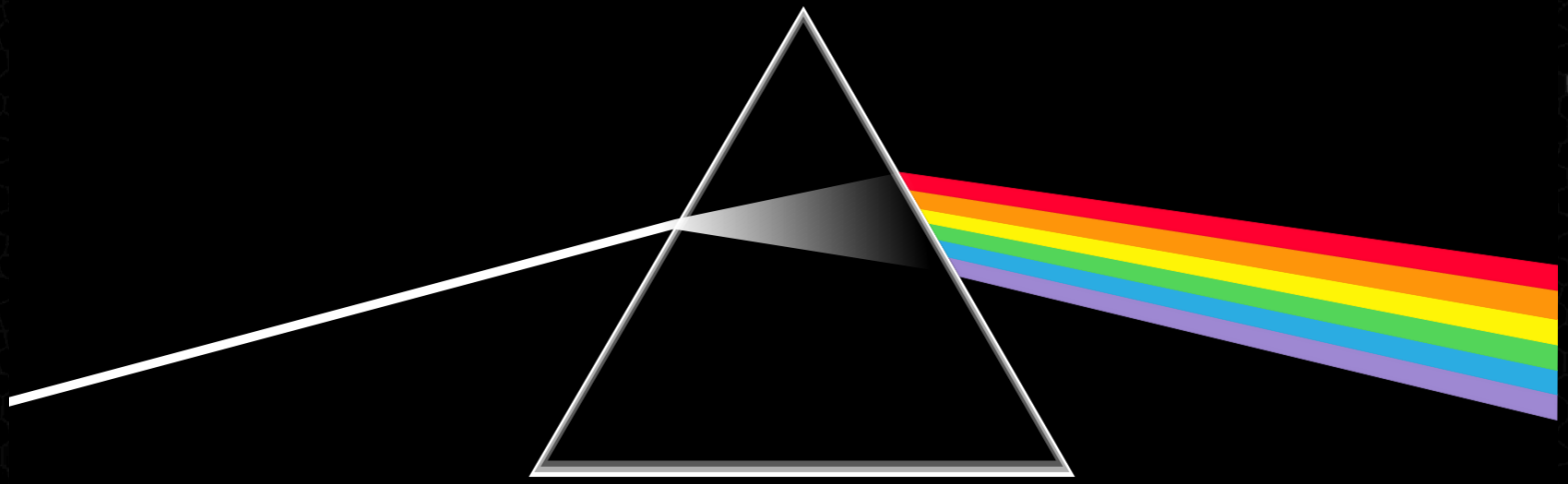
University of Washington

Distant GCs

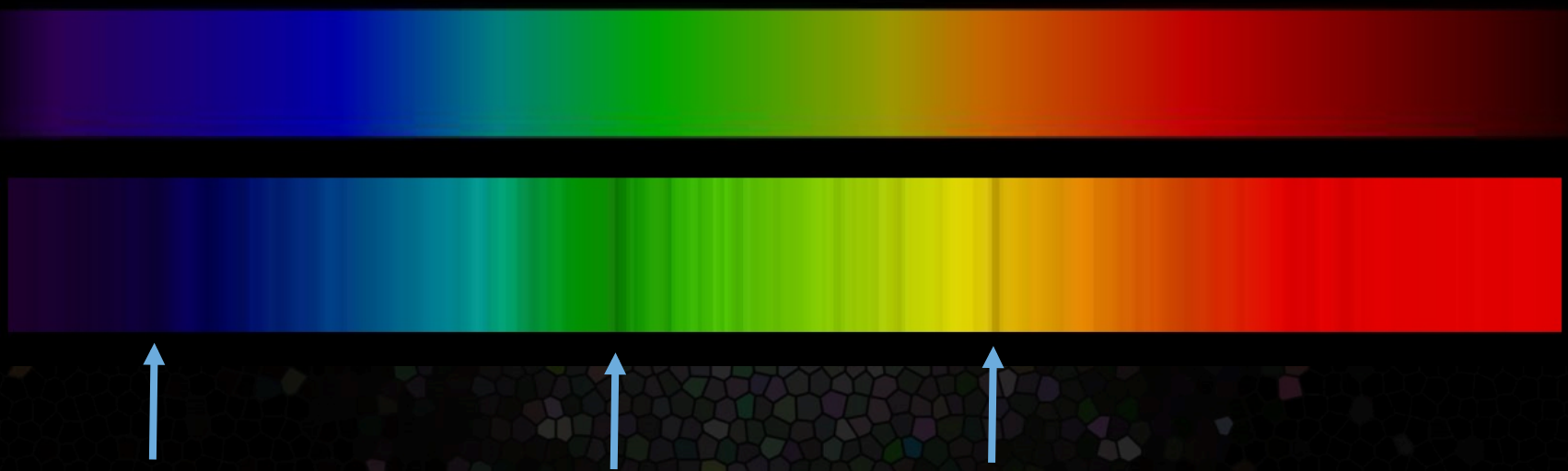


NGC 1407—Image from Harris et al. 2006

Spectroscopy



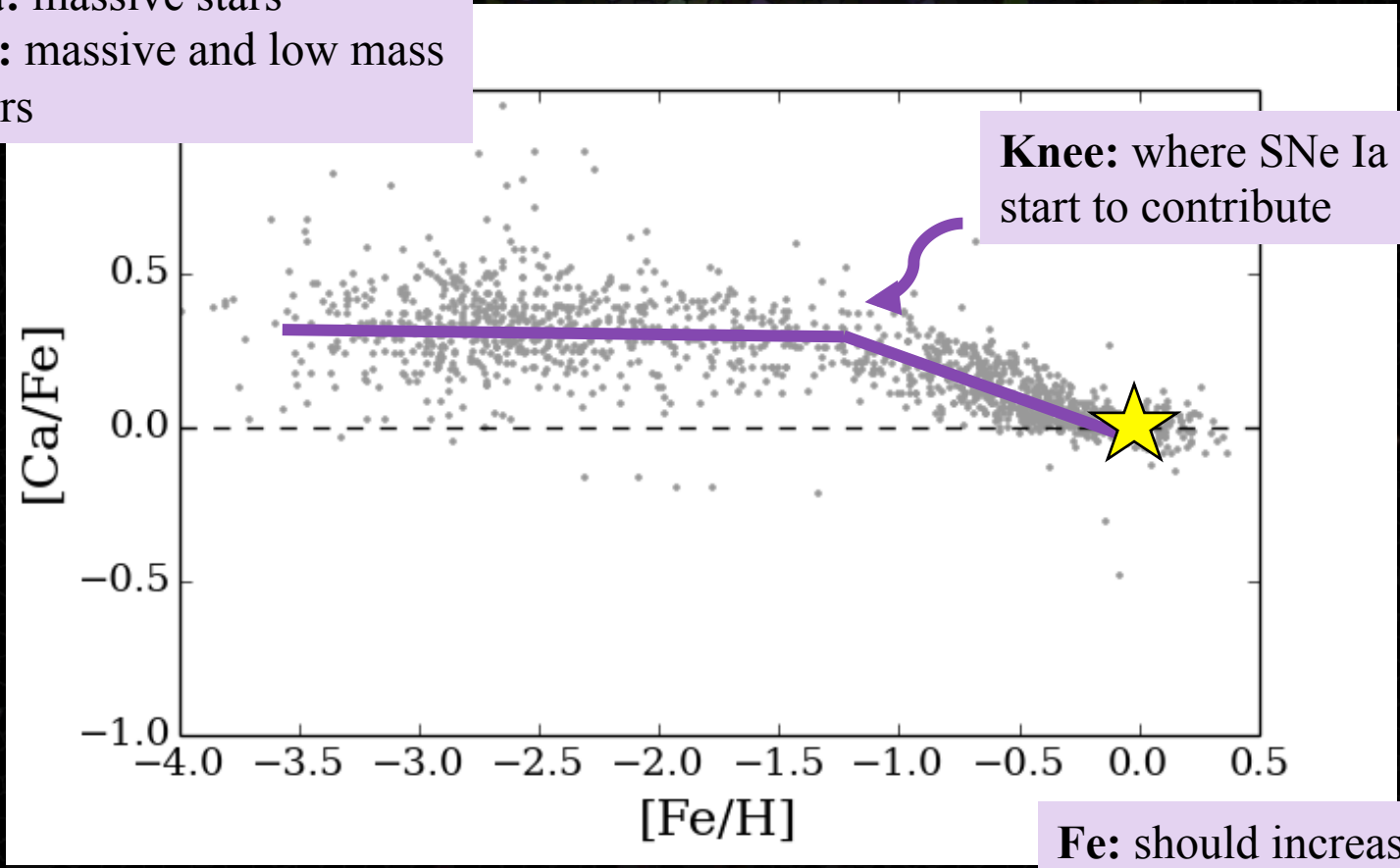
Spectroscopy



Dark bands = absorption lines

Chemical Tagging

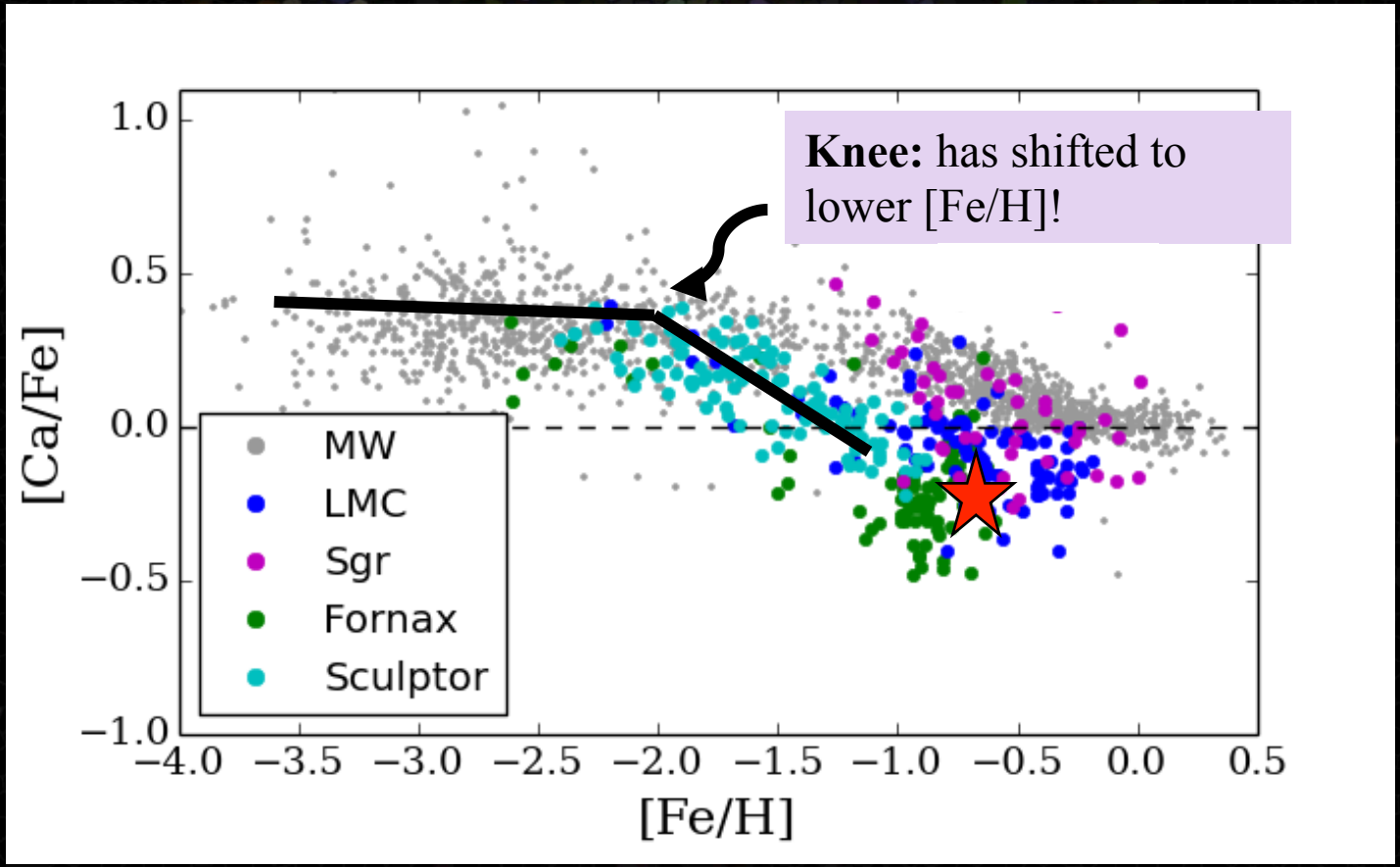
Ca: massive stars
Fe: massive and low mass stars



Knee: where SNe Ia start to contribute

Fe: should increase over time

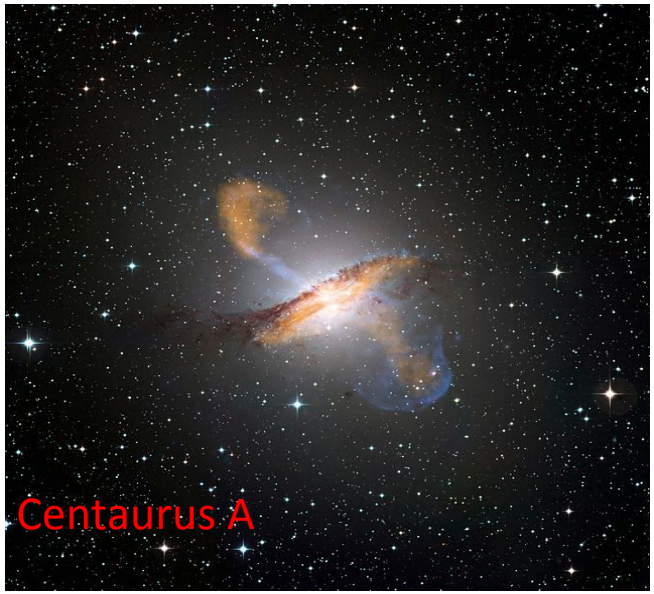
Chemical Tagging

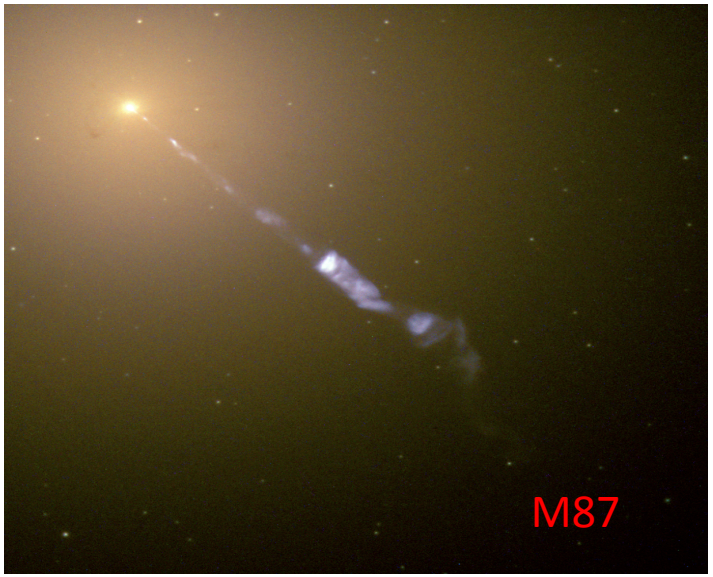


The Romulus Simulations

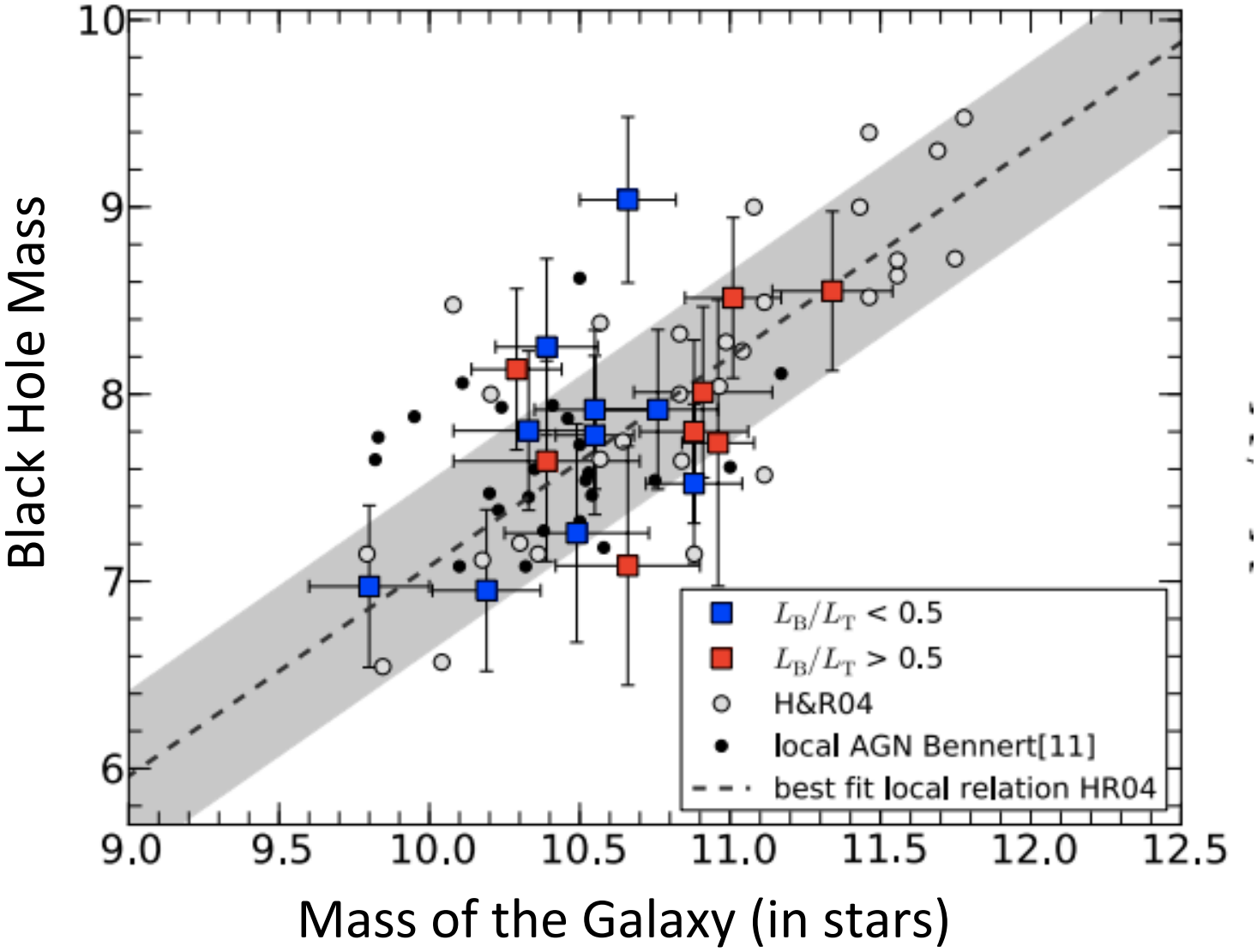
Studying the Co-Evolution of Galaxies and Supermassive Black Holes

Black Holes and Their Galaxies





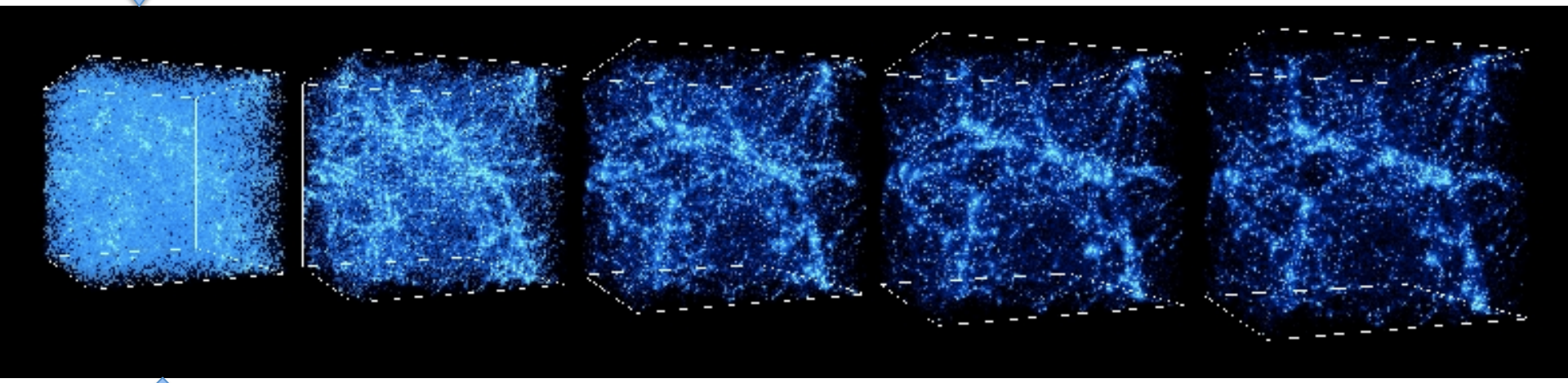
Black Holes and Their Galaxies



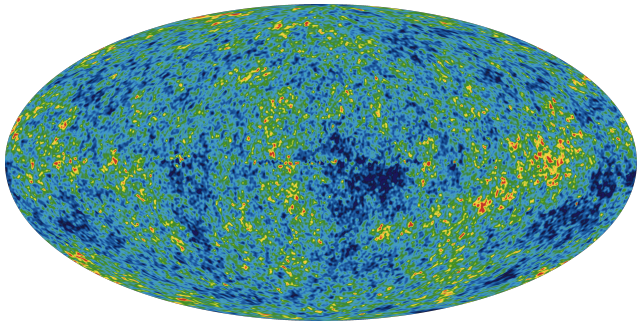
Cosmological Simulation Basics

Physics

- ✓ Gravity
- ✓ Hydrodynamics
- ✓ Star Formation, Supernovae
- ✓ Supermassive Black Holes

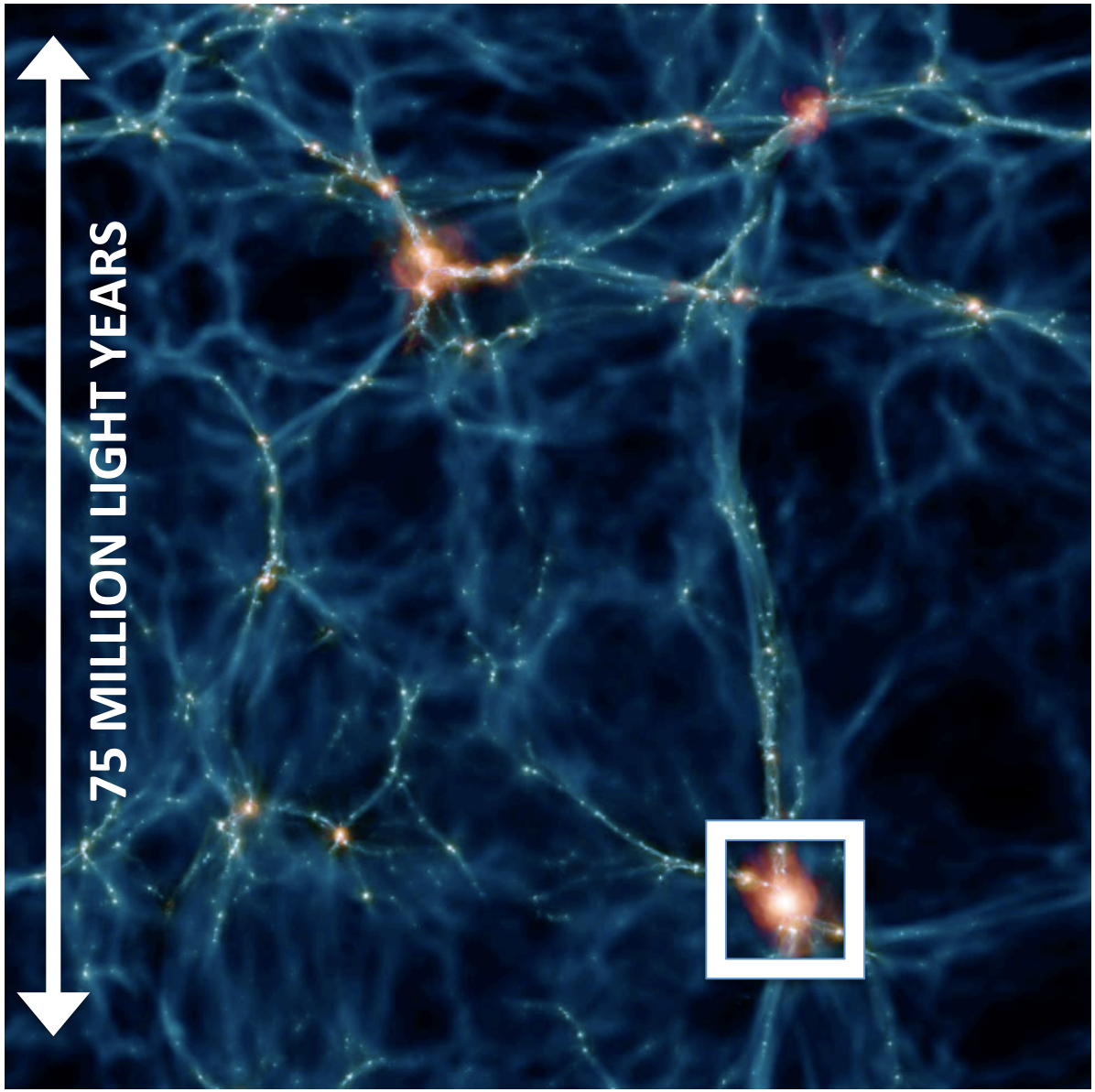


Initial Conditions



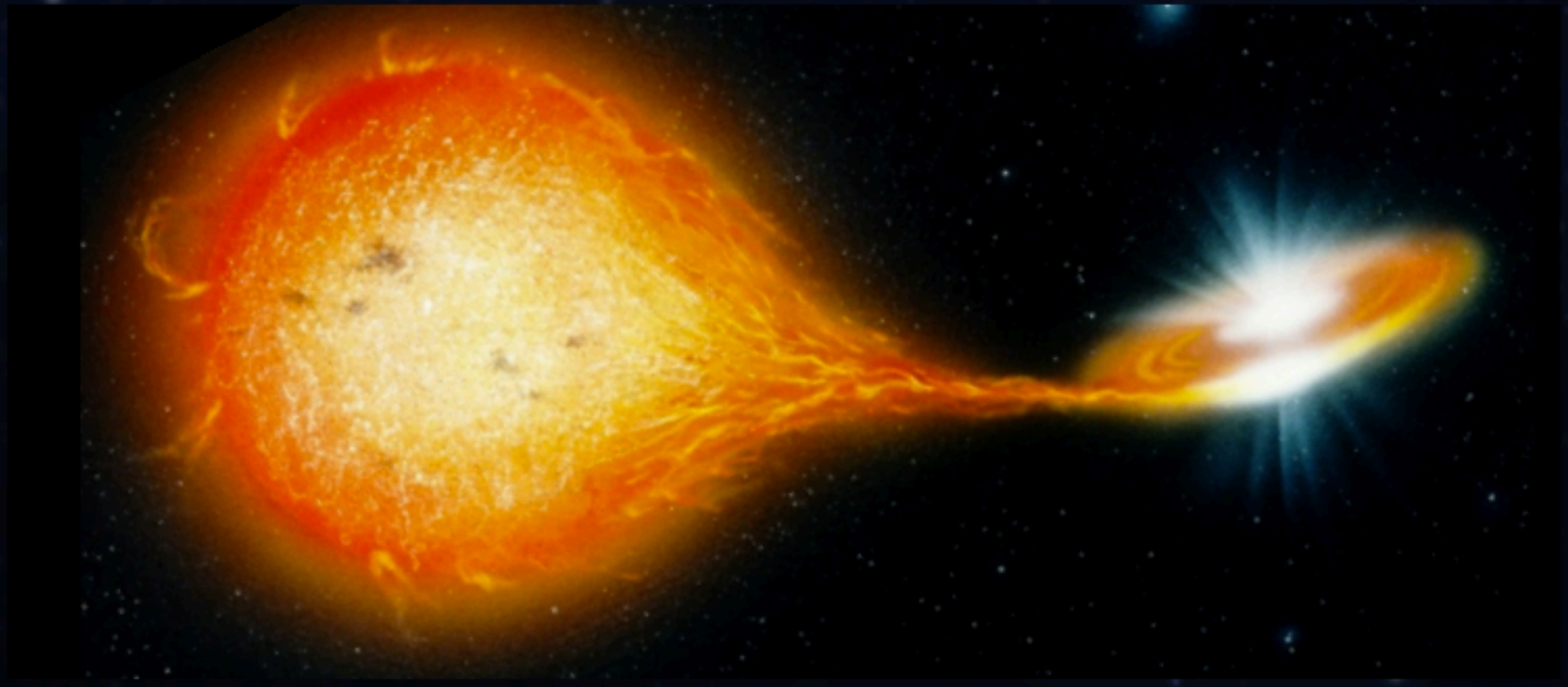
The Romulus Simulations

- ✓ High Resolution
- ✓ Well constrained physics
- ✓ **New Supermassive Black Hole Physics**



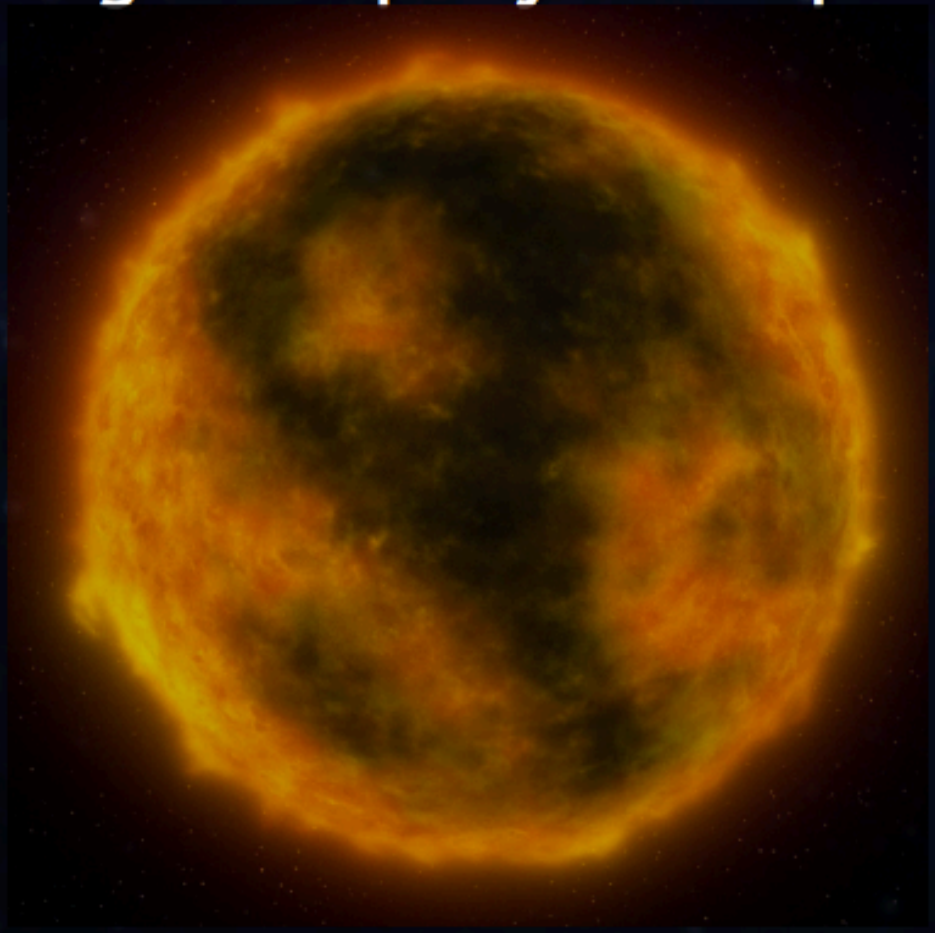
Thorne-Żytkow Objects: The Weirdest Stars in the Universe

Emily Levesque emsque@uw.edu



11.20.2015

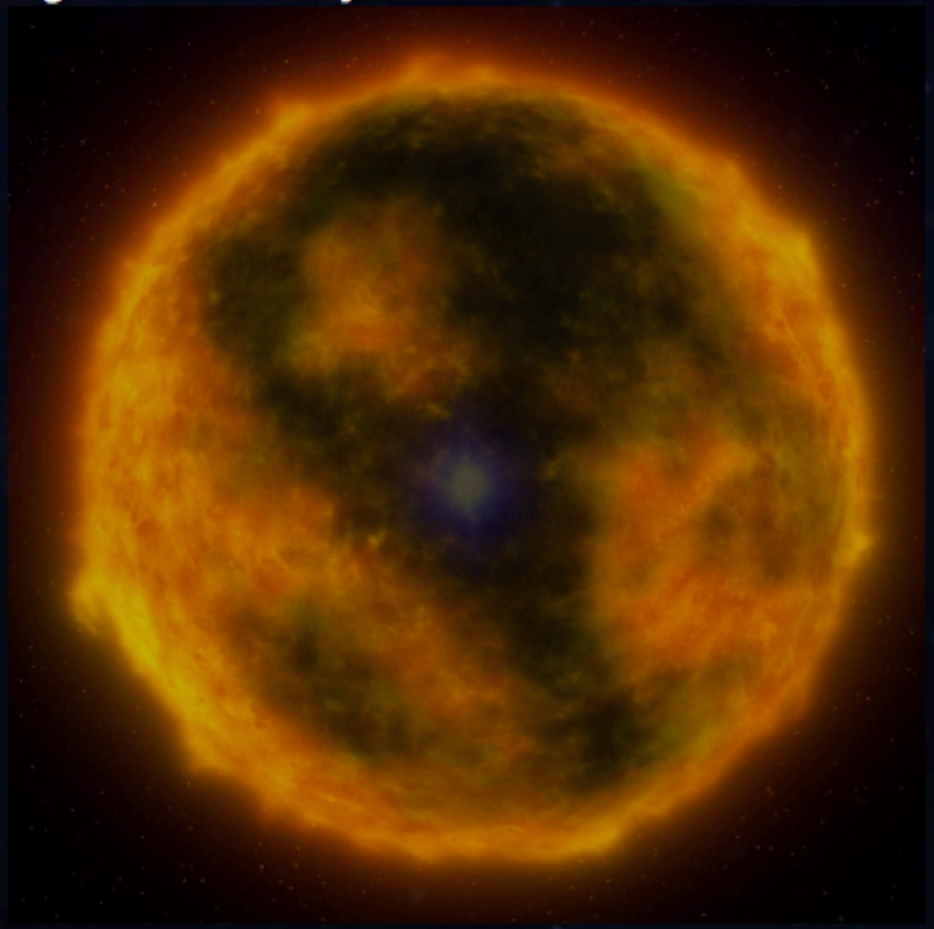
Thorne-Żytkow Objects (TŻOs) are a theoretical class of star: a neutron star "core" surrounded by a large cold puffy envelope.



red supergiant

neutron star

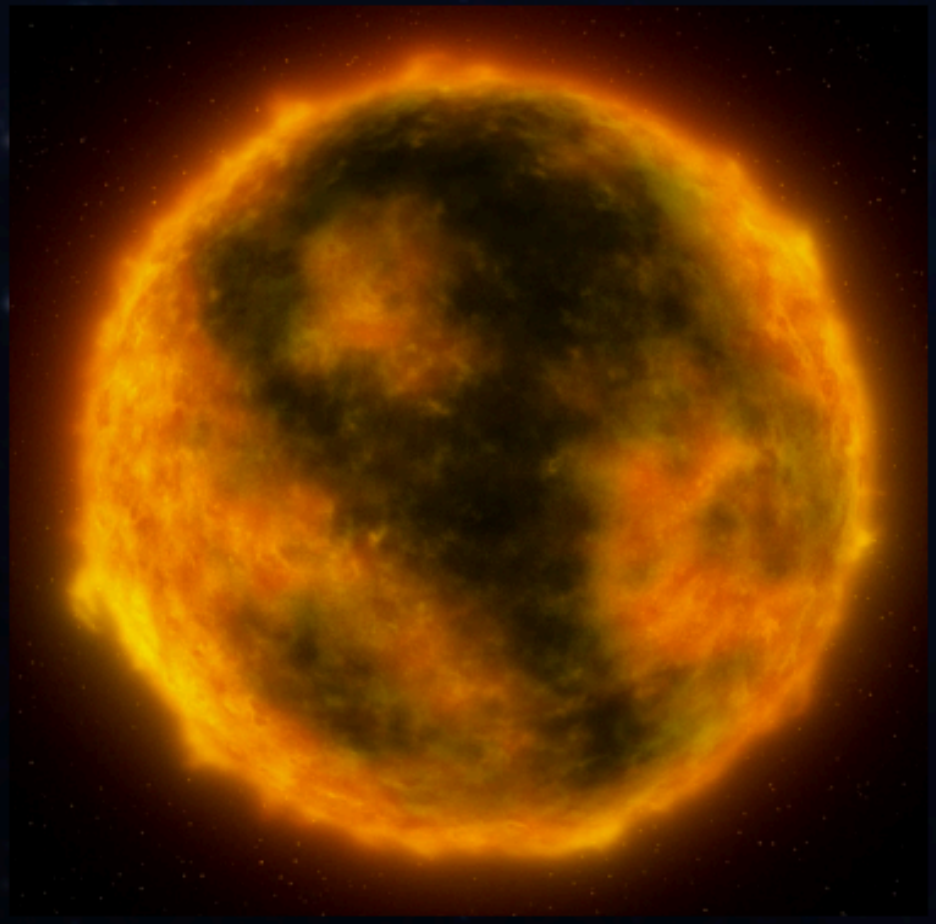
Thorne-Żytkow Objects (TŻOs) are a theoretical class of star: a neutron star "core" surrounded by a large cold puffy envelope.



For years TŻOs were just a theory;
nobody had ever observed one.

TŻOs look exactly like red supergiants...

almost!

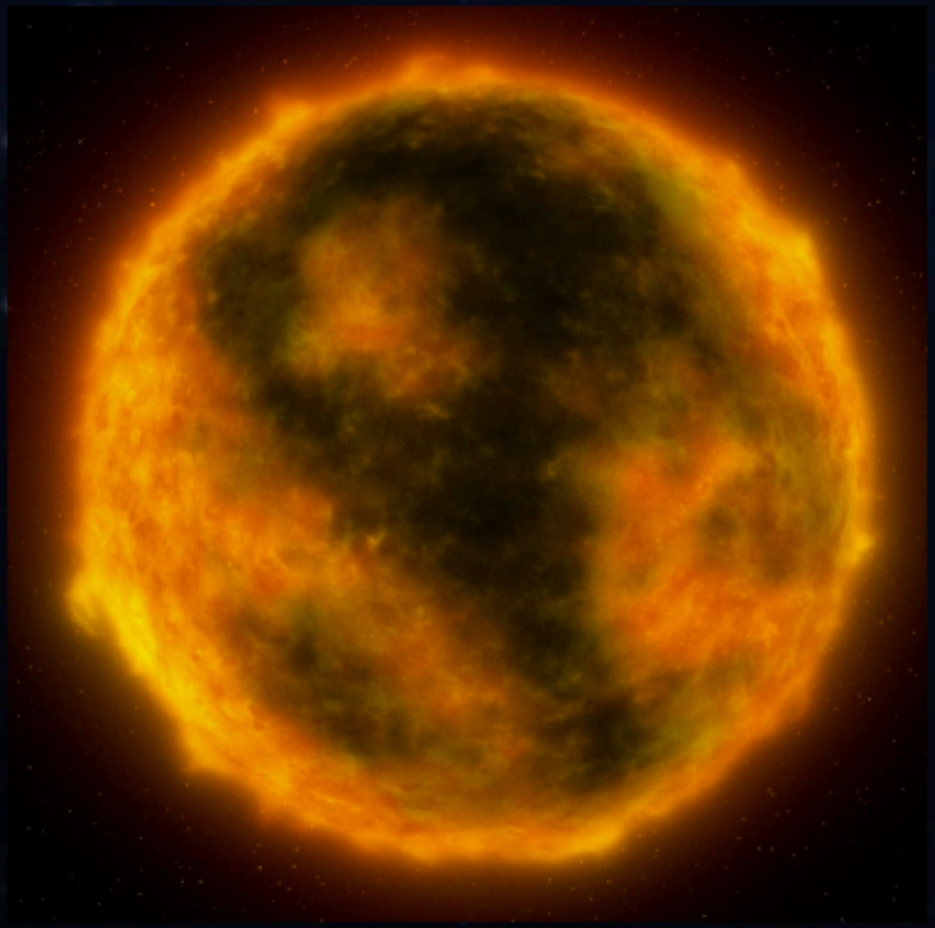


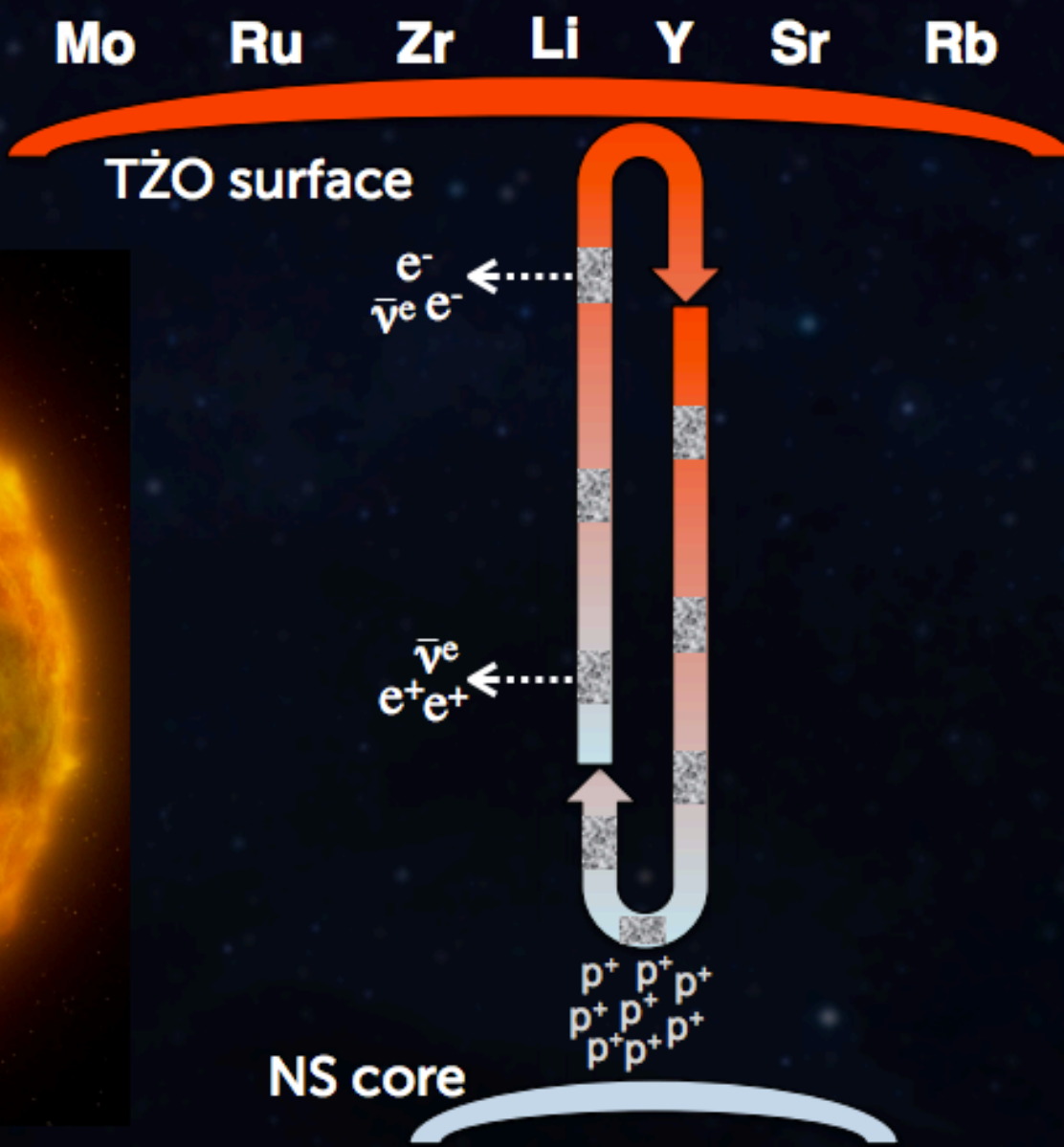
RSG surface

He-burning core

TŻOs look exactly like red supergiants...

almost!

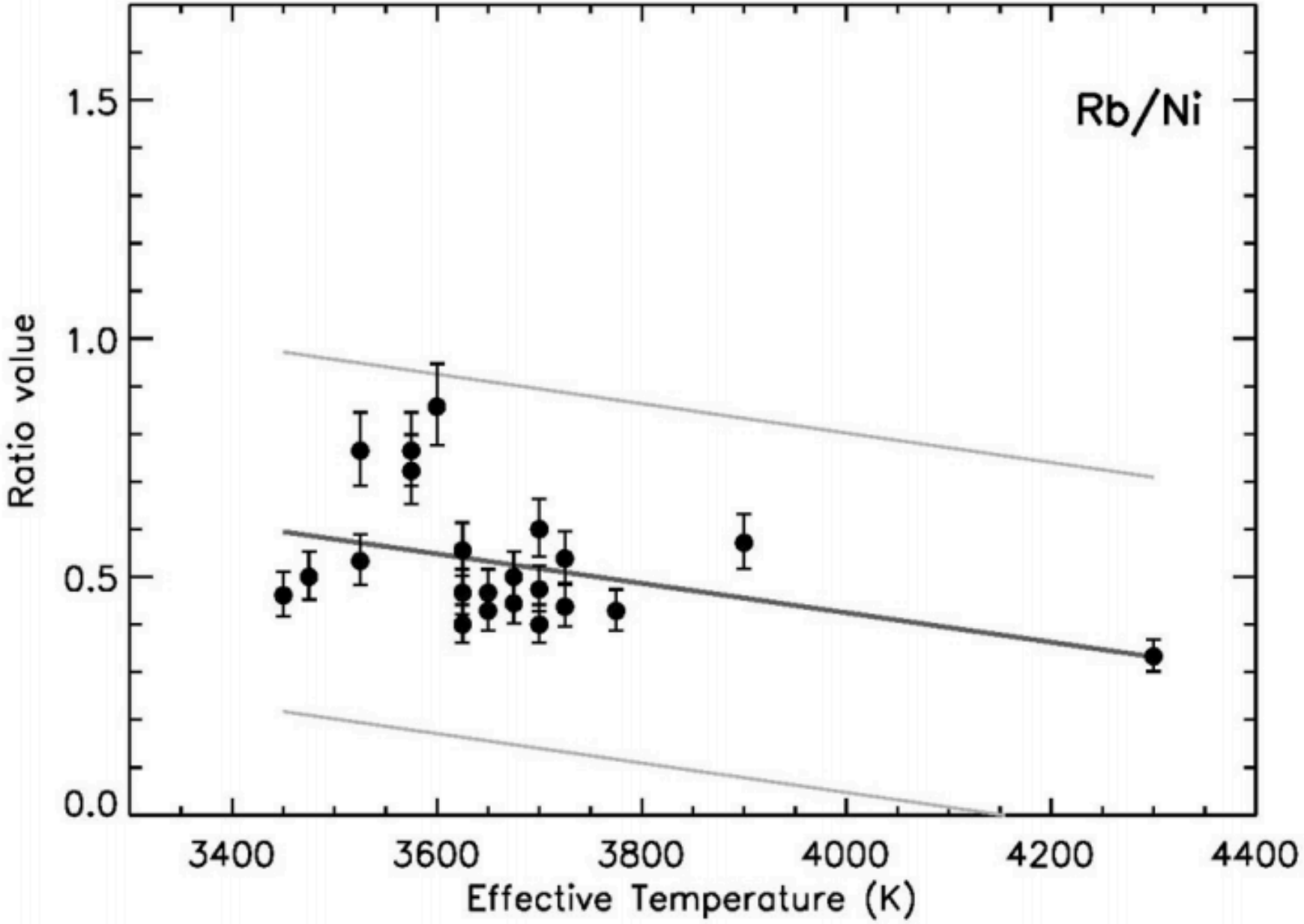




TŻOs look exactly like red supergiants...

A search for TŻOs: high-resolution spectroscopy of RSGs in nearby galaxies

NS core


Rb/Ni
Ratio value
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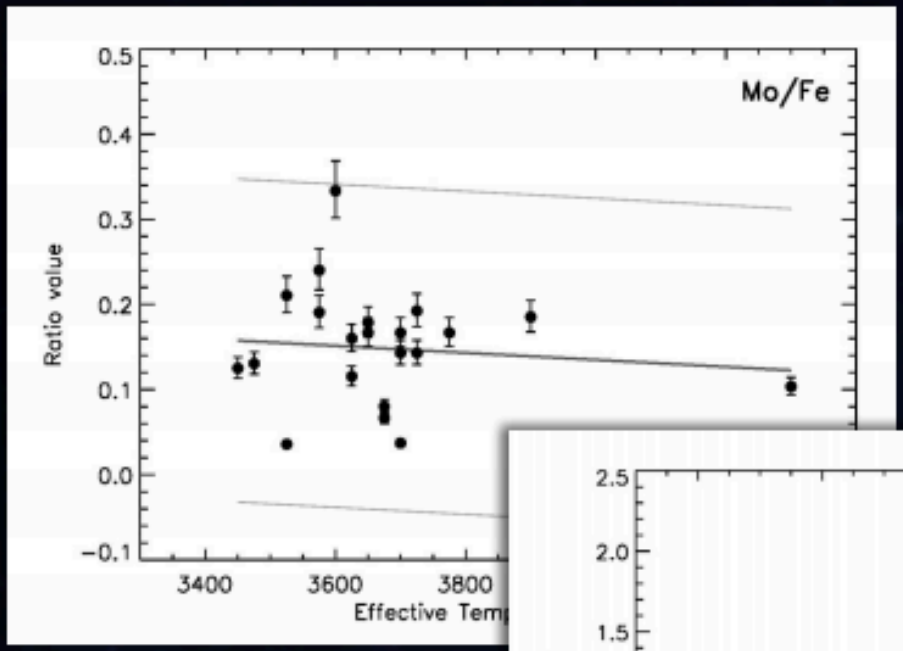
0.5
0.0
3400
3600
3800
4000
4200
4400
Effective Temperature (K)


Mo/Fe
Ratio value
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0.1
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−0.1
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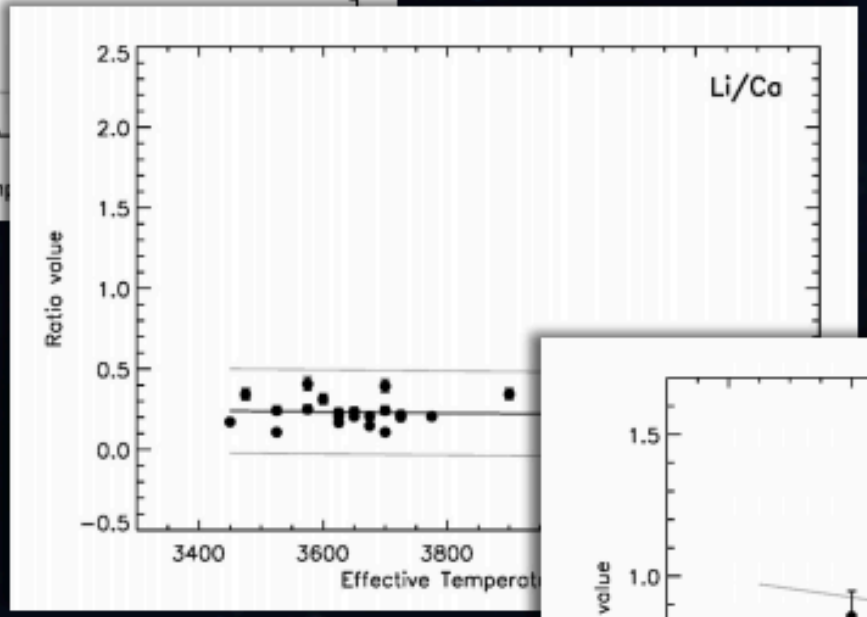
3600
3800
Effective Tem


Li/Ca
Ratio value
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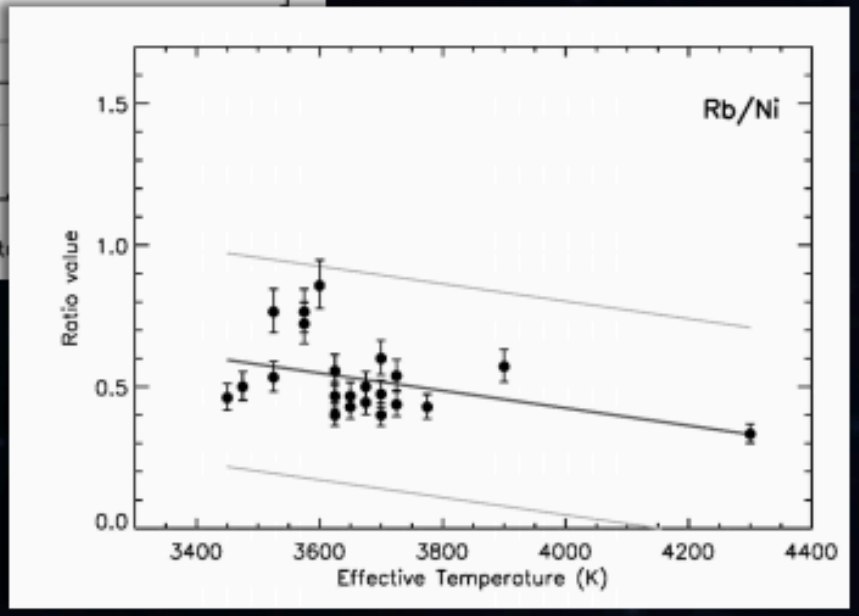
1.5
1.0
0.5
0.0
−0.5
3400
3600
3800
Effective Temperat


Rb/Ni
Ratio value
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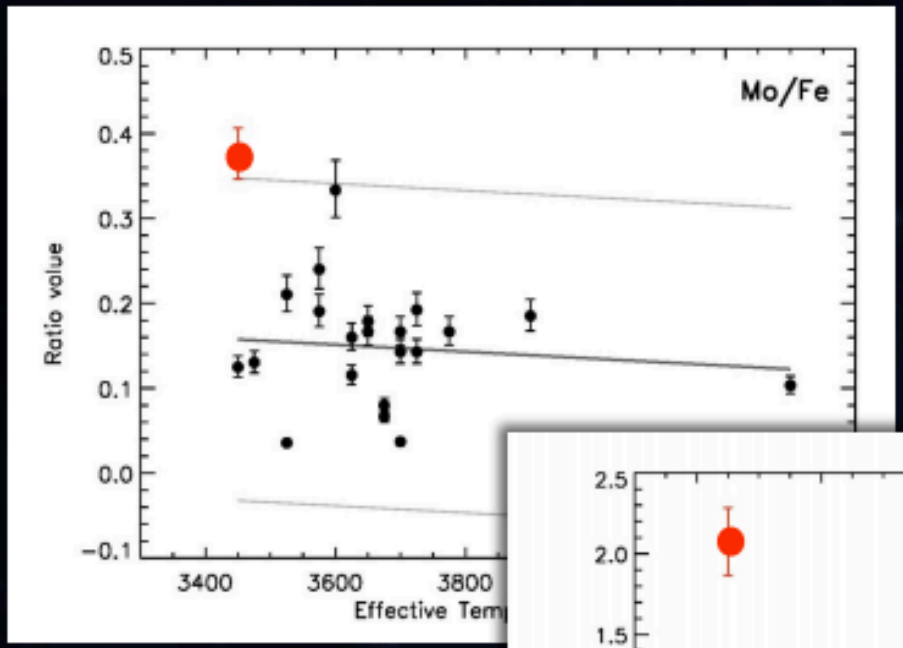
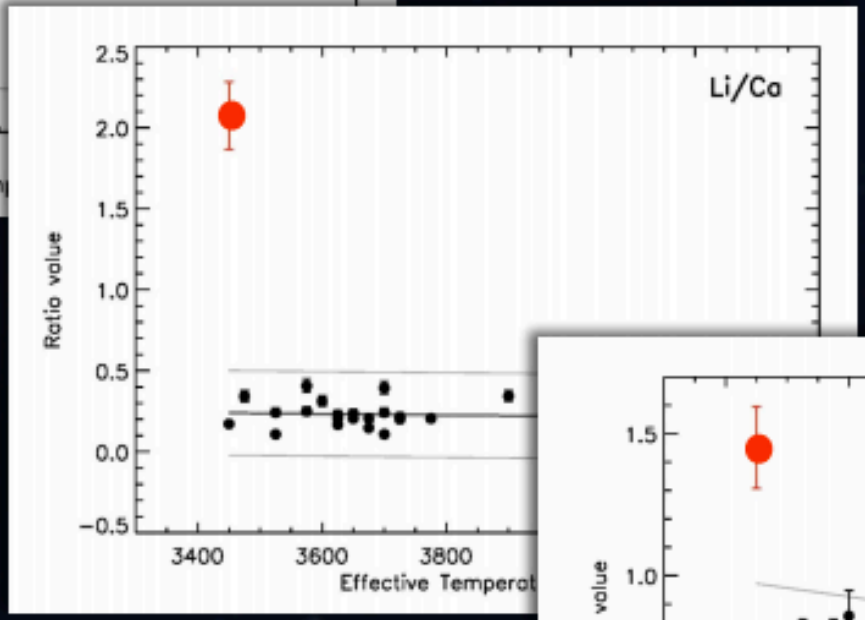
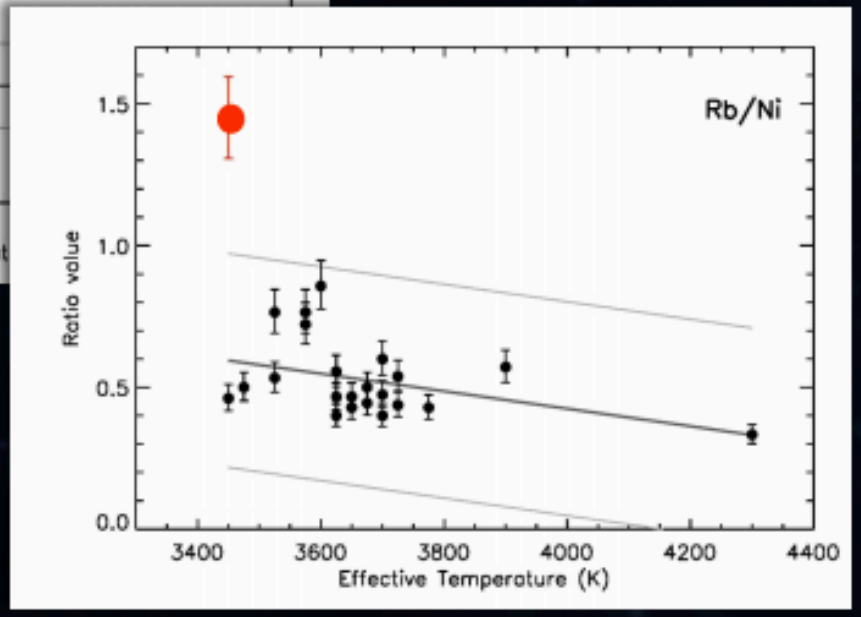
1.0
0.5
0.0
3400
3600
3800
4000
4200
4400
Effective Temperature (K)



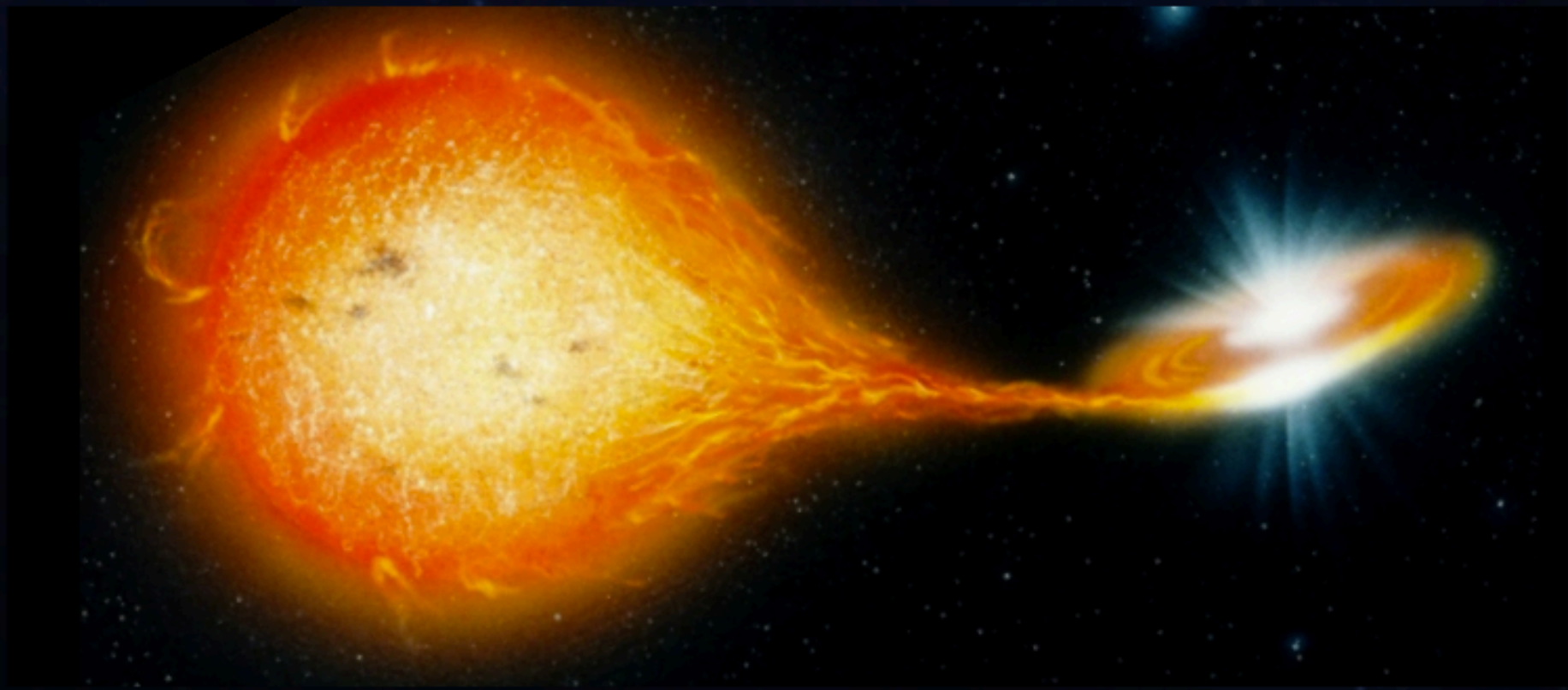




TŻO candidate!

The existence of TŻOs would have profound implications for astronomy.

- completely new model of stable stellar interiors
- a new fate for massive binary systems
- new ways to make Li and heavy elements in our universe



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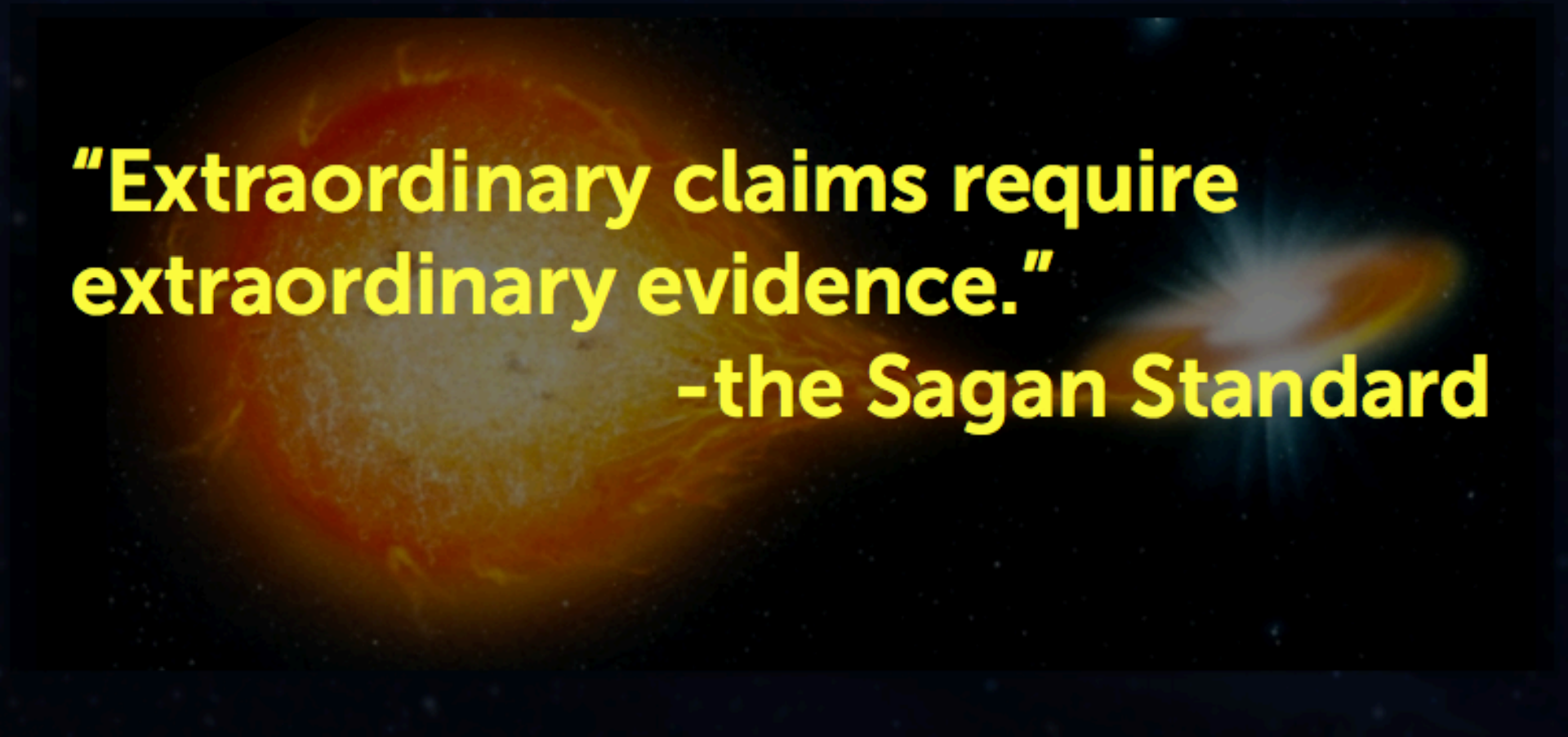


The existence of TŻOs would have profound implications for astronomy

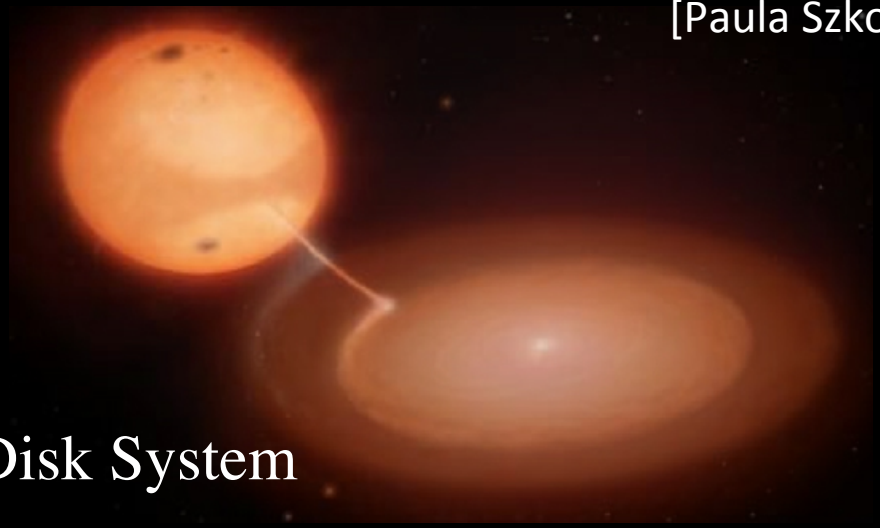
What's next?

- New models of TŻO interiors (dynamics, chemistry, etc.)
- New predictions of observables
- Search for pre- and post-TŻO signatures (supernova remnants, binaries, "naked" TŻO cores...)

emsque@uw.edu

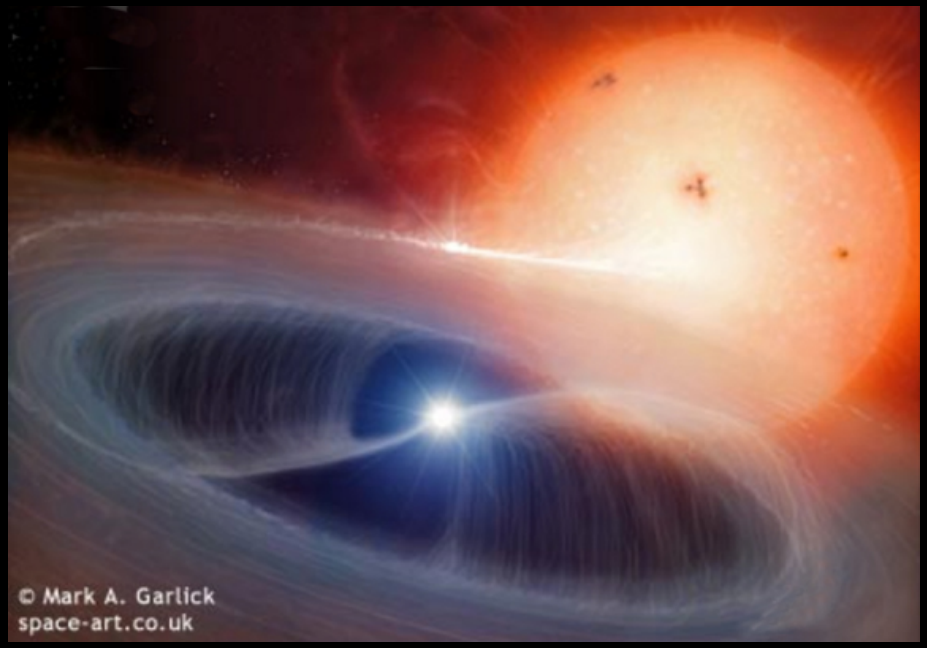
Cataclysmic Variables

[Paula Szkody]

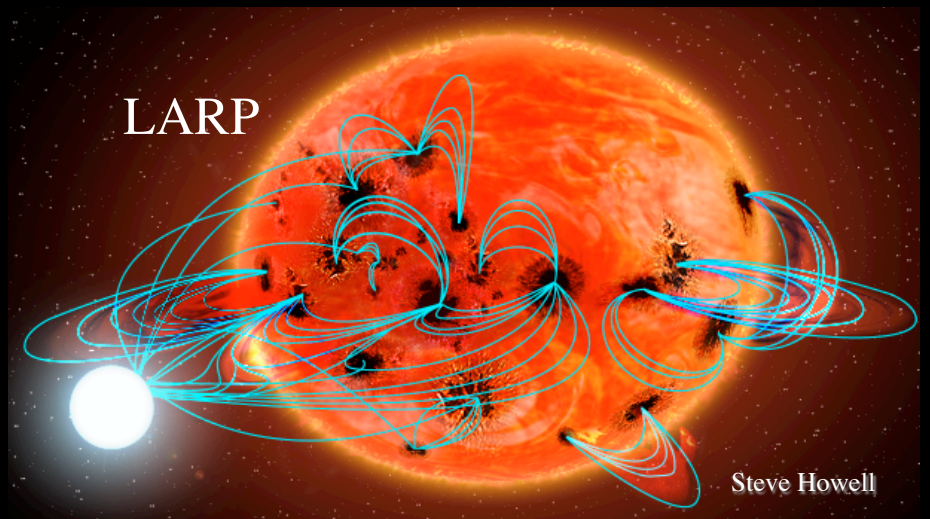


Disk System

Polar



Intermediate Polar



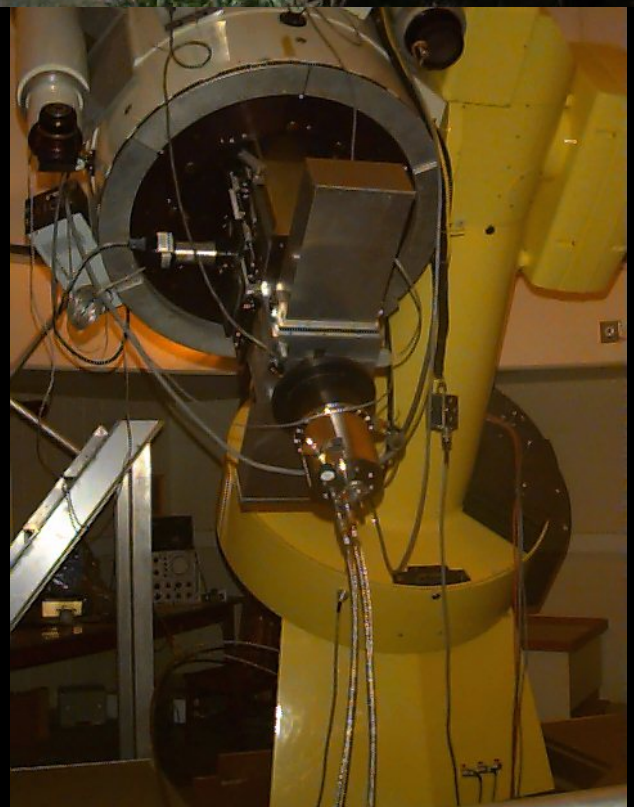
Key Questions:

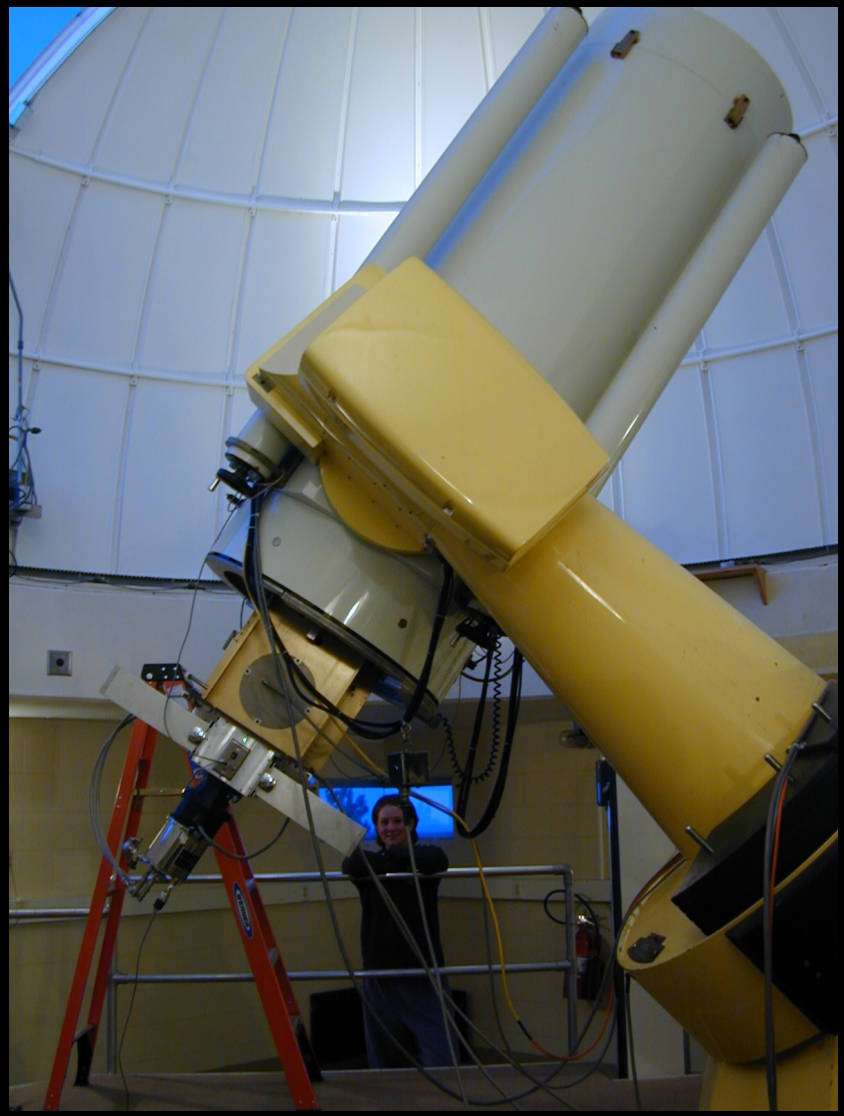
- How many are there?
- How do they evolve?
- What are the effects of mass transfer, accretion?

Optical Gives Info on:

- numbers from surveys
- types of systems
- timescale of phenomena

U of W 30 inch reflector at Manastash Ridge Observatory outside Ellensburg Lat=+47



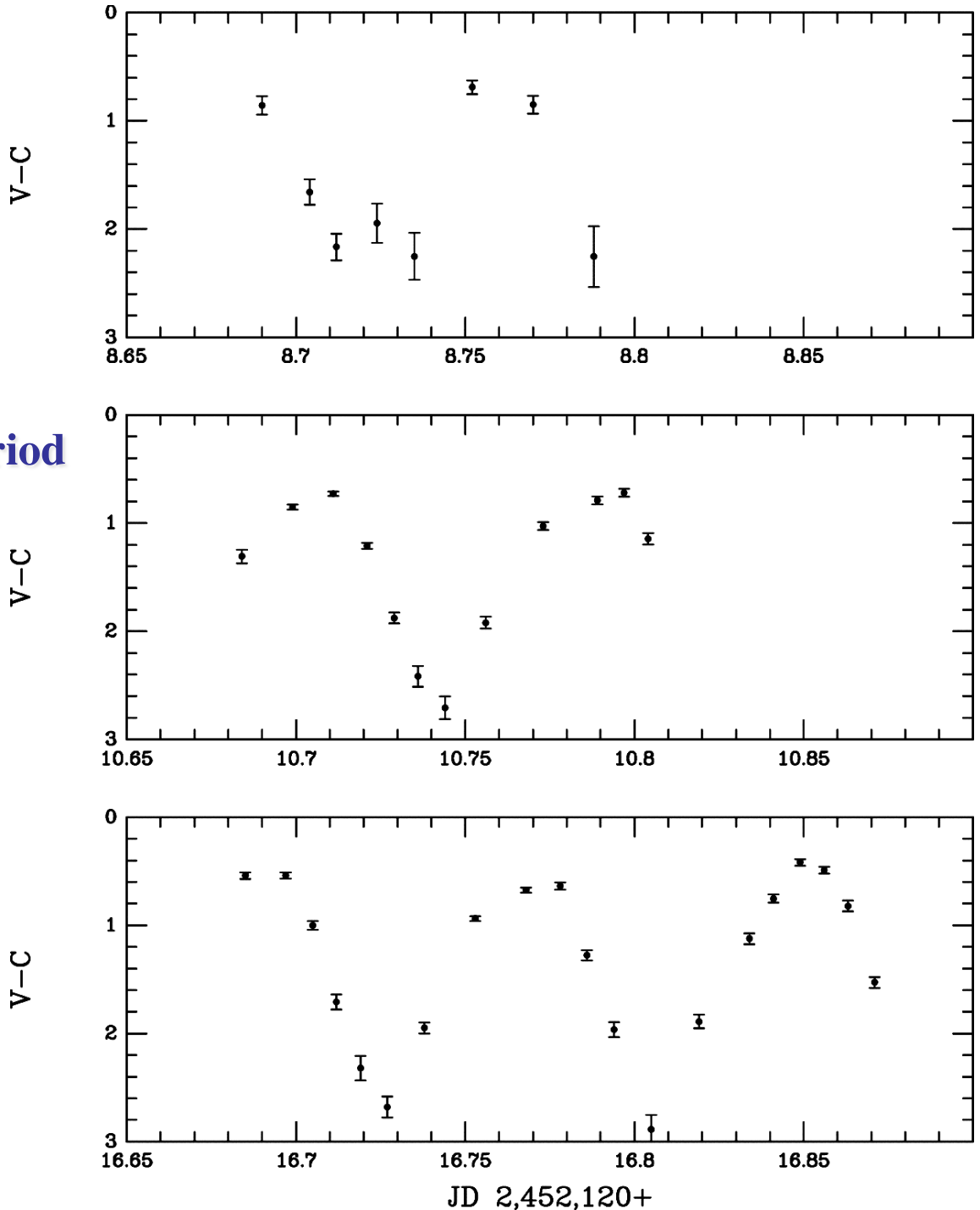


SDSS1700

MRO photometry

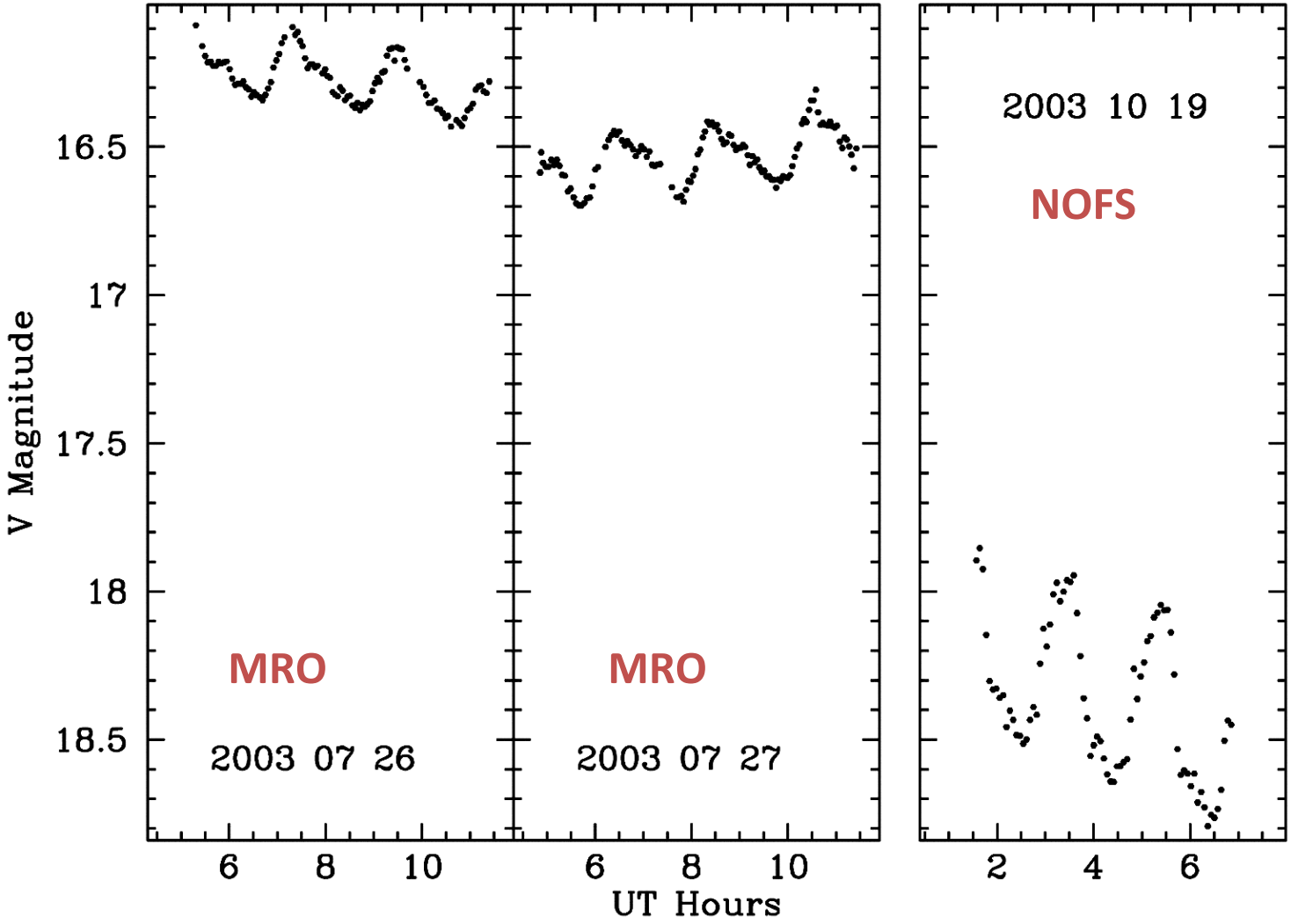
Found Orbital Period

P=115 min



Positive SH

P= 1.9 hr

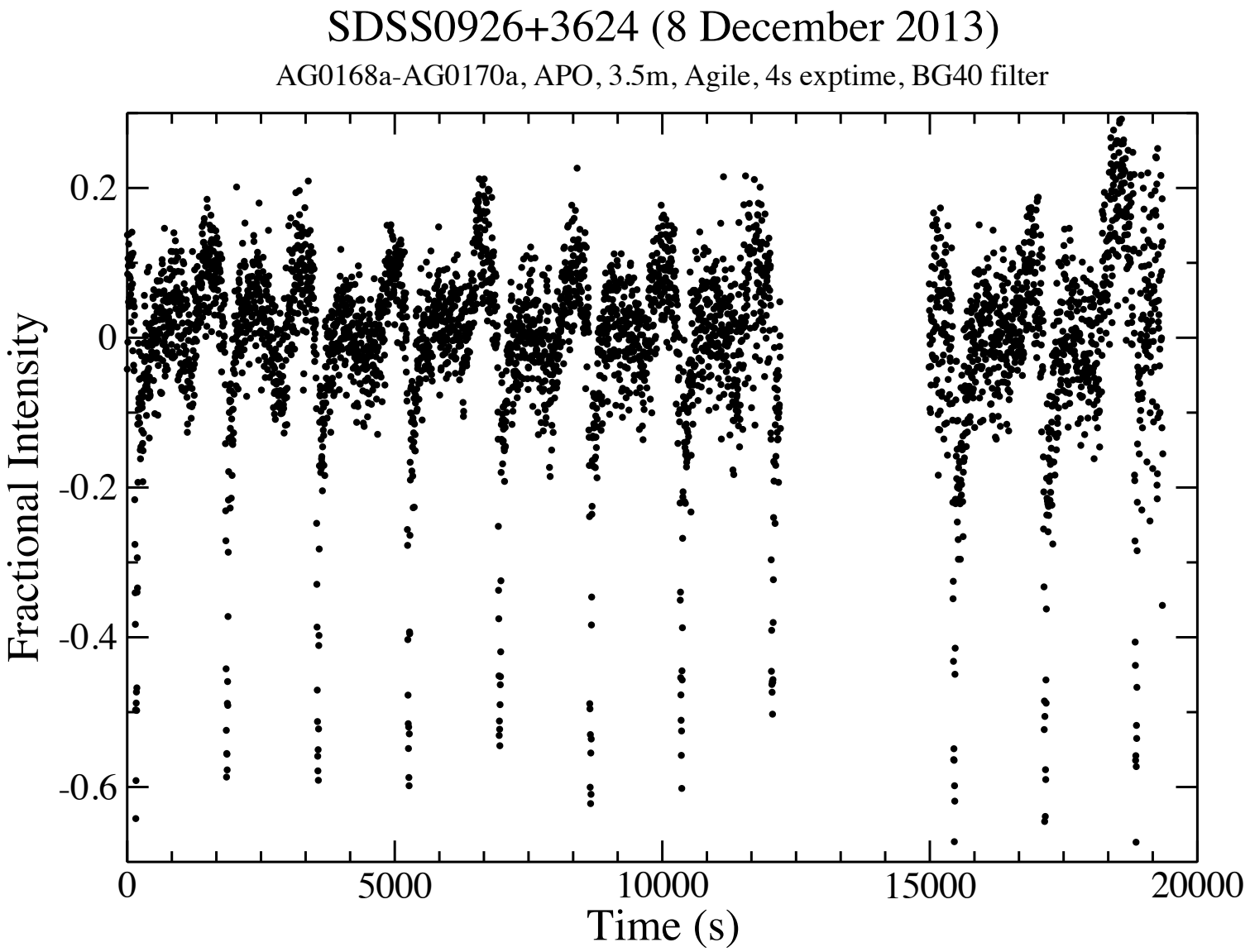


Tramposch et al. 2005, PASP 117, 262

Negative SH

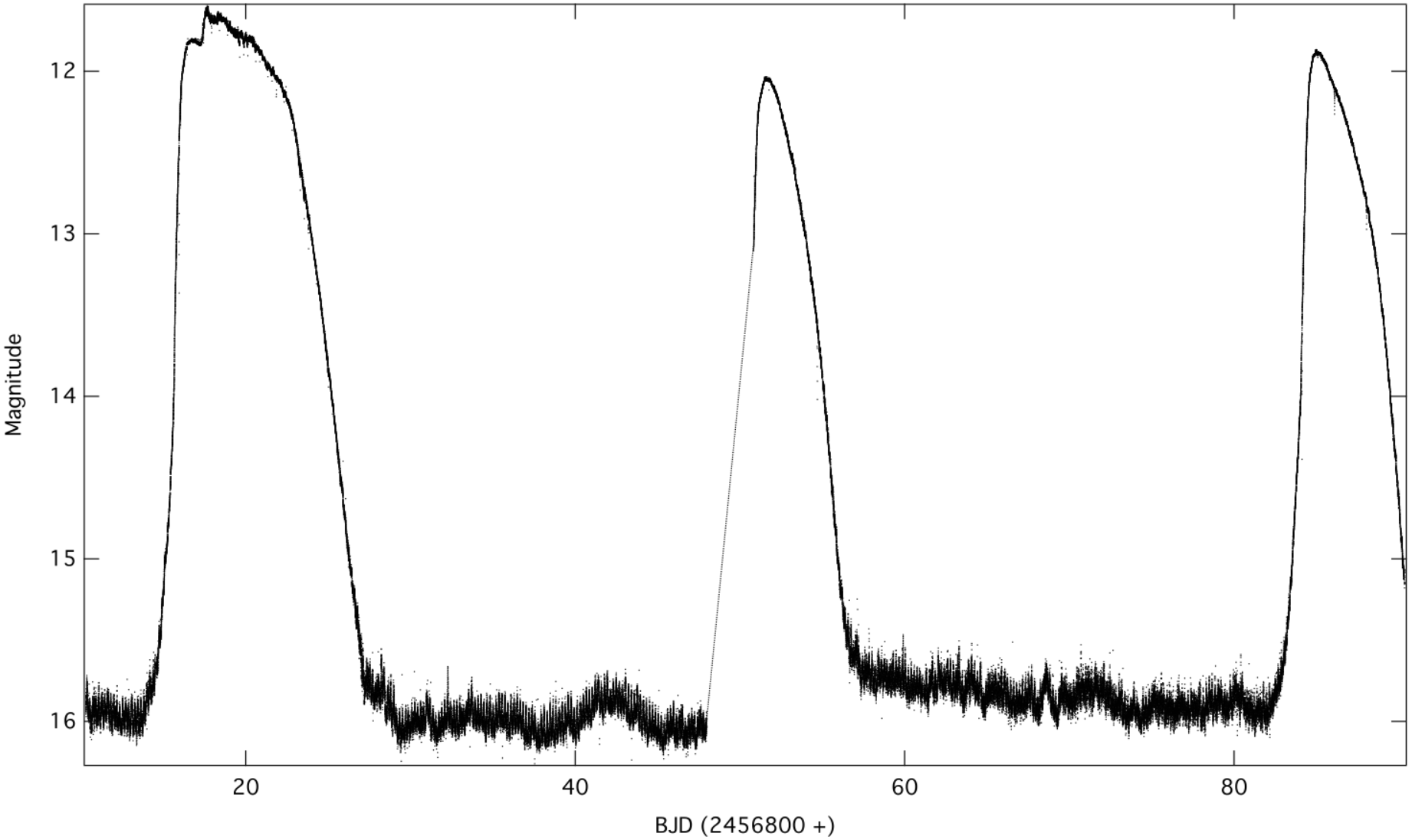

Apache Point Observatory New Mexico
Lat =+33
3.5m
2.5m

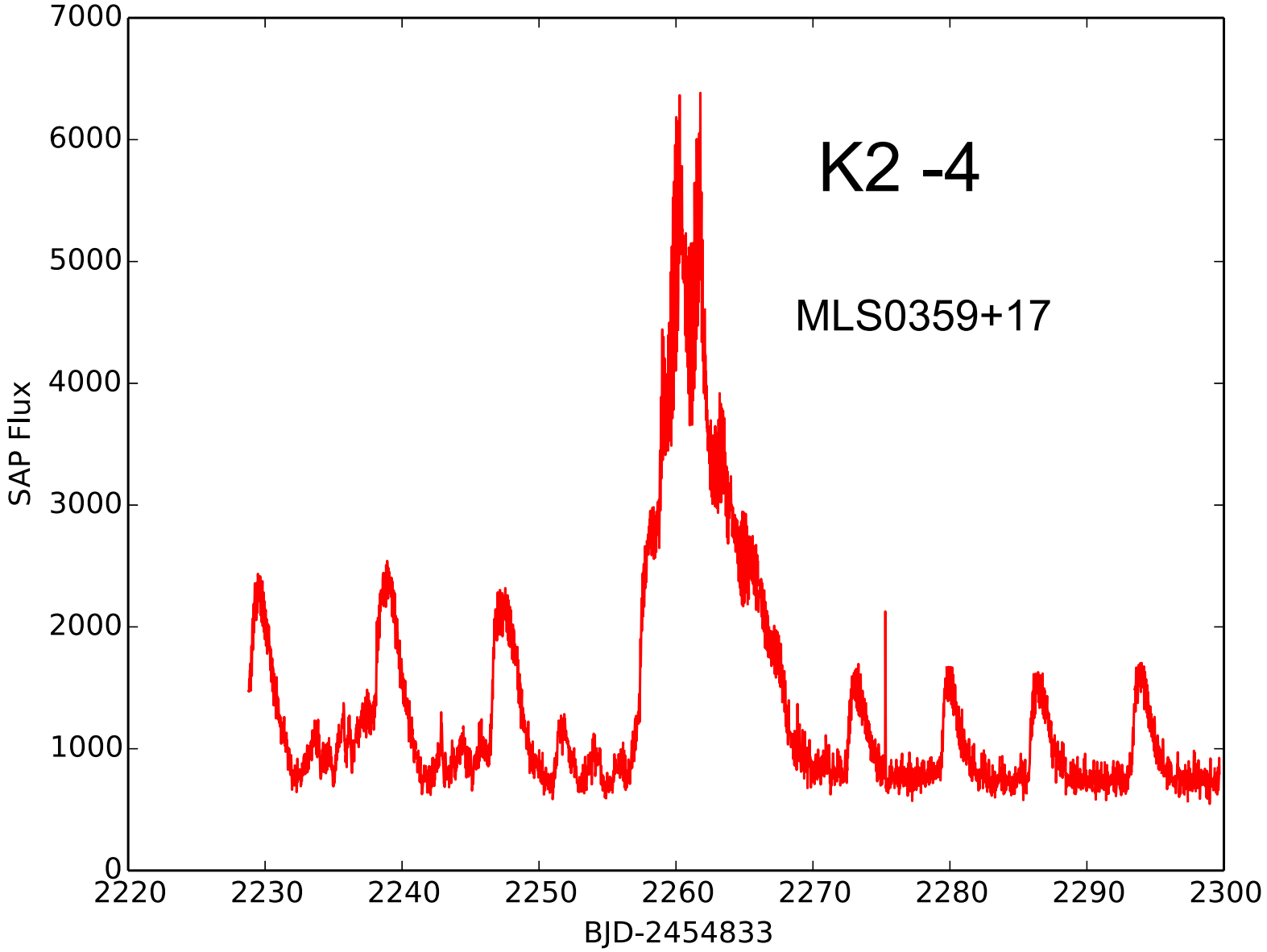
Eclipsing AM CVn P=28 min, eclipse=1 min



Kepler Satellite Data

K2-1 TW Vir

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MLS0359+17
SAP Flux
BJD-2454833
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1000
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3000
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5000
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7000
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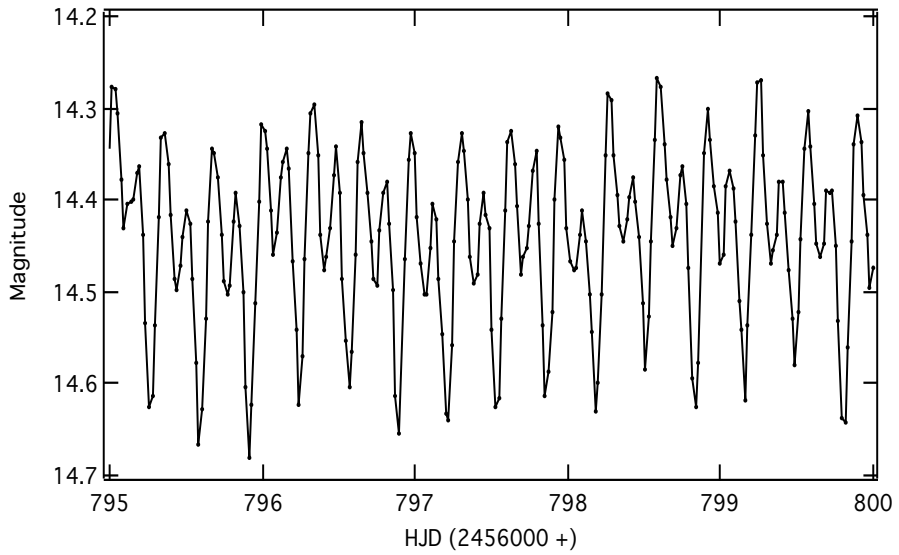
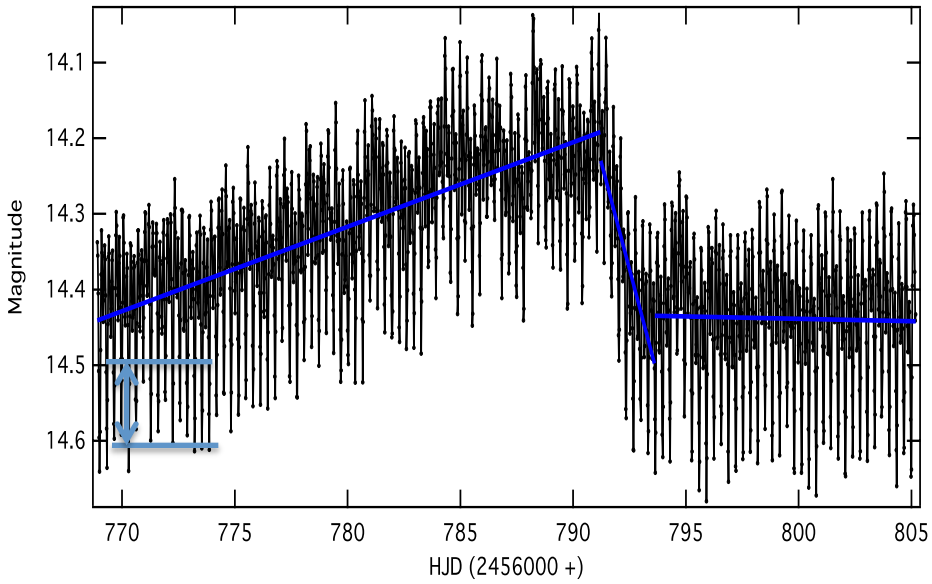
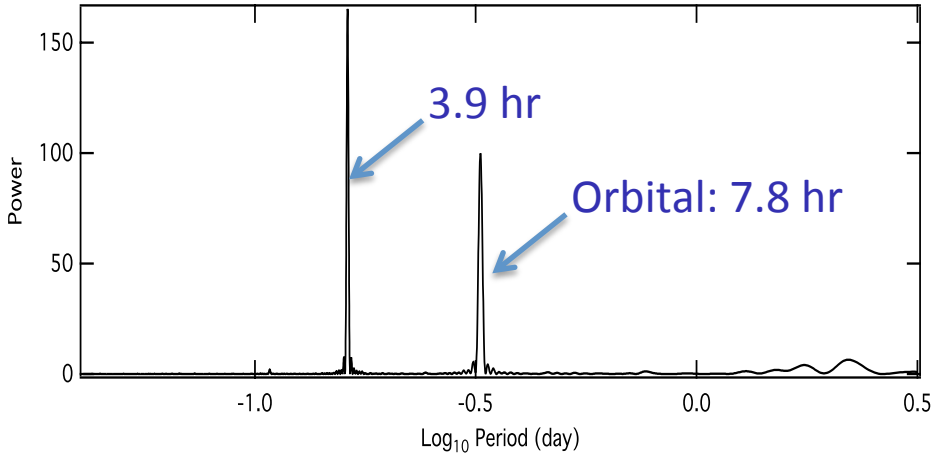
SDSS J0632+25







The Far Future: LSST (2022-2032)