Transient Detection and Verification with the ROTSE-III Telescope

By Anastasiya Romadan and Brett Sandler

The ROTSE Project

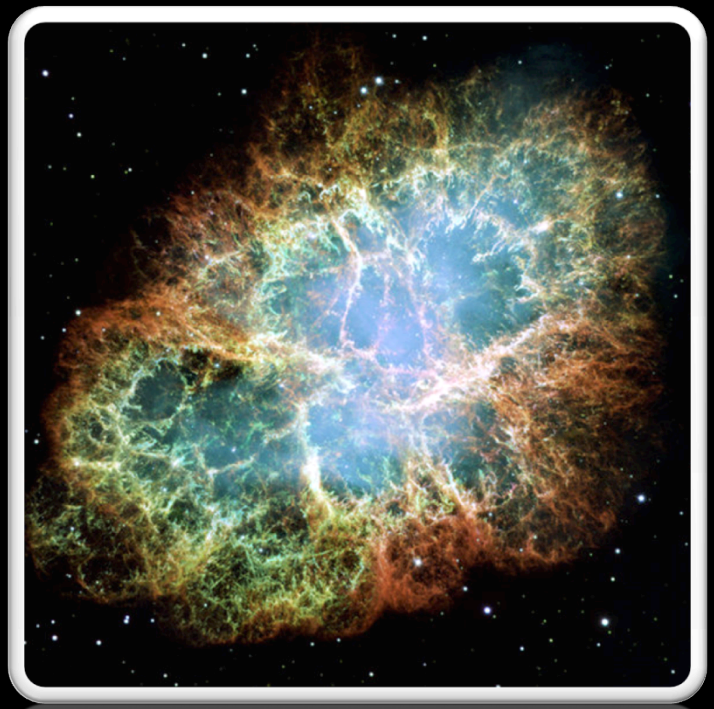
- 4 Telescopes
  - Australia, Namibia, Texas, Turkey
- Advantages:
  - Large field of view (1.85°x1.85°)
  - Robotic
  - 19 Limiting magnitude
- Optical band
  - Observes variable stars, CV, GRB, asteroid, supernovae, novae



Supernovae

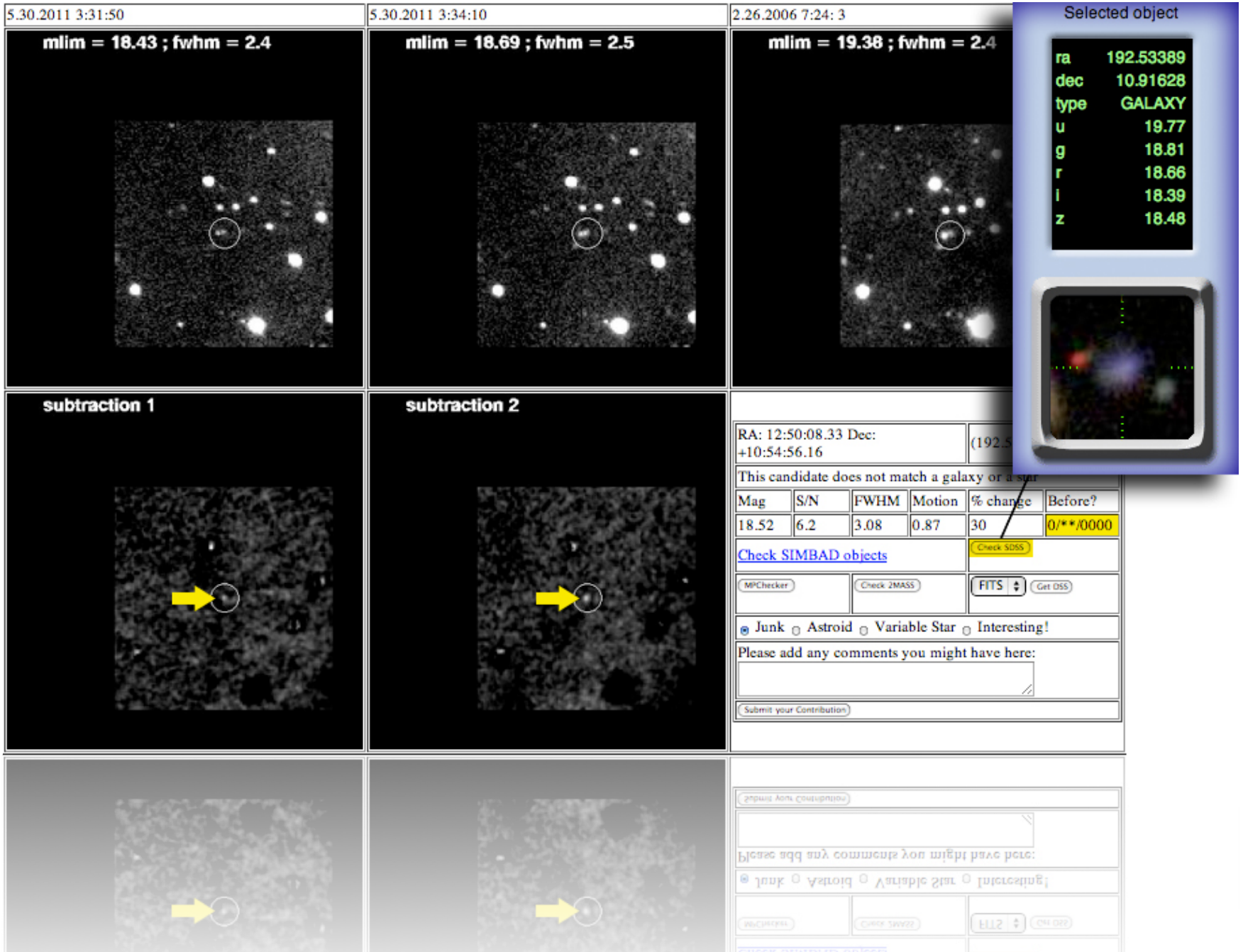
Exploding star - 10^{20} times as much energy is produced in the supernova explosion as our Sun releases every Second!

1) Massive star collapses
2) White dwarf binary system



Crab Nebula

SN Candidate



Subtraction in theory…

New Image

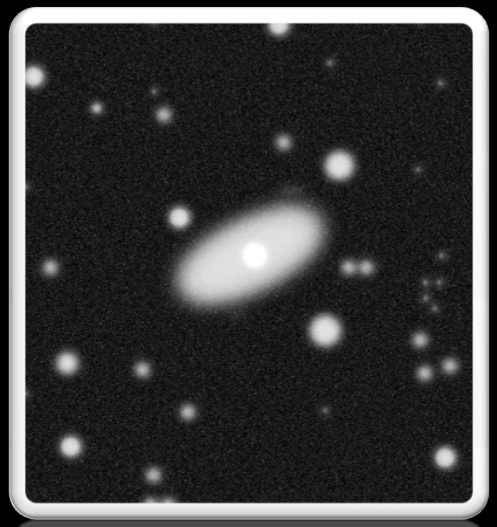


Reference Image

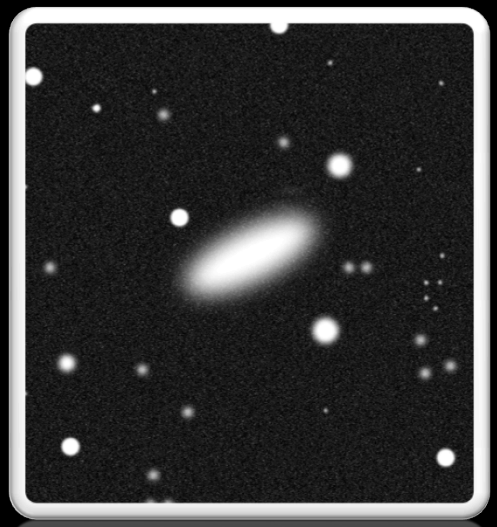


Subtraction in theory…

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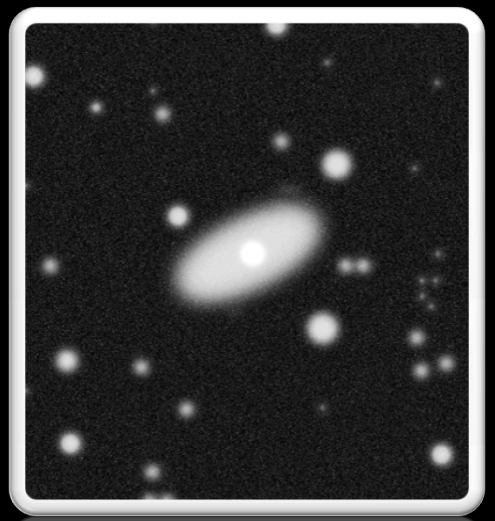


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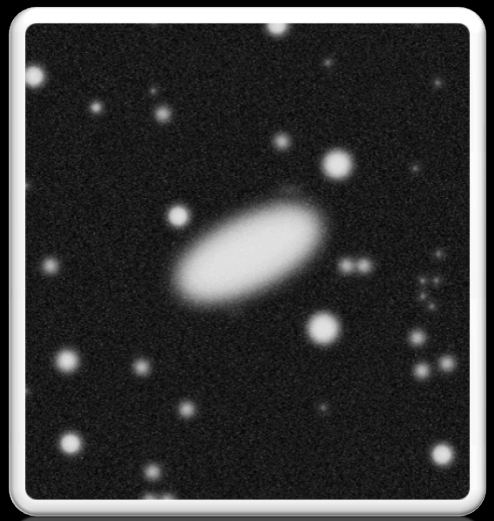


Subtraction in theory

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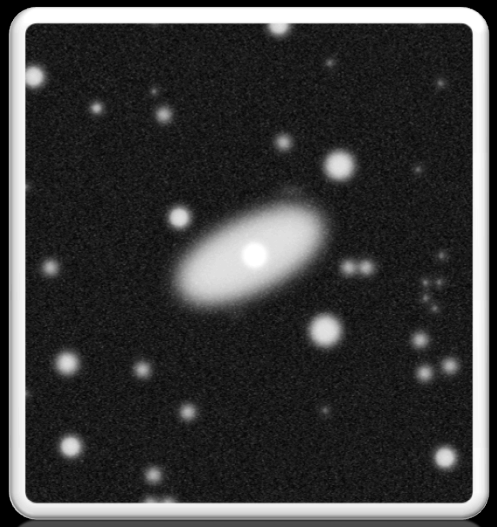


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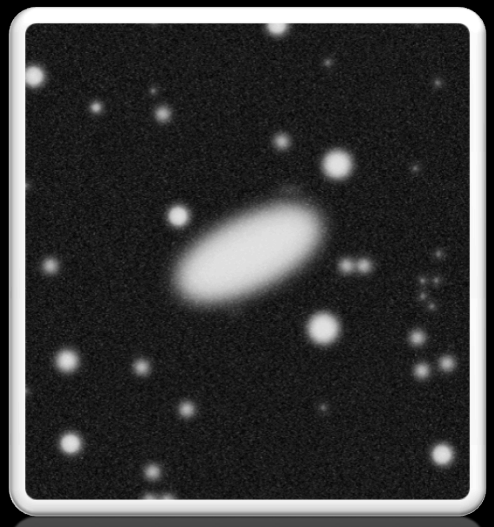
Subtraction in theory…

New Image



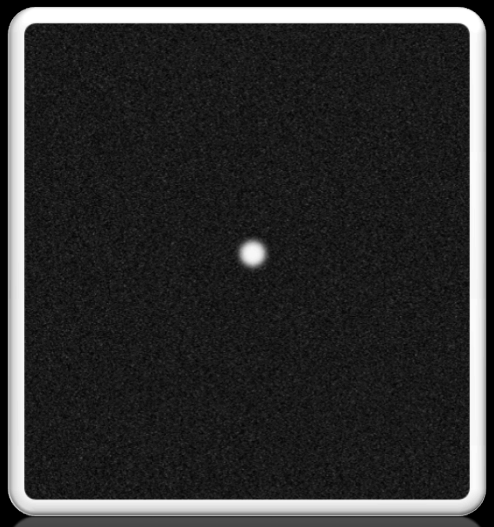
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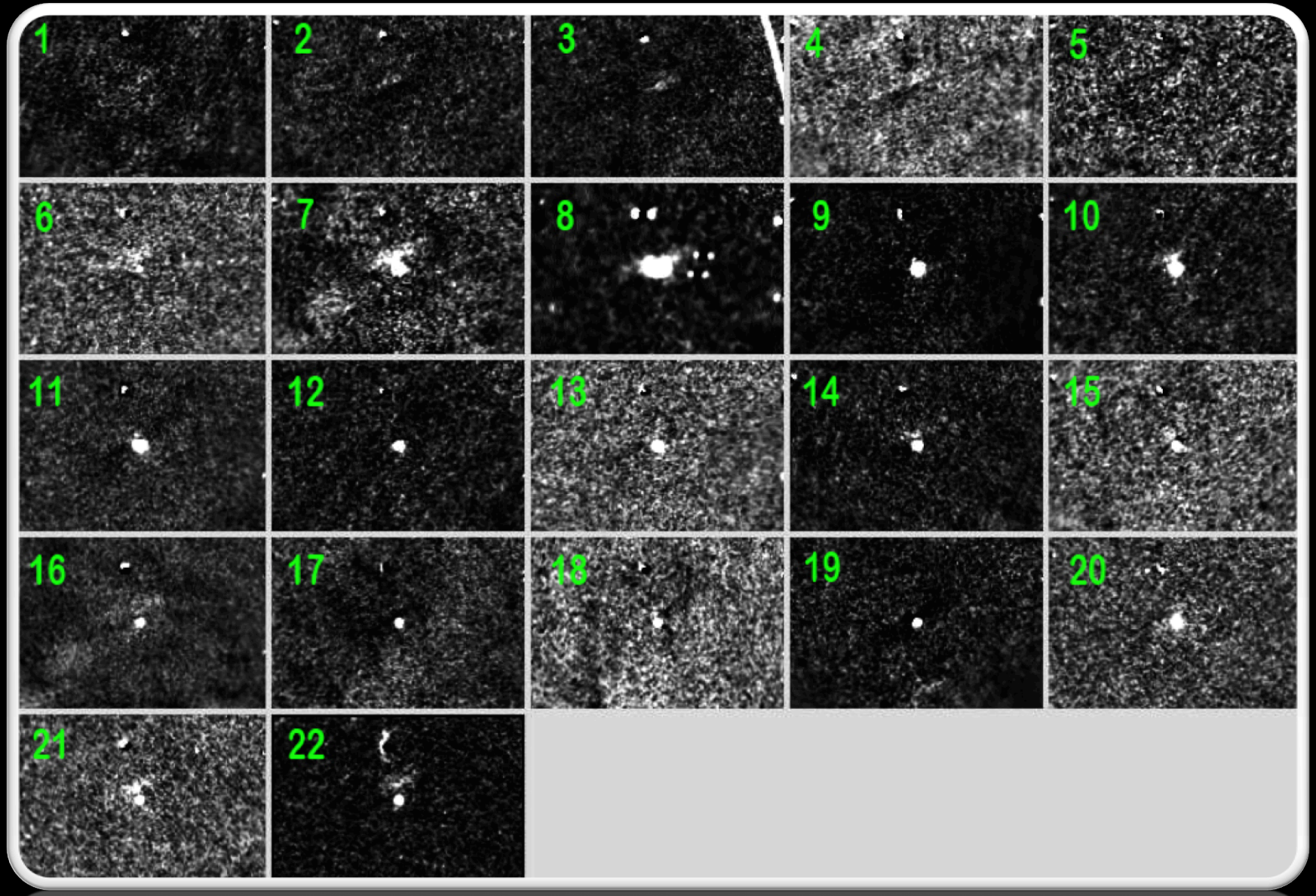


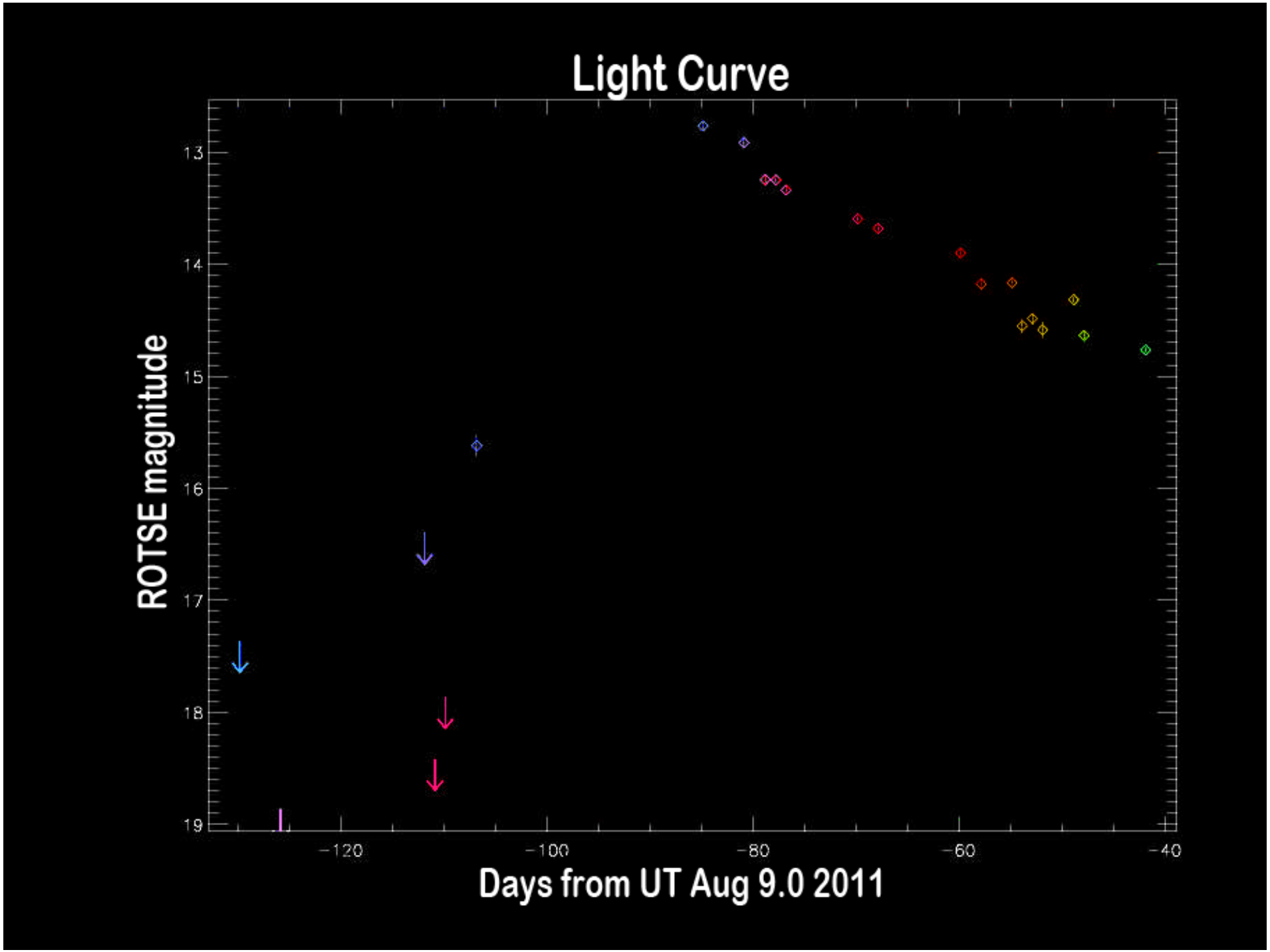
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Subtraction

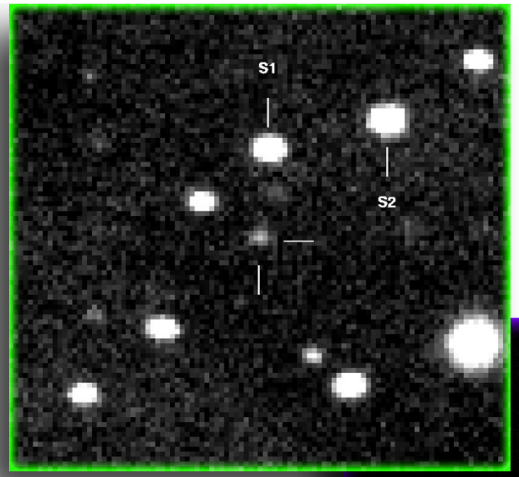


Real Data Subtraction

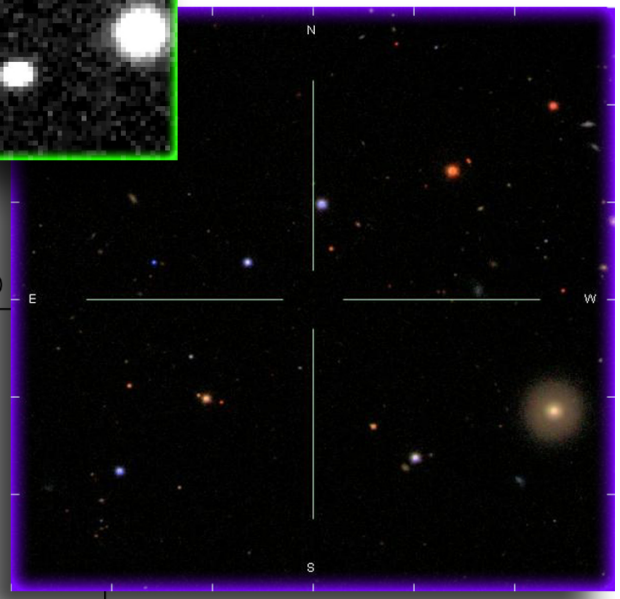



Light Curve
ROTSE magnitude
13
14
15
16
17
18
19
−120
−100
−80
−60
−40
Days from UT Aug 9.0 2011

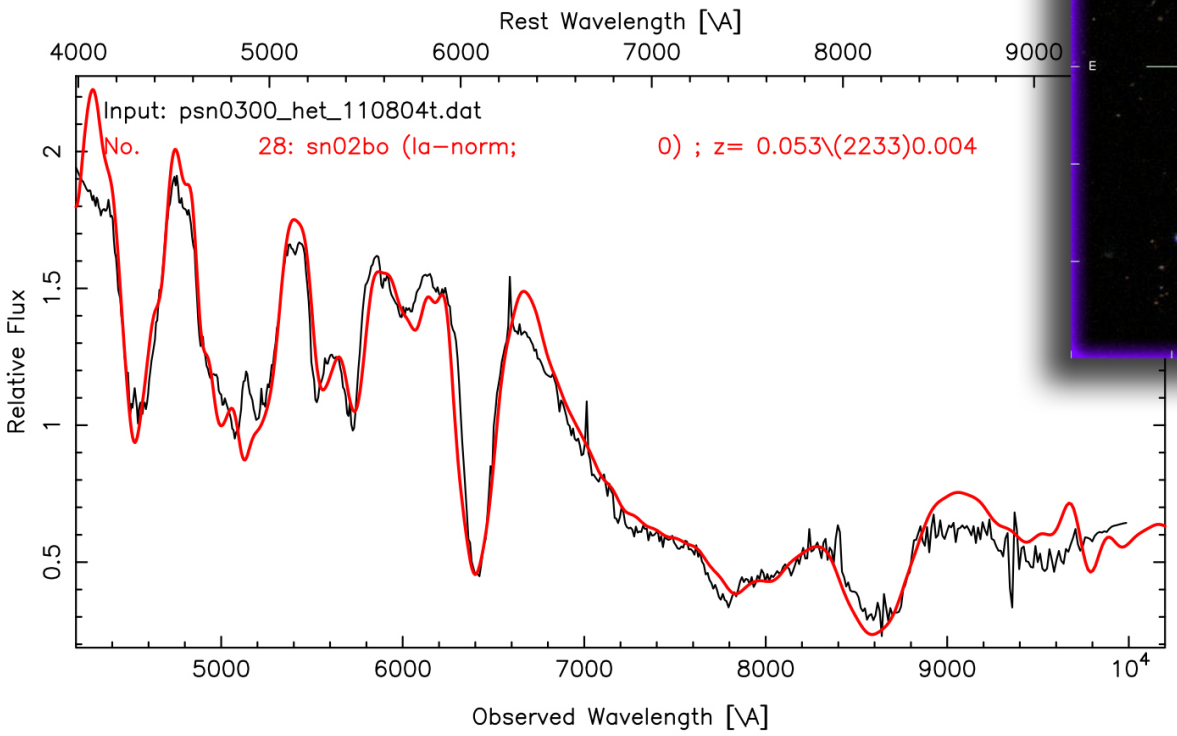
ROTSE III image



SDSS image



Spectrum from HET telescope



Variable Stars

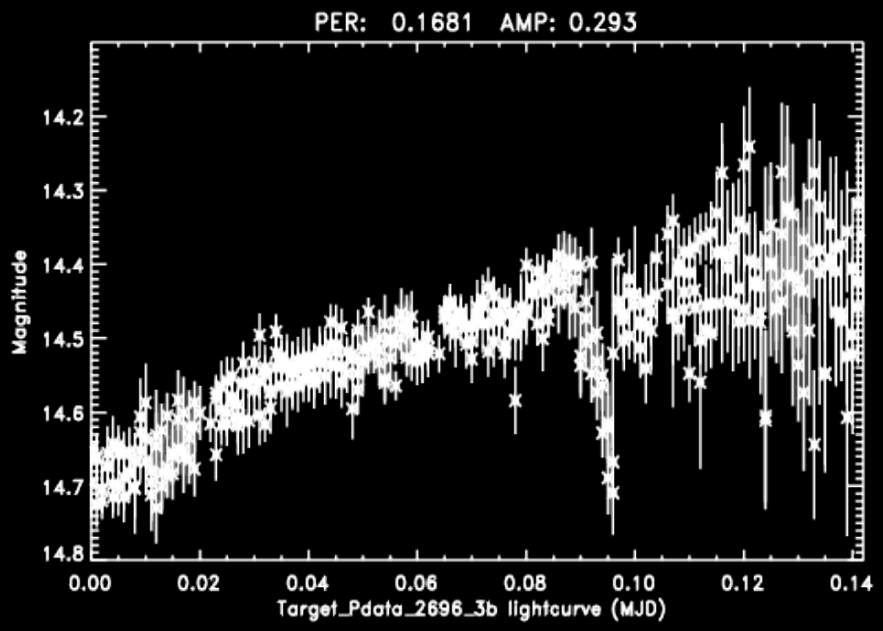
- Types
  - Intrinsic vs Extrinsic
- Uses
  - Stellar evolution
  - Standard candles

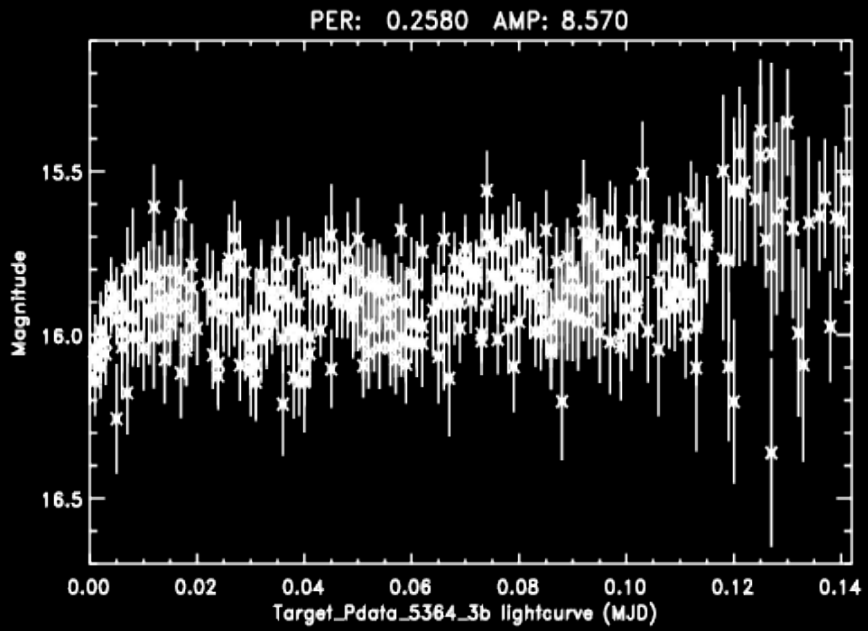


Short Period Variable Stars

GRB observations provide easy to detect short period VS candidates

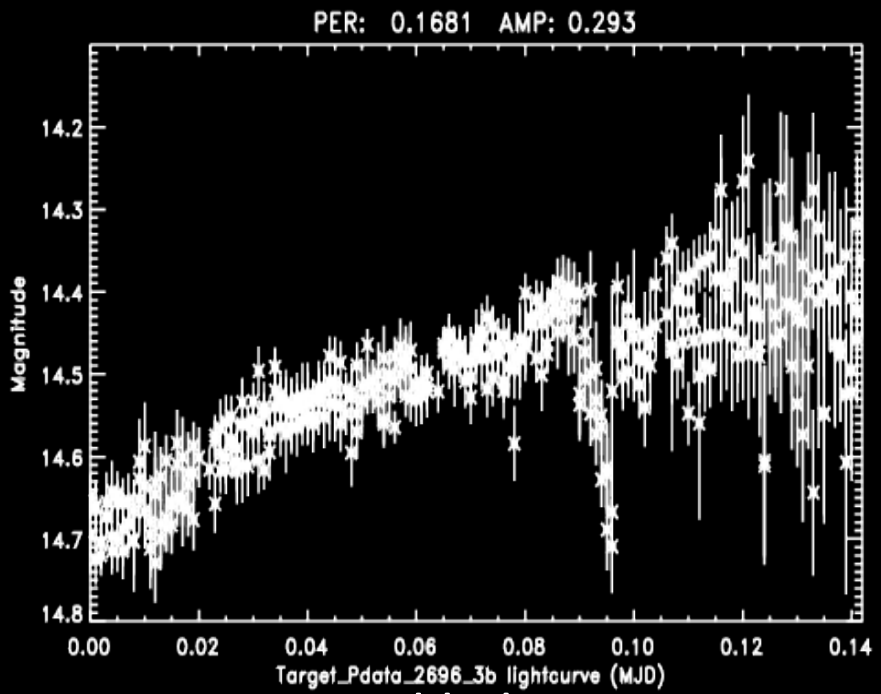
Periods range from ~6 hours to ~15 hours



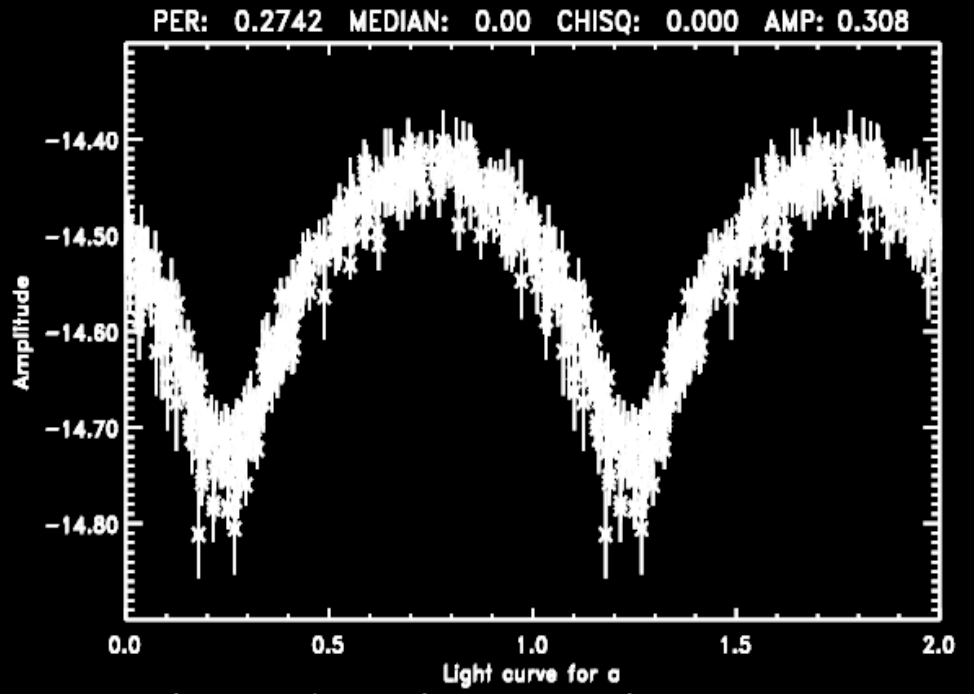


Confirming Candidates

Additional observation necessary



original lightcurve



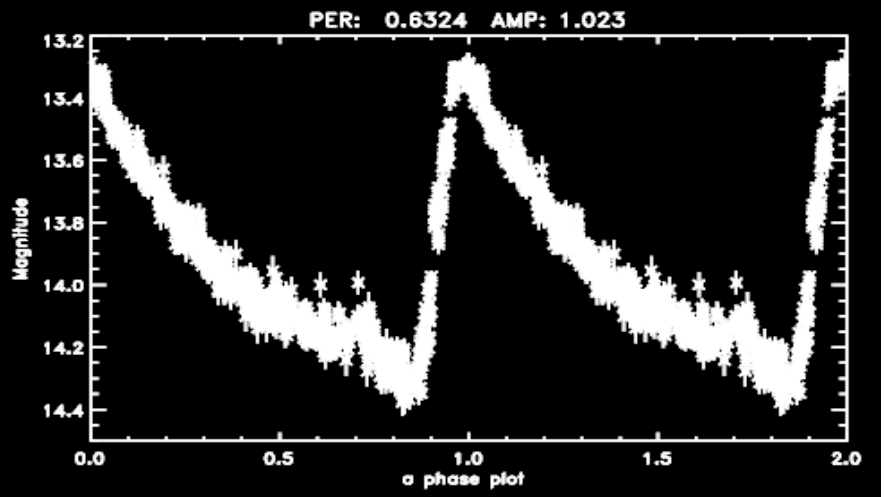
phased with new observations

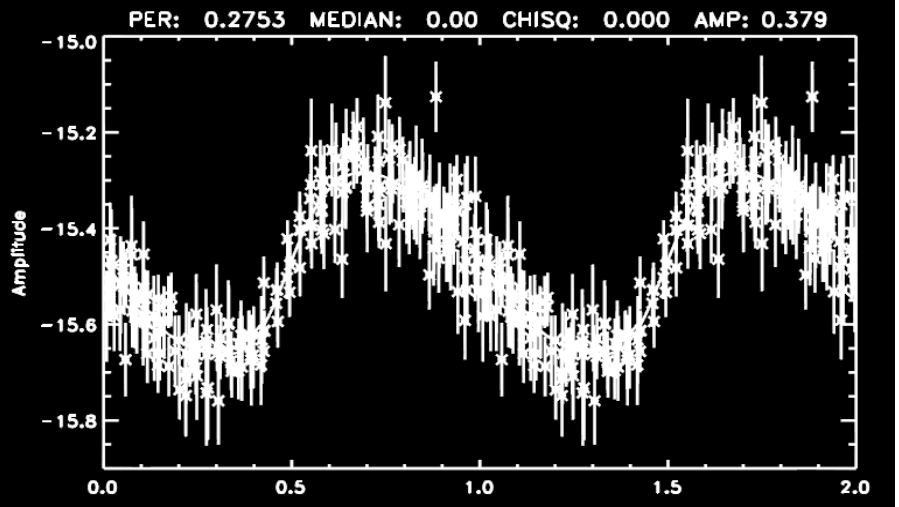
RR Lyrae Variable Stars

- Follow the red giant phase
- Helium core, Hydrogen Shell
- Standard Candles
- Similar to Cepheid Variables

  RRab (top)

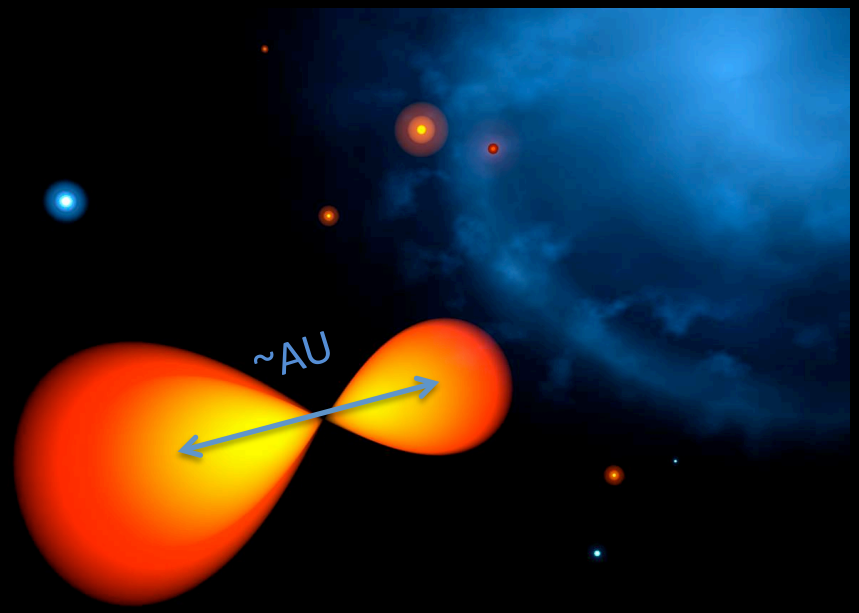
  RRc (bottom)



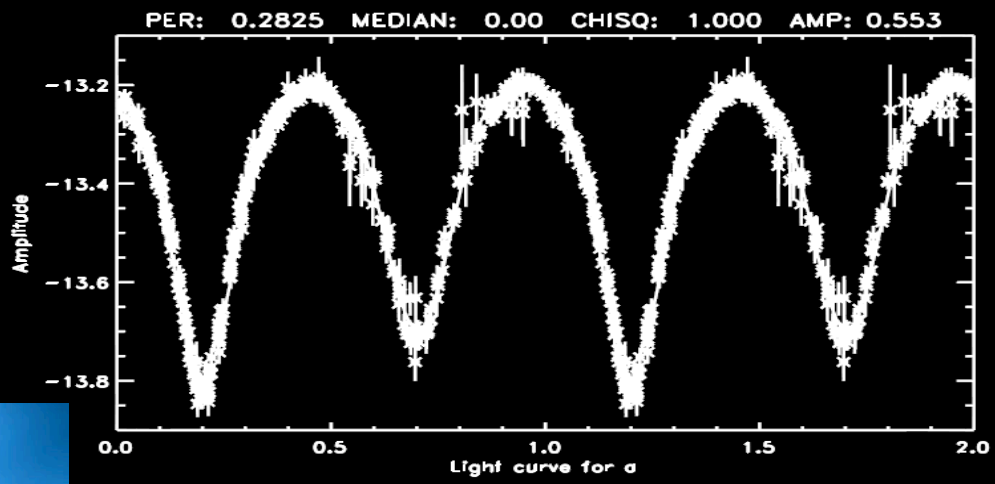


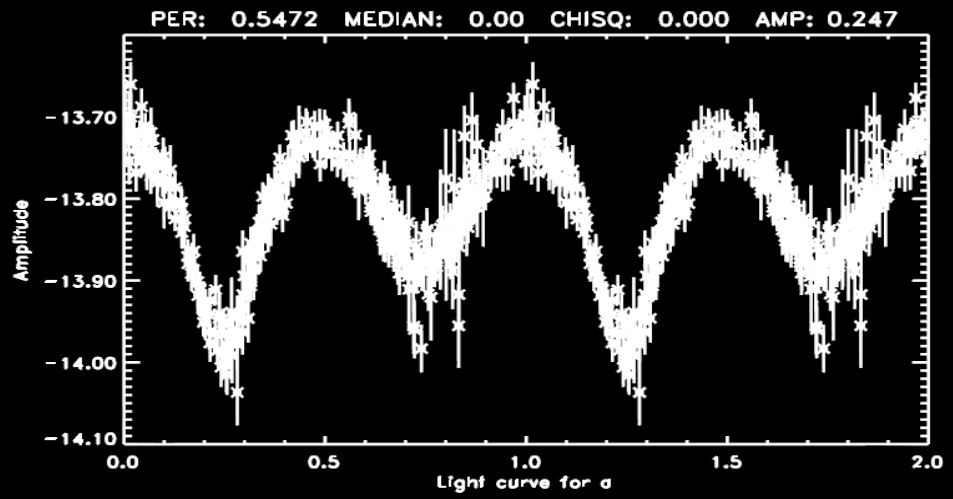
Close Binary Eclipsing Stars

- Constantly varying light curves
- W UMa type



http://cronodon.com/sitebuilder/images/Contact_Binary.jpg





Results

- Currently 29 Confirmed
- Addition to previous effort (RVVP)
- Primarily Eclipsing Binaries and RR Lyrae
- Will be added to already catalogued discoveries: www.rotse.net/rvvp