



The Search for Be/X-Ray Binaries: Finding Needles in a Cosmic Haystack

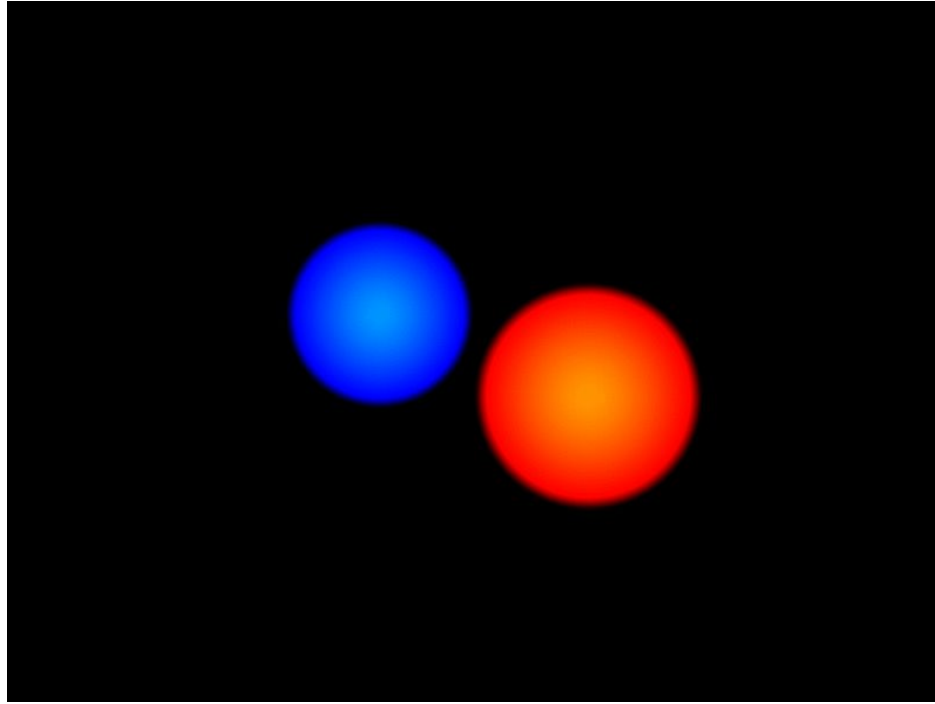
Astronomy on Tap
June 20th, 2024



Binary Stars are Everywhere



What is a Binary Star?



X-Ray Binaries

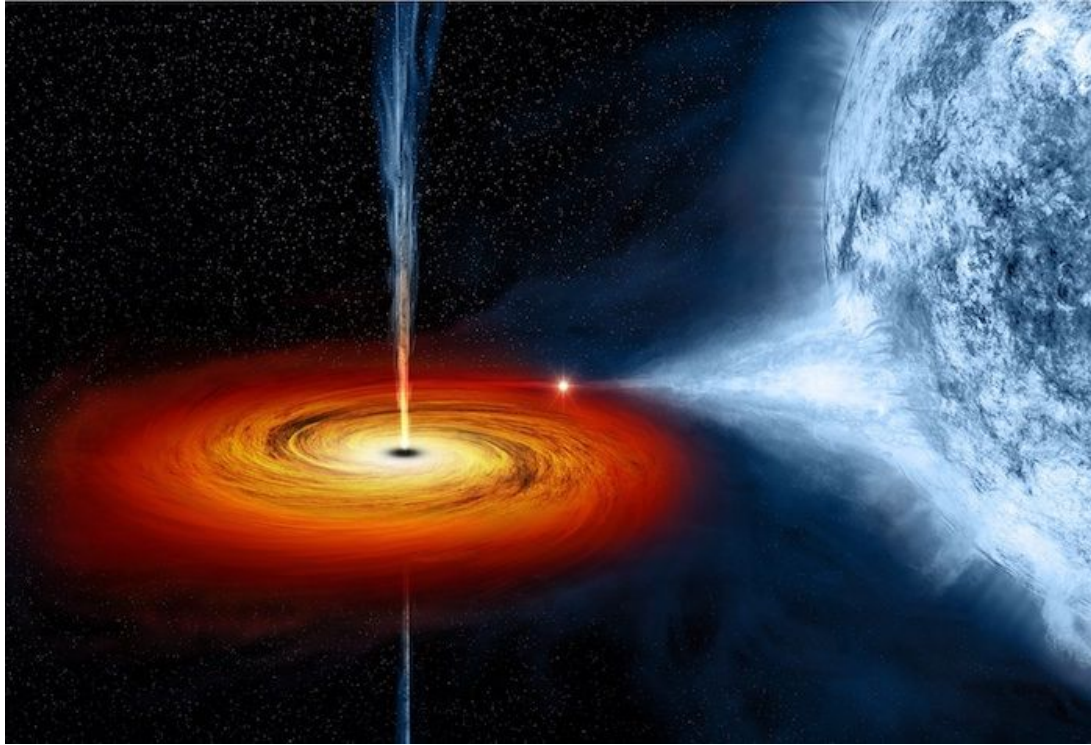


Image Credit: NASA/CXC/M.Weiss

X-Ray Binaries

Compact Object

- White Dwarf
- Neutron Star
- Black Hole

Nuclear Burning Star

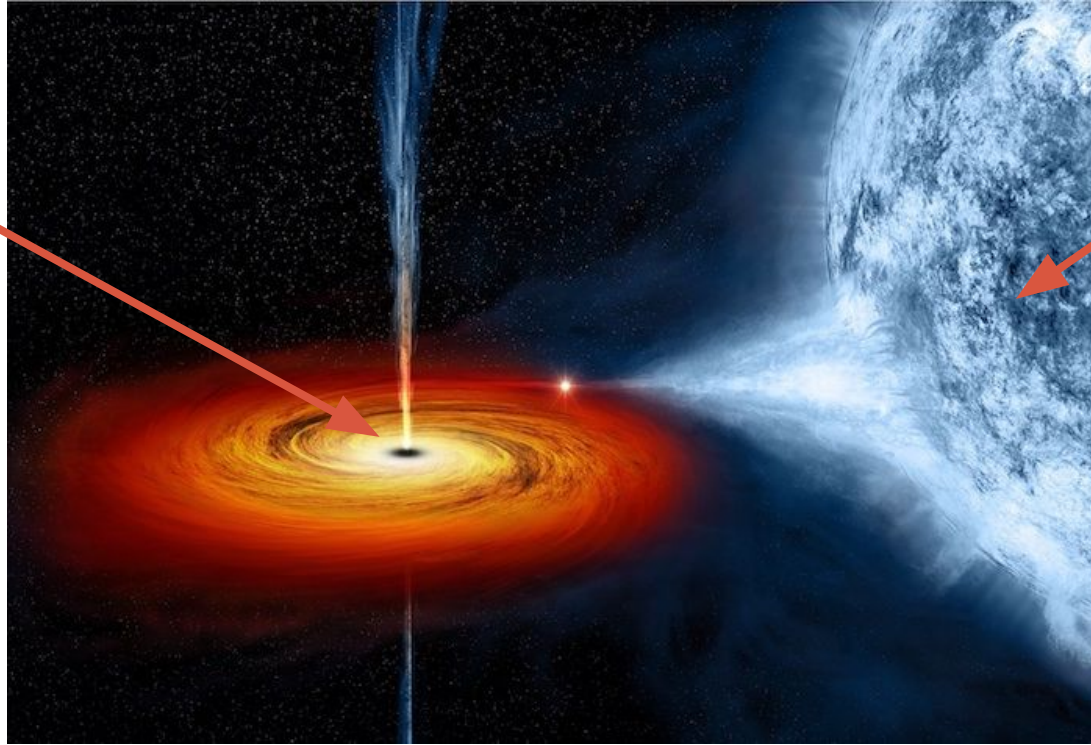


Image Credit: NASA/CXC/M.Weiss

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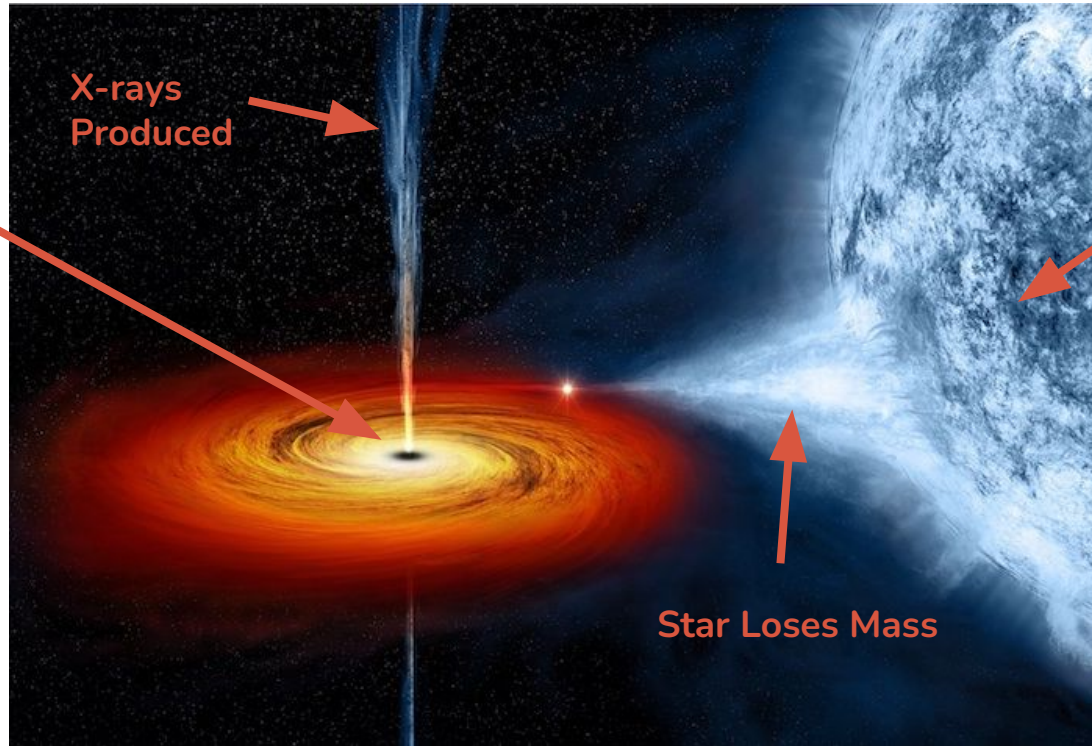


Image Credit: NASA/CXC/M.Weiss

The X-Ray Binary Zoo

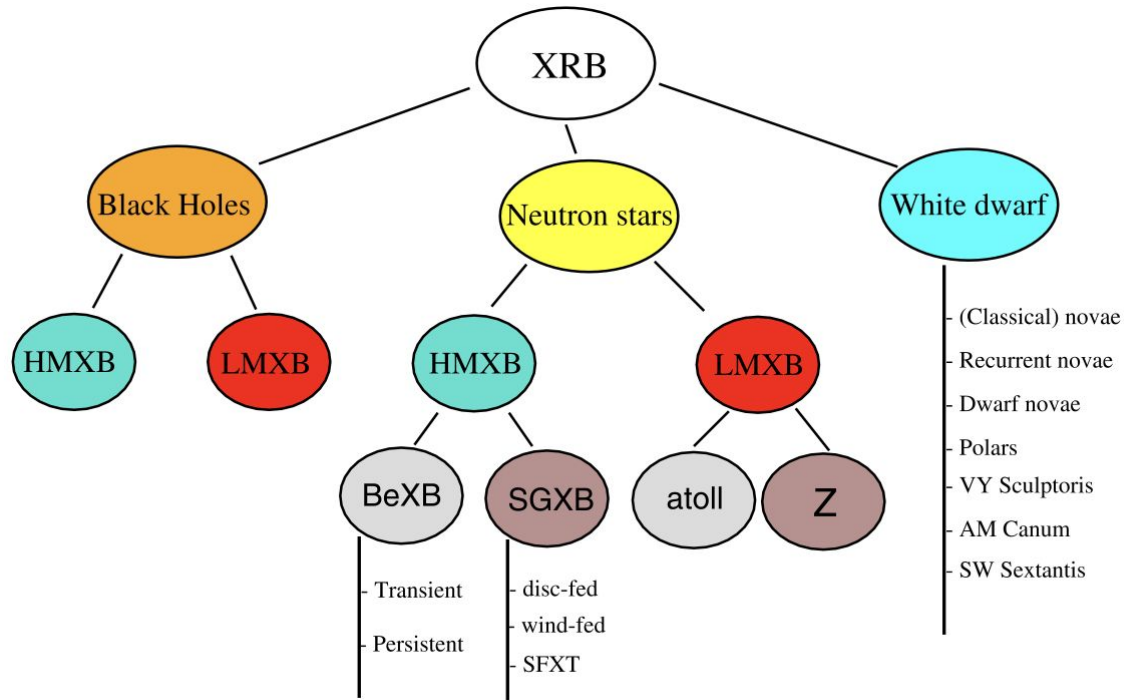
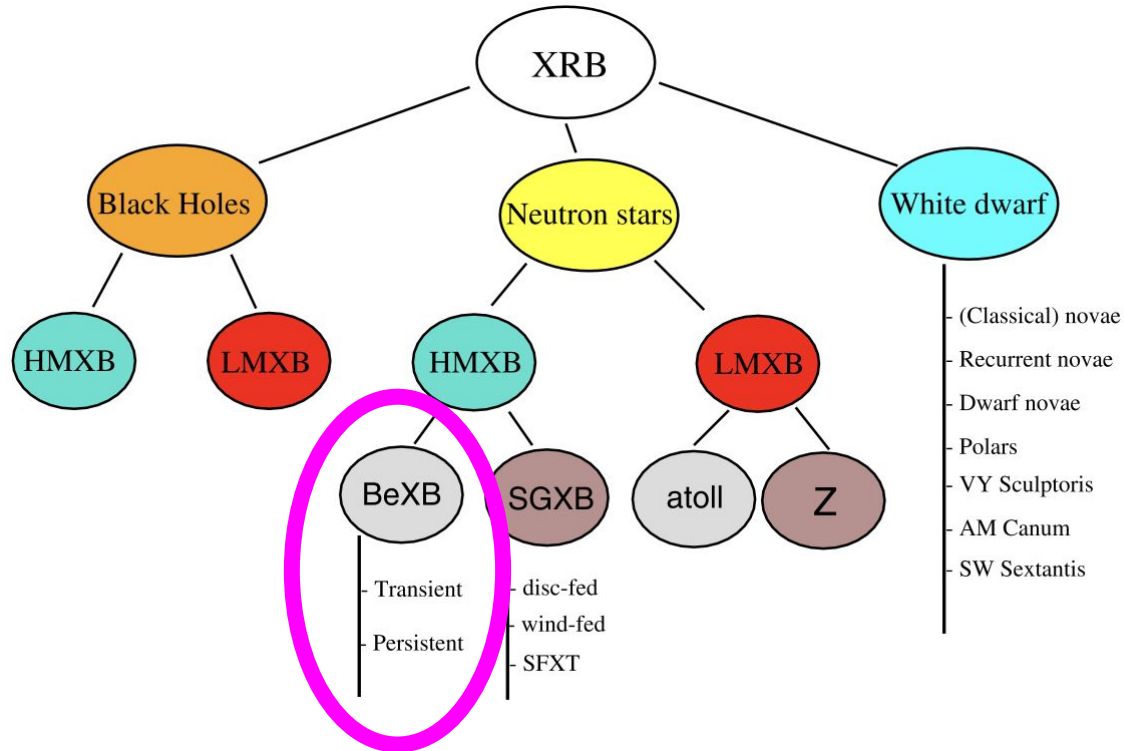


Image Credit: Reig 2011

The X-Ray Binary Zoo



The Needles: Be/X-Ray Binaries

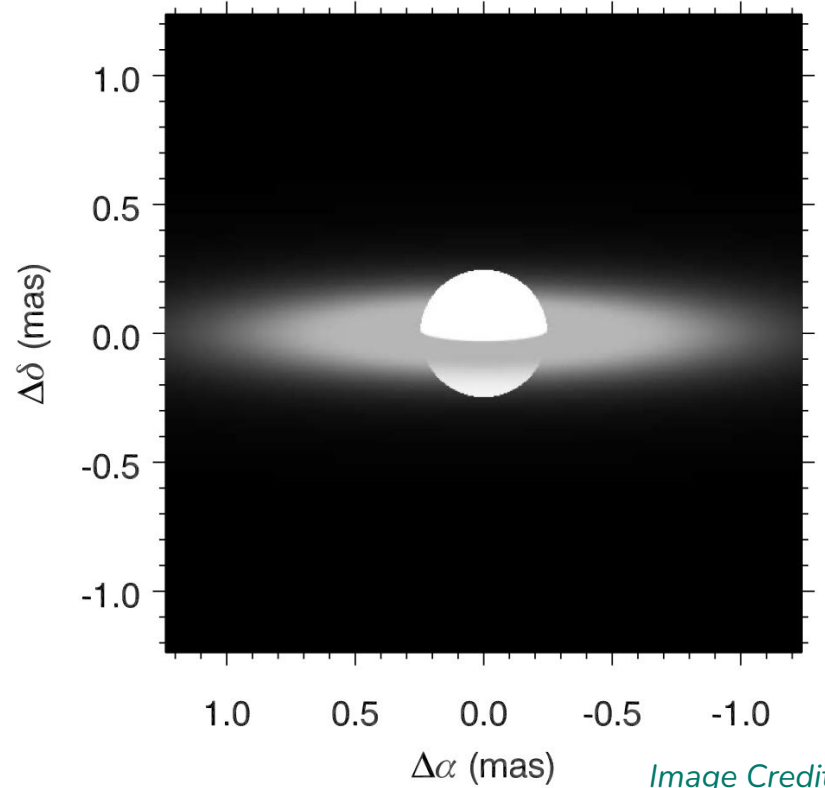
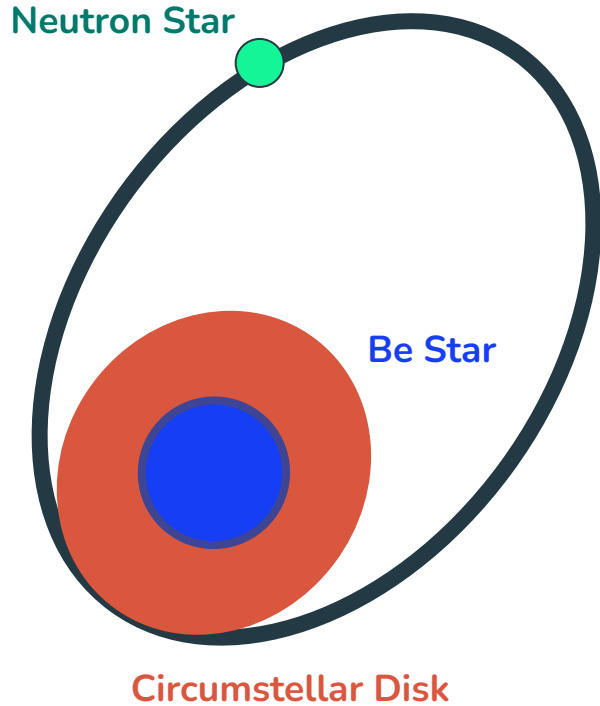


Image Credit:
Geis 2007

X-Rays from Be/X-Ray Binaries

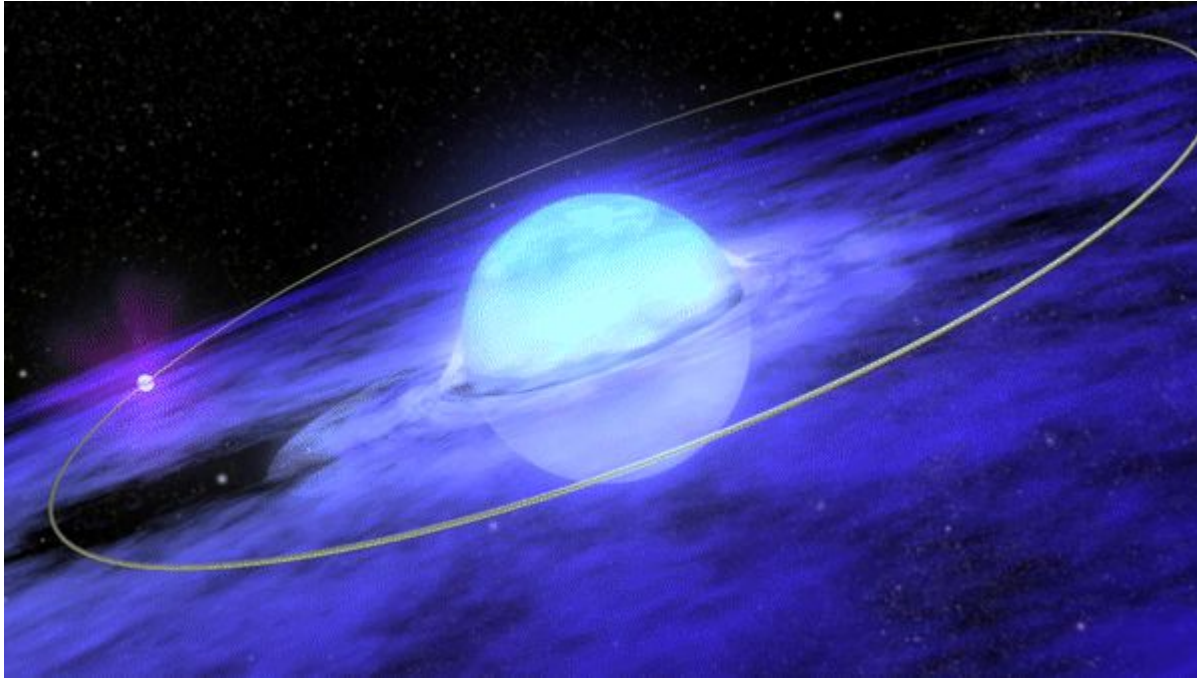


Image Credit: Walt Feimer, NASA/Goddard Space Flight Center

The Haystack: The Small Magellanic Cloud



Image Credit:
ESA/Gaia/DPAC

Swift SMC Survey (S-CUBED)

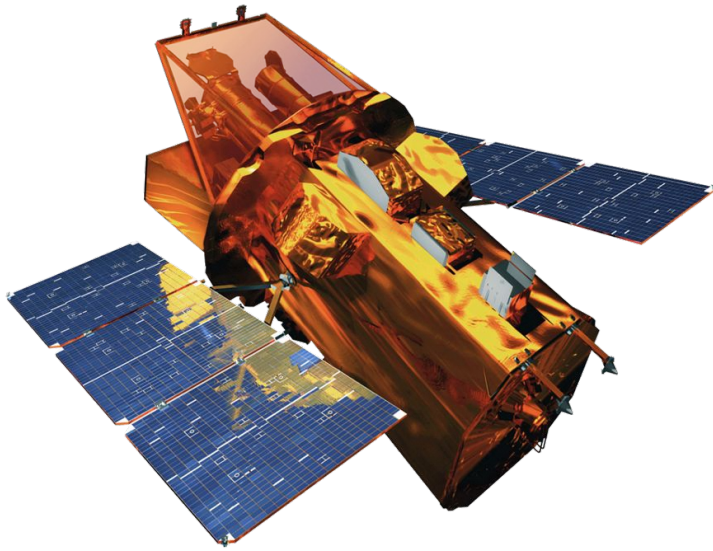
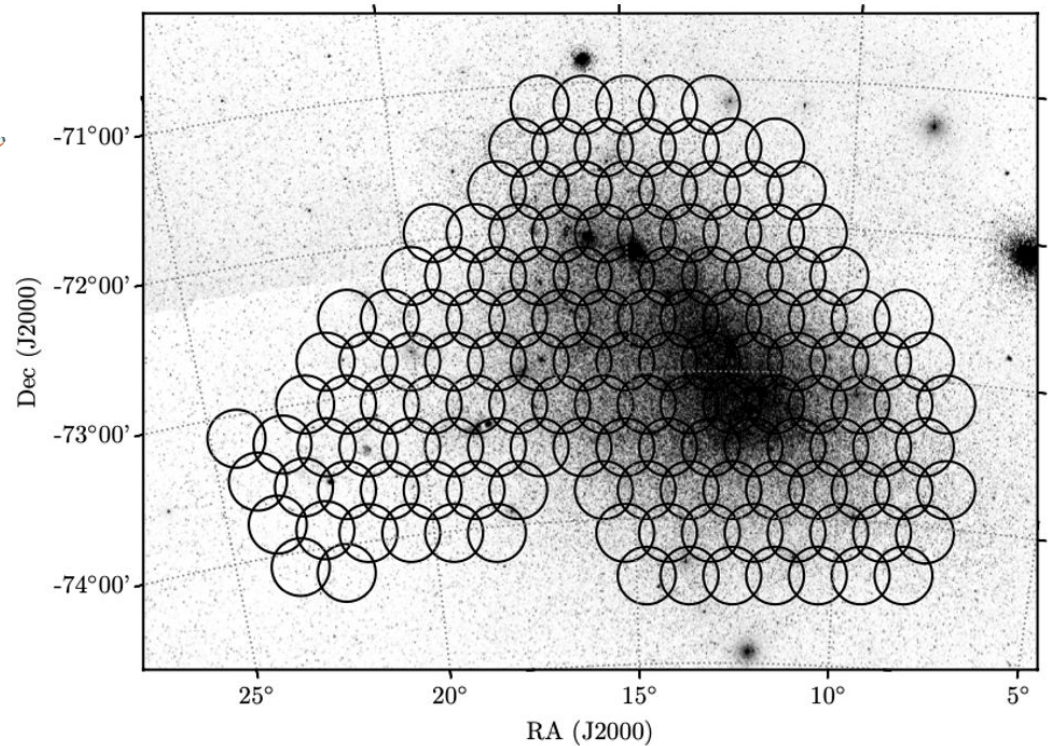
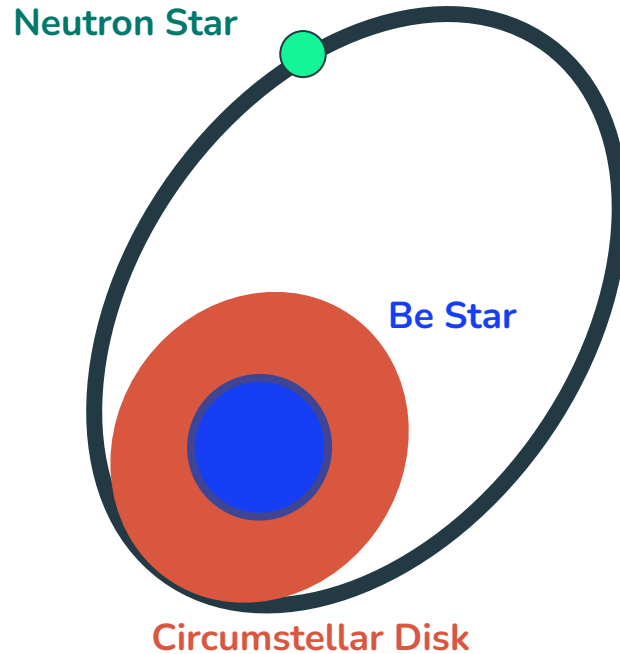


Image Credit:
NASA E/PO, Sonoma State
University/Aurore Simonnet

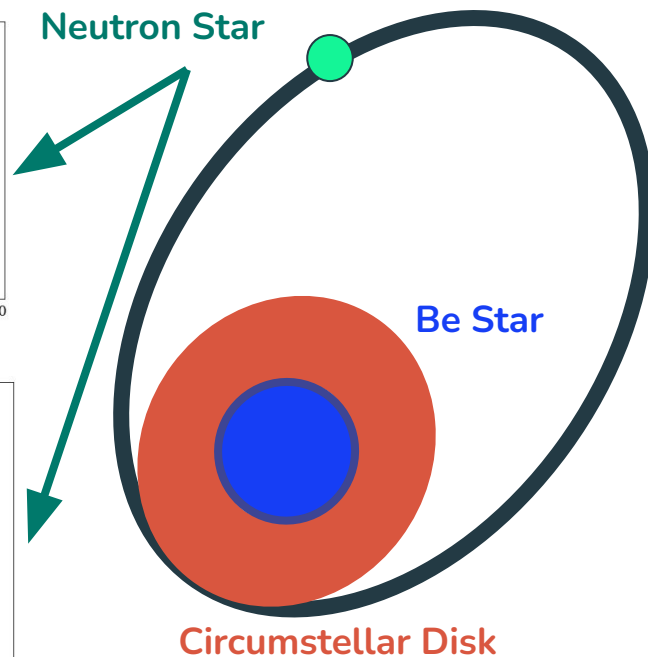
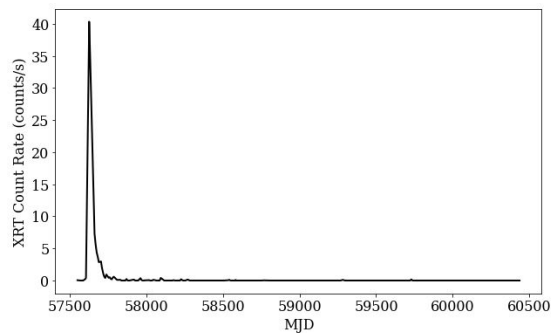
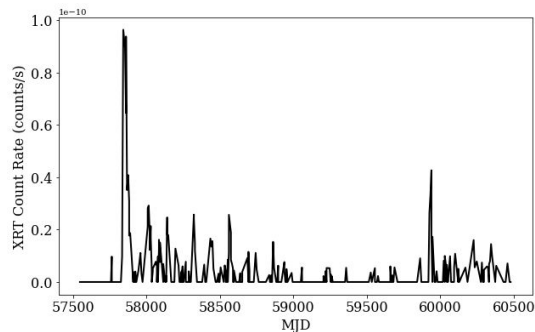
Image Credit: Kennea et al. 2018



Searching for BeXRBs: Finding Clues



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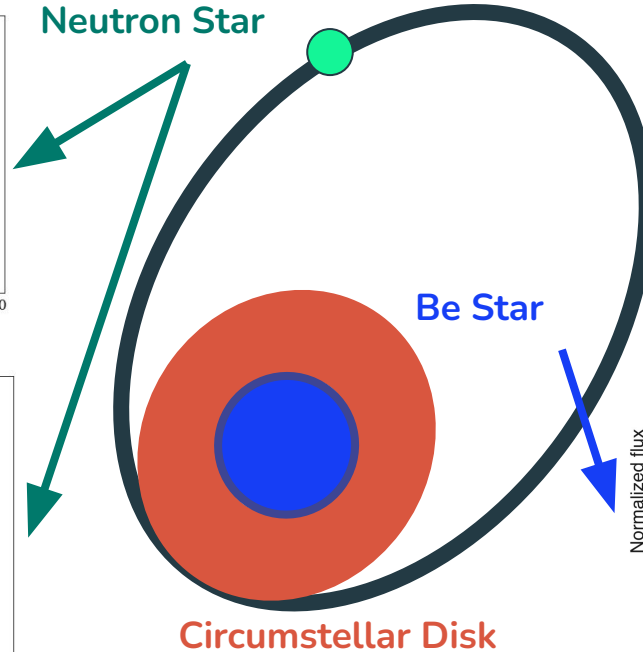
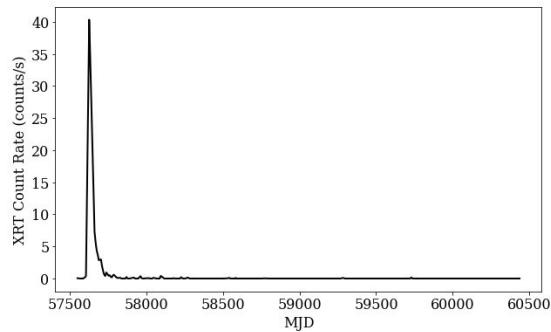
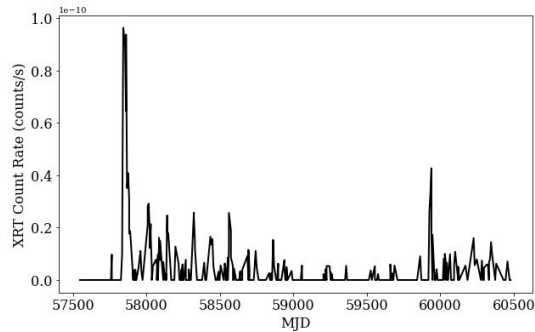
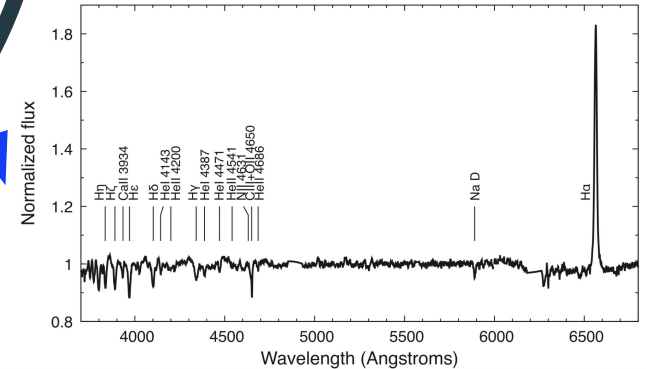
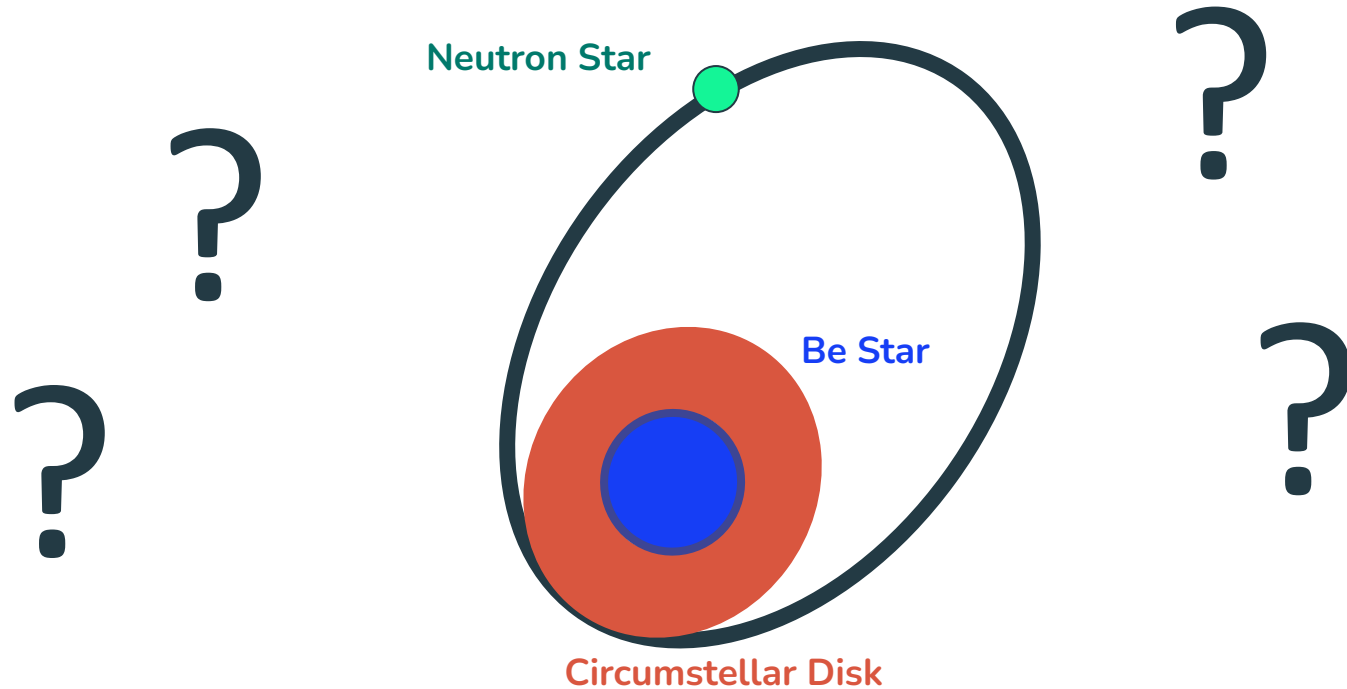


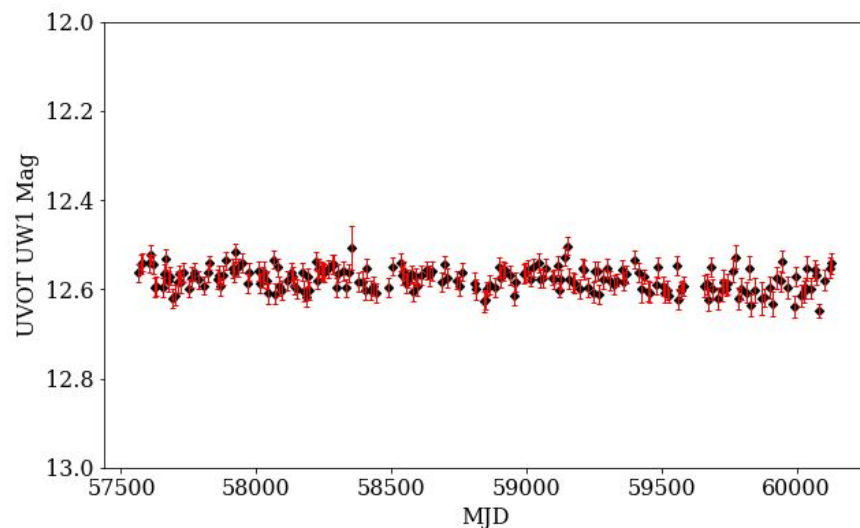
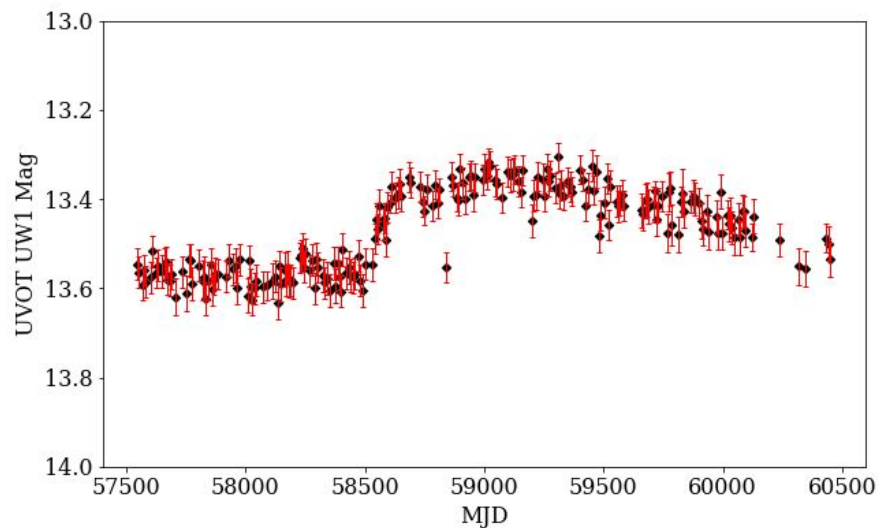
Image Credit: Coe et al. 2023



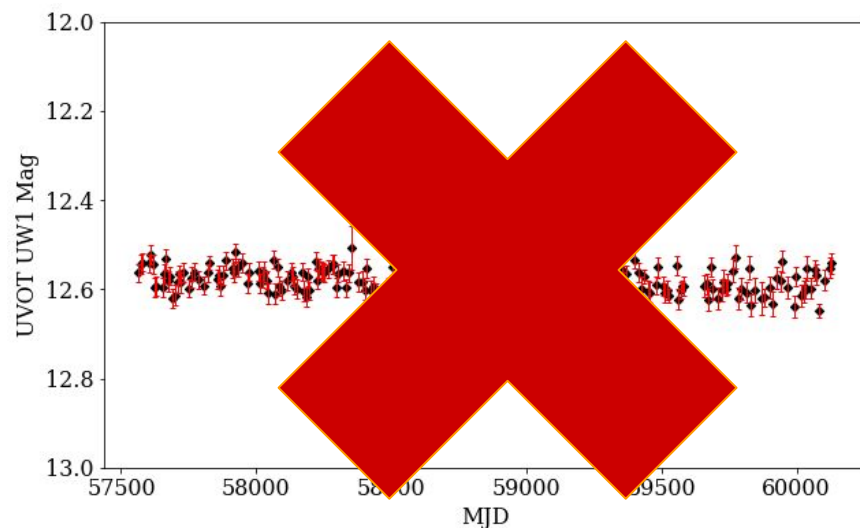
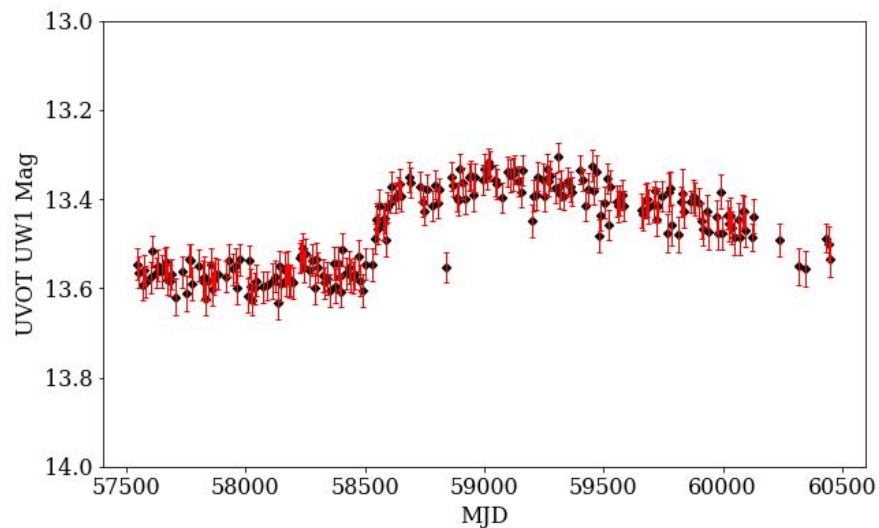
Searching for BeXRBs: Finding Clues



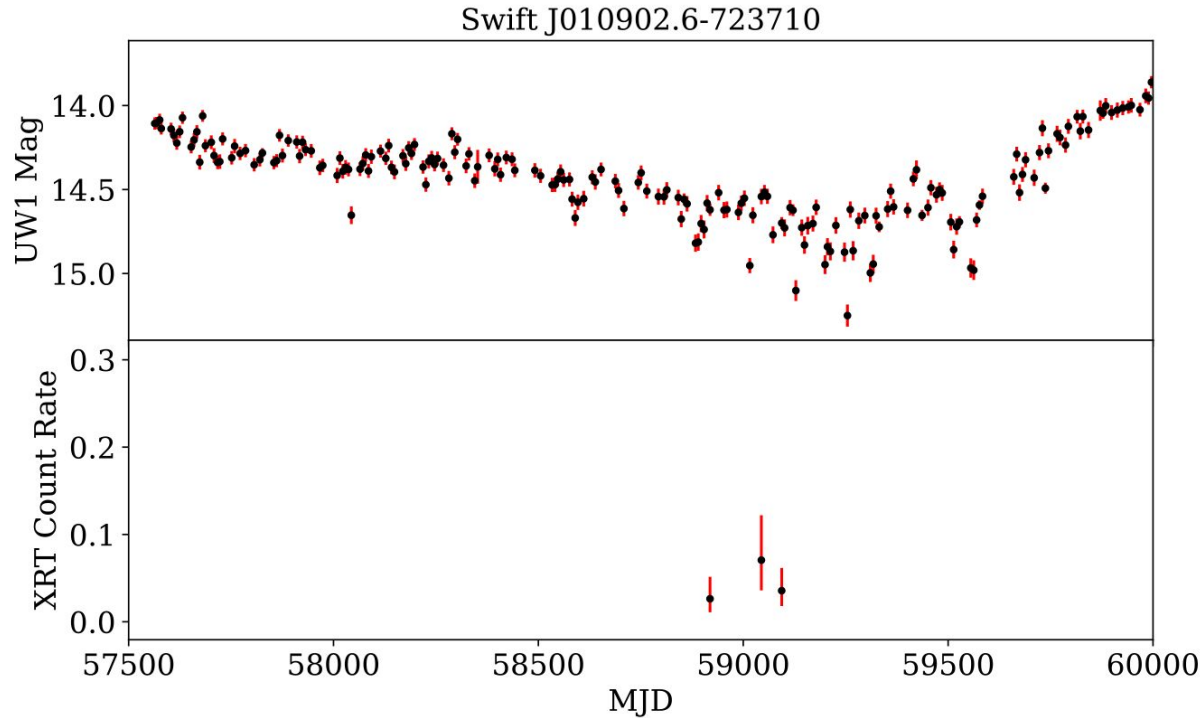
Searching for BeXRBs: Finding Clues



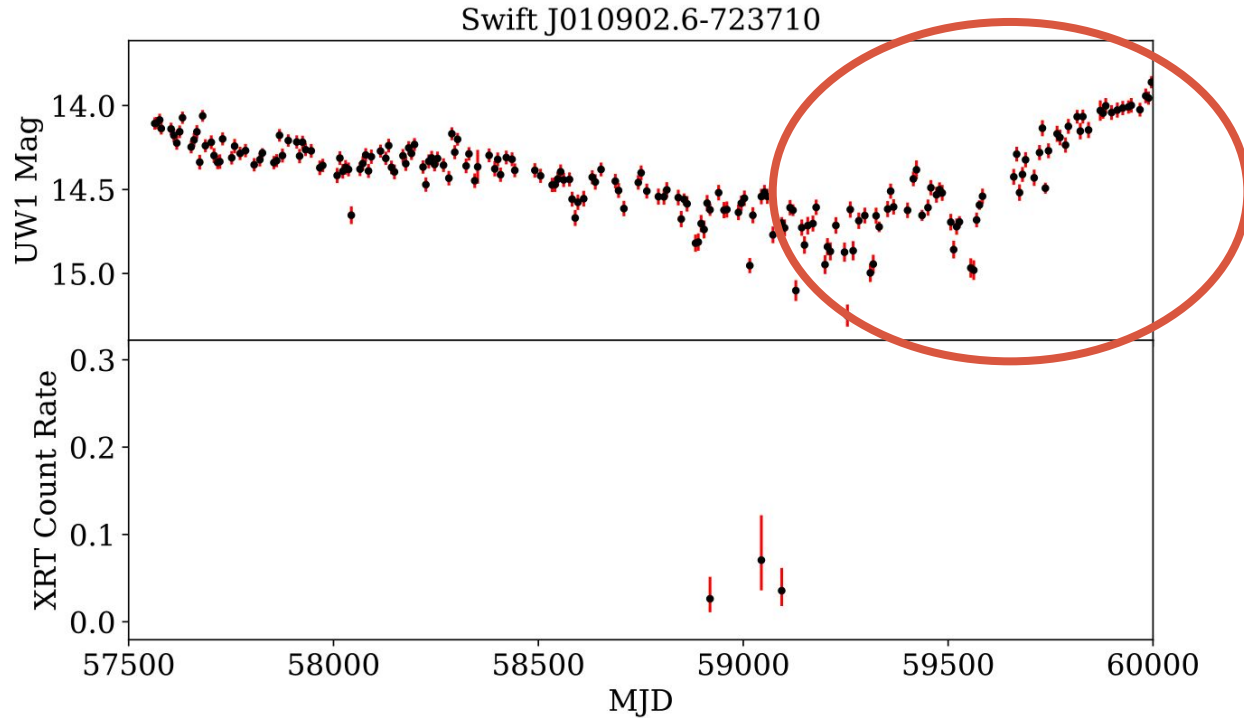
Searching for BeXRBs: Finding Clues





Searching for BeXRBs: The Best Candidate



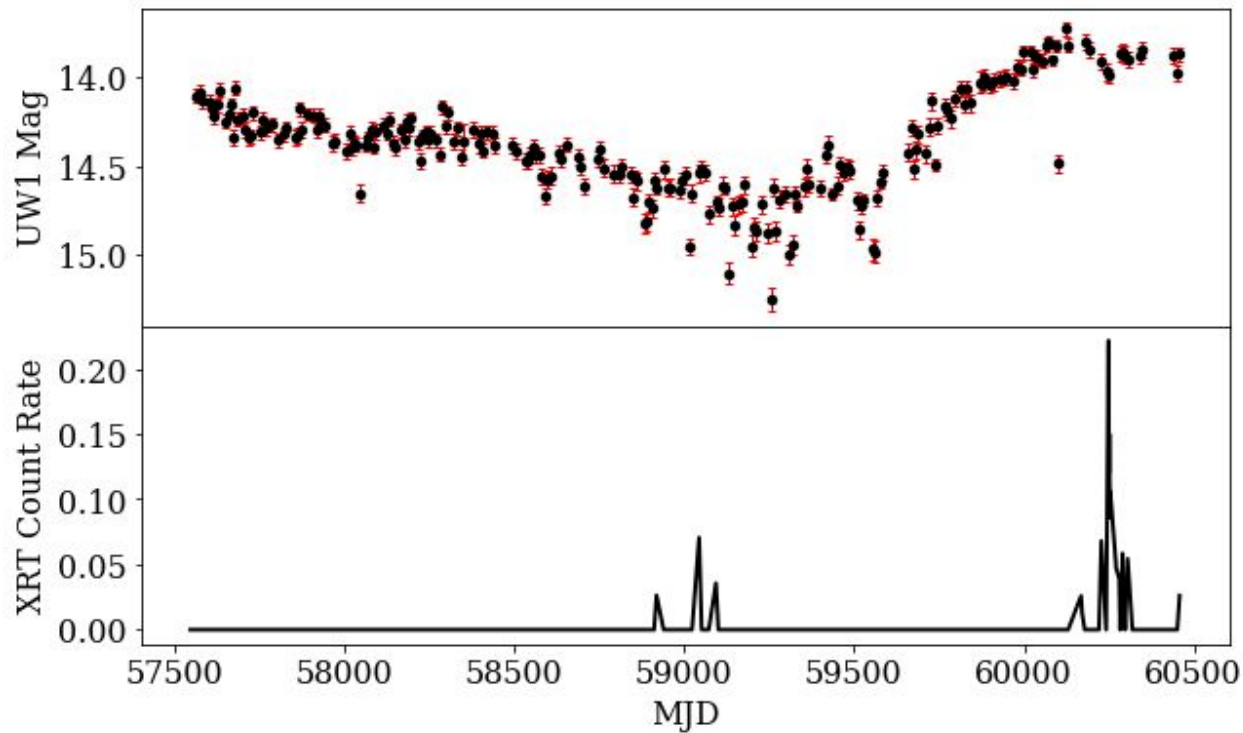
Searching for BeXRBs: The Best Candidate



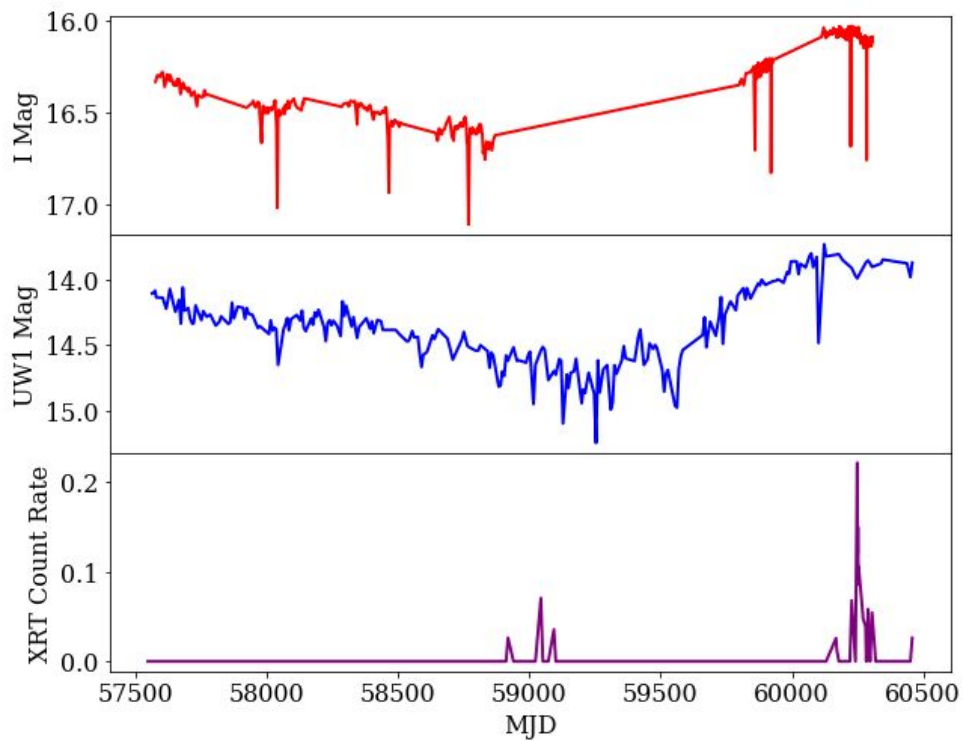


The Outburst of Swift J010902.6-723710

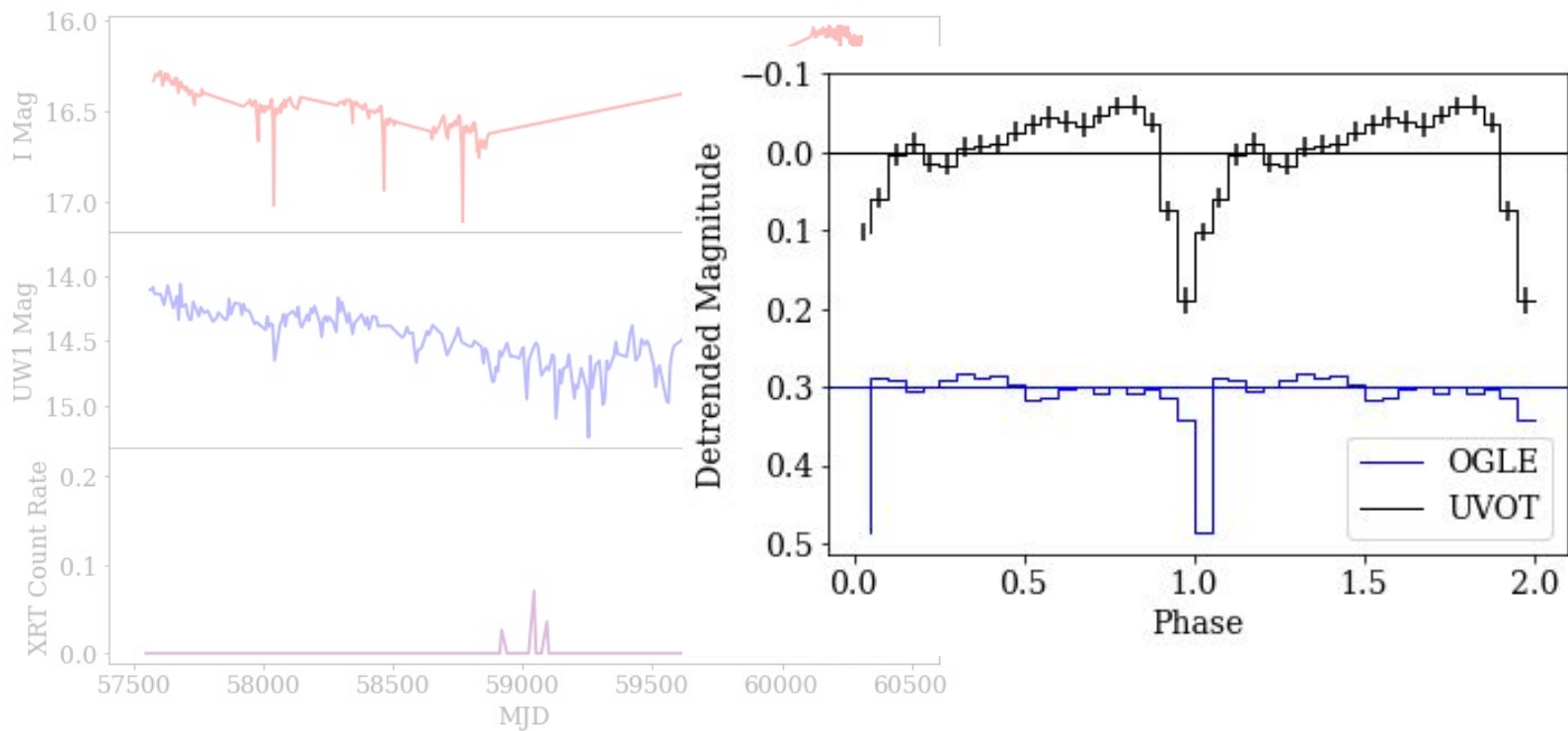
X-Rays Galore



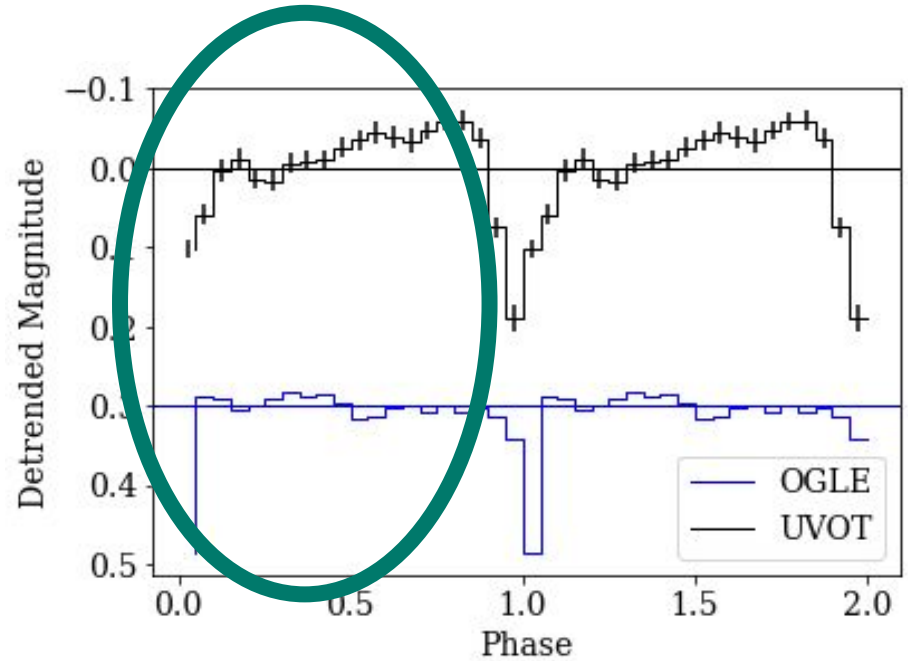
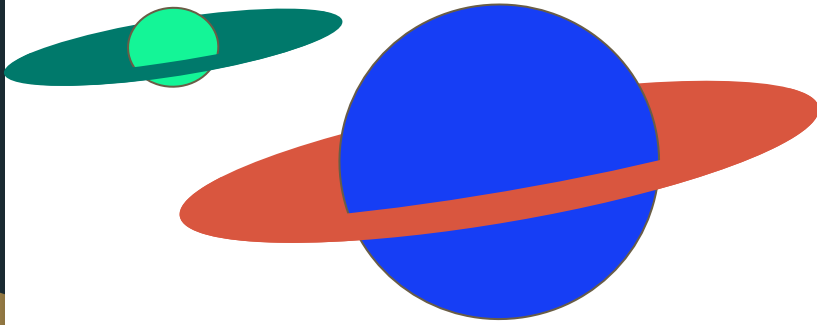
Things Get Weird



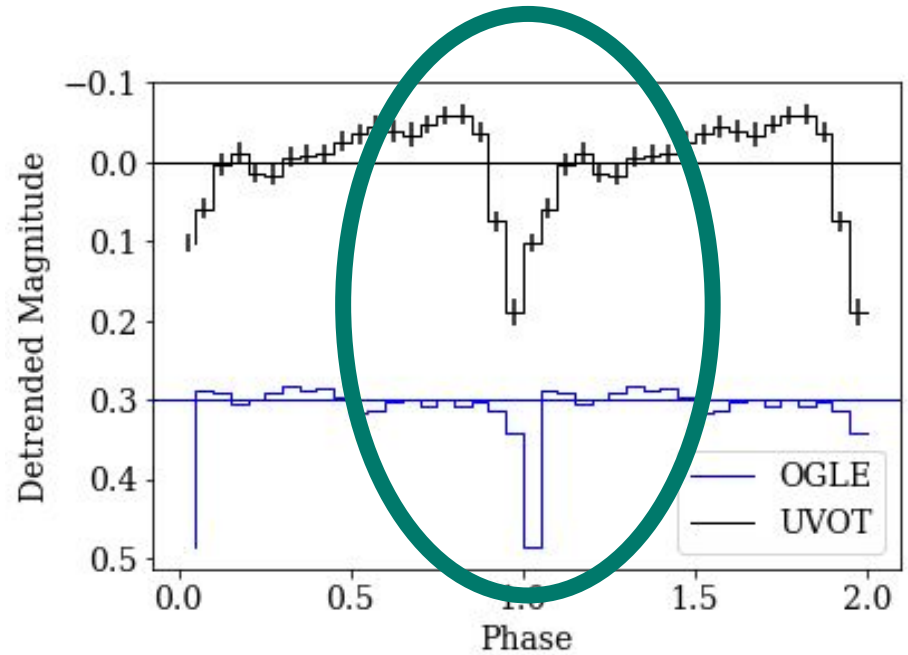
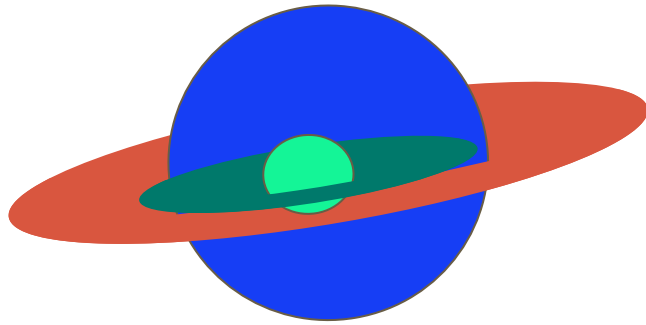
Things Get Weird



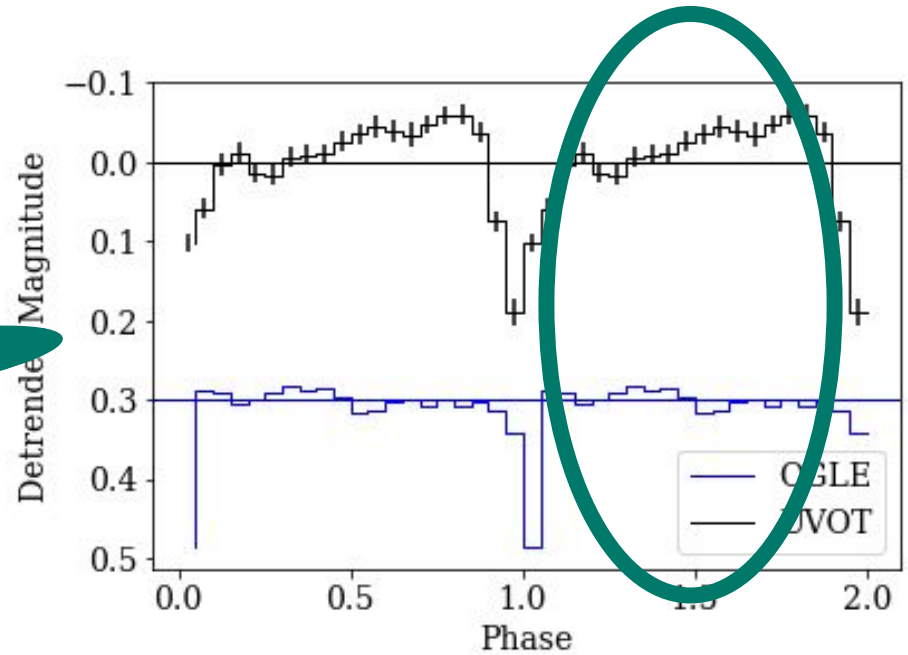
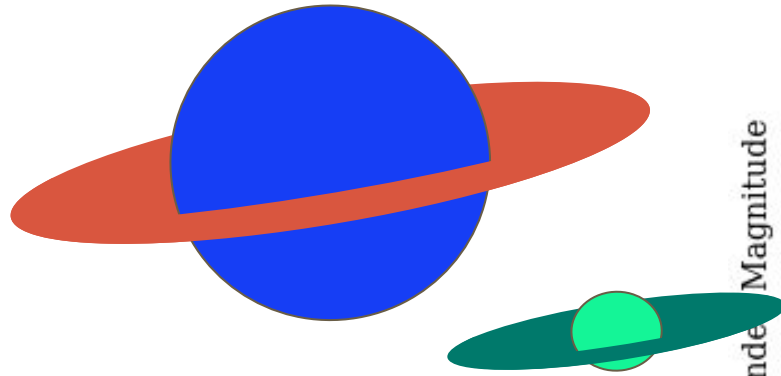
Eclipsing Be/X-Ray Binary



Eclipsing Be/X-Ray Binary



Eclipsing Be/X-Ray Binary



Conclusions

- Be/X-ray Binaries are hard to find
- We use Swift to look for X-ray and UV variability, which tells us where these sources are
- Sometimes we find a really cool system
 - Swift J010902.6-723710 is the third ever eclipsing Be/X-ray Binary found by astronomers
- There are more exciting systems just waiting to be found!



Questions?

Searching for BeXRBs: Finding Clues

