

# SX Phoenicis Stars

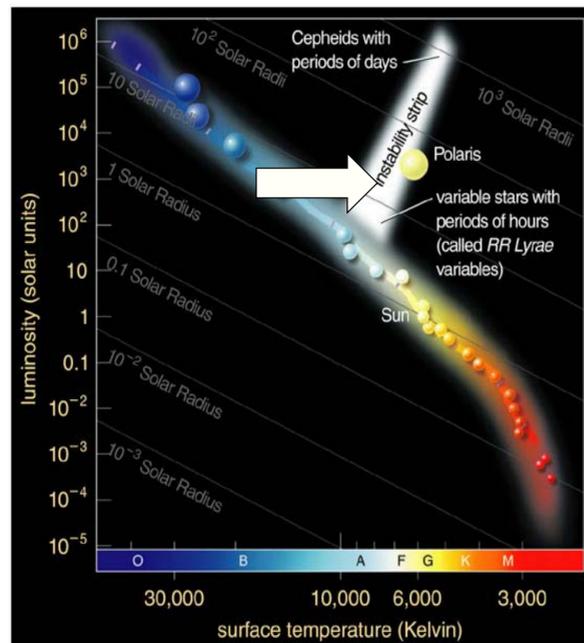
Suzanne Shuda

Faculty Advisor: Dr. Oluseyi, Dept of Physics and Space Sciences, Florida Institute of Technology

## Introduction

SX Phoenicis stars are usually found in the outer regions of the galaxy which is called galactic halo. Their luminosity varies with a period of 1-2 hours. They are interesting because they are very old but have not become white dwarfs as expected. Fewer than 20 field SX Phoenicis stars are known to exist. By studying these stars, we can learn about how they formed, the makeup of the galactic halo, and possibly locate dwarf galaxies. The origin of SX Phe stars is still unknown.

Fig 1: H-R diagram relates surface temperature with luminosity. SX Phoenicis stars are located in the instability strip, close to the main sequence.



Copyright © 2004 Pearson Education, publishing as Addison Wesley.

## Methods and Design

I crossmatched the SDSS and SIMBAD databases to compile a list of likely SX Phoenicis stars. I used SQL queries to display the information I wanted. I used known characteristics such as spectral type and period to narrow down the stars in the database. I learned the best queries by experimenting with the suggestions in the tutorials on the website for SDSS. Using the data list from the SDSS Database, I crossmatched the list with the SIMBAD database using the internal function in SIMBAD. I also found the metallicity of the stars in the databases. The metallicity or [Fe/H] is a measure of the density of heavy elements within a star. The metallicity can then be used to determine whether or not the star has gone through s-process element enrichment and therefore determine the origin of the star.

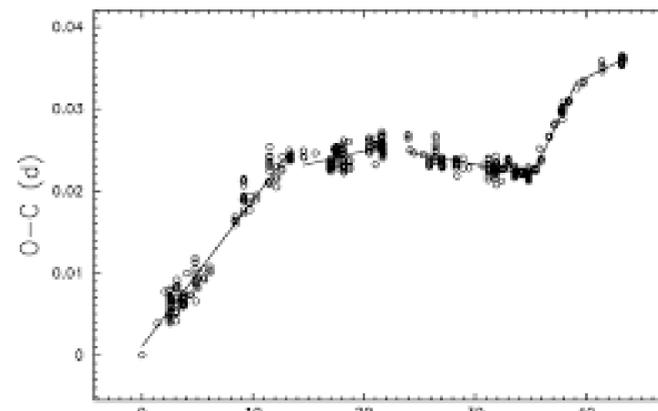


Fig 2: O-C diagram of CY Aquarii. Shows long-term changes in the period

## Results

A total of 42 SX Phoenicis stars were found with metallicity measurements, much more than the previously known 13 SX Phe stars. An O-C diagram describes the observed minus calculated luminosity of a specific star. The purpose is to study the long term changes in luminosity. CY Aquarii, one of the more well-known SX Phe stars which has been studied in the past. An O-C diagram for CY Aquarii is shown in Fig 2.

## Conclusions/ Future Work

The results show that there are very few SX Phoenicis stars in the galaxy and very little data from them. By studying the metallicities, the origin of these stars can be determined. If there is a high metallicity, the star has gone through s-process element enrichment and was most likely formed by stellar cannibalism. If not, it was most likely formed through stellar collisions. The methods used for this experiment can be applied to any other type of variable star. Other uses would be determining the overall metallicity of the galactic halo.

**NORTHROP GRUMMAN**



Engineering & Science  
Student Design Showcase  
at Florida Institute of Technology

