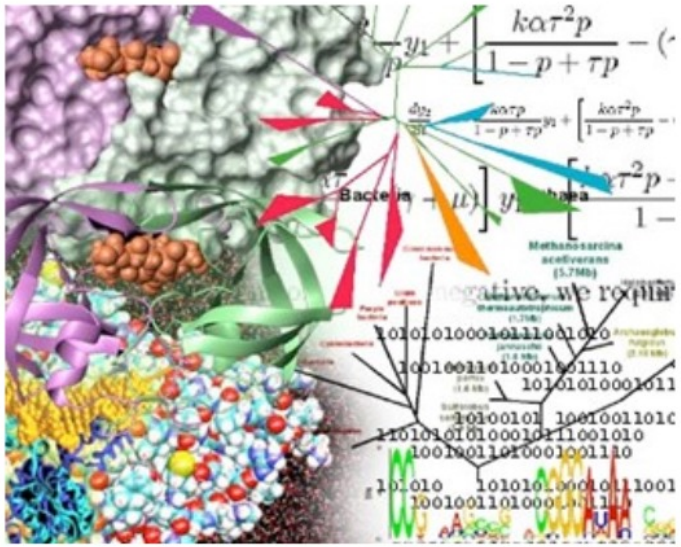
Variable Stars

An iPhone Database Project

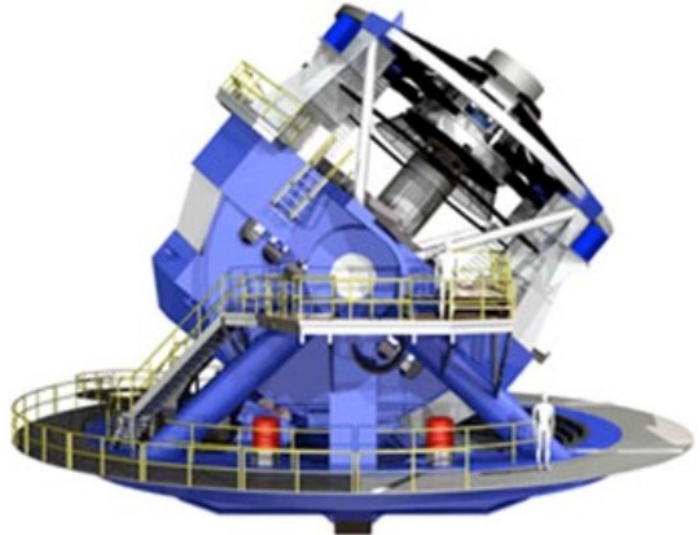
Motivation

The Post-Genomic Era: Bioinformatics is a major scientific endeavor driving research in biomedical science and drug discovery.



The rise of survey astronomy: current and future wide-field surveys across the spectrum creating massive astronomical catalogues (and exciting opportunities for *in silico* discovery through data-mining).

GOAL: Create a generic framework for converting modest data sets (< 1 million records) into an app for the iOS platform (iPhone, iPod Touch, and iPad) that would enable searching, sorting, and viewing of data (with data analysis capability to follow).

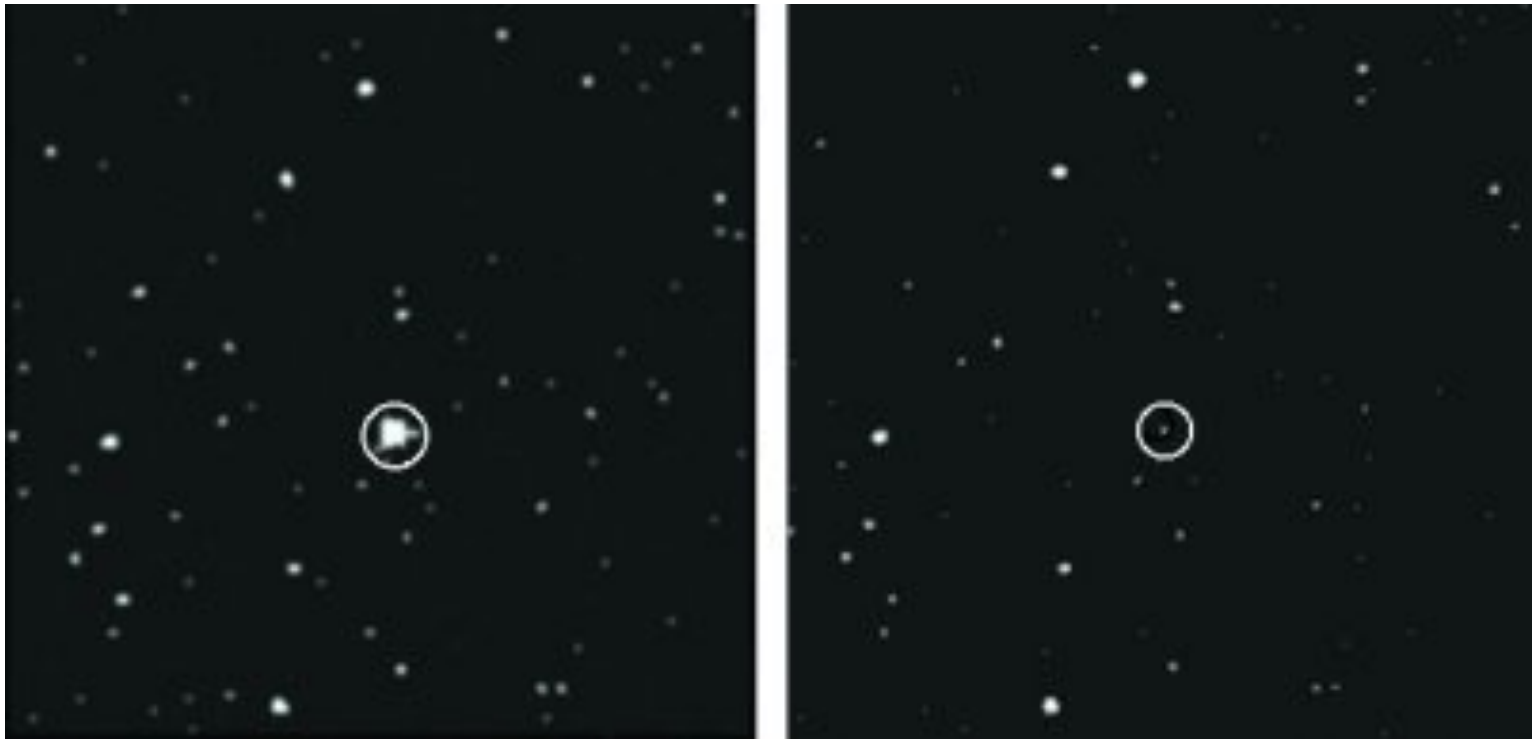


What are variable stars?

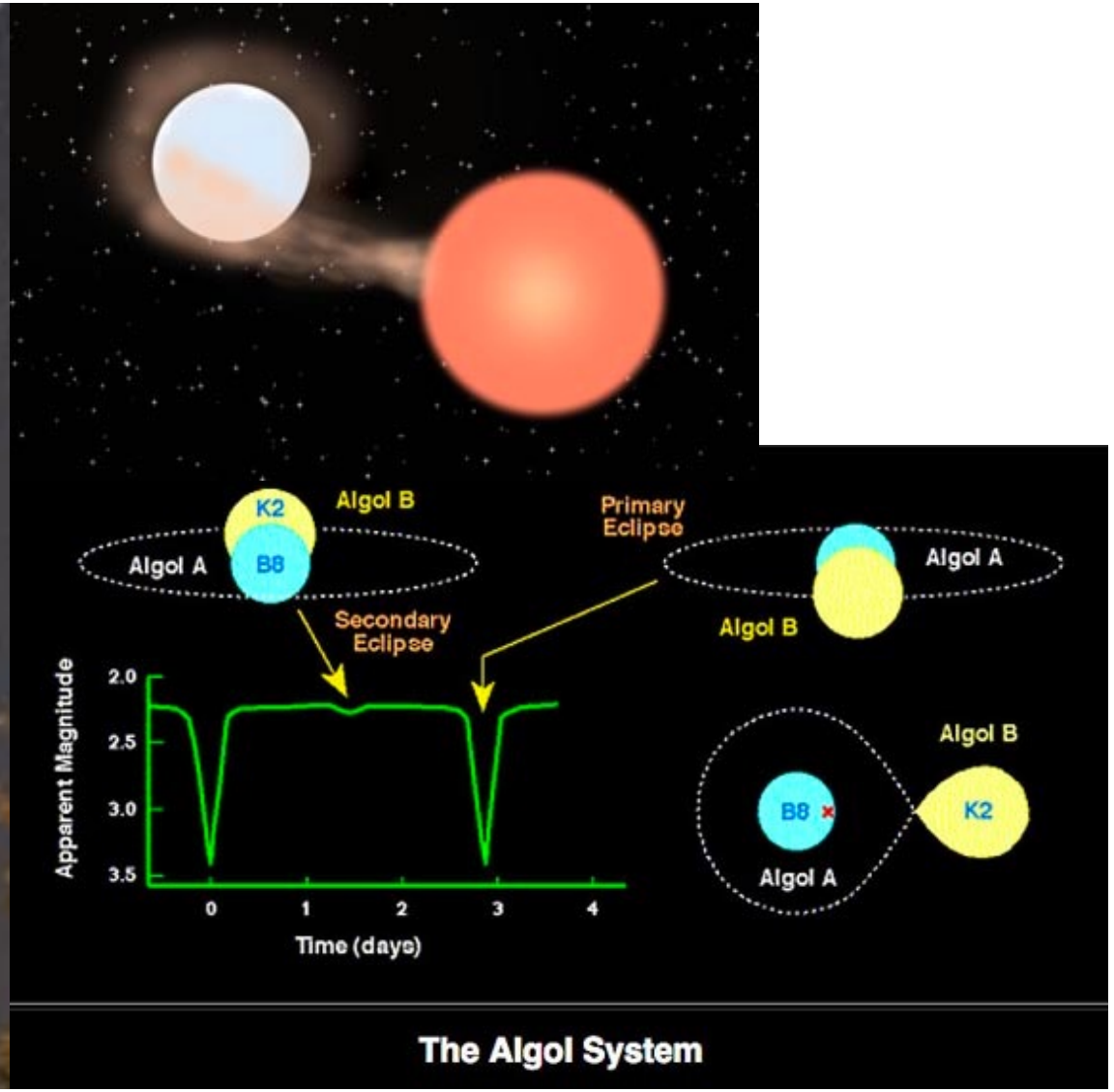
Variable stars are stars that vary in brightness.

There are many different kinds of variable stars.

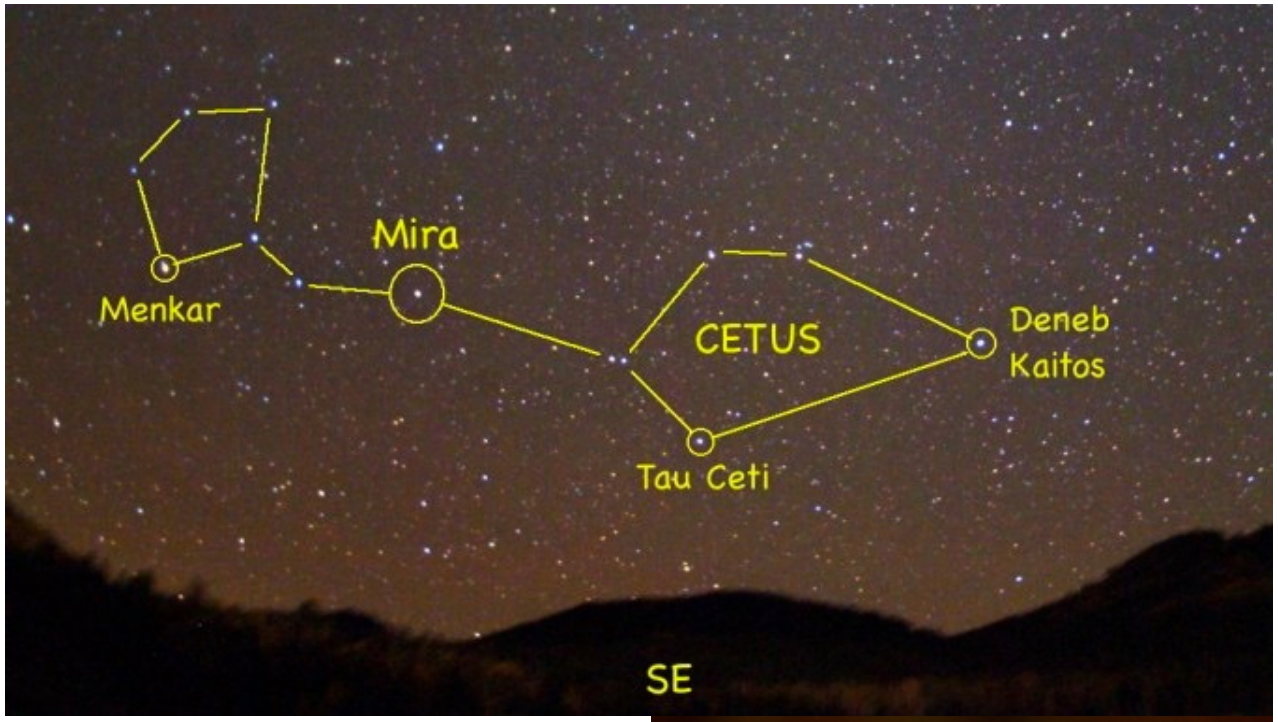
Over 450,000 variable stars have been catalogued, most of them within the last 10 years.



Algol – an eclipsing binary

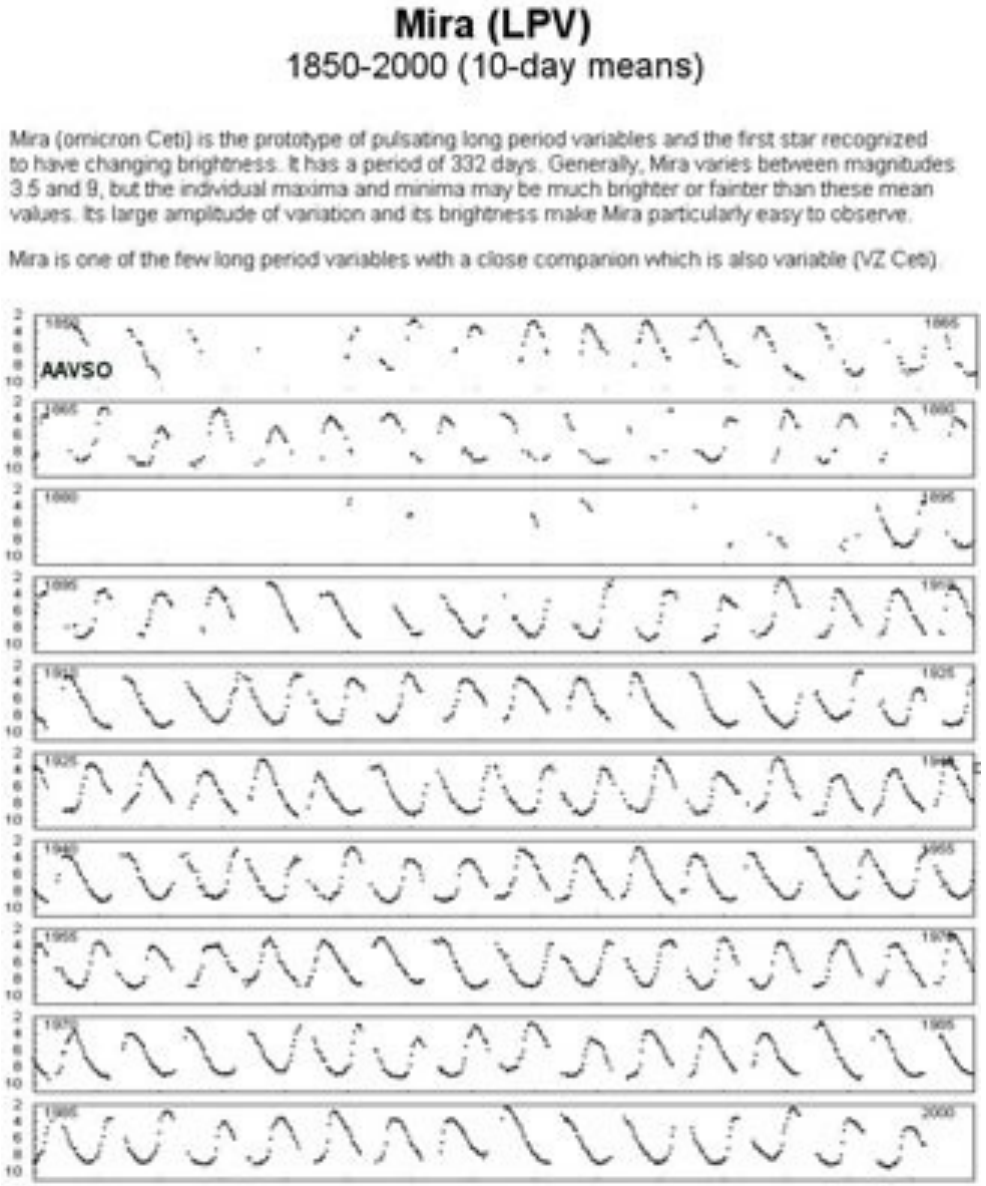


Omicron Ceti (“Mira”) – Long Period Variable (LPV)

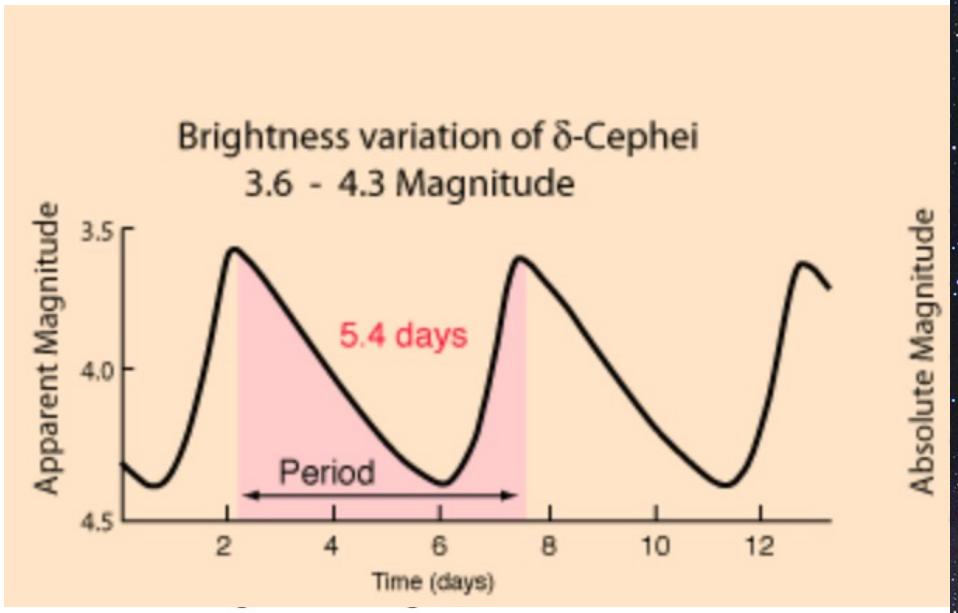


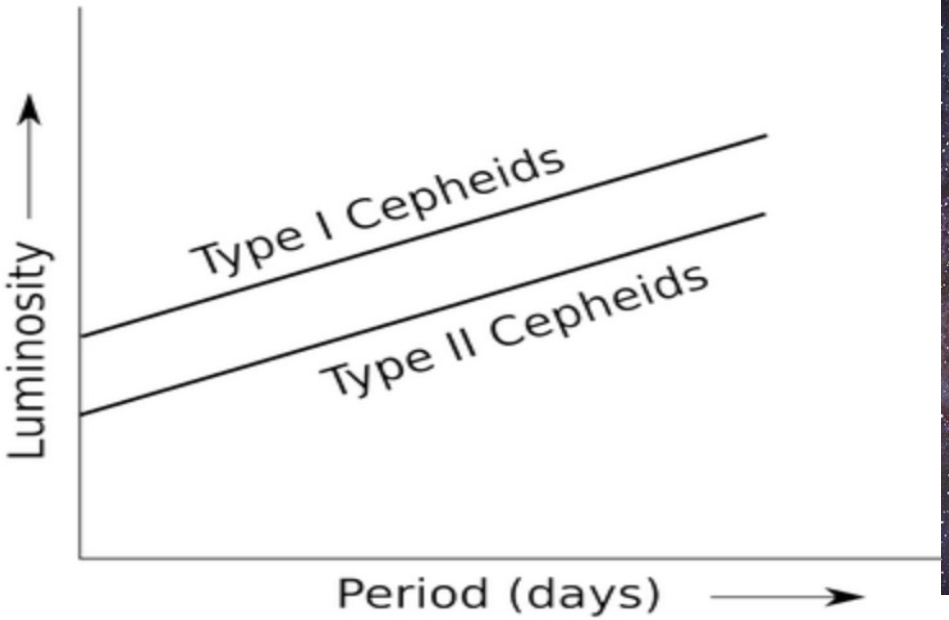
Range: 2.0 – 10.1

Period: 332 days

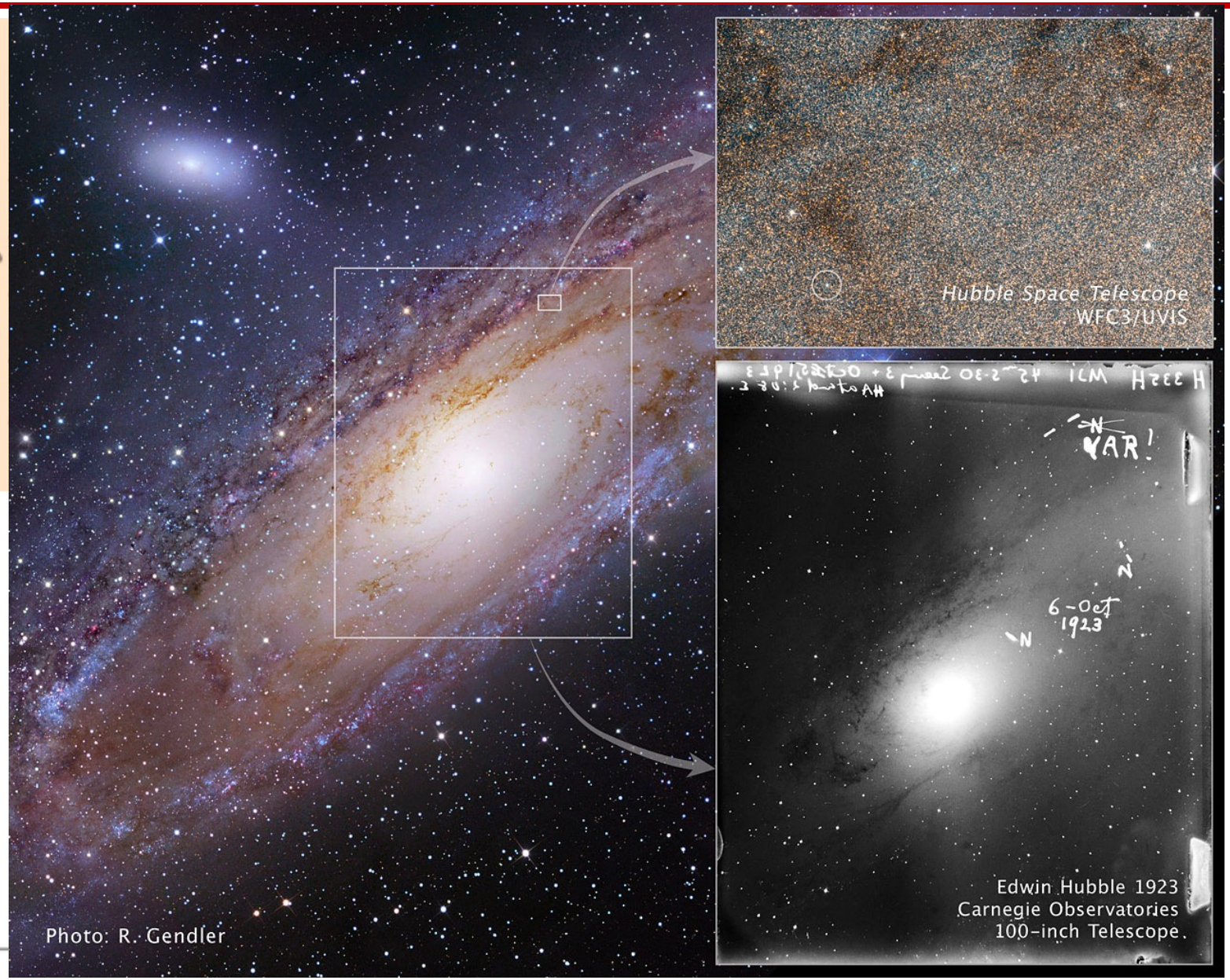


Cepheid Variables – A Cosmic Yardstick

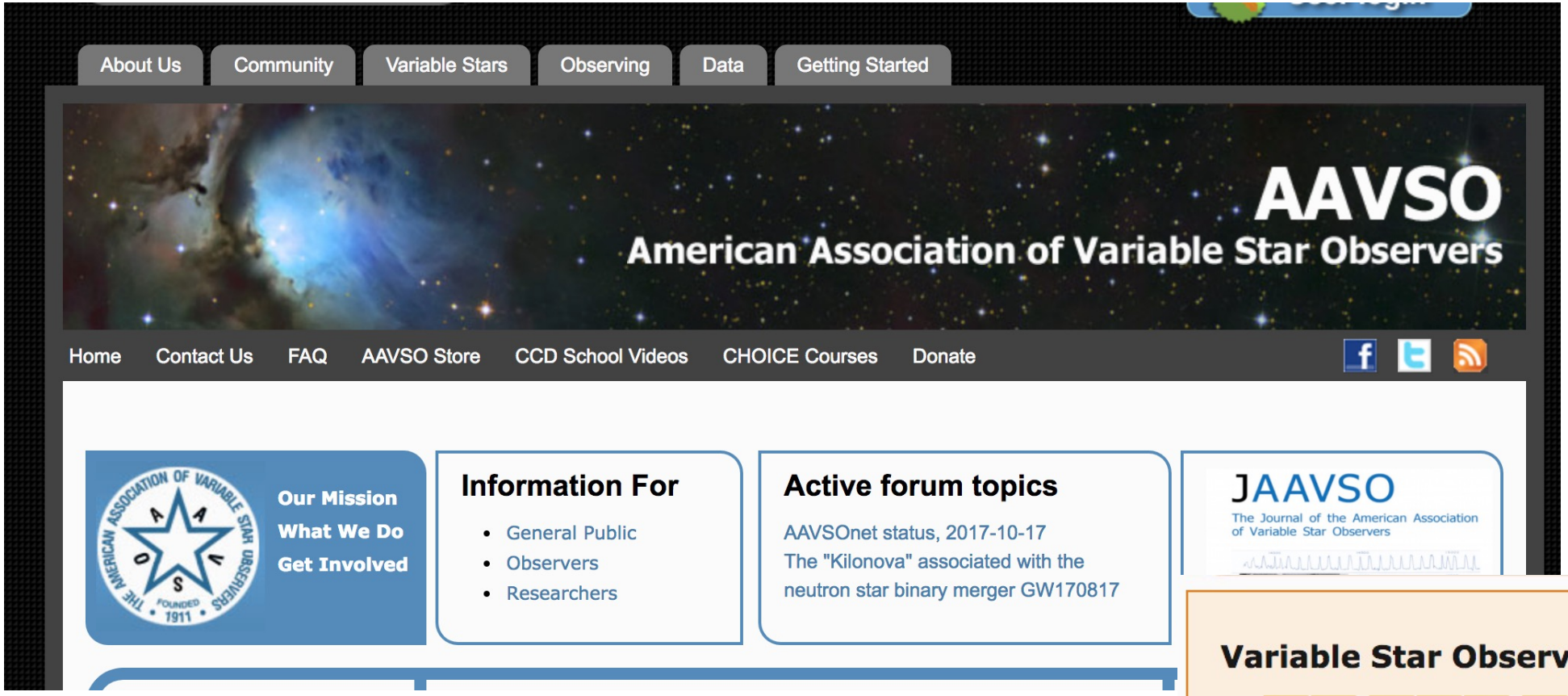




Absolute Magnitude



The AAVSO – www.aavso.org



Variable Star Observations in Database:

3 4 , 2 1 1 , 9 6 3 *and Counting ...*

Last Observation Received:

14 sec ago by SET - Christopher Stephan (US)

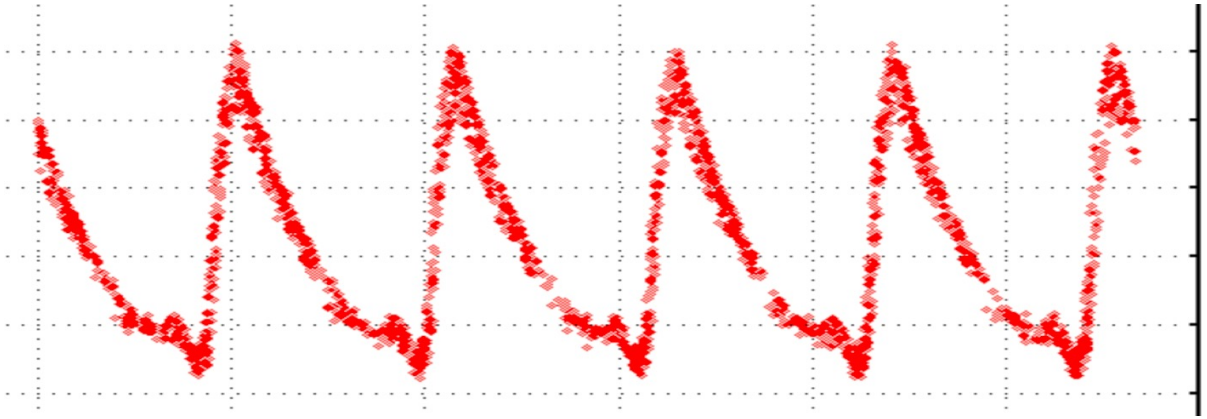
FZ DEL Oct 17.0361 10.0Vis.

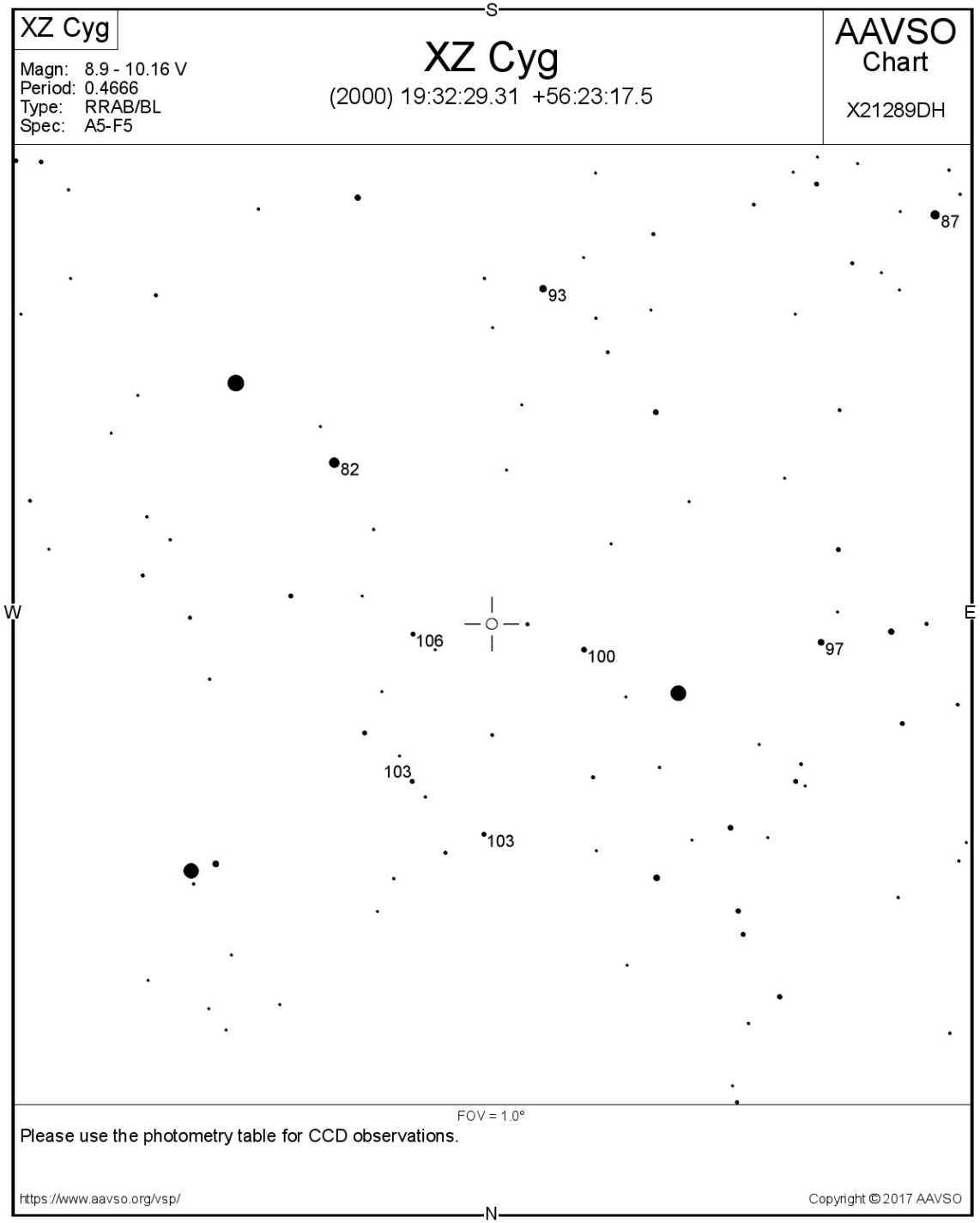
Observing Variable Stars

XZ Cygni is an RR Lyrae type star, that pulsates with a period of 11.2 hours.

Its brightness ranges from 8.7 to 10.4 magnitude.

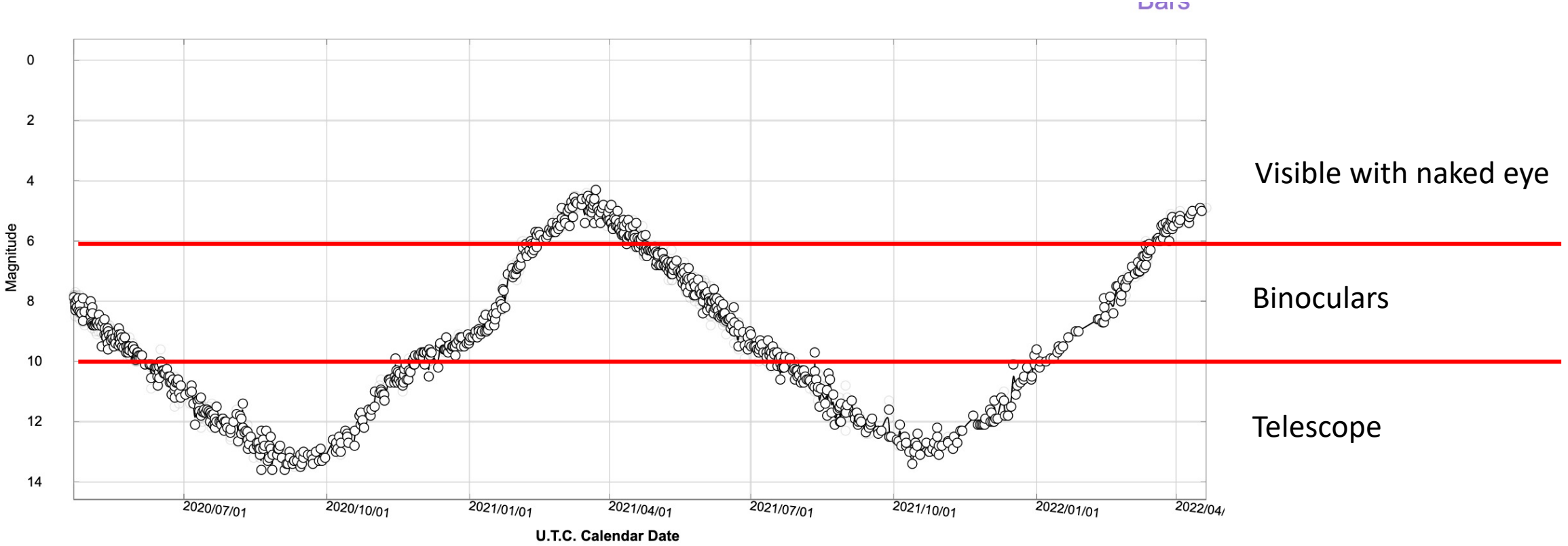
It climbs from minimum to maximum in about one hour.





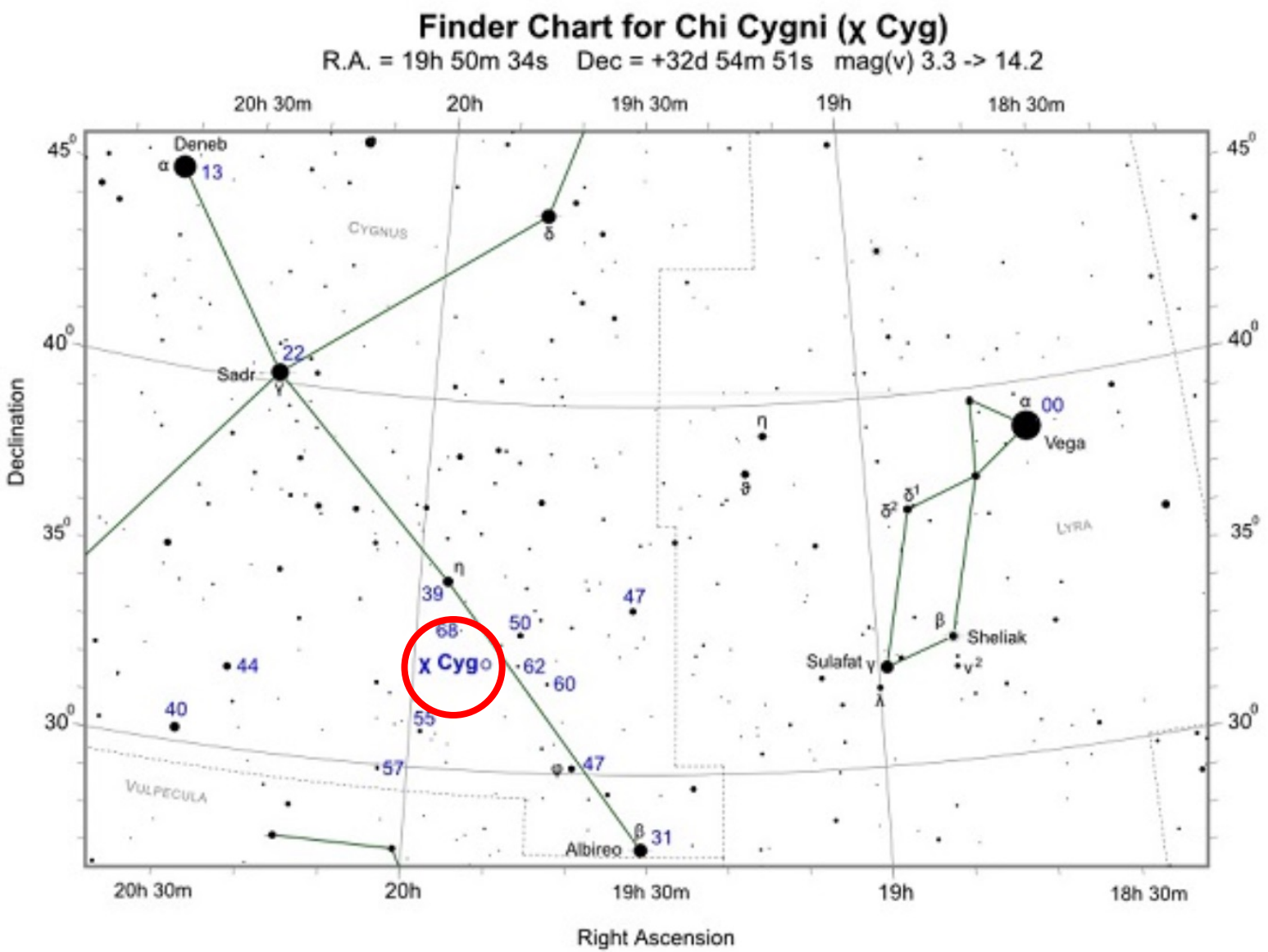
Chi Cygni

A luminous red giant nearing the end of its life.*



* Only 400 million years to go before it evolves into a white dwarf.

Finding Chi Cygni



Centre de Données astronomiques de Strasbourg

Strasbourg astronomical Data Center

Search Criteria

Save in CDSportal

Keywords Back

- B/vsx/vsx

Tables Add

B/vsx
..vsx
..refs
..vsx_id

Choose

Preferences

max: 50

HTML Table

All columns

Compute

- Distance ϱ
- Position angle θ
- Distance (x,y)
- Galactic
- J2000
- B1950
- Ecl. J2000
- default

Sort by Distance

+ order -

No sort

Position in:

Sexagesimal

Decimal °

Simple Target | List Of Targets

Fast Xmatch with large catalogs or Simbad

Target Name (resolved by Sesame) or **Position**:

Clear | J2000 | Target dimension: 2 arcmin

Radius | Box size

B/vsx AAVSO International Variable Star Index VSX (Watson+, 2006-2014) Similar Catalogs 2006SASS...25..47W ReadMe+ftp

Post annotation

1.B/vsx/vsx Variable Star indeX, Version 2017-10-16 *(465200 rows)*

Simple Constraint | List Of Constraints

Submit | Reset All

Query by Constraints applied on Columns *(Output Order:* + - *)*

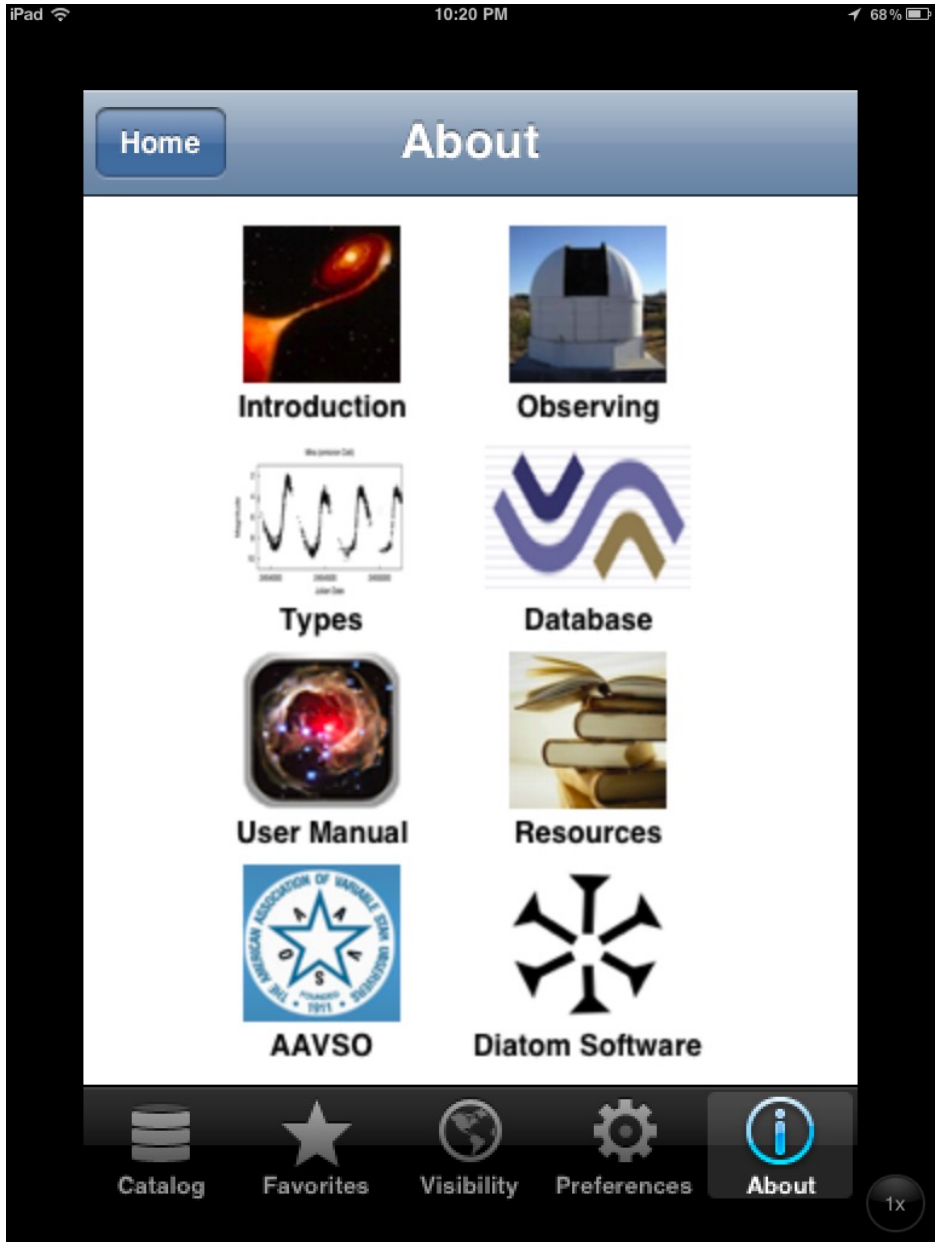
Show	Sort	Column	Clear	Constraint		Explain (UCD)
☐	○	recno				Record number assigned by the VizieR team. Should Not be used for identification. (meta.record)
☑	○	OID				Internal identifier, can be used to link out to the VSX database *(Note 1)* (meta.id)
☑	○	n_OID			(char)	**B** indicates bibliography (in file " refs.dat"), **V** indicates an additional VSX name (in file vsx_id) (meta.ref.url)
☑	○	Name			(char)	Variable star identifier (meta.id;meta.main)
☑	○	V				[0,2] Variability flag *(Note 2)* (meta.note)
☑	○	Type			(char)	Variability type (see details of VSX type list) (meta.note;src.var)
☑	○	l_max			(char)	Limit flag on max (meta.code.error)
☑	○	max			mag	(n) Magnitude at maximum, or amplitude (phot.mag)
☑	○	u_max			(char)	Uncertainty flag on max (meta.code.error)
☑	○	n_max			(char)	Passband on max magnitude *(Note 4)* (meta.note)
☑	○	f_min			(char)	[(] '(' indicates an amplitude (meta.code)

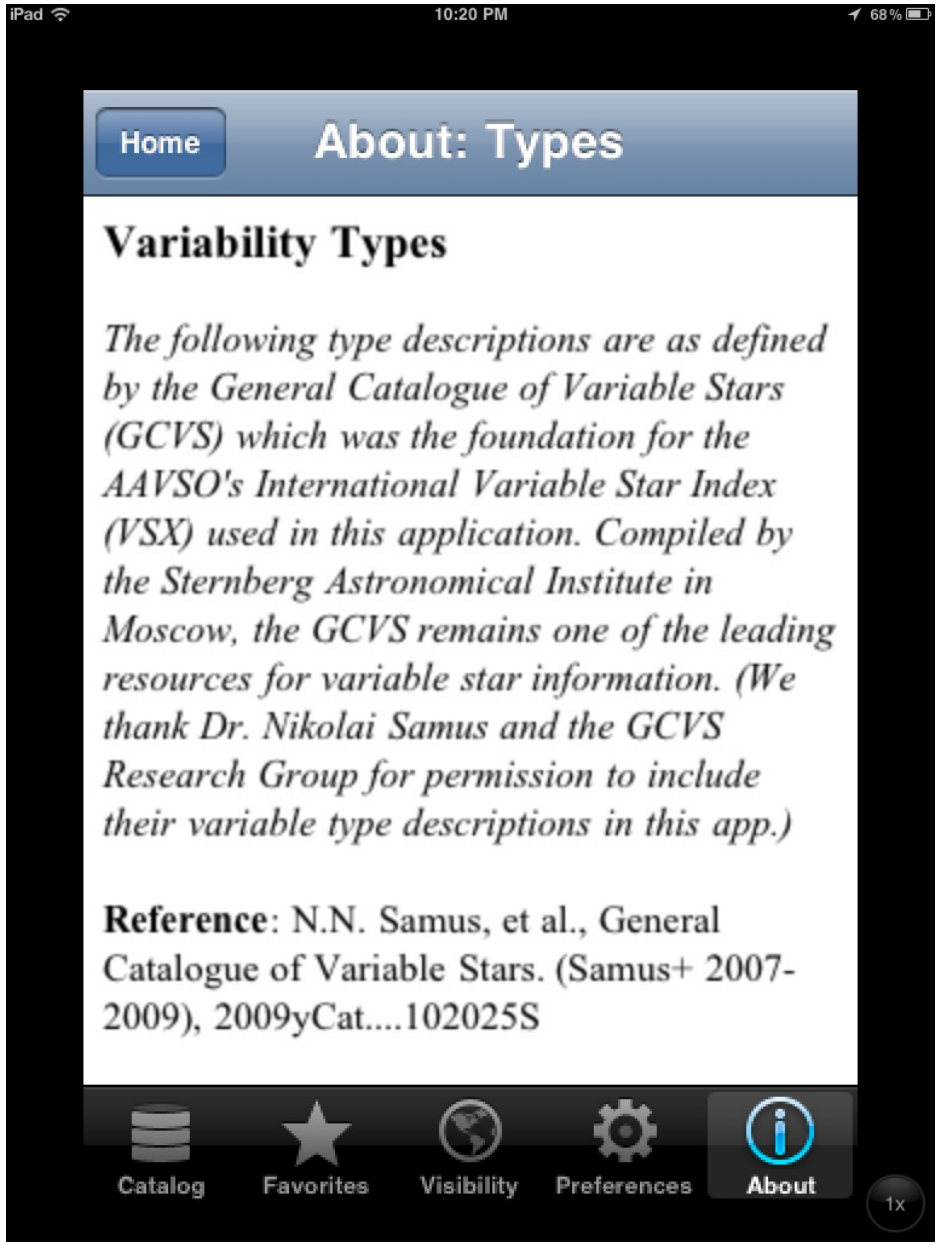
Reset All | Clear

(n) indicates a possible blank or NULL column

Submit

Northeastern University


iPad
10:20 PM
68%
Home
About
Introduction
Observing
Types
Database
User Manual
Resources
AAVSO
Diatom Software
Catalog
Favorites
Visibility
Preferences
About
1x


iPad
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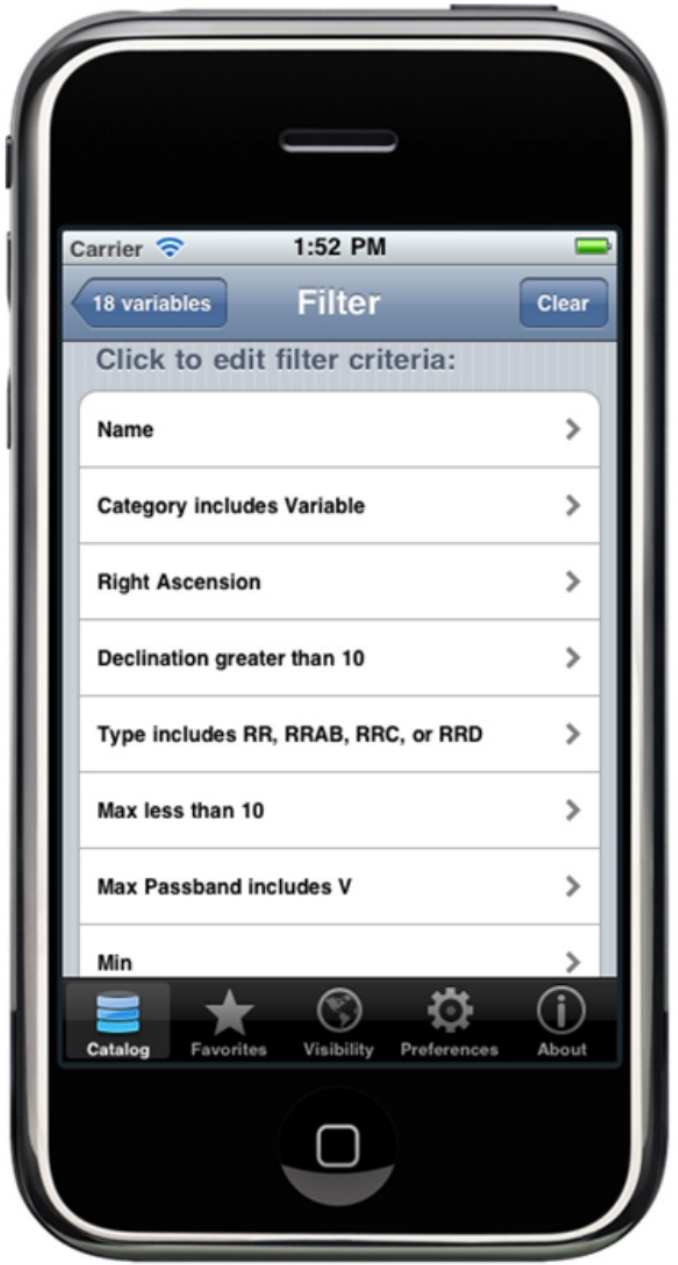
Home
About: Types
Variability Types
The following type descriptions are as defined by the General Catalogue of Variable Stars (GCVS) which was the foundation for the AAVSO's International Variable Star Index (VSX) used in this application. Compiled by the Sternberg Astronomical Institute in Moscow, the GCVS remains one of the leading resources for variable star information. (We thank Dr. Nikolai Samus and the GCVS Research Group for permission to include their variable type descriptions in this app.)
Reference: N.N. Samus, et al., General Catalogue of Variable Stars. (Samus+ 2007-2009), 2009yCat....102025S
Catalog
Favorites
Visibility
Preferences
About
1x

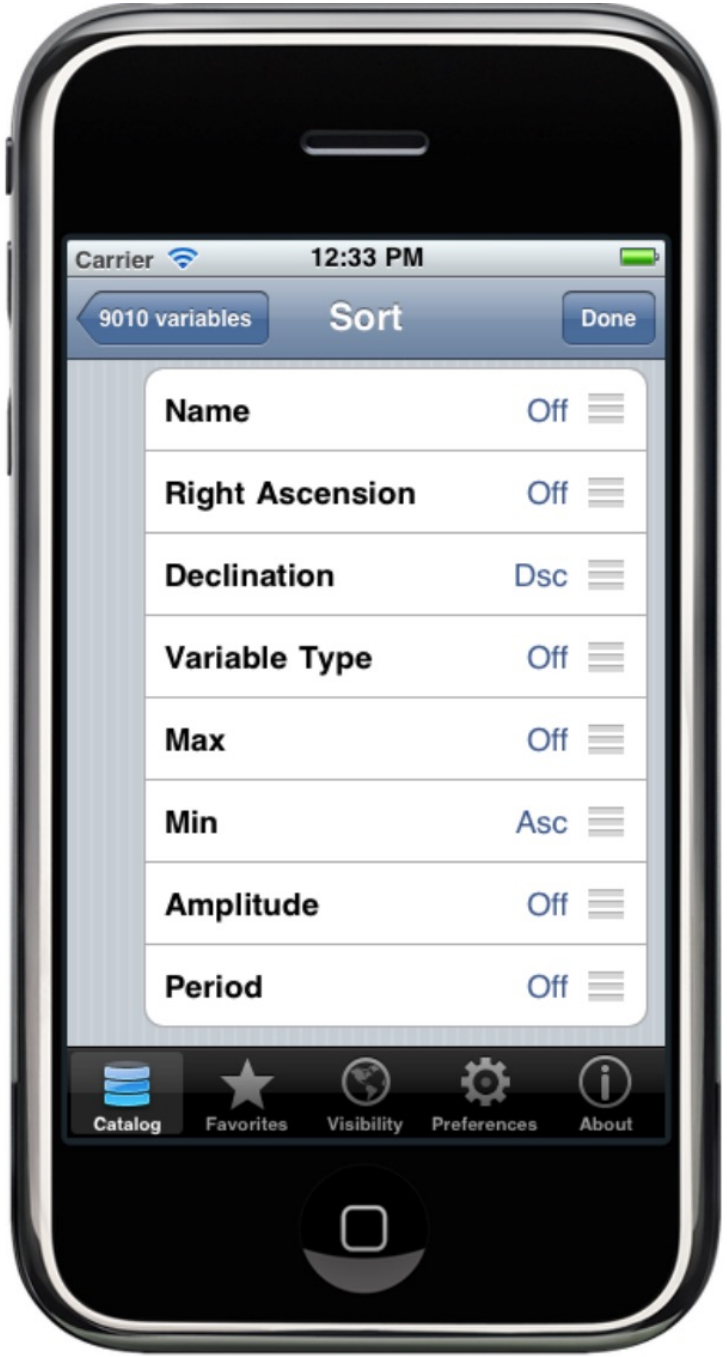
Filtering

- Meta-data defines whether you can filter on a particular column, and how (**Multi-Select, Numeric, Boolean**)
- Number of hits is automatically updated

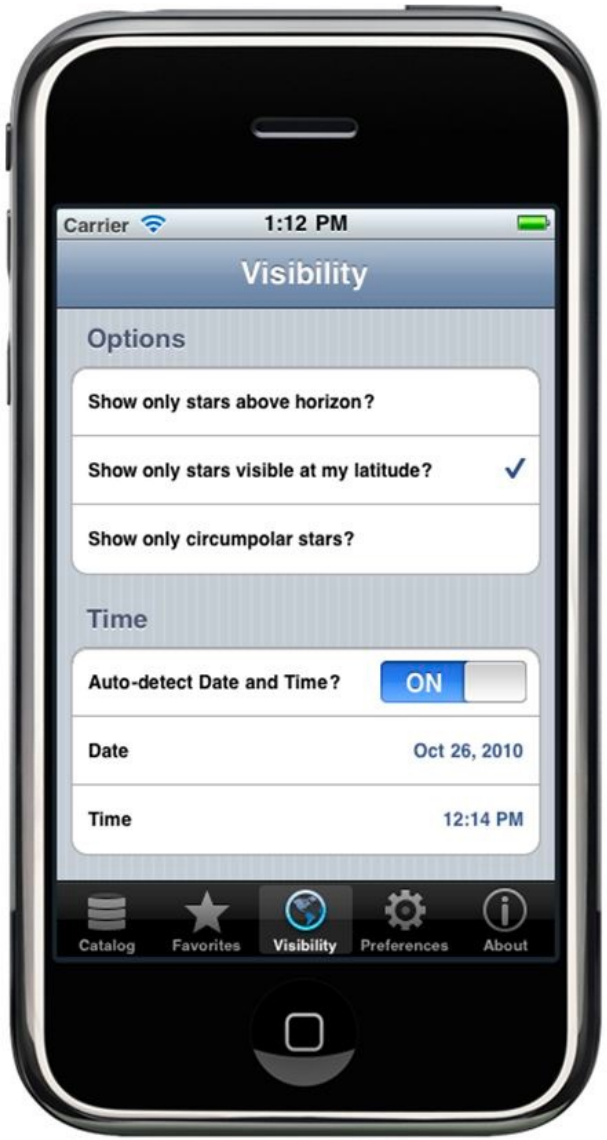


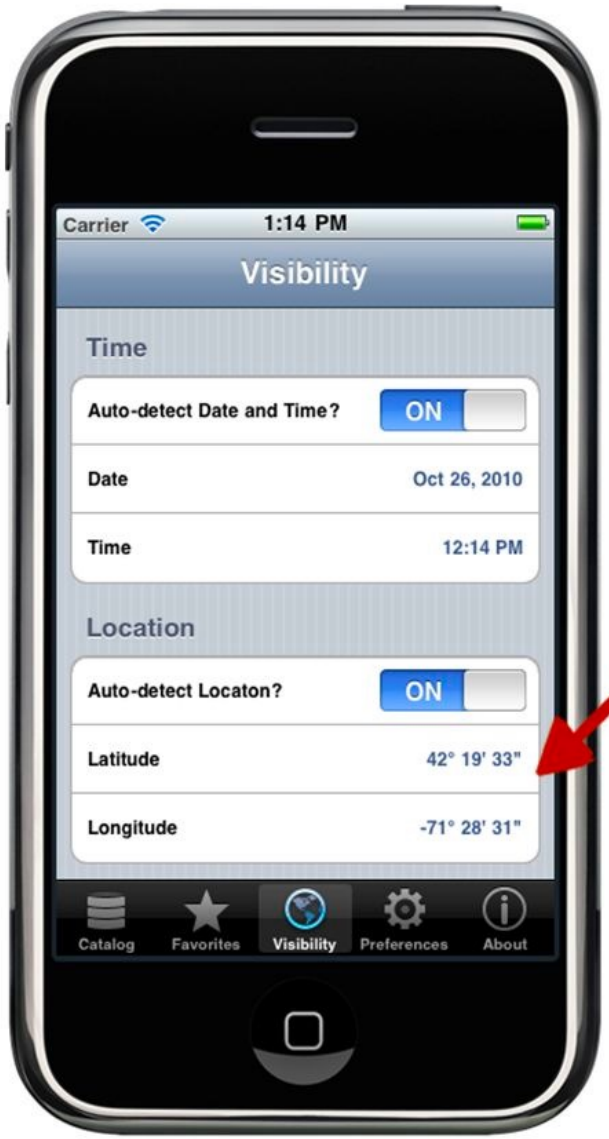
Sorting

- Sortable fields are defined in meta-data
- Ascending/Descending/Off
- Drag to reorder



Visibility: Astronomical Extensions

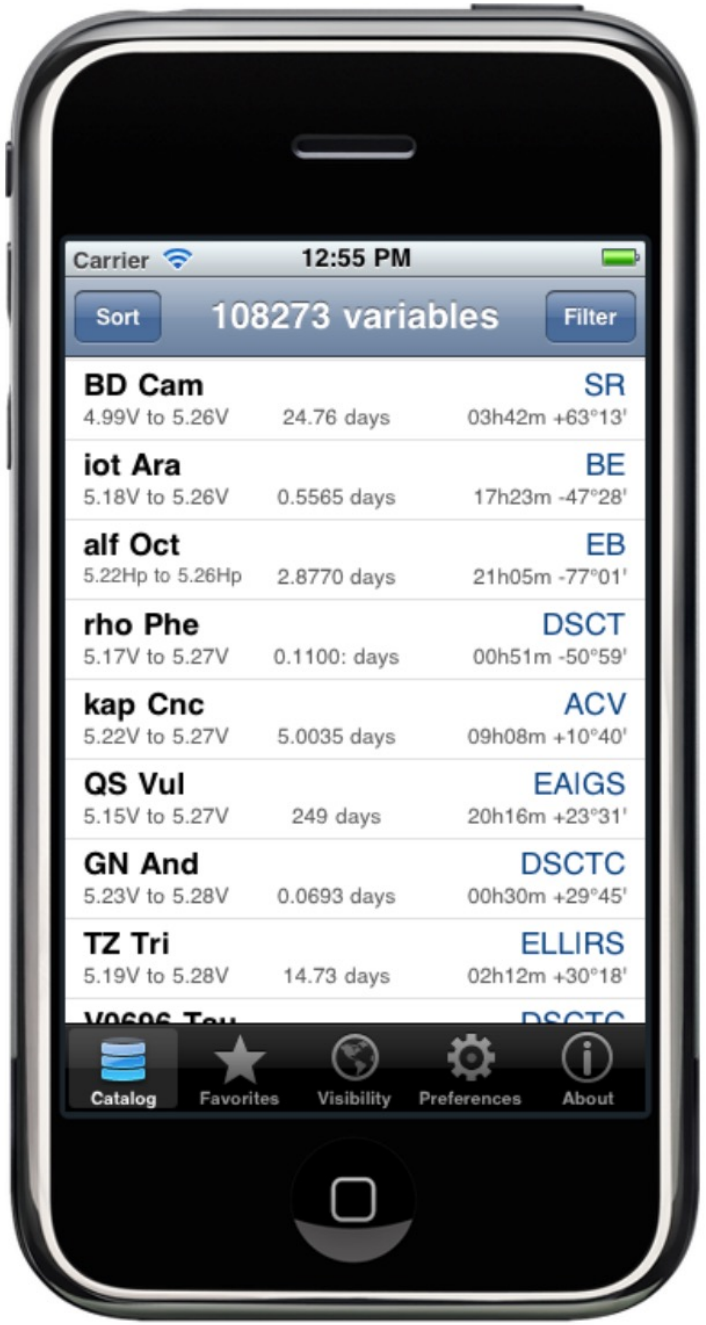




Where to find
me on a clear night!

Viewing matches

- The summary table provides a sorted list of all matching variables
- Key information displayed: name, type, range, period, position



Project Significance

- Created a metadata-driven framework for querying small to mid-sized datasets on the Apple iOS platform

- Provided research support for variable star observers and amateur astronomy enthusiasts. This citizen science effort, in turn, supports professional research in astrophysics and cosmology.

- Learned how to build and deploy iOS applications on the Apple Store, and gained insight on the market demand for free vs. paid apps. (Free apps get 10-100x more downloads!)