

What is the True Population of the R Coronae Borealis Stars?



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VI. On the periodical Changes of Brightness of two fixed Stars.

By Edward Pigott, Esq. Communicated by Sir Henry C. Englefield, Bart. F. R. S.

Read January 12, 1797.

Bath, August, 1796.

ALTHOUGH those far distant suns, the fixed stars, have baffled all investigation with regard to our knowledge of their distance, magnitudes, and attractions; we have, nevertheless, by determining their periodical changes of light, established a strong affinity between them and our sun; and among such an inconceivable number, we may expect to find some with periods of rotation much longer and shorter than those we are already acquainted with, and with changes perhaps even sufficiently rapid to afford a ready means for determining accurately differences of terrestrial longitudes. This would be a most satisfactory, useful, and profitable discovery, and may be the lot of those who have but a slight knowledge of astronomy, provided that with great exactness, and a good memory, a constant look out be given. The discoveries which at present I have the honour of laying before the Society, are the periodical changes of brightness of two stars, one in *Sobieski's Shield*, the other in the *Northern Crown*.

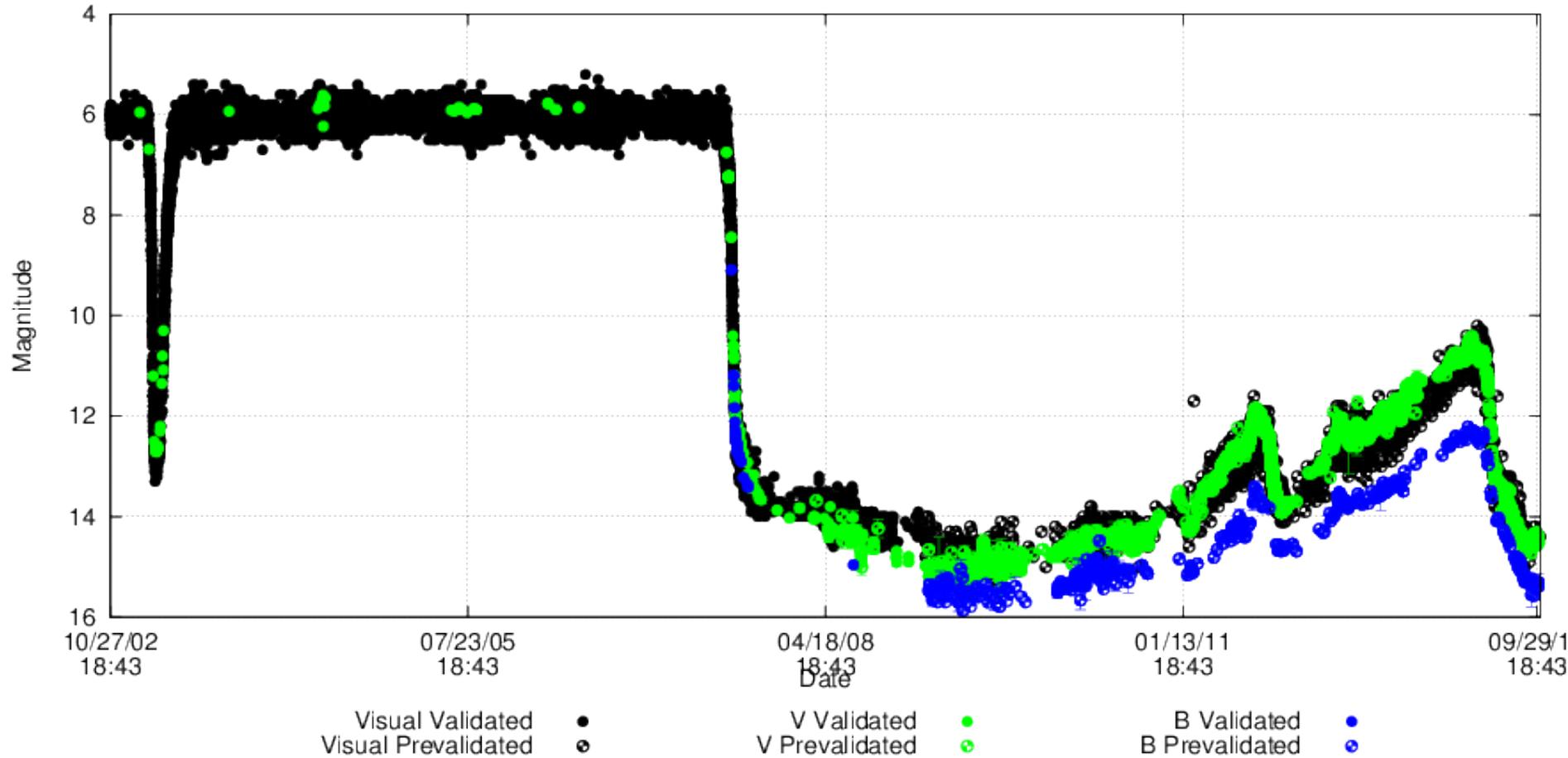
Pigott & Englefield 1797, Philosophical Transactions of the Royal Society of London, 87, 133

Extracts from my Journal, of the Observations on the Variable in the *Northern Crown*; made at Bath.

Dates.	Magnit.	
1783. July 27	7.8	seen with difficulty with an opera-glass.
30	7	much brighter.
31	7	though the air was hazy, I could see it <i>with D°</i> .
August 8	7	saw it distinctly—opera-glass.
1784. July 11	6.7	{ thought it considerably brighter than last year.
14	6.7	{ rather less than π , but evidently brighter than w .
1785. May 20	7	not so bright as ϵ , equal to π , and brighter than w .
1795. May 28	7	it is marked less than π , and brighter than the 7.8th magnitude
June 20	9.10	not visible with an opera-glass.
23	9	evidently less than o ; rather less than P ; rather brighter than x .
29	8.9	equal to, or brighter than P .
July 6	7	evidently brighter than P ; nearly equal to o .
7	7	evidently brighter than o ; nearly equal to w .
13		
24		
25	6.7	certainly brighter than w , and rather less than $\pi \epsilon$.
31		
August 2		
6		
11	6.7	nearly equal to π ; no perceptible alteration during these dates.
17		
21		
28	7.6	less than π ; moon nearly full.
Sept. 4	7	evidently less than π ; if any difference brighter than w .
13	8.7	evidently less than w ; if any difference brighter than o .
15	9	less than o , and equal to P .
16	9.10	equal to, or less than P ; brighter than x .
20		not visible with an excellent night-glass; therefore less than the 11th magnitude; a remarkably rapid disappearance; air clear.
22		
Nov. 1		
Dec. 12		
1796. Jan. 11		{ not visible with an opera-glass, with which I can, when the air is very clear, see the star o of my plan.
Feb. 12		
March 27		
28		not visible with the night-glass; therefore not of the 11th magnit.
April 14	10	visible with night-glass; less than x .
17		
25	9.10	brighter than x ; rather less than P .
May 1	9	less than o , and equal to, or rather brighter than P .
10		
12		
19	8.9	equal to, or rather brighter than o . D near full.

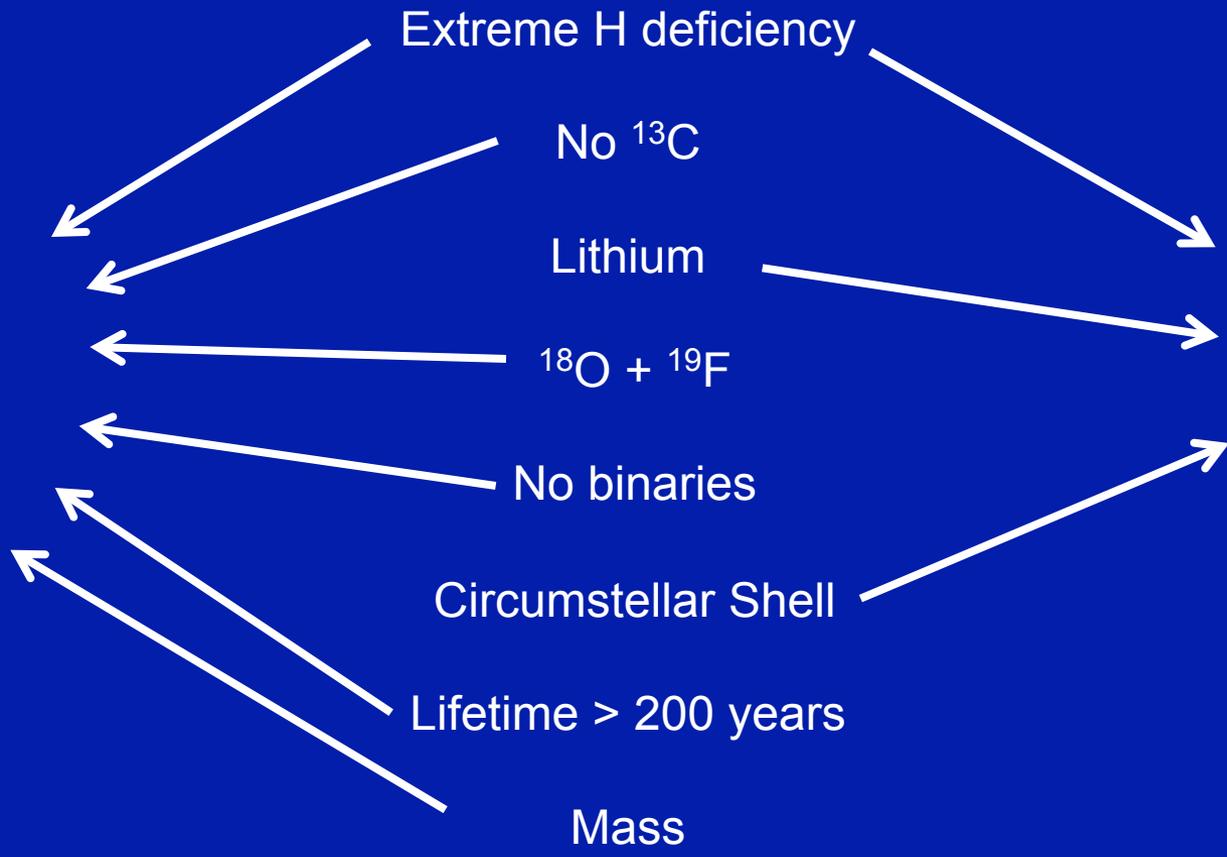
R CrB

AAVSO DATA FOR R CRB - WWW.AAVSO.ORG



White Dwarf
Merger

Final Helium
Shell Flash

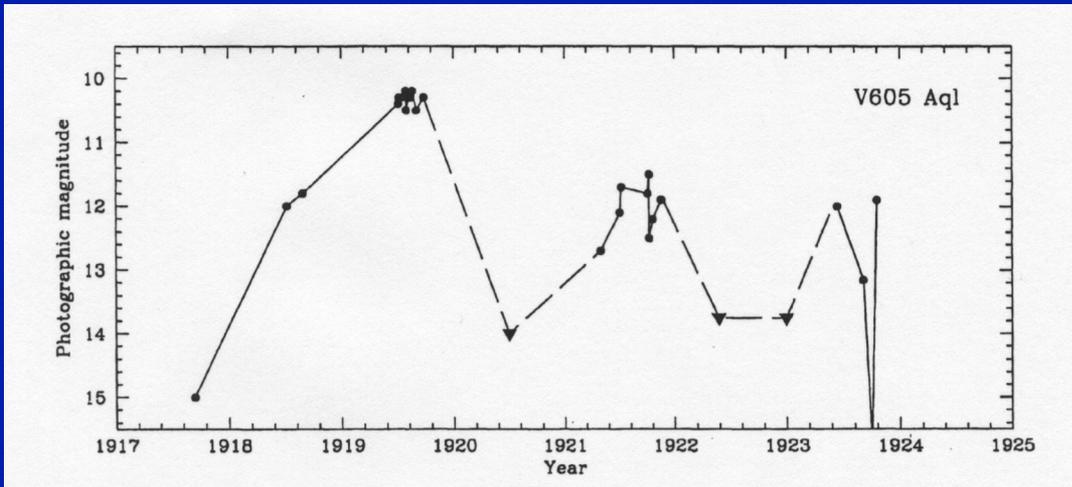


V605 Aql



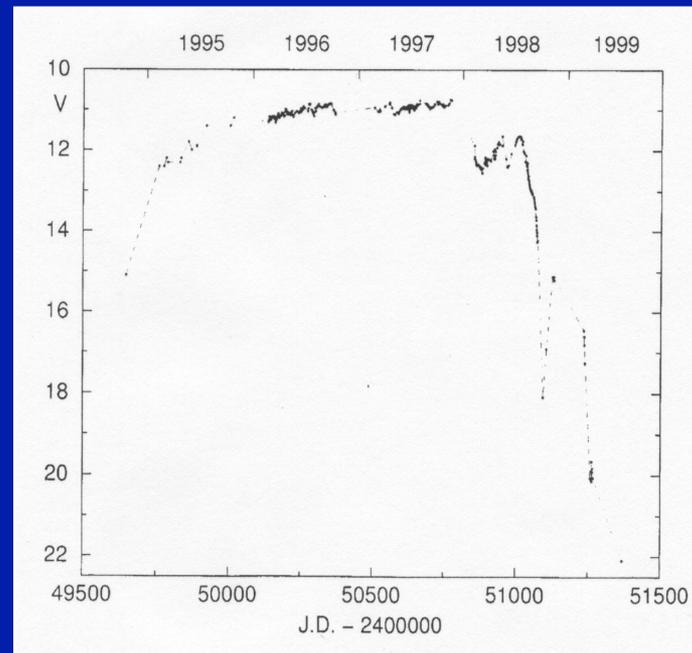
Clayton et al. 2013

Red = [N II], blue = [O III]



V605 Aql

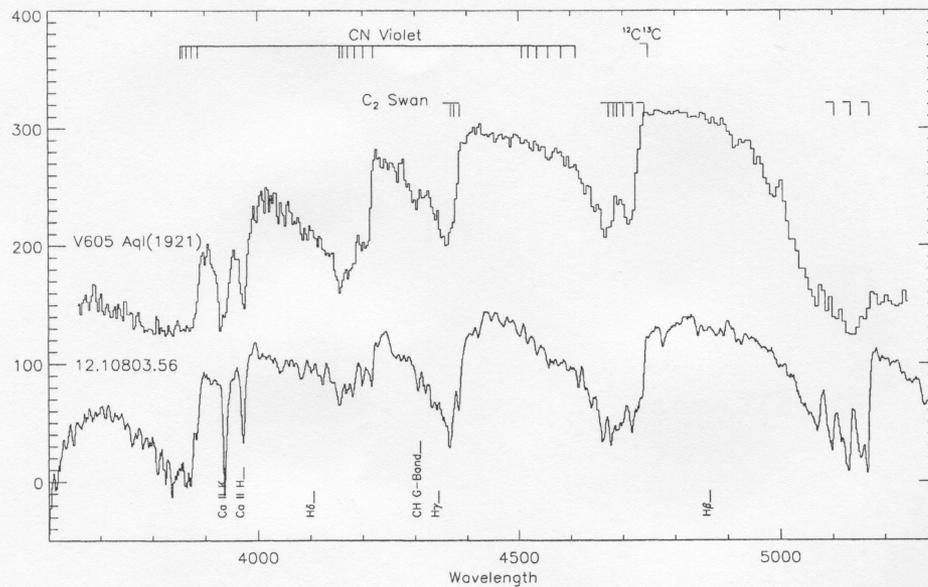
Harrison 1996



Sakurai's Object

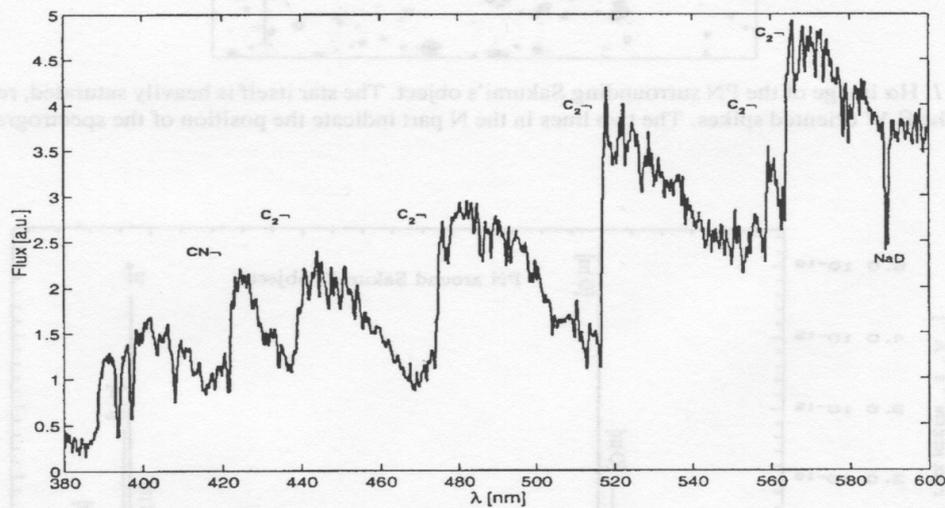
Duerbeck et al. 2000

V605 Aql
(in 1921)



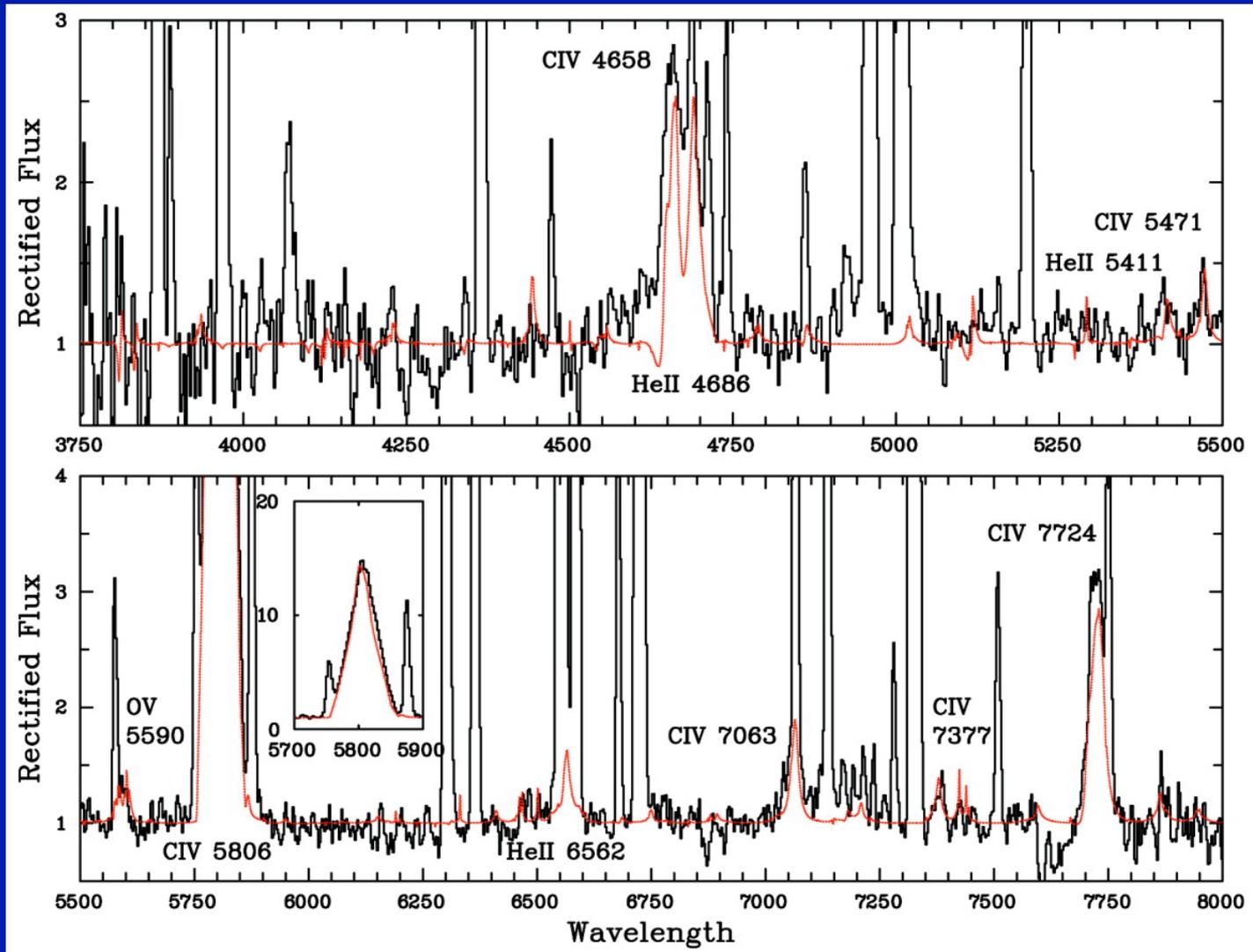
Clayton, G. C., and
De Marco, O. 1997,
AJ, 114, 2679

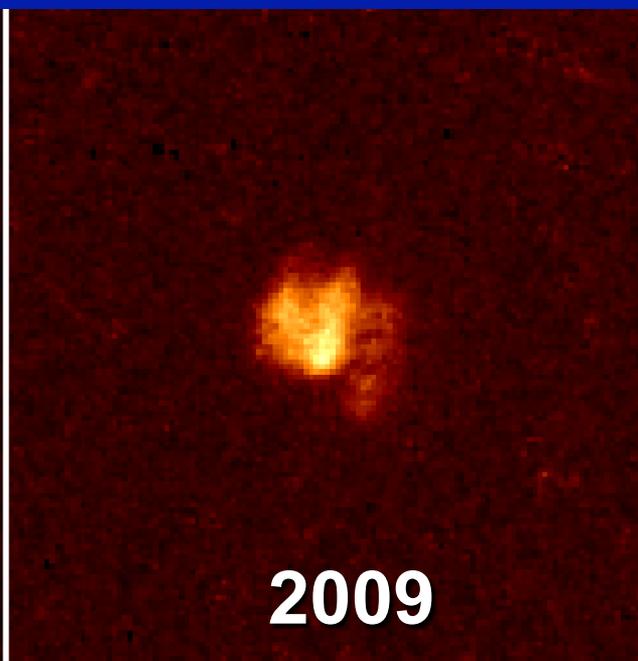
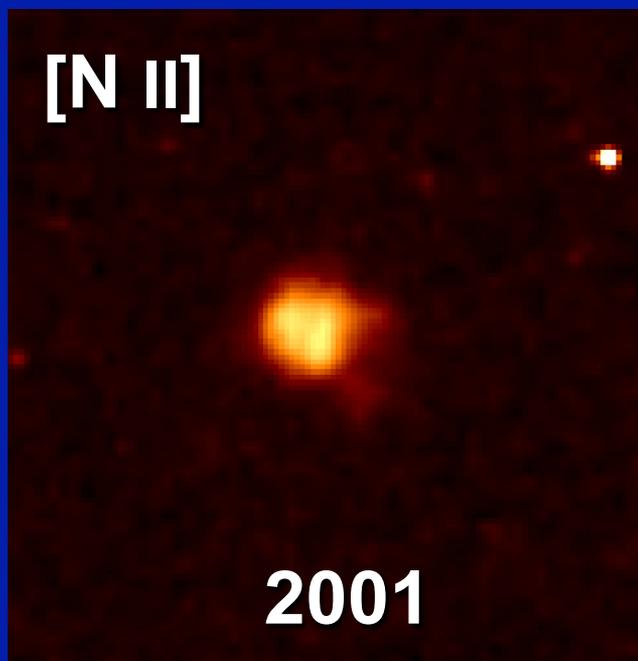
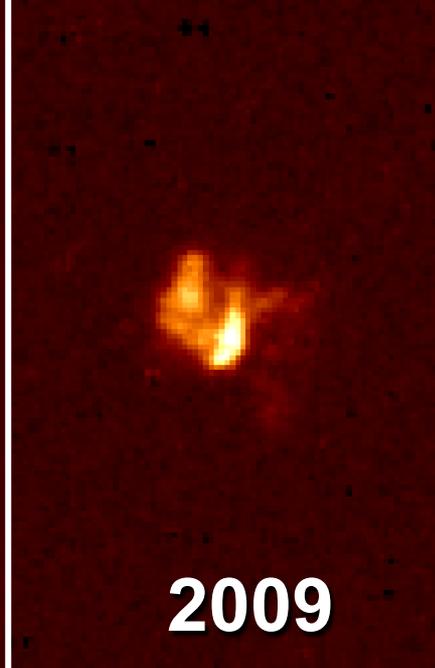
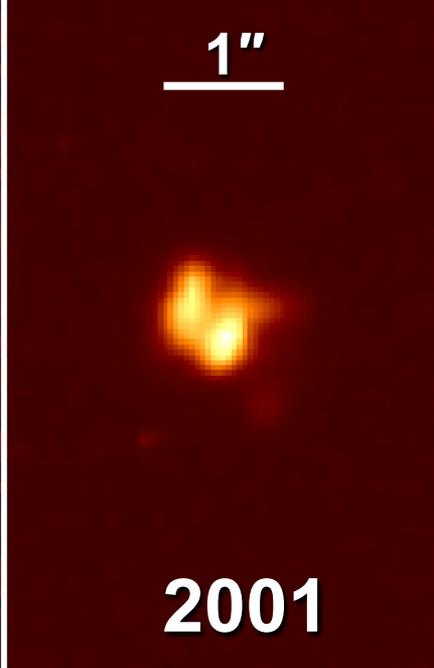
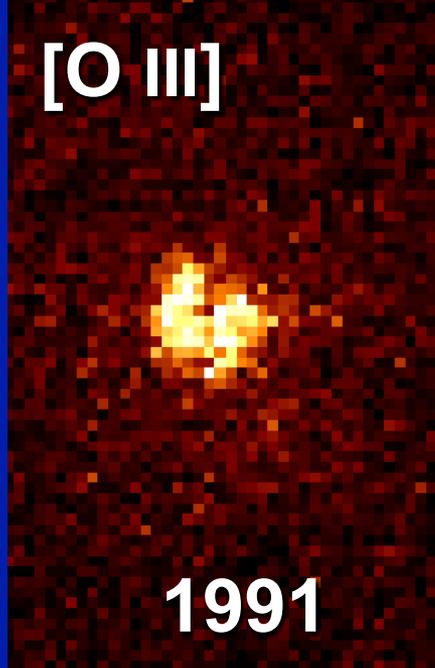
Sakurai's Object
(in 1997)



Kerber 1999

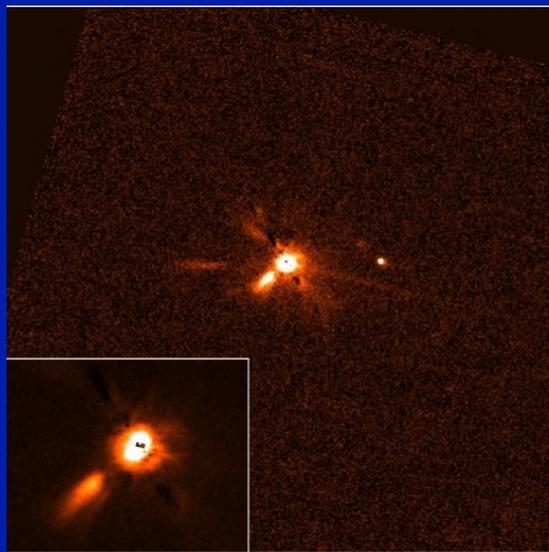
V605 Aql in 2001



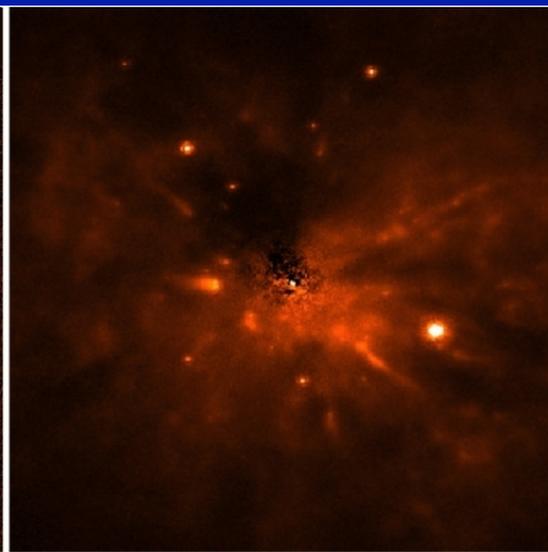


Clayton et al. 2013

R CrB

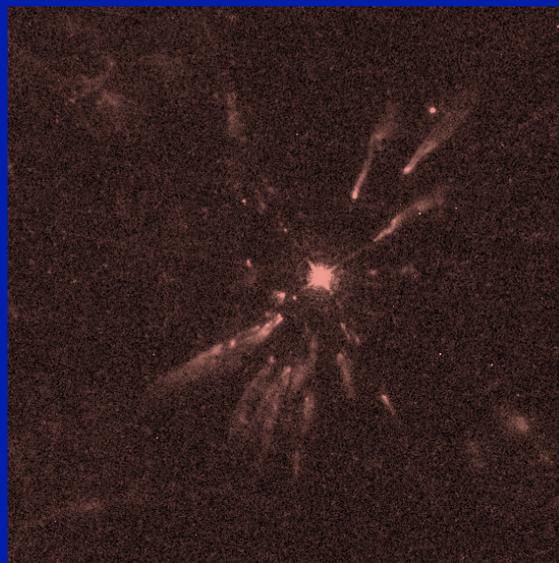


UW Cen



Clayton et al. 2011

A78



Eskimo Nebula

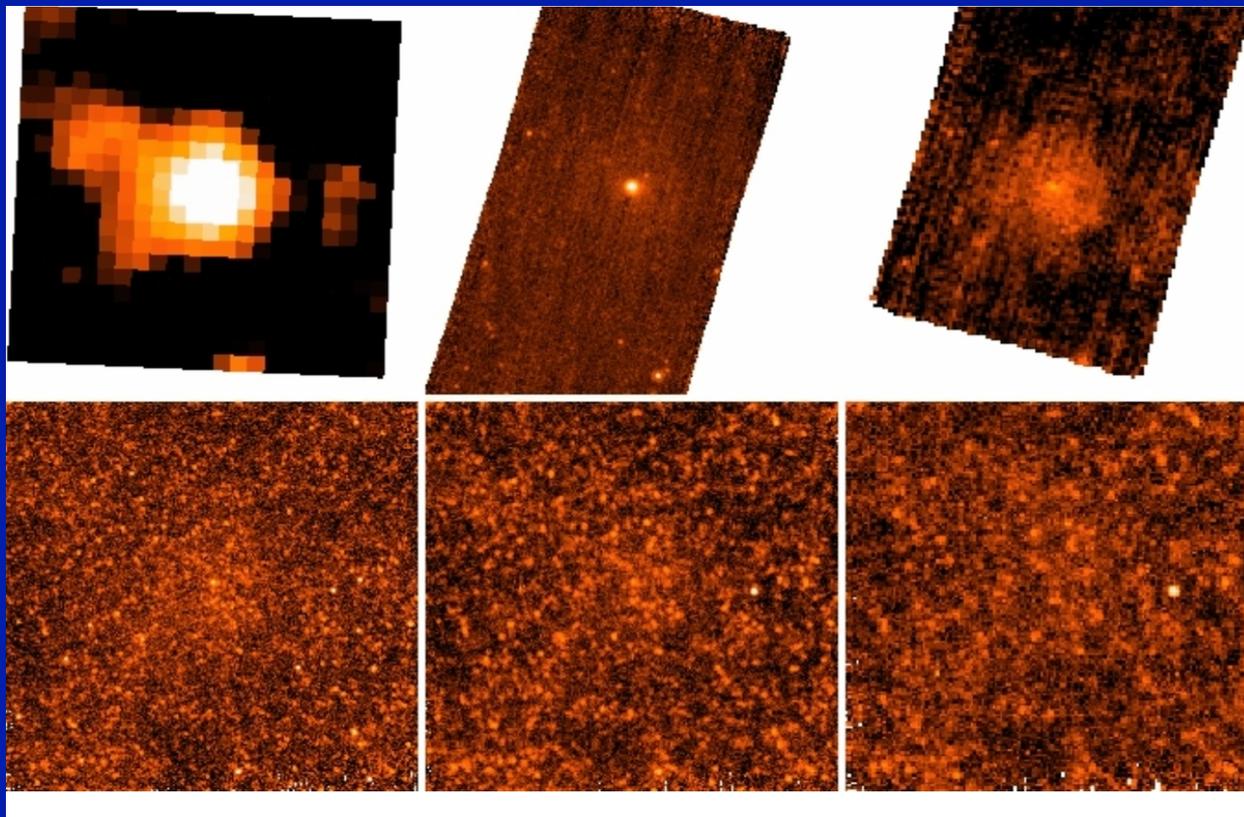


R CrB

IRAS 100

MIPS 70

MIPS 160



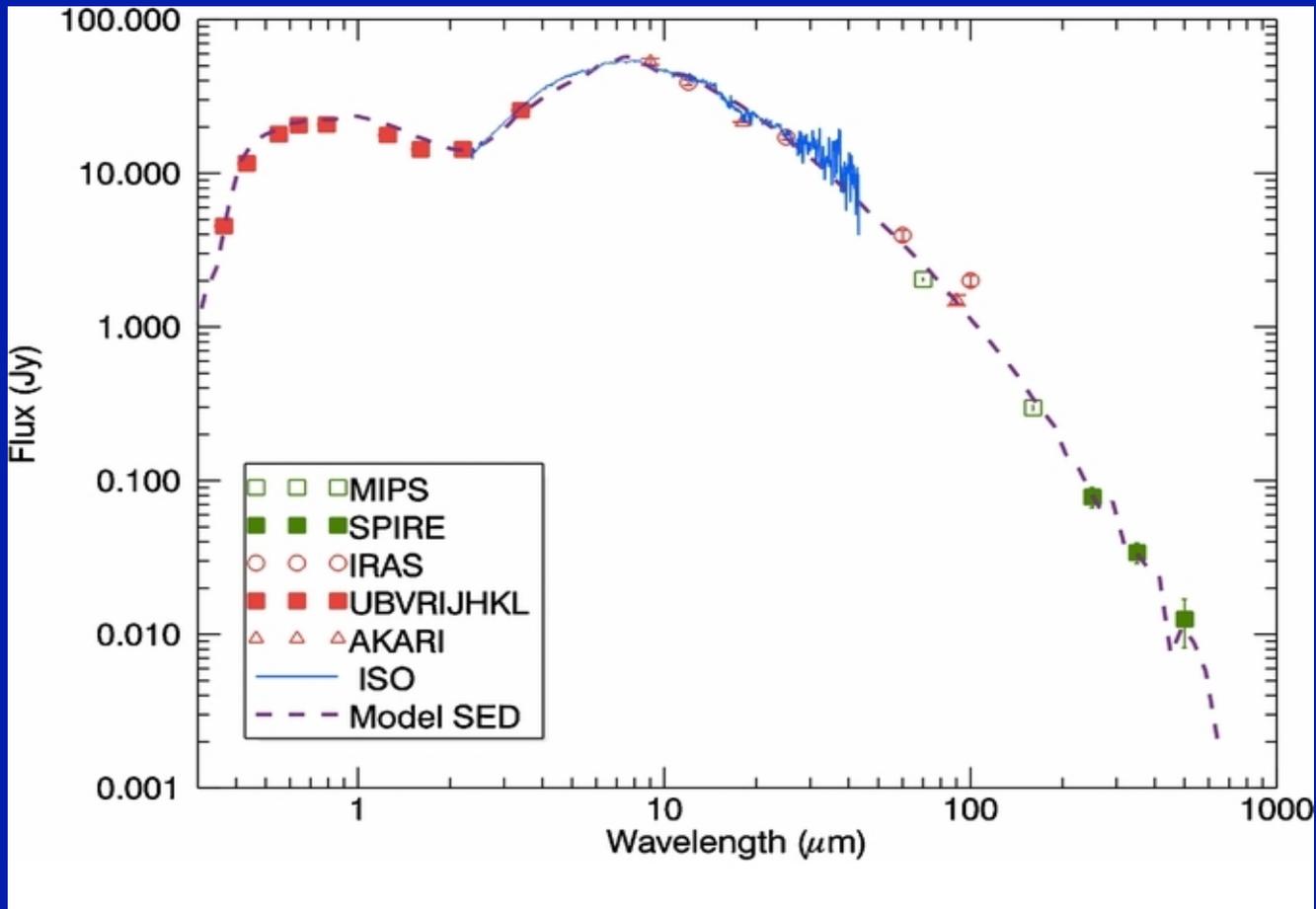
35' x 35'

250

350
SPIRE

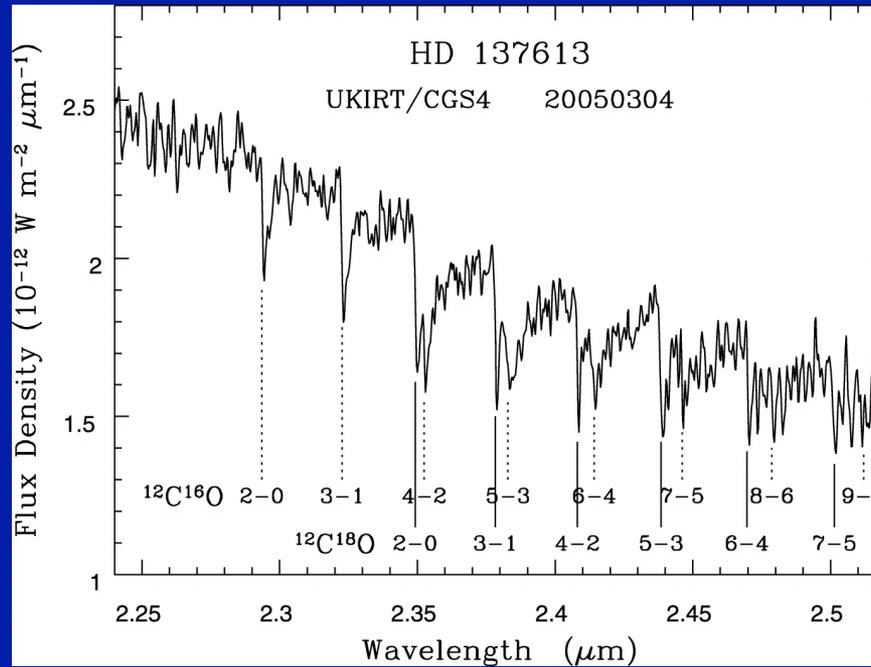
500

R CrB



Dust Mass $\sim 2 \times 10^{-2} M_{\odot} \rightarrow$ Shell Mass $\sim 2 M_{\odot}$

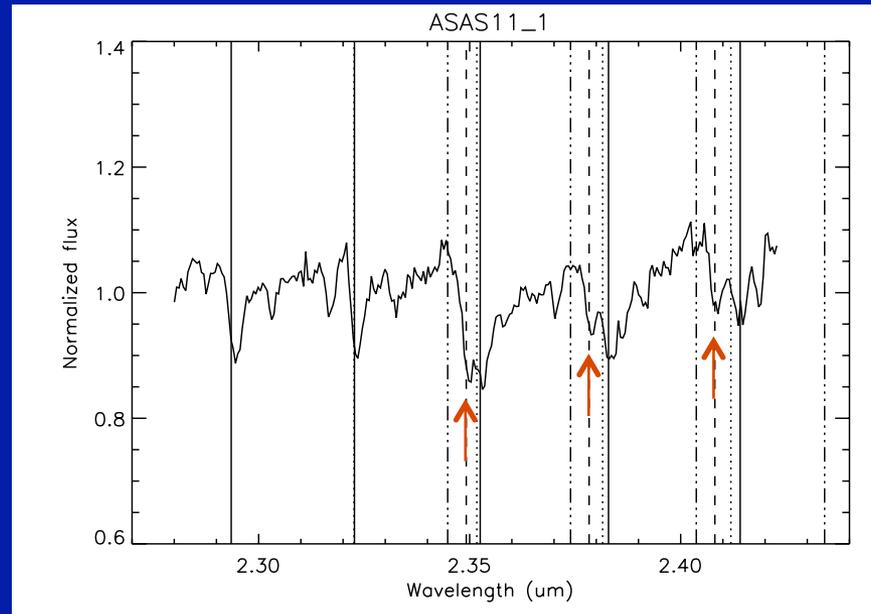
$^{16}\text{O}/^{18}\text{O} \sim 0.5$



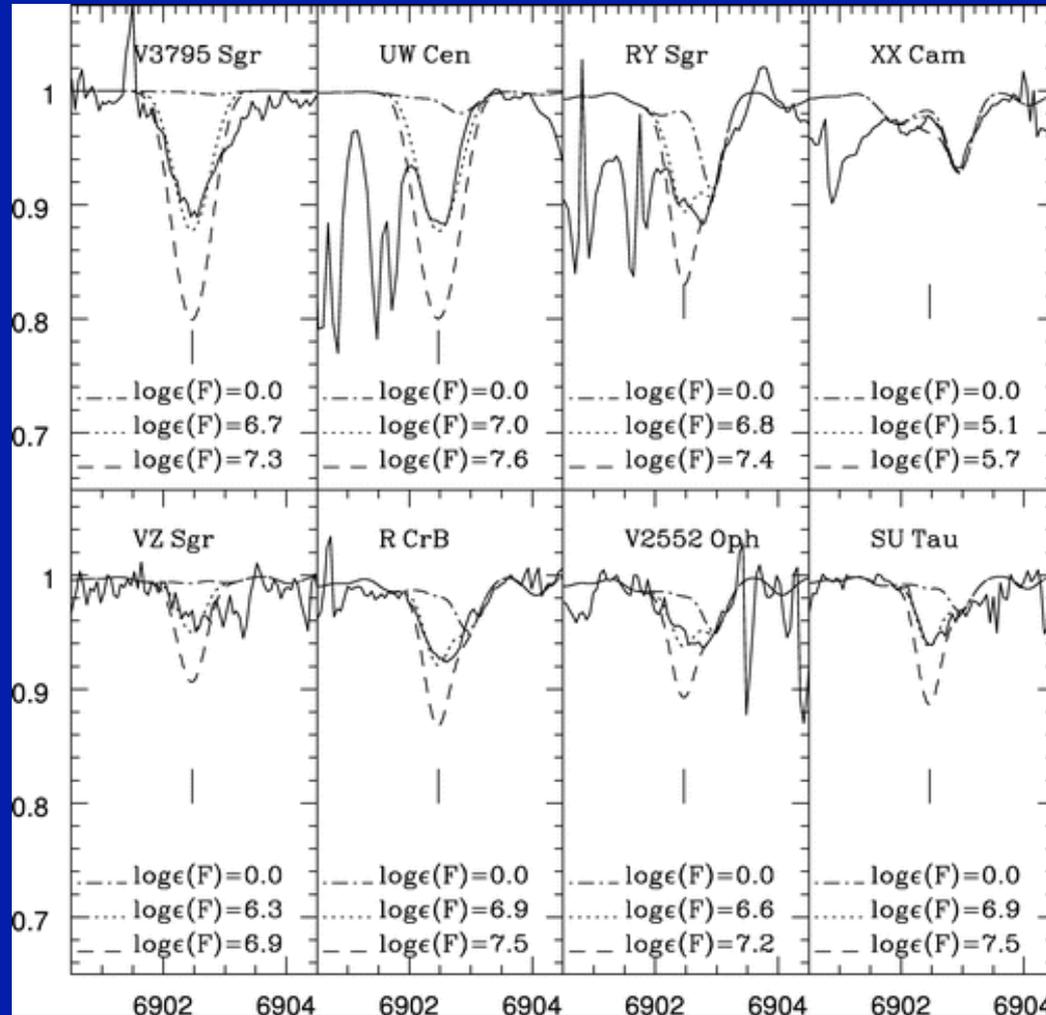
Solar Value
 $^{16}\text{O}/^{18}\text{O} \sim 500$

Clayton, G.C. et al. 2005

$^{16}\text{O}/^{18}\text{O} \sim 0.5$

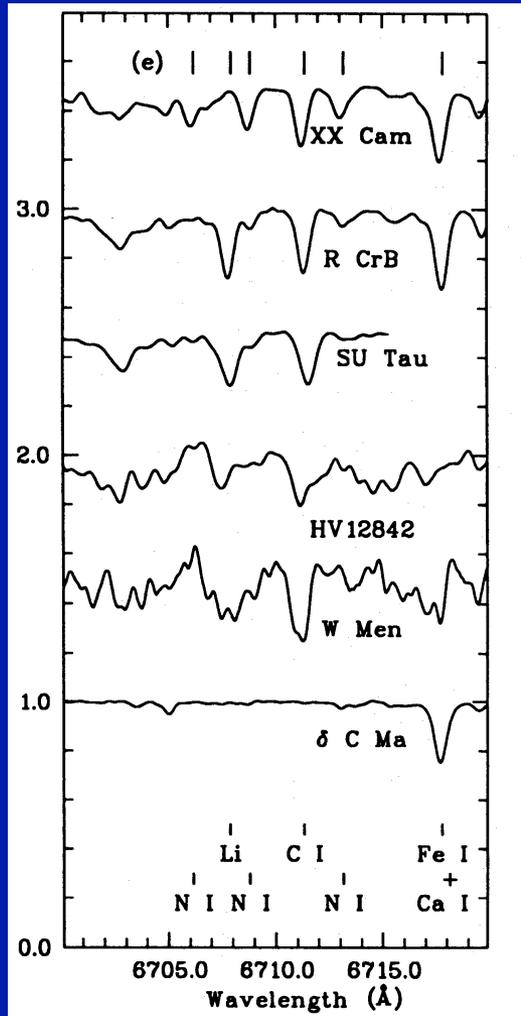


Fluorine



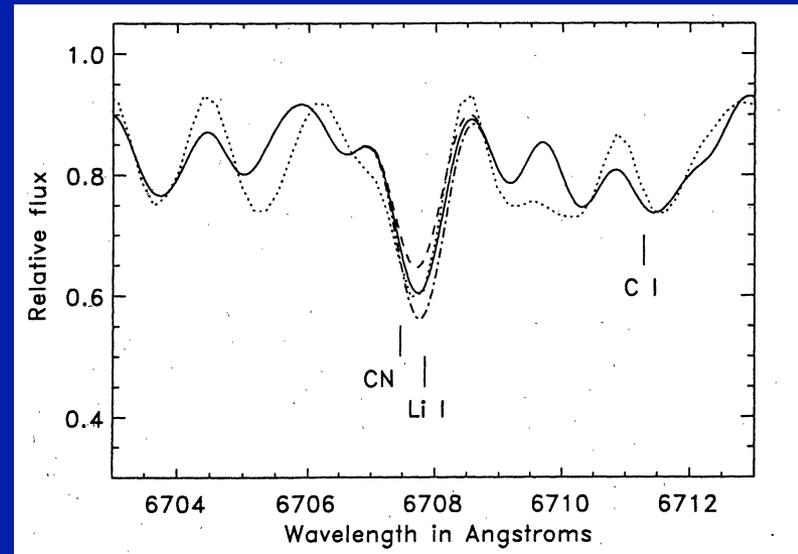
Lithium

RCB Stars



Pollard et al. 1994

Sakurai's Object

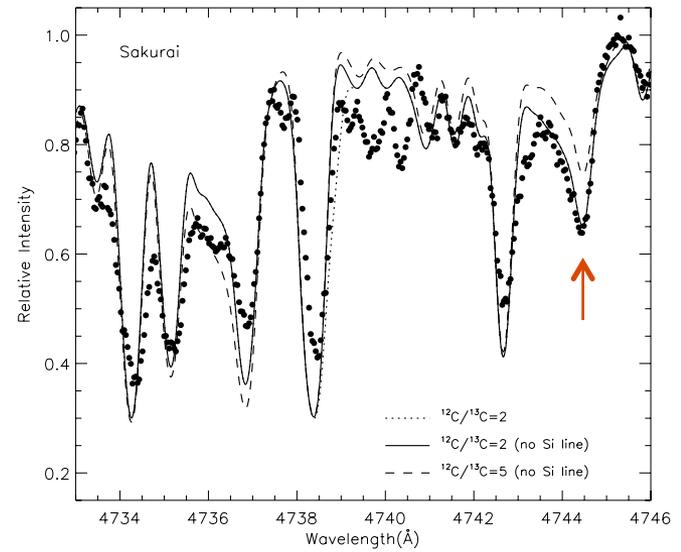
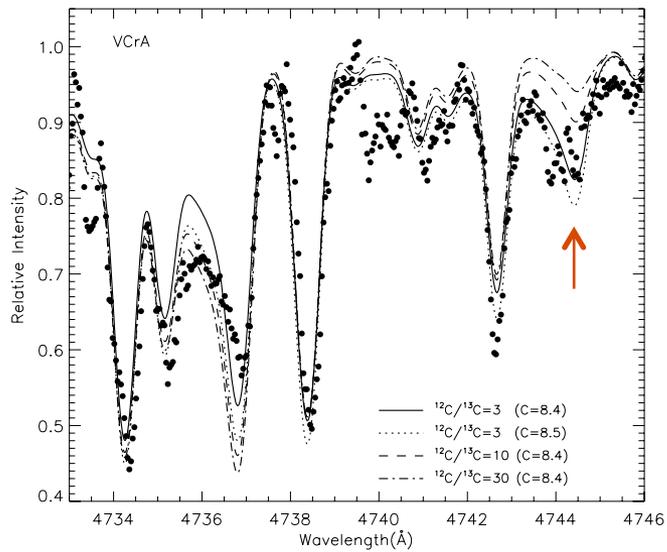


Kipper 2001

^{13}C

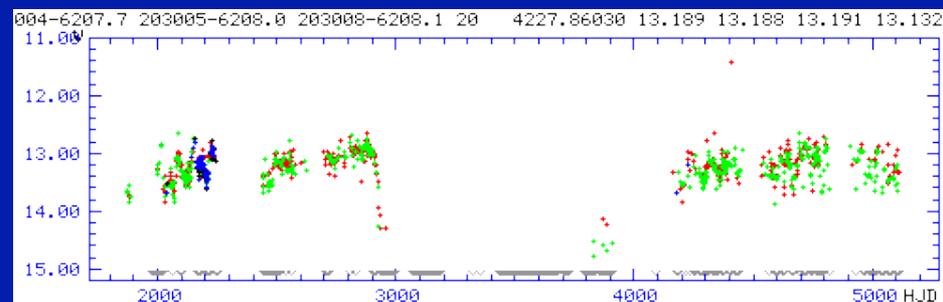
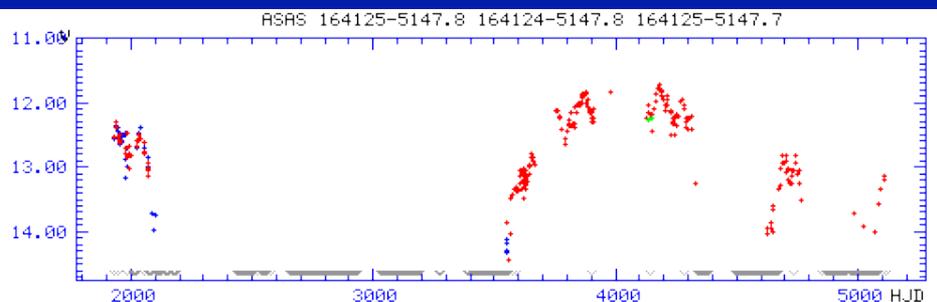
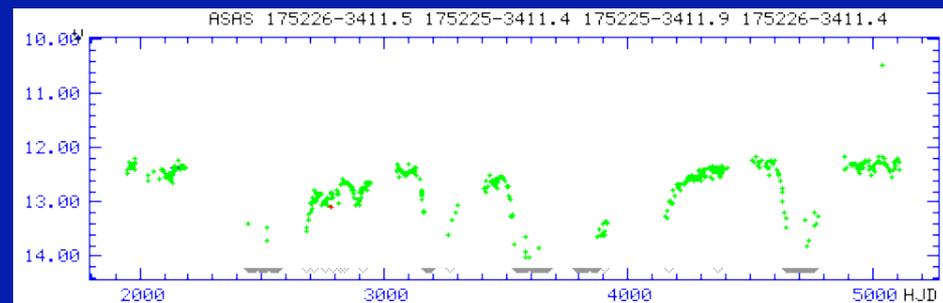
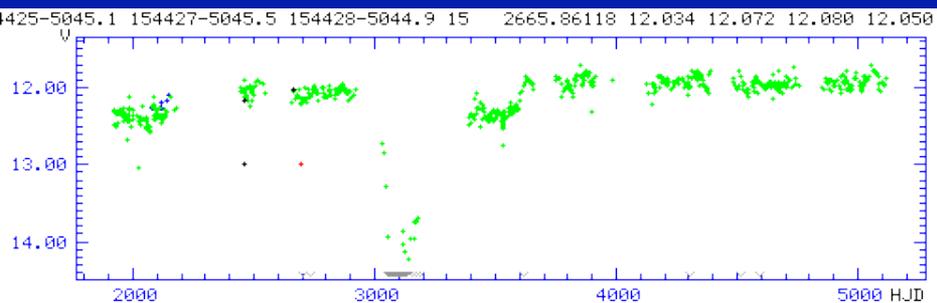
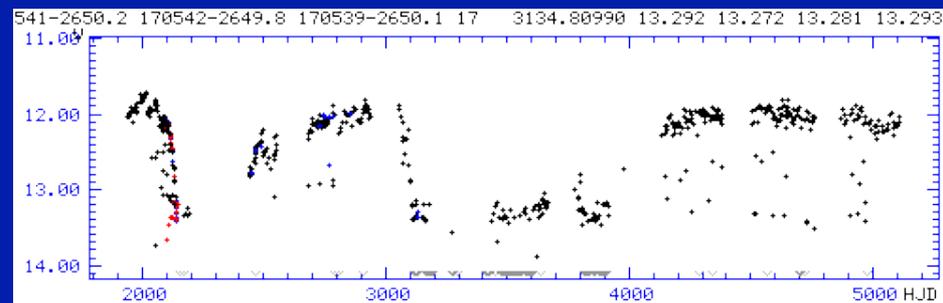
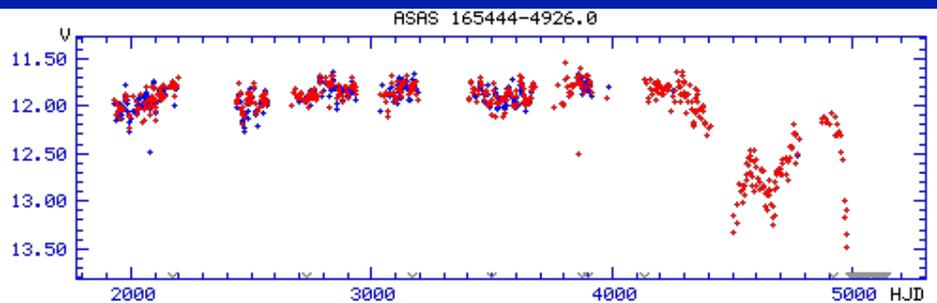
V CrA

Sakurai's Object

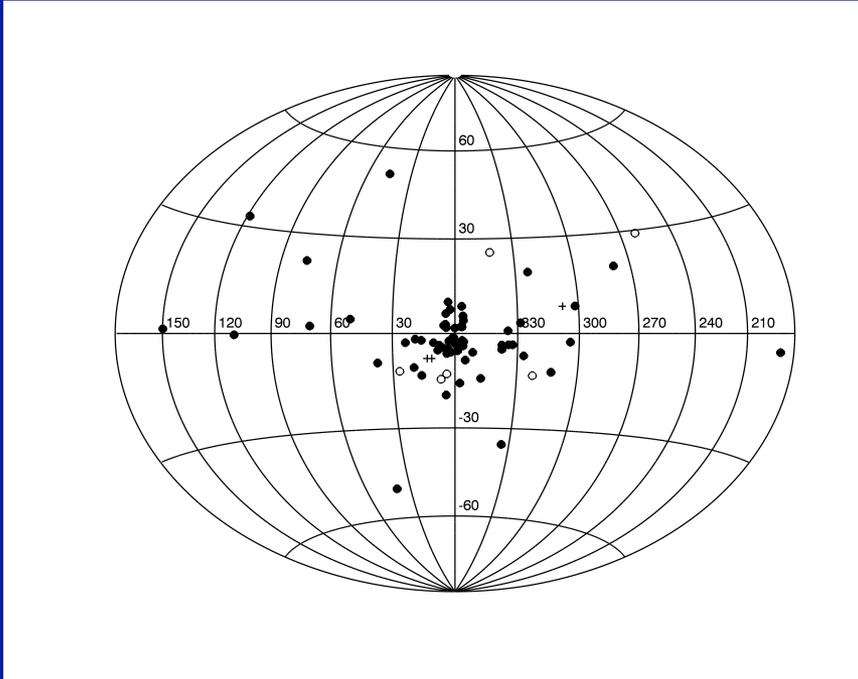


Rao & Lambert 2008

New RCB Stars from ASAS-3

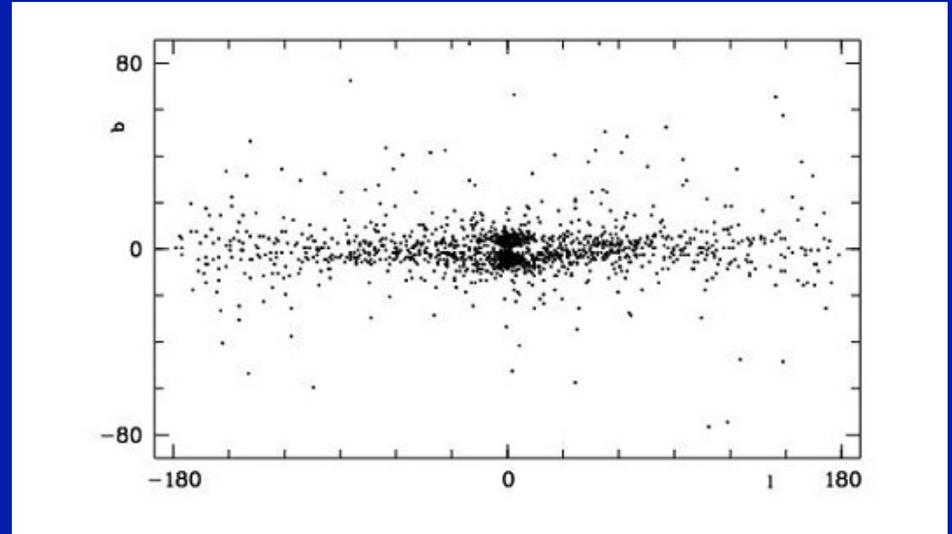


Distribution of RCB Stars



Clayton 2012, JAAVSO, 40, 201

Distribution of PNe



Kohoutek

White Dwarf
Merger

Final Helium
Shell Flash

