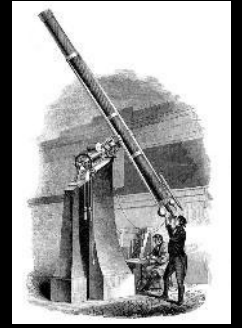


Outline

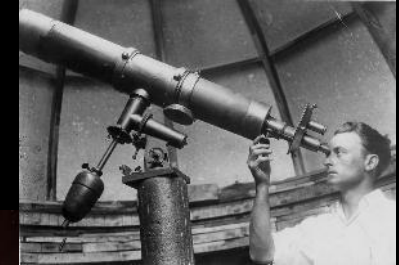
A Little Bit of History: 1850 to 1946

- The early years of variable star observing and naming
- The discovery of T CrB
- The founding of the AAVSO and the dawn of modern variable star observing



An Opportunity Missed and the Lead UP to the Pending Eruption: 1940 to 2024

- The 1946 eruption and the waiting begins
- Hints that the 2026 eruption may arrive early



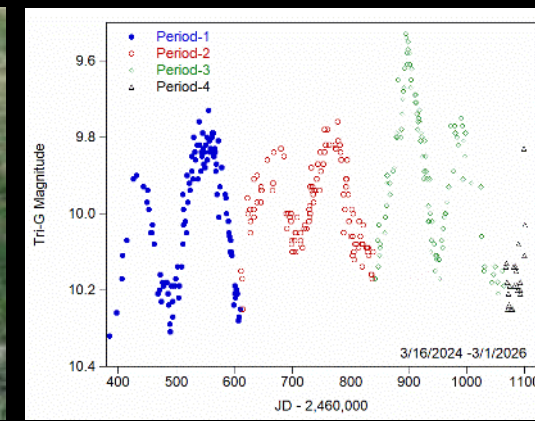
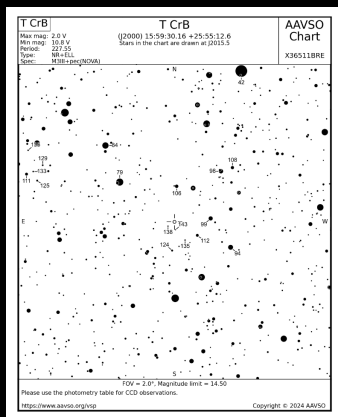
What are we Looking at and Why Didn't T CrB Erupt?

- A brief introduction to the variable star family, recurring nova, and T CrB



Observing Variable Stars and T CrB

- A brief introduction on how to observe variables stars visually and with a camera or smart telescope



Astronomy in the 1800s

The 1800s marked a transitional time for astronomy

Keep in mind that this was before the age of photography and working within the limitations of visual astronomy the universe was a lot smaller and our understanding of the universe was a lot simpler than it is today

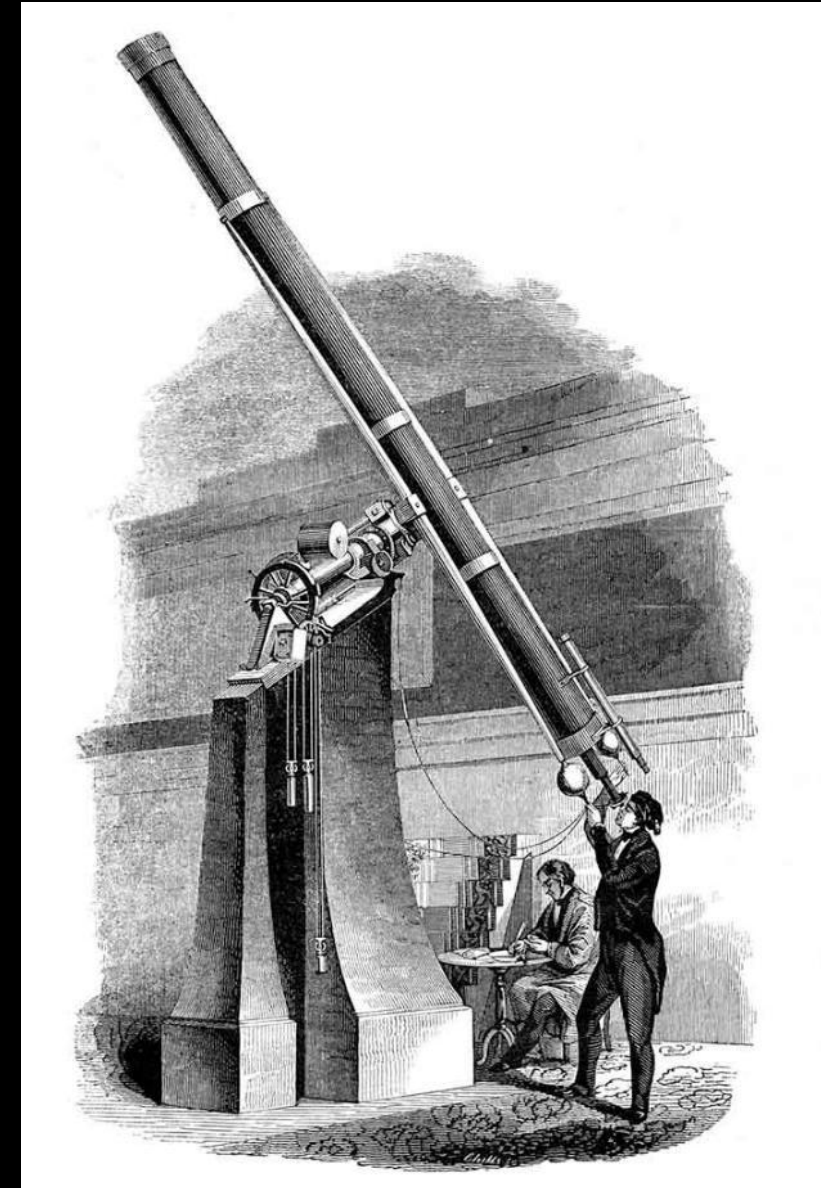
There was a general feeling that all of the major discoveries had been made

To some extent it was even becoming difficult to raise funds to acquire new equipment or to update existing facilities

One area that saw steady work was the creation of ever larger and more accurate star catalogs as these were of practical value for time keeping and navigation

With the availability of relatively large, high-quality telescopes the number of stars needing to be cataloged was growing exponentially

To accommodate the enormous number of stars that needed to be catalogued there was a need for methods to rapidly and accurately measure stellar positions and magnitudes.



Cincinnati Observatory ca.1850

Friedrich Wilhelm August Argelander (1799-1875)

Friedrich Argelander was a German astronomer known for his determinations of stellar brightnesses, positions, and distances

He excelled in developing effective, simple and fast methods for measuring star positions and magnitudes and from 1859 to 1862 he published the last great pre-photographic star atlas containing 324,198 stars in the northern hemisphere down to magnitude 9

As star catalogs grew in size and precision something odd began to appear in the data

While most of the star positions were in good agreement between catalogs, some of the brightness values were not

It turns out it wasn't the catalogs were in error, but that some stars themselves were changing in brightness

Just as deep sky objects were a nuisance to comet hunters, variable stars were a nuisance to celestial cartographers and there was a growing need to keep track of them

Argelander was the first astronomer to begin a careful study of variable stars, and he developed the system that forms the basis for identifying them that we still use today.



What's in a Name? Variable Star Designations

Argelander proposed that each variable star discovered in a constellation would be designated using a capital letter and the genitive form of the constellation name starting with the letter R. So, the first variable star discovered in Corona Borealis was named R Coronae Borealis. The IAU later introduced 3-letter abbreviations for each constellation, so R Coronae Borealis would become R CrB. The next would be S CrB, and so on until you reach Z CrB.

Once they ran out of letters from R to Z they started over with RR, RS, RT, RU, ..., RZ

...and then they would start again with SS instead of SR so that the two letters would be in order. So, these ran as SS, ST, SU, ... to SZ

...and so-on starting with TT, UU, VV, WW, XX, and YY until you reach ZZ

At this point you give up and start all over again with AA, AB, AC... AZ, BB, BC...BZ, and so on until you reach QZ

Fun fact: the letter J is never used as it was difficult to distinguish between I and J

This gives a total combination of 334 one and two-letter designations

At this point you get sensible and do what you should have done at the beginning by designating variable stars with the letter V and a sequential number starting with V335, V336, and so on...

So... That's how what was originally named The Blaze Star became cataloged as T Coronae Borealis, or T CrB

...and, if you see a star labeled with one of these odd designations it means that it is likely a variable star and you can then look it up on the AAVSO website (for example UY Sct)

The Discovery of The Blaze Star



John Birmingham
(1816-1884)

On the evening of May 12, 1866, Irish astronomer John Birmingham observed a “New Star” in Corona Borealis. A bright, blue-white star shining at about magnitude 2 where no significant star was observed before.

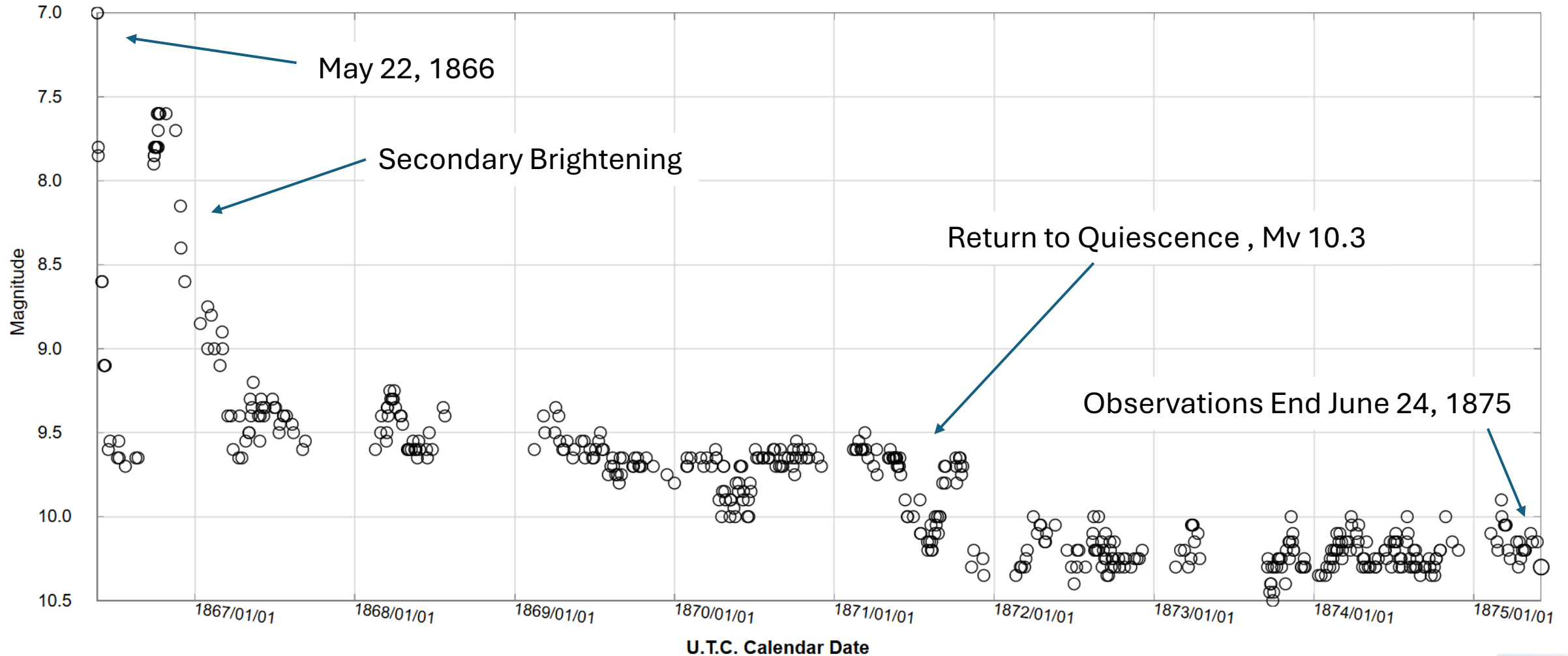
The Discovery of The Blaze Star



John Birmingham
(1816-1884)

On the evening of May 12, 1866, Irish astronomer John Birmingham observed a “New Star” in Corona Borealis. A bright, blue-white star shining at about magnitude 2 where no significant star was observed before. A Nova. The first bright nova to appear since Kepler’s Star in 1604! Being the first bright nova to appear in the telescopic age it provided a unique opportunity to study these very rare stars.

The 1866 Outburst of T CrB



This was the first nova to be discovered in the telescopic era and was initially closely studied

T CrB was previously cataloged as a faint, red, Mv 10.5 star, and after an initial period of rapid fading showed a secondary brightening before slowly returning to being a non-descript Mv 10.3 star

Three years later on June 24th, 1875, observations ceased

The American Association of Variable Star Observers (AAVSO)

The Harvard Observatory recognized the need to monitor the growing list of variable stars and the lack of resources to do so.

So, in 1911 the Harvard Observatory founded the American Association of Variable Star Observers (AAVSO) provide training, resources, and to coordinate variable star observations made largely by amateur astronomers



The mission of the AAVSO is to enable anyone, anywhere to participate in scientific discovery through variable star astronomy.

Today, the AASVO is the world's largest association of variable star observers with active participants in more than 100 countries, and an archive of over 34 million variable star observations, including over 760,000 observations of T CrB

Thanks to the AAVSO, the observing draught for T CrB came to and end on the evening of June 15, 1920, by a 20 year old AAVSO member living in Delphos, Ohio, Leslie Peltier

Leslie Peltier (1900-1980) & T CrB

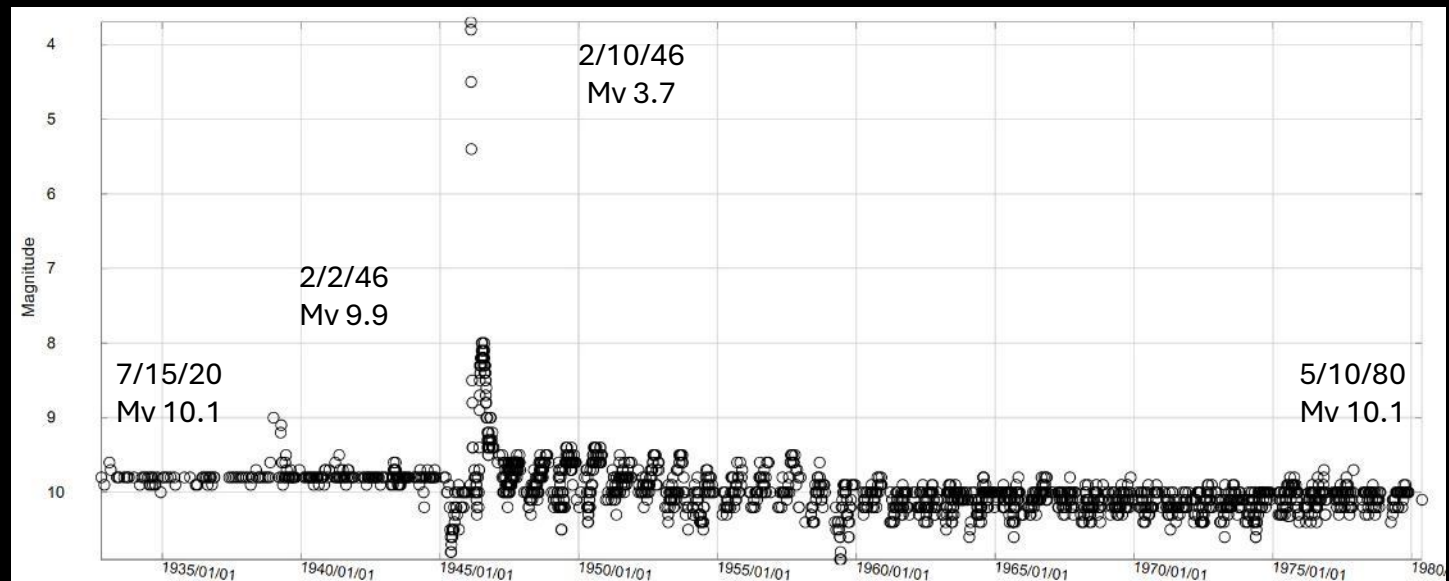
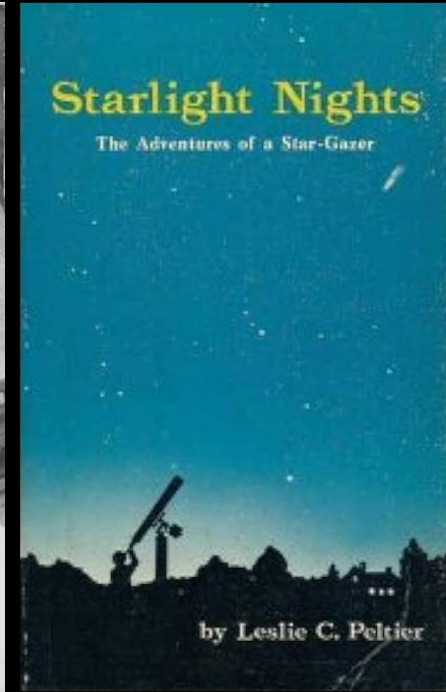
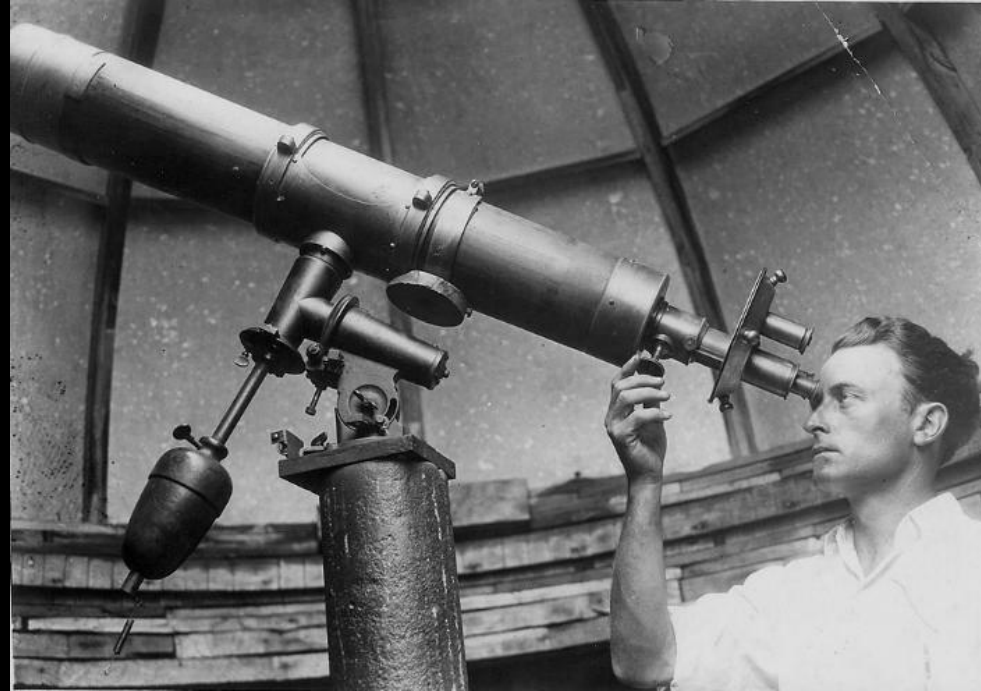
Leslie Peltier was arguably the most productive variable star observer of all time contributing over 132,000 observations to the AAVSO including 2,261 observations of T CrB.

Harlow Shapley, described him as “the world's greatest non-professional astronomer”.

On the evening of February 9, 1946, he awoke with a cold and decided to remain in bed... and missed the eruption of T CrB! That honor went to Michael Woodman, a 15-year-old schoolboy in Wales.

He often described the stars as his friends, but of T CrB he wrote...

“We had been friends for many years; on thousands of nights I had watched over it as it slept and then, it arose in my hour of weakness as I nodded at my post. I still am watching it but now it is with wary eye. There is no warmth between us any more.”



1946 Eruption

The 1946 eruption gave us three things...

First, we now had at least one known interval between eruptions: 80 years. Looking back in time a third probable eruption was identified from 1787. Simple math suggested that the next eruption would occur sometime in 2026.

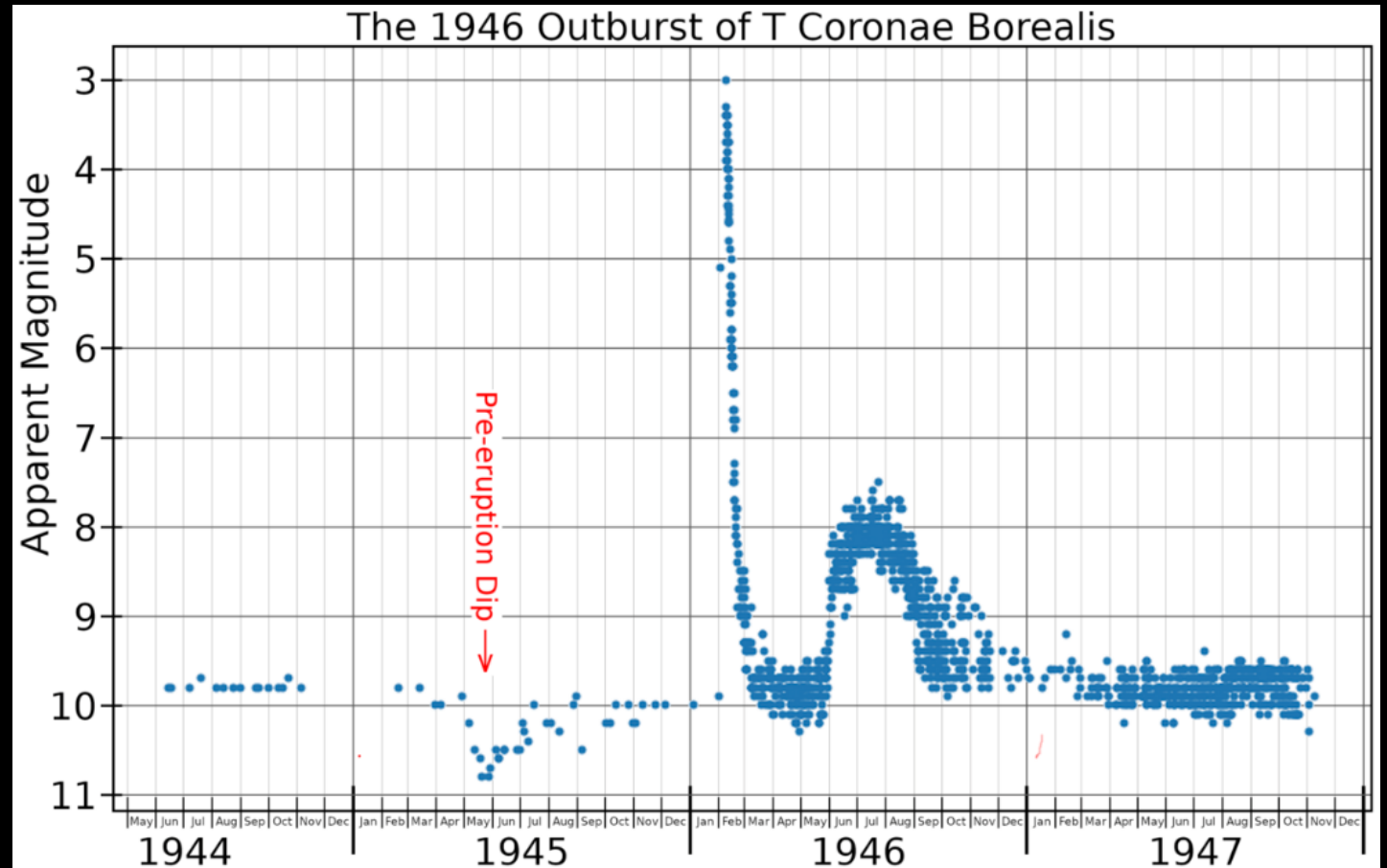
Second, for the first time we had accurate, high cadence observations of T CrB during and after its eruption.

Third, when it erupts, you need to act quickly!

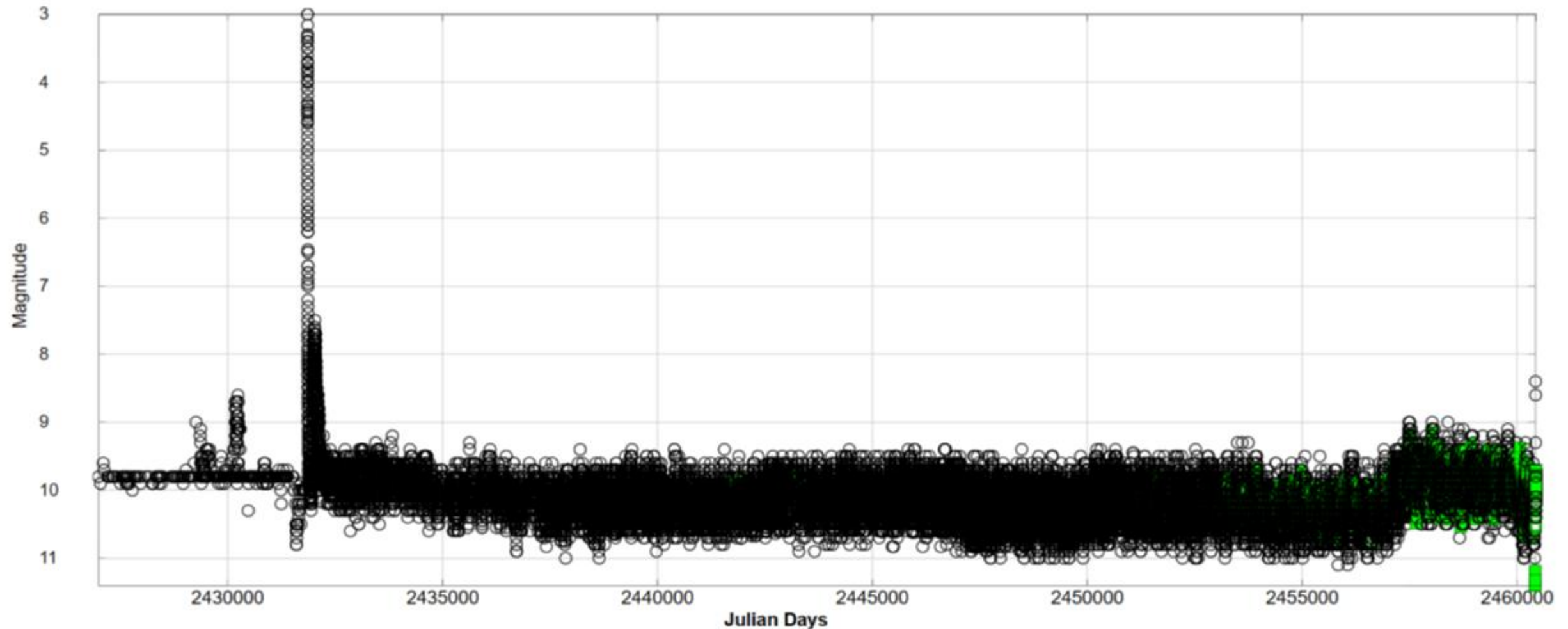
As the 2026 eruption approached data from the 1946 eruption was studied to determine if there were warning signs of the approaching flare

Overall, the light curve is very similar to the eruption of 1866 with a sharp outburst, rapid decay, and a secondary brightening

However, a small dip several months before the eruption was also noted

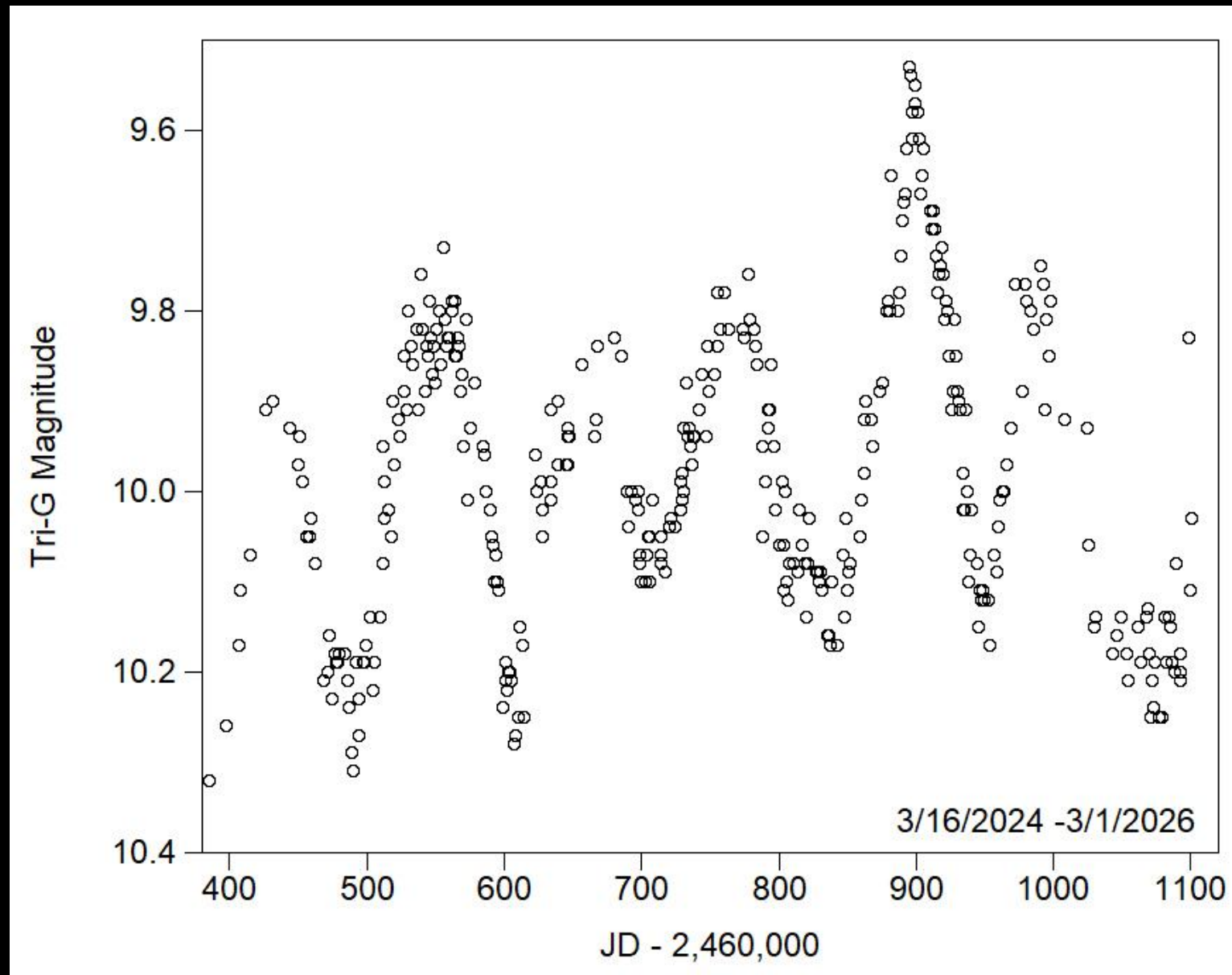


T CrB - AAVSO Observations from ~ 1940-2023

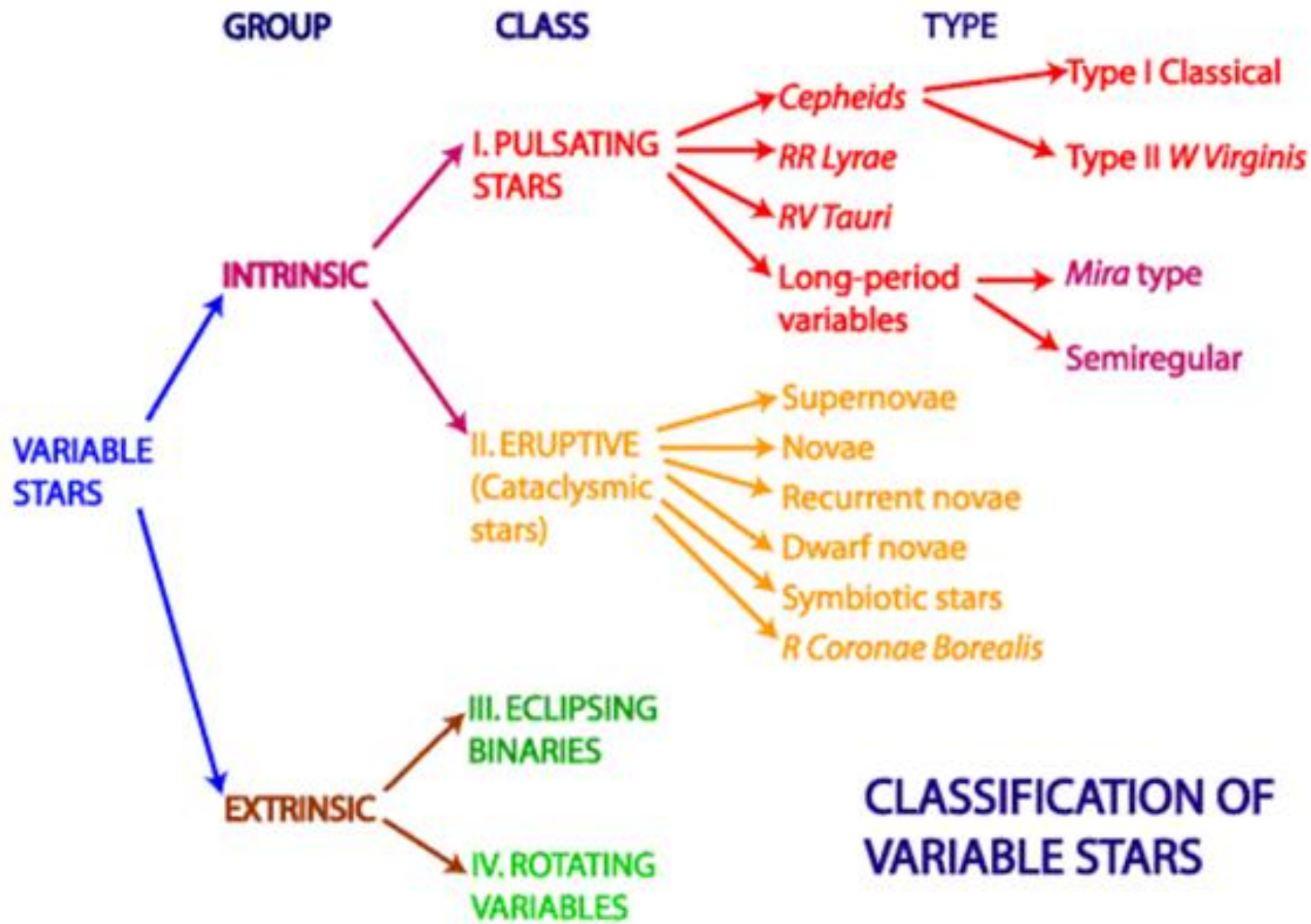


And so, the waiting began. Simple math suggested that the next eruption would occur in 2026. However, a slight brightening of about 0.5 magnitude was noted in 2015 followed by a similar dip in brightness in 2023. This was taken as an indication that an eruption was imminent, and the astronomy community went on high alert for a possible eruption between March and September 2024... and that's where our story begins.

T CrB Observations 3/16/2024 – 3/1/2026



The Variable Star Family Tree

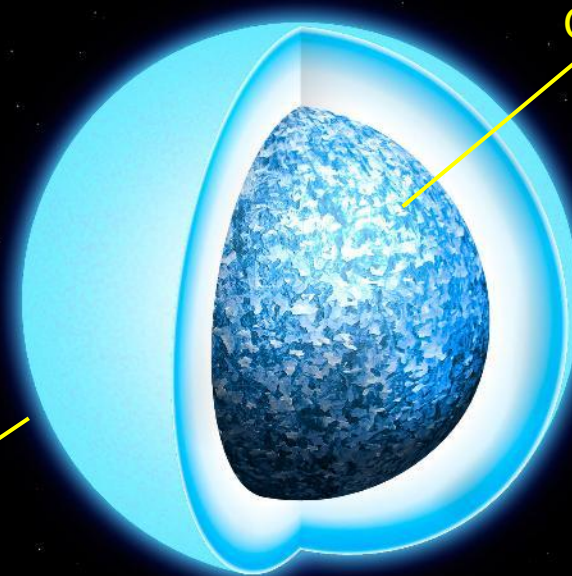
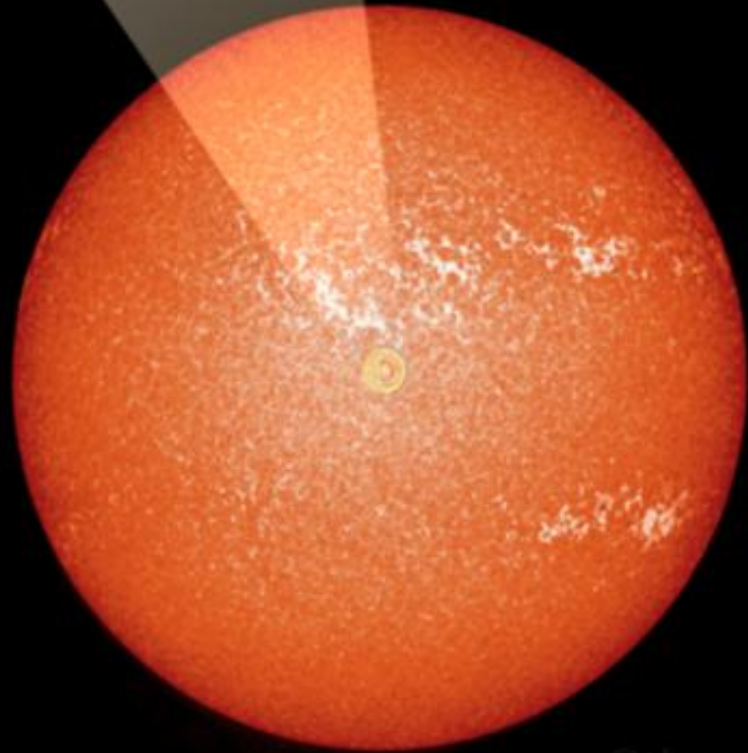


- Long-period variables are well suited for Ohio weather conditions
- Recurring dwarf novae make interesting targets of opportunity
- Eclipsing variables, Cepheids, and very short period RR Lyrae stars also make interesting targets
- The convenience and ease of use of Smart Telescopes like the Seestar opens the door for observing a broad range of variable stars and observing projects

White Dwarf – Stellar Core



A normal star is a sphere of hydrogen and helium where the pressure and temperature in the core are high enough to fuse hydrogen into helium. (27 million F, 250 billion atm.) Once the hydrogen is consumed the star may collapse until the pressure and temperature in the core are high enough to fuse helium into carbon and the process starts all over again. For most stars, this process will end with a core of carbon and oxygen, though it may go all the way to iron in truly massive stars. In any event, the end point for most stars will be the same; an inert core with the mass of a star, but the size of a planet.



Carbon/Oxygen Core

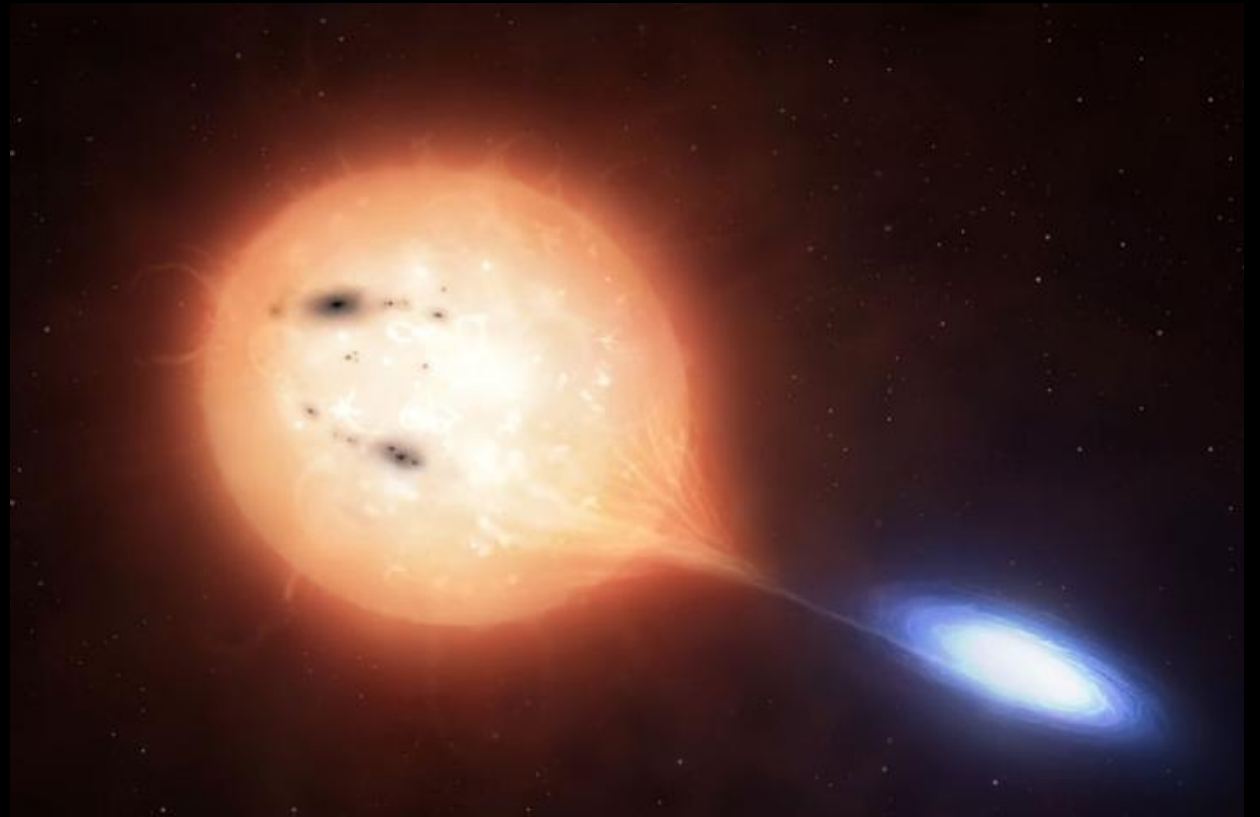
Hydrogen/Helium Shell

@theceler

...and inert it will remain, unless there's a way to regenerate the hydrogen surface...

Recurring Novae/Cataclysmic Variables

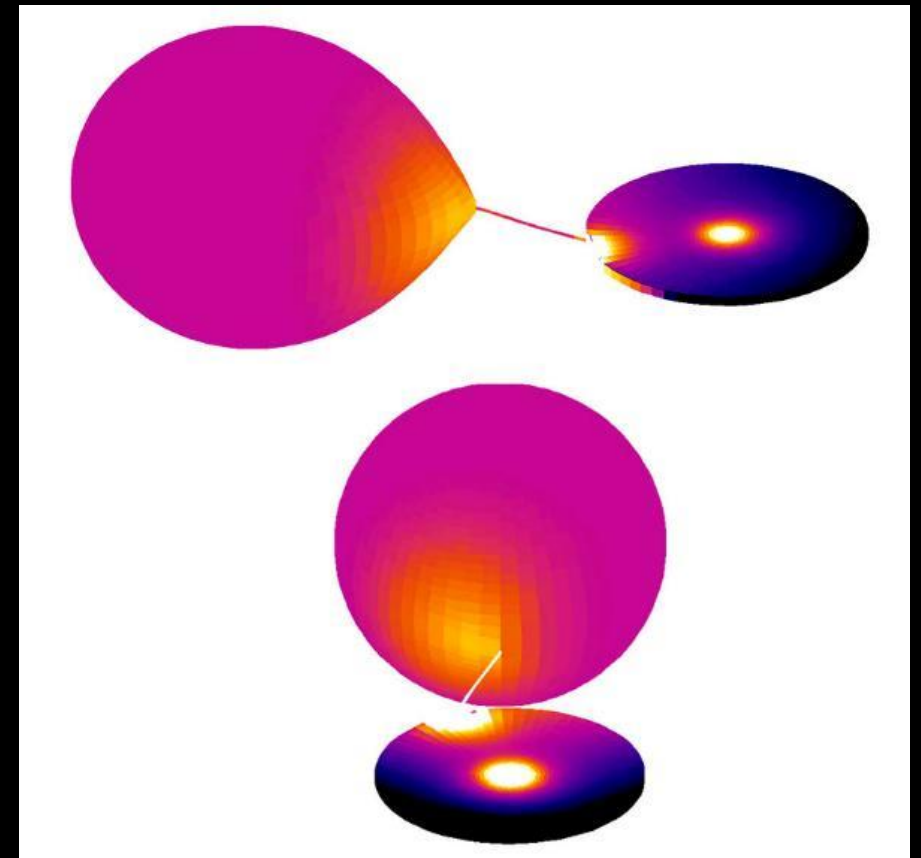
- Recurring novae stars are binary stars that consist of a white dwarf primary, and a red giant secondary
- Over time, the white dwarf accretes matter from the companion, principally hydrogen and helium, which accumulates on the surface of the white dwarf
- When the mass of the accumulated matter reaches a critical level, a nuclear explosion can occur either on the surface of the white dwarf or out in the accretion disk
- The exact nature of this interaction determines the type of recurring nova that will occur
- Eruptions that occur on the surface of the white dwarf tend to be by far the brightest, while eruptions that occur out in the accretion disk tend to be more frequent and not as bright
- Most recurring novae are close pairs with orbital periods that can be less than an hour
- T CrB is unusual in that the spacing between the white dwarf and red giant is relatively large, in this case about 0.9 AU with an orbital period of 228 days



T Corona Borealis (T CrB) – By the Numbers



Artist Rendering

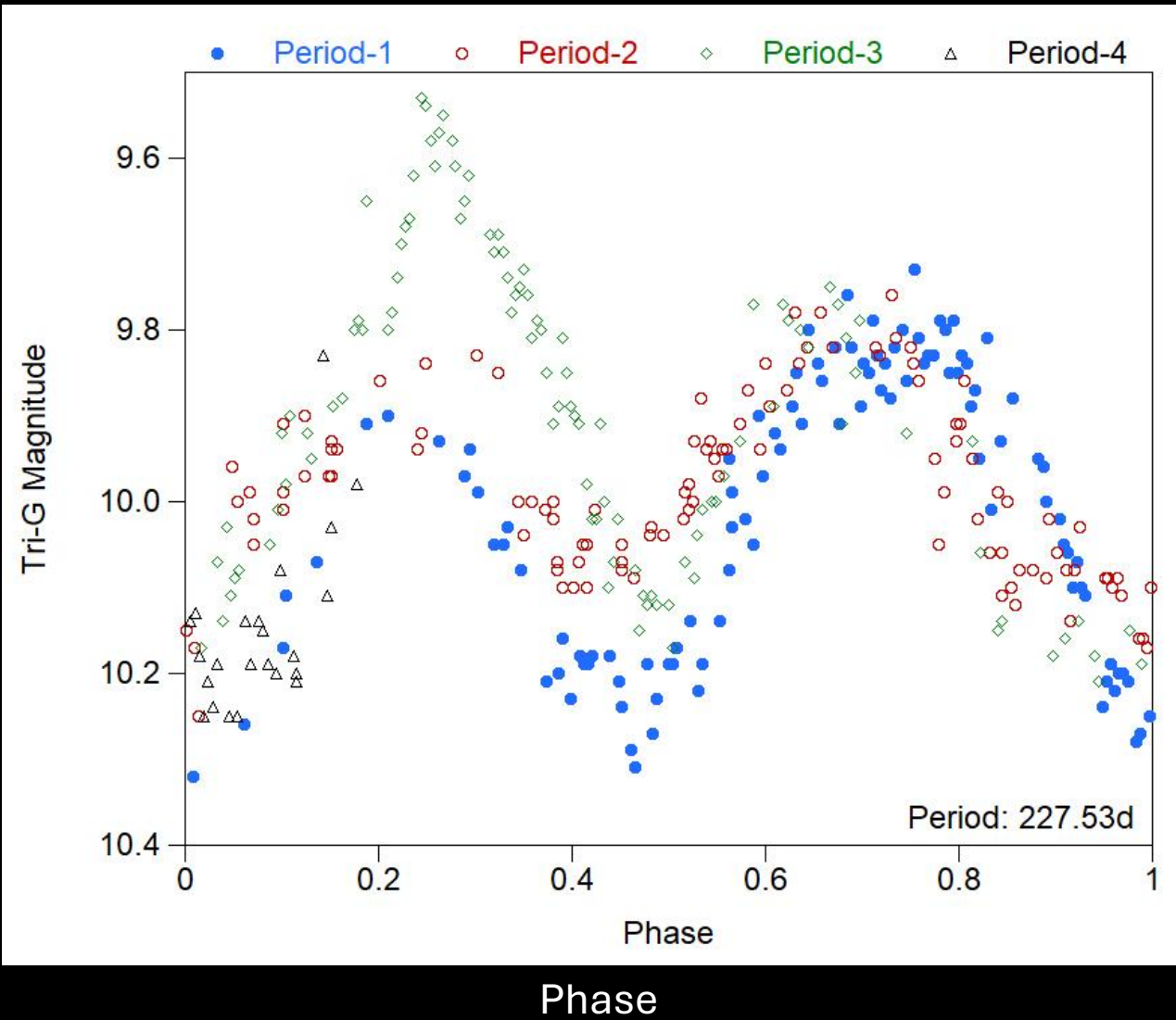
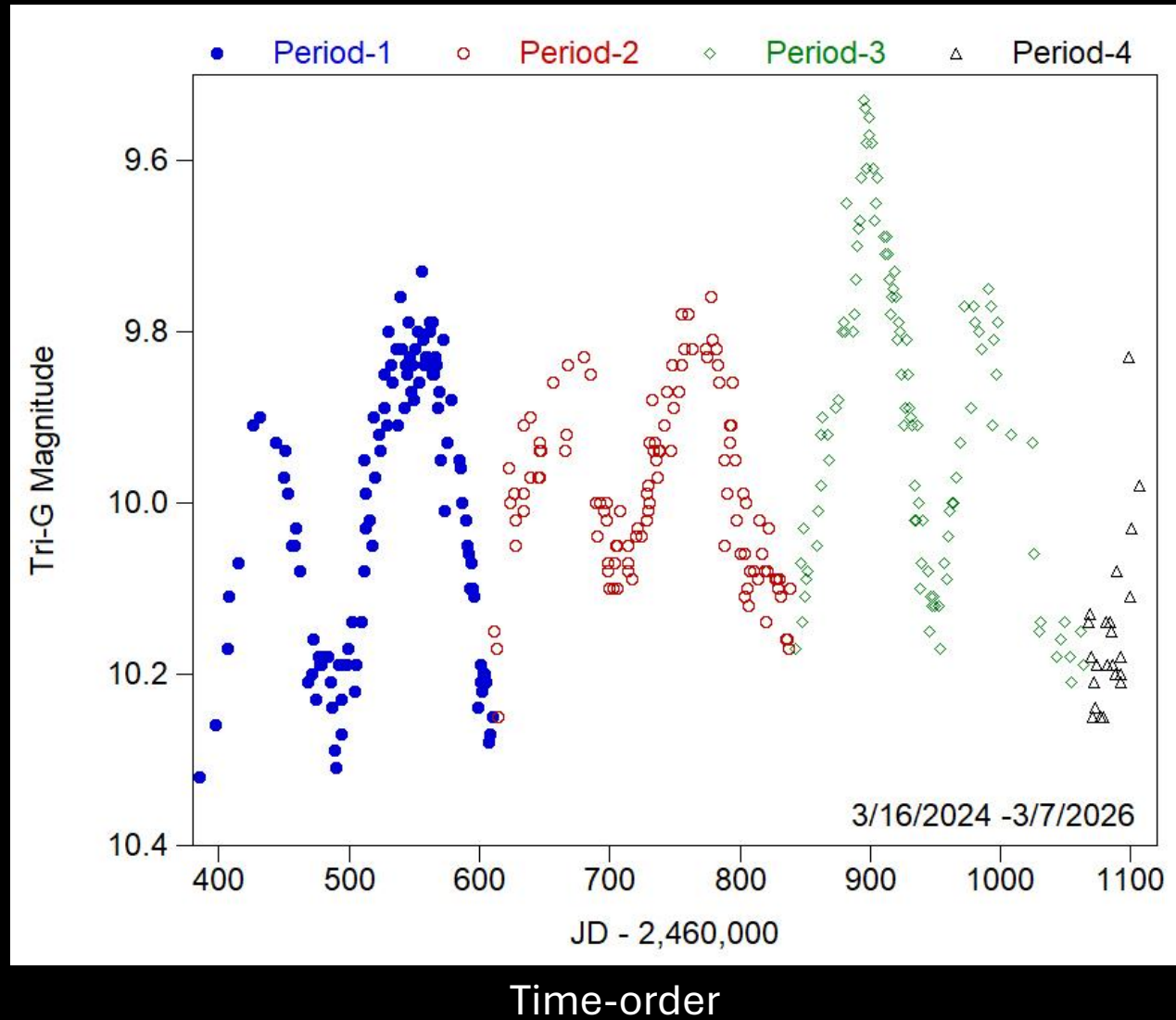


T CrB Radiative Model

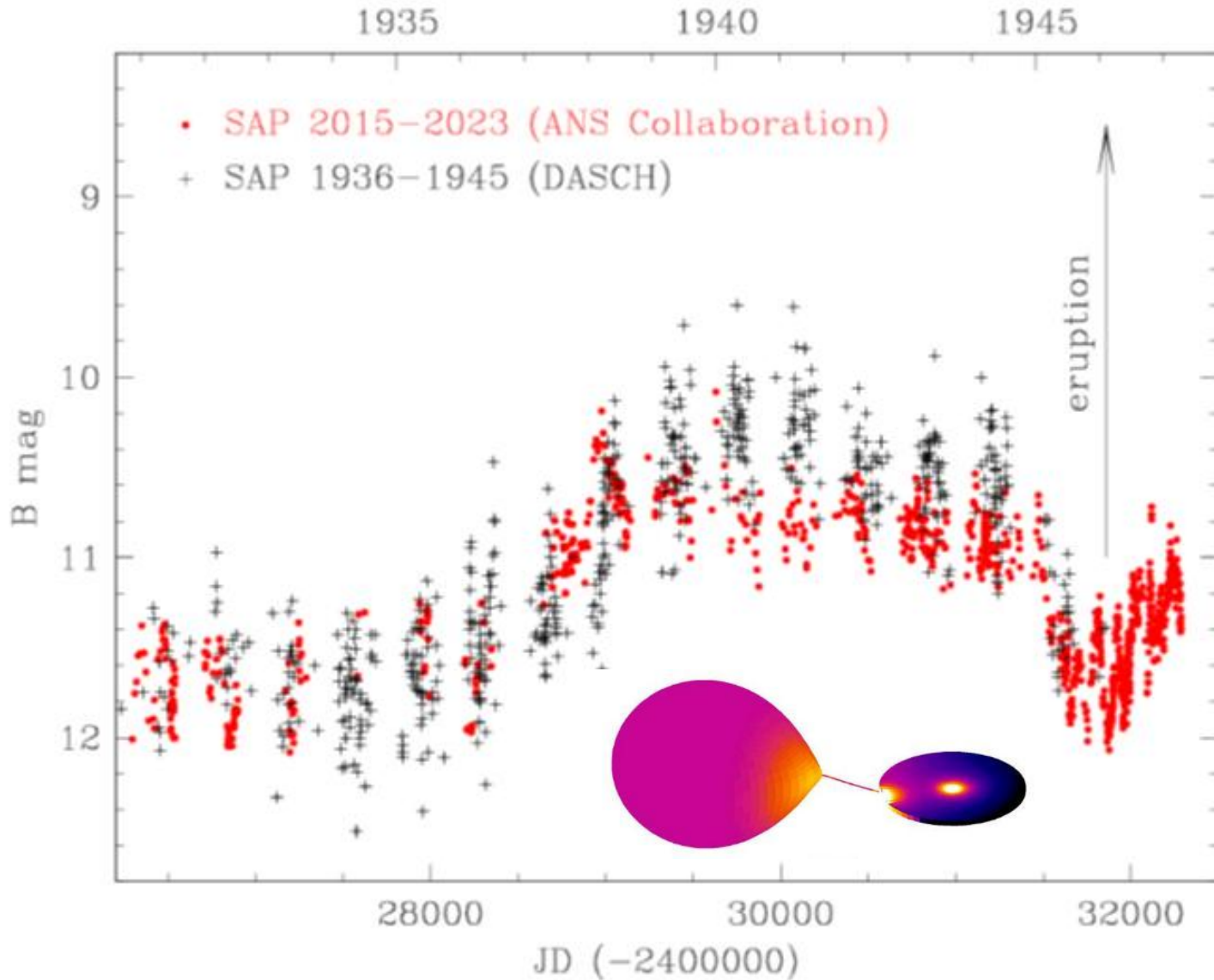
Parameter	Red Giant	White Dwarf
Diameter, suns	70	0.0045
Diameter, miles	60,520,000	3,890
Mass, suns	0.93	1.35
CG Distance, miles	52,860,000	36,420,000

Distance: 3,000 light years
Eccentricity: 0.009 (Circular)
Inclination: ~30 degrees (line of sight)
Orbital Period: 227.553 days

T CrB – 3/16/2024 to 3/7/2026



1936-1946 vs 2015-2023



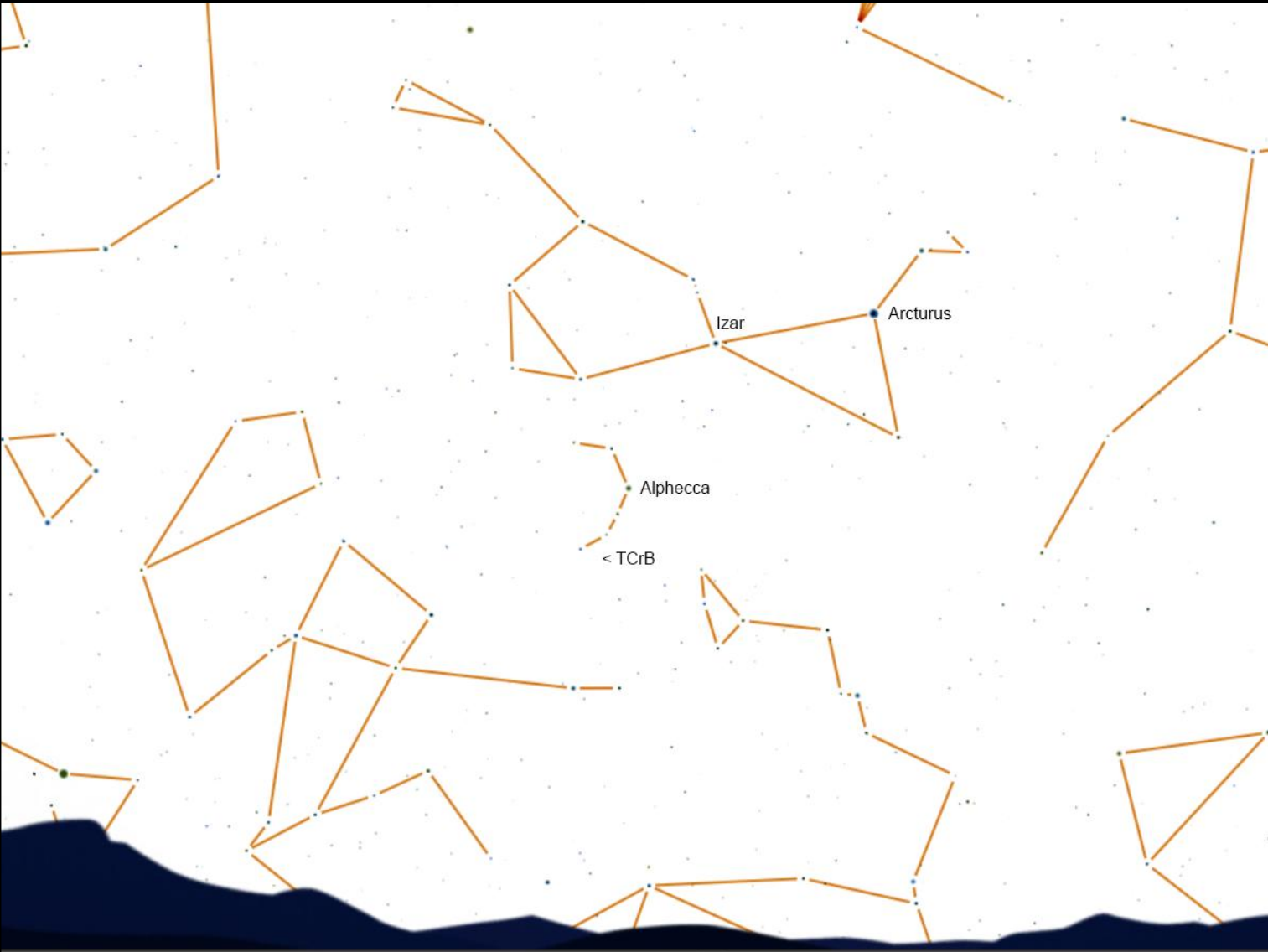
Researchers used the vast archive of digitized photographic plates from the Harvard observatory to obtain high resolution photometric data on T CrB leading up to the 1946 eruption

They found that the brightening observed prior to 1946 was nearly identical to what was observed in 2015-2023 with the exception that the 1946 event was about 40% brighter than the current event, suggesting a lower total mass transfer between the accretion disk and the white dwarf

Current thinking is that while the current hydrogen loading on the white dwarf is sub-critical, it could still reach the critical limit at any time

So, the waiting continues...

Observing T CrB – Naked Eye & Binoculars



Looking East @ Midnight on 5/13/2026

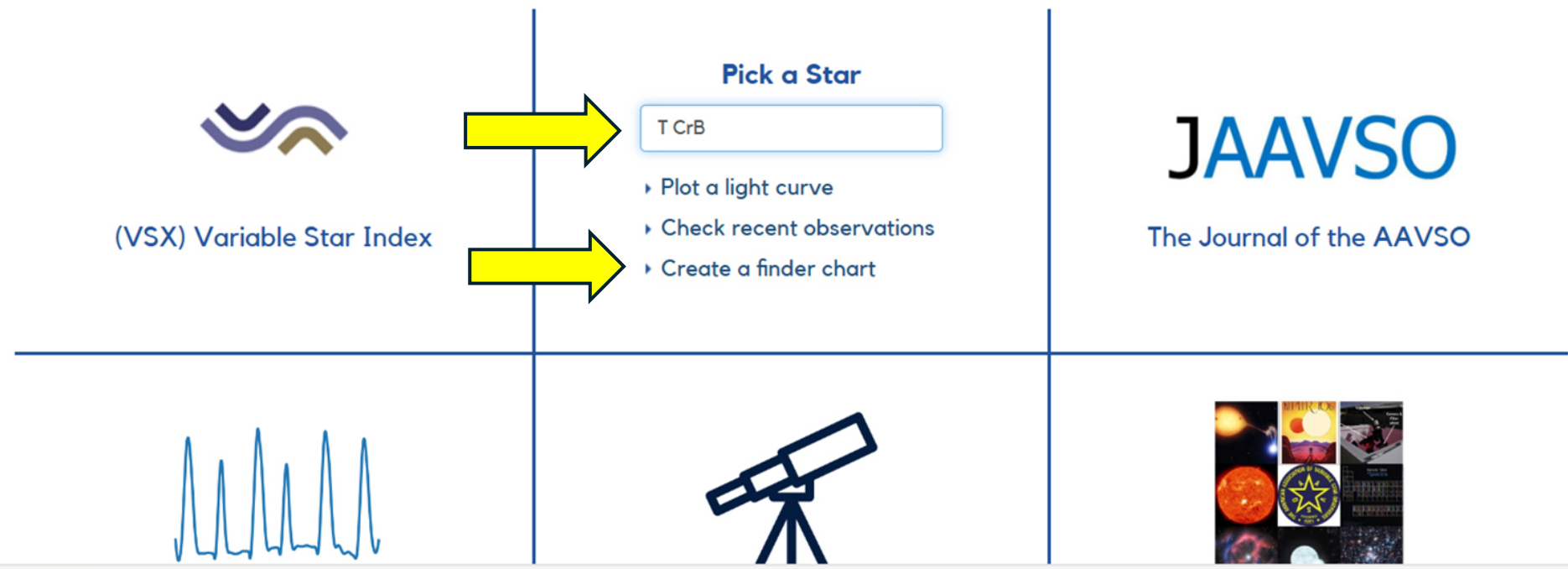


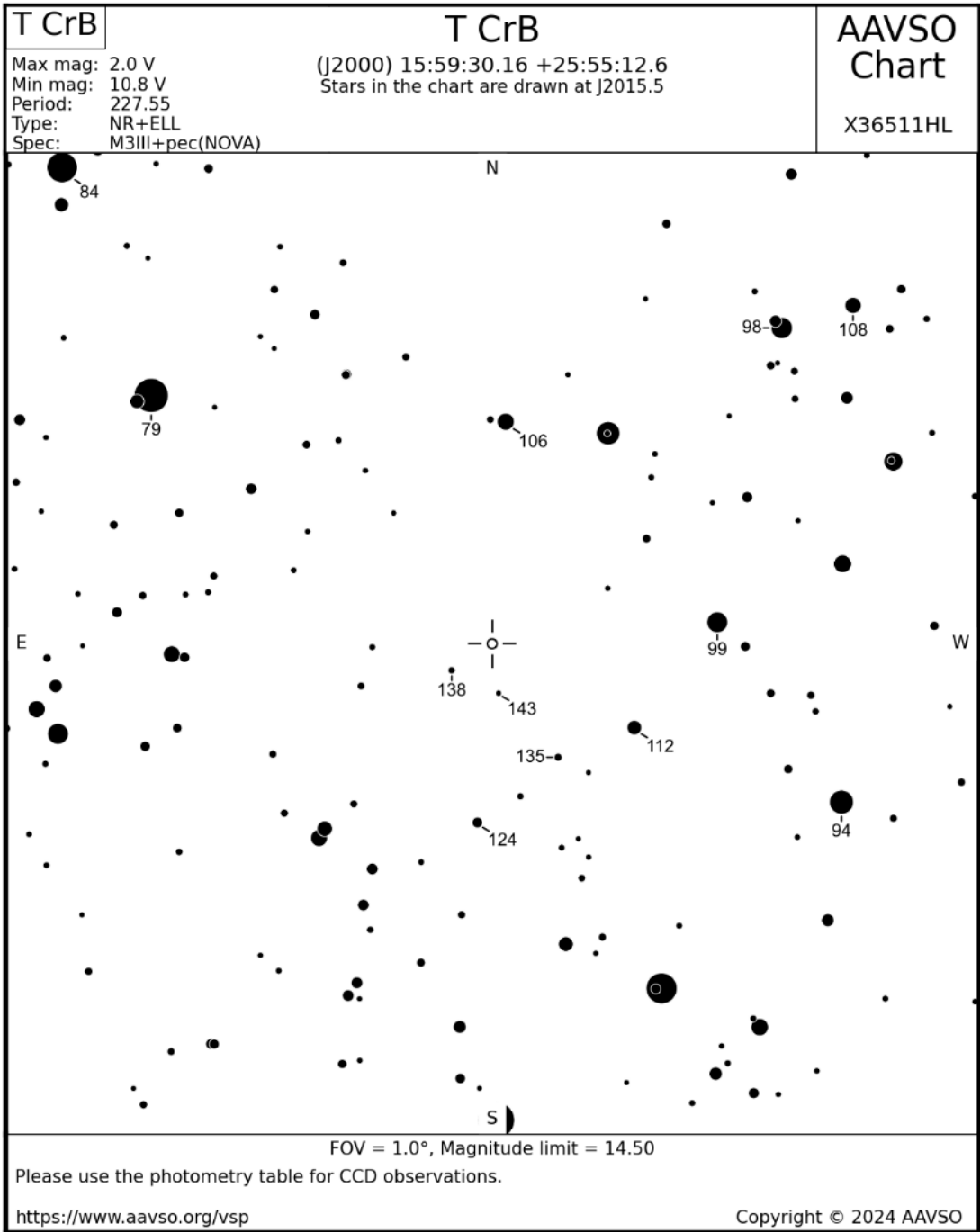
Looking East @ 2am on 3/1/2026



The mission of the AAVSO is to enable anyone, anywhere to participate in scientific discovery through variable star astronomy.

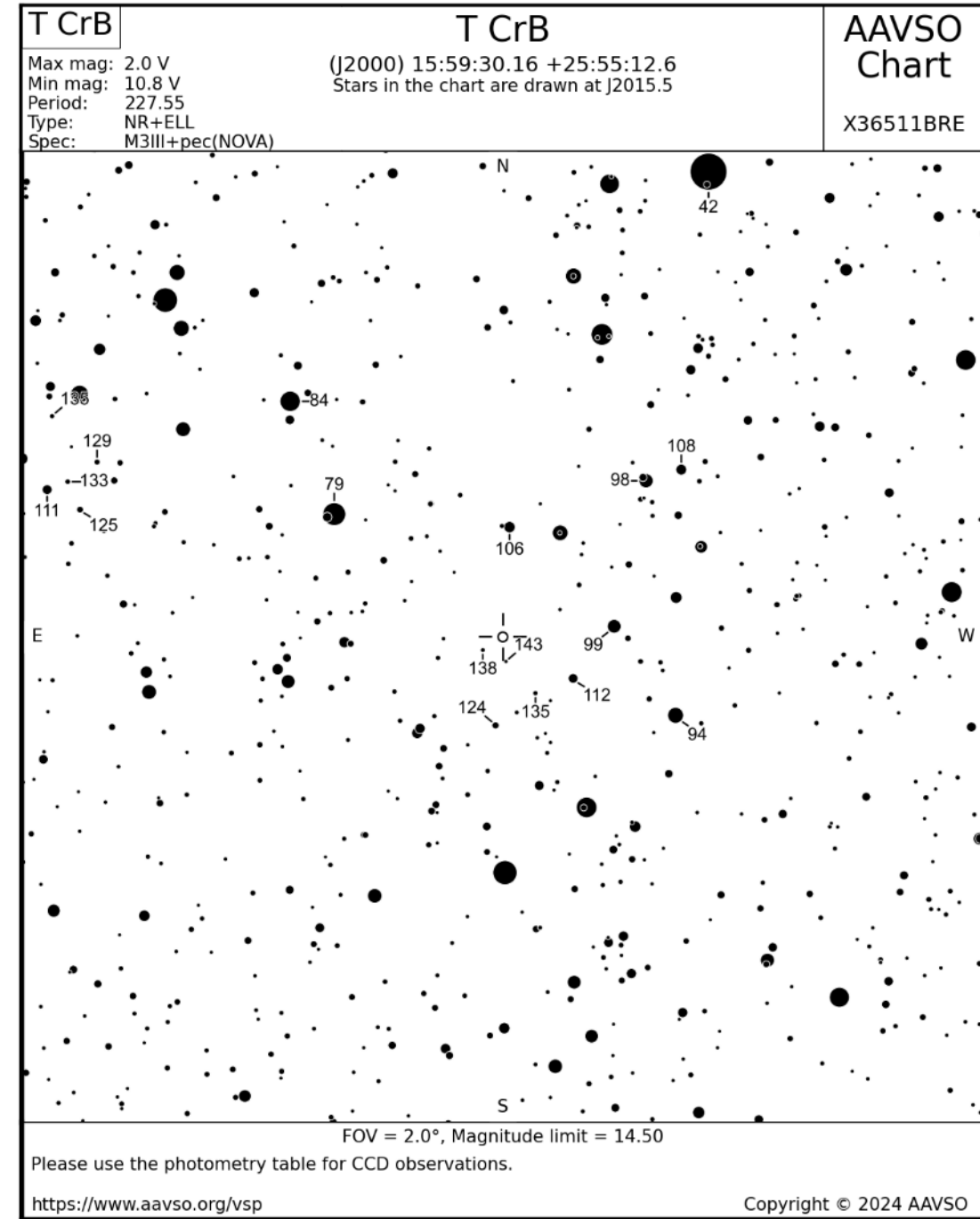
Resources



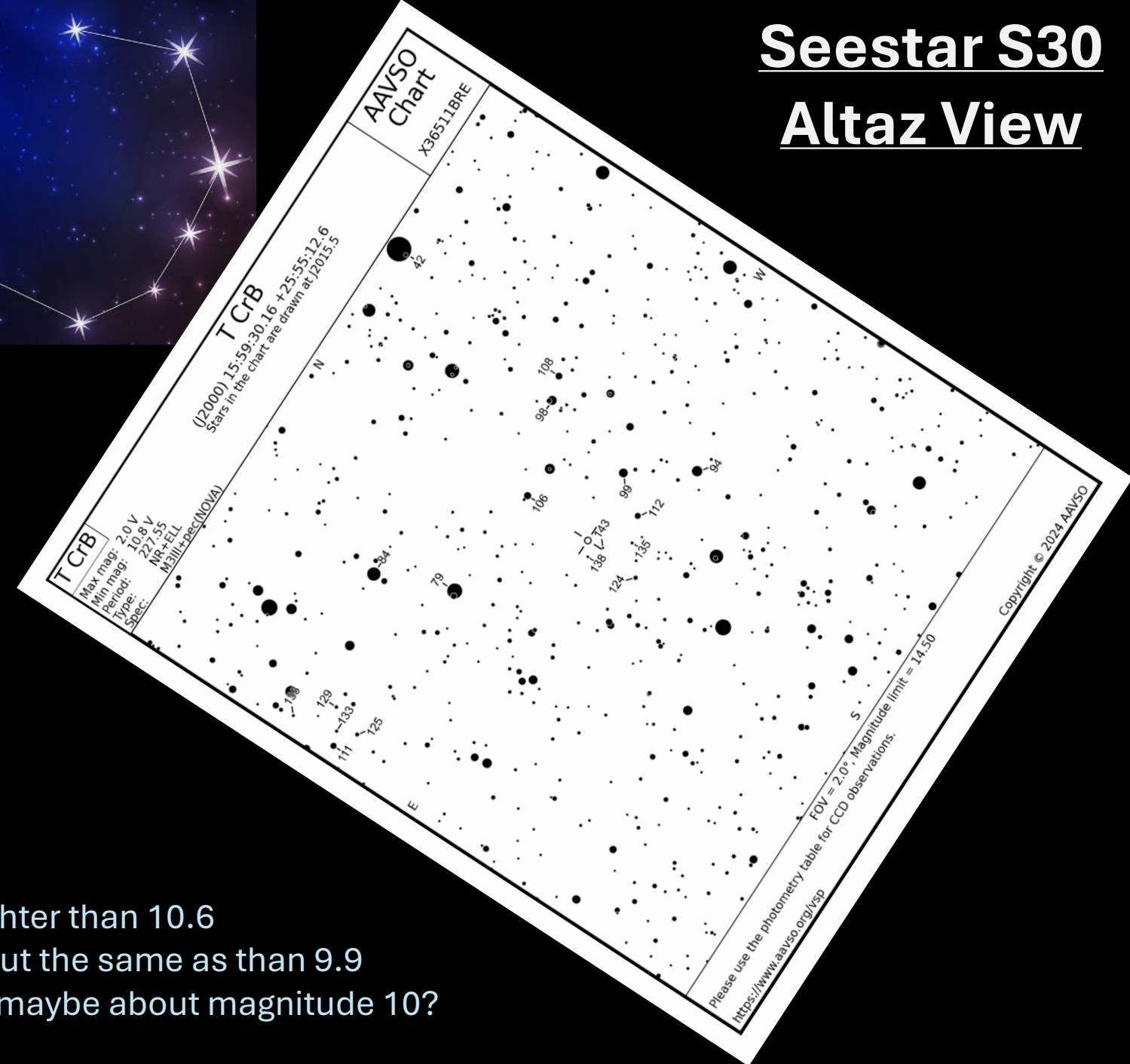


Standard
1 deg
← Seestar S50

Custom
2 deg
→ Seestar S30



Seestar S30 Altaz View



Brighter than 10.6
About the same as than 9.9
So, maybe about magnitude 10?

**Seestar S30
Simulated
Outburst**



~ Mag 10
← Before...



~ Mag 2
→ After...

Photometric Source Images

Most digital cameras are linear to within about 90% of their response range (~230 on a scale of 0-255)

If you are careful to take a source image where the brightness of the variable and the reference stars are within the linear range of the camera, you can use that image to measure the brightness of the variable

This is normally done using a monochrome camera through a photometric filter, usually a green Johnson V filter

However, you can also use the green data from a color camera, what the AAVSO refers to as Tri-G photometry

The overall procedure is to take a clean source image where the brightness of the variable and the reference stars are within the linear range of the camera

Separate the red, green, and blue data

Extract the brightness information from the green data

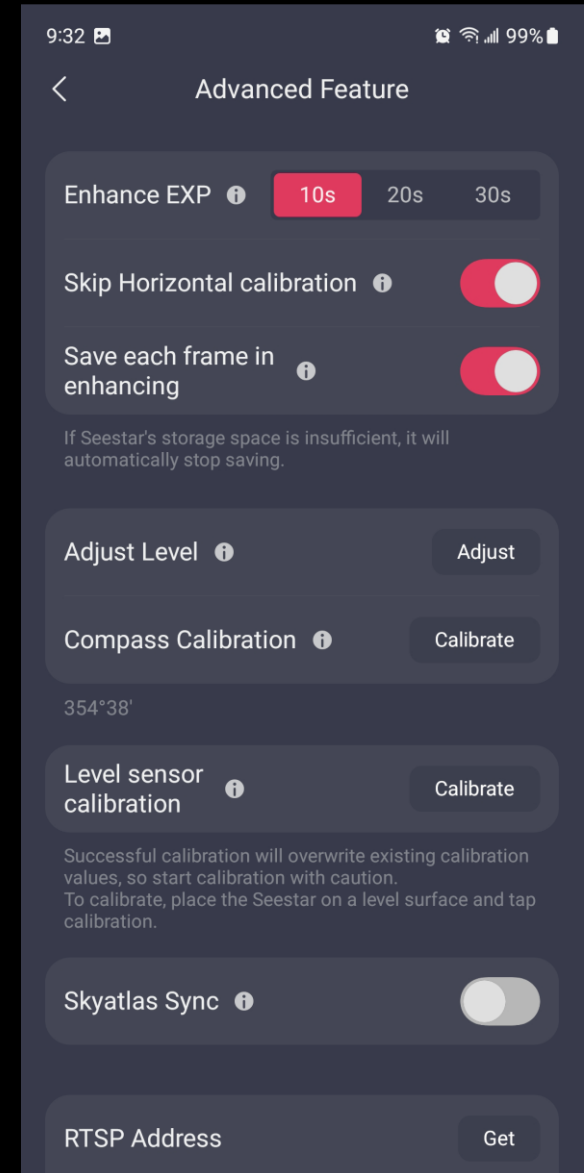
In theory you could also use the blue and red data (Tri-B and Tri-R), but green seems to be the most reliable and is usually a good match to conventional Johnson V filter data

Some modern software can extract photometry from the green data directly from the color source image

See the AAVSO website for details

Photometry with the Seestar

- Enter the location of T CrB into your Seestar as a custom object
 - R.A. 16h 00m 37s
 - Dec. +25d 50' 41''
- Configure your Seestar to use 10s exposures and to save all of the uncombined source images
- You can use the live & enhanced image for a visual estimate of the current brightness
- I take a brief series of at least 3 minutes total integration time (18 x 10sec)
- Stack the individual source images as you would any other deep sky image (I use Deep Sky Stacker)
- Save the stacked image ***without*** any processing such as brightness, contrast, or color balance
- If necessary, separate the red, green, and blue data from the stacked image into separate files (I use Nebulosity 4, free, Open-Source software)
- From here proceed as required by your software
- I then use the method of differential photometry to measure the brightness of a reference star, a calibration star, and the variable star using Autostar Suite Image Processing (ASIP)



T CrB, 22h 33m EDT, 4/30/2024



20 x 10 sec



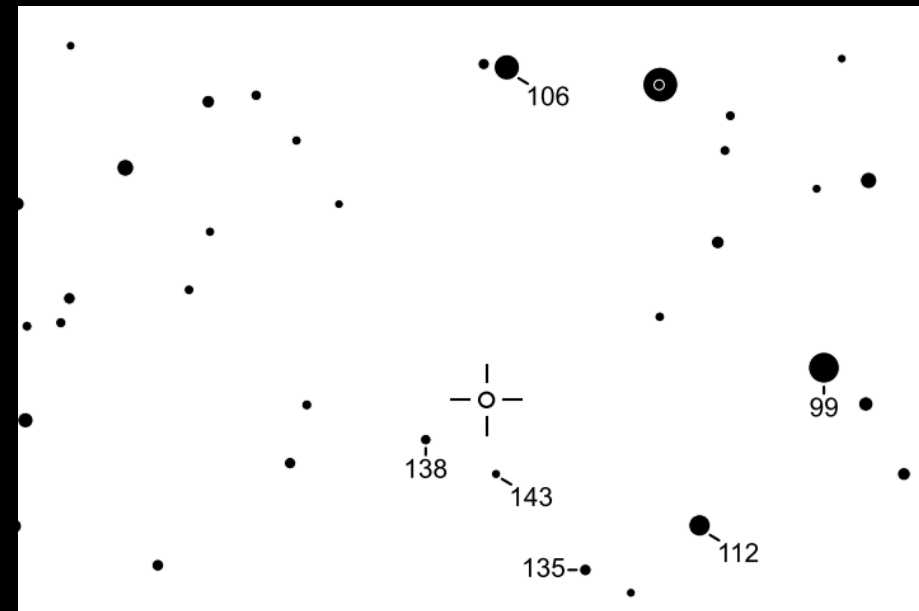
Green Data

Reference Star: 106
Photometric Magnitude (V): 10.566

Calibration Star: 112
Photometric Magnitude (V): 11.187
Measured Magnitude: 11.200
Offset: +0.013

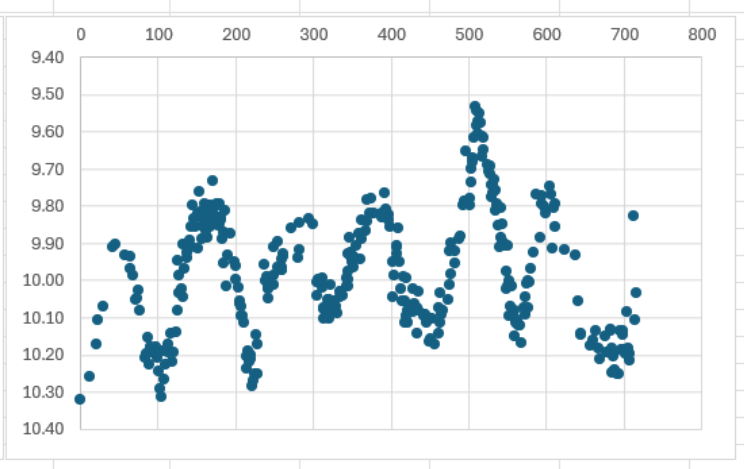
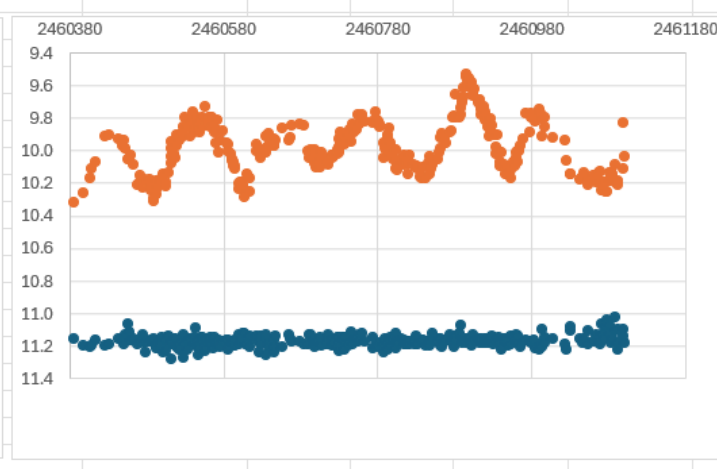
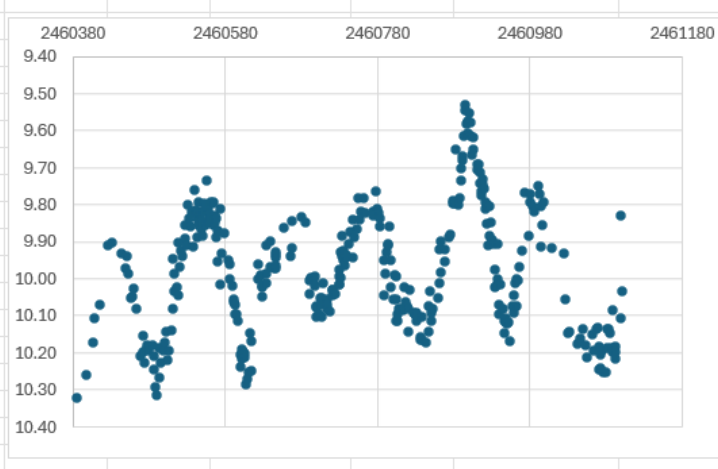
Variable Star (T CrB):
Measured Magnitude: 9.923
Calibrated Magnitude: 9.910

The value is reported as 9.910, Tri-G

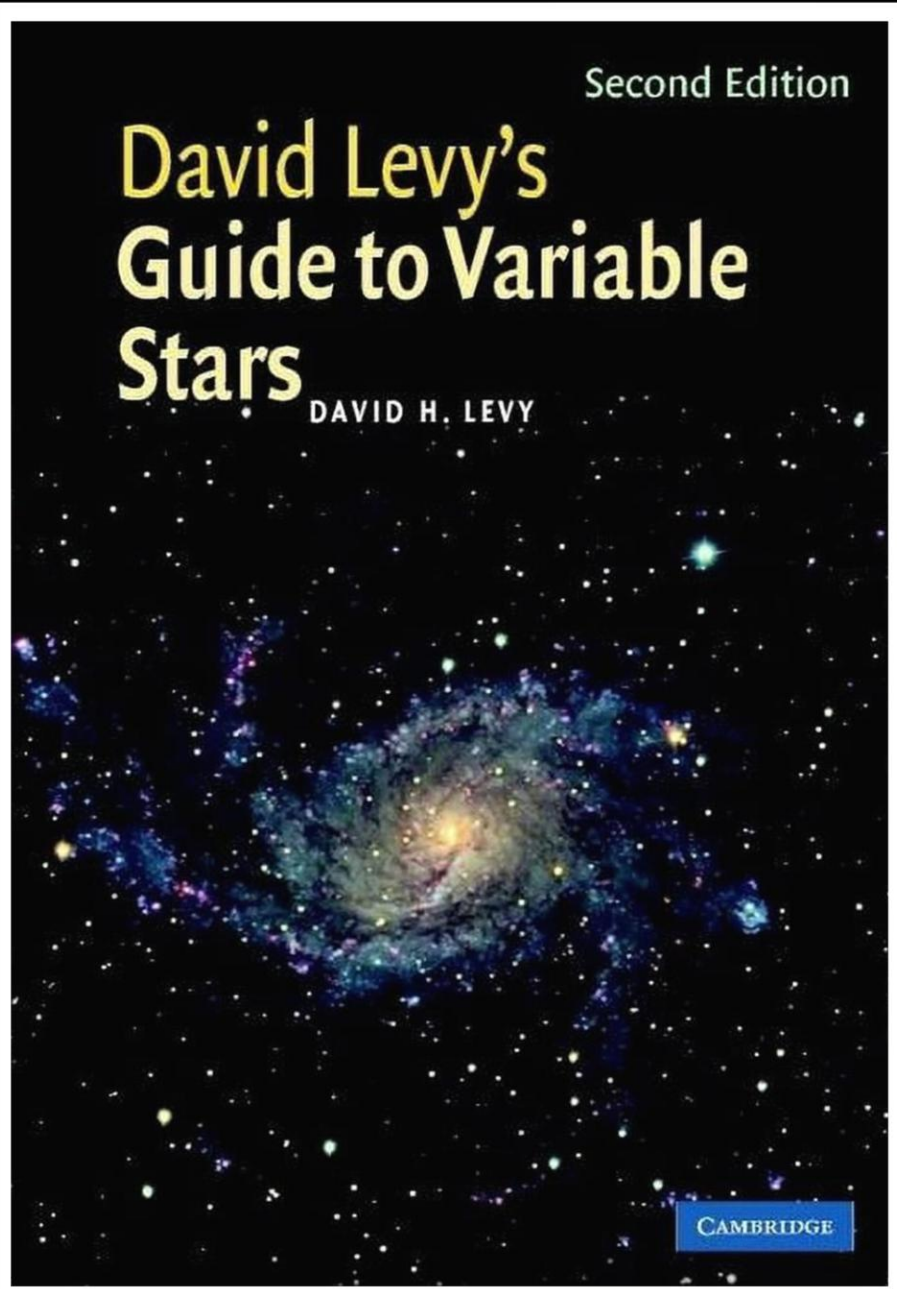


Clipboard | Font: Arial, 10 | Bold, Italic, Underline, Paragraph | Alignment: Wrap Text, Merge & Center | Number: General, Currency, Percentage, Thousand Separator | Styles: Conditional Formatting, Format as Table, Cell Styles | Cells: Insert, Delete, Format | Editing: AutoSum, Fill, Clear, Sort & Filter, Find & Select | Add-ins: Add-ins, Copilot

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
2/5/2026	11077	8	14	2461076.843	10.25	000-BJS-901	10.566	106	000-BBW-805	11.187	112	X36276EC	11.080	10.146	10.25	1076.843	691.079	10.25	S_30	
2/7/2026	11079	9	16	2461078.886	10.25	000-BJS-901	10.566	106	000-BBW-805	11.187	112	X36276EC	11.038	10.104	10.25	1078.886	693.122	10.25	S_30	
2/9/2026	11081	6	52	2461080.786	10.14	000-BJS-901	10.566	106	000-BBW-805	11.187	112	X36276EC	11.136	10.086	10.14	1080.786	695.022	10.14	S_30	
2/10/2026	11082	9	27	2461081.894	10.19	000-BJS-901	10.566	106	000-BBW-805	11.187	112	X36276EC	11.077	10.077	10.19	1081.894	696.130	10.19	S_30	
2/12/2026	11084	9	18	2461083.888	10.14	000-BJS-901	10.566	106	000-BBW-805	11.187	112	X36276EC	11.186	10.134	10.14	1083.888	698.124	10.14	S_30	
2/13/2026	11085	6	48	2461084.783	10.15	000-BJS-901	10.566	106	000-BBW-805	11.187	112	X36276EC	11.169	10.127	10.15	1084.783	699.019	10.15	S_30	
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2/16/2026	11088	10	53	2461087.953	10.20	000-BJS-901	10.566	106	000-BBW-805	11.187	112	X36276EC	11.028	10.038	10.20	1087.953	702.190	10.20	S_30	
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3/1/2026	11101	9	12	2461100.883	10.03	000-BJS-901	10.566	106	000-BBW-805	11.187	112	X36276EC	11.185	10.030	10.03	1100.883	715.119	10.03	S_30 Pro	
3/2/2026	11102																			
3/3/2026	11103																			
3/4/2026	11104																			
3/5/2026	11105																			
3/6/2026	11106																			
3/7/2026	11107																			
3/8/2026	11108																			
3/9/2026	11109																			
3/10/2026	11110																			
3/11/2026	11111																			
3/12/2026	11112																			
3/13/2026	11113																			
3/14/2026	11114																			
3/15/2026	11115																			
3/16/2026	11116																			
3/17/2026	11117																			
3/18/2026	11118																			
3/19/2026	11119																			



Resources



The mission of the AAVSO is to enable anyone, anywhere to participate in scientific discovery through variable star astronomy.

www.AAVSO.org

Wikipedia

T Coronae Borealis

From Wikipedia, the free encyclopedia

Not to be confused with [Tau Coronae Borealis](#).
"Blaze Star" redirects here; not to be confused with [Blaze Starr](#).

T Coronae Borealis is a **binary star** and a **recurrent nova** about 3,000 **light-years** (920 **parsecs**) away in the **constellation Corona Borealis**.^[12] It has the official proper name **Blaze Star**, T Coronae Borealis is the **variable-star designation**. The system was first observed in outburst in 1866 by **John Birmingham**,^[13] though it had been observed earlier in **quiescence** as a **10th magnitude star**.^[14] It may have been observed in 1217 and in 1787 as well.^{[15][16]} In February 1946, Michael Woodman, a 15-year-old schoolboy from Wales, observed a flare-up, subsequently writing to the **Astronomer Royal** and leading to the theory that the star **flares** every 80 years,^[17] with the next nova expected to occur before 2027.

Nomenclature

T Coronae Borealis (abbreviated *T CrB* or unofficially *T Cor Bor*)^[18] is the star's **variable star designation**. It also has the **Bright Star Catalogue** designation HR 5958 and the **Henry Draper Catalogue** designation HD 143454.^[11]

The proper name *Blaze Star*^[19] has been used since its outburst in 1866, and was officially approved by the **IAU Working Group on Star Names** on 22 September 2025.^[20]

Observation data	
Epoch J2000	Equinox J2000
Constellation	Corona Borealis
Right ascension	15 ^h 59 ^m 30.1622 ^s ^[1]
Declination	+25° 55′ 12.613 ^m ^[1]
Apparent magnitude (V)	2.0–10.8 ^[2]

Characteristics	
Evolutionary stage	Red giant + white

Questions?

