

# A Predicted Great Dimming of T Tauri: Has it Begun?

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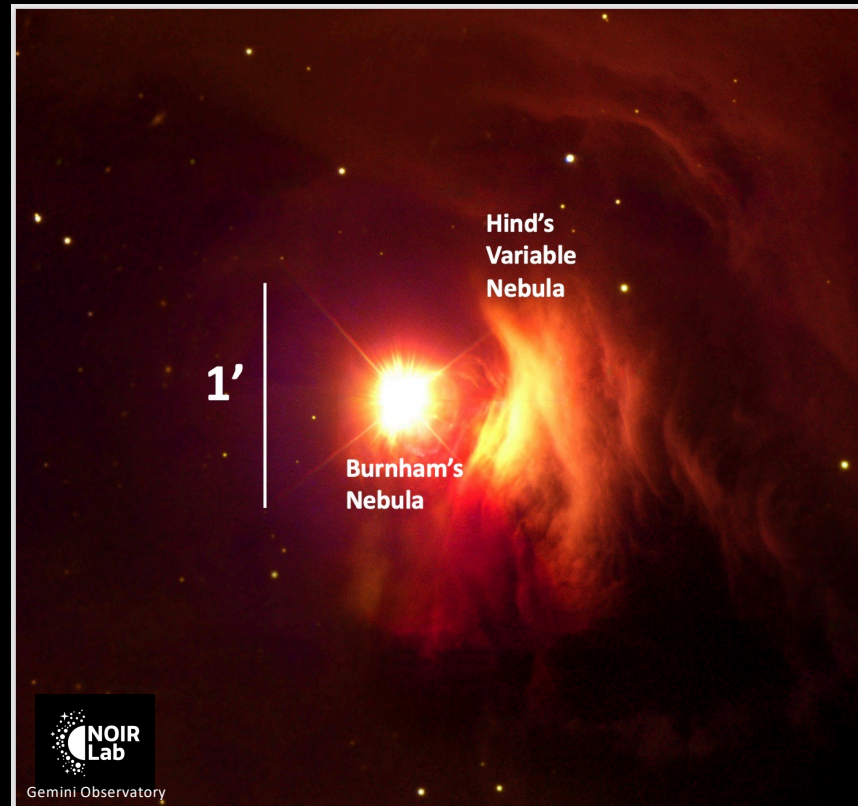
“press summary”:  
<https://www.stsci.edu/~tbeck/ttau2025.html>

# An Introduction to T Tauri

Identified as an  
interesting  
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THE prototype for  
young sun-like stars in  
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100+ years of  
literature...

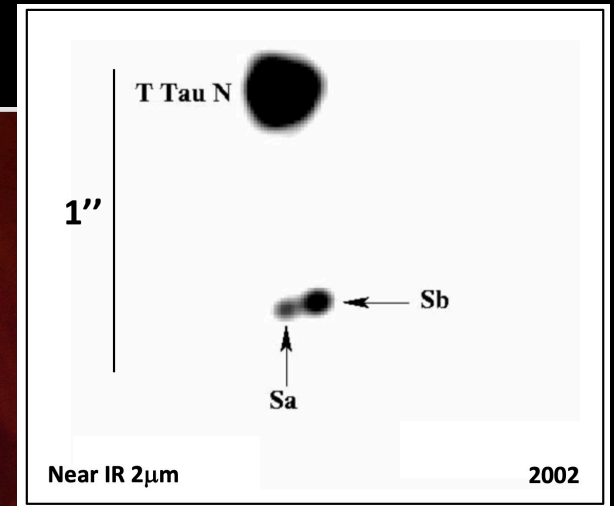
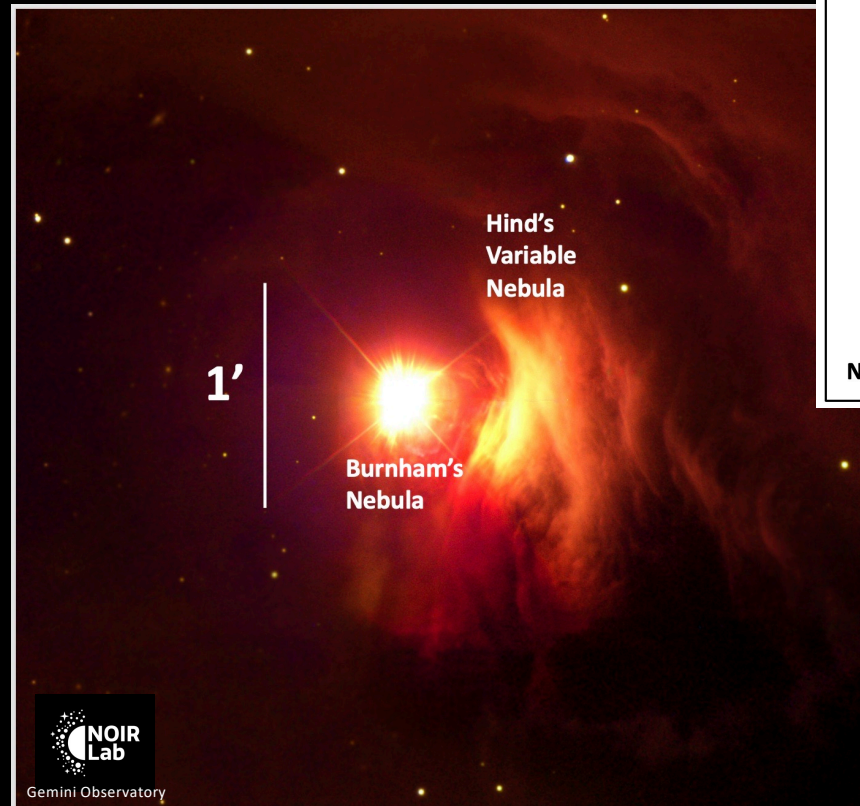


# An Introduction to T Tauri

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THE prototype for young sun-like stars in our galaxy, the 'T Tauri Stars'

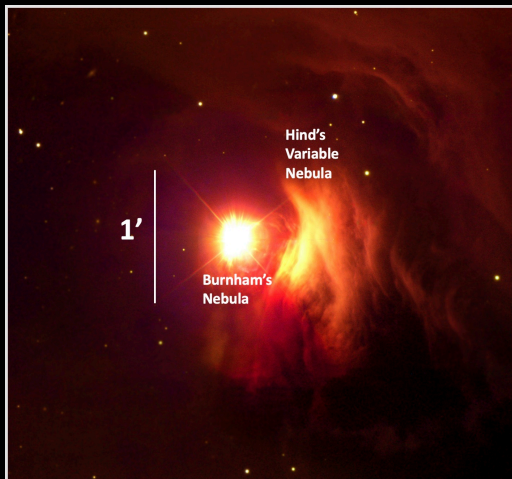
100+ years of literature...



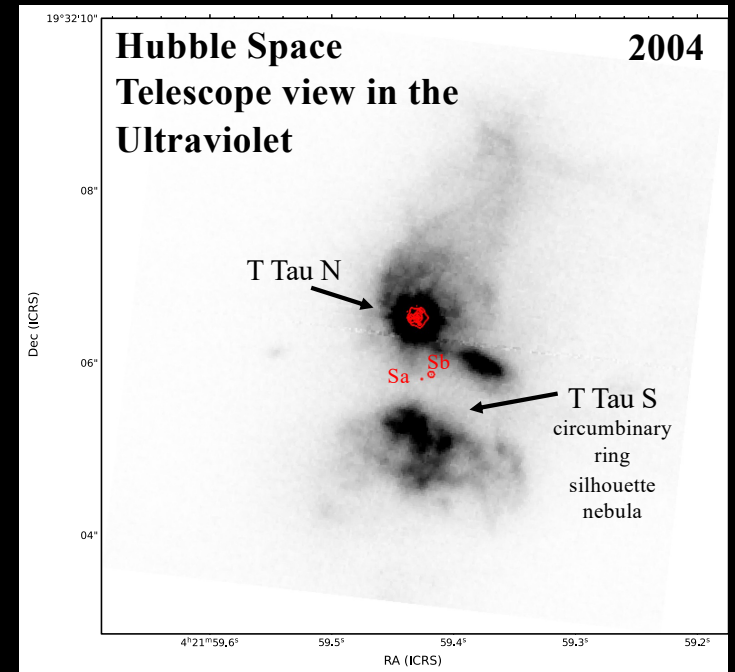
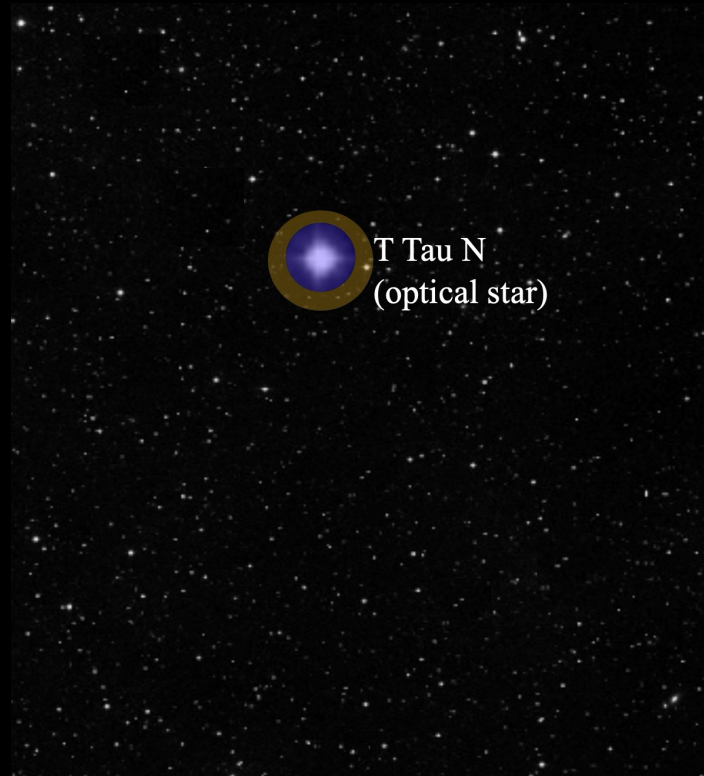
Observations have shown that it is a young triple star system

Companion "T Tau S" discovered in 1980, Resolved into "Sa and Sb" in 1997 – seen only in the infrared

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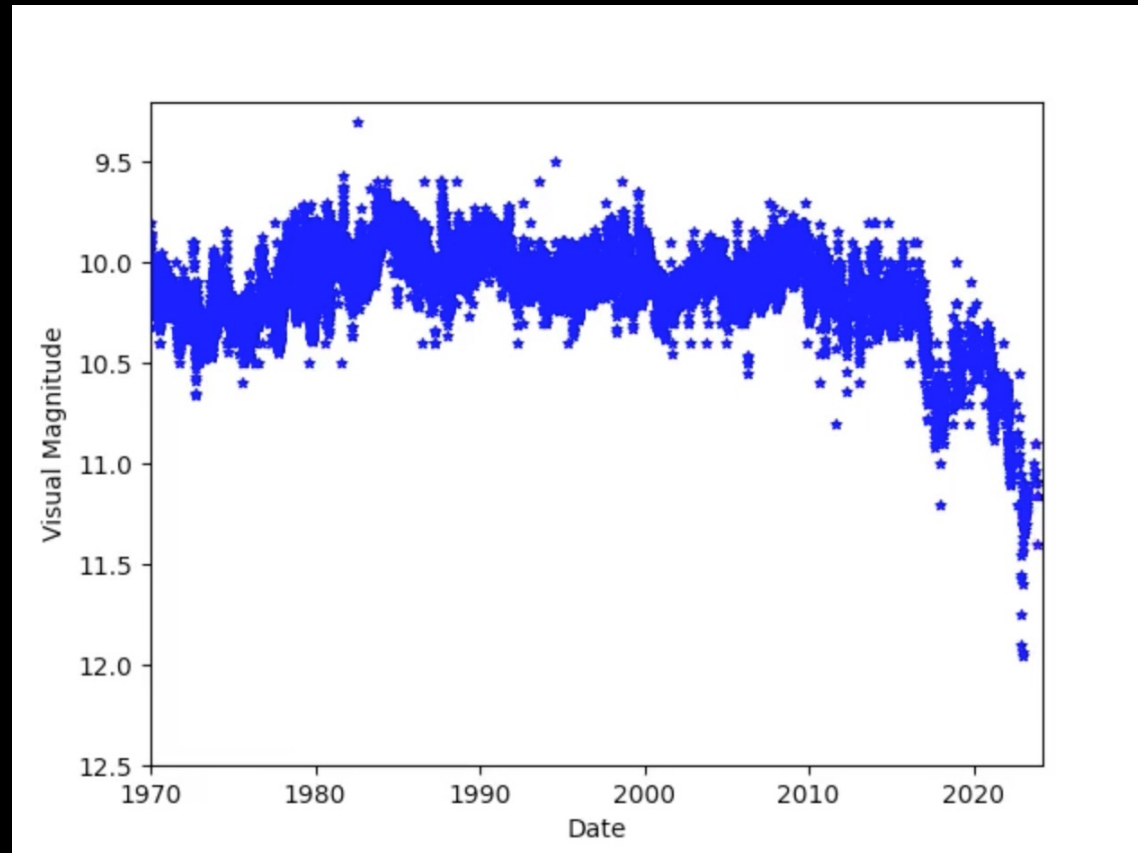
T Tau N, the optical star



The T Tau South binary is foreground to T Tau N, and obscured to optical invisibility because it is viewed through a circumbinary ring viewed edge-on.

See <https://www.stsci.edu/~tbeck/ttau2025.html> for full animation.

# New Results – A Dimming of T Tauri in the Optical



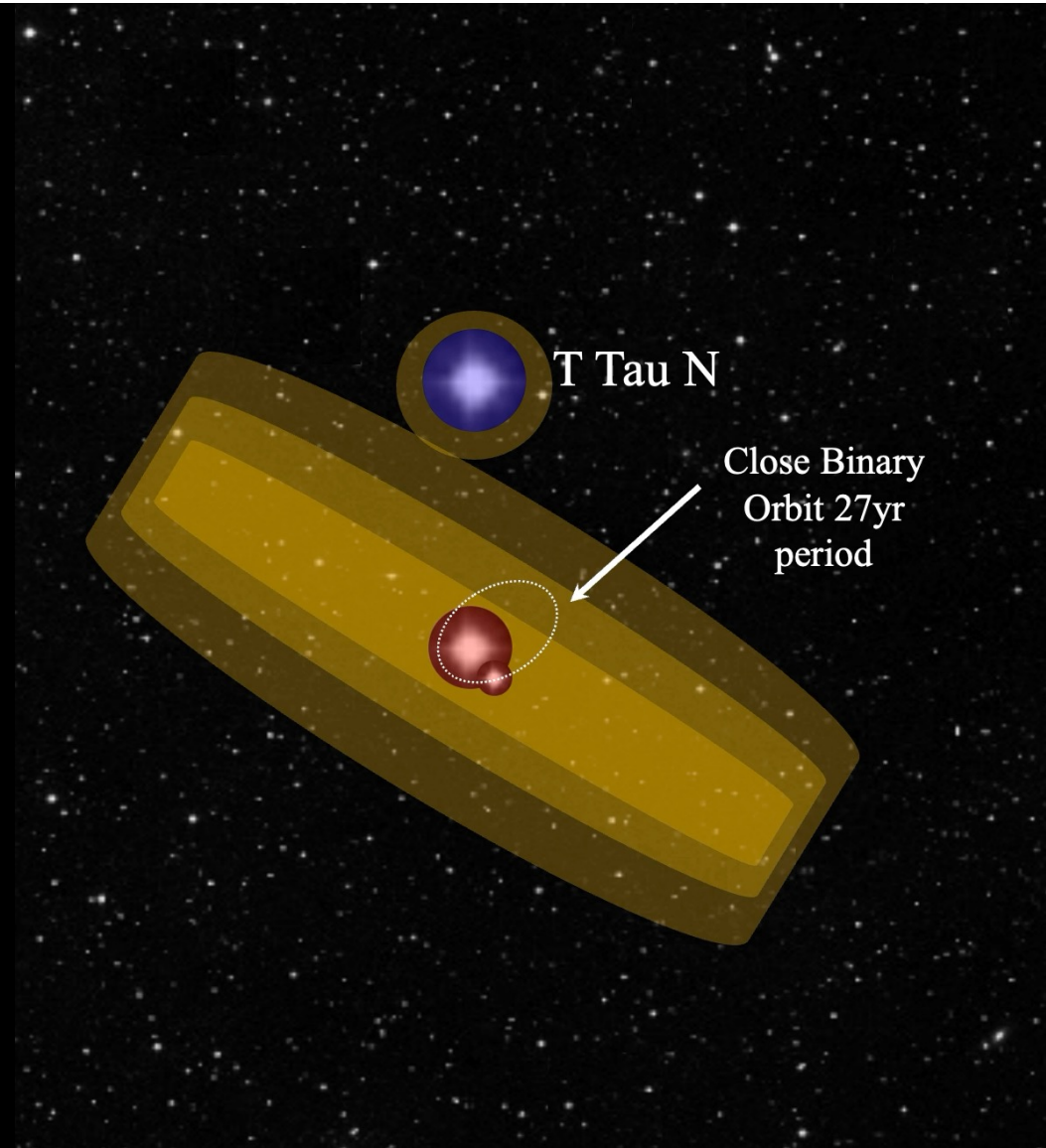
A (Visible light) Light Curve from The American Association of Variable Star Observers (AAVSO)

# What is Causing this Dimming?

Take a Closer Look at the Geometry of the Stars and Orbits in the System

The T Tau S Binary is Foreground to the Optical star, T Tau N.

(Sizes of Stars, close orbit exaggerated for clarity)



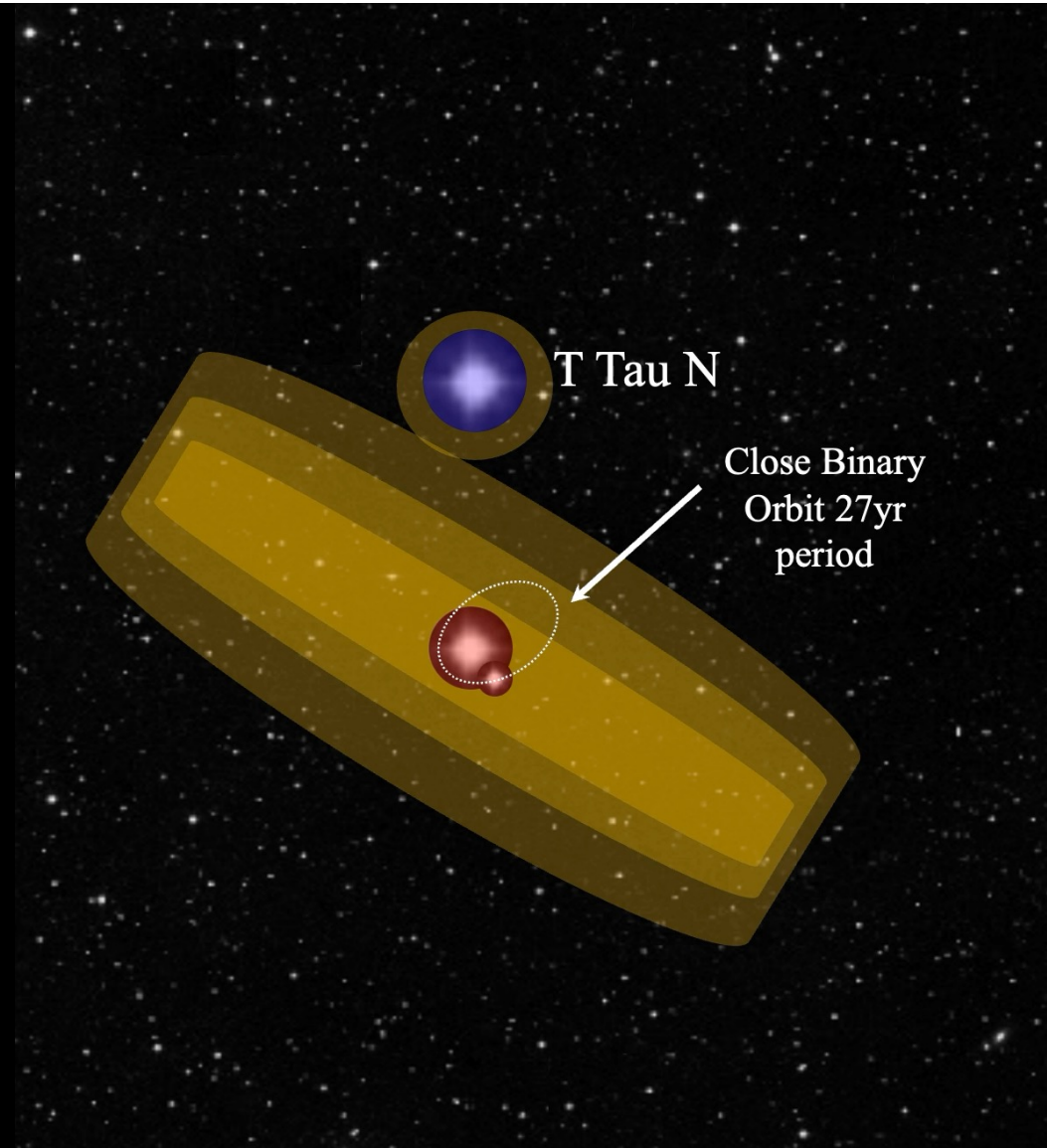
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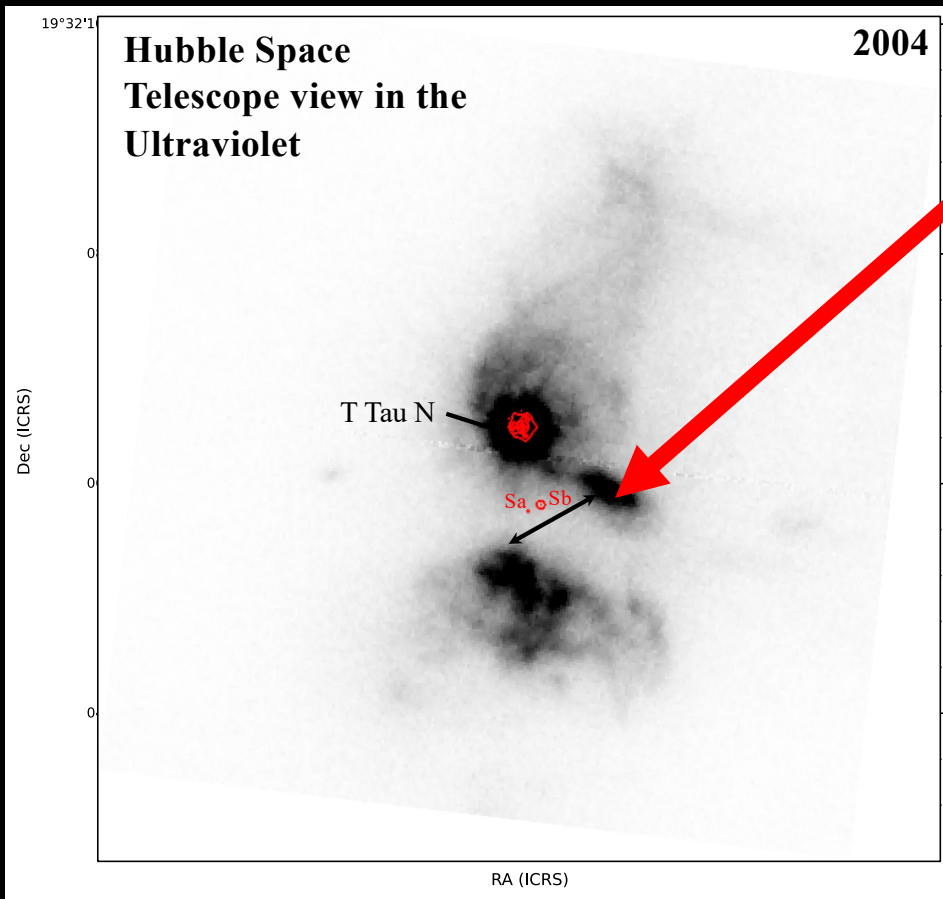
The T Tau S Binary is Foreground to the Optical star, T Tau N.

As T Tau Sa+Sb move along the wide orbit relative to T Tau N, the extended circumbinary ring is starting to occult the optical star!

(predicted to occur soon by Flores et al. 2020, and Beck et al 2020)



# What Will Happen In the Future?



Future Dimming events depend on the structure of the Circumbinary Ring

Extent of Circumbinary Ring in the Direction of Orbital Motion =  $\sim 1''$

Wide scale orbital motion of T Tau S relative to N =  $\sim 100$  milli arcsec / decade

→ So, Dimming events may continue and last for  $\sim 100$  years.

T Tau S is obscured by  $\sim 20$  magnitudes of material in the circumbinary ring (foreground part of the ring)  
If the extended regions of the ring have a similar level of gas+ dust T Tau N – The prototypical T Tauri – could disappear from the optical sky in the future!

# Why is this Interesting?



While some T Tauri stars (or their companions) have dimmed from dust attenuation in from material in disks or in nearby environments, there has never been a case where occultation by dust has caused the all of the stars in a ‘Classical’ T Tauri system to disappear from the optical sky (becoming visible only at infrared or longer wavelengths).

Monitoring gas and dust absorption features in the spectrum of T Tau N as the circumbinary ring of T Tau S passes in the foreground provides the exciting opportunity to measure the chemical composition of the ring material – at  $\sim 100$  AU distances which is comparable to the forming region of the Kuiper Belt in our own Solar System.

*→ It is going to be very exciting to watch and monitor the T Tauri system in the coming decades!*

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