

# The Ursa Minor Report



Newsletter of the Kutztown University Planetarium &  
C. R. Chambliss Astronomical Observatory

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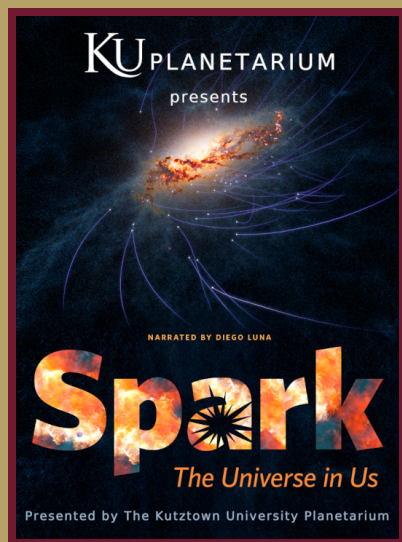
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## Spring 2026 Schedule of Community Planetarium Shows

Everyone is welcome to join us for these planetarium shows this spring semester! Admission is free. Tickets are not required and seating is on a first-come, first-served basis. Doors open at 6:00 pm. The planetarium is located on the ground floor of the Grim Science Building.

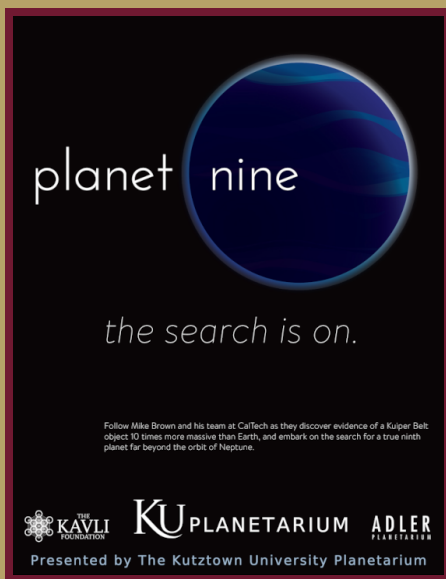
Date	Time	Title	Cost
Thu. Feb. 26	6:30 pm	<i>Spark: The Universe in Us</i>	FREE
Thu. Mar. 26	6:30 pm	<i>Planet Nine: The Search is On</i>	FREE
Thu. Apr. 30	6:30 pm	<i>One Step Beyond: A Journey to Mars</i>	FREE



### *Spark: The Universe in Us*

Where did the building blocks of life come from? The answer lies far from home. Travel inside a giant star nearing the end of its life, witness stellar corpses colliding, and experience the quiet demise of a Sun-like star. From the oxygen we breathe to the iron in our blood, the silicon in Earth's mantle to the uranium that warms our planet, we owe it all to the stars. Narrated by Diego Luna, "Spark: The Universe in Us" explores how hundreds of millions of celestial events have forged the elements that make up the Solar System, Earth—and us!

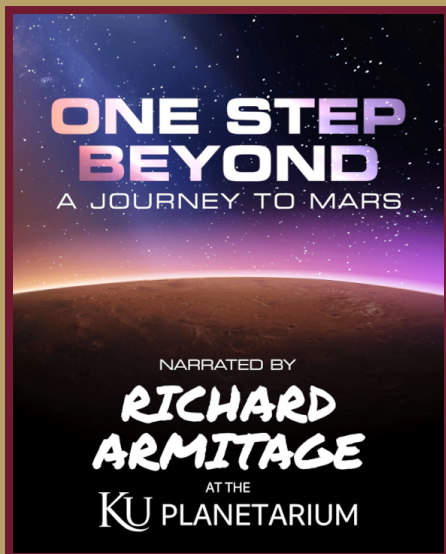
**Thursday, Feb. 26 at 6:30 p.m.**



### *Planet Nine: The Search is On*

Journey to the icy outskirts of our solar system in Planet Nine, a planetarium show that follows the search for a hidden giant beyond Neptune. From the discoveries of Pluto, Eris, and other distant worlds to the tantalizing orbital clues that suggest an unseen planet, Caltech astronomer Mike Brown and his team take us to mountain-top observatories in their quest to find the elusive “Planet Nine.” The program at KU’s planetarium includes a short introduction to the upcoming Vera C. Rubin Observatory, whose sweeping sky survey may soon reveal this mysterious world.

*Thursday, Mar. 26 at 6:30 p.m.*



### *One Step Beyond: A Journey to Mars*

One small step was just the beginning. Now, we take one step beyond - driven by curiosity, bound for Mars, and ready to write the boldest chapter in human exploration.

Experience the thrill of launch, the challenges of life in space, the cutting-edge technology of NASA’s Artemis program, and the search for life that could transform how we see our planet, our past, and our place in the cosmos - as we prepare for humanity’s biggest step yet: setting foot on Mars.

*Thursday, Apr. 30 at 6:30 p.m.*

## T Coronae Borealis - Where's the Nova?



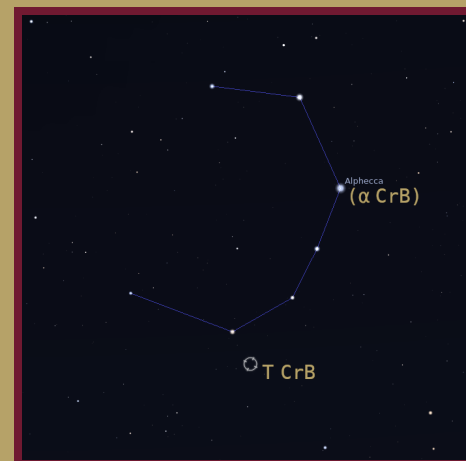
T Coronae Borealis (T CrB) lies about 3000 light-years away and is famously expected to go nova sometime “soon” ... but will it happen? And when? We’ve been monitoring T CrB with the high-resolution spectrograph at the C. R. Chambliss Astronomical Observatory (CRAO) at Kutztown University and have some exciting observations to report.

### *About the Recurrent Nova*

T CrB is a system of two stars in an interacting binary star system. Interacting binaries share material between the stars, and in T CrB, the large red giant star is dumping hot gas onto its white dwarf companion at a rate of about  $10^{-8}$  solar masses per year – that’s several hundred tons per second. The white dwarf is embedded in the bright accretion disk to the right of the large red giant star in the conceptual image above. The red giant is more than 60 times the size of our Sun and the white dwarf is only about half the size of planet Earth (that’s just 0.0045 solar radii). The red giant weighs a little less than the Sun and the white dwarf is a little heavier than the Sun. The two stars are in a circular orbit that takes 227 days to complete one full rotation. The binary star’s apparent magnitude is about +10, which is far too faint to see without a telescope.

By “go nova,” we mean that the accretion disk will reach the conditions for a thermonuclear ex-

plosion near the white dwarf’s surface. When that happens, the system will brighten to a magnitude of about +2, which is nearly 1600 times brighter than its normal state. For a couple days, it will become the brightest star in the Coronae Borealis constellation (slightly outshining  $\alpha$  CrB), and will match the brightness of Polaris (the North Star). The sky map below shows the location of T CrB. This is where you will see the nova when it happens. But when *will* it happen?



T CrB is a recurrent nova, which means it can happen again and again at somewhat regular intervals. We know that T CrB exploded in 1866 (the same year Kutztown University was founded as the Keystone State Normal School) and again in 1946. Historical records also provide dates for

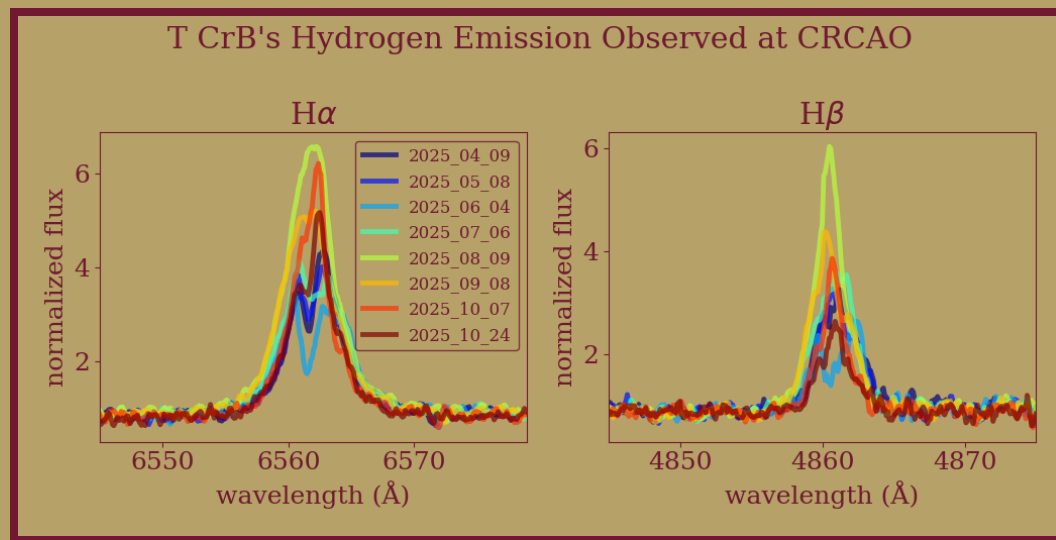
earlier eruptions in 1217 and 1787. A statistical analysis<sup>1</sup> (ignoring the physical mechanisms involved), determined that the nova should reoccur every 78 to 81 years (126 to 129 orbits) and predicted the most likely dates for the next eruption to be: 12 August 2024, 27 March 2025, 10 November 2025, and 25 June 2026. All but the June 2026 prediction have come and gone without a nova. We need to observe the physical properties of the star system for a better idea.

### *The Pre-Eruption Dimming*

The T CrB nova explosion of 1946 was well-studied. Before that latest eruption in 1946, T CrB faded slightly, becoming a few tenths of a magnitude dimmer for many months before suddenly exploding into naked-eye view as a nova. Remarkably, the same behavior was observed again in 2024, when T CrB entered an extended dim state well below its normal brightness. Astronomers interpreted this pre-eruption dimming as a change in the accretion flow onto the white dwarf, signaling that conditions on its surface are approaching the thermonuclear runaway that triggers the nova eruption. But still no nova.

### *Monitoring the System with KU's Observatory*

In search of a better understanding, we observed T CrB on 47 nights between 9 April and 24 October in 2025 using the high-resolution echelle spectrograph on CRCAO's 0.61-meter research telescope. Our observations (shown below) indicate strong hydrogen emission ( $H\alpha$  and  $H\beta$ ), which arises from hot, fast-moving gas in the system's accretion disk. Changes in the strength and shape of these emission features reveal how material is flowing onto the white dwarf and how the disk is responding as the system evolves. The persistence and variability of hydrogen emission indicate that accretion is ongoing and dynamically changing, which is a tell-tale sign that the system is likely preparing for a nova eruption rather than entering a dormant state. We lost view of T CrB as it fell out of season by November (it's been up during the day all winter), but it will slowly make its way into the eastern morning sky as spring emerges. We will continue to monitor T CrB this spring as a project in Stellar & Galactic Astronomy (ASTR 142) to learn more about its pre-eruption variations, to help predict future novae, and maybe even witness the explosion.



The graph above presents a sample of 8 of our 47 spectra, each spaced about one month apart, to illustrate the observed variations. The complete dataset can be seen in an online animated graph, here ([https://faculty.kutztown.edu/preed/data/T\\_CrB\\_H\\_emission\\_2025.gif](https://faculty.kutztown.edu/preed/data/T_CrB_H_emission_2025.gif)).

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*Prepared by Phill Reed (Planetarium & Observatory Director)*

*More Information: <https://www.kutztown.edu/planetarium> & <https://www.kutztown.edu/observatory>*

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<sup>1</sup>When will the next T CrB eruption occur? (Schneider 2024) *Research Notes of the American Astronomical Society* Volume 8, Issue 10