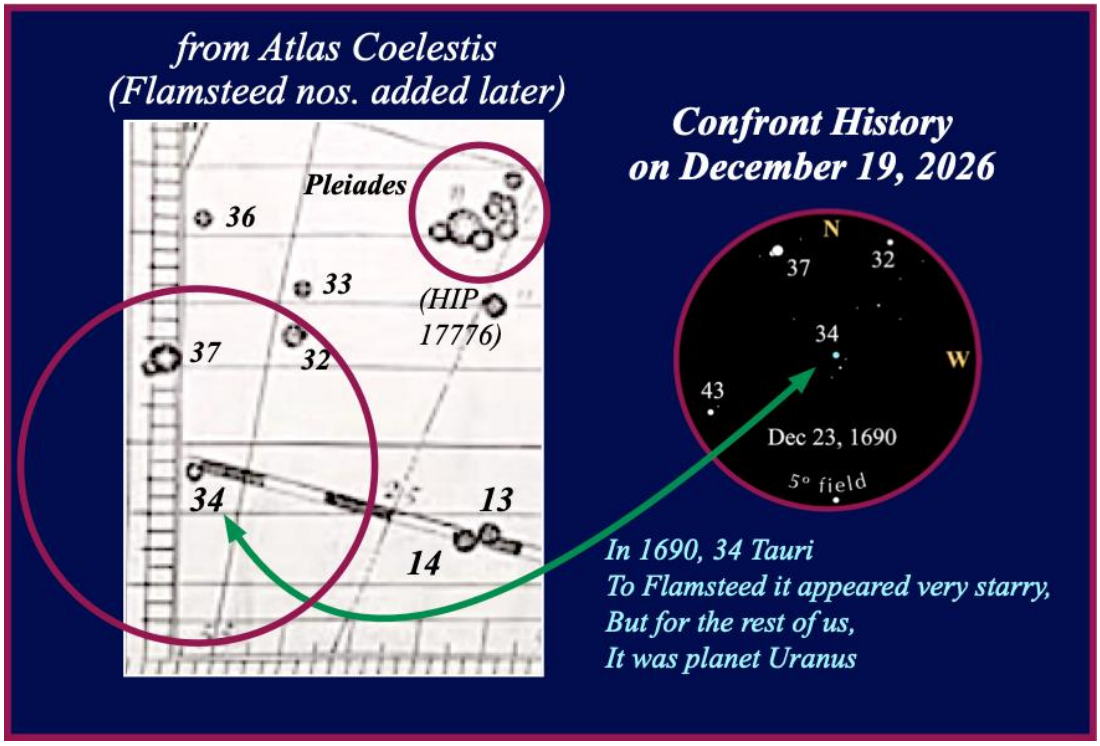
Observing Challenge: 34 Tauri Returns!

Britain's first Astronomer Royal, John Flamsteed, charted the entire sky in 1690 as seen by the unaided eye from southern England. His plotted stars eventually received numerical designations with respect to their constellation. Hence, the Flamsteed numbers came into being – the same Flamsteed numbers that we still use today.

He mapped 141 stars in Taurus in succession of increasing right ascension. His first star, 1 Tauri, is also known as Omicron. On star maps today, you can find 32 Tauri just southeast of the Pleiades, 33 Tauri is also just southeast of the Pleiades, next is 35 Tauri, also called Lambda Tauri, farther south. But no 34 Tauri!



When he charted this part of the heavens, he did plot a 34 Tauri, just as he did the other visible stars of the constellation. But when the area was observed later, it was gone. If someone had observed the same region three months later on March 16, 1691, they would have notice that 34 Tauri had returned. Observing again a few weeks after that would have shown that it was missing again. What was going on?

What Flamsteed and later observers didn't realize was that 34 Tauri wasn't a star at all, but a moving planet. This was a missed opportunity for the first discovery of Uranus?

Instead, it was William Herschel who is given credit for the first discovery of the planet Uranus in March 1781, over 90 years after Flamsteed's observations.

Every 84 years, the period of its orbit, the planet Uranus moves into this region along the ecliptic, and for only a few days it appears to lie where John Flamsteed logged 34 Tauri. **December 19, 2026** marks the fourth return since his observation on December 23, 1690.

Returns of 34 Tauri:

While Uranus is closest to the location of Flamsteed's initial sighting on these dates, it lies in the general region for two weeks before and after.

Dec 23, 1690 (retrograde)
Mar 16, 1691 (prograde)
Jun 4, 1774 (prograde), near the Sun
Dec 22, 1774 (retrograde)
Mar 20, 1775 (prograde)
Jun 8, 1858 (prograde), near the Sun
Dec 19, 1858 (retrograde)
Mar 25, 1859 (prograde)
Jun 10, 1942 (prograde), near the Sun
Dec 20, 1942 (retrograde)
Mar 26, 1943 (prograde)
Jun 11, 2026 (prograde), near the Sun
Dec 19, 2026 (retrograde)
Mar 30, 2027 (prograde)
Jun 14, 2110 (prograde), near the Sun
Dec 21, 2110 (retrograde)
Mar 31, 2111 (prograde)

Tasks required by this Observing Challenge:

Note: It is easier to complete these tasks leading up to December 19 because of the interference of bright moonlight.

1. Attempt to see Uranus with unaided eyes. Can you also see 32, 37, or 43 Tauri? You will need very dark and clear skies. John Flamsteed saw them in 1690!
2. Do one of these:
   a. Using binoculars, draw the area and plot Uranus' position at least twice in December 2026. Include stars of brightness to 7th magnitude. Also include 32, 37, 39, and 43 Tauri. Try to be as accurate as you can. Doing this should confirm that Uranus does indeed move along a retrograde path (i.e., east to west) with respect to the background stars.
   b. Image the area on at least two separate dates in December. It would be preferable to have one image captured as near to December 19 as you can. Note that Uranus moves in a retrograde motion (I.e., east to west) with respect to the background stars.

3. Estimate how does the brightness of Uranus compare to 32, 39, and 43 Tauri? Is it brighter or dimmer?
4. With a telescope, observe Uranus to confirm that it is not a star, but a round body. What magnification did you use?
5. You must do an outreach activity. Do at least one of the following:
    a. Hold an observing session in December, preferably close to December 19, to show other people 34 Tauri/Uranus.
    b. Give a presentation describing the charting of 34 Tauri and your observations.
    c. Write an article describing the charting of 34 Tauri and your observations.

If you miss out, don't worry. It returns to the same location in three months on March 30, 2027 as it moves in a prograde motion. And if you again miss out, it next returns in 2110. These observing opportunities are not part of this Observing Challenge!

References

https://articles.adsabs.harvard.edu/cgi-bin/nph-iarticle_query?bibcode=1987JHA....18..209W&db_key=AST&page_ind=0&data_type=GIF&type=SCREEN_VIEW&classic=YES

https://www.rmg.co.uk/stories/space-astronomy/planet-uranus

https://adsabs.harvard.edu/full/1998Obs...118..219B