



The mystery of classical cepheids in globular clusters

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The 2022 paper "Additional Galactic Cepheids from the OGLE Survey" highlights 4 cepheids located in the regions delineated by the tidal rays of globular clusters.

Suspensions were raised that they might be located inside these clusters.



Globular clusters

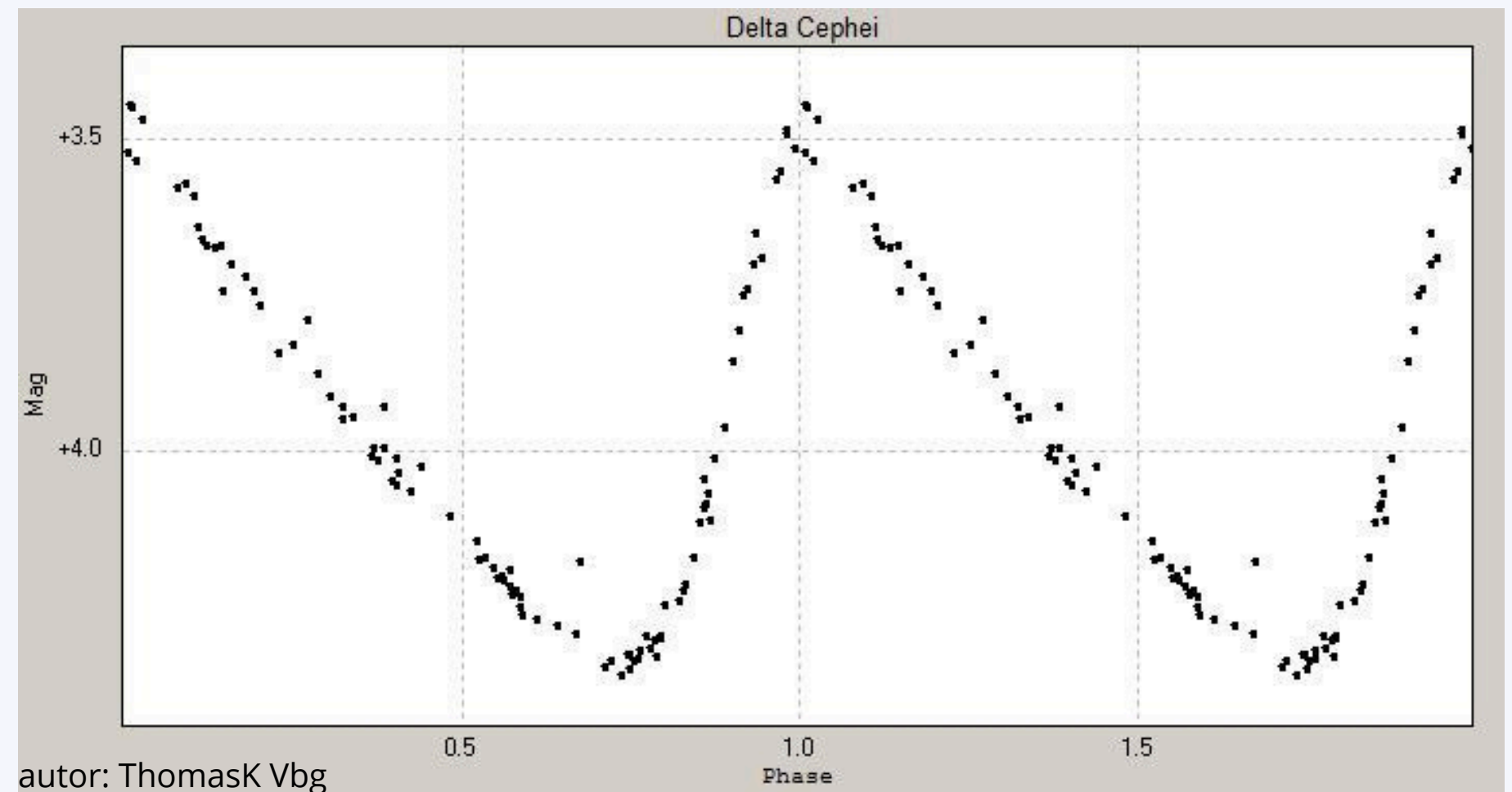
A spherical grouping of gravitationally bound stars. They are among the oldest components of the galaxy, their age is estimated to be between a few and several billion years.

Compared to their age, the period of star formation inside clusters is short.



Classical Cepheids

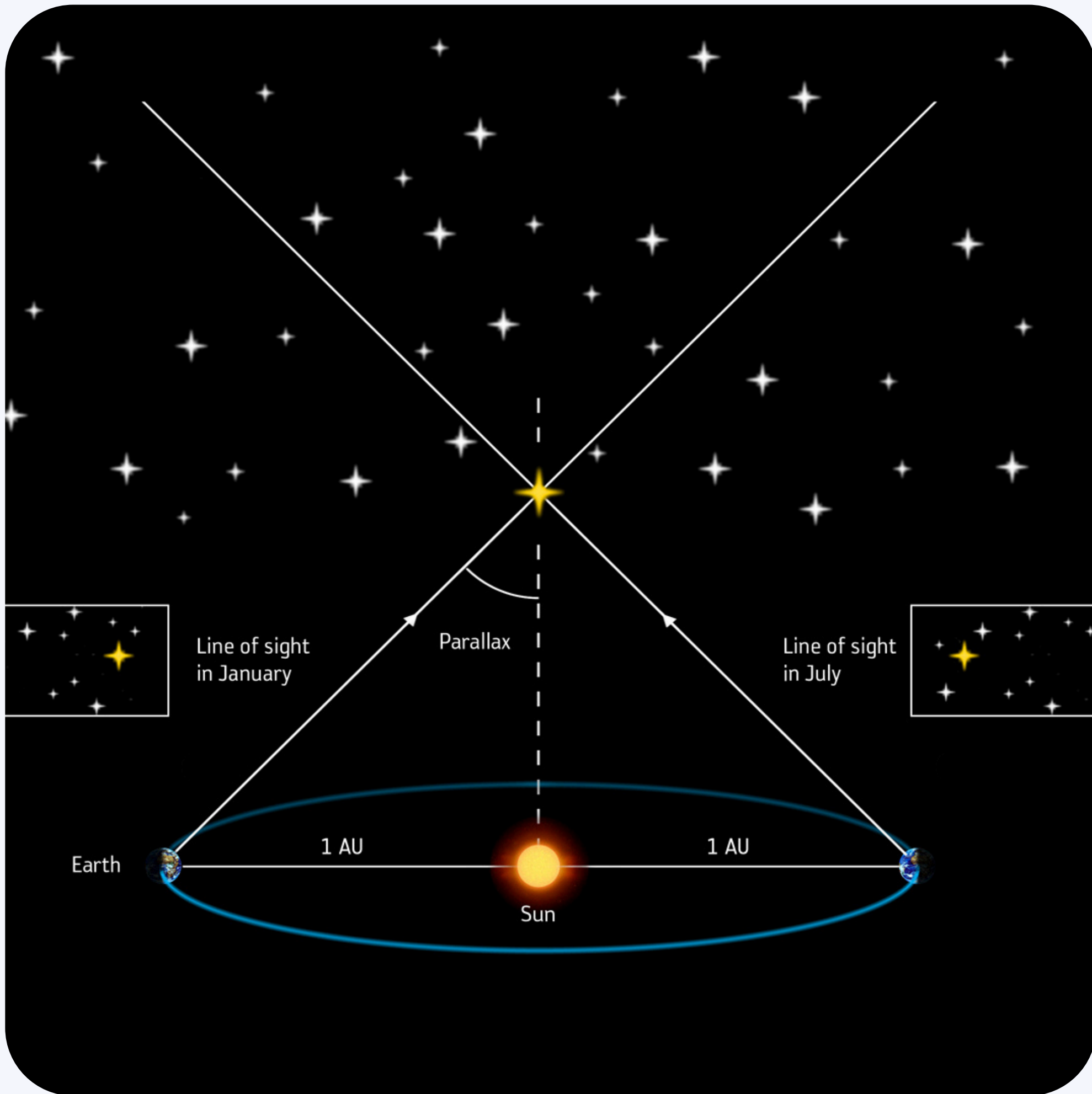
Pulsating variable stars, classified as giants. These stars are young stars of the 1st population. They change their brightness due to changes in the surface temperature. All known classical cepheids are younger than a billion years.



The age of the clusters was determined by a review of the literature.

Star based on the metallicity and location in Milky Way

| Star | Age (mln years) | Cluster | Age (mln years) |
|-------------------------|----------------------------|------------------|----------------------------|
| OGLE-BLG-CEP-034 | 459.97 | NGC 6355 | 13200 |
| OGLE-BLG-CEP-068 | 547.60 | Pal 6 | 12400 |
| OGLE-BLG-CEP-098 | 359.51 | NGC 6569 | 12800 |
| OGLE-GD-CEP-1244 | 70.59 | GLIMPSE01 | 400 |



| Star | Parallax | Distance (kpc) |
|-------------------------|-------------|-------------------------------------|
| OGLE-BLG-CEP-034 | 0.15 | 6.73 ± 2.97 |
| OGLE-BLG-CEP-068 | 0.19 | 5.20 ± 8.02 |
| OGLE-BLG-CEP-098 | 0.06 | 17.66 ± 20.69 |
| OGLE-BLG-CEP-098 | 0.15 | 6.51 ± 3.87 |

Parallax enables astronomers to measure the distances of far away stars by using trigonometry. (Image credit: ESA)

$$d = 10^{0.2(m-M+5-Av)}$$

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**m is the magnitude.
This quantity is observed in
different ranges of light by
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**M magnitude absolute.
It describes what brightness an
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Thanks to the repetitive period
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$$d = 10^{0.2(m - M + 5 - A_v)}$$

**m is the magnitude.
This quantity is observed in
different ranges of light by
telescopes.**

**A_v is the extinction.
This value defines how
many dust is between earth
and star.**

**M magnitude absolute.
It describes what brightness an
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Distances

Average distances in kpc

OGLE-BLG-CEP-034

11.37 ± 0.57

11.34 ± 0.85

OGLE-BLG-CEP-068

11.97 ± 0.37

11.96 ± 0.22

OGLE-BLG-CEP-098

21.52 ± 0.74



21.52 ± 0.09

OGLE-GD-CEP-1244

Distances to globular clusters

Based on the
literature review

| Cluster | Source | Distance (kpc) |
|------------------|----------------------------|----------------|
| NGC 6355 | Gaia DR3 | 8.66 |
| | Harris 1996 (2010 edition) | 9.2 |
| Pal 6 | Gaia DR3 | 7.05 |
| | Harris 1996 (2010 edition) | 5.8 |
| NGC 6569 | Gaia DR3 | 8.92 |
| | Harris 1996 (2010 edition) | 10.53 |
| GLIMPSE01 | Harris 1996 (2010 edition) | 4.2 |

| Star and cluster | Distance to the star (kpc) | Distance to the cluster (kpc) | Is it inside? |
|-------------------------------|----------------------------|-------------------------------|---|
| OGLE-BLG-CEP-034 NGC 6355 | 11.34 ± 0.85 | 8.66 | work in progrss |
| OGLE-BLG-CEP-068 Pal 6 | 11.96 ± 0.22 | 7.05 |  |
| OGLE-BLG-CEP-098 NGC 6569 | 21.52 ± 0.09 | 8.92 |  |
| OGLE-GD-CEP-1244 GLIMPSE01 | | 4.2 | work in progrss |

Conclusions

The fact that these stars are not in globular clusters is consistent with current models.

A night sky with the Milky Way galaxy visible, set against a dark background with a silhouette of a forest and water in the foreground.

**Thank you for your
attention**

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