computers, are abundant today. But given the brightness of T CrB in eruption, even an amateur astronomer using a pair of binoculars, just like Gunnar Larsson-Leander did, can contribute useful photometry in aid of unravelling the nature of T CrB.

Acknowledgements

I wish to acknowledge the on-going and rewarding discussions about the history of astronomy with my colleague Johan Kärnfelt, as well as the kind help provided by Eva Jurlander, librarian at the Lund Observatory, and the staff at the Center for the History of Science at the Royal Swedish Academy of Sciences, Stockholm. This work was supported by the Swedish Research Council, grant number 2022-01940.

References

(1) J. B. Hearnshaw, *The Analysis of Starlight: One Hundred and Fifty Years of Astronomical Spectroscopy* (Cambridge University Press), 1986.
(2) W. Huggins, *MNRAS*, **26**, 275, 1866.
(3) B. E. Schaefer, *MNRAS*, **524**, 2, 2023.
(4) K. Johannisson, *Det Mätbara Samhället: Statistik och Samhällsdröm i 1700-Talets Europa* (Norstedt), 1988.
(5) S. Lindroth, *Kungl. Svenska Vetenskapsakademiens Historia 1739-1818. 1:1, Tiden intill Wargentins Död (1783)* (Kungl. Vetenskapsakademien), 1967.
(6) G. Hoppe *et al.*, *Till Landets Gagn: Knut och Alice Wallenbergs Stiftelse 1917–1992* (Knut och Alice Wallenbergs Stiftelse), 1993.
(7) G. Holmberg, *Reaching for the Stars: Studies in the History of Swedish Stellar and Nebular Astronomy, 1860–1940* (History of Science and Ideas Department, Lund University), 1999.
(8) G. Larsson-Leander, *Arkiv För Matematik, Astronomi och Fysik*, **34 B**, 1, 1947.

WHO NAMED THE STARS OF THE PLEIADES?

By Ian Ridpath

Member, IAU Working Group on Star Names
48 Otho Court, Brentford, TW8 8PY, UK
ian@ianridpath.com

The IAU recognizes official names for nine members of the Pleiades cluster. Those names come from ancient Greek mythology but were not allocated to specific stars until post-telescopic times when their positions could be accurately determined. Who first applied them?

Taurus is a grand constellation blessed with two of the finest naked-eye clusters in the sky, the Hyades [Ὑάδες in Greek] and Pleiades [Πλειάδες], named after two groups of nymphs from Greek mythology. The Hyades cluster is much the older of the pair, with an age of around 600 million years as against ≈ 100 million years for the Pleiades. Hence its stars have had longer to drift apart and are easier to see individually.

Ptolemy listed five individual members of the Hyades in his star catalogue in the *Almagest* compiled around AD 150, but in the case of the smaller and denser Pleiades he was less specific. Ptolemy's entry on the Pleiades referred to "the northern end of the advance side",

"the southern end of the advance side", and "the rearmost and narrowest end", which suggests he was outlining the shape and extent of the cluster rather than attempting to list individual stars.[1]

Only with the invention of the telescope did it became possible to identify individual members of the Pleiades cluster with any certainty. Galileo published a sketch showing six naked-eye stars and 30 fainter ones in his book *Sidereus Nuncius* in 1610 (see Fig. 1), but he did not name them.[2]

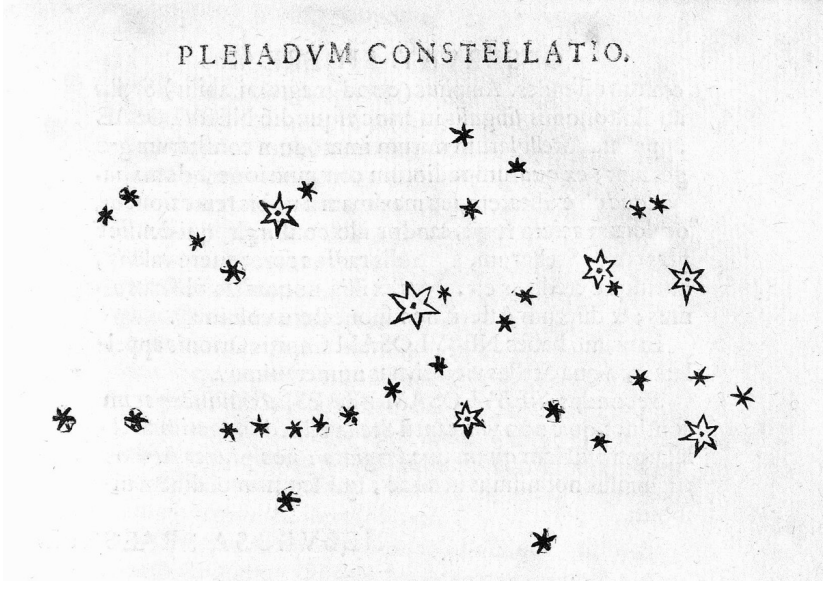


Fig. 1

Galileo's sketch of the Pleiades from his book *Sidereus Nuncius* of 1610. The six brightest stars, depicted with larger symbols, are: Atlas (upper left), Alcyone (the brightest and hence the largest symbol of all), Merope (lower left), Maia (upper centre), Taygeta (upper right), and Electra (lower right). In Galileo's time, however, none of the individual stars had yet been named.

Nowadays we have names for nine stars of the Pleiades: the seven nymphs themselves and two other stars named after their parents, Atlas and Pleione. Although the names are taken from Greek mythology, their application to the individual members of the cluster dates from some time after Galileo. So who named them?

Riccioli, Langrenus, and Mutus

Even the great constellation historian R. H. Allen expressed uncertainty as to the answer in his classic book *Star Names*[3], but the available evidence suggests that the credit is jointly due to three men: the Italian astronomer Giovanni Battista Riccioli (1598–1671); the Mallorcan astronomer Vicente Mut (1614–87), aka Mutus; and the Dutch astronomer Michael van Langren (1598–1675), also known as Langrenus.

The first recorded use of names for any of the Pleiades is found in Riccioli's massive textbook *Almagestum Novum* ('New Almagest') of 1651. In that he wrote that Maia was "the most brilliant in the quadrilateral", *i.e.*, the shape formed by the four brightest members of the cluster.[4] The other three stars in the quadrilateral he named as Sterope, Taygeta, and

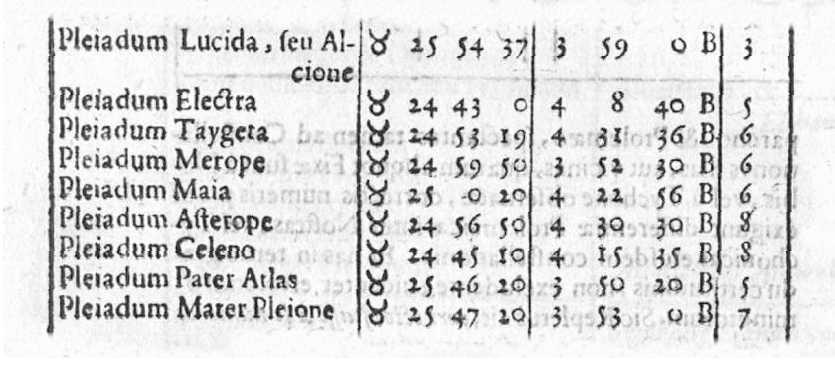
Celeno. Whether those attributions were his idea or someone else's he did not say, but either way they did not last. He renamed those stars in his next book, *Astronomia Reformata*, with the identifications we know today.

Names for two other related stars were also announced in *Almagestum Novum*, and in that case the names did stick. In 1647 July Langrenus had sent Riccioli a diagram of the Pleiades as seen through his telescope on which, Riccioli tells us, he added two stars "which he himself calls Atlas and Pleione".[4] That statement makes clear that it was Langrenus who named the stars representing the parents of the Pleiades. Unfortunately, Riccioli did not reproduce Langrenus's diagram so we cannot tell if he applied names to the other members of the cluster as well.

In 1650 March, just as Riccioli was finishing the *Almagestum Novum*, he received from Mutus a list of latitudes, longitudes, and magnitudes of the seven main members of the Pleiades, which he included in an appendix at the end of the book.* No names for those stars were given in that table; instead they are simply described by their position in the group, such as "Pleiadum occidentalis lucidior", "Media & Lucida Pleiadum", and so on (ref. 4, p. 747). A full set of names would have to await Riccioli's next book 14 years later, and that letter from Mutus turned out to play a significant role.

The final list

Riccioli's follow-up to *Almagestum Novum* was called *Astronomia Reformata* (*Astronomy Reformed*), published in 1665. It is there that we find the now-familiar names of the seven Pleiades, plus their parents, contained in a catalogue of star positions for the year 1700 (see Fig. 2). That star catalogue actually appears twice, once in Book IV and again in a set of tables at the end.[5]



Pleiadum Lucida, seu Alcione	♉	25	54	37	3	59	0 B	3
Pleiadum Electra	♉	24	43	0	4	8	40 B	5
Pleiadum Taygeta	♉	24	53	19	4	31	36 B	6
Pleiadum Merope	♉	24	59	50	3	52	30 B	6
Pleiadum Maia	♉	25	0	20	4	22	56 B	6
Pleiadum Asterope	♉	24	56	50	4	30	30 B	8
Pleiadum Celeno	♉	24	45	10	4	15	35 B	8
Pleiadum Pater Atlas	♉	25	46	20	3	50	20 B	5
Pleiadum Mater Pleione	♉	25	47	20	3	53	0 B	7

Fig. 2

Names of the individual members of the Pleiades listed for the first time in G. B. Riccioli's *Astronomia Reformata* of 1665. Those names are still used today, with two minor changes of spelling: Alcione and Celeno are now written as Alcyone and Celaeno.

In *Astronomia Reformata* Riccioli quoted more extensively from Mutus's letter of 1650, and we discover that in that letter Mutus had referred to the individual stars of the Pleiades by name (ref. 5, pp. 243–4). For some reason Riccioli had not mentioned those names in the table published in *Almagestum Novum*, perhaps because they contradicted the ones he had

*Mutus and Riccioli were long-term collaborators, united by their anti-Copernicanism. Their original correspondence apparently no longer survives, but Riccioli quotes Mutus extensively in his books.

given earlier in the book. When Riccioli came to compile his star catalogue in *Astronomia Reformata* it seems that he adopted the names in Mutus's letter (abandoning his own early attempt), plus the two stars previously named by Langrenus.*

Although Riccioli was widely respected by other astronomers, the new names did not immediately catch on. Neither Johannes Hevelius nor John Flamsteed used them in their star catalogues of 1690 and 1725. But Johann Bode adopted all nine names in the catalogue that accompanied his *Uranographia* atlas of 1801[6], as did Giuseppe Piazzi in his *Palermo Catalogue* of 1814[7]. From then on they became firmly established, and were officially approved by the IAU Working Group on Star Names in 2016.

References

(1) G. J. Toomer, *Ptolemy's Almagest* (Duckworth), 1984, p. 363.
(2) G. Galilei, *Siderius Nuncius* (Tommaso Baglioni), 1610.
(3) R. H. Allen, *Star Names* (G. E. Stechert), 1899, p. 403.
(4) G. B. Riccioli, *Almagestum Novum* (Vittorio Benacci), 1651, p. 399.
(5) G. B. Riccioli, *Astronomia Reformata* (Vittorio Benacci), 1665, p. 349.
(6) J. E. Bode, *Allgemeine Beschreibung und Nachweisung der Gestirne* (self-published), 1801, p. 42.
(7) G. Piazzi, *Praecipuarum Stellarum Inerrantium* (Regia Typographia Militari), 1814, p. 23.

LONG-TERM OBSERVATIONS AND COMPREHENSIVE STUDY OF THE NEW DELTA SCUTI STAR TYC 4311-825-1

By [1]*A. Garrigós-Sánchez,* [2]*F. Sánchez-Bajo &* [3]*M. Jurado-Vargas*

[1]*Grup d'Estudis Astronòmics, Observatorio de L'Ametlla del Vallès, L'Ametlla del Vallès 08480, Spain*
[2]*Departamento de Física Aplicada, Escuela de Ingenierías Industriales, Universidad de Extremadura, Avda de Elvas s/n, Badajoz 06006, Spain*
[3]*Departamento de Física, Facultad de Ciencias, Universidad de Extremadura, Avda de Elvas s/n, Badajoz 06006, Spain*

In this work, we present the results of a photometric study of the star TYC 4311-825-1. Differential photometry measurements (in the Johnson–Cousins — B, V, Rc, Ic — system) have been obtained from observations carried out in the years 2004–2005, 2011, and 2020–2021 by using a 0·51-m telescope. Analysis of those data shows that the star pulsates with two frequencies of $12{\cdot}55\,\mathrm{d}^{-1}$ and $16{\cdot}03\,\mathrm{d}^{-1}$. Those frequencies correspond to radial-pulsation fundamental and first-overtone modes in agreement with a model of adiabatic oscillations ($\gamma = 5/3$). Information derived from *Gaia* DR3 data indicates that TYC 4311-825-1 is a main-sequence Population I star with $\log T_{\mathrm{eff}} = 3{\cdot}85$, $\log L/L_{\odot} = 1{\cdot}11$, and $M = 1{\cdot}68\,M_{\odot}$. Those data place the star in the δ Scuti instability strip.

*Mutus published a summary of his positional measurements of the Pleiades in one brief paragraph in his *Observationes motuum caelestium* of 1666 (pp. 51–2), but without giving any names for the stars. Hence Riccioli's catalogue is the only published source for those names.