

Variable Star Of The Month

January, 1999: Beta Persei (Algol)

Every month we will feature a special variable star in the AAVSO observing program.

BETA PERSEI

"...the Gorgon's head, a ghastly sight, deformed and dreadful, and a sight of woe".
- Homer, writing of Algol in the Iliad.



This is a PSPC image of a portion of the Perseus region of the sky. The image was taken by the [ROSAT](#) spacecraft and is courtesy of the Max Planck Institute.

A Look at Algol

Algol is one of the most popular and well known variable stars in the sky. One of the reasons for this is that it is a star which can be observed with the *unaided eye*. Another reason is because it has a relatively short period of less than three days. This means a new observer can go outside everynight and see a complete cycle of Algol in their first week of observing if the star is visible at night in their location.

Algol is an eclipsing binary star system 93 light-years away as determined by the Hipparcos satellite. The main star is a B8 main-sequence star 3 times as large as our sun and the secondary star is a K2-type subgiant. Together they rotate around each other. As seen from Earth, when one star blocks our view of the other star its overall brightness changes. There is a very faint third star in the system. It is an F1 main-sequence star orbiting the inner pair every 1.86 years.

Algol's variability was discovered in 1667 by the Italian astronomer Geminiano Montanari making it one of the first ever non-nova variable stars discovered. John Goodricke of England is credited with the discovery of Algol's periodicity in 1782-83. It was apparently also independently discovered by a German farmer named Palitzsch. At first it was believed that a planet was causing the eclipses. In 1881 astronomers theorized it was actually an eclipsing binary system based on evidence presented by Edward Pickering, the Director of the [Harvard College Observatory \(HCO\)](#). In 1889 this theory was proven through spectrographic analysis by H.C. Vogel at Potsdam.



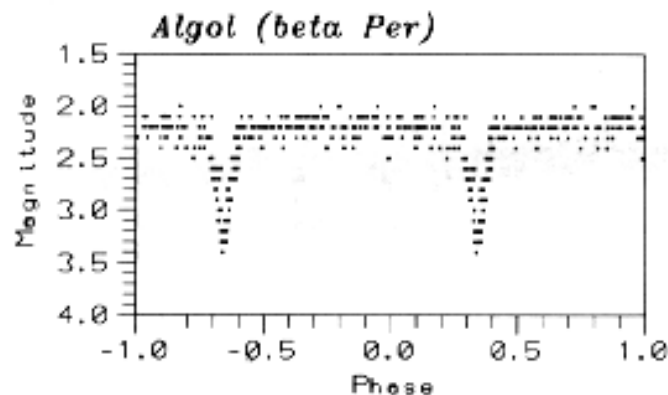
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"The Demon Star"

Human history has not been kind to this star. Homer wrote of Algol in the Iliad: "...the Gorgon's head, a ghastly sight, deformed and dreadful, and a sight of woe". Some common names for Algol are The Demon, the Demon Star, the Blinking Demon, the Ghoul, and the Spectre's Head. Sounds rather more like members of a hard rock goth band than a beautiful astronomical object. The earliest known maligning of this star is from the Arabian name Ri'B al Ohill, the Demon's Head. We also have Al Ghul meaning Mischief-maker. In Hebrew it is called Rosh ha Sitan, Satan's Head, and also Lilith, Adam's legendary demonic first wife (predecessor to Eve) according to Babylonian myth. 17th century maps referred to it as Caput Larvae, a translation of "The Spectre's Head". The Chinese referred to it as Tseih She, the Piled-up Corpses. Even astrologers refer to it as the worst star in the heavens to be involved with. More recently, the name Algol has been given to a violent video game. What does a star have to do to get respect?

"The Algol Paradox"

One way is to excite scientists. Despite its popularity and the attention focused on Algol, it still is not fully understood and has a few surprises for researchers. Recently, "The Algol Paradox" is a term that has been used to describe a discrepancy in our theories of stellar evolution. The primary star should expand first due to its greater mass, yet we find that the secondary is the older star in the Algol system. Many theories abound about how this can be. The most popular is that the secondary star is indeed older than the primary. It is only smaller because it dumped a lot of its mass onto the younger star, making it more massive and subsequently to look beyond it's years.



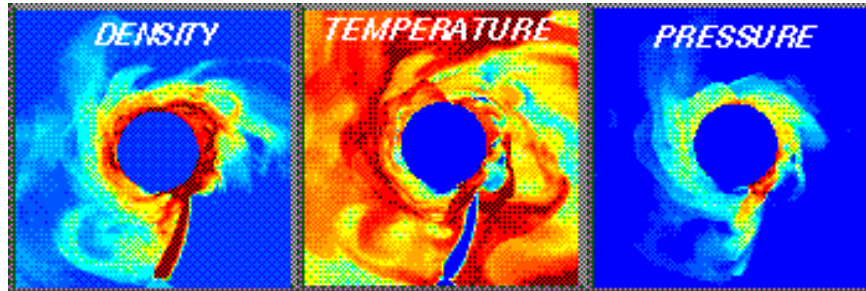
The above light curve is based upon observations of Algol made and submitted by John Isles. It is printed in Chapter 11 of the [Hands-On Astrophysics](#) manual.

More Info

The text below was written by Dr. John R. Percy, former AAVSO president, and Dr. Janet A. Mattei, AAVSO director. It was originally published in the Royal Astronomical Society of Canada Observer's Handbook in 1995.

Algol (β Persei) is the bright eclipsing binary with deep eclipses. It is also the brightest and closest *semi-detached* binary, a type of binary system in which one component has filled its *Roche lobe* (the volume within which gas is gravitationally bound to the star) and is now transferring material to its companion.

Algol varies in V magnitude from 2.1 at maximum to 3.4 at primary minimum, with a period of 2.867315 days; this period, however, is slowly lengthening. The primary eclipse occurs when the fainter K2IV star passes in front of the brighter B8V star, and lasts for some 10 hours in total. Because the eclipse is partial, the minimum is not flat, but rounded. There is also a shallow secondary eclipse when the B8V star passes in front of the K2IV star. It can only be detected photoelectrically. The primary eclipse, however, can easily be detected with the unaided eye, and the magnitude and the time of minimum can be measured.



[These images reflect modelled theories of the circumstellar flow of Algol. Results were published in the *The Astrophysical Journal*, 1995, **445**, 889. The authors are John M. Blondin, Mercedes T. Richards & Michael L. Malinowski.](#)

For More Information

- [aa Scale Observing Chart for Algol](#)
- [Predicted Minima For Algol 1999-2000](#)
- [Animated simulation of Algol's hydrodynamic mass transfer \(900K MPEG\)](#)
- [X-ray version of image at top of page](#)
- [AAVSO Eclipsing Binary Committee](#)
- ["Algol, in astronomy" by The Columbia Encyclopedia, Sixth Edition for Barnaby Online.](#)
- ["Eclipsing Binary Stars" by Encyclopedia Britannica.](#)
- ["Binary and Multiple Stars" by Dewey B. Larson for The Universe In Motion.](#)
- ["Companions to Stars: Binaries, Multiples, and Possible Planetary Systems" by William K. Hartmann and Chris Impey for Astronomy: The Cosmic Journey.](#)
- ["Algol" by Anne Wright for The Fixed Stars.](#)
- Burnham, Robert Jr. [Burnham's Celestial Handbook: Volume Three](#). General Publishing Company, Toronto. 1978.

For more information on observing eclipsing binaries contact the AAVSO Eclipsing Binary Committee Chairperson Marvin Baldwin (mbaldwin00@hsonline.net).

This month's Variable Star of the Month was prepared by Aaron Price.

- [Variable Star of the Month Archive](#)

