

### Offered Title: Variable Stars

Many, if not most stars fluctuate. No, this isn't a joke about being a ball of hot gas. Even our Sun does it to a relatively small degree.

This week's article is about variable stars, or maybe it should be about how most stars are variable. Seems to me just having a category called variable makes them sound unique or different. They are not. Even though variable stars are not unusual they are interesting.

First things first, what varies and what makes it vary?

The base aspect of a variable star is change in apparent brightness. The causes include changing size, heat, radiation, and spectrum. Some event precipitates the change and is categorized as intrinsic or extrinsic.

An intrinsic event is usually a core contraction and expansion (pulse) causing the star's size to slowly increase and decrease, producing either radial (symmetrical) or non-radial (unsymmetrical) variations. The pulsations can even be complex, having harmonics that produce rapid variations. The cause of core fluctuation is often unbalanced gravity vs. energy production...pull and push. Pulsation is also caused by uneven mass distribution, with periodic eruptive outbursts of energy. The mac-daddy event is a cataclysm if the pulsating star goes nova or supernova. No more variable star. There are many, many classes of intrinsic variable stars based on the mechanism involved, such as Cepheid, RR Lyrae, Mira, Long Period, SX Phoenicis, ... etc.

An extrinsic event is usually a body, such as another star in orbit around the star, that passes between the star and we observers on Earth. These are called eclipsing binaries. Apparent brightness changes as one star eclipses the other. Rotating stars with large dark spots can show variability in apparent brightness. Non-spherical stars such as very close binary stars are more egg shaped, and as they rotate, larger and smaller surfaces are presented, changing their apparent brightness. Single, rapidly rotating stars are also non-spherical and can have brightness variability. Stars with large planets whose orbits cause them to pass in-between the star and us can show variability. The classes of extrinsic variable stars include Beta Lyrae variables, Algol variables, Ellipsoidal variables.

Maybe the first variable star discovered was Algol in the constellation Perseus, documented on an Egyptian calendar 3,200 years ago. It's a three-star system with two of the stars eclipsing each other, and has a period of 2.86 days. The apparent brightness change is from magnitude 2.1 to magnitude 3.4 and back.

I've wondered how astronomers of ancient times caught variable stars in the act of dimming and brightening. It's generally subtle and occurs over a longish timescale. I guess they didn't have many distractions.

### What's in the Sky?

The great thing about observing variable stars is you don't need equipment to observe them. You just need to know where to look, keep a log of its apparent brightness, and repeat until it has gone through a cycle. Try Algol, look it up and check it out.