EGG-SHAPED STAR

With the aid of trick photography take a mental ride out into space to have an imaginary look at the largest known star, Mira. Mira is egg-shaped, according to a new hypothesis. As it rotates an observer on earth sees it first broadside, as at the left. Then Mira's light is nearly as bright as the brightest star in the Big Dipper. As it turns the observer then sees it end on as at the right and its brightness dims greatly. Science Service Photographer Fremont Davis made the above montage by taking pictures of common eggs and superimposed his negative on that of a typical picture of the sky as seen with a large telescope.

ASTRONOMY

Mystery Star's Light Varies Because of Hidden Companion

Dark Attendant on Largest Known Star, Mira, May Raise Tides That Are 30,000,000 Miles in Height

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MIRA, the largest star known to astronomers, 125,000,000 times as large as the sun but only ten times as heavy, is still one of the most mysterious of all although its existence has been known since Fabricius of Holland discovered it on August 16, 1596.

The reason is that Mira is a variable star which, every 331.6 days on the average, changes in brightness some 600 fold. At times Mira is as bright as the brightest star of the Big Dipper. At its faintest it cannot be seen without a telescope.

How Mira can undergo any internal disturbance which would make its brightness change by a factor of 600 every 331 days is impossible to conceive. In a recent number of the *Journal of The Royal Astronomical Society of Canada* the writer has given an explanation of this baffling periodic light variation in terms of a dark, smaller, and invisible companion star of Mira which agrees well with observational facts.

While the companion has not been seen one can picture it linked to Mira in orbital motion. The effects of gravity of this companion star would raise enormous tides on Mira that would make it an egg-shaped body. When seen end on from the earth egg-shaped Mira would be faint. When viewed broadside Mira would be at its brightest.

Spectroscopic observations show that at its maximum brilliance the star, or its atmosphere, is receding from the earth and at minimum the star is approaching. To account for this motion a tidal wave on Mira 30,000,000 to 40,000,000 miles high would be required. This may seem enormous but is really less than a tenth of the star's diameter of 432,000,000 miles.

By Kepler's third law and the law of the conservation of momentum it is possible to calculate the velocity and mass of Mira's dark companion. The companion star turns out to be about 73 times as massive as the planet Jupiter, and Mira itself is about 81 times as massive as its companion.

It seems certain that the period of Mira in its orbit is just twice the period of the swings in brilliance of its light. This makes the orbital period 633.2 days and would produce two maxima and two minima in light intensity in one orbital period.

Astronomers now have observations for the last 14 maxima of Mira. On examining these it is found that on seven occasions the star was moving toward the earth in its orbit and the other seven times was moving away in strict agreement with the 633 day period.

While Mira's maximum brightness comes, on the average, every 331 days, there is a variation of 15 days either way. How this can occur is one of the most difficult things of all to explain.

It is probable that the center of gravity of Mira is not a fixed point within the star, but keeps shifting with the position and height of the tide on its surface. It can be easily shown that the tide on Mira nearest its dark companion is great compared with the tide on the far side of Mira.

Because Mira is not rigid, but a tenuous and mobile body, its center of gravity is continually displaced toward the side of the highest tide. This steady displacement would continually change the distance between Mira and its companion. The effect of this is that the period of motion of Mira and its companion would not be constant but would vary within small limits.

There are some 1,100 long-period variable stars known to astronomy. If this explanation of the variability of Mira is accepted it will hold also for these other stars which show like velocity and light changes.