GOLDILOCKS IN THE DUMBBELL NEBULA

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The Dumbbell Nebula (M27) is one of my favorite nebulae. I've taken many pictures of it over the years. I like to joke to my friends that it is named after me—the dumbbell. One night back in September, I invited my freshman seminar astronomy class out to my house to show them how to do some astrophotography. Eight students came. We took some snapshots of stars and stuff and then I suggested that we take a sequence of pictures of M27. So, for the next few hours, that's what my telescope and camera did while my students and I had some tea and brownies in the house and talked about astronomy.

The resulting picture came out pretty good—almost as nice as one I took two years earlier with the same telescope and camera. So, I thought it would be fun to combine the two pictures into one thereby achieving a picture with a longer total exposure time. Of course, the first step in this process is to load both pictures into a stacking program and then align the images. In the alignment process, I flipped back and forth between the two images a few times and I noticed that a fairly prominent star in the 2016 image was totally missing from the 2018 image. This caught me completely by surprise. I'd never seen a star totally disappear like that before.

I uploaded the star-showing picture to astrometry.net to get an astrometrically annotated fits-file version of the picture that I was then able to load into my computer planetarium program, Cartes du Ciel (aka Star Charts), and then determine the right ascension (RA) and declination (Dec) of the star of interest. Next, I visited the Simbad website and entered these coordinates. Simbad told me that the star is a known Mira-type variable star and provided links to further information about this star.

Interestingly, this variable star in M27 was discovered only about thirty years ago by another amateur astronomer, Leos Ondra.

Prior to my "(re)discovery", I was completely unfamiliar with Mira type variable stars. I have over the years had an interest in globular clusters and the RR-Lyrae variable stars contained therein. These variable stars are noticeably blue, they have a period that's typically shorter than a day, and they vary in brightness by only a modest amount. Mira variables, on the other hand, are red giants with long periods (on the order of a year) and dramatic dips in brightness, generally a few orders of magnitude. It is this last property that surprised me the most. It means that a Mira variable star can seemingly disappear and then return. Its brightness can vary that much! And, as shown below, this is exactly what we see in the pictures I took.

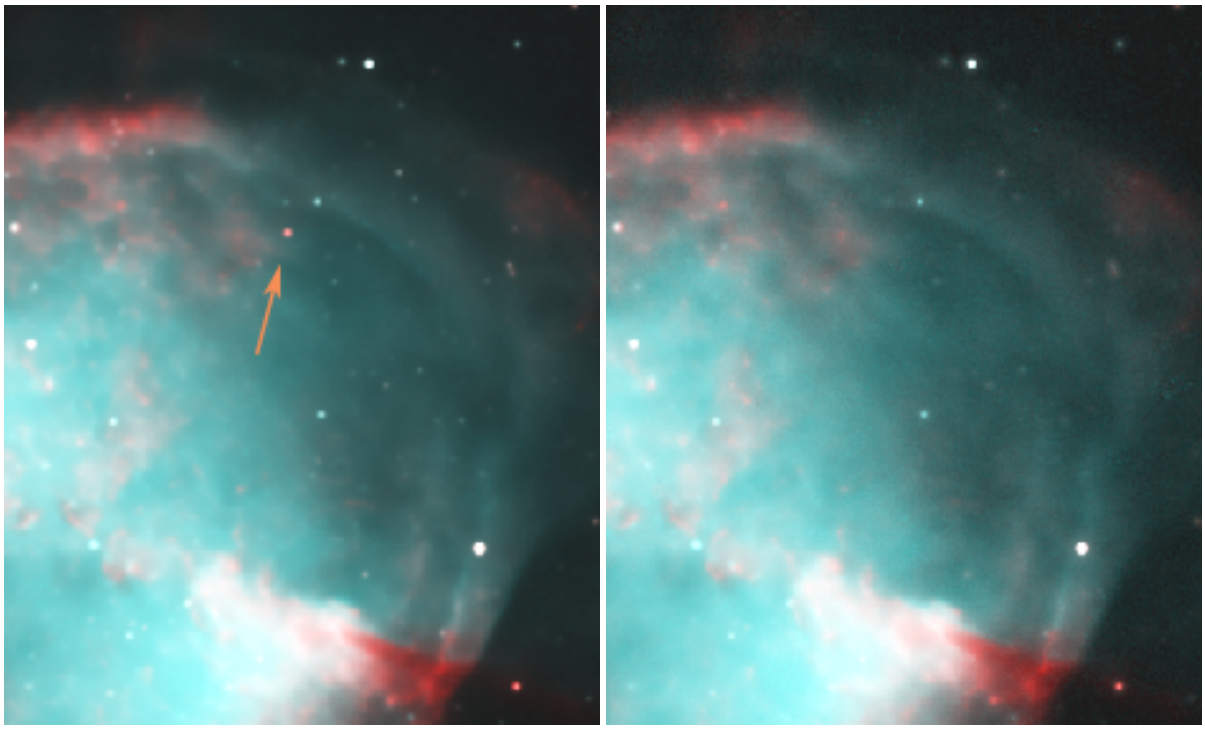
A few days after my discovery, I blinked the two pictures for my class. The students were amazed at how this star appeared and disappeared.

One final note... In blinking the two pictures, I also noticed that there's a second Mira variable star in this field of view. It's over toward the upper left side. This star is dim, but not absent, in the 2016 picture and it is significantly brighter in the 2018 picture.

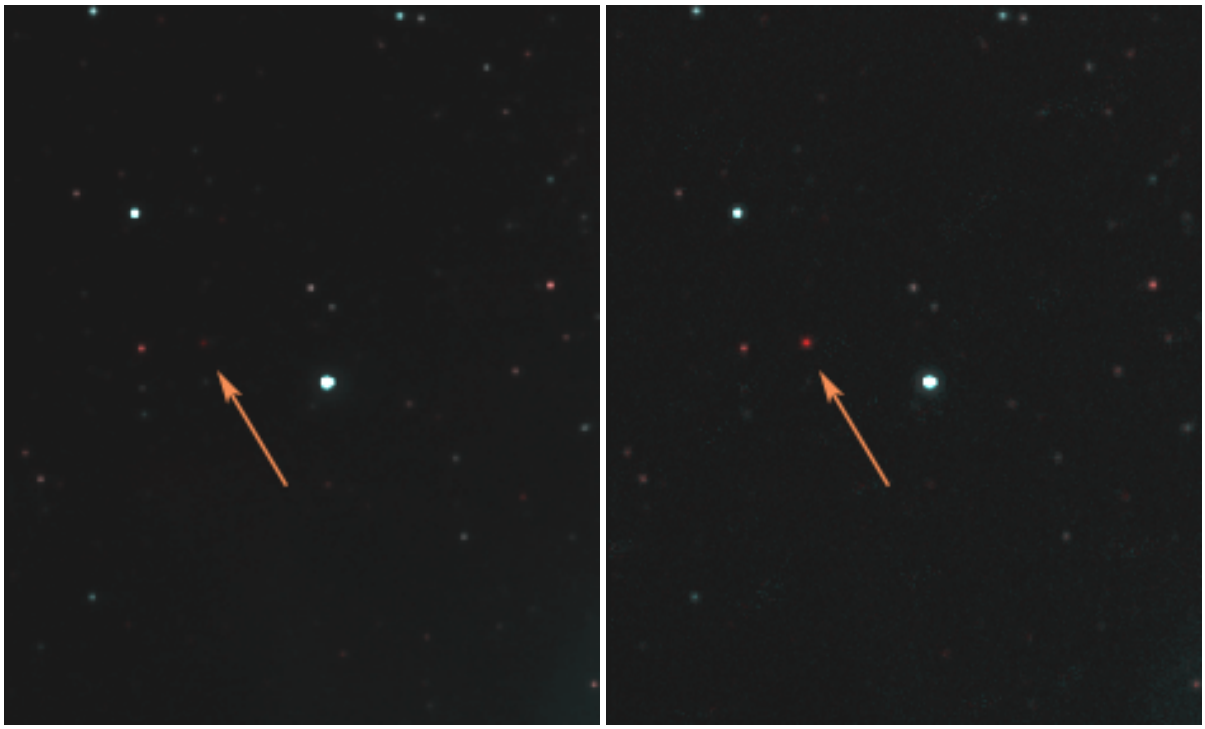
PS. I'm a mathematician by training and so I like variables of all kinds, including variable stars.

Picture of the Dumbbell Nebula taken August 4, 2016. Image taken by the author.

Picture of the Dumbbell Nebula taken October 1, 2018. Image taken by the author.



Cropped close up showing Goldilocks.



Cropped close up of a second Mira variable located near upper left part of original picture.