

A Split in Time

By Rik Hill

At the Riverside Telescope Makers Conference in 1983 Celestron brought a number of instruments that had experimental paint jobs done to them. A friend was the representative for Celestron and after he told me the prices for these I found testing them irresistible. I tested all six that were there. They were all optically good as every undamaged C8 I have ever tested has been (and that's been quite a few!). One stood out as a bit better than all of them. I borrowed a ronchi eyepiece and found that it had a focal plane that was good to better than 1/8 wave.

I wanted it. After a bit of haggling the telescope was mine. As soon as I got this home I motorized the declination control and the focus so my hands could stay off the telescope when observing.

Then, Christmas 1983, my wife gave me a used B&L microscope micrometer that I saw in a local telescope shop. I quickly adapted this to telescope use with the installation of small lights inside and an adaptor with a position angle wheel that all fit into the 1.25" eyepiece holder. This was tested with a number of barlows and eventually one particular barlow was selected to be used between the diagonal and micrometer and between the diagonal and telescope. Drift tests were done, as outlined in Aitken's still excellent treatise *BINARY STARS*. Over 100 drifts at each of the three magnifications (one with no barlow and then the two barlow positions) were taken over a number of nights. These gave very accurate determinations of a turn of the micrometer barrel. In the daylight sky the exit pupil was measured for each magnification and that was divided into the diameter of the telescope (in the same units) yielding the magnifications of: 242x, 597x and 847x.

My observing site in the 1980s was in mid-town Tucson. Now while this is not particularly good for transparency, it was apparently very good for seeing as I got 3-5 sub-arc-second nights per month. I have since learned that the reason for this was that in "mid-town" you are out in the desert flats, far away from the mountains. The air can become very stable with little vertical variation in temperature after sunset. I would help the situation along by watering the lawn and garden that surrounded the observatory and using a sprinkler hose that had been wound around on the roof of my roll off roof observatory, I would also wet down the building. All this watering carried off a lot of daytime heat, especially in summer.

Thus my micrometer double star measures began in October of 1984, the same month my daughter was born. The first star measured was Ras Algethi, or Alph Herc. One of the earliest stars measured was Gamma Andromeda. It is fascinating to see how many nights were good enough to use the higher two magnifications. I have since moved nearer the mountains, and learned the lesson of the good seeing in the 'flats'.

On the night of Oct. 13/14, 1985 I gave a talk on double stars and telescopic resolution to the local astronomy club. I told them of the quality of the C8, the frequency of good nights that I enjoyed at my site and the magnifications used with my micrometer. Stars as close as 0.4" had been 'detected' (not 'split') using this equipment at this site. When they heard of the seeing, in the 'city' no less, and magnifications of 597x and 847x they all scoffed being properly schooled in the low power, faint fuzzy objects school. I took this derision as a challenge. With an approving nod from my wife I invited the entire club to our house for an observing session immediately after the meeting.

We rushed home after the meeting and while my wife got snacks and drinks ready for however many would arrive, I prepared the observatory and grounds. I took an awful chance that the seeing would be good, but in that it was fall (our best season for good seeing) and had been clear for a few nights, I felt reasonably confident at the outcome.

People began arriving shortly after we arrived and soon we had a full house. The snacks and drinks were ignored. All expected to see me 'eat crow' on my claims. This was a premature expectation. The night had cooperated beautifully and the seeing was rock solid. Altair showed a splendid disk with three diffraction

rings at 597x. 1 Aretis was easily split at 597x but at 2.8" it should have been. Both components were perfect diffraction images. Everyone was impressed with the seeing but wanted to really test the sky. So next I took the telescope to Gamma Andromeda at 597x. The A-B split was, of course, no challenge but all enjoyed the colors. Even for someone like me, nearly color blind in the night sky, the colors were stark. The images were still perfectly steady calling for the jump to 847x and a go at the B-C split. The A component was gold and the B-C pair was a powder blue. They were not cleanly split but rather a 'figure-8'. In Cou-teau's book, OBSERVING VISUAL DOUBLE STARS, he describes a technique of using such an observation of the combined diffraction images to infer a separation. Indeed, he says, "Experience shows that the best micrometer is the diffraction image itself." Using his technique this 'figure-8' would imply a separation 85-90% of the distance expressed as a function of the radius of the Airy Disk (to the first dark ring) of $12/D$ where D is the aperture in centimeters or in this case, 0.59". That separation here would be 0.50-0.53", in fair agreement with measures of 0.3, and 0.5 in 1925 and 1997 respectively. Now this began to impress them.

This was not enough. The night was perfect for such tests. The sky was as steady as if there were no atmosphere. Everyone enjoyed studying perfect diffraction images so easily seen at this high magnification. After looking through my binary star observing card file I came across 31 Tau. In 1937 the separation between the 6.4 & 6.5 mag. components was 0.3" and in 1960 it was 0.4. This made it a good challenge. It was seen as another figure-8 of 90% , not a flattened figure-8 at 85%. Recent observations make the separation to be 0.7 (1997) so this was probably pretty close to the mark.

After this it was time for snacks and drinks all around. Everyone went away a believer and it was Gamma And that did the trick. It was a night and view I will never forget.

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