

OBSERVATIONS OF GJJC 1 AND PEASE 1 WITH A 10-INCH MAKUTOV
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A friend of mine is fond of saying, "If it was easy, everybody'd do it." She retired at 35 with a self-made fortune of over a hundred million dollars. When she gives advice, I listen.

On June 22-23, 2001, I was at Fremont Peak, mostly to look at Mars. When I got tired of that I decided to look for GJJC 1 and Pease 1, planetary nebulae associated with M22 and M15 respectively. I seem to have been successful, and with relatively modest aperture, so I thought people might be interested in the details.

CIRCUMSTANCES OF OBSERVATIONS:

Equipment: Astro-Physics 10-inch f/14.6 Maksutov-Cassegrain, with the "small" (23 percent of diameter) central baffle, MaxBright diagonal, 8 mm Brandon and 6 mm Pentax SMC-ED orthoscopic eyepieces (464x and 618x), Orion "Ultrablock" narrow-band filter, used as described below.

Seeing: Looking at Mars made us much aware of seeing during the evening. It was episodic, with intervals a few tens of seconds to a minute long when little Martian surface detail showed, yet there were comparable intervals of much better conditions. During the latter, the diffraction pattern of a suitable star at similar elevation to Mars (and to M22 -- M15 was higher) showed the Airy disc continuously visible but mostly in motion, and the first diffraction ring continuously visible, always in motion, and mostly interrupted; that is, I could not see it as a continuous whole. I observed at 309x (12 mm Brandon) and used the brighter, closer pair of nu Sco for this test; it was well resolved, with much dark space between the two stars. Results with the planetaries were in intervals of good seeing; when seeing got bad, not only the planetaries but also many of the guide stars in the clusters, that I was using, simply disappeared. Except where explicitly stated, the notes that follow are based on moments of good seeing.

Sky conditions: Fremont Peak is not dark like the Sierra Nevada, but transparency was good, and the fog was in on the coastal plain, which much diminished local city lights. These cities have cut back their nighttime lighting considerably -- hurrah for the California power crisis! In any case, sky background brightness was not a factor in these observations, considering the magnifications used.

Aids to navigation: Some time ago, I downloaded the finder charts

and images that then existed on Doug Snyder's web site, the home page of which is <http://www.blackskies.com>. I checked that site while preparing this posting. Doug now has lots more stuff. I have no way to prepare and append graphics to this missive, so I will describe star-hopping and so on with reference to Doug's current images.

GJJC 1:

I started with GJJC 1 because M15 hadn't cleared the tree line. Doug has five images with increasing amounts of detail. The one with the bar 60 arc-seconds long is most useful for describing star-hopping. I found star "FC1" easily, as the west point of a right isosceles triangle whose other stars, about as bright as FC1, lie about 40" east and 60" northeast of FC1. These stars were easy with direct vision.

Centered about 60" toward position angle 100 degrees from the right-angle star of this triangle, is a star pattern I would describe as a narrow bow tie or butterfly. It comprises a skewed rectangle, about 10" by 50", with a star about as bright as FC1 at each corner, with the long axis running about in position angle 030/210, with a pair of fainter stars at the center. Star "V8" is about 100" east of the south end of the rectangle. V8 is one of an obvious quadrilateral of stars, about 30" high and wide. The other three stars (actually more) are a single star about 30" toward position angle 160 from V8, a tight group about 20" toward position angle 250 from V8, and another tight group about 30" toward position angle 225 from V8. All stars mentioned so far were easy with direct vision at 464x with no filter, and I could tell that the two tight groups were not single stars. The quadrilateral was very useful, for it established both scale and orientation at the eyepiece, and GJJC 1 is less than an arc-minute away.

Look now at the "tilted" image on Doug's pages, from a 1989 issue of Astrophysical Journal. The star whose disc is cut in two at the bottom corner of that image, is the southeast star of the quadrilateral just mentioned. Stretching about 25" toward position angle 50 from it, and including it, is a long, narrow kite or diamond shape of stars, whose long axis is in position angle 050/230. GJJC 1 is about 20" north of the northeast end of the diamond, and is the southernmost of a pair of "stars" (actually, both have companions) that lie some 10" apart on a north-south line. Another easily identified star in this area was about 30" toward 030 from GJJC 1; on the "tilted" image it appears as a bright star flanked by three fainter ones 120 degrees apart. I could see it with direct vision, and could tell it was not merely a single star.

The "cut-in-two-at-the-corner" star was easy with direct vision at

464x. The other three stars of the diamond were more difficult with direct vision, but easy with averted vision. There was no sign of GJJC 1 with direct vision, or of the star 10" north of it, but with averted vision, I occasionally saw stars at the correct positions for this pair -- sometimes one, sometimes two equally bright. The proportion of time at the eyepiece during which I could see stars at or near the position of GJJC 1 was no more than a few percent, but that proportion includes times of poor seeing; in good seeing I believe I would have seen the averted-vision stars in a much higher proportion of the time. In any case, with patience, the averted-vision observation was repeatable.

The two "stars" at or near GJJC 1's position were so hard to see that there was no hope of "blinking" the usual way, by interposing a filter between eyepiece and eye, so I took the star diagonal off the back of the telescope, attached my Orion Ultrablock to it, and put it back. Here I must give due credit to Scott Losmandy -- I use a G-11, which many consider too little mount for 40 pounds of OTA and fittings plus two 21-pound counterweights, but after all the fumbling with the filter, when I looked through the eyepiece again, the line of sight was within a few tens of arc seconds of where it had been before. Stellar images were much dimmer, but the stars of the quadrilateral were still detectable, so there was no issue of not knowing where to look.

In this configuration, during several minutes of observation, I several times saw a single star by averted vision at the position of GJJC 1 -- never two stars, always just one. The averted vision image was noticeably brighter, compared to the "blinked out" stellar images nearby, than had been the averted-vision images that I had seen without the Ultrablock in the optical path; that is, the image that I was seeing clearly had not had its brightness as much diminished by the filter as the other stars. (If it had, I probably would not have seen it at all.)

All averted-vision images appeared entirely stellar, at least in good seeing. There was no trace of anything I would call "nebosity".

The processed image on Doug's pages, with continuum removed, shows that GJJC 1 has a small, nearly stellar component that is quite bright in OIII. I believe that is what I saw. I think this is a reasonably convincing observation of GJJC 1, though it wasn't as much fun as if I could have pointed at something and said "Wow, there it is!" Instead, I had to make lengthy observations with two different configurations of the telescope, and then think carefully about what I had seen.

PEASE 1:

With ten inches of aperture, this planetary was harder to find, but much easier to see, than GJJC 1. I started with 464x. Again with reference to Doug's finder images, the boxed "trapezium" of stars on the first image was easy to see with direct vision, as were stars "C" and "D" on the second finder image. Then things got tough, because the background glow of unresolved stars was more obtrusive in M15 than in M22. The effect at the eyepiece was much as in the first finder image.

I made progress by noting that not quite 20" north of the center of M15 is a fairly linear east-west strew of ten or a dozen stars, about 20" long, many as bright as the "trapezium" stars. In Doug's second finder image, the discs of stars in this group range from clearly separated to touching. In the AP-10, hampered by background glow, these stars were difficult to see separately; the effect was rather that of a glowing east-west bar, divided in the middle. The stars were almost as blurred together as in Doug's first finder image.

Going to 618x much improved my ability to see detail in this region, but note that Pease 1 is on the eastern side of a mini-asterism of stars four or five arc-seconds across, all fainter than any in the "bar". Most the stars in this mini-asterism were at or below the limit of direct-vision visibility with the 10-inch, and their half-seen presence lent great confusion to my attempts to view the planetary.

Fortunately, Pease 1 was bright enough to "blink" obviously and immediately with the Ultrablock. I would view the area with averted vision, and see a diffuse glow which (with hindsight) was composed of the merged images of the stars in the asterism -- poorly resolved because I was using a part of my retina not sensitive to detail -- plus the planetary. When I slid the Ultrablock in between my eye and the eyepiece, most of the glow diminished greatly, but a slightly non-stellar patch in the correct position for Pease 1 remained bright. Blinking was immediate, obvious, and entirely repeatable.

CONCLUDING COMMENTS:

I mentioned what I was doing to a couple of people present, but no one was much interested in looking at the planetaries. Most of the local crew aren't as craz- er, enthusiastic, about deep-sky work as I am. Anyhow, it would be difficult to show these targets to a line of people. Each observer would have to spend much time comparing finder images to the eyepiece view, to determine where to look, and would then have to wait for good enough seeing to see the objects.

Without the excellent finder images on Doug's web site, I wouldn't

have had a ghost of a chance at finding either Pease 1 or GJJC 1. Furthermore, I cannot overemphasize the importance of good seeing in finding them -- without conditions that made stellar images small enough to see the Airy disc, I am sure that the star-like core of GJJC 1 would have been smeared out and undetectable, even with averted vision, and that the brighter and broader glow of Pease 1 would have merged in with the fuzzy images of nearby stars. I am sure that a lot of credit also goes to the high quality, excellent polish, and freedom from scattering of Astro-Physics's optics -- you can't see the corrector plate on the AP-10 even when you are shining a light on it, the secondary spot just seems to hang there in space.

I hope my remarks are encouraging and helpful to others who may try to view these faint planetary nebulae. It is probably true, that if it were easy, everybody would do it. Yet just because it's not easy doesn't mean it's not possible.