

## Summer small wonders

*Telescope:* **ATC82/1670** (oil doublet)

*Eyepieces:*

- PEX40** - ATC f40PEX, f=40mm, (42×, 86')
- A-16** - Zeiss ZAO-I 16, f=16mm, (104×, 27')
- A-10** - Zeiss ZAO-I 10, f=10mm, (167×, 17')
- A-6** - Zeiss ZAO-I 6, f=6mm, (278×, 10')
- XO5** - Pentax XO5, f=5.1mm, (327×, 8')
- XO2.5** - Pentax XO2.5, f=2.58mm, (647×, 4')

*Time:* June-August 2015

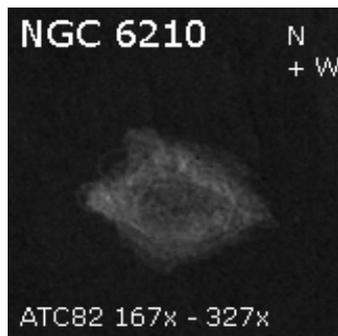
*Location:* Říčany and Ondřejov

*Mount:* Zeiss Ib and Fornax 50



This report is unusual as it combines several observations made during the hot summer of 2015. All four nights had in common the telescope – long oil doublet 82/1670mm of my own design, and the targets – small bright planetary nebulae. This tiny lens revealed an interesting level of details in all cases.

The first target was planetary nebula **NGC 6210** ( $V = 8.8$ ,  $48 \times 8''$ ) in Ophiuchus. The night of June 3 was not perfect, seeing was quite bad. Even in 82mm lens, I judged it to be of Pickering 5/10.



I could recognise the target among the other stars already at 42× thanks to its suspicious bluish-green tint. It was very tiny spot at 104×. The rounded shape was visible at 167×. There were even some first hints of a ring structure. Averted vision showed several tips or filaments but nothing for certain. The ring was nicely visible at 278×, especially, when I plugged in the OIII filter. The highest magnification I used that evening was 327×. It revealed a hint of a tip in the NEN direc-

tion from the northern vertex. The ring was not rounded anymore, it looked more like a diamond-shaped.

The night of July 2 was an average one with a good seeing and just a slight haze. The sky was bright thanks to the full Moon. This time I selected for a detailed study the famous *Blinking Planetary*, **NGC 6826** ( $V = 8.8$ ,  $27 \times 24''$ ) in Cygnus.

The nebula was still quite bright even at power of 647×. The central star was visible for all the time, there was no blinking effect at this power. The brighter part of the nebula was rounded with several irregularities. They were very hard to locate. There was no definite ring structure, only short and vague arcs here and there. The most prominent was on the northern edge. It formed a faint tip that I suspected at north-west edge. If NGC 6826 were a galaxy I would have thought it was its spiral arm.



Smaller magnification of  $327\times$  showed similar picture. There was one more faint, lobe-like extension on south-east side. I have noticed two faint stars in the vicinity of the nebula. The fainter was of visual brightness  $V = 13.1$ .

The night of July 10 was almost perfect. I was experiencing a rare combination of excellent seeing and excellent transparency. Even quite low at horizon, the view of **Saturn** was rock steady at  $104\times$ . I could see two brownish parallel belts north of equatorial zone. Higher magnification of  $167\times$  was very steady as well. In good moments of better clarity I was enjoying very sharp views with Cassini division, well defined almost around the whole ring. Some subtle coloring was also showing. North of brownish NEB, the color changed to slightly more grey, with some hints of light blue mixed in. I could not see the north polar region properly. The ring was passing just behind the polar region and it was interfering too much.

I got excited and I have decided to try to crack **Antares** properly in this small refractor. After couple of years of trying I saw it clearly through my 110mm refractor. So far I had no luck with the 82mm oil doublet. Only once, I glimpsed in the telescope the secondary for about half a second. Hardly a positive observation. I have jumped immediately to the power of  $278\times$  and I was turned down. I had spent about five minutes staring into the eyepiece, trying to refocus numerous times. Still no hint.

I'm stubborn, and I felt this was the night. If I don't split Antares under such conditions, I have no real chance of seeing the companion in 80mm class telescope at all. I took out the  $2''$  mirror diagonal and I looked at the star with straight tube. The image completely changed. The secondary was there, it was difficult target requiring strong concentration but with that, it was visible for about 50% of time as a tiny white spot preceding the bright orange primary. I should probably keep my mirror diagonal cleaner.

The main target of this night was planetary nebula **NGC 6572** ( $V=8.1$ ,  $16'' \times 13''$ ). Two years ago, through 63mm Telementor, I was able to see interesting, diamond-shaped ring. Larger lens, combined with excellent seeing, showed me more this time.



Nebula looked at  $42\times$  as suspicious star thanks to the bluish color. It was still stellar at  $167\times$  with direct vision. Averted vision showed tiny spot elongated at  $PA \sim 20^\circ$ . Nothing more was revealed at  $278\times$ . Things became more interesting at  $327\times$ . There was hint of bright ring with some central brightening. Not sure if it was the central star. The western edge of the ring was brighter. With averted vision, I noticed another ellipse spot, much fainter and of about the same size as the ring. The position angle was  $PA \sim 160^\circ$ .

Interestingly, the images are showing some tips in those areas, may be my fantasy was not too much on the loose. O'Meara mentions in his book *Hidden Treasures* as well a faint nebulosity visible in 100mm refractor. However he concluded that it was not true nebulosity but very probably an effect caused by unresolved nearby very faint stars.

In night of August 30, I decided to take my 82/1670mm doublet to the darker-side observatory. Not that it matter too much as it was almost full Moon. What helped was the heavy duty mount Fornax 50. At home, this long refractor is heavily under-mounted (Zeiss T1 mount) and observing at  $650\times$  is not too effective (that is the reason why most of the previously mentioned observation was using magnification up to  $327\times$  only). Observing was far more relaxing with this large mount and I think that the rock-solid mount was one of the main reasons why I observed an unexpected level details.

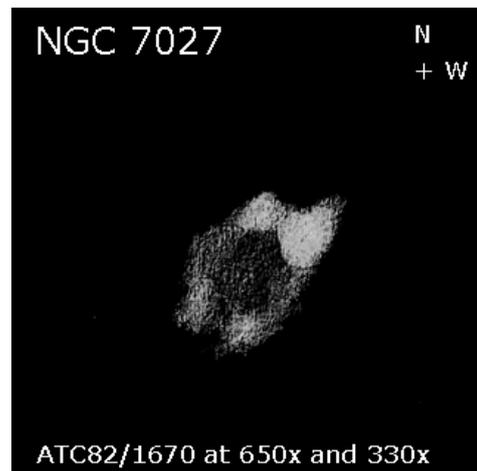
I focused on planetary nebula **NGC 7027** ( $V = 8.5$ ,  $18 \times 10'$ ) in Cygnus. It was discovered in 1878 by J. Stephan in 80cm reflector in Marseilles. The glass mirror was

made by Léon Foucault and it was one of the first larger mirrors with silver reflective layer. This new technique was an important step from metal mirrors towards the large reflectors build in 20th century. The technological pendulum started to swing from refractors to reflectors.

J. Stephan was not aware of the nature of the object. He actually used NGC 7027 for measurement of star diameters. The nebula was discovered independently by T. Webb in 24cm reflector just a year later. The discovery was confirmed within few days from several observatories, including spectroscopic observation which revealed the gaseous character of the object.

This young nebula was classified as proto-planetary before the HST era as there was no sign of a hot central star. It was a big surprise for astronomers when HST found in there very hot central star with temperature of 200 000 K. In fact one of the hottest known star.

Visually, NGC 7027 was a very difficult target what concerns observing the detailed shape. At 327 $\times$ , it was very tiny ring with one prominent brightening at north-western part. More was revealed at 647 $\times$ . Namely two pronounced knots in the northern part. The knot in the north-western corner was very prominent and bright, it looked like there is even a small tip from its northern side. The nebula was elongated at PA $\sim$  150 $^\circ$ . On its southern end, I could glimpse in addition two much fainter knots occasionally. The ring structure was not well visible at 647 $\times$  but as it was there clearly there at 327 $\times$  I kept it on the final sketch. May be it was just a trick played on eye as the nebula was still quite tiny at 330 $\times$ .



I'm more and more surprised with what humble 82mm lens can reveal on those tiny objects. It does not come easily and requires quite some concentration and effort. It is very similar to observing planets where the details come and go with varying seeing. The name *planetary nebula* was chosen appropriately from this point of view.

Don't be surprised if you can't see this level of details on the first glance. I often observed the objects for one hour, taking many notes and sketches. To have more fun and to push my skills further, I'm trying to record also features I'm not 100% sure about them. My experience is that sometimes they were just pure fantasies, however, quite often, they seem to have a real background. Compared to visual observers of the past, we have the great advantage in direct confrontation of our observations with images of the object. This is helping me to better identify the line between reality and fantasy which in turn makes me more experienced observer.

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