

Deep in Camelopardalis

Telescope: **AS110** (Zeiss AS110/1650 mm)

Eyepieces:

ATC40 - ATC Kellner, $f=40\text{mm}$, ($41\times$, $61'$)

O-20 - Vintage Zeiss Ortho, $f=20\text{mm}$, ($83\times$, $31'$)

A-16 - Zeiss Abbe Ortho, $f=16\text{mm}$, ($103\times$, $28'$)

O-15 - Vintage Zeiss Ortho, $f=15\text{mm}$, ($110\times$, $23'$)

A-10 - Zeiss Abbe Ortho, $f=10\text{mm}$, ($165\times$, $17'$)

Accessories: Baader/Zeiss T2 prism

Time: 2014/10/28 20:00-22:30UT

Location: Ondřejov

Weather: Clear and transparent sky.



This was one of the better nights with a clear and transparent sky. Not the best, but very good. I decided to go to my dark-site observatory where I keep my largest refractor, Zeiss AS110/1650.

I have spent some time trying to determine naked eye limiting magnitude to have a reference point for those favourable conditions. I could see ε Tri ($V=5.5$) clearly with averted vision, nearby $V=5.8$ star required some concentration and $V=6.0$ star between α Tri and M33 showed only several times in brief moments. I have noticed relatively large hazy spot of the size of the full Moon. I identified it as open cluster **NGC 752** ($V=5.7$, $50'$).

I have decided to keep the observation simple and I was using almost exclusively just three eyepieces. Low power 40mm Kellner from ATC and two vintage Zeiss orthos, 20mm and 15mm. In this way I was tasting the experience of observers from the golden era of visual astronomy, like W. Tempel who owned very similar telescope – doublet 108/1620mm made by Steinheil. I made my life easier by using modern zenith prism though. Also my AS110 lens from 1924 was coated by previous owner. It improved, probably, the reach on faint objects a little bit.

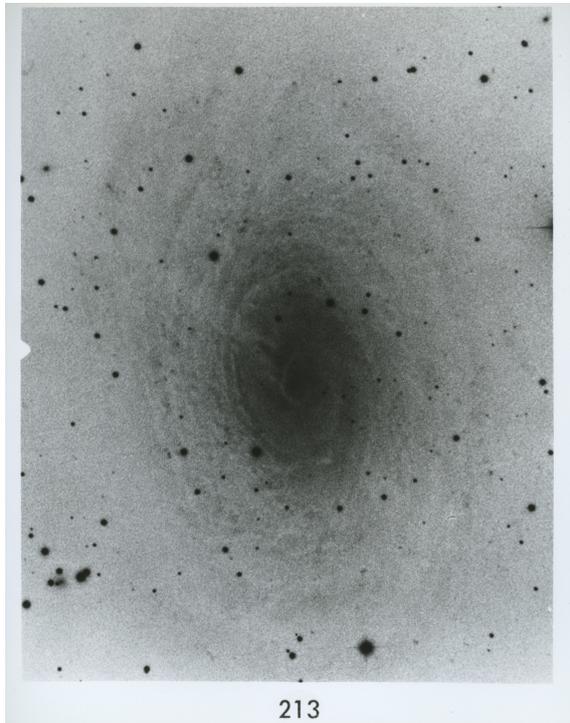
During previous couple of nights, I was exploring the western part of Camelopardalis from my backyard. The plan for the night was to revisit those objects under more favourable conditions and with a larger telescope.

I have started with two faint nebulae **IC 59** ($10'$) and **IC 63** ($10'$) near γ Cas. As in my previous attempts, I saw nothing convincing at $41\times$ or $83\times$. The $H\beta$ filter did not help either.

Then I jumped to Camelopardalis. The first target was large and bright galaxy **IC 342** ($V=8.4$, $21.4' \times 20.9'$, $PA168^\circ$). This spiral face-on galaxy was discovered quite late by well known amateur astronomer W. Denning in 1895 while he was scanning the sky for comets. Being just 11 million light year distant, it is one of the closest galaxies just outside of the Local Galaxy Group. It is one of the brightest and largest members of IC 342/Maffei group.

I saw it clearly in past only once in 10×50 binocular during holidays under one of the darkest skies in Czech. This night, it was again unclear observation. I could trace at $41\times$ several irregular milky patches but as they were following too often the chains of

brighter stars I had not good feeling about them. As for the galaxy center, there was indeed a suspicious brightening. Again, I could not convince myself that what I saw wasn't just the haziness made by numerous fainter stars which were concentrating around the spot as well.



Galaxy IC 356. North is left. Original image from Arp's Catalog of Peculiar Galaxies

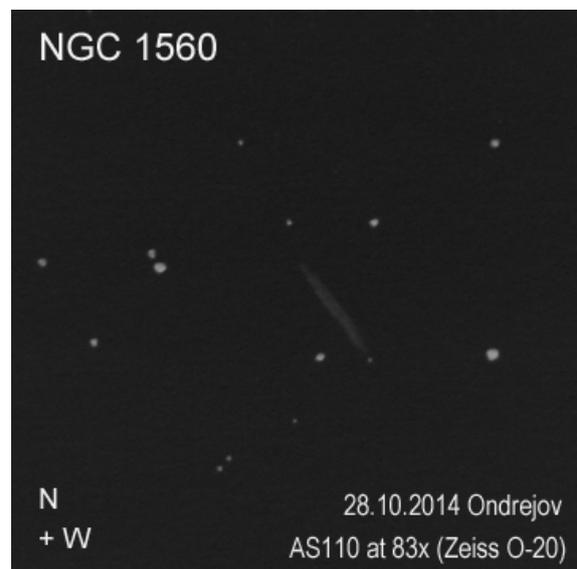
The next target was nearby spiral galaxy **IC 356** ($V=10.6$, $5.9' \times 3.9'$, $PA105^\circ$). Denning run on this galaxy in 1890 as well, however the credit for the discovery goes with another talented visual observer, E. Barnard, who saw the galaxy through 12" refractor in 1889. He let to know the rest of the world about his discovery three years later in 1892 for which he was, quite rightly, criticised by Denning.

The galaxy was already visible at $41\times$ as a small hazy spot showing out nicely with averted vision. At $83\times$, the galaxy was an easy target. Its elliptic shape was apparent and the galaxy was showing mild central condensation.

Fun started at $110\times$. The galaxy looked more round now and it was showing almost no central condensation. I estimated the size to be about one fourth or fifth of the distance to the nearby faint star just south of the the galaxy. This would correspond to the diam-

eter of about $1.2'$. There was some mottling, even more than this. I had a strange feeling like the southern end was edged by some arc-like structure. It was very similar feeling to observing planetary nebula with ring structure just at the detection threshold.

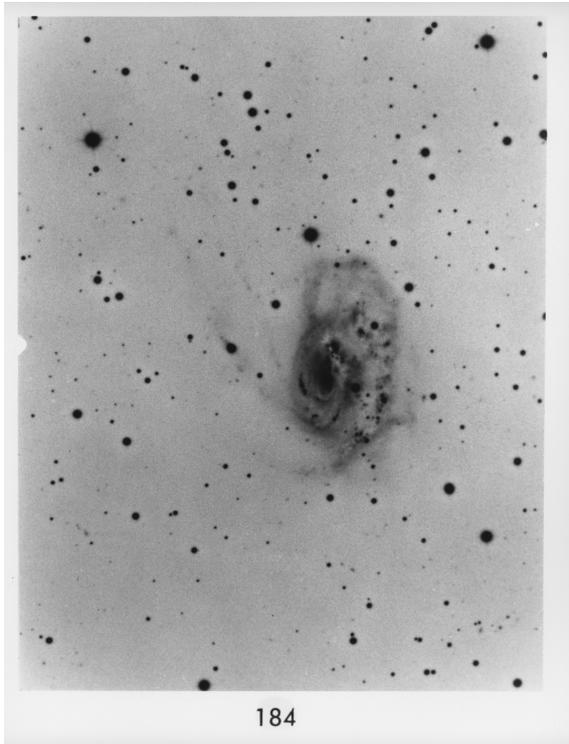
I was not paying too much attention to this detail during the session, I thought the galaxy was elliptical after all. To my surprise, some images show a faint arm in this position. I have hard time to believe that I saw a feature that is hardly visible on images. I need to return definitely to this interesting object. I have also discovered at home that this galaxy belongs to the Arp's Catalog of Peculiar Galaxies where it bears designation *Arp 213*. This is due to a strange dark radial structure pointing to the galaxy's central region.



The next stop was another member of IC342/Maffei group, galaxy **NGC 1560** ($V=11.3$, $10' \times 1.8'$, $PA23^\circ$). This faint edge-on spiral galaxy was discovered in 1883 by another keen visual observer W. Tempel. Not in his private 108mm refractor mentioned above but in much larger 11" Amici refractor in Arcetri observatory where he spent the last part of his life.

Some haziness could be seen already at $41\times$, it was although hard to be sure it was the galaxy due to interfering fainter stars. There was no doubt about it at $83\times$. The target still required a concentrated use of averted vision. I saw a thick line hiding between two stars of magnitudes 11.8 and 12.0.

More careful view revealed the galaxy pointing to a fainter $V=13.2$ star at its southern end and to $V=13.5$ star at its northern end. Observed length, about $3'$, corresponded to about one third of the galaxy catalog size. No other detail was revealed at $110\times$.



Galaxy NGC 1961. North is left. Original image from Arp's Catalog of Peculiar Galaxies

With the next galaxy **NGC 1961** ($V=11.3$, $4.6' \times 3.0'$, $PA85^\circ$), I jumped to the distance of 190 million light years. Two nights before I had spent an hour trying to glimpse from our backyard this galaxy through 63mm refractor. I made so much effort because this would had been then the most distant spiral galaxy I have seen through this small refractor.

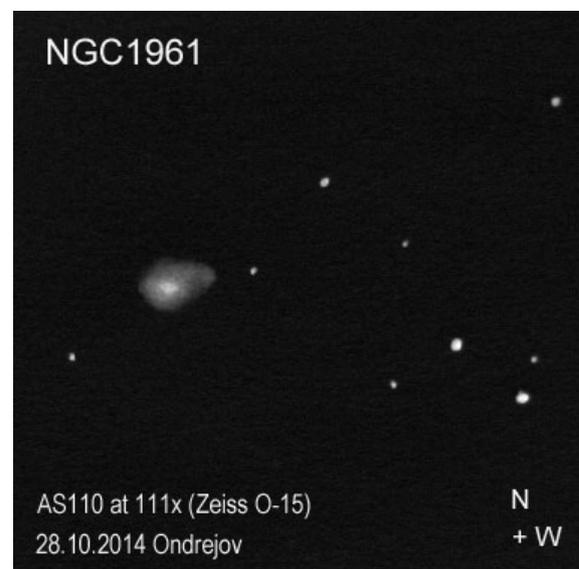
NGC 1961 is one of the largest known spiral galaxies. It is the last entry in the second Herschel's catalog. He liked the round numbers and his first two catalogs of new nebulae and clusters of stars contain exactly one thousand entries each. When it was clear that he would not make it to the next, third, thousand, Herschel performed few final sweeps just to have at least 500 entries for the last catalog. He discovered more than was needed. His preference to the round numbers showed in the last catalog where Herschel omitted last few discoveries and he pub-

lished just 500.

The galaxy was also put into the Arp's catalog (*Arp 184*) due to the strange morphology which could not be explained by an encounter with another galaxy. The evidence shows that the galaxy collides with a huge intergalactic cloud of gas.

Under dark sky, NGC 1961 was an easy target readily visible already at $41\times$. Higher magnification of $83\times$ showed hazy spot elongated in east-west direction with mild central condensation. The size was about $2'$, slightly less than the distance to preceding faint star of $V=12.3$.

Larger magnification of $110\times$ revealed interesting asymmetrical shape. The central nucleus was not exactly stellar. It was a tiny spot elongated in east-west direction. It was not located exactly in the geometrical center of the galaxy. The galaxy looked drop-like shaped, sometimes even like an apostrophe character with the "arm" extending west along the north side. Comparing my sketch with the image later at home, I have realised that I have glimpsed one spiral arm. I found that cool, after all there are not many 200 million light years distant galaxies with spiral arms visible in 110mm telescope.



NGC 2146 ($V=10.3$, $6.0' \times 3.8'$, $PA123^\circ$) was another interesting galaxy that I have visited that night. It was discovered by an eager visual observer from past, A. Winnecke, in 1876 in 6.5" refractor.

The galaxy was well visible at $41\times$ with averted vision as a slightly elongated misty

cloud. Magnification of $83\times$ showed nice oval shape at $PA150^\circ$ with only mild central condensation and some mottling. Higher magnification $110\times$ did not reveal new details. I was looking for the prominent dark line feature visible on images but I saw none.

I could not resist to look quickly at Pleiades, in particular **NGC 1435** ($30'$). W. Tempel discovered this reflection nebula in 1859 shortly after he got his 108mm refractor. It was quite an achievement, as this cluster was at that time probably the most investigated cluster by the professional astronomers. And no one noticed this nebulosity. Even 30 years after the discovery, there were some astronomers who denied the existence of the nebulosity.

I wanted to mimic Tempel's experience. The Tempel's nebula was quite nicely visible at $41\times$, definitely not a threshold object for this telescope. I do not know if this was the magnification used during the discovery.

Tempel's refractor was equipped with eyepieces providing $24\times$ and $40\times$ and six more covering magnification from $60\times$ to $300\times$ ¹.

I finished the night trying to glimpse some details in galaxy **NGC 936** ($V=10.0$, $4.7' \times 4.1'$, $PA135^\circ$). For this, I switched to modern Zeiss orthos 16mm and 10mm. All I could see at $103\times$ and $165\times$ was just a fainter rounded body with bright nucleus which looked double from time to time. No sign of bar, even though I was looking for it quite hardly.

The night brought several surprises. The 110mm refractor in combination with darker side is powerful enough to reveal unexpected level of details on distant objects. I'm looking forward running on some more, I'm sure I will. The vintage experience was also fun. In particular, I was surprised how these old uncoated eyepieces were keeping up on faint stars and fuzzies so well with some of the best modern ones.

Alexander Kupčo

¹See for the details S. Bianchi, A. Gasperini, D. Galli, F. Palla, *Wilhelm Tempel and his 10.8-cm Steinheil Telescope*, *Journal of Astronomical History and Heritage*, 13(1), 43-58 (2010)