

0: ½ MPC ~ 1.5 Mly, the **Milky Way**, including its two Magellanic Cloud irregular spirals and many spheroidal dwarf galaxies and GCs.

1: 2 Mpc - 5 Mly, the **Local Group**, The *Milky Way – Andromeda – Triangulum* galaxies with their satellites, plus the *Sculptor Group* (N55 at ~10 Mly).

2: 6 Mpc ~ 20 Mly, the **Local Supercluster**, The *M81 - CVn – M83 – CenA* groups, plus the **Leo Groups** (several Messiers at ~40 Mly).

3: 20 Mpc ~ 70 Mly, the **Virgo Supercluster**, The *UMa – Coma -Virgo* groups, all in the background at ~50 Mly.

4: 90 Mpc ~ 300 Mly, the **Surrounding voids and supercluster filaments**, for instance *Taurus Void* and *Perseus-Pisces wall*.

5: And beyond...

Most galaxies as seen in small telescopes from a suburban backyard will show up as just faint patches or stellar points surrounded by tiny halos; What interests me though is not so much what I'm able to catch of details in the individual objects, but rather the **large-scale location and distribution of the galaxies**, that is: how the groups can be seen "wide field" on the celestial dome as I zoom out from our *Milky Way*.

Below I've listed the Messier galaxy objects, arranged according to their distance from our own Milky Way galaxy:

5: Galaxies [40]

M NGC LOCAL GROUP (5 Mly) Autumn

M31 N224 S And *Great Andromeda*
M32 N221 E And Dwarf to M31
M110 N205 E And Dwarf to M31
M33 N598 S Tri *Triangulum/Pinwheel*

M NGC LOCAL SUPERCLUSTER (Near~ 15 Mly)

M81 N3031 SA(s)ab UMa *Bode's*
M82 N3034 IO UMa *Cigar*
M94 N4736 (R)SA(r)ab CVn *CrocEye* Canes-I
M64 N4826 (R)SA(rs)ab Com *Black Eye*
M83 N5236 SAB(s)c Hya *S.Pinwheel* Cen-A

M NGC LOCAL SUPERCLUSTER (Far~ 30 Mly)

M101-Cloud
M101 N5457 SAB(rs)cd UMa *Pinwheel*
M51 N5194 SAbc CVn, *Whirlpool*
M63 N5055 SAbc CVn *Sunflower*
M66 N3627 SAB(s)b Leo E Triplet
M65 N3623 SAB(rs)a Leo E Triplet
M96 N3368 SAB(rs)ab Leo W Triplet
M95 N3351 SB(r)b Leo W Triplet
M105 N379 E1 Leo W Triplet

M NGC VIRGO SUPERCLUSTER (60-70 Mly) →

- VIRGO-I Core
- UMa-I Association (SUPERGROUP)
- COMA-I Association (SUPERGROUP)

5: Galaxies 40 -- continued]

M NGC VIRGO-I CORE (60 Mly)

M87 N4486 cD pec Virgo A Wall W
M86 N4460 E2 Vir *Markarian* Wall W
M84 N4374 E1 Vir *Markarian* Wall W
M58 N4579 SAB(rs)b Vir Wall E
M59 N4621 E5 Vir Wall E
M60 N4649 E2 Vir Virgo C Wall E
M49 N4472 E2 in Vir Virgo B Outskirts
M61 N4303 SAB(rs)bc Virgo S Outskirts
M85 N4382 SA0+(s)pec Com Outskirts
M88 N4501 SA(rs)b Com Hook N
M91 N4589 SB(rs)b Com Hook N
M89 N4552 E0-1 Vir Hook S
M90 N4569 SAB(rs)ab Vir Hook S
M98 N4192 SAB(s)ab Com Triangle
M99 N4254 SSA(s)c Virgo N Triangle
M100 N4321 SAB(s)bc Com Triangle

M NGC COMA-I Association (60 Mly)
-- N4725,N4565 --<no Messier galaxies>

M NGC UMa-I Association (70 Mly)

M106 N4258 SAB(s)bc CVn
M108 N3556 SAB(s)cd UMa
M109 N3992 SB(rs)bc Uma

M74 N628 SA(s)c Psc *Phantom* 30 Mly
M104 N4594 SA(s)a Vir *Sombrero* 30 Mly
M102 N5866 SA0 Draco *Spindle* 50 Mly
M77 N1068 (R)SA(rc)b Cetus 50 Mly

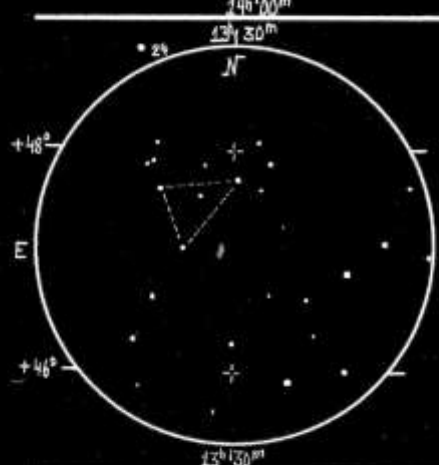
Galaxy Observation Record

The M101 Galaxy Group

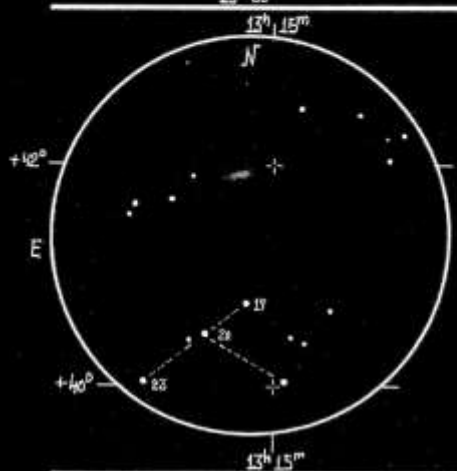
Index: M101 Galaxy Group



Subject: M101, "Pinwheel Galaxy", 25 Mly
 PK: Pale, diffuse large (~4") hazy spot
 Sep:
 Color:
 Date: 2018-04-09 Time: 01:00 loc DST (UT+2)
 Observing Location: 56N 13E DENMARK (N. of Allerød)
 Instrument: VIXEN FL-55S/440mm Aperture 55mm F/8
 EP/Mag: Mas 32mm/23x TFOV: 3.6° Focal Length: +1.7x GPC=
 Conditions: SBM 19.7/NELM 5.9m No Moon 748mm FL
 Seeing: 8/10, Color Transparency: 4-5/7
 Notes: Haze towards the horizon
 Temp. 8°C, DewPt 5°C, Humid 83%
 NGC 5457, UMa.



Subject: M51, "Whirlpool Galaxy", 27 Mly
 PK: Faint hazy spot, slightly brighter center
 Sep: Slight N-S elongation
 Color:
 Date: 2018-08-20 Time: 21:00 loc (UT+1)
 Observing Location: 56N 12E, DENMARK (Allerød)
 Instrument: VIXEN FL-55S/440mm Aperture 55mm F/8
 EP/Mag: Mas 32mm/23x TFOV: 3.6° Focal Length: +1.7x GPC=
 Conditions: SBM 19.2/NELM 5.6m 748mm FL
 Seeing: 6/10, Color Transparency: 4-5/7
 Notes: Thin high cirrus haze
 Temp. 0°C
 NGC 5194, CVn.



Subject: M63 "Sunflower Galaxy", 27 Mly
 PK: Faint Halo, slightly brighter nucleus, stellar core
 Sep: Elliptic E-W orientation
 Color:
 Date: 2019-03-20 Time: 23:30 loc (UT+1)
 Observing Location: As above
 Instrument: As above Aperture:
 EP/Mag: -- TFOV: Focal Length:
 Conditions: As above
 Seeing: -- Transparency:
 Notes:
 NGC 5055, CVn.

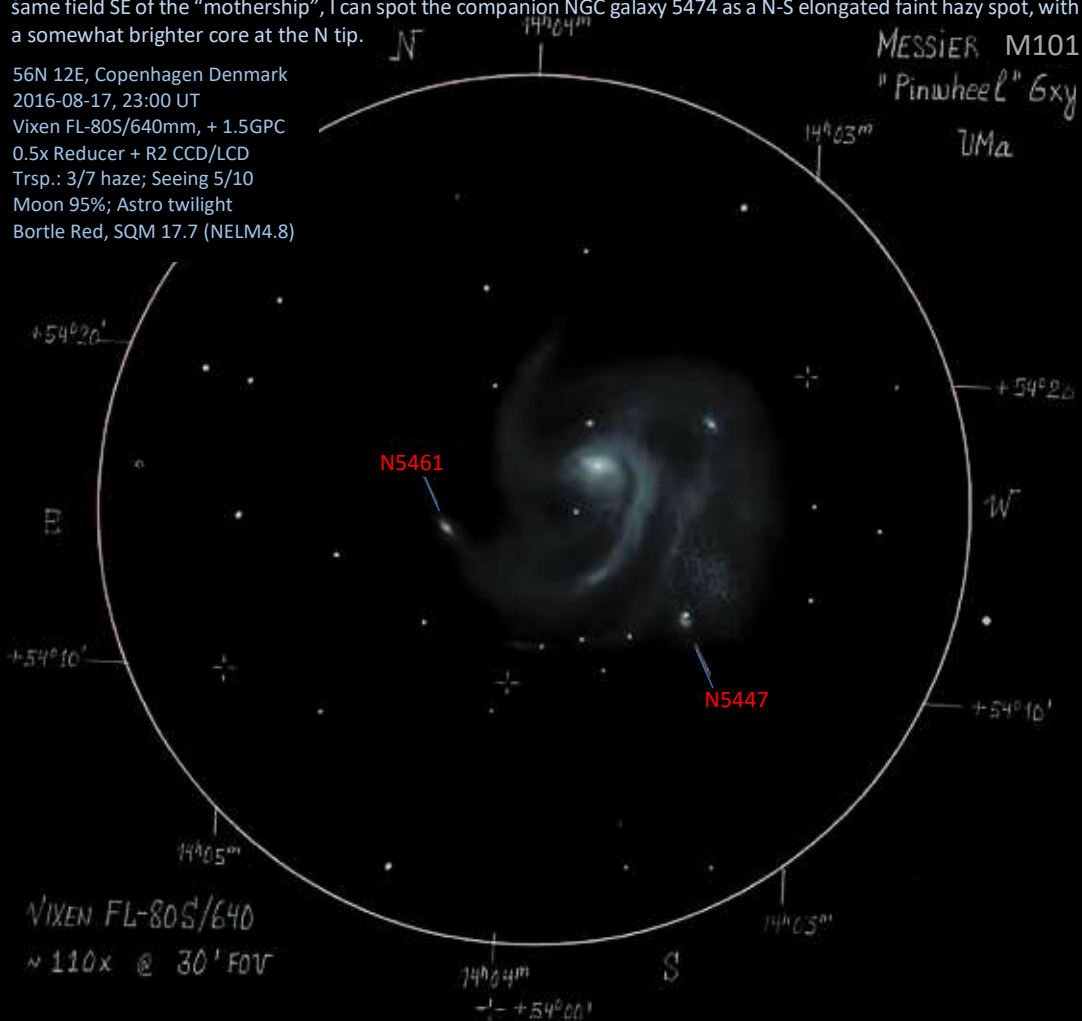
The M101 galaxy group in the extended sense includes the M101 subgroup (with NGC 5457 Pinwheel) plus the M51 subgroup (with NGC 5194 Whirlpool and NGC 5055 Sunflower), both at a distance of around 25 Mly.

- Besides the Messier Pinwheel Galaxy (N5454), the M101 subgroup contains the two NGC dwarfs: N5474 (peculiar SA) and N5477 plus 6 smaller galaxies.
- The M51 subgroup contains 4 galaxies around the Messier Whirlpool pair (M51a-b, aka N5194-5195) including NGC 5229 (edge-on spiral), while another 6 galaxies are grouped around the Messier Sunflower (N5055), including NGC 5023 (edge-on spiral).

We're in the start of April, closing in on midnight (2019-04-04, 23:00 CEST DST, UT+2). The temp. is very mild at 8°C, with a relatively low 73% humidity and the dew point down at 4°C. The transparency is an OK 4-5/7 with a slight high haze still hanging around from the warm spring day, and the seeing is calm and steady at 8/10. There's a new moon out of the way -30° Alt. below the NW horizon, so the LP is a good suburban NELM 5.5 (SQM 19.0 @ zenith).

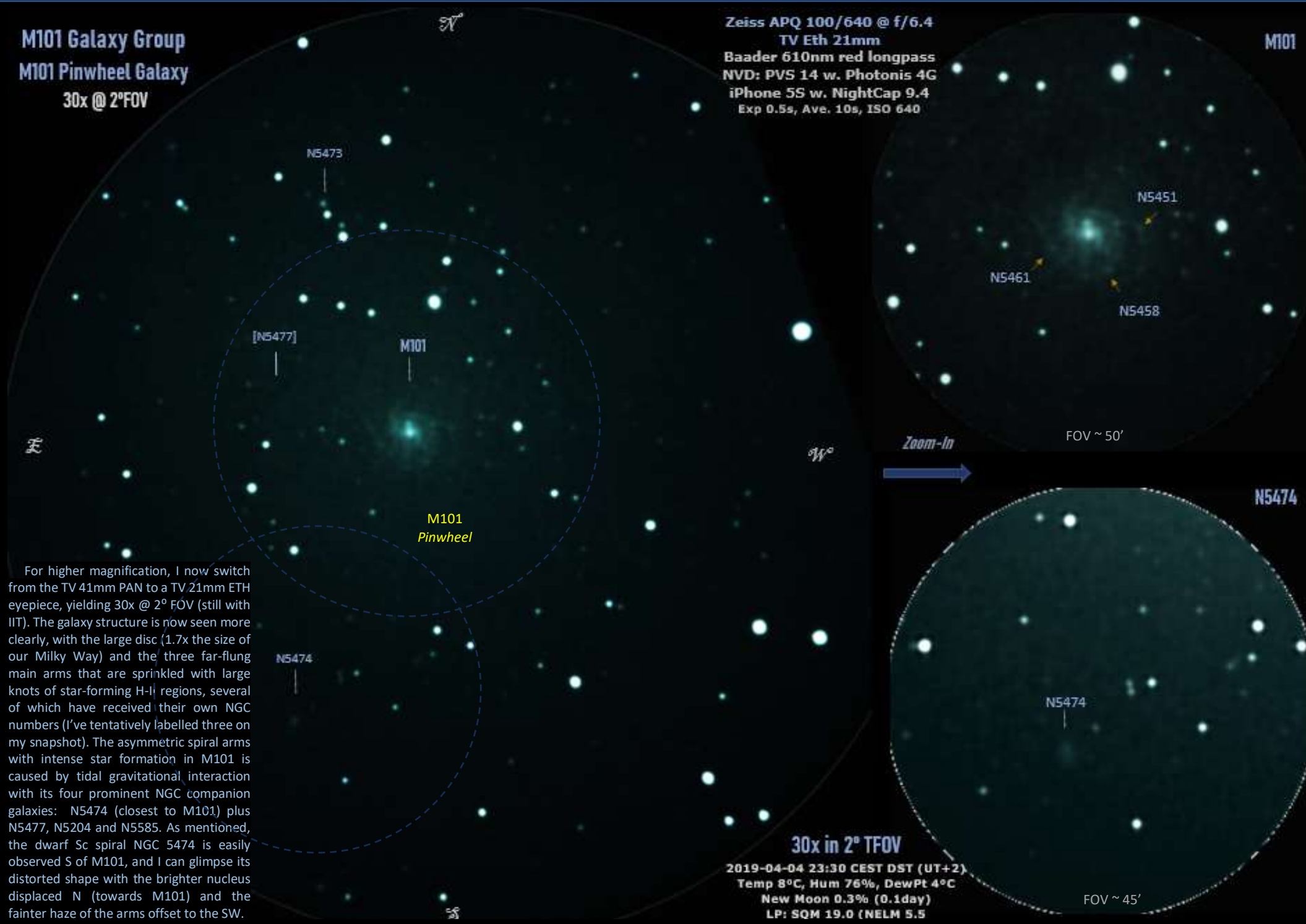
I start my galaxy sweep of the M101 Group from the North with the M101 subgroup; In my 4" refractor at 16x in 2½° FOV, the mixed SAB face-on spiral NGC 5457 (M101 itself, the "Pinwheel" galaxy) shows up using glass only as an E-W elongated hazy splotch with a small brighter nucleus. Using image intensification, I can glimpse the 3 main spiral arms: two branching out and down from the NW side, and one coming out and up from the SE side. Also, in the same field SE of the "mothership", I can spot the companion NGC galaxy 5474 as a N-S elongated faint hazy spot, with a somewhat brighter core at the N tip.

56N 12E, Copenhagen Denmark
 2016-08-17, 23:00 UT
 Vixen FL-80S/640mm, + 1.5GPC
 0.5x Reducer + R2 CCD/LCD
 Trsp.: 3/7 haze; Seeing 5/10
 Moon 95%; Astro twilight
 Bortle Red, SQM 17.7 (NELM4.8)



M101 Galaxy Group
M101 Pinwheel Galaxy
 30x @ 2° FOV

Zeiss APQ 100/640 @ f/6.4
 TV Eth 21mm
 Baader 610nm red longpass
 NVD: PVS 14 w. Photonis 4G
 iPhone 5S w. NightCap 9.4
 Exp 0.5s, Ave. 10s, ISO 640



For higher magnification, I now switch from the TV 41mm PAN to a TV 21mm ETH eyepiece, yielding 30x @ 2° FOV (still with IIT). The galaxy structure is now seen more clearly, with the large disc (1.7x the size of our Milky Way) and the three far-flung main arms that are sprinkled with large knots of star-forming H-II regions, several of which have received their own NGC numbers (I've tentatively labelled three on my snapshot). The asymmetric spiral arms with intense star formation in M101 is caused by tidal gravitational interaction with its four prominent NGC companion galaxies: N5474 (closest to M101) plus N5477, N5204 and N5585. As mentioned, the dwarf Sc spiral NGC 5474 is easily observed S of M101, and I can glimpse its distorted shape with the brighter nucleus displaced N (towards M101) and the fainter haze of the arms offset to the SW.

Zoom-In



30x in 2° TFOV

2019-04-04 23:30 CEST DST (UT+2)
 Temp 8°C, Hum 76%, DewPt 4°C
 New Moon 0.3% (0.1day)
 LP: SQM 19.0 (NELM 5.5)

FOV ~ 45'

M01 Extended Group
M51 Subgroup
 NGC 5194-95 & N5229
Whirlpool

N

Zeiss APQ 100/640 @ f/6.4
 TV Pan 41mm
 Baader 610nm red longpass filter
 NVD: PVS 14 w. Photonis 4G Intens
 iPhone 5S w. NightCap 9.4
 Exp 0.5s, Ave. 60s, ISO 400

The M101 Galaxy Group
M51 Subgroup

M51 (the *Whirlpool*) is the brightest galaxy in the **M51 Subgroup**, that also includes M63 (the Sunflower). This subgroup in turn belongs to the elongated galaxy association that includes the M101 (the Pinwheel) Subgroup towards the NE.

The large face-on SA spiral **M51a (N5194)** plus its peculiar SB dwarf companion **M51b (N5195)** form a conspicuous colliding galaxy pair connected by a dust rich tidal bridge. The galaxy interaction has enhanced the spiral structure of M51a while significantly distorting the shape of M51b. The bright bulges of the two M51 galaxies are evident, and both harbor an active supermassive black hole with accretion discs (AGN) that contribute to the brightness in visual as well as in X-ray emission.

In my 4" refractor at 16x (TV 41 PAN, with IIT), I can glimpse the two main spiral arms of M51a curving around the core, and I can also easily see the amorphous hazy spot of M51b, but I can't identify the tidal bridge between them. I can however glimpse the faint dot of the edge-on SB galaxy N5229, which is a more distant member of the M51 Subgroup to the NE of the Whirlpool, and I can also identify the E1 elliptical N5198 due S of the Whirlpool. The latter has a tidal tail towards the W from disruption of a smaller satellite, but this is way too faint to see with my equipment.

M51
Whirlpool

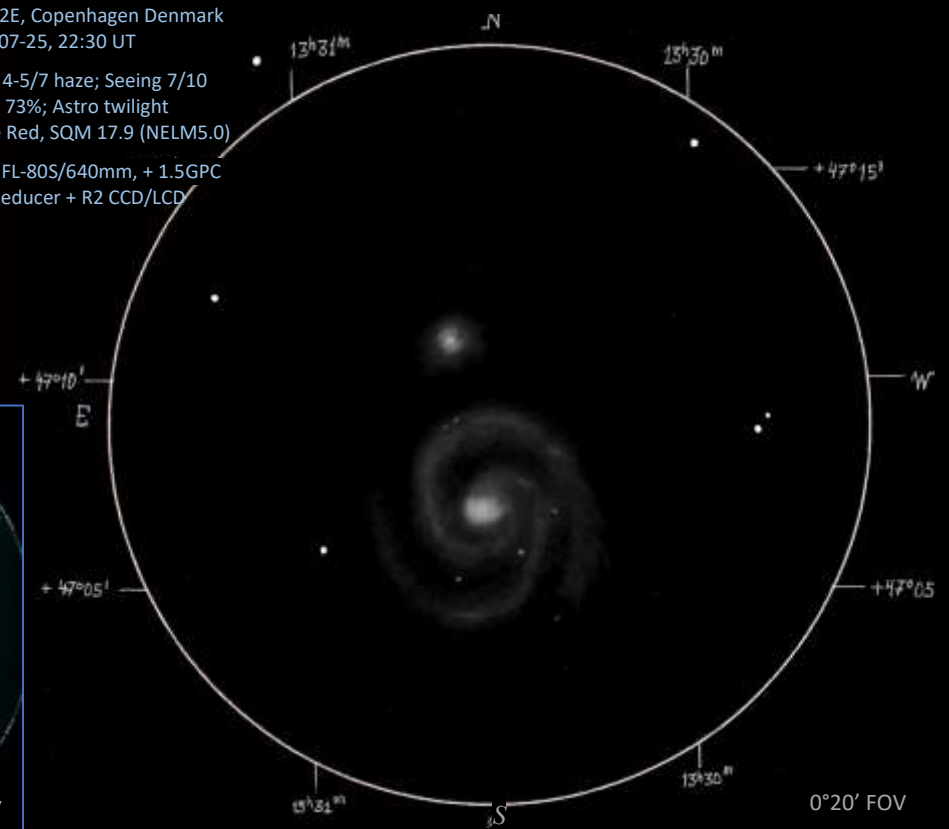
— M51 b
 — M51 a

E

56N 12E, Copenhagen Denmark
 2016-07-25, 22:30 UT

Trsp.: 4-5/7 haze; Seeing 7/10
 Moon 73%; Astro twilight
 Bortle Red, SQM 17.9 (NELM5.0)

Vixen FL-80S/640mm, + 1.5GPC
 0.5x Reducer + R2 CCD/LCD



16x in 2½° TFOV

2019-04-04 23:00 CEST DST (UT+2)
 Temp 8°C (!), Hum 73%, DewPt 4°C
 New Moon 0.3% (0.1dy)
 LP: SQM 19.0 (NELM 5.5)
 Trsp. 4-5/7, Seeing 8/10, light haze

S

M101 Extended Group
M51 Subgroup
M63 - NGC 5055
Sunflower

Zeiss APQ 100/640 @ f/6.4
TV Pan 41mm

Baader 610nm red longpass filter
MVD: PVS 14 w. Photonis 4C Intens
iPhone 5S w. NightCap 9.4
Exp 0.5s, Ave. 20s, ISO 800

16x in 2½° FOV

2019-04-04 23:30 CEST DST (UT+2)
Temp 8°C (!), Hum 73%, DewPt 4°C
New Moon 0.3% (0.1dy)
LP: SQM 19.0 (NELM 5.5)
Trsp. 4-5/7, Seeing 8/10, light haze

M63
Sunflower

Zoom-in

M63 - APQ 100/640

V* TV CVn

M63, Wikipedia

As previously mentioned, the M51 Subgroup has two gravitational centers: one around M51 (the *Whirlpool*) plus one around M63 (the *Sunflower*); And together the M51 Subgroup in CVn + the M101 Pinwheel Subgroup in UMa form the extended M101 Galaxy association. After having observed the M51 galaxy pair with their smaller companions, I now pan my 4" refractor a bit further SW to the M63 galaxy with its satellites.

M63 (NGC 5055, the *Sunflower*) is a SA flocculent spiral galaxy with an active galactic nucleus (AGN). In my wide-field view at 16x (TV 41 PAN+IIT) the nucleus is seen as a bright, slightly E-W elongated core, embedded in a pale outer elliptic halo.

Switching to a higher magnification of 30x (TV 21mm ETH+IIT), I can now see a hint of a ring around the central core plus some mottling in the faint outer disc, -- but these details are fleeting and hard to pinpoint.

M63 is surrounded by 6 smaller companion galaxies, including the edge-on spiral NGC 2023 ~2° NNW of M63 (this satellite is however outside the 2½° FOV of my snapshot above taken at 16x magnification).

M63

FOV ~ 2½°

FOV ~ 15'

Leo Triplet East: M65 & M66 (plus N3628)

It's just past midnight in mid-February (01 AM, Local Time); All is calm, cool (-2C/28°F) and quiet, apart from our pair of night owls, who make soft meowing calls in the distance. A 75% waxing Moon is sailing between *Taurus* and *Gemini*, down towards the W horizon, but still (at 23° Alt) high enough to reduce my NELM to 4.9^m (Bortle Red), and so it's not a good night for galaxy observation; I have however cunningly placed the moon behind our wooden cabin, and with a free view of *Leo* closing in on the meridian, plus having had a rather skewed diet of open clusters lately, I firmly decide to try the **Leo Triplet of galaxies**, for a change.

I aim my red dot right between the two 3-4^m stars *Theta* and *Iota Leonis*, the hind leg of The Lion. I get a bended line of ~7^m stars @ 27x and 1.5° FOV in my ATC K-40mm finder eyepiece – it looks somewhat like the outline of a person sitting on a chair, facing east. Slightly shifting the FOV from the head of the sitting person (73 Leo), 1° due E, I reset my eyepiece field to include the **Leo Triplet of galaxies (M65, M66, NGC 3628)**. [To be more specific, I should really be saying the **Eastern Leo Triplet**, around 11h18m east of 73 Leo, as there is also the **Western Triplet (M95, M96, M105)** around 10h46m south of 52 Leo].

56N 12E, Copenhagen
Denmark
2016-02-17, 23:20 UT
Trsp.: 5/7, Seeing: 8/10
Vixen FL-80S/640mm
+1.7x GPC, K-40mm EP



M66 and M65 are not obvious at first in the field...; As my eyes get dark adapted, the two Messier galaxies slowly start to enter the scene. M66 seems brighter, with a sharper spindle-shaped outline, a stellar like core and a more mottled interior than M65 (this impression is reinforced by a 10^m foreground star, TYC 861-1197-1, that is seen close to the NW part of the galaxy). With time, I can hold the core of M66 with direct vision, while M65 appears larger, more elongated, oval and fuzzy without a conspicuous central core, and is thus best studied with indirect vision. M65 is oriented close to a N-S direction, while M66 seems "tilted" slightly more towards the W. This impression is probably caused by the fact, that what I'm predominantly seeing in M66 is the bright, barred nucleus of the galaxy (angled ~20° PA), and not as much the fainter N-S oriented spiral arms. I take some time trying to spot NGC 3628 (ca. 20' NW of HD98388), -- but it is too faint to be caught with certainty in this moonlit sky (it has a lower SB than M65/66, due to a broad dust lane seen edge on)

M65 is a type Sa spiral galaxy that we see 74° inclined to our line of sight. It consists of a central lens of yellowish older stars, and of tightly wound spiral arms with prominent dust lanes and a few bluish star-forming regions. M65 does not seem to have undergone any recent close encounters with another galaxy, and hence, in terms of star formation, M 65 cannot compete with the much more active M66.

M66, only 20' to the east of M65, is a physical companion; The galaxies may be separated by only 200 Kly. M66 is elongated in the N-S direction, while the 1.5'-long central region is a little tilted at PA 20°. There is a bright foreground star only 2.5' northwest of M 66. Two spiral arms originate from the ends of a short, bright bar (Sb type) in the center. While the eastern arm is closely wound around the galaxy, the western arm is somewhat angled away from the galaxy. This deformation is the result of a past encounter with another galaxy in the Leo Triplet.

The most likely candidate is **NGC 3628**, a fainter spiral galaxy seen edge on ½° to the N of M66. All 3 galaxies are part of the Eastern Leo group, and are at similar distances to the Western Leo Triplet galaxy group consisting of M96, M 95 and M 105; We may thus conclude, that these two galaxy triplets are loosely associated in the larger *Leo Group*.

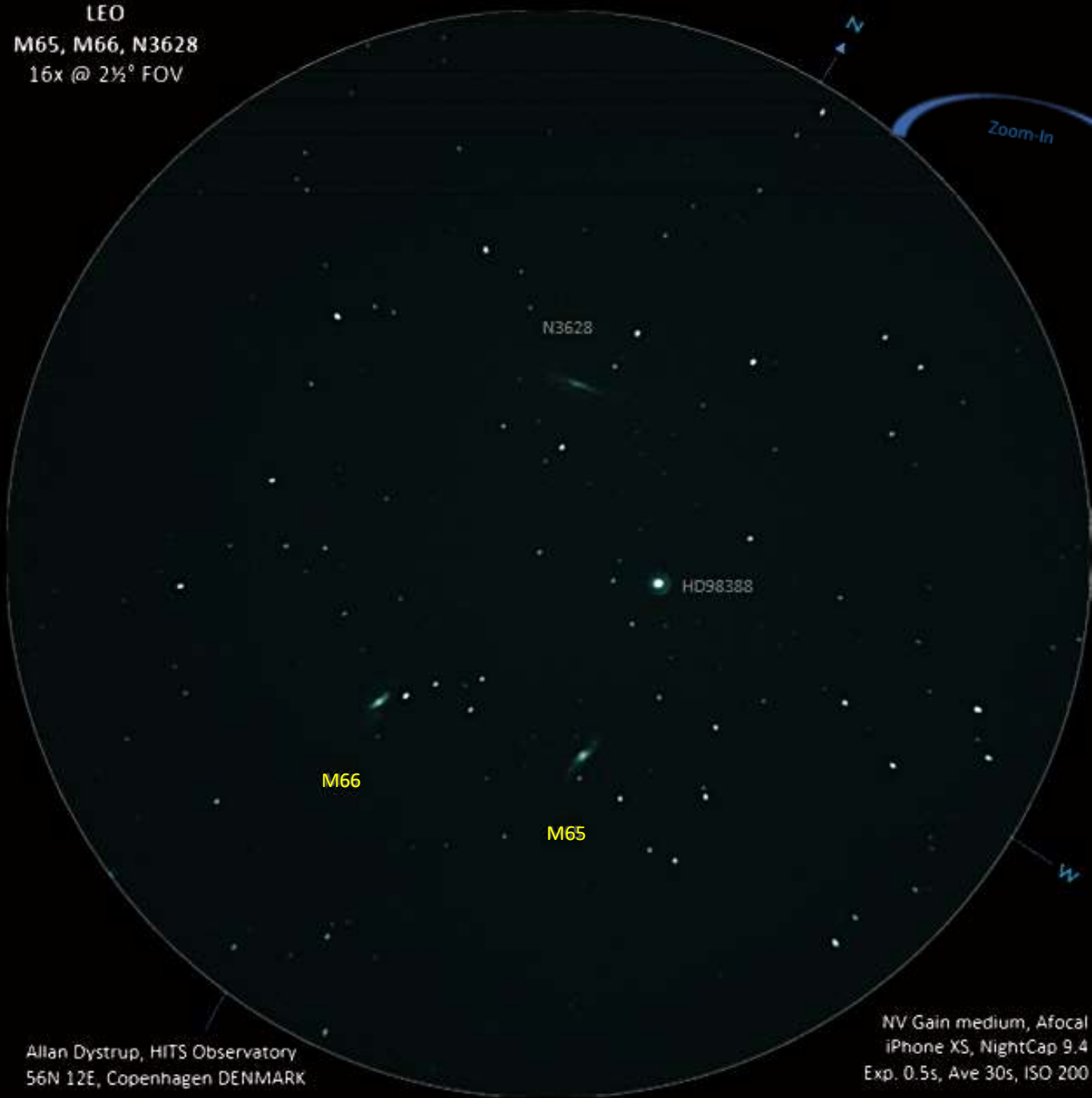
It's a fresh early morning at the start of astronomical dusk, just 1h past midnight in mid-May (2020-05-12, 01:00 Local DST, UT+2). After a week with mild, cozy days up to 20°C, a cold front yesterday swept in from the *North Sea*, pulling down polar air over *Scandinavia* with gusts of wind and a sudden 10°C drop in day temperatures; The night temp. has now settled around the freezing point, but it's calm with low humidity and the dew point is way down at -6°C. The transparency is a medium 4/7 with a rank of distant clouds marching up on the NW horizon, the seeing is above medium at 8/10, and with the Moon below the E horizon, I have a good rural/suburban transition NELM of 6.4^m.

My current project is centered on solar system targets, but these days I'm also testing a setup using my small machine camera on my Night Vision monocular for deep sky observations. My test object tonight is the **Eastern Leo Triplet**, and although it is way past the meridian by now and currently sinking from 29° altitude towards the W horizon, I can still get an OK view of this galaxy group. I start by monitoring the area in my 4" refractor with a 41mm TV PAN eyepiece; Then I add my NV-monocular in a-focal mode on top of the eyepiece, which frames the object in a good field of 2½° @ 16x magnification, -- already revealing several details.

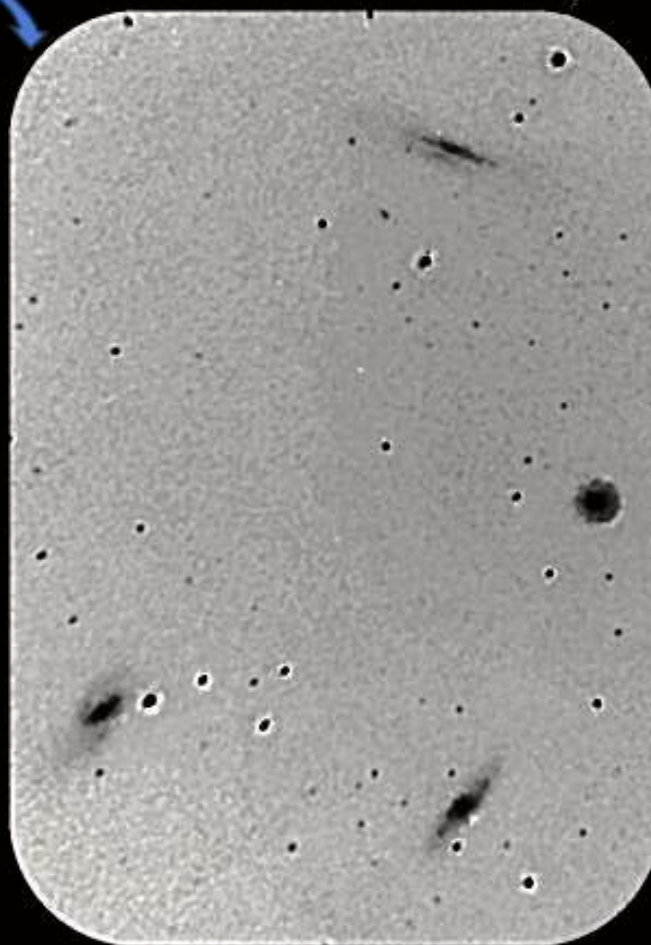
I've described the M66 galaxy group (the Leo-I East Triplet) previously; It is located in a small galaxy spur below the Supergalactic plane (the Local Sheet of galaxies at 10 Mpc ~33 Mly). The distance between M66 (NGC3627) and **M65** (NGC3623) is only ~150 Kly, i.e., about the same as from our Milky Way to the LMC, while NGC3628 is a bit further away at double this distance ~300 Kly. There are clear morphological signs of close encounters between NGC3628 and M66 in the form of distortions of the galaxy disks and a tidal bridge of gas between them showing up as an optical plume in long exposure Astro-photos.

N3628 (the "*Hamburger Galaxy*") is seen edge on, where it shows an obscuring dark dust band along the outer spiral arm crossing and bisecting the bright bulge. The spiral disk of N3628 is surrounded by an unusual hazy halo of stars, that seems to be broadening at the far NE and the SW ends, giving the disc a doubly warped "X-wing" appearance as seen in profile. M66 is seen almost face-on, but shows the same type of peculiar distorted form with two large spiral arms, one warped up NE and the other down SW of the disc plane. A warped "peanut" shape of a galaxy seems to be connected with barred spirals where the bar has been buckling as a result of galactic interactions. In M66, the bar is clearly visible, while in N3628 it probably hides in the bulge, being aligned directly with our line of sight. In my short 30 sec exposure I can see no trace of the faint long tail trailing N3628 up NE, nor can I detect the optical plume from N3628 and down towards M66.

LEO
M65, M66, N3628
16x @ 2½° FOV



NGC3628
"Hamburger Galaxy"
SAB pec barred spiral



M66 – NGC3627
SAB(s)b

M65 – NGC3623
SAB(rs)a

Allan Dystrup, HITS Observatory
56N 12E, Copenhagen DENMARK

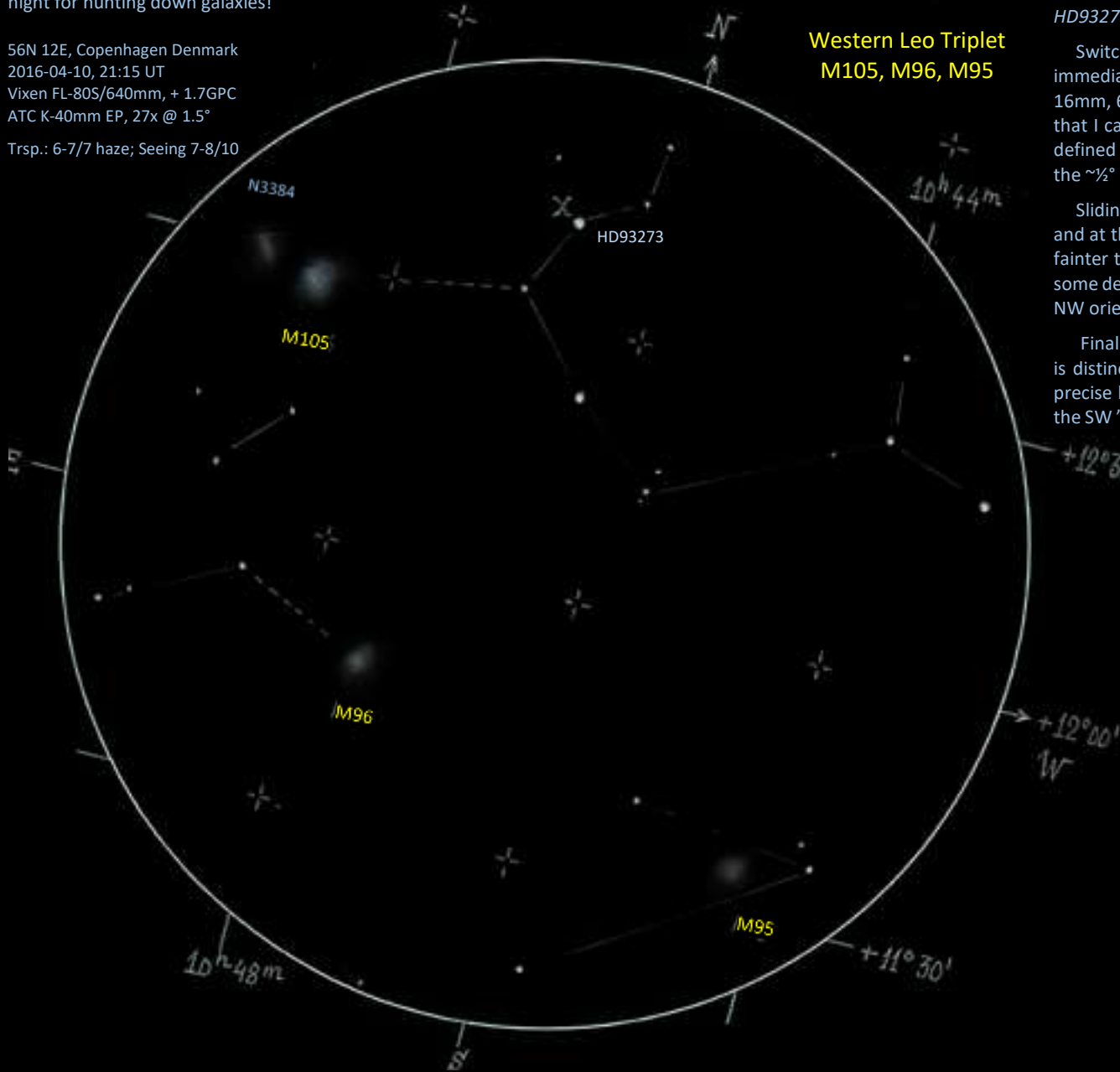
NV Gain medium, Afocal
iPhone XS, NightCap 9.4
Exp. 0.5s, Ave 30s, ISO 200

It's just before midnight (23h15m LOC) in early April, 2016; I'm out under a starry sky with my small Vixen FL-80S refractor at my "semi-dark" observation site by our weekend cottage at a local nature reserve. A deer is rummaging around with a raucous barking at the neighbor's plot, and our own owl has just flown by, leaving a hooting trail above my head. All is well.

The transparency is the best I've experienced in the past 6 months (NELM 5.7^m), the seeing is above medium, and a 4 day (17%) waxing crescent moon is steadily sinking behind the trees on the W horizon, at the feet of *Gemini*. This will be a fine night for hunting down galaxies!

56N 12E, Copenhagen Denmark
 2016-04-10, 21:15 UT
 Vixen FL-80S/640mm, + 1.7GPC
 ATC K-40mm EP, 27x @ 1.5°
 Trsp.: 6-7/7 haze; Seeing 7-8/10

**Western Leo Triplet
 M105, M96, M95**

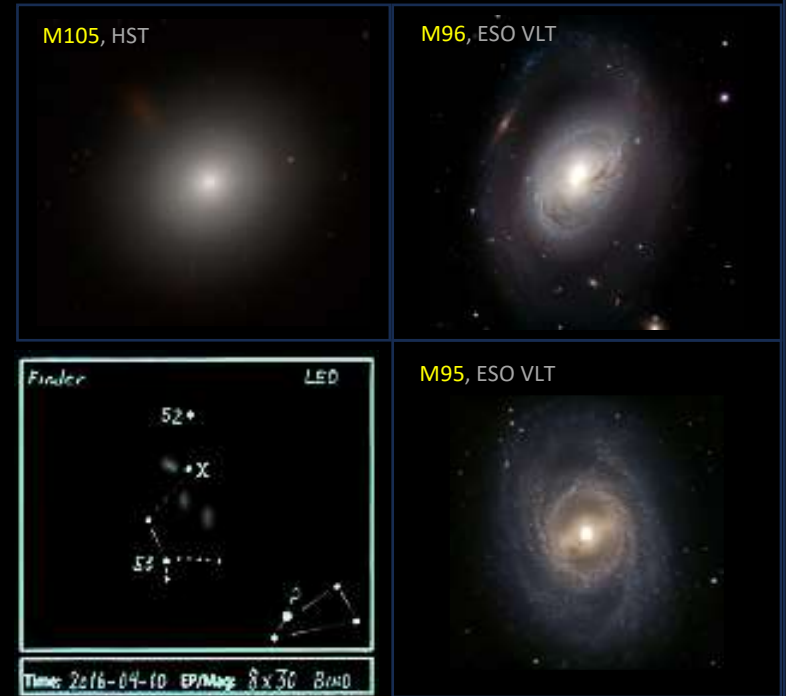


I start with the **Western Leo Triplet (M105, M96, M95)**, in the *Leo I galaxy group*. My star hop takes off from *Rho Leonis*, easily found naked eye ca. 9° E of *Regulus*, and identified in the 7° FOV of my KK 8x50 RACI finder by a nearby triangle of 6^m stars. From *Rho Leo*, I first pan 4° due E, and then center the 5.3^m star *53 Leo* in the finder view. This star is at the center of a Y-shaped asterism, and from the NE tip of this Y, I finally pan the finder 1½° to the NW and center on a 7^m star (marked 'X' on my star drawing, alias: *HD93273*). This is my anchor for navigating the W Leo Triplet.

Switching to my K-40mm finder eyepiece on the telescope (27x @ 1.5° FOV), I immediately see a fuzzy spot barely ½° E of 'X'; This is **M105**. It is easily observed (O-16mm, 68x @ 0.6° FOV) as a hazy halo with a brighter, slightly NE-elongated stellar core that I can hold with direct vision. It has an obvious galaxy companion without a clearly defined core, just 7' to the ENE (NGC 3384), and together they make a beautiful pair in the ~½° FOV of the 16mm CZJ orthoscopic eyepiece!

Sliding now the field of the K-40mm ½° down S, I move M105 to the top of the FOV, and at the same time get another fuzzy spot close to the center of view: **M96**. Although fainter than M105, this galaxy is also easily seen in the K-40mm finder EP, and it shows some details at 44x (O-25) and 68x (O-16) magnification: a rounded hazy spot with a slight NW orientation and a mottled core.

Finally, I start the hunt for the last galaxy in the *Western Leo Triplet*: **M95**. This galaxy is distinctly fainter than its two companions, so I have to check my star maps for the precise location. Keeping the FOV as described above for M96, I suspect a faint spot in the SW "corner" of the field, at the expected position. I now center on this spot, and click up the magnification to 44x (O-25mm @ 0.9° FOV): M95 is now seen as a "faint fuzzy", with no brighter core – actually best observed with averted vision.



Leo Spur, LEO-I Galaxy Group
 "Leo Triplet - West": M96 - M95 - M105 - (NGC3384)

Tonight (2019-03-01, 20:30 CEST UT+1) I'm using my 4" refractor with a 41mm wide field eyepiece for 17x magnification in a 2½° FOV. The temp. and dew.pt. are both down at 2°C, and falling, so with a humidity of 100%, there'll soon be an icy coating on the dew shield of my telescope; So long as the objective and eyepieces are not dewing up though, I'm fine. The moon is down below the horizon, transparency is medium, the seeing is above medium, and the LP is 'controlled' at 5.7 NELM. I'm good to go!

The Messier galaxies M96-M95-M105 (also known as the *Western Leo Triplet*) are located together with N3384 plus 36 fainter galaxies in the in the M96 group. The M96 galaxy group (aka W Triplet) plus the M66 group (aka E Triplet) are then aggregated in the Leo-I association, located in the foreground at 10 Mpc (~33 Mly) in the *Leo Spur of galaxies*.

I find the easiest way to frame the M96 galaxy group is to start from the "foot" of the *Sitting Man asterism* below θ Leonis, and then just pan the telescope (on my GEM mount) ~8° due W, till I have the M96-M95 galaxy pair in the FOV. Looking through an NVD using a red longpass filter, I can easily see M95 as a round "faint fuzzy", and M96 with a brighter stellar core in a faint tight envelope of galaxy arms, tilted a bit SE-NW. In the NE part of the field, the pair of bright elliptical galaxies M105-N3384 (=N3371!) are also clearly seen: M105 larger and round, while N3384 somewhat fainter, slightly elongated and slanting a bit towards NE.

Leo Spur, LEO-I Galaxy Group
 "Leo Triplet - West"
 M96 - M95 - M105 - (NGC3384)

Zeiss APQ 100/640 @ f/6.4
 TV Pan 41mm
 Baader 610nm red longpass filter
 NVD: PVS 14 w. Photonis 4G Intens
 Gain: Medium
 iPhone 5S w. NightCap 9.4
 Exp 0.5s, Ave. 60s, ISO 400



As described in the previous post, there's a large ring of intergalactic neutral (HI) gas surrounding the M105-NGC3384 galaxy pair, possibly an expanding density wave of stripped gas from a head on collision of two primordial spiral galaxies, merging and leaving the two ellipticals (M105 + NGC3384) near the center of this *Leo Ring*. Currently M96 is drawing a tidal plume from the Leo Ring, accreting gas onto its warped outer disk.

17x in 2½° TFOV

2019-03-01 20:30 CEST (UT+1)
 Temp 2°C, Hum 100%, DewPt 2°C
 Moon 27% (24dy) below horizon
 LP: SQM 19.3 (NELM 5.7)
 Trsd. 4-5.5/7. Seeing 8/10

The Phantom, the Sombrero, the Spindle and the Squid

The following four galaxies are found in small filament-like clouds of galaxies that are not part of any large galaxy group; They are hanging around at a distance of ~10 Mpc (30-40 Mly), on the outskirts of our Local Supercluster of galaxies.

M74 (NGC 628) is a face-on spiral galaxy in *Pisces*, the main member of the small *M74 galaxy group* with at least 4 other members, including the peculiar merged galaxy NGC 660 around 2½° SSE of M74.

M104 (NGC 4594) is a peculiar edge-on spiral galaxy in *Virgo*, featuring a large bulge and a broad dust band; It is the main member of the small *M104 galaxy group* with at least 4 members.

M102 (NGC 5866) is an edge-on lenticular galaxy in *Draco*, the main member of the small *M102 group* that includes two other spiral galaxies.

M77 (NGC 1068) is a face-on barred spiral galaxy in *Cetus*, where it is found in the **M77 group** together with 7 smaller galaxies.

5: Galaxies [40]

M NGC LOCAL GROUP (5 Mly) Autumn

M31	N224	S And	<i>Great Andromeda</i>
M32	N221	E And	Dwarf to M31
M110	N205	E And	Dwarf to M31
M33	N598	S Tri	<i>Triangulum/Pinwheel</i>

M NGC LOCAL SUPERCLUSTER (Near~ 15 Mly)

M81	N3031	SA(s)ab	UMA <i>Bode's</i>
M82	N3034	IO	UMa <i>Cigar</i>
M94	N4736	(R)SA(r)ab	CVn <i>CrocEye</i> Canes-I
M64	N4826	(R)SA(rs)ab	Com <i>Black Eye</i>
M83	N5236	SAB(s)c	Hya <i>S.Pinwheel</i> Cen-A

M NGC LOCAL SUPERCLUSTER (Far~ 30 Mly)

				M101-Cloud
M101	N5457	SAB(rs)cd	UMA <i>Pinwheel</i>	
M51	N5194	SAbc	CVn, <i>Whirlpool</i>	
M63	N5055	SAbc	CVn <i>Sunflower</i>	
M66	N3627	SAB(s)b	Leo E Triplet	
M65	N3623	SAB(rs)a	Leo E Triplet	
M96	N3368	SAB(rs)ab	Leo W Triplet	
M95	N3351	SB(r)b	Leo W Triplet	
M105	N379	E1	Leo W Triplet	

M NGC VIRGO SUPERCLUSTER (60-70 Mly) →

- VIRGO-I Core
- UMA-I Association (SUPERGROUP)
- COMA-I Association (SUPERGROUP)

5: Galaxies 40 -- continued]

M NGC VIRGO-I CORE (60 Mly)

M87	N4486	cD pec	Virgo A	Wall	W
M86	N4460	E2 Vir	Markarian	Wall	W
M84	N4374	E1 Vir	Markarian	Wall	W
M58	N4579	SAB(rs)b	Vir	Wall	E
M59	N4621	E5 Vir		Wall	E
M60	N4649	E2 Vir	Virgo C	Wall	E
M49	N4472	E2 in Vir	Virgo B	Outskirts	
M61	N4303	SAB(rs)bc	Virgo S	Outskirts	
M85	N4382	SA0+(s)pec	Com	Outskirts	
M88	N4501	SA(rs)b	Com	Hook	N
M91	N4589	SB(rs)b	Com	Hook	N
M89	N4552	E0-1	Vir	Hook	S
M90	N4569	SAB(rs)ab	Vir	Hook	S
M98	N4192	SAB(s)ab	Com	Triangle	
M99	N4254	SSA(s)c	Virgo N	Triangle	
M100	N4321	SAB(s)bc	Com	Triangle	

M NGC COMA-I Association (60 Mly)
-- N4725, N4565 --<no Messier galaxies>

M NGC UMA-I Association (70 Mly)

M106	N4258	SAB(s)bc	CVn
M108	N3556	SAB(s)cd	UMA
M109	N3992	SB(rs)bc	Uma

M74	N628	SA(s)c	Psc <i>Phantom</i>	30 Mly
M104	N4594	SA(s)a	Vir <i>Sombrero</i>	30 Mly
M102	N5866	SAO	Draco <i>Spindle</i>	50 Mly
M77	N1068	(R)SA(rc)b	Cetus	50 Mly

M74, The Phantom Galaxy, in Pisces

My observation of M72 has taken me past midnight and turned into an early September morning session (local time), as I continue my "Mission Impossible" by turning the small FL80S/640mm refractor towards **M74: "The Phantom"** galaxy in Pisces. The breeze has risen a bit, and the transparency and seeing have both decreased to around NELM 4.6".

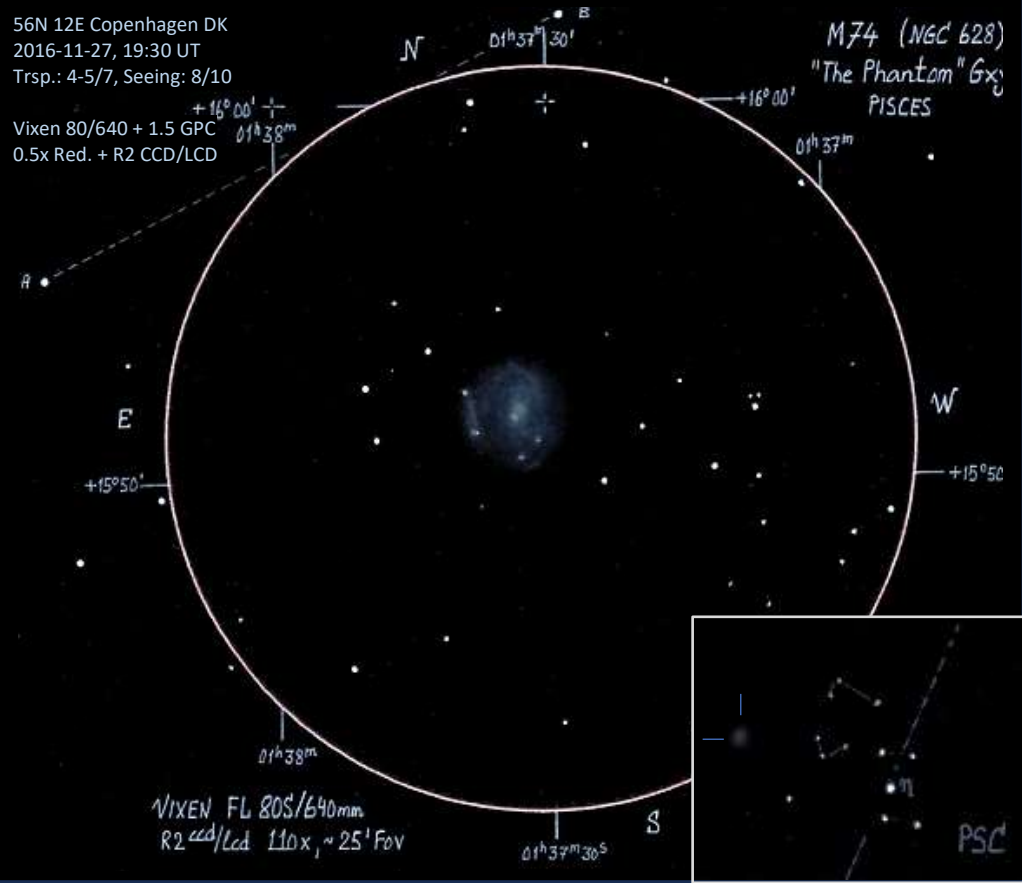
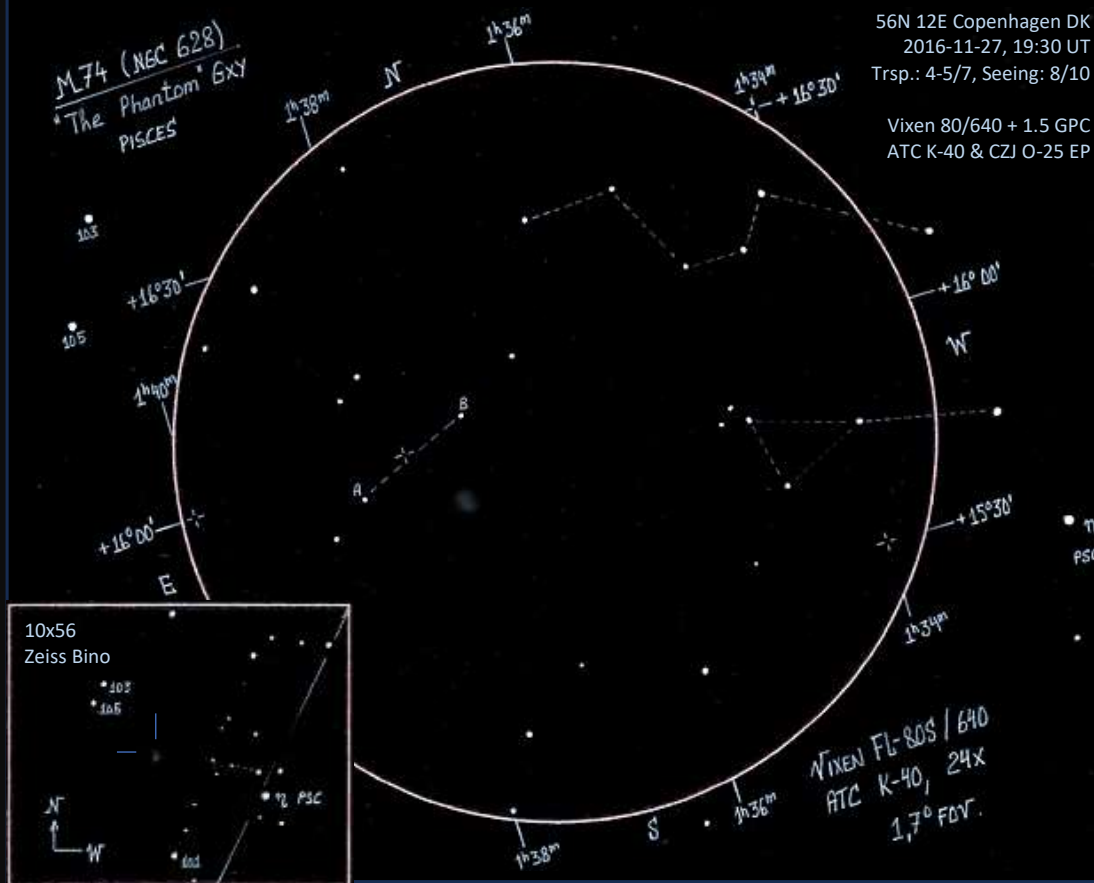
My star hop takes off from Beta Aries -> Eta Pisces; Then from Eta PSC, up 1.2° NE (ca. ¼ of the FOV of my K-40mm finder eyepiece at 24x). I now have M74 in the center of the field of view (I can easily verify the position by identifying the 11^m field star asterisms surrounding the galaxy). I study the field intensely for 20 min at 60x (CZJ O-16mm, 0.7° FOV) – but the transparency and LP today does not allow me to detect M74 visually with pure glass eyepieces.

Instead, I click over to my R2 ccd/lcd for 110x @ 0.3° field of view; I am now able to actually see the center of the galaxy as an obvious, elongated hazy patch, with two brighter cores. The S "core" is a foreground star close to the galaxy nucleus. The bright galaxy center is surrounded by a much fainter, round dim halo of ca 4' diameter. I can glimpse four brighter spots in the halo, which I – after subsequent study of Astro-photography – can identify as foreground stars. The halo shows hints of circular structure (spiral arms), as I watch the averaging of the ccd images settle down... I end my observation, and decide to try "The Phantom" again with glass eyepieces under better conditions than today.

It has been two months since my last observation of **M74**; It is now an early evening in the end of November, and M74 is reasonably well placed at 41° altitude towards the SE, rotating across the meridian. The transparency is just above medium, and the seeing is good with a NELM ~ 5.4". I center my 80mm refractor on the position of M74, with the ATC K-40mm eyepiece in the revolver (24x @ 1.7° FOV), and start my observation by plotting the field stars. I know the exact position of M74, and I now try to catch it visually. It is difficult, -- at first, I see... nothing. I sit with a black towel over my head to shield against stray light, and let my eyes rest for 5 min. Then, using indirect vision, I catch faint glimpses of nebulosity at the position of M74. I can't see the galaxy with direct vision. M74 is definitely on my top 3 list of difficult M-objects from my Bortle Orange/Red suburban backyard.

Messier 74 is not an easy object to observe for amateur astronomers because it has a low surface brightness and thus requires exceptionally clear, dark skies. The only Messier object with a lower surface brightness is the Pinwheel Galaxy (M101), a face-on spiral galaxy located in the constellation Ursa Major.

M 74 is generally regarded, after M 91, as the second most difficult Messier object for visual observation. Small telescopes will reveal the galaxy's bright nucleus surrounded by a hazy halo; The galaxy looks similar to the Triangulum Galaxy (M33), but it has a more defined nucleus. In larger telescopes its face-on orientation shows up revealing a large apparent size with two defined spiral arms.



Observation Record

M104, The Sombrero Galaxy

MESSIER Index: M104

Feature(s): M104, "Sombrero", VIRGO	Date: 2017-04-22	Time: 22:15 UT	Location: 56N 12E, DENMARK
Conditions: Trsp.: 4-5/7, No moon	Seeing: 7-8/10, Calm	Instrument: VIXEN FL-80S/640mm Refractor.	
Aperture: 80mm f/8	Focal Length: +1.7x GPC = 1088mm	EP/Filter/Mags: +0.5x RED, R2 CCD/LCD; 136x @ 0.3° FOV	
Notes: SQM 17.9, NELM 5.2", Light haze			

Snapshot:
Vixen 80/640 + 1.5 GPC
0.5x Red. + R2 CCD/LCD



It's a nice spring evening (2017-04-22, 22:15 UT), and I'm out in my Copenhagen suburban backyard with my 3" Vixen refractor to study M104, the Sombrero Galaxy in Virgo.

M104 is easily located, if you sweep your finder 11° due W in R.A. from Spica (α Vir); I can spot it already as an obvious ~8^m fuzzy glow in my 10x56 Zeiss bino, and switching to a 32mm eyepiece on my 3" refractor, I see it at 34x magnification as small E-W elongated bright oval.

At higher magnification (~136x), using live video on my 3" refractor, M104 reveals itself as a wonderful cosmic "fried egg", with a bright central nucleus inside a large oval bulge that is crossed by the dark dust lanes of the tightly wound spiral arms, which are seen almost edge on; A beautiful sight indeed!

M104 is a 'peculiar' galaxy with an unusually large central bulge and a prominent dark ring of dust lanes formed by the outer spiral arms. The bright active galactic nucleus (AGN) contains a supermassive black hole, which ionizes the surrounding interstellar medium



M102, The Spindle Galaxy

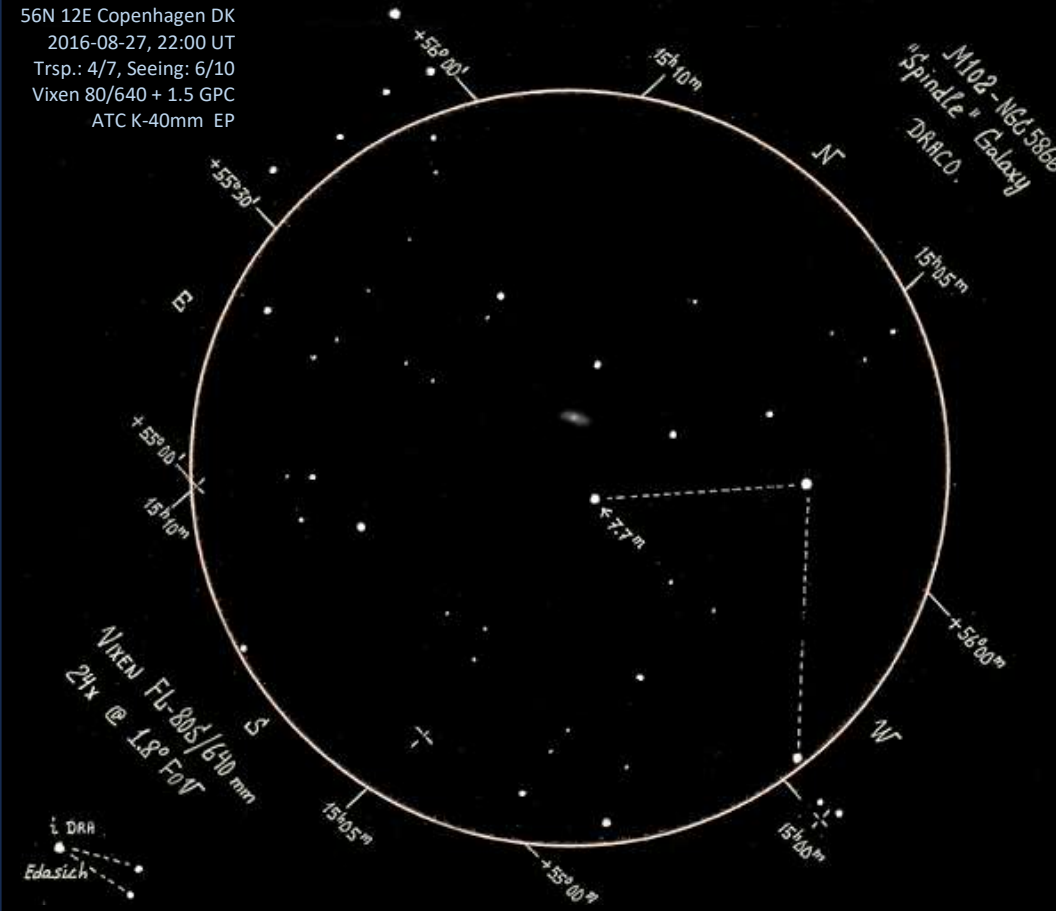
It's a mild late summer evening at 23:30 local DST; The moon is below the horizon towards the E, and I have set up my Vixen FL-80S/640mm refractor in our bright suburban backyard, at NELM 5.4^m (Bortle Orange). *Ursa Major* is trotting along the N horizon, but I have a window for observation before he drags his long tail behind the neighbor's high Cypress tree. I decide to aim my small scope at **M102, the "Spindle" galaxy (NGC 586)** in Draco, above the Bear's tail.



M102 as seen by HST, revealing an edge-on galaxy with a bright nucleus inside a fainter bulge divided by a thin dust lane.



56N 12E Copenhagen DK
2016-08-27, 22:00 UT
Trsp.: 4/7, Seeing: 6/10
Vixen 80/640 + 1.5 GPC
ATC K-40mm EP



M102 (NGC 5866) can be found on the line from the star *Theta Boo*, (in the raised fist of "Boötes", the Herdsman), ca. 7° NE towards *Iota Dra* (also known as *Edasich*, the name derived from Arabic: "male hyena"). I start my star hop from the Hyena Star -- a 3^m orange-red giant, that was Earth's North Celestial Pole Star around 4,420 BCE. There's a pair of ~7^m stars almost 1° W of *Edasich*, which makes it easily recognizable in a bino or finder scope. From *Edasich*, I sweep my finder 5° SSW to a bright 5^m star (HIP:73909), and then up just 1° N to a triangle of ~7^m stars. M102 is located just to the NE of the easternmost 7.7^m star in this triangle.

At 24x (1.8° FOV) in my **K-40mm finder** eyepiece, M102 is seen as a faint but distinct hazy streak of light, elongated ca. SE-NW. Clicking up the magnification (O-25:38x, O-16:60x) reveals a brighter central core, -- but no further detail.

Shifting to the **R2 ccd/lcd live video**, yielding ~110x @ ½° FOV, clearly shows the delicate hazy "spindle" shape of NGC 5866, with the embedded oval core, including a bright bar in the SE-NW direction, which together gives the galaxy its characteristic lenticular form. I cannot with certainty identify the dark dust lane that is running through the center of the galaxy, although at moments I do see a tendency towards "dichotomy" for the SE end of the spindle.

56N 12E Copenhagen DK
2016-08-27, 22:30 UT
Trsp.: 4-5/7, Seeing: 7-8/10
Vixen 80/640 + 1.5 GPC
0.5x Red. + R2 CCD/LCD



M77, The Squid Galaxy

It's an early evening in late November, and I'm out in our suburban backyard with my Vixen FL-80S/640mm refractor for a closer look at the Messier galaxies: M77 (Cetus), M74 (Pisces) and M33 (Triangulum). These three galaxies are all rather faint (surface brightness ~ 13-14^m), but well placed here in early winter, moving right now at nightfall from the SE towards the meridian.

I start "from below" with **M77 in Cetus**. As seen from my backyard, this galaxy is currently at only 17° altitude, and in a direction right over the close by suburb, so though it is relatively bright (Mag 8.9^m, SB 13.2^m/amin), it is not exactly an easy object. The location is easily found though: I start from *Aries*, move SW to *Eta PSC*, the climb down SE past *Omi PSC* (a nice kite shaped asterism) and to the bottom of the well *Alpha PSC* (*Alrescha* -- Arabic for: The Well Rope). From *Alrescha* (that is part of an axe-shaped asterism), I pan due E to the pair Gamma – Delta in the *Cetus Circle* (the *Whale's Tail*). Centering finally on Delta CET, M77 is easy to locate, almost 1° to the SE.

At 24x (ATC K-40mm) the galaxy can be seen with indirect vision as a faint, but obvious nebulous haze;

At **38x (CZJ O-25mm)** the galaxy shows up with direct vision as a round, nebulous spot, brightening towards the center.

At **110x (R2 ccd/lcd live video)** M77 shows a slightly oval, bright galaxy nucleus, tilted towards NE, with traces of a mottled spiral arm towards the NW, including a brighter knot at the SW edge (the HII region H7?), and with a much fainter, round outer halo.

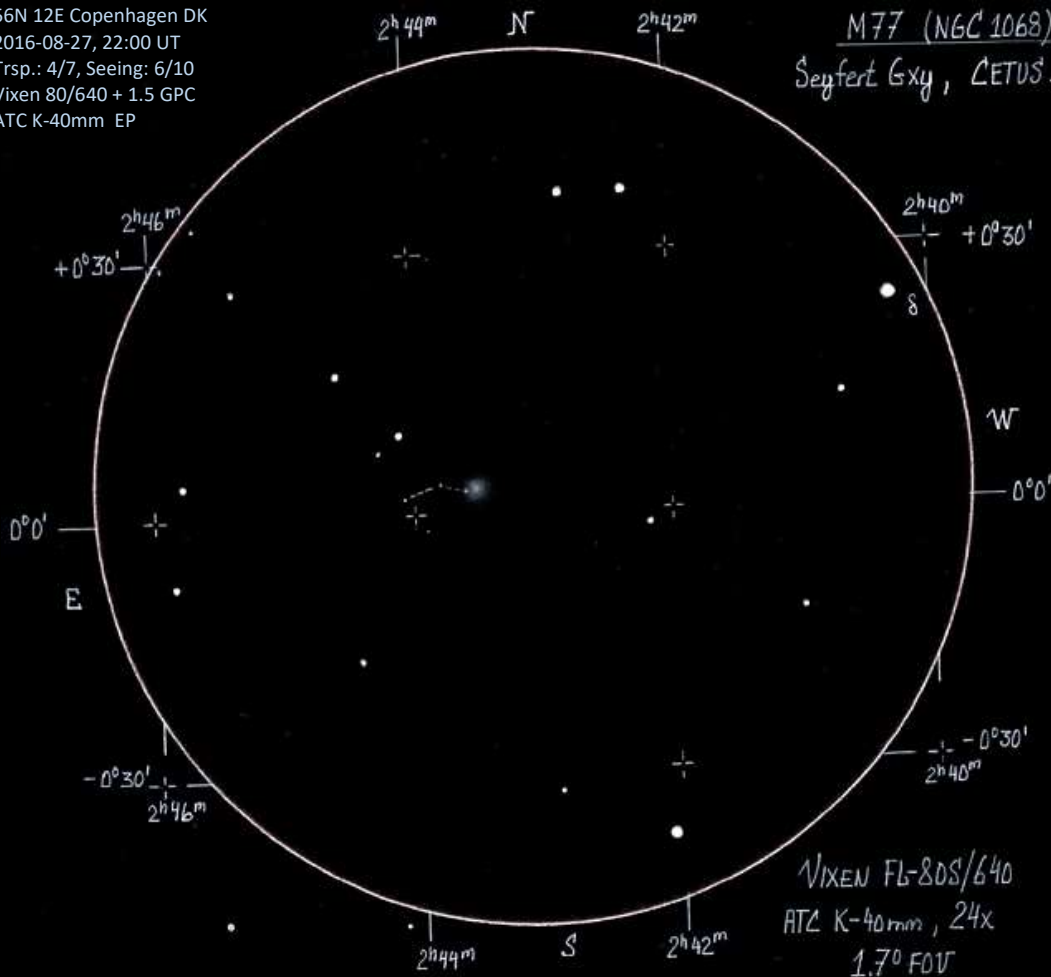


As seen through the **ESO VLT** 8.2m reflector, the disk of M77 shows an inner elliptic core of tightly wound knotty starburst arms, inside an outer faint region of two sprawling dusty arms ...

The center of the core is an active galactic nucleus (AGN) revealing a supermassive black hole with a thin accretion disc surrounded by a thick torus of gas and dust; M77 is thus a peculiar *Seyfert* galaxy.

56N 12E Copenhagen DK
2016-08-27, 22:00 UT
Trsp.: 4/7, Seeing: 6/10
Vixen 80/640 + 1.5 GPC
ATC K-40mm EP

M77 (NGC 1068)
Seyfert Gxy, CETUS.



M77 (NGC 1068)
Seyfert Gxy, CETUS



56N 12E Copenhagen DK
2016-08-27, 22:30 UT
Trsp.: 4-5/7, Seeing: 7-8/10
Vixen 80/640 + 1.5 GPC
0.5x Red. + R2 CCD/LCD