

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

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

M NGC LOCAL SUPERCLUSTER (Near~ 15 Mly)

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

M NGC LOCAL SUPERCLUSTER (Far~ 30 Mly)

				<u>M101-Cloud</u>
<u>M101</u>	N5457	SAB(rs)cd	UMa Pinwheel	
M51	N5194	SAbc	CVn, Whirlpool	
M63	N5055	SAbc	CVn Sunflower	
<u>M66</u>	N3627	SAB(s)b	Leo E Triplet	
M65	N3623	SAB(rs)a	Leo E Triplet	
<u>M96</u>	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)

<u>M87</u>	N4486	cD pec	<u>Virgo A</u>	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
<u>M60</u>	N4649	E2 Vir	<u>Virgo C</u>	Wall	E
<u>M49</u>	N4472	E2 in Vir	<u>Virgo B</u>	Outskirts	
<u>M61</u>	N4303	SAB(rs)bc	<u>Virgo S</u>	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	
<u>M99</u>	N4254	SSA(s)c	<u>Virgo N</u>	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)

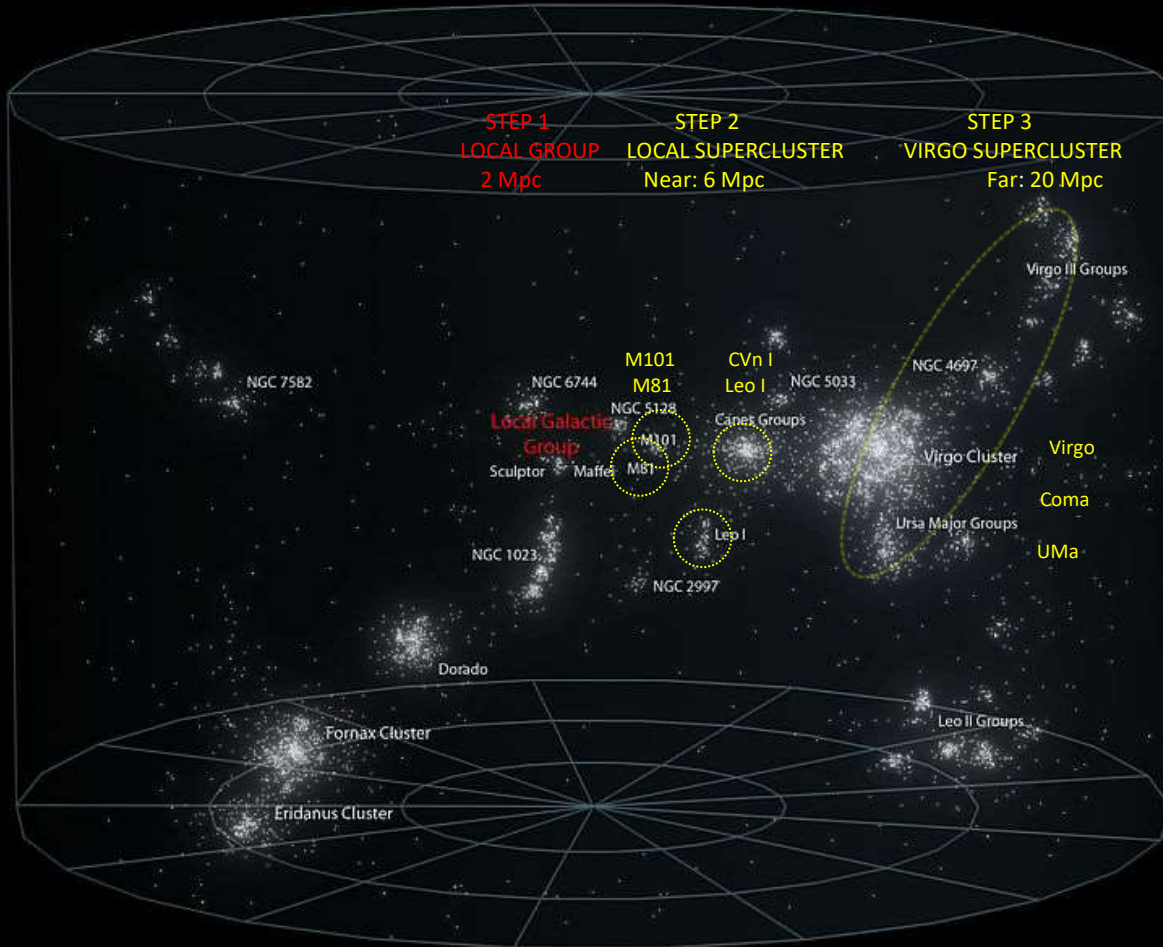
<u>M106</u>	N4258	SAB(s)bc	CVn
M108	N3556	SAB(s)cd	UMa
M109	N3992	SB(rs)bc	Uma

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

Step 2: 6 Mpc ~ 20 Mly

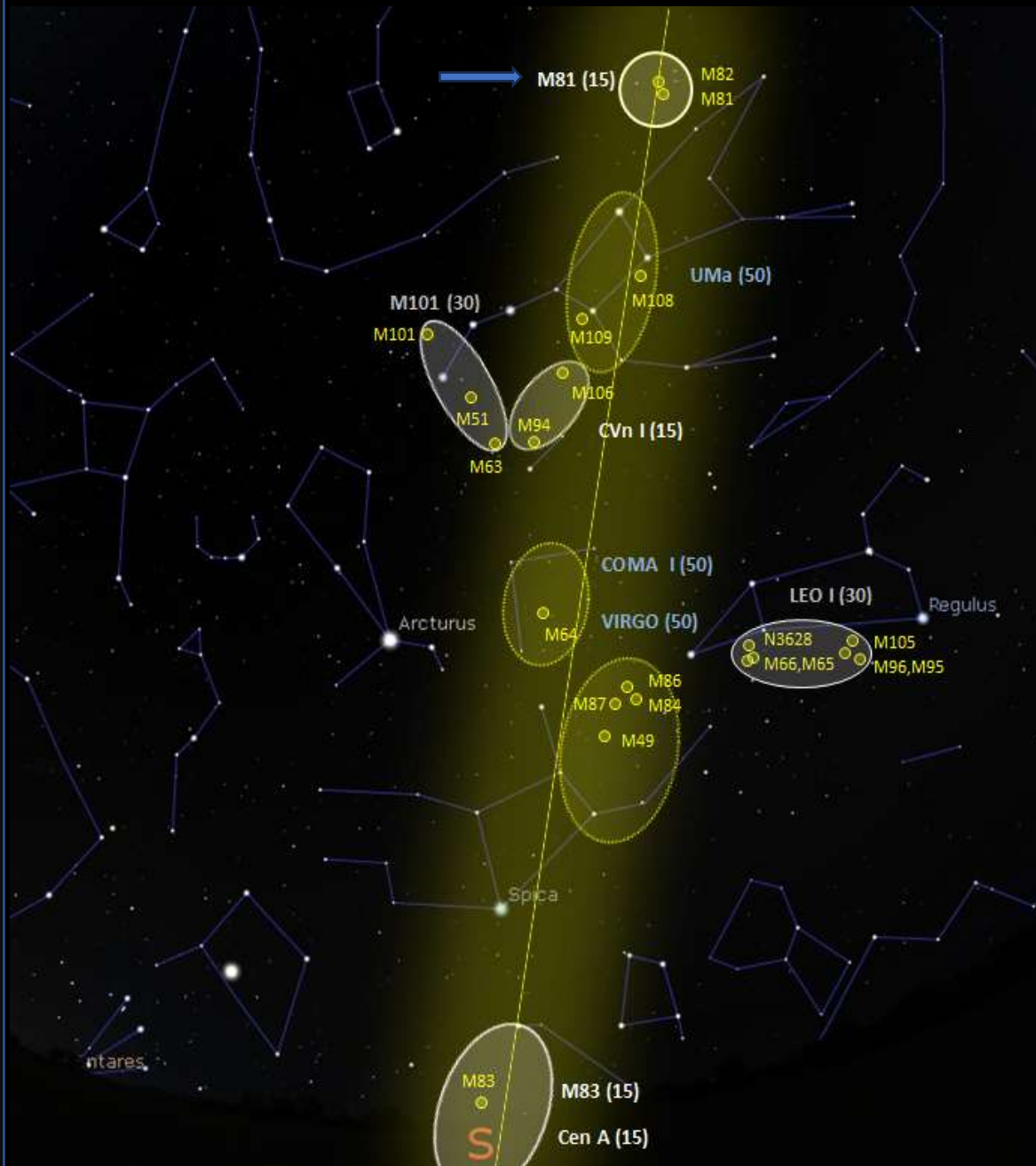
The Local Supercluster

The M81 - CVn - M83 - CenA Groups
plus, the Leo Groups (several Messiers at ~40 Mly)



Step 2-3 (the **Local Supercluster plus The Virgo supercluster**) are both centered around R.A. 12-13^h on the celestial dome (galactic $\sim 330^\circ$ l), stretching like a *"Summer Milky Way of Galaxies"*

- both the **nearby (15 Mly) M81 – M101 – CVn I – Leo I – M83/CenA** groups in the foreground (Local SC)
- and the far more **distant (50 Mly) UMa – Coma – Virgo** groups in the background (Virgo SC)



Tonight, I'd like to focus on the **nearby galaxy groups in our own Local Supercluster, close by (~5 Mpc - 15 Mly)**, starting from the north with the M81 Group in UMa, then moving south to the M101 and the CVn-I Galaxy Groups in Canes Venatici, and finally ending up deep south with the M83 Group in Hydra. Being $\sim 3\times$ closer to our Milky Way than the Virgo Attractor, the galaxies in these local groups show up more widely scattered on the night sky, but they also offer greater detail in structure as compared to the more distant galaxy groups.

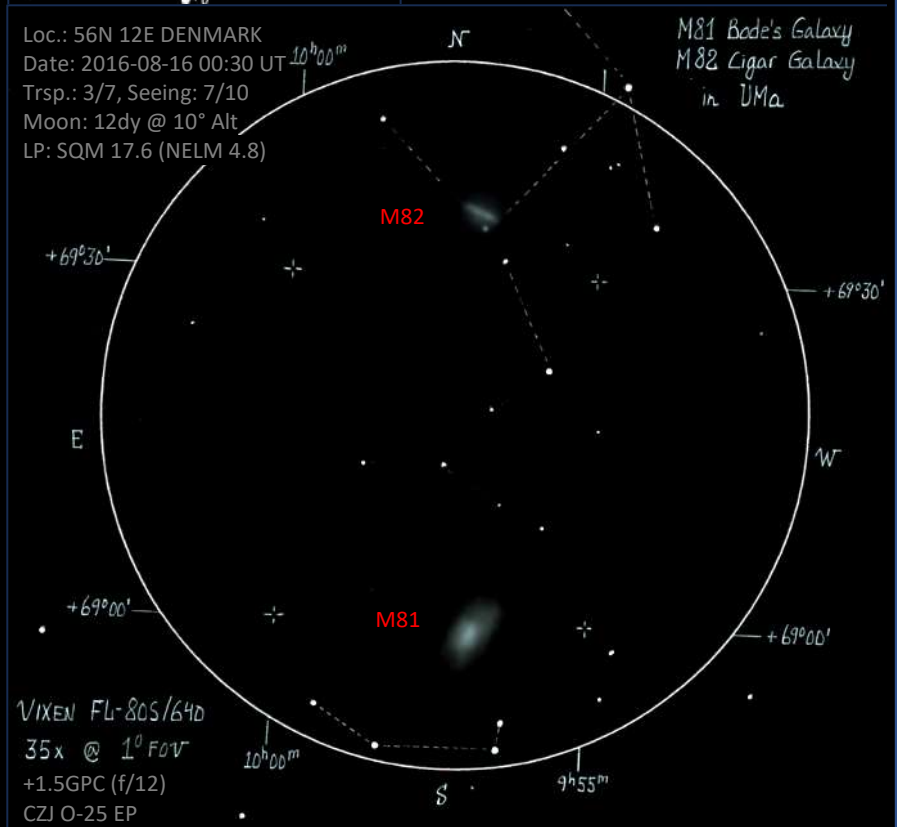


M81 Galaxy Group

It is just past midnight, local time, in early August. There's a thin high haze with a few passing bands of high cirrus and a 93% Moon at $\sim 10^\circ$ altitude to the S in *Sagittarius*. NELM is only 4.8^m, so pressing on with the Messiers in the southern *Milky Way* (as planned) is not a good idea.

Instead, I decide to aim my 80mm refractor N, at the **pair of Bode's (M81) and the Cigar (M82) galaxies** at $\sim 35^\circ$ altitude in *Ursa Major*.

Loc.: 56N 12E DENMARK
 Date: 2016-08-16 00:30 UT
 Trsp.: 3/7, Seeing: 7/10
 Moon: 12dy @ 10° Alt
 LP: SQM 17.6 (NELM 4.8)



M81 "Bode's" Galaxy, Ursa Major

The star hop is easy: following the line from *Nu* through *23 UMa*, and extending it the same distance (~4° NW) gets me to the triangle of *Rho* and *Sig 1-2 UMa*. A line through *Sig 1-2* extended 3° NE leads to another star triangle, including the 4.5^m *24 UMa*. The galaxy pair **M81/2** is found just 2° W of this triangle (corresponding nicely to the 1.7° FOV of my K-40mm EP @ 24x). M81 can just be glimpsed in my [10x56 bino](#).

M81 (Bode's Galaxy) shows up immediately in my finder eyepiece (24x @ 1.8° FOV, -- see previous drawing) as an obvious oval nebulosity, while **M82 (The Cigar Galaxy)** is harder to spot in this wide field view. I click up the magnification using my CZJ O-25mm for 38x @ 1° FOV; This nicely frames the pair of galaxies with the large bright oval of the face-on M81 elongated in an SSE-NNW direction to the south, and the considerably fainter light streak of the edge-on M82 now revealing itself as a narrow sliver of nebulosity elongated SSW-NNE to the north in the field.

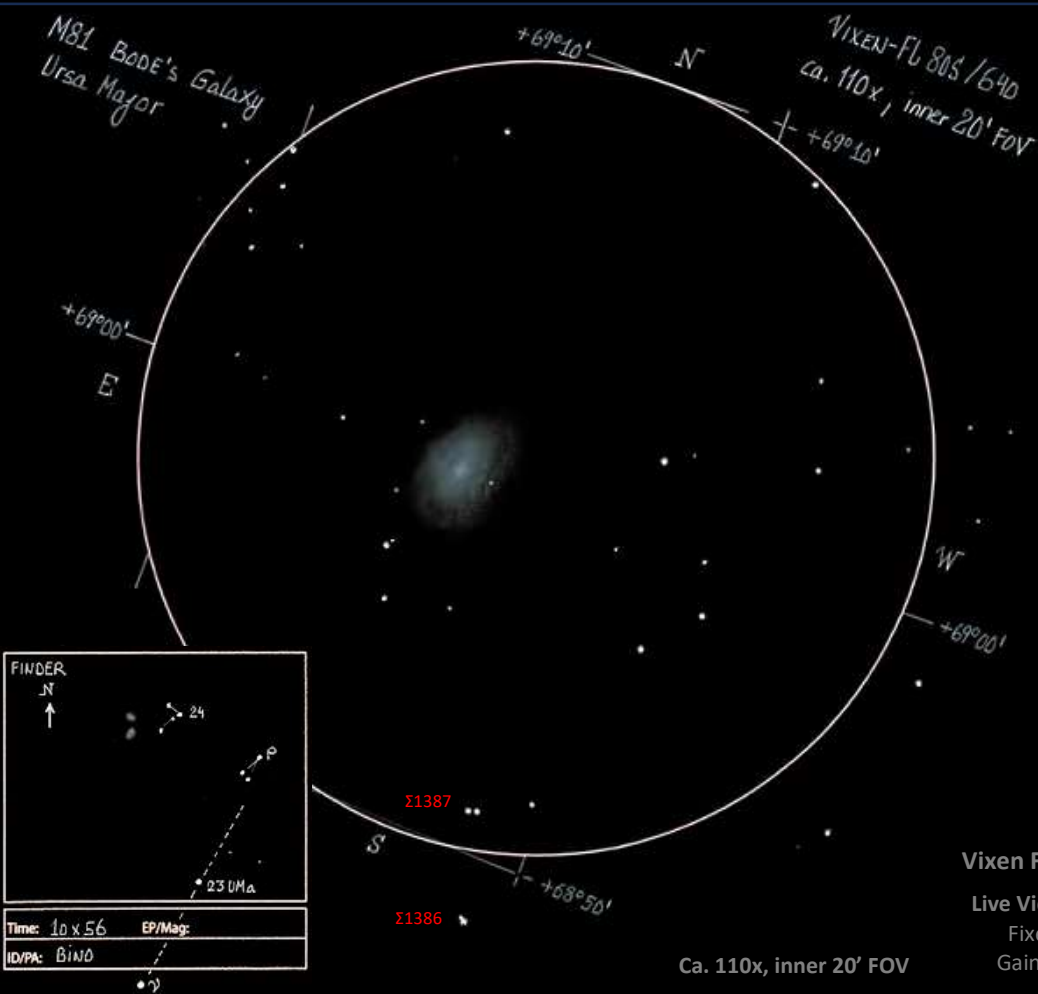
At closer study, the oval of M81 shows a gradual increase in brightness to a denser core area, with a not quite stellar core, while M82 remains featureless, apart from a slightly brighter central bar. I cannot see the two bright (~9^m) double stars to the SW of the core in M81 (Σ 1387 and Σ 1386).

M82 "Cigar" Galaxy, Ursa Major

Switching now to the [R2 ccd/lcd](#) (~110x @ 30' FOV) I get much more detail.

The stellar core of **M81** is seen at the center of a bright elongated nucleus, that fades in two steps to a larger (ca. 4') egg-shaped nebulosity. Any spiral structure or outer arms cannot be clearly seen, which I presume is due to the adverse transparency; However, the northern of the two bright double stars (Sigma 1387, Sep. 9.0" in PA 112°) south of M81 is nicely resolved into a pair of ~11^m components. The southern double (Sigma 1386, Sep. 2.1" in PA 271°) shows hints of elongation at moments, but no clear resolving.

In the R2, the "Cigar" shaped nebulosity of **M82** shows two bright central nuclei, separated by a darker dust band. The nuclei both show hints of finer structure. There's also a dark bay cutting into the SW part of the Cigar.



M81 Galaxy Group

M81 - M82 - N3077

3031 - N3034)

15x @ 2°FOV

N

2019-04-01, 23:00 CEST DST, UT+2

Temp: 2°C, Hum: 78%, DewPt -2°C

Trsp: 5-6/7, Seeing: 8-9/10

LP: SQM 19.6, NELM 5.8

Zeiss APQ 100/640, f/6.4
TV PAN 41mm Eyepiece
Baader Red 610nm longpass
NVD: PVS 14 w. Photonis 4G Intens
Gain: Medium-High
iPhone 5S w. NightCap 9.4
Exp 0.5s, Ave. 30s, ISO 1000

Tonight is 2019-04-01, 23:00 CEST DST UT+2, i.e., the first night in April this year, and we have moved from normal astronomical time to summer time (aka DST: "Daylight Saving Time"). The temp. is a fresh and cool 2°C, the humidity is relatively low ~78%, and the Dew Pt. is down at -2°C. The 11% - 26dy Moon is buried way down 48° below the N horizon, so the LP is quite good for my suburban backyard (NELM 5.8 - SQM 19.6). We're still in the wake of a weak high pressure, guiding clear polar air down over Denmark, resulting in another exceptionally transparent (5-6/7) and calm night (seeing 8-9/10). Such perfect DSO nights are rare at our latitudes, but hey! -- here is one...

E

M82

M81

N3077

N

W

Zoom-In



M81

M81 (NGC 3031 aka *Bode's Galaxy*) is a SA spiral with a bulge that is significantly larger than the one found in our *Milky Way*. The bulge has an active galactic nucleus (AGN) with a supermassive black hole $\sim 15x$ the mass of the black hole in our *Milky Way*. M81 is surrounded by two prominent spiral arms with large quantities of dust as well as starburst regions.

Observing M81, the large central bulge is evident, and already at 15x I can glimpse the pair of closely wound spiral arms. At higher resolution some small H-II regions should be visible in the spiral arms (position indicated on my snapshot), but I'm not able to spot these with the 610nm Longpass; Maybe I'll try later with a 12nm H α filter, but my guess is I'll need more aperture than my 4" for this. (A better option will probably be to do a live video observation of this object).

M82

Gravitational interactions of M81 with the smaller, surrounding NGCs in the group have stripped hydrogen gas from all galaxies into gaseous filamentary structures in the group. Some of this gas has subsequently fallen into the centers of M82 and NGC 3077, leading to vigorous starburst in these companions.

M82 (NGC 3034 aka the *Cigar Galaxy*) has been classified as an IO irregular, and I can see the bright starburst core divided in two by dark gas and dust filaments. Recent research has however shown M82 to be a nearly edge-on spiral galaxy with a bright central bar plus two spiral arms that both have a bright starburst knot at the point where they emerge from the bar; Looking for this morphology, I can indeed identify the bar plus the two knots where the arms connect to the bar, all embedded in the fainter glow of the pair of closely wrapped spiral arms. Interesting!

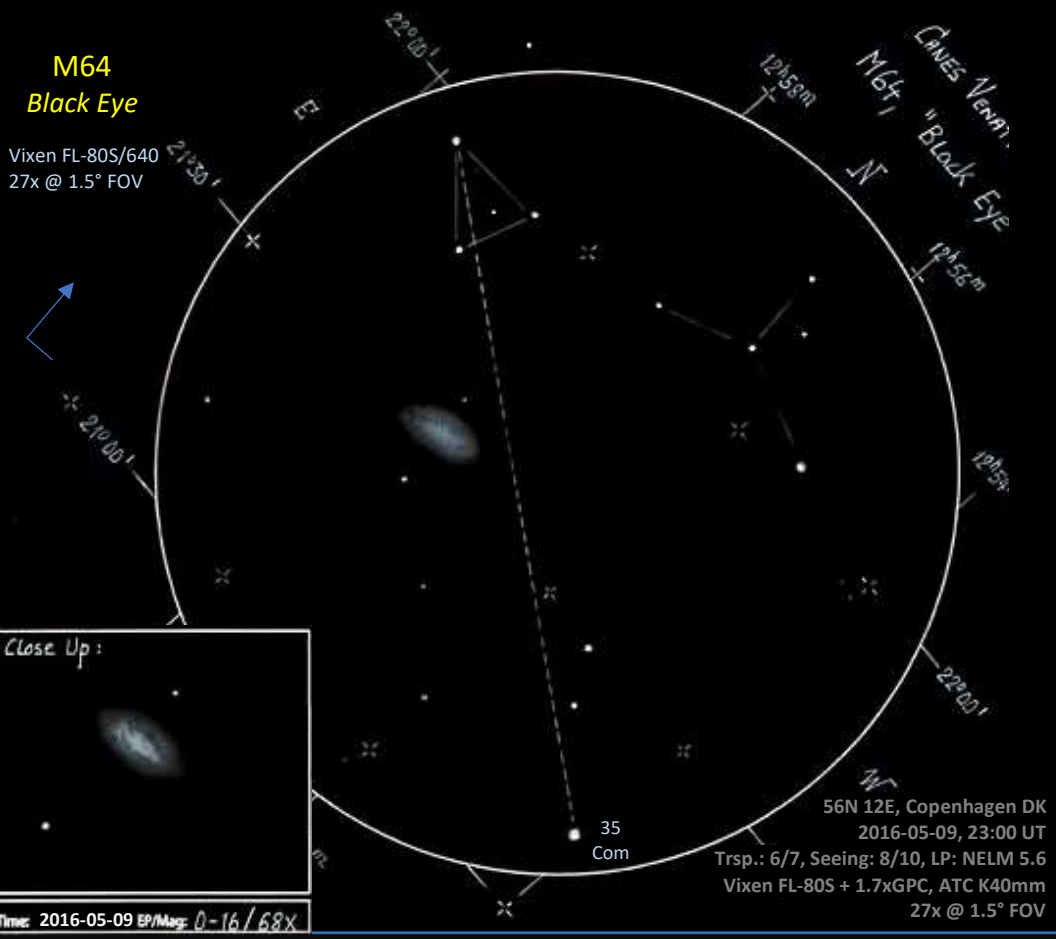


It's 01:00 local time at the start of May, and the transparency and seeing are both excellent this early morning, at least for my NELM 5.6^m suburban site; Yesterday I finished observing the galaxies in the distant *Virgo Cloud* (50-60 MLY away), and today I have set as my new target the Messier galaxies in our neighbouring cluster: *Canes Venatici I* (just 17 MLY from the Milky Way). **The M-objects in CVn-I comprises the two spiral galaxies : M64 (the Black Eye) plus M94 (the Croc's Eye).**

This morning I start with the southernmost CVn-I Messier galaxy: **M64 in Coma Berenices**. To locate it, I imagine a triangle from *Alpha COM*, E 2.5° to 36 COM, and then further up NE 2.5° to a small "Coat hanger" asterism. (The view from Alp COM to the Coma Coat hanger spans 5°, and can easily be held in the 8° FOV of my 8x30 Zeiss Bino).

Placing the Coma *Coat Hanger* in my 27x K-40mm eyepiece, I next move up N by one 1.5° FOV to the 5^m star 35 COM, and placing this star in the SW part of the field of view, I now clearly see M64 with direct vision as a nebulous spot towards the NE. Clicking up the magnification to 44x (O-25mm), I see an obvious E-W orientation (with a small N-S tilt) of the brighter, mottled core, and at 68x (O-16mm) I see the bright oblong nucleus inside a fainter hazy halo. The core seems a bit darker to the N.

M64 is a member of the CVn I galaxy subgroup, which also includes M94. M64 has a bright counter-rotating core, surrounded by absorbing dark clouds, that are tilted towards us (and thus visible as the "Black Eyelid" on the N side of the nucleus).

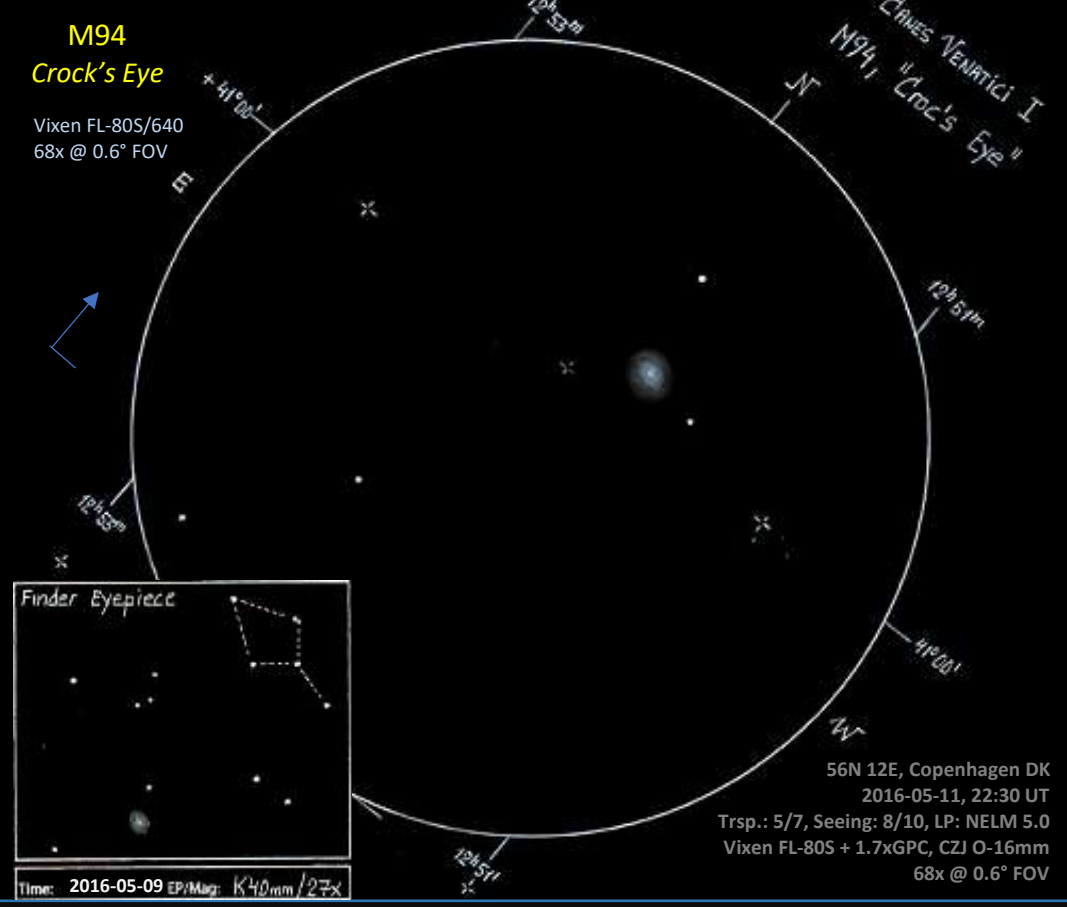


It's mid-May, just past midnight local time. There's a 4-day (13%) moon setting in *Cancer* beyond some trees on the W horizon. The night is calm, almost balmy, and with a NELM of 5.0^m it is reasonably dark for my suburban backyard. There's nothing to interfere with another DSO night, -- the last in a long row after high pressure weather has settled on Scandinavia.

My target for tonight is **M94, the "Croc's Eye" galaxy** (credit O'Meara) in Canes Venatici, which is soaring high up in the W, ca. 60° above the horizon. M94 is the other Messier object (together with M64) in the close by CVn-I Galaxy Group (also known as "The M94 Galaxy Cloud").

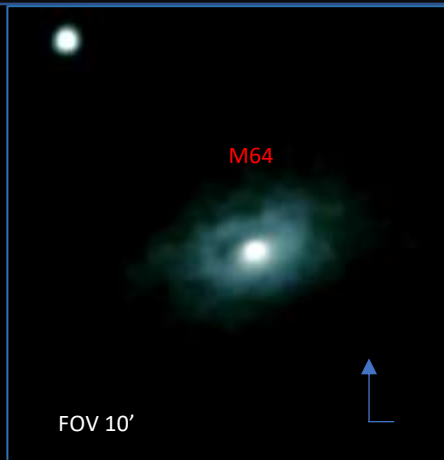
Finding M94 is easy : I first locate the 6^m star 10 CVn, just below the centre of the line from Alpha CVn (Cor Caroli) to Beta CVn (Chara); With 10 CVn in the centre of my K-40mm wide field EP (27x @ 1.5°) I then move the field up 2½° NNE, where I immediately identify M94 as a round nebula with a brighter core and a stellar condensation in the centre. The galaxy is found glowing below a nice kite asterism formed by 5 stars of ~8.5^m magnitude.

I click up the magnification, first to 44x (O-25mm), and notice that the galaxy itself is enclosed in an almost orthogonal triangle of fainter (10-11^m) stars. The galaxy is fairly bright, so I continue "zooming in", first to 68x @ 0.6° FOV (O-16mm). This seems to be a good magnification for framing M94, so I decide to use that for my drawing. At this magnification M94 is seen as a round, bright nucleus with a stellar core (using direct vision) and a fainter halo. At my next higher magnification (108x @ 0.5° FOV, using O-10mm) the galaxy is seen as a very nice "bull's eye" pattern of increasing brightness, which shows definite internal structure (using averted vision). What a wonderful sight!



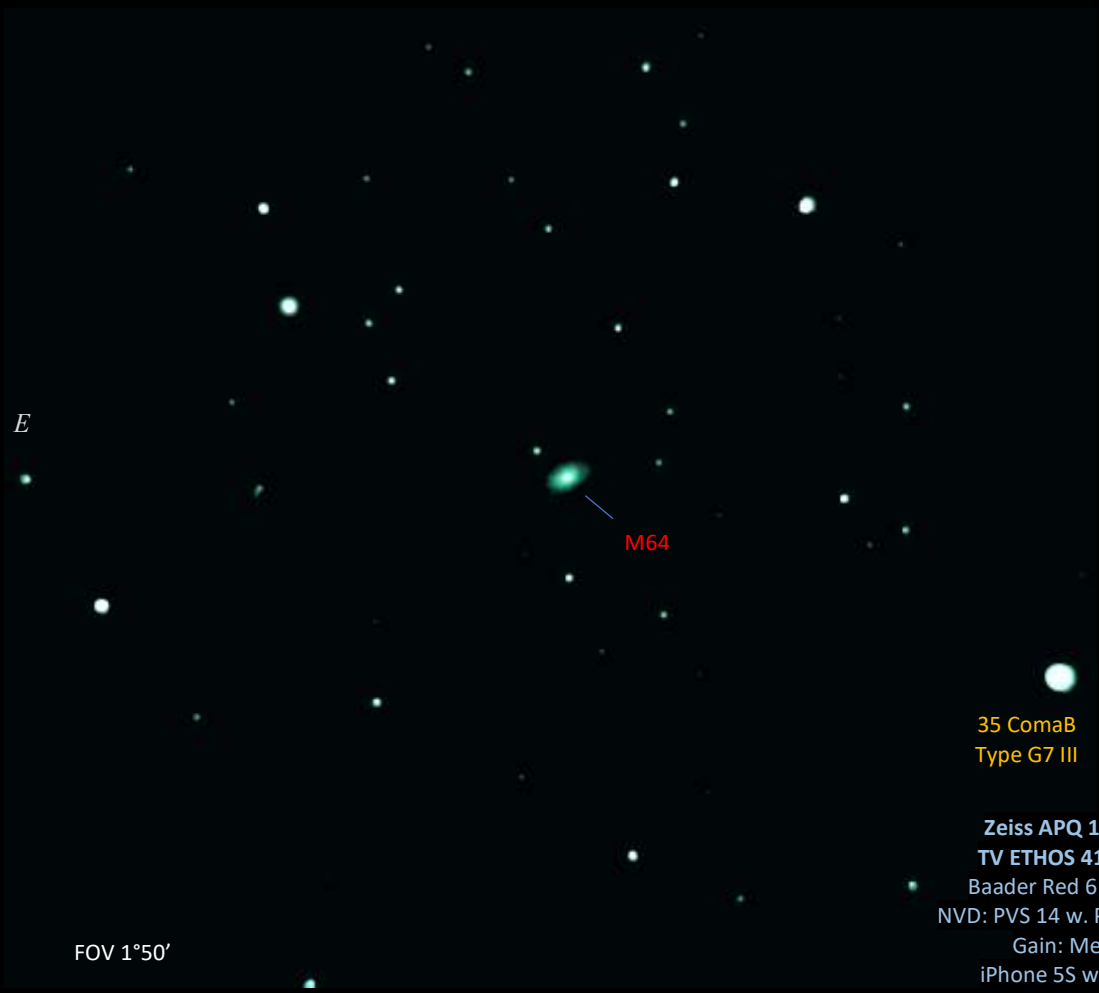
M64
Black Eye

2019-04-06, 23:45 CEST DST, UT+2
Temp: 7°C, Hum: 76%, Dew-Pt 3°C
Trsp: 3/7 mod haze, Seeing: 7-8/10
LP: SQM 19.0, NELM 5.5 @ zenith



M94
Crock's Eye

2019-04-06, 23:00 CEST DST, UT+2
Temp: 7°C, Hum: 76%, Dew-Pt 3°C
Trsp: 3/7 mod haze, Seeing: 7-8/10
LP: SQM 19.0, NELM 5.5 @ zenith



Zeiss APQ 100/640, f/6.4
TV ETHOS 41mm Eyepiece
Baader Red 610nm Longpass
NVD: PVS 14 w. Photonis 4G Intens
Gain: Medium-High
iPhone 5S w. NightCap 9.4
Exp 0.5s, Ave. 30s, ISO 1000

Messier 83 -- The Southern Pinwheel

It's a good hour past midnight in the middle of March (2019-03-19, 01:30 CEST, UT+1), and I'm out with my small 60/360mm finder scope for a wide field view of **M83 (NGC 5236)**, the *Southern Pinwheel galaxy*. M83 is a type SAB face-on spiral with three arms wrapped tightly around a nucleus featuring a weak stellar bar.

The conditions for DSO this early morning are actually quite bad: a 93% moon is blazing right above *Regulus* in Leo, and there's a mediocre 3-4/7 transparency due to condensing humidity in the atmosphere, accompanied by a few low, drifting *Stratus fractus* clouds. Since M83 is at only ~4° altitude right now, as seen here from 56° on the outskirts of Copenhagen (culminating due S in ½h at 4°20'), all the stars below 10° towards the horizon are drowned out by sky glow, and I have a hard time star hopping to the galaxy. With a 610nm red Longpass filter and my night vision monocular on top of the 55mm Plössl eyepiece, I do manage to pan from γ *Hya*, 5° SE to a line of ~6m stars curving south, and less than 1° E from the end of this line I finally identify the location of M83. -- One thing is identifying the location though; another is actually spotting the galaxy ...

After prolonged observation with shielded and averted eyesight, I do manage to catch a very faint undifferentiated, round hazy glow at the location of M83, so I count it as a positive observation of the object.

I take an iPhone snapshot of the view, and later I confirm the observation on a zoom-in of this image. -- I do hope to get a more detailed view of M83 under better observing conditions in the near future though.

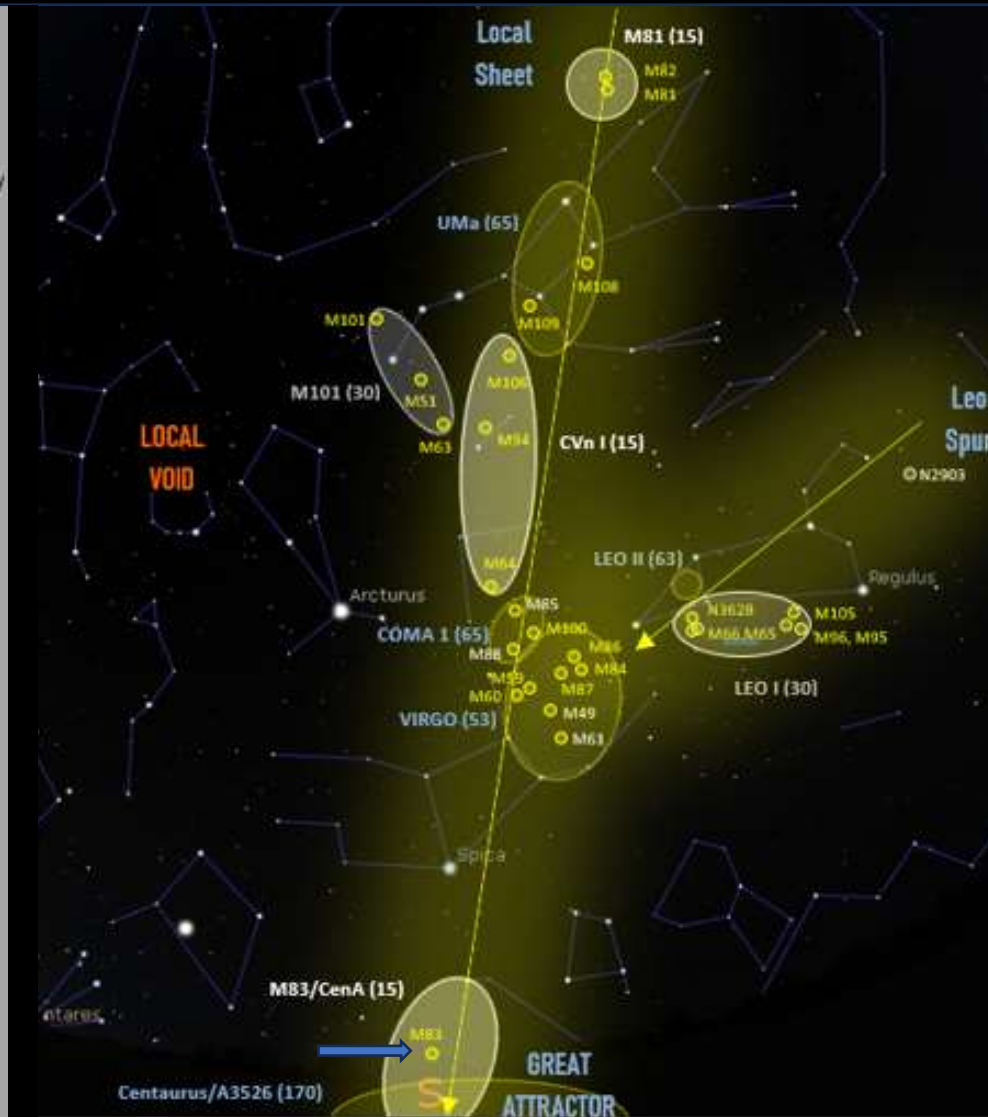
The M83 / Centaurus A Galaxy Group.

The Cen A group (with ~30 members @ 12 Mly) and the M83 group (13 members @ 15 Mly) are a binary group of galaxies to the S of the Virgo Cluster in the spring milky way of galaxies.

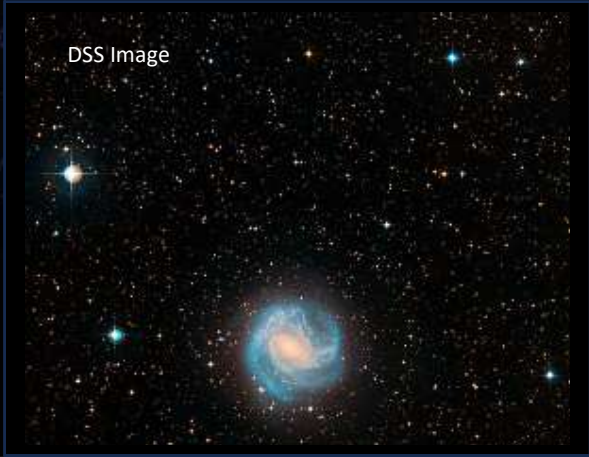
They M83/Cen-A assembly is relatively close to our local group, together with the CVn-I and the UMa M81/82 groups.

The M83 galaxy group members

PGC	SGY	Mpc
48029	ESO444-078	2.93
677373	PGC677373	2.19
47073	IC4247	2.77
166176	PGC166176	2.56
46885	PGC046885	2.51
166170	PGC166170	2.68
166163	PGC166163	2.54
48467	NGC5264	2.52
48368	IC4316	2.35
48111	ESO444-084	2.73
3097728	PGC3097728	2.78
48082	NGC5236	2.47
2802340	PGC2802340	2.36



TS 60/360 Refractor, 610nm red LP filter, TV 55mm EP
Photonis 4G Intens NVD, iPhone 5S + NightCap 9.4
1/8s Exp., averaged for 20s



Messier M83 (NGC 5236)

The Southern Pinwheel

SAB Spiral galaxy in HYDRA

6½x @ 4½° FOV

HD118349

TS 60/360 I/6 refractor
Baader 610nm red longpass filter
TV 55mm PLO EP
MVD: PVS 14 w. Photonis 4G Intens
Gain: Medium
iPhone 5S w. NightCap 9.4
Exp 0.5s, Ave. 20s, ISO 34

2019.03.19, 01:30 CEST, UT+1
Temp. 1°C, Hum: 89%, DewPt 0°C
Moon 93% close by in LEO
LP: SQM 18.7 (NELM 5.4) at zenith

N

E

SW

M83
Position

SE

ZOOM IN

M83

E