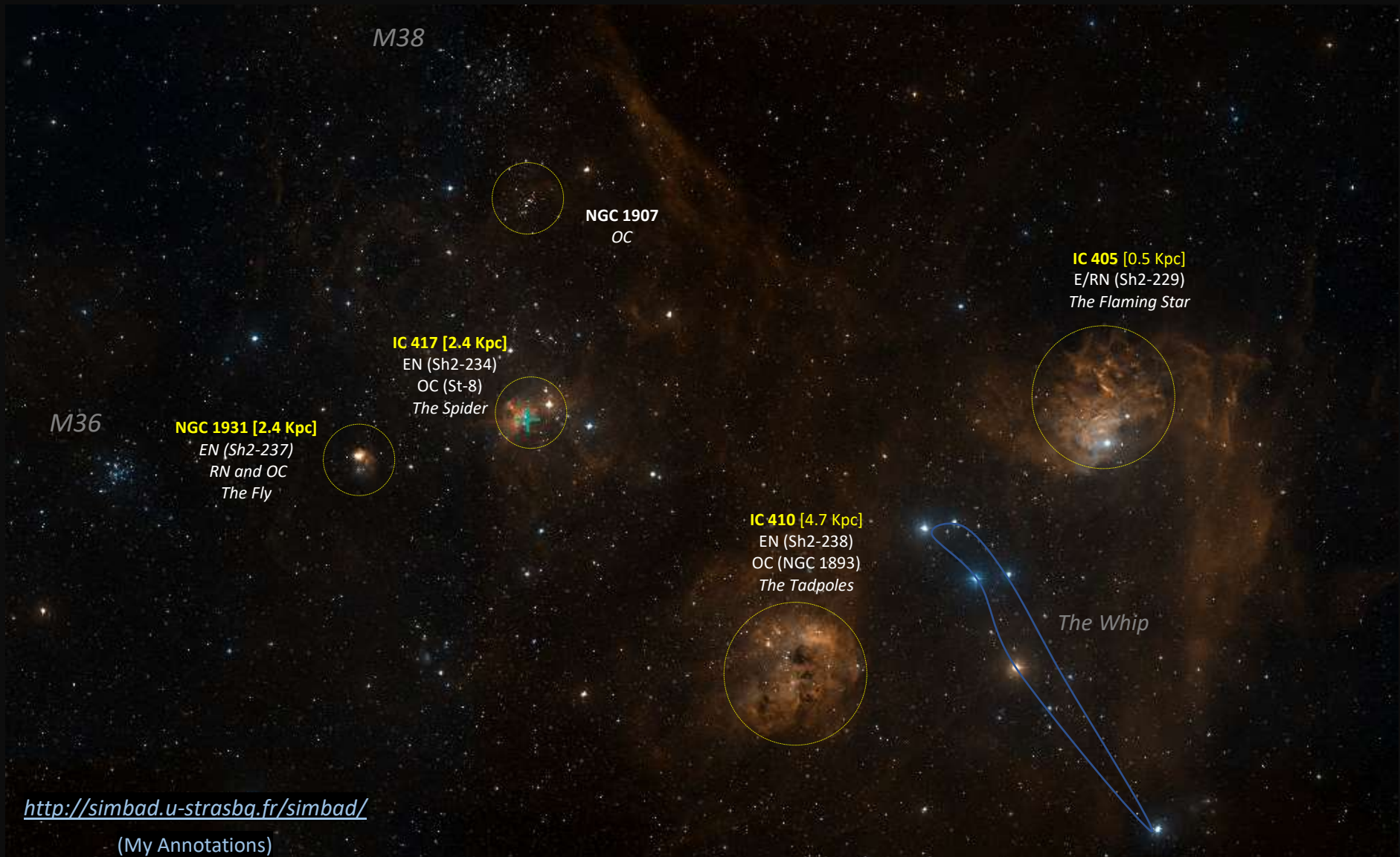


Auriga

√	NGC	RASC	SAC	CALD	HER-400	O-HT	O-SD	Season	Con	Type	R.A. H:m.s	DEC °'	m_v	Size "	Comment
√	I-2149						D027	W	Aur	PN	05:56.4	46.06	10.7	8,5	Bipolar PN, near Bet Aur, small 11m fuzzy *, 170x mag
√	1664				H056 (8,51)			W	Aur	OC	04:51.1	43.41	7.6	18	Meteor trail / Kite OC, near Eps Aur, >100*, use low power
√	1907		S007		H060 (7,39)			W	Aur	OC	05:28.0	35.19	8.2	7	30* mags ~9
√	I-0417						D022	W	Aur	EN/OC	05:28.1	34.26	8	13x10	# Spider EN/OC; S of M38, at Phi Aur; Stock-8 OC. See also NGC1931
√	I-0405			C031				W	Aur	E/RN	05:16.2	34.16	6	30x19	Flaming Star, at AE Aur; Binary runaway* with Mu Col (from I Ori)
√	I-0410							W	Aur	EN/OC	05:22.4	33.24	7.5	25x25	Tadpoles, Sh2-236 HII-nebula with NGC1893 OC,
√	1931	R024	S008		H061 (1,261)		D023	W	Aur	E/RN/OC	05:31.4	34.15	-	3x3	# Fly E/RN/OC, Small neb (Sh 2-237), tiny 4*OC; High Mag.; E of IC417



IC 2149 PN

A small (12') but **bright (10.6^m) planetary nebula**, relatively close by (~1.1 Kpc) in our Local spiral arm, looking out towards the galactic anticenter in *Auriga*.

Its progenitor was a solar type star (~1 solar mass), the remnant of which is now the 11.3^m type O7.5 hot central star in the ejected nebula. The PN is young (~7,000 yr) and shows a **bipolar structure** with a bright and dense edge-on ring embedded in an oblong shell with faint remnant bipolar lobes/ansae.

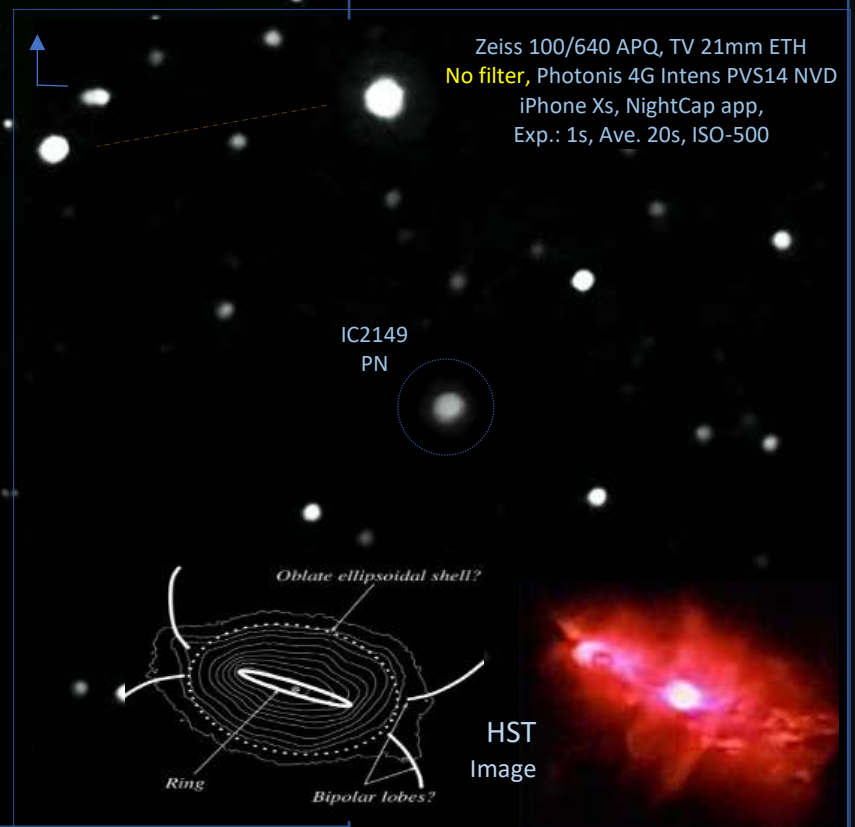
HST images shows a **bright eastern bow shock and a western knot**, both from a collimated bipolar jet.



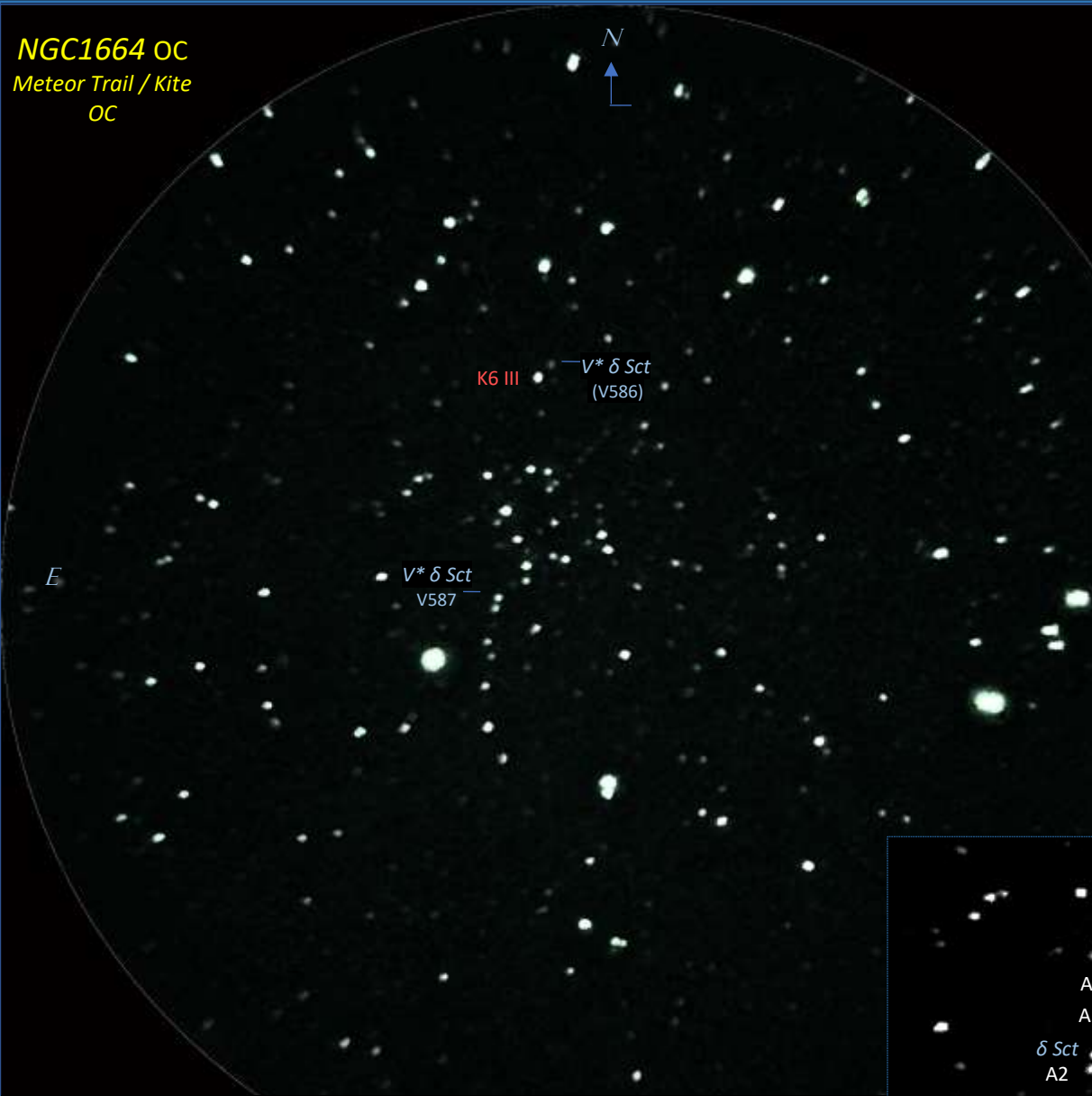
56N 12E, Copenhagen Denmark
2022-01-14, 19:30 Local (UT+1)

Zeiss 100/640 APQ, TV 41mm PAN
CLS-filter, Photonis 4G Intens PVS14 NVD
iPhone Xs, NightCap app,
Exp.: 1s, Ave. 15s, ISO-250

N
Zoom-In

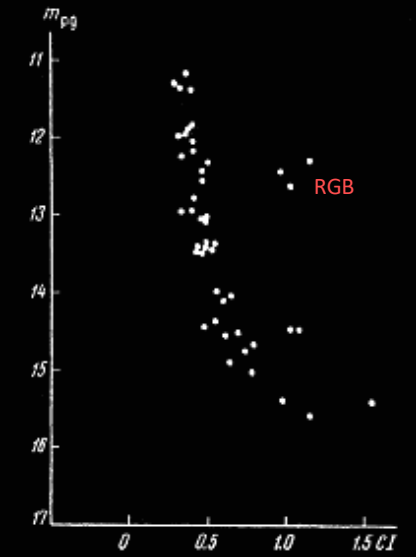


NGC1664 OC
Meteor Trail / Kite
OC



N1664 is a small, young (~300 Myr) OC found ~2° due W of ε AUR (one of the Auriga Kids); It is located at **1.2 Kpc in our local Ori-Cyg spiral arm** towards Auriga. The cluster contains ~100 stars, with the brightest ~30 members of ~11^m arranged in a delicate oval shape with a 'tail' trailing down south (hence: the *'Kite cluster'*). There's a 7.5^m type-B6V foreground star just E of the 'tail'.

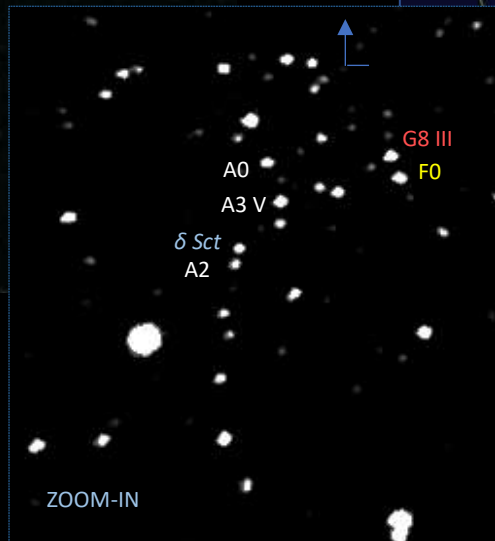
The cluster's integrated magnitude is 7.6^m with a spectral type of B8. I've indicated some of the **member star spectral types**, which range from white, early type-A to early type-F, with one type **G8 orange giant on the RGB**. The indicated stars V586 and V587 AUR are two short period pulsating delta-Scuti type variables caused by changing radiative opacity.



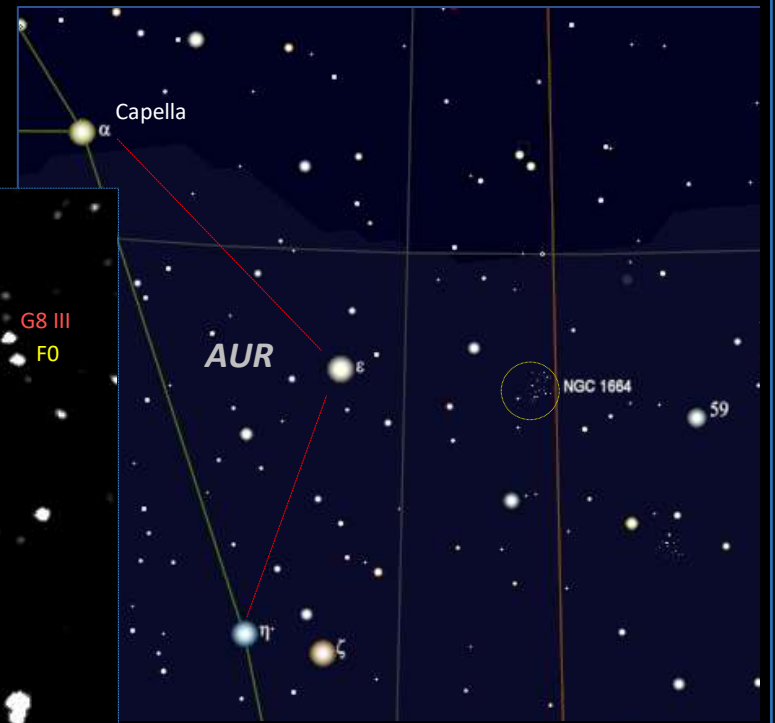
CMD of core members in N1664. The main sequence starts at ~11^m type B9-A0, and goes down to 14.5^m type-F. The CMD shows three stars of ~12.5^m on the RGB.

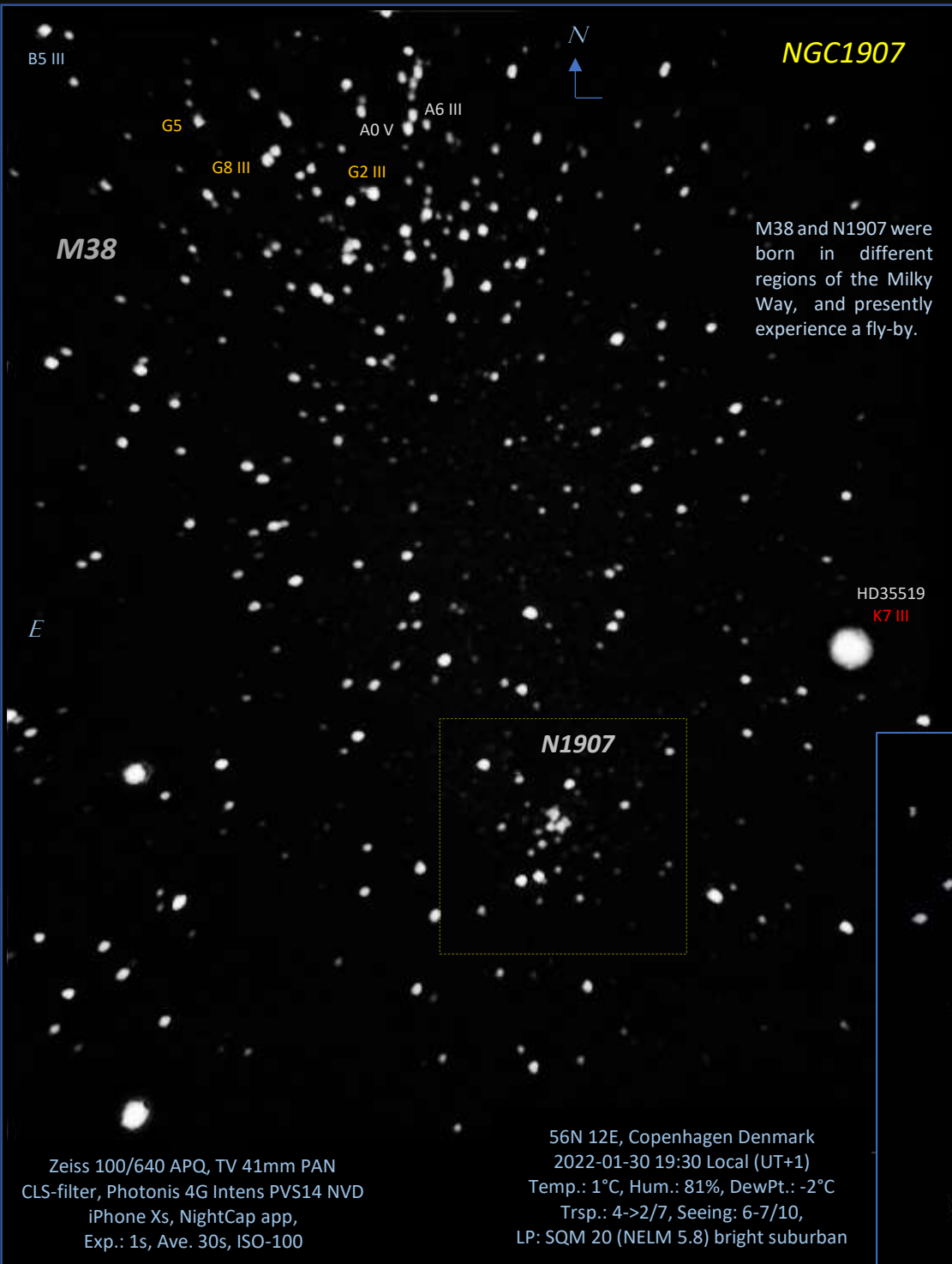
56N 12E, Copenhagen Denmark
 2022-01-30 20:00 Local (UT+1)
 Temp.: 1°C, Hum.: 81%, DewPt.: -2°C
 Trsp.: 4->2/7, Seeing: 6-7/10,
 LP: SQM 20 (NELM 5.8) bright suburban

Zeiss 100/640 APQ, TV 41mm PAN
CLS-filter, Photonis 4G Intens PVS14 NVD
 iPhone Xs, NightCap app,
 Exp.: 1s, Ave. 30s, ISO-160



ZOOM-IN





NGC1907

M38

M38 and N1907 were born in different regions of the Milky Way, and presently experience a fly-by.

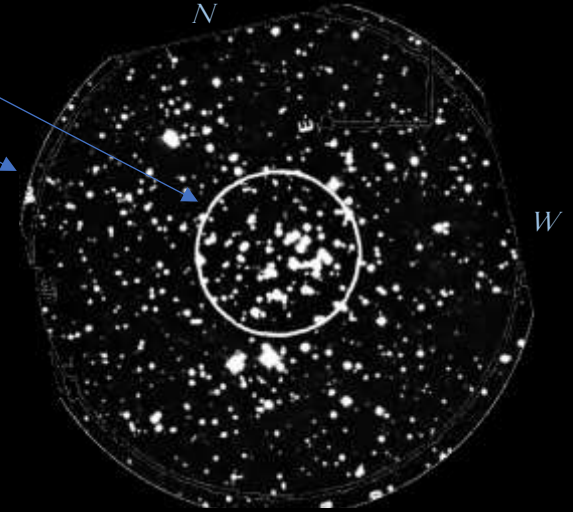
NGC 1907 is a ~400 Myr young OC located at 1.7 Kpc in the inner part of the Perseus spiral arm, looking out our galaxy in the direction of *Auriga*. There are two bright 10^m field stars to the south, below the OC, and the cluster itself is compressed with >100 member stars, the brightest of magnitude 12-14^m. The OC apparent size is 6' and the integrated magnitude is 8.2^m, with a spectral type of B3.

The nearby Messier M38 OC is at roughly the same distance as N1907, though the two clusters are physically unrelated, and N1907 at an age of 400 Myr is older and more distant than M38 (260 Myr and 1.4 Kpc). The CMD of N1907 is similar to that of M38, with some young PMS stars, but the majority of cluster stars now on the main sequence, and a few bright type-G giants having evolved off to the RGB.

N1907 has a small core of ~2' and a halo radius of 6'.

(Picture [Source](#))

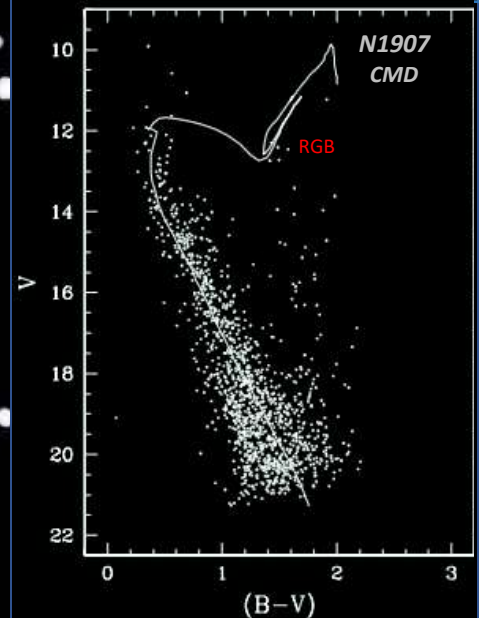
N1907 shows mass segregation with around ~30 stars of 11-12^m in the core.



N1907

N1907 ZOOM-IN

F2 OBe



Zeiss 100/640 APQ, TV 41mm PAN
 CLS-filter, Photonis 4G Intens PVS14 NVD
 iPhone Xs, NightCap app,
 Exp.: 1s, Ave. 30s, ISO-100

56N 12E, Copenhagen Denmark
 2022-01-30 19:30 Local (UT+1)
 Temp.: 1°C, Hum.: 81%, DewPt.: -2°C
 Trsp.: 4->2/7, Seeing: 6-7/10,
 LP: SQM 20 (NELM 5.8) bright suburban

IC 405 - Sh2-229

Flaming Star EN

[0.5 Kpc]

56N 12E, Copenhagen Denmark
2022-01-30 21:30 Local (UT+1)
Temp.: 1°C, Hum.: 81%, DewPt.: -2°C
Trsp.: 4->2/7, Seeing: 6-7/10,
LP: SQM 20 (NELM 5.8) bright suburban



Zeiss 100/640 APQ, TV 21mm ETH
6nm H α , Photonis 4G Intens PVS14 NVD
iPhone Xs, NightCap 9.9 app,
Exp.: 1s, Ave. 100s, ISO-5000

The hot tyoe-O9.5 runaway *AE Aur* is now ploughing supersonically through the interstellar gas towards the Auriga constellation, creating a heated bright **emission nebula (EN)** with a cometary **bow shock** (ram pressure confinement of the hot stellar wind, as it moves through the ambient medium) and waves of ionized gas intertwined with patches of darker dust, all surrounded by a fainter **reflection nebula (RN)** of dusty filaments illuminated by scattered starlight from *AE Aur*.

The two main H α regions: **filament A and B**, are created by erosion of the molecular cloud, as the strong UV field of *AE Aur* (HD 34078) is photoevaporating the carbonaceous grains and weakly shielded molecules in the ISM.

IC405 is a galactic diffuse nebula containing both emission- and reflection parts around the 6^m hot type O9.5 Ve irregular variable star *AE Aurigae*. The nebula is located close by in our **Local Ori-Cyg spiral arm at a distance of 0.5 Kpc**, looking out towards the Perseus arm.

AE Aur is a runaway star from a close encounter around 2.5 Myr ago between two binary systems in the *Trapezium* cluster in M42; The two lightest stars were flung out of M42 in opposite directions during this encounter: *AE Aurigae* (O9.5 V) plus *Mu Columbae* (O9.5 V), while the remaining two massive stars ended up as the binary giant *Iota Orionis* (O9 III + B0.8 III).



Zeiss 100/640 APQ, TV 21mm ETH
12nm H α , Photonis 4G Intens PVS14 NVD
iPhone Xs, NightCap 9.9 app,
Exp.: 1s, Ave. 60s, ISO-2500

IC 410 - Sh2-236

Tadpoles EN
N1893 OC



56N 12E, Copenhagen Denmark
2022-01-30 21:00 Local (UT+1)
Temp.: 1°C, Hum.: 81%, DewPt.: -2°C
Trsp.: 4->2/7, Seeing: 6-7/10,
LP: SQM 20 (NELM 5.8) bright suburban

IC 410 is an emission nebula (sh2-236) with an embedded open cluster (NGC 1893). It is located far away, in the outer galactic disc at 4.7 Kpc distance, beyond the Perseus Arm and out towards the Milky Way Outer Spiral Arm.

At the centre of IC 410 is seen the very young (1-2 Myr) open cluster NGC 1893 that contains ~20 relatively bright stars of 9-12^m, including a row of 5 massive and hot type-O main sequence stars, the brightest being the 8.7^m super-hot type-O4V star: HD 242908.

The stellar winds from the hot O-stars ionize and blow up the HII region Sh2-236, carving out hollows and sculpting streams of dust and gas, -- most prominent the two large "Tadpole" knots of denser and cooler gas in the nebula. The nebula condensations contain hundreds of Pre-MS YSOs and new-born low-mass stars.

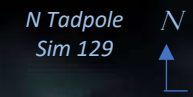
The Tadpoles



E

Zeiss 100/640 APQ, TV 21mm ETH
6nm H α , Photonis 4G Intens PVS14 NVD
iPhone Xs, NightCap 9.9 app,
Exp.: 1s, Ave. 120s, ISO-5000

NGC 1893
Zoom-In



The Tadpoles

S Tadpole
Sim 130

W

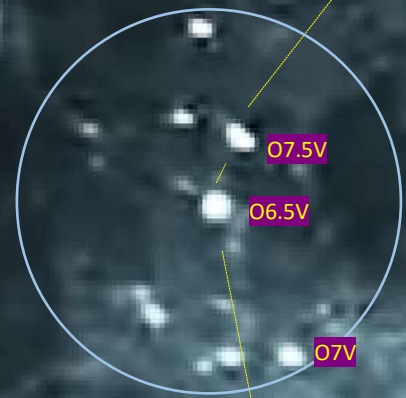
O4V
HD242908

O7.5V

O6.5V

O7V

O7V



56N 12E, Copenhagen Denmark
 2022-02-08 21:30 Local (UT+1)
 Temp.: 4°C, Hum.: 85%, DewPt.: 2°C
 Trsp.: 4->2/7, Seeing: 6-7/10,
 LP: SQM 20 (NELM 5.8) bright suburban

Zeiss 100/640 APQ, TV 41mm PAN
 12nm H α narrowband filter
 Photonis 4G Intens PVS14 NVD
 iPhone Xs, NightCap app v. 9.9
 Exp.: 1s, Ave. 15s, ISO-5000



IC 417 plus NGC 1931 is a pair consisting of an EN plus a small mixed EN/RN nebula, respectively, and both located east of the 5^m bright, type K3III orange giant Φ Aurigae. IC 417 is a large cloud of ionized hydrogen gas with streamers stretching up north and east, like the legs of a jumping *Spider* that is slowly sneaking up on a close by *Fly* (the small E/RN NGC 1931).

Both these objects have an age of ~ 10 Myr and are found at a distance of ~ 2.4 Kpc on the inner side of the Perseus spiral arm, looking out of our galaxy towards *Auriga*; And both nebulae contain at their centre a new born (~ 2 Myr) open cluster with many young stellar objects (YSO) and pre main sequence (PMS) stars, probably spawned by triggered star formation caused by stellar winds from their hot ionizing stars.

IC 417 has the young OC **Stock 8** embedded in the Sh2-234 EN; St-8 features one late type-O plus three early type-B stars as the main ionizing sources for the EN.

NGC 1931 is a mixed E/RN nebula + a cluster of 15 main sequence stars, including a pair of central hot type-B2 stars; The hot B-stars are ionizing the Sh-237 EN and have triggered the formation of many embedded YSO and PMS stars.

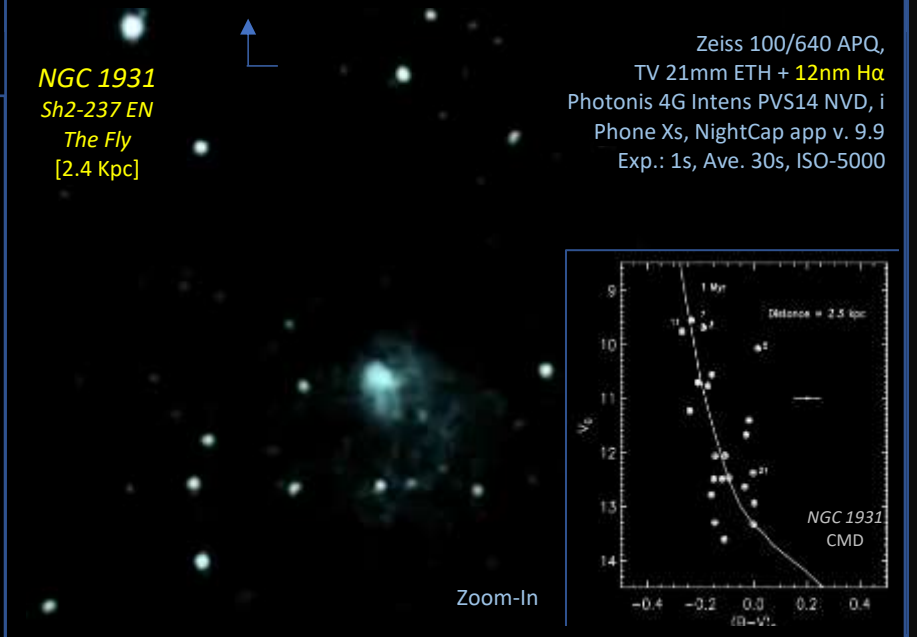
PS: Note that the nearby on the night sky **IC 405 (Flaming Star)** and **IC 410 (Tadpoles)** are **completely unrelated nebulae**,

- the first is associated to a foreground cloud in our Local Ori-Cyg spiral arm (0.5 Kpc), illuminated by the runaway star *AE Aur* that is believed to have been ejected from the Orion Cloud, and
- the second a distant object in the Outer Spiral Arm of the Milky Way (4.7 Kpc!).

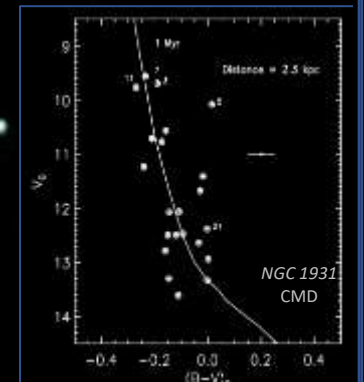
IC 417
 Sh2-234 EN
 The Spider
 [2.4 Kpc]



NGC 1931
 Sh2-237 EN
 The Fly
 [2.4 Kpc]

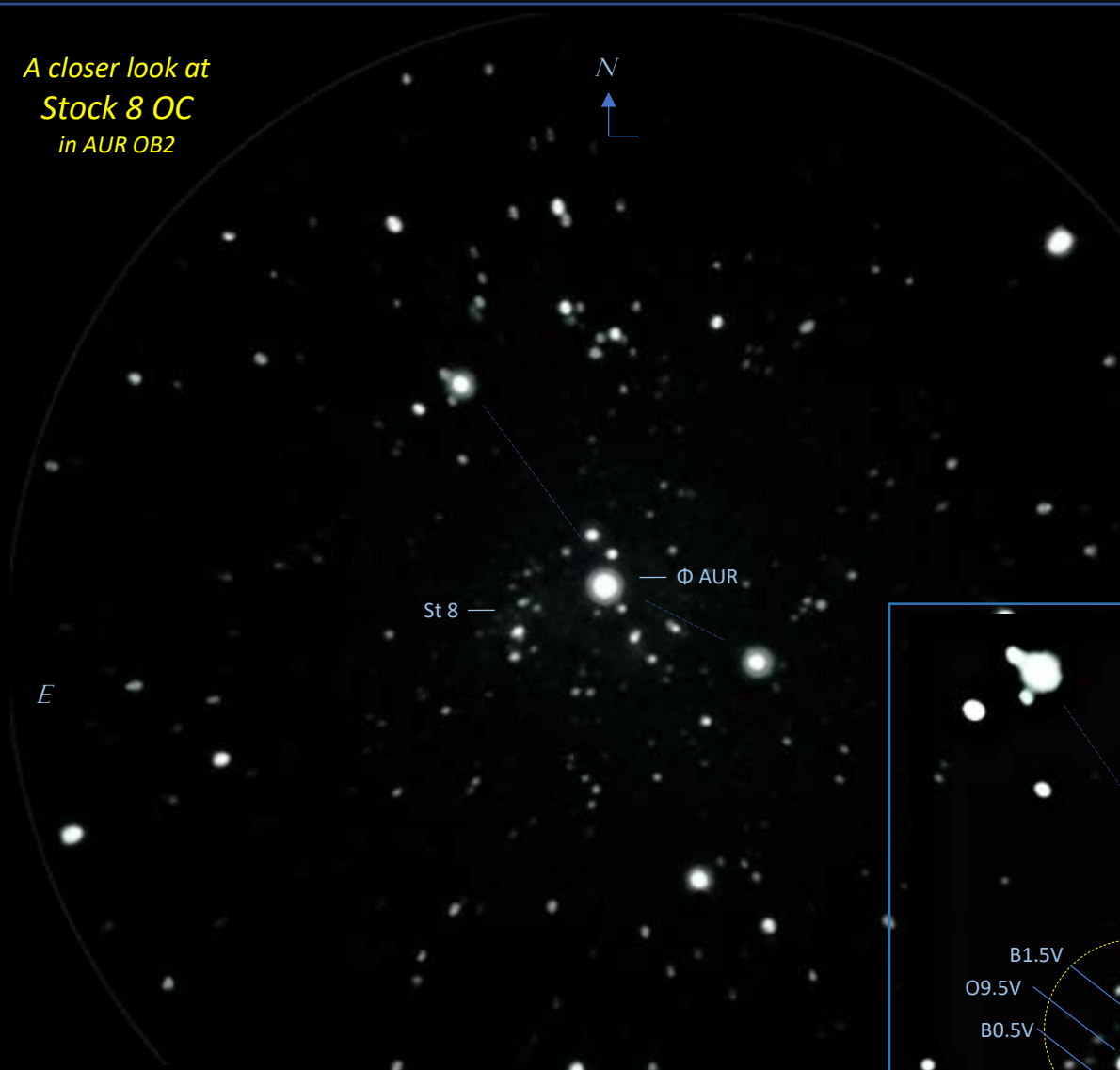


Zeiss 100/640 APQ,
 TV 21mm ETH + 12nm H α
 Photonis 4G Intens PVS14 NVD, i
 Phone Xs, NightCap app v. 9.9
 Exp.: 1s, Ave. 30s, ISO-5000



Zoom-In

A closer look at
Stock 8 OC
 in AUR OB2



56N 12E, Copenhagen Denmark
 2022-01-30 20:15 Local (UT+1)
 Temp.: 1°C, Hum.: 81%, DewPt.: -2°C
 Trsp.: 4->2/7, Seeing: 6-7/10,
 LP: SQM 20 (NELM 5.8) bright suburban

Zeiss 100/640 APQ, TV 41mm PAN
 CLS-filter, Photonis 4G Intens PVS14 NVD
 iPhone Xs, NightCap app,
 Exp.: 1s, Ave. 40s, ISO-80

Just SE of Φ AUR is the young (1-5 Myr) **open cluster: Stock-8**. This OC contains 9 early type-B main sequence stars, but SW of Φ AUR is also a group of 4 hot late type-O stars, that are ionizing the surrounding gas forming the **IC 417 (Sh2-234) emission nebula**. The nebula is an active star-forming region with many young stellar objects (YSO) of age 1-5 Myr, which clearly shows up on the colour-magnitude diagram (CMD) for the cluster.

There's a nebulous stream stretching from the embedded Stock-8 OC down SE, which seems to be a bright rim (ionization front) in the Sh2-234 gas cloud. The whole IC 417 complex is located at a distance of 2.5 Kpc in the Perseus spiral arm.

Aur OB2?

The classical definition of Aur OB2 includes the two main open clusters **Stock 8** (in IC417/Sh2-234) and **NGC 1893** (in IC410/Sh2-236). These two young open clusters are however NOT at the same distance, as Stock 8 is located in the Perseus arm, while the other major H II regions towards Auriga show quite different distances and radial velocities, with the **pair of small EN: IC 417 and NGC 1931 both at an intermediate distance of ~2.4 Kpc** in the Perseus Arm, while *the Tadpoles EN* is in 'a Kingdom far, far away' out in the Outer Spiral Arm at 4.7 Kpc (!) and *the Flaming Star EN* is a close by foreground object at 0.5 Kpc in our own Local Ori-Cyg Arm.

